REGULAR MEETING OF THE PLANNING BOARD
WEDNESDAY, JANUARY 22, 2020
7:30 PM
151 MARTIN STREET, CITY COMMISSION ROOM, BIRMINGHAM, MI

A. Roll Call
B. Review and Approval of the Minutes of the regular meeting of **January 8, 2020**
C. Chairpersons' Comments
D. Review of the Agenda

E. Community Impact Study Review

1. **35001 Woodward (Parking lots & Hunter House)** - Revised Community Impact Study Review to allow construction of a new 5 story mixed use building containing retail, office and residential uses

F. Special Land Use Permit Reviews

1. **34350 Woodward (previously 835 Haynes, Fred Lavery Porsche) & 907 - 911 Haynes (former Barda Salon Building)** - Amendment of Special Land Use Permit at 34350 Woodward to include the property at 907-911 Haynes to allow demolition of the existing Barda Salon Building and construction of a surface parking lot on 907 – 911 Haynes to provide additional parking for the Porsche dealership at 34350 Woodward

G. Final Site Plan & Design Reviews

1. **34350 Woodward (previously 835 Haynes, Fred Lavery Porsche) & 907 - 911 Haynes (former Barda Salon Building)** - Final Site Plan & Design Review for the entire site to allow demolition of the existing Barda Salon Building and construction of a surface parking lot on 907 – 911 Haynes to provide additional parking for the Porsche dealership at 34350 Woodward.
2. **501 S. Eton (Whistle Stop) -** Final Site Plan & Design Review for construction of rear addition to the existing building and changes to existing building
3. **1026 Canterbury Street (House) -** Design Review to consider installation of solar panels on roof of single family home
4. **1800 Pine Street (House) -** Design Review to consider installation of solar panels on roof of single family home

H. Preliminary Site Plan Reviews

1. **35001 Woodward (Parking lots & Hunter House)** – Revised Preliminary Site Plan & Community Impact Study Review to allow construction of a new 5 story mixed use building containing retail, office and residential uses

I. Pre-Application Discussion

1. **219 Elm Street (existing chiropractic office)**

Notice: Due to Building Security, public entrance during non-business hours is through the Police Department—Pierce St. Entrance only.
Individuals with disabilities requiring assistance to enter the building should request aid via the intercom system at the parking lot entrance gate on Henrietta St.

Persons with disabilities that may require assistance for effective participation in this public meeting should contact the City Clerk's Office at the number (248) 530-1880, or (248) 644-5115 (for the hearing impaired) at least one day before the meeting to request help in mobility, visual, hearing, or other assistance.

Las personas con incapacidad que requieren algún tipo de ayuda para la participación en esta sesión pública deben ponerse en contacto con la oficina del escribano de la ciudad en el número (248) 530-1800 o al (248) 644-5115 (para las personas con incapacidad auditiva) por lo menos un dia antes de la reunión para solicitar ayuda a la movilidad, visual, auditiva, o de otras asistencias. (Title VI of the Civil Rights Act of 1964).

J. Miscellaneous Business and Communications:
    a. Communications
    b. **Administrative Approval** Correspondence
    c. Draft Agenda for the next Regular Planning Board Meeting **(February 12, 2020)**
    d. Other Business

K. Planning Division Action Items
    a. Staff Report on Previous Requests
    b. Additional Items from tonight's meeting

L. Adjournment

CITY OF BIRMINGHAM
REGULAR MEETING OF THE PLANNING BOARD
WEDNESDAY, JANUARY 8, 2020
City Commission Room
151 Martin Street, Birmingham, Michigan

Minutes of the regular meeting of the City of Birmingham Planning Board held on January 8, 2020. Chairman Scott Clein convened the meeting at 7:30 p.m.

A. ROLL CALL

Present: Chairman Scott Clein; Board Members Stuart Jeffares, Bert Koseck, Daniel Share, Janelle Whipple-Boyce, Bryan Williams (left 7:32 p.m.); Alternate Board Members Jason Emerine, Nasseem Ramin

Absent: Board Member Robin Boyle

Administration: Jana Ecker, Planning Director
Nicholas Dupuis, City Planner
Nicole Ciurla, City Planner
Laura Eichenhorn, Transcriptionist

01-01-20

B. Approval Of The Minutes Of The Regular Planning Board Meeting of December 11, 2019

Motion by Mr. Williams
Seconded by Ms. Whipple-Boyce to approve the minutes of the Regular Planning Board Meeting of December 11, 2019 as submitted.

Motion carried, 5-0.

VOICE VOTE
Yeas: Share, Williams, Clein, Jeffares, Whipple-Boyce, Koseck
Nays: None
Abstain: Emerine, Ramin

01-02-20

C. Chairperson's Comments

Chairman Clein explained standard Planning Board meeting procedures and when the public would have opportunity to comment on items before the Board.

01-03-20

D. Approval Of The Agenda

There were no changes to the agenda.

01-04-20

E. Preliminary Site Plan Reviews

1. 770 S. Adams (existing office building) – Request for Preliminary Site Plan approval for construction of a new five story mixed use building in the MU3/MU5 zone of the Triangle District (Postponed from December 11, 2019).

Mr. Williams stated that his law firm, Dickinson Wright, represents MD Properties which owns the building immediately to the south of 770 S. Adams. He explained that in order to avoid any conflict of interest he would be recusing himself.

Mr. Williams departed the meeting at 7:32 p.m.

Planning Director Ecker presented the item.

In reply to Ms. Whipple-Boyce, Ross Hoekstra with McIntosh Poris Associates explained that they were not pursuing angled parking off of the alley per Ms. Kroll's recommendation because it takes up more space than the proposed parking design.

Ms. Whipple-Boyce noted angled parking could be a safety benefit by encouraging drivers to pull out and proceed in the correct direction down the one-way alley. She also noted that the plans as submitted provide for parking over the required amount, so that losing a few spaces in order to install angled parking should not necessarily present the applicant with an issue.

Michael Poris with McIntosh Poris Associates stated that angled parking would make those spaces inaccessible to cars entering the alley from N. Worth Street, since the alley is two-way until the last 40 feet closest to N. Adams Road.

Rick Rattner, attorney for the project, said he would like to be able to go before other City Boards with the Planning Board's opinion on the record regarding this project's alley-setback issue. He suggested that this alley should be treated as alleys are treated in the downtown district, with no sideyard setback required. Mr. Rattner asked that the required setback of the building be measured from the center of the alley instead. He explained that this project would greatly benefit the City in terms of helping develop the Triangle District, and that requiring the building to step back any further would be prohibitive to the building's development.

Seeing no further comment from the applicant team, Chairman Clein invited public comment.

Dr. Mitchell Shek spoke as one of the owners of Birmingham MD Properties, located at 800 S. Adams. He emphasized the importance of maintaining the parking lot's ingress, egress, and accessible parking for his practice's patients. He said he looked forward to working with the applicant team to make sure this is accomplished, and that he just wanted that information included in the public record.

Seeing no further public comment, Chairman Clein returned the discussion to the Board.

Mr. Share said it would be helpful to know where the one-way ends in the alley in order to determine the best parking configuration for the project.

Chairman Clein commended the applicant team on the changes made since the previous review of the project. He said his only concerns were making the direction of traffic within the alley clear and making the parking layout beneficial for visitors to both 700 and 800 S. Adams. He said that angled parking, per Ms. Kroll's and Ms. Whipple-Boyce's suggestion, could be a good way to achieve those goals.

Mr. Emerine said that determining where the one-way begins in the alley, where it ends, and whether those aspects would be best designated by striping, signage or both would be a matter for the City's Engineering Department to determine. He agreed that the angled parking could be a good idea and would likely cause the applicant to lose two of the currently laid out retail parking spots.

Planning Director Ecker noted that the Engineering Department provided comments on the project indicating their opinion that the entirety of the alley is one-way, and that traffic flows from east to west.

Chairman Clein suggested that since this was a preliminary site plan, the plan could be approved with requirements to further consider angled parking, to work with the site's neighbors on mutually beneficial parking designs, and to conform with the Engineering and Police Department comments related to the alley.

Mr. Emerine noted that the furthest west parking spaces, closest to the wall, would be difficult to pull into even if the current parking design were maintained. He also said that if a vehicle were proceeding the wrong way down the alley, and another vehicle were to back out of one of those spaces, it would have a high likelihood of resulting in a collision. He said, as a result, that even if the current perpendicular parking design were maintained he would likely request that the applicant remove one or two of those furthest west parking spaces. That would mean that the applicant faces a loss of two parking spaces whether they maintain the current parking layout or switch to the recommended angled parking.

Mr. Koseck said the angled parking spaces would likely increase the safety of parking and driving in the alley.

Chairman Clein spoke to Mr. Rattner's earlier question about the alley setback. Chairman Clein explained that in his work in Detroit his projects use the middle of the alley for calculation of the correct setback. He said in this particular case he had no concerns with regard to the layout of the setback, that it is an example of fine urban planning, and that he would be pleased to see the project moved forward with that consideration.

Mr. Emerine echoed Chairman Clein's comments, saying that cities like Ferndale and Northville do the same thing for calculating setbacks on alleys, and that measuring from the middle is a pretty standard way of doing so.

Mr. Poris asserted that the ordinance says that frontage on a right-of-way determines a front yard which results in a different setback calculation than a side yard designation. He said the frontage on the alley in this case should result in a front yard setback.

Motion by Mr. Share
Seconded by Ms. Whipple-Boyce to approve the Preliminary Site Plan Review for 770 S. Adams with the following conditions: 1. Revisions to the south side setbacks of the building or removal of windows within 10' of the property line, or obtain a variance from the Board of Zoning Appeals; 2. Correction of all site, landscape, elevations, streetscape and engineering plans showing consistency on all, and demonstrating that all zoning requirements have been met; 3. The addition/clarification of 43 bike racks on site; 4. A photometric plan and material samples and specifications will be required at Final Site Plan and Design Review; 5. Compliance with the requirements of all departments; and, 6. The conversion of parking spaces fronting on the alley to be angled so that the front of the vehicle would be facing northwest.

Mr. Share added that if the motion passes it should be clear that the Planning Board sees the project as worthwhile, and the minutes should accurately reflect that for the benefit of the Board of Zoning Appeals.

Motion carried, 7-0.

VOICE VOTE
Yeas: Share, Whipple-Boyce, Clein, Emerine, Jeffares, Koseck, Ramin
Nays: None

01-05-20

F. Study Session Items

1. 2019 Administrative Approval Report

Planning Director Ecker presented the item.

Chairman Clein invited the Planning Department to keep the Planning Board updated on any frequently appearing administrative approval matters that would be worth further Planning Board discussion.

Planning Director Ecker confirmed that, when they arise, frequently appearing matters are brought to the attention of the Planning Board for potential future discussion, such as the issue of solar panels which will be discussed by the Board later this evening.

2. Master Plan Review Process Update

Planning Director Ecker presented the item. She explained that the City Commission approved the proposal as submitted with the exception that the schedule would start in February 2020, and not January 2020. She stated that in December 2019 the City Commission approved the expenditure of up to $28,600 for additional public engagement activities. That figure included the potential for two different round-table discussions, a drop-in clinic, and two additional short surveys. Should the Board want to pursue any of those options, they would make a recommendation to the City Manager who would disburse the requisite funds should he approve of the recommendation.

Planning Director Ecker said the scheduled Planning Board master plan discussions would be publicized on the City's website, the Master Plan website, and all City social media channels. Sarah Traxler, one of the local members of the Master Plan team, would likely be attending each meeting and giving a presentation of the evening's master planning topic. Those presentations would also be included in the Planning Board's agenda packets the Friday before their Wednesday meetings in order to afford both the public and the Board members time to review the topic. Robert Gibbs, another local member of the Master Plan team, would likely also be present at the meetings.

Planning Director Ecker said that between sessions she would collect any master plan comments submitted to the Planning Department and include them in the agenda packet for the next scheduled master plan meeting so that the Board would have an opportunity to review those as well.

3. Solar Panel Review Process

City Planner Dupuis presented the item.

Mr. Emerine noted that on page 620 of the Planning Board's agenda packet, 4.88 B said 'wind' when it should read 'solar'.

City Planner Dupuis agreed and said he would make the change. He further explained:

- Ancillary solar panel equipment is very small and would be mounted to the wall of whatever building is using it. He said it would be visually unobtrusive and that he had not come across any information on undue noise production by the equipment. He said he would bring the spec sheets for the ancillary equipment to a public hearing once scheduled which would provide both the Board and the public with more information on the items.
- He would clarify the suggested language to explain that the 40 square foot limit on a solar panel system counts all connected panels as part of one system. Since the average solar panel is three-and-a-half feet by five feet, he recommended the 40 square foot limit in order to allow two average-sized solar panels. City Planner Dupuis said he provided the 40 square feet to begin the conversation, and also proposed the number because he was unsure whether it would be appropriate in a residential setting to have more than 40 square feet of solar panels. He noted that some other cities restrict solar panels to occupying no more than a certain percentage of a given lot.

- Ground mounted solar panels could enable residents who do not want to mount panels on their roof to still have access to some solar power. Ground mounted solar panels would also allow businesses to use solar-powered trash compactors.

Ms. Whipple-Boyce said that she did not yet know enough about ground-mounted solar panels, but that if the City proceeded toward allowing them she would prefer that their allowable yard coverage be calculated by percentage and not by a set amount. She also told City Planner Dupuis that there had been a conversation regarding wind energy facilities about ten years hence, and that if he could find the minutes from that conversation it might help provide some useful information on the topic.

Mr. Koseck said the Board might want to consider not allowing solar panels at grade because it could encourage residents to do away with any greenery that could get in the way of the panels. He also said that 40 square feet of solar panels on the ground might not be enough to generate a worthwhile amount of energy. Mr. Koseck added that solar panels are impervious which would also raise ordinance issues in terms of ground cover. Since most people would likely rather not install solar panels at grade anyways, Mr. Koseck said he would just as soon prohibit it to avoid these issues since the potential environmental gain would likely not be significant in those cases.

Mr. Jeffares echoed Mr. Koseck's concerns about ground mounted solar panels and said he would prefer to continue studying that possibility and whether it would be worthwhile.

Ms. Ramin noted that on page 625, in section G, the phrase "If a wind energy facility has not been removed within 30 days a deadline specified by the City" would need to be clarified.

Mr. Share noted that on page 621, Item F, the word should be 'complemented', not 'complimented'. He agreed with Mr. Koseck and Mr. Jeffares that ground mounted solar panels were likely not necessary to pursue at this time.

Chairman Clein expressed agreement with Mr. Koseck, Mr. Jeffares, and Mr. Share regarding ground mounted solar panels.

In reply to Chairman Clein, City Planner Dupuis said he would do more research on the benefits and drawbacks of the anti-reflective coating some other cities' ordinances require for solar panels.

4. Glazing Standards

City Planner Dupuis presented the item.

Mr. Koseck said he had a list of two or three people he would be reaching out to soon who might be able to contribute meaningfully to the glazing standards conversation. He said that once he had done that he would loop City Planner Dupuis in as appropriate.

Chairman Clein explained that in February 2020 and April 2020 there will only be one Planning Board meeting per each month and that both of those meetings are dedicated to master plan discussion. He suggested that Board members look at their calendars to see if a special meeting could be scheduled to wrap up some of these other study session topics. He added that even if

the Board moved forward with a resolution on this item during the present meeting, due to noticing requirements the public hearing would not occur until the second meeting in March 2020. Chairman Clein recommended the Board take the time to do adequate research, as a result, before moving further forward on this.

Mr. Emerine suggested it might be worthwhile to speak with glass contractors in addition to glass vendors in order to get more insight.

Planning Director Ecker said she would recommend reaching out to a mechanical engineer, a glass vendor or supplier, and a glass contractor or installer.

City Planner Dupuis confirmed he would reach out to people who work with glass regularly in architectural settings and would return to the Board with further information.

01-06-20

G. Miscellaneous Business and Communications:

a. Communications

b. Administrative Approval Correspondence

c. Draft Agenda for the next Regular Planning Board Meeting (January 22, 2020)

- Whistle Stop Design Review
- 35001 Woodward - Amended CIS and Amended Preliminary Site Plan
- Fred Lavery Porsche SLUP
- Two small solar panel items

d. Other Business – Discuss amending Rules of Procedure for January 22, 2020 meeting

Motion by Ms. Whipple-Boyce
Seconded by Mr. Share to amend the Rules of Procedure for the Planning Board's January 22, 2020 meeting to allow for the review of the above items as described by Planning Director Ecker.

Motion carried, 7-0.

VOICE VOTE
Yeas: Whipple-Boyce, Share, Emerine, Clein, Jeffares, Ramin, Koseck
Nays: None
Abstain: Emerine, Ramin

01-07-20

H. Planning Division Action Items

a. Staff Report on Previous Requests
b. Additional Items from tonight's meeting

01-08-20

I. Adjournment

No further business being evident, the Chairman adjourned the meeting at 9:11 p.m.

Jana L. Ecker

Planning Director

City of Birmingham
A Walkable Community

MEMORANDUM

Planning Division

DATE: **January 17, 2020**

TO: **Planning Board Members**

FROM: **Jana Ecker, Planning Director**

SUBJECT: **35001 & 35075 Woodward – The Maple – Community Impact Study & Revised Preliminary Site Plan Review**

I. INTRODUCTION

The subject site, 35001 - 35075 Woodward Avenue, is currently home to the Hunter House restaurant, a City owned parking lot and vacant land currently leased to the city for public parking, and has a total land area of 0.5 acres. The property is located on the west side of Woodward (southbound), and surrounded by four streets: Maple, Park, Hamilton Row, and Woodward. The applicant previously submitted a Community Impact Study and Preliminary Site Plan Review for this site in 2018. At that time, a five story building was proposed with first floor retail, a hotel use, and residential units on the top floor.

On January 9, 2019 the Planning Board voted to ACCEPT the Community Impact Study as provided by the applicant for the proposed development at 35001 & 35075 Woodward, The Maple, with the following conditions:

1) Applicant must provide a City-approved special event operations plan at the same time as completing the Final Site Plan Review process;
2) Applicant must provide mitigation strategies for control of noise vibration and dust;
3) Applicant will be required to bury all utilities on the site;
4) Applicant must distinguish an area for the separation and storage of recycling;
5) Applicant must conform to the streetscape design as outlined in the new E. Maple Rd. streetscape project;
6) Applicant provide information on all life safety issues and Fire Dept. approval, as well as details on the proposed security system provided to and approved by the Police Dept.;
7) Applicant must address the concerns of all City Depts.

On May 22, 2019, the Planning Board voted to APPROVE the Preliminary Site Plan for the proposed development at 35001 & 35075 Woodward, with the following conditions:

1) The applicant must clarify which refuse areas the two proposed retail uses are permitted to use, and the accessibility of such;

2) Submit specification sheets for the proposed ground mounted and rooftop mechanical units to ensure full screening;
3) Add the correct number of street trees to each street frontage, or obtain a waiver from the Staff Arborist;
4) The applicant must provide the correct number of street lights and provide regular spacing of such by Final Site Plan Review;
5) Submit a photometric plan and specifications on all proposed lighting;
5) The applicant must reduce the width of the garage entry on the west elevation or obtain a variance from the Board of Zoning Appeals;
6) Submit material samples, colors, and specifications as well as details on any proposed signage;
7) Applicant comply with the requests of all City Departments;
8) Applicant obtain approval of a lease agreement by the City Commission for all projections and /or encroachments on City property;
9) Applicant revise plan sheets as necessary to ensure all sheets are consistent and show the required property lines and clearly note all projections / encroachments across property lines; and
10) At Final Site Plan Review, the applicant must provide the Special Event Operations Plan for the said hotel.

However, since the Community Impact Study and Preliminary Site Plan were approved by the Planning Board in 2019, the applicant has made significant changes. Instead of a hotel, the applicant has now revised the plans and is proposing to construct a five-story mixed use building containing retail, office, residential and parking uses. The building will provide two levels of underground off-street parking, first floor retail, commercial and parking, second floor office use, with the third to fifth floors containing 42 residential units. Parking for the residential units, and parking for a portion of the retail and office areas will be provided below grade in the two level underground parking garage. A small additional parking area is provided on the first level. However, as the building is located within the Parking Assessment District, no on-site parking is required for retail, commercial or office uses.

The Downtown Birmingham 2016 Master Plan suggests several specific projects for Birmingham's Downtown, including the Maple Gateway. The Maple Gateway, which was formerly a pair of gas filling stations, was recommended to contain two reciprocal buildings of similar height and massing, and to achieve architectural syntax to complete a gateway to the Central Business District. The proposed development would complete the Maple Gateway.

II. COMMUNITY IMPACT STUDY

The applicant was required to prepare a Community Impact Study given the size of the proposed development. The Zoning Ordinance recognizes that buildings of a certain size may affect community services, the environment, and neighboring properties. The CIS acts as a foundation for discussion between the Planning Board and the applicant, beyond the normal scope of information addressed in the preliminary site plan review application. The Planning Board "accepts" the CIS prior to taking action on a Preliminary

Site Plan. The applicant has now submitted a revised CIS based on the changes made to the proposed building since 2019. **However, the Table of Contents listed on page 3 of the CIS lists some items that did not appear to be included in the CIS, including the Phase I and II Environmental Reports and details on the proposed security system for the building.**

A. Planning & Zoning Issues:

Use

The property is currently zoned B-4 and D-4 in the Overlay District. The proposed commercial, hotel, and residential uses are permitted principal uses in the B-4 and D-4 zone districts.

Master Plan Compliance: Downtown Birmingham 2016 Plan

Article 3, section 3.01 of the Zoning Ordinance states that the purposes of the Downtown Birmingham Overlay District are to:

(a) Encourage and direct development within the boundaries of the Overlay Zoning District and implement the 2016 Plan;
(b) Encourage a form of development that will achieve the physical qualities necessary to maintain and enhance the economic vitality of downtown Birmingham and to maintain the desired character of the City of Birmingham as stated in the 2016 Plan;
(c) Encourage the renovation of buildings; ensure that new buildings are compatible with their context and the desired character of the city; ensure that all uses relate to the pedestrian; and, ensure that retail be safeguarded along specific street frontages; and
(d) Ensure that new buildings are compatible with and enhance the historic districts which reflect the city's cultural, social, economic, political, and architectural heritage.

The proposed development implements many of the recommendations contained in the Downtown Birmingham 2016 Master Plan ("2016 Plan") as the applicant is proposing a mixed use building with first floor retail space and is congruent with Article 3, section 3.04(A) which states that "All buildings containing a fifth story should be designed harmoniously with adjacent structures in terms of mass, scale and proportion, to the best extent possible." The new structure will link together with the Greenleaf Trust building, filling a void of unused space, which will solidify the Maple Gateway envisioned in Specific Project 8 of the 2016 Plan.

In addition, the DB 2016 Report encourages four or five story buildings in this part of the Overlay District and states that "Traditional American cities, except the very largest, rarely exceed five stories in building height and most commonly range from two to four stories. Downtown Birmingham adheres to this rule, with the most memorable streets tending to be at least two stories and the least

memorable being mostly one story". The Planning Division finds that the proposed five story building does meet the spirit and intent of the 2016 Plan as it does create a continuous and harmonious façade along Woodward Avenue and Maple, creating the Maple Gateway. The proposed development also provides retail on the ground floor with access from Woodward and Park.

The proposed development and its uses relate to the pedestrian, as the building is located at the property line and is proposed with human scale detailing on the first floor, including canopies, large windows, attractive stone and masonry facades, and elegant pedestrian entrances from adjacent streets. The 2016 Plan encourages proper building mass and scale to create an environment that is more comfortable to pedestrians creating a walkable downtown. The proposed development will help improve the visual appearance of the area, by creating a denser, more compact development with enough height to create a street wall along Woodward. The main entry to the building is located on Park.

In addition, the 2016 Plan encourages pedestrian-scale features which should be incorporated on the first floor of buildings and at entrances to help relate buildings to the streetscape. The plan for the proposed building includes canopies, quality stone façades, and extensive storefront glazing.

The proposed development is also located at a terminating vista as outlined by the 2016 Plan and Article 3, Section 3.04 (E) of the Zoning Ordinance which states that any building that terminates a view, as designated on the Regulating Plan, shall provide distinct and prominent architectural features of enhanced character and visibility, which reflect the importance of the building's location and create a positive visual landmark. The building provides several architectural variations that are unique in character, but also complements the Greenleaf Trust building located at the opposite corner.

Streetscape components are an integral part of the 2016 Plan. The applicant is required to maintain the pedestrian scale street lighting and street trees along all adjacent roadways. The Planning Board may wish to recommend the addition of benches and/or trash receptacles in the public right-of-way. All streetscape plans should incorporate the proposed changes to E. Maple in Phase II of the Downtown project. A full design review will be conducted at the time of Final Site Plan and Design Review.

B. Land Development Issues:

The applicant has noted that there are no major land development issues present for the site, as there are no sensitive soils and the site is flat. The impervious area of the site will be increased, but only just, as the southern portion of the site was used as a gravel parking lot, thus the soil is highly compacted and not conducive to permeability.

The applicant has submitted an environmental site assessment report for the proposed development site dated May 4th, 2018 by PM Environmental (PM). The

investigation was performed to assess and document soil concentrations in the area of former automotive service operations as a part of soil removal and disposal planning. It was noted in the report that the site is a closed Leaking Underground Storage Tank (LUST) site based on a 1996 release identified during a subsurface investigation. Site investigation and targeted soil removal were completed between 1996 and 2010 when the closure report was completed. On April 17th, 2018, PM completed five soil borings to further evaluate the site for volatile organic compounds (VOC's) and polychlorinated biphenyls (PCB's). PM concluded that soil analysis did not identify any concentrations of VOC's or PCB's exceeding method detection limits.

The CIS has indicated that roughly 12,000 cubic yards of in-place soils will be removed from the site for the construction of the new building with underground parking. The applicant has submitted a haul map indicating a route exiting the site onto Hamilton Row and continuing onto southbound Woodward.

Finally, the applicant has stated that there are no potential hazards or nuisances that may be created by the proposed development. However, it is generally understood that the demolition, excavation, and construction associated with the proposed development may produce excess dust/debris, noise and other nuisances that must be mitigated throughout the development process. **The applicant must provide measures to mitigate such nuisances throughout the duration of construction.**

C. Utilities, Noise and Air Issues:

In accordance with the 2016 Plan, all utilities on the site should be buried to visually enhance the site. Thus, **the applicant will be required to bury all utilities on the site**. The applicant has indicated which utility companies are available to service the site: electricity from DTE, natural gas from CMS Energy and telephone/cable from AT&T/Comcast.

The site plans submitted show existing 12 in. and 8 in. public water mains within the Maple right-of-way along the southern frontage of the proposed development. The applicant has not indicated which public utilities they will be utilizing and whether or not they will be sufficient in providing for the proposed development with no capacity issues. **The applicant must gain approval from the City Engineer prior to site plan approvals.**

A noise study for the site was prepared by Kolano and Saha Engineers, Inc. dated November 22, 2019. Measurements were taken using a calibrated Bruel & Kjaer 2270 environmental noise analyzer for a continuous period for the day of May 16th, 2018 at 4:30 pm through May 17th, 2018 at 3:45 pm. The equipment was placed on the west side of Woodward, approximately 28 ft. from the center of the right turn lane and 40 ft. from the center of the nearest through lane. The data gathered a DNL, or day-night sound level average of 75 dB. HUD determined that a level of 65 dB is a desirable goal for residential land use. HUD considers the measured level on this site as "normally unacceptable" for

residential use. Kolano and Saha Engineers recommend designing the façade of the building with construction features that isolate the noise from entering the indoor living spaces to meet HUD's noise standards.

The Noise Impact Assessment noted that the only noise that will emanate from the proposed new development will come from building wide heating and cooling mechanical systems, exhaust fans, emergency power generator, delivery vehicles, and parking garage exhaust fans.

The noise study provides that the project site will likely comply with the City's noise limits for commercial developments. Specification sheets for all mechanical equipment will be reviewed at Final Site Plan Review for noise output to ensure that the City's noise limits for commercial property will be met.

The applicant has stated in the CIS that the proposed development is located in the Southeast Michigan Air Quality District. The monitoring station is located in Oak Park, and there are no air quality violations in this attainment area. The proposed development use is identical to its surrounding uses and will not establish any trend of air quality standards. HVAC equipment will have filters and will meet all code requirements.

D. Environmental Design and Historic Values:

The applicant has indicated that the small building and parking lots will be demolished. The site survey provided by the applicant shows that there are 11 trees on site, which the site plan shows as being removed and replaced along the streetscape as required street trees, along with 6 more for 17 total proposed trees. The proposed building will be similar in size, material and scale to the neighboring buildings. A complete design review, including streetscape elements, will be conducted as a part of the Final Site Plan review process.

The site is not listed on the National Register of Historic Places nor is it located in a local historic district. The CIS states that there are no properties or elements within the site plan boundaries that are historic. No adjacent properties are on the Historic Register.

E. Refuse, Sewer and Water:

The CIS describes a refuse storage area on the Park (west) side of the building, which will be accessible via the entry drive to the underground parking levels. This refuse area will be used for the residential and retail space, which covers a majority of the site. A second refuse area is located adjacent to the building loading zones, which will be utilized by the Hunter House restaurant, and is accessible through the entry way off of Hamilton on the first floor. The CIS indicates that the solid waste generated from the building will be standard and can easily be handled by local waste management companies. **The applicant has not indicated in the CIS or on the proposed site plans if there will be separate recycling storage facilities on site.**

The CIS further indicates that the planned sewer service basis of design, and the capacity of the combined sewer has been reviewed and confirmed by the City Engineer and is not anticipated to exceed the limits of the municipal combined sewer. Similarly, the CIS states that the existing water main will adequately supply the proposed development, and there are no apparent water quality issues. The Engineering Department has provided comments below regarding water improvements needed.

F. Public Safety:

The applicant has stated that the proposed development and its location on four surrounding streets (Woodward, Maple, Park, Hamilton Row) allows for direct access on all sides for emergency personnel. The CIS also states that several emergency friendly features are proposed, such as access to commercial and residential space at-grade on either side of the building, elevators that can accommodate a stretcher, and a fire command center adjacent to the main entry.

The applicant has not provided information on a fire suppression system or a Knox Box. The Police and Fire Departments will require further information to ensure that all life safety issues have been addressed. The applicant has indicated that there will be a security system on the property, but no details have been submitted. **Details of the proposed security system must be provided and approved by the Police Department.**

G. Transportation Issues:

The applicant has provided a transportation study prepared by Stonefield Engineering including Form B – Transportation Study as well as a full Traffic Impact Study.

Please see attached letter from the Fleis & Vandenbrink and dated January 17, 2020 accepting the results of the Traffic Impact Study.

A full parking analysis is provided in the Preliminary Site Plan review below. The CIS also concluded that bicycle, pedestrian and transit connections with the neighborhoods, downtown Birmingham and the region will be present. The applicant has also noted that bike racks will be provided for occupants and guests.

H. Parking Issues:

The CIS indicates that the proposed development will have a two-level underground parking garage that will contain 82 spaces and an at-grade lot

within the building envelope containing 3 spaces for a combined 85 spaces provided on-site. There is no required parking for the commercial portions of the development because the proposed project is within the Parking Assessment District. However, parking is required for the residential units on the third through fifth floors. A thorough discussion of the parking requirements is contained in the attached Preliminary Site Plan report.

I. Natural Features:

The applicant has indicated that there will be little impact on natural features or bodies of water as a result of the proposed development, as the site is currently 100% impervious surface. There are no ponds or streams near the project. The CIS indicates that there are no natural features that will be disturbed or isolated, and there exists no natural wildlife habitats.

J. Departmental Reports

1. Engineering Division – The Engineering Division has not yet provided comments, but will do so prior to the meeting on January 22, 2020.

2. Department of Public Services – The Department of Public Services has not yet provided comments, but will do so prior to the meeting on January 22, 2020.

3. Fire Department – The Fire Department provided the following comments:
    - This building shall meet all high rise requirements for fire codes, and life safety codes. MBC 2015, IFC 2015.
    - This building shall be fully protected with a fire suppression system. NFPA 13 (2013).
    - The fire protection water supply shall be a minimum of 6 inches.
    - This building shall have a full, monitored fire alarm system. NFPA 72 (2013).
    - The exterior balconies, and the rooftop terrace will require occupant notification devices.
    - The exterior balconies, and the rooftop terrace will require fire suppression if any BBQ's, fire features, or other ignition sources are present, for any areas that have an overhang, or covered top, of 2 feet or more.
    - Any fire pump installed in the building shall have an alternative power supply (generator).
    - The rooftop terrace shall have a minimum of two paths of egress, proper markings, emergency lighting, and adhere to the required travel distances.
    - Submitted floor plans shall include calculated egress travel distances for all areas of the building, including rooftop terrace.
    - Once the project is underway, and reaches 40 feet in height, a temporary or permanent stairwell will need to be in place and fully operational.

- Once the project is underway, and reaches 40 feet in height, a temporary or permanent fire suppression standpipe will need to be installed and fully operational.
- The building will meet all emergency responder radio requirements. An evaluation of the radio signal strength will be conducted when the building is substantially complete. If radio signal strength is found to be below the minimum requirements, a Bi-Directional Antenna system shall be installed.

3. Police Department – The Police Department has no concerns at this time.
4. Building Division – The Building Department has no concerns at this time.

K. Summary of CIS:

The following issues remain outstanding with regards to the CIS:

1) Provide copies of Phase I and II Environmental Assessments;
2) Applicant must provide mitigation strategies for control of noise vibration and dust;
3) Applicant will be required to bury all utilities on the site;
4) Applicant must distinguish an area for the separation and storage of recycling;
5) Applicant must conform to the streetscape design as outlined in the new E. Maple streetscape project; and
6) Applicant provide information on all life safety issues and Fire Dept. approval, as well as details on the proposed security system provided to and approved by the Police Department.

L. Suggested Action:

1. To **ACCEPT** the Community Impact Study as provided by the applicant for the proposed development at 35001 & 35075 Woodward – The Maple – with the following conditions:

    1) Provide copies of Phase I and II Environmental Assessments;
    2) Applicant must provide mitigation strategies for control of noise vibration and dust;
    3) Applicant will be required to bury all utilities on the site;
    4) Applicant must distinguish an area for the separation and storage of recycling;
    5) Applicant must conform to the streetscape design as outlined in the new E. Maple streetscape project; and
    6) Applicant provide information on all life safety issues and Fire Dept. approval, as well as details on the proposed security system provided to and approved by the Police Department.

OR

2. To **POSTPONE** action on the Community Impact Study as provided by

the applicant for the proposed development at 35001 & 35075 Woodward – The Maple – allowing the applicant the opportunity to address the issues raised above.

OR

3. To **DECLINE** the Community Impact Study as provided by the applicant for the proposed development at 35001 & 35075 Woodward – The Maple.

Revised Preliminary Site Plan Review

III. Preliminary Site Plan Review

The applicant has submitted an application for Preliminary Site Plan review to construct a five story building in the B-4/D-4 zoning district. The property is located on the west side of Woodward Avenue and bordered by three other streets: Maple, Park and Hamilton Row. The site is currently home to the Hunter House restaurant and parking lots, one of which is owned by the City of Birmingham.

The applicant is now proposing a five story mixed use building with two levels of underground parking, three retail spaces and the Hunter House restaurant on the first floor along with a residential lobby, an office lobby and a small parking area for the Hunter House, a second floor of office space, and 42 residential units on floors three, four and five. An outdoor terrace is also proposed on the rooftop.

1.0 Land Use and Zoning

1.1 Existing Land Use – The site is currently used as commercial and parking, and contains the Hunter House restaurant (and its associated parking) and a gravel parking lot. A portion of the parking currently used by Hunter House on the NW corner of the site is owned by the City of Birmingham.

1.2 Zoning – The property is zoned B-4 Business-Residential, and D-4 in the Downtown Overlay District. The proposed residential, retail and commercial uses, and their surrounding uses, appear to conform to the permitted uses of the zoning district, including the off street parking facility in the form of two levels of parking decks below the development.

1.3 Summary of Adjacent Land Use and Zoning - The following chart summarizes existing land use and zoning adjacent to and/or in the vicinity of the subject site, including the 2016 Regulating Plan.

	North	South	East	West
Existing Land Use	Commercial/ Office	Mixed Use	Commercial	Commercial/ Office
Existing Zoning District	B-4, Business - Residential	B-4, Business - Residential	B-2, General Business	B-4, Business - Residential
`Downtown Overlay Zoning District	D-4	D-4	D-2	D-4

2.0 Setback and Height Requirements

The attached summary analysis provides the required and proposed bulk, area, and placement regulations for the proposed project. The applicant has resolved a majority of the previous zoning issues in regards to units meeting minimum floor area required, removing parking within 20 ft. of frontage line, and has now submitted a rooftop plan showing proposed RTU's and screening. However, the three loading spaces proposed are 39' by 10' by 14' in height, although they are required to be 40' by 12' 14' in height. **Thus, the applicant must submit plans showing 3 off-street loading spaces with the required dimensions, or obtain a variance from the Board of Zoning Appeals.**

3.0 Screening and Landscaping

3.1 Dumpster Screening – The applicant is proposing to store all refuse inside the building envelope in two separate areas:

- Refuse Area 1: The commercial and residential uses will utilize a refuse area located just inside on both sides of the entryway for the underground parking facilities on the west side of the building on Park. The four dumpsters shown in this area are screened by a solid wall. However, it should be noted that there are several large windows in the general area.

- Refuse Area 2: The Hunter House restaurant will utilize a separate refuse area, which is located in their parking and loading area at grade on the northern portion of the site, underneath the building. This refuse area contains 2 dumpsters and is located within the building envelope and enclosed on all sides.

3.2 Parking Lot Screening – The applicant is proposing two levels of underground parking containing 82 parking spaces, and a small ground level parking area for the Hunter House restaurant containing 3 additional

spaces, for a total of 85 parking spaces on site. The two underground levels will be fully screened within the building envelope and the ground level spaces will also be fully screened by the building. Both openings to the lower level and ground floor parking are 25' in width or less, and are covered by glass overhead doors.

3.3 Mechanical Equipment Screening – The applicant has submitted a rooftop plan for the proposed development showing the location of all proposed rooftop units (RTU) and the proposed screening. The screening proposed is 10.6' in height. **While the RTUs are shown on the roof plan, the applicant will be required to provide specification sheets on all RTUs to determine if they will be below the maximum allowable height and fully screened by the proposed mechanical screen walls.**

The site plans show two ground mounted mechanical units at the northwest corner of the property that are proposed to be screened with landscaping elements: Twenty-two, 5 ft. tall Grey Gleam Junipers and four, 6 ft. tall Emerald Green Arborvitaes. **The applicant must submit specification sheets for the proposed ground mounted mechanical units to ensure full screening**.

3.4 Landscaping – The Downtown Overlay District requires that one street tree be provided for every 40' of street frontage. This development is required to have 6 trees along Woodward, 6 trees along Park, 2 trees along Maple, and 2 trees along Hamilton Row for a total of 16 trees. The applicant has proposed 6 street trees along Woodward, 5 trees along Park, 3 trees along Maple, and 3 trees along Hamilton Row for a total of 13 trees. Seven Bowhall Red Maples are proposed along Maple and Hamilton, 5 American Sentry Lindens on Park Street, and 5 Skyline Honeylocust trees along Woodward, for a total of 17 street trees now proposed.

The applicant is also proposing several planting areas around the building that contain shrubs and perennials that are not on the City's list of prohibited species. However, the applicant should consider the use of an alternative variety of Daylily as Stella D'Oro Daylilies have been overused throughout the City.

3.5 Streetscape Elements – The applicant will be expected to design the streetscape with reference to the E. Maple streetscape project. The applicant is proposing three 5' by 12' raised tree wells along E. Maple to match the proposed streetscape, as well as 2 City standard street lights along E. Maple. A 5' wide pedestrian walkway is also provided as required. Additional landscape beds are also proposed in recessed areas along the southern elevation of the building. Along Woodward, the applicant is not proposing any pedestrian scale street lights, but is proposing three City standard benches. Along Park Street, 4 pedestrian

scale lights are proposed, along with 1 bench and 1 trash can. The plans show what appear to be 2 bike racks, one near the southwest corner of the site and one at the northeast corner of the site. **However, these markings are not labelled, so the applicant must clarify. In addition, the Planning Board may wish to consider the spacing of street lighting along Park and / or Hamilton as the lights are spaced more than 40' apart as required.**

4.0 Parking, Loading and Circulation

4.1 Parking – The proposed development and its commercial and residential uses are located in the Downtown Parking Assessment District; thus no parking is required on site for the retail or office uses. The third through fifth floor residential units, however, require parking on-site. The proposed floor plans show a total of 42 units, 27 of which have 3 or more rooms, while the remaining 15 have 2 or less rooms.

1.5 spaces x 27 units = 41
1.25 spaces x 15 units = 19
Required Parking = 60 spaces

The applicant is proposing 2 levels of underground parking with 82 spaces, and a ground level parking area with 3 spaces for a total of 85 spaces on site which exceeds the parking requirement. All parking spaces meet the minimum size requirement of 180 square feet. The proposed parking areas show one handicap accessible space on both levels of the underground parking, as well as an additional handicap accessible space on the ground level adjacent to Hunter House.

4.2 Loading – In accordance with Article 4, section 4.24 C (2) of the Zoning Ordinance, developments with over 50,000 sq. ft. of commercial space require 3 usable off-street loading spaces measuring 40' x 12' x 14'. in area. **The applicant is proposing 3 loading spaces within the building envelope, however the spaces proposed are 39' by 10' by 14', and thus must be increased in size or the applicant will be required to obtain a variance from the Board of Zoning Appeals**.

4.3 Vehicular Circulation and Access – Entry and exit from the underground parking garage is proposed to be accessed via a garage door on the west side of the building, along Park Street. This entry is 25' in width and has a glass overhead garage door proposed. Entry and exit to the 3 at grade parking spaces adjacent to Hunter House will be via a garage door on the north side of the building off of Hamilton Row. This entry is 19' wide and also has a glass overhead garage door proposed

4.4 Pedestrian Circulation and Access –The applicant is proposing pedestrian entrances at twelve locations around the building. Five of the entrances are proposed on the west side of the building along Park, serving two

retail spaces, an office lobby and a residential lobby. Six others are proposed along Woodward to serve Hunter House, two retail spaces, the loading area and an egress to the residential and office entries. Lastly, on Hamilton Row there is one pedestrian access via stairwell.

The applicant is also proposing to complete the sidewalk along Woodward, making the sidewalk accessible on all four sides of the building.

5.0 Lighting

The applicant has not submitted any information regarding lighting at this time. **Specifications for any proposed lighting and a photometric plan must be submitted to determine compliance with the Zoning Ordinance lighting standards.**

6.0 Departmental Reports

6.1 Engineering Division – The Engineering Division will provide comments before the meeting on January 22, 2020.

6.2 Department of Public Services – The DPS will provide comments before the meeting on January 22, 2020.

6.3 Fire Department –The Fire Department provided the following comments:

- This building shall meet all high rise requirements for fire codes, and life safety codes. MBC 2015, IFC 2015.
- This building shall be fully protected with a fire suppression system. NFPA 13 (2013).
- The fire protection water supply shall be a minimum of 6 inches.
- This building shall have a full, monitored fire alarm system. NFPA 72 (2013).
- The exterior balconies, and the rooftop terrace will require occupant notification devices.
- The exterior balconies, and the rooftop terrace will require fire suppression if any BBQ's, fire features, or other ignition sources are present, for any areas that have an overhang, or covered top, of 2 feet or more.
- Any fire pump installed in the building shall have an alternative power supply (generator).
- The rooftop terrace shall have a minimum of two paths of egress, proper markings, emergency lighting, and adhere to the required travel distances.
- Submitted floor plans shall include calculated egress travel distances for all areas of the building, including rooftop terrace.
- Once the project is underway, and reaches 40 feet in height, a temporary or permanent stairwell will need to be in place and fully operational.

- Once the project is underway, and reaches 40 feet in height, a temporary or permanent fire suppression standpipe will need to be installed and fully operational.
- The building will meet all emergency responder radio requirements. An evaluation of the radio signal strength will be conducted when the building is substantially complete. If radio signal strength is found to be below the minimum requirements, a Bi-Directional Antenna system shall be installed.

6.4 Police Department – The Police Department will provide comments before the meeting on January 22, 2020.

6.5 Building Division – The Building Department has examined the plans for the proposed project referenced above. The plans were provided to the Planning Department for site plan review purposes only and present conceptual elevations and floor plans. Although the plans lack sufficient detail to perform a code review, the following comments are offered for Planning Design Review purposes and applicant consideration:

- No apparent building code concerns at this stage.

7.0 Design Review

The proposed building façade will contain elements of brick, Travertine Stone, limestone, metal paneling, steel and clear glazing. The elevation plans show there will be at least one sign for the Hunter House facility, although each of the retail spaces are likely to have their own identification signs as well. A full design review will be completed at Final Site Plan, where **the applicant must submit material samples, colors, and specifications as well as details on any proposed signage**. A brief review of potential issues is noted below.

The applicant has submitted glazing calculations for the proposed development, which are as follows:

ELEVATION	MATERIAL AREA (SQ. FT.)	
	SOLID	GLASS
EAST (1' – 8')	565	1,325
% OF TOTAL	29.9%	70.1%
REQUIRED %	30% MAX	70% MIN
EAST (UPPER)	10,672	5,588
% OF TOTAL	65.6%	34.4%
REQUIRED %	65% MIN	35% MAX
WEST (1' – 8')	525	1,318
% OF TOTAL	29.6%	70.4%
REQUIRED %	30% MAX	70% MIN
WEST (UPPER)	10,629	5,418
% OF TOTAL	66.3%	33.7%
REQUIRED %	65% MIN	35% MAX

SOUTH (1′ – 8′)	190	468
% OF TOTAL	28.9%	71.1%
REQUIRED %	30% MAX	70% MIN
SOUTH (UPPER)	3,394	2,059
% OF TOTAL	**64%**	**36%**
REQUIRED %	**65% MIN**	**35% MAX**
NORTH (1′ – 8′)	187	471
% OF TOTAL	28.4%	71.6%
REQUIRED %	30% MAX	70% MIN
NORTH (UPPER)	3,600	1,600
% OF TOTAL	69.4%	30.6%
REQUIRED %	65% MIN	35% MAX

All glazing requirements have been meet with the exception of the calculation provided for the upper portion of the south elevation (shaded in blue above) which misses the requirements by one percent. The applicant must submit glazing calculations that meet the ordinance, or obtain a variance from the Board of Zoning Appeals.

Another item of note is that the proposed building extends onto City property. The building itself is proposed below, on and over the City parcel at the northwest corner of this block. **The applicant will be required to enter into a lease agreement with the City for the use of this property.** In addition, the proposed underground parking levels also extend past the northern, southern and western property lines. **The City Engineer has determined that a successful lease agreement between the owner and the City will be required to be prepared before issuance of a building permit for the use of City property in the underground parking deck.**

Finally, metal entry canopies at the southeast corner of the building that wrap around both the Maple and Woodward elevations project 2′ into the City's right-of-way. In accordance with the recent changes to the projection standards**, the Planning Board is authorized at approve up to a 2′ projection as part of the Final Site Plan Review process**.

As mentioned in the CIS, the proposed development is also located at a Terminating Vista as described in the 2016 Plan, which states that any building that terminates a view, as designated on the Regulating Plan, shall provide distinct and prominent architectural features of enhanced character and visibility, which reflect the importance of the building's location and create a positive visual landmark. The proposed building consists of several high quality materials such as brick, Travertine Stone and limestone, and provides several distinct architectural features that are appropriate for its location as a terminating vista.

8.0 Approval Criteria

In accordance with Article 7, section 7.27 of the Zoning Ordinance, the proposed plans for development must meet the following conditions:

(1) The location, size and height of the building, walls and fences shall be such that there is adequate landscaped open space so as to provide light, air and access to the persons occupying the structure.

(2) The location, size and height of the building, walls and fences shall be such that there will be no interference with adequate light, air and access to adjacent lands and buildings.

(3) The location, size and height of the building, walls and fences shall be such that they will not hinder the reasonable development of adjoining property and not diminish the value thereof.

(4) The site plan, and its relation to streets, driveways and sidewalks, shall be such as to not interfere with or be hazardous to vehicular and pedestrian traffic.

(5) The proposed development will be compatible with other uses and buildings in the neighborhood and will not be contrary to the spirit and purpose of this chapter.

(6) The location, shape and size of required landscaped open space is such as to provide adequate open space for the benefit of the inhabitants of the building and the surrounding neighborhood.

9.0 Recommendation

Based on a review of the site plan revisions submitted, the Planning Division recommends that the Planning Board **APPROVE** the Revised Preliminary Site Plan for 35001 & 35075 Woodward – The Maple – with the following conditions:

1) Submit specification sheets on all of the proposed rooftop units and material/dimensional information on the screen wall to ensure full screening;
2) Revise the streetscape plans to meet all City requirements with regards to street lighting, furnishings and sidewalks;
3) Submit plans showing three usable off-street loading spaces measuring 40 x 12 x 14, or obtain a variance from the Board of Zoning Appeals;
4) Submit a photometric plan and specifications on all proposed lighting and materials, along with material samples at Final Site Plan and Design.
5) Submit glazing calculations that meet the ordinance, or obtain a variance from the Board of Zoning Appeals for the upper South Elevation;
6) Work with the City to negotiate a lease for the use of City property below, at and above grade;
7) The Planning Board approves of the 2’ projection into the right-of-way for the entry canopy at the corner of Maple and Woodward; and
8) Comply with the requests of all City Departments.

10.0 Sample Motion Language

Motion to **APPROVE** the Revised Preliminary Site Plan for 35001 & 35075 Woodward – The Maple – with the following conditions:

1) Submit specification sheets on all of the proposed rooftop units and material/dimensional information on the screen wall to ensure full screening;
2) Revise the streetscape plans to meet all City requirements with regards to street lighting, furnishings and sidewalks;
3) Submit plans showing three usable off-street loading spaces measuring 40 x 12 x 14, or obtain a variance from the Board of Zoning Appeals;
4) Submit a photometric plan and specifications on all proposed lighting and materials, along with material samples at Final Site Plan and Design.
5) Submit glazing calculations that meet the ordinance, or obtain a variance from the Board of Zoning Appeals for the upper South Elevation;
6) Work with the City to negotiate a lease for the use of City property below, at and above grade;
7) The Planning Board approves of the 2' projection into the right-of-way for the entry canopy at the corner of Maple and Woodward; and
8) Comply with the requests of all City Departments.

OR

Motion to **POSTPONE** the Preliminary Site Plan for 35001 & 35075 Woodward – The Maple – pending receipt of the following:

1) Submit specification sheets on all of the proposed rooftop units and material/dimensional information on the screen wall to ensure full screening;
2) Revise the streetscape plans to meet all City requirements with regards to street lighting, furnishings and sidewalks;
3) Submit plans showing three usable off-street loading spaces measuring 40 x 12 x 14, or obtain a variance from the Board of Zoning Appeals;
4) Submit a photometric plan and specifications on all proposed lighting and materials, along with material samples at Final Site Plan and Design.
5) Submit glazing calculations that meet the ordinance, or obtain a variance from the Board of Zoning Appeals for the upper South Elevation;
6) Work with the City to negotiate a lease for the use of City property below, at and above grade;
7) The Planning Board approves of the 2' projection into the right-of-way for the entry canopy at the corner of Maple and Woodward; and
8) Comply with the requests of all City Departments.

OR

Motion to **DENY** the Preliminary Site Plan for 35001 & 35075 Woodward – The Maple – for the following reasons:

1._____
2._____
3._____

Planning Board Minutes
January 9, 2019

F. COMMUNITY IMPACT STUDY ("CIS") AND PRELIMINARY SITE PLAN REVIEW

1. 35001 Woodward Ave. (Hunter House and vacant parking lot) Request for approval of new five-story mixed use building with hotel, retail and residential uses (postponed from December 12, 2018)

The Chairman explained the CIS is an opportunity for the developer to provide answers to questions that help the Planning Board to understand how the proposed development might impact the community. That is something the board would either accept, decline, or postpone. The Preliminary Site Plan is a separate approval. It is the first step that is needed for the applicant to move forward with the project.

Ms. Ecker clarified that the subject site has a total land area of 0.5 acres which is made up of three parcels, 35001 Woodward Ave., 35075 Woodward Ave. and a surface parking lot that is owned by the City. The sites along Woodward Ave. are owned by Select Commercial Assets Hospitality, LLC. The owner of that property is Dr. Guyare, who is the applicant tonight and who has the right to seek approval for development on the property containing both sites. As part of his request he is asking that the City consider allowing him to develop a piece of City property.

Whenever someone is seeking to use City property they also need to enter into a Lease Agreement with the City. The applicant is proposing to continue to use the City parcel that currently is rented out for parking. They are also looking to lease some property in the right-of-way from the City.

CIS

Ms. Ecker recalled from the December meeting that main thing that was outstanding was with regard to the traffic study. The City's Traffic Consultant, F&V, had not had a chance to fully review all of the traffic information. At this time the City has a letter dated January 4 from F&V indicating they would recommend that the Planning Board accept the Traffic Study with the condition that a detailed special event operations plan be completed prior to obtaining a Certificate of Occupancy for the building. That would ensure that the hotel will have enough valets and enough time to take the cars over to a parking structure so that they don't queue up too far on Park St. and spill onto Maple Rd. If they do that it causes congestion moving onto Woodward Ave.

In response to Mr. Boyle, Ms. Ecker advised that F&V would review and approve the special event operations plan and then it would be brought back to the Planning Board as an addendum to the CIS as an offshoot of the Traffic Impact Study. The valet stand also has to be approved through the City. Any use of City parking spaces needs to be reviewed and approved by the City Commission.

Mr. Koseck inquired whether the Traffic Consultant is confident that there is a valet plan that would work. It seems to him the two parking structures that would likely serve this development are often tapped out.

Ms. Kroll answered that was one of her concerns. The Peabody and Park St. garages have been at capacity during the middle of the day. So if there was a banquet that occurred during the middle of the day there would probably be some issues. In that case she would want the hotel to outline where they propose to park their vehicles if the garages are full. For an evening event the two garages have plenty of capacity. In addition, the amount of time it takes for a valet to park a car needs to be documented in the special event plan. If they are not able to meet the plan then there is a code enforcement issue. There are only three queue spaces, so during a special event the hotel may want to ~~bag~~ **rent** the spaces on the north end of Park for queuing of vehicles.

Responding to Mr. Williams, Ms. Ecker established that the traffic signal currently located at Park / Maple Rd. / Peabody will stay but there will be changes made to the signal timing along with a signal for pedestrians as they cross Park. Maple Rd. traffic west of Peabody / Park is being reduced to a single lane.

It was discussed and Ms. Ecker affirmed that any contractual issues that the operator of the Hunter House and the owner of the land may have between themselves is a private civil matter and is not for this board or the City to adjudicate on, because there is established ownership of the property.

Mr. Kevin Biddison, Biddison Architecture, 320 Martin St. said they are working on operational procedures for queuing, such as hiring additional valets. They will do their best to keep the traffic and queuing out of the intersection. It has been noted that the underground parking that would extend out into the right-of-way might be in conflict with electrical conduits and they are reviewing that with the City. If there is an issue with the utility it is something they will pull back on, but if it is a small item it would be a monetary thing.

The proposed parking spaces that are outlined to service the new Hunter House all meet the 180 sq. ft. requirement. Mr. Biddison explained how deliveries and trash will be handled. The banquet room might accommodate 50 to 60 people at the most, as it is not a huge area. Mr. Boyle said in his opinion that isn't a particularly large space. That is an important issue in order to understand the community impact of the hotel.

Mr. Williams asked Ms. Kroll to comment on existing traffic on Maple Rd. at peak times, leaving the hotel. Ms. Kroll said that presently traffic going westbound on Maple Rd. does not back up into Woodward Ave. Eastbound, it does back up. Mr. Williams did not agree with that analysis because the traffic backs up between Old Woodward Ave. and Peabody, as the lights are not coordinated. The stacking at Peabody and Park is fine but the traffic moving west past Park and past Peabody stacks up. Ms. Kroll said that when an evaluation study for the hotel was made, they evaluated the future conditions with the two-way operations on Park.

Mr. Koseck questioned if there are any tweaks that Ms. Kroll would recommend that would make a better development from a traffic impact standpoint. Ms. Kroll replied her biggest concern is that they really only have space for three vehicles to queue up. During peak times that may not be enough storage space. Ideally if the hotel was located on the Hunter House corner, it would provide better queuing. Further responding to Mr. Koseck, she said that people going south on Woodward Ave. turning onto Hamilton and making a left turn into the Hunter House site is a condition that currently exists. Ms. Ecker pointed out there is no interior connection to get to the hotel site from the Hunter House parking lot. Mr. Koseck thought that generally people would not know that and may turn in to park there.

Chairman Clein opened up discussion from members of the public at 8:05 p.m.

Mr. Kelly Cobb said he is one of the owners of Hunter House along with his mother, Susan, who was also present. Hunter House is one of the oldest businesses in Birmingham as they have been in operation for 67 years. Some of their issues are not in the Planning Board's purview but he highlighted a couple that he thinks are.

To establish background, Mr. Cobb explained he transferred the property to the applicant, and as a part of that transfer there was a purchase agreement outlining certain rights that he retained. That agreement has not been furnished to the City as it is not necessarily within their purview. The agreement gives Hunter House sole discretion and approval rights over what their space looks like and the municipal lot. They have not approved the space, as it was submitted to the City without their knowledge.

Ms. Ecker clarified that regardless of what the agreement says, Hunter House does not have sole discretion over what happens on the City's property.

Mr. Cobb went on to say they have concerns and questions about parking, the same as the City has with traffic. He would appreciate if the City would contract with F&V to come up with a better study than the one proposed. The study assumes that Hunter House needs only 14 spots. Not accounted for in the study is that it would be fair to presume that Hunter House would need to use another 15 spaces or so in surrounding parking decks. Also not accounted for in the study is the Peabody development. The Peabody assumed a shortage of 57 spots between the Park and the Peabody decks. Add that to the 15 that Hunter House will need and that comes to a deficiency of 87 parking spots.

This raises concerns for them because they already have parking problems. People park in their lot and walk to Downtown. They are also concerned about traffic circulation. Their customers already loop around until they can get a spot to pick up the food from their phone in orders. That activity will increase if their parking shrinks and there is a severe deficiency within the broader area.

There is a statement in the CIS that it appears the Hunter House is not historic, as they have not been registered historic. They believe that they are, and he raised that as a concern for them.

Ms. Ecker clarified on the historic issue that the site or the building is not designated historic within the City of Birmingham, nor have they received an application from either the current or previous owners to consider designating it as such.

Mr. Koseck inquired how Mr. Cobb would change the proposal to meet his needs. Mr. Cobb indicated they have certain minimums of what they are guaranteed in the space, certain discretion on the shape of their building, how the layout would be, and all of those things. They are working with Mr. Biddison to find a solution to that and have not reached agreement over what the space looks like.

Mr. David Hart said he represents Hunter House. He stated the agreement between the two parties is part of the public record at the Oakland County Register of Deeds. It has been recorded since 2007 and perfects the interest of Hunter House.

Ms. Theresa Pelovocian from Bloomfield Hills said she believes that Hunter House is very special to everyone. People can remember countless times going to the Hunter House with their sons or daughters to celebrate some accomplishment. On another note, her daughter has been employed by Hunter House for four years and it has been a phenomenal place for her to work. The kids make good money, pick up great work ethics, and learn to handle themselves with the public. Hunter House is a great place for the community to go.

Motion by Mr. Williams
Seconded by Mr. Koseck to receive and file an e-mail against the project and supporting Hunter House dated January 2019.

Motion carried, 7-0.

VOICE VOTE
Yeas: Williams, Koseck, Boyle, Clein, Jeffares, Share, Whipple-Boyce
Nays: None
Absent: Ramin

Mr. Williams announced that he has come to a different conclusion than the Planning Dept. or than F&V. There are a couple of concerns in their report that should be highlighted:

- Based on the parking analysis there is no capacity in either the Park or Peabody parking garage during the day;
- Any vehicle queues that extend beyond a four vehicle storage area will impact the operations of Maple Rd. and potentially the intersection at Woodward Ave.

Missing from the analysis is the single lane traffic heading west on Maple Rd. to Old Woodward Ave. which backs up frequently to beyond Peabody during busy hours. Therefore Mr. Williams said he is not inclined to approve the CIS or the project with this many unanswered traffic and parking issues. Further, he is not satisfied that the issues that the chairman highlighted at the last meeting have been answered adequately.

This situation is exacerbated because the City has to recognize the difficulties of building on this site, most importantly the traffic in this very confined area.

Mr. Koseck observed that anything that is developed on this site will bring in more traffic and have an enormous impact. He was curious how a hotel fits.

Mr. Share observed he is not hearing that the Traffic Consultant needs to do any more work. Secondly, he has never seen in a CIS the suggested condition that the applicant provide a City-approved special event operations plan prior to obtaining a Certificate of Occupancy. He would accept the CIS without that suggested condition but he has some extremely serious reservations about a site plan for this project because of the danger to public safety that the special event use and the valet operation create.

Mr. Boyle was in favor of deleting the requirement in the CIS for a special event operations plan. The appropriate place for that is in the Site Plan Review, along with concerns about traffic movements. He explained that by accepting the CIS it does not mean that the Planning Board is tacitly accepting this development. Chairman Clein added that he also doesn't want it inferred that by accepting the CIS the board is accepting the Traffic Study because they are clearly not.

Mr. Jeffares said that the Master Plan Downtown calls for a sister building to the Greenleaf Trust building on this site. If they were to develop an office building there would be the condition of many people leaving at the exact same time, all trying to get out onto Woodward Ave. If that is the alternative, to him that use would be far worse.

Motion by Mr. Boyle
Seconded by Mr. Jeffares to ACCEPT the Community Impact Study as provided by the applicant for the proposed development at 35001 & 35075 Woodward, The Maple, with the following conditions:
1) Applicant must provide a City-approved special event operations plan at the same time as completing the Final Site Plan Review process;
2) Applicant must provide mitigation strategies for control of noise vibration and dust;
3) Applicant will be required to bury all utilities on the site;
4) Applicant must distinguish an area for the separation and storage of recycling;
5) Applicant must conform to the streetscape design as outlined in the new E. Maple Rd. streetscape project;
6) Applicant provide information on all life safety issues and Fire Dept. approval, as well as details on the proposed security system provided to and approved by the Police Dept.; and
7) Applicant must address the concerns of all City Depts.

Amended by Mr. Share
And accepted by the makers of the motion to replace 1) as follows: Applicant must submit for approval by the Planning Board at the same time as completing the Final Site Plan Application process a special event operations

plan approved by the City Police Dept. after consultation with the City's Traffic Consultant.

No one from the public wished to comment on the motion at 8:40 p.m.

Motion carried, 6-1.

ROLLCALL VOTE
Yeas: Boyle, Jeffares, Clein, Koseck, Whipple-Boyce, Share
Nays: Williams
Absent: Ramin

The chairman noted that a number of issues have been raised during the CIS process that make him uncomfortable with moving forward with the Preliminary Site Plan this evening.

Mr. Williams agreed. The Planning Board has pointed out the unresolved issues that need to be addressed. Additionally, he feels that the Parking Assessment District with its impact on this particular property requires City attention. However, this problem exists whether this or any other significant development goes through.

Mr. Jeffares commented that the amount of time required to get into a deck is significantly longer than it used to be because of the queuing. A valet would have to wait behind people who are having trouble getting through with their card.

Ms. Whipple-Boyce expressed her concerns:
- She would like to see an internal floor plan for the retail level in order to better understand how the banquet area will be used. She thinks a lot more than 60 people will be using that space and that has a direct impact on the queuing of vehicles that are arriving;
- She wondered if keeping the Hunter House building has ever been considered because it is such an iconic structure.

Mr. Boyle made a couple of points:
- The board should know what the City intends to do in that area. He wanted to see the plan for turning Park into two-way, what the parking will be, and how long cars are going to wait;
- He is frustrated that so much emphasis is being placed on parking and designing around parking. This is not how it should be done. Also, the Hunter House states they need parking, yet they take four spaces in their lot to park their vans. Why not shift them farther away and release the parking spaces? They could also make arrangements to shuttle people back and forth for an event and include that in the plan.

Mr. Share observed that on Page 3 of the developer's December 31 traffic report, it states that the banquet facility will have a capacity of 150 to 200 guests.

Mr. Koseck did not think the site plan goes far enough beyond the limits of the site. His further thoughts were:

- Whether turning Park into a two-way street is still the right thing today just because it was someone's idea 20 years ago in the Downtown 2016 Master Plan. If he is going south on Park, where is he going;
- The 20 ft. parking zone will need a variance, but also it is a planning issue and he will have to be convinced that it is good planning.

Motion by Mr. Share
Seconded by Mr. Williams to postpone the Preliminary Site Plan for 35001 Woodward Ave. (Hunter House and vacant parking lot) to February 27, 2019.

Motion carried, 7-0.

VOICE VOTE
Yeas: Share, Williams, Koseck, Boyle, Clein, Jeffares, Whipple-Boyce
Nays: None
Absent: Ramin

Planning Board Minutes
May 22, 2019

E. Request for Preliminary Site Plan Review

1. 35001 Woodward – The Maple – Request for approval of a Preliminary Site Plan to permit the construction of a five story hotel building (Postponed from February 27, 2019).

Planning Director Ecker presented the item.

Planning Director Ecker confirmed:

- City Engineer O'Meara has said the applicant's proposed plans for Park Street would not interfere with the City's plans for Park Street.
- The applicant has amended their plans to make them consistent with the City's plans for Maple.
- The applicant is required to have three loading spaces based on use and square footage of building. The spaces are required to be 40 feet long, 12 feet wide, and 14 feet in height.
- The traffic consultant has reviewed the most current plans. The three parking spaces further to the north have also been removed so the hotel may stack cars there if necessary.

Mr. Williams noted that the three spaces to the north which were removed were in front of retail establishments.

Kevin Biddison, architect, told the PB that he had met with the City's Engineering and Planning Departments multiple times in the past month and that the project had undergone a number of adjustments in order to come further into alignment with the City's requirements. He continued:

- The double-banked loading zone would allow the applicant to stack up to 10 cars if needed. Such circumstances would only be likely to occur in the daytime hours.
- The garage door width will be reduced to 25 feet from 30 feet as required.
- The applicant would be more than willing to add the additional tree necessary if the arborist signs off on it. The applicant will also add the additional street lamp required.
- Additional lighting will be added around the building once the building is built and the first round of lighting is installed to illuminate any remaining darker areas.
- The vertical aluminum fins with LED lighting at Maple and Park and Maple and Woodward are being installed to provide visual interest and are cut back into the stone so they will not project into the right-of-way.

Mr. Williams suggested adding the operations plan with the City onto the list of conditions for preliminary. He also cited his previous 'No' vote on the CIS due to safety

concerns, and commended the applicant for their efforts towards making the project safer through improved traffic flow and valet parking.

Mr. Koseck agreed with Mr. Williams, saying the applicant had come a long way in terms of improvements made to safety and traffic flow. He also said the hotel would likely need vestibules within the building, but that as long as they were interior it would not affect the site plan.

In reply to a query by Mr. Koseck, Mr. Biddison said the parking spaces on Hamilton are part of the conversation with the Hunter House Group. In addition, there are stairs on the Hamilton side of the building which would allow Hunter House patrons access to some of the additional spaces below grade.

Mr. Koseck said the retention of the 1½ foot wide curbed median on Park Street was a strange decision.

Mr. Biddison said the curb was being maintained at the request of City Engineer O'Meara in order to help drainage along the street. He said he anticipated the conversation with the Engineering Department regarding the curb would continue.

Mr. Boyle acknowledged that with all the competing interests on this site, nothing was going to be perfect but that the applicant's efforts had brought them much closer.

In response to Mr. Boyle, Mr. Biddison explained the rooftop would have seating and a rooftop bar.

Planning Director Ecker advised Mr. Biddison that within the overlay a commercial use could not be located above a residential use. She suggested the rooftop could be used by the residential occupants of the fifth floor of the building.

Mr. Biddison stated that both elevators would be available for resident use in the building. He confirmed a key system would be in use, allowing only residents to access residential floors.

Chairman Clein asked that the applicant confirm the width of the sidewalk in front of Greenleaf Trust and design their sidewalk to match that width.

Mr. Biddison said the five feet sidewalk proposed is what the Engineering Department instructed the applicant to provide.

Mr. Williams said the elevator usage should be reconsidered by the City from a security standpoint since residents may not know all their neighbors, and a non-resident could easily follow a resident out onto a residential floor.

Chairman Clein said he was not as concerned about a potential security issue, and advised that the applicant work the issue out within their own operations and with the City's Building Department. He continued:

- He appreciated the applicant's continued efforts to meet City requirements.

- Seven stacking spaces on Park Street seemed like too many to reserve for the purpose. It would require the City give up too much pedestrian and public space. He said he was not comfortable with it, and that while it might not yield a no vote from him this evening, he would advise the layout be reconsidered for the final.
- There is no reason one line of valet cars should be insufficient, especially with the three extra spaces being made available to the north.
- For the final review he would want to know that the applicant and the City's Engineering Department are creating good design for these conditions, and not just what works.
- This should look like a valet operation, which would take up little more space than parallel parking, instead of a double-stack for cars.

Mr. Williams said he agreed with Chairman Clein's concerns, but that he would also not want to see cars unable to move on Maple. He said the City might have to change some of its plans if it wants to allow reasonable development on this site.

Mr. Boyle recommended the applicant discuss the possibility of renting some of the space within the small parking lot near the hotel on Park Street, which would reduce some of the need to have extra street space for stacking cars.

Chairman Clein noted the applicant would have to speak to the City about its lease of the City's property, so it should also raise the question of renting that parking lot space per Mr. Boyle's recommendation.

Mr. Biddison said the applicant would be open to the conversation.

Mr. Koseck said he also believed it would be a good idea to explore with the City.

Chairman Clein recommended adding a letter dated May 20, 2019 from Kelly William Cobb, Vice-President of Hunter House Hamburgers to the official record. He summarized the letter as notifying the PB of the applicant's contractual obligations to Hunter House as related to the development. Noting that the issues raised by the letter were not in the PB's purview, Chairman Clein said it was still helpful to understand where the negotiations stand and extended his appreciation for the letter to Mr. Cobb.

Motion by Mr. Williams
Seconded by Mr. Share to receive and file the letter dated May 20, 2019 from Kelly William Cobb into the official record.

Motion carried, 7-0.

VOICE VOTE
Yeas: Williams, Share, Jeffares, Boyle, Whipple-Boyce, Clein, Koseck
Nays: None

Mike Kopmeyer, 1351 Bennaville Ave, said he would like to see more green space in this plan. He said he would like to see some amount of the space set aside for a public park,

and that in a perfect world Birmingham would not have a four or five story building on that lot. He said as a compromise it would be good if there could be areas shaded by trees which are public and allow for people to gather. He also said he endorsed Chairman Clein's concerns with the planned double-stacked space on Park Street.

Mr. Kopmeyer continued that the frontage along Woodward seemed cold and not conducive to pedestrian usage and activity. He suggested that awnings or more masonry or other options could make that frontage seem more human-scale and approachable.

Mr. Boyle commended the applicant and architect on all the work they have done. He said he would like the applicant to review the stacking plans on Park Street. He added that, along the lines of Mr. Kopmeyer's comments, Mr. Boyle was keen to see the proposed building materials at the final site plan.

Mr. Williams suggested it would be prudent for Chairman Clein to participate in some of the operation discussions between the applicant and the City since he could best represent the PB's concerns about traffic flow and parking. He noted that while Planning Director Ecker is a capable intermediary between the PB and the applicant, the PB's recommendations should be directly conveyed by Chairman Clein due to the specificity of the Board's concerns.

Mr. Share said he would also dislike the double-stacking if not for the extreme public safety risks that could result should traffic not be managed efficiently at this intersection. He noted that the hotel could handle up to 120 vehicles for events, and that a dangerous situation would likely compound very quickly if hotel traffic is not adequately controlled. He said he would be satisfied if the Engineering Department and the City's traffic consultant confirmed that high-volume hotel traffic could be managed with single-stacking and a healthy margin of safety. Otherwise, he said double-stacking is a reasonable, although not ideal, condition to accept.

Mr. Boyle recommended the applicant consider different options for signage as it moves towards its Final Site Plan Review, specifying that it should avoid the signage issue that the Greenleaf Trust building has.

Motion by Mr. Boyle
Seconded by Mr. Koseck to approve the Preliminary Site Plan for 35001 & 35075 Woodward – The Maple – with the following conditions: 1) The applicant must clarify which refuse areas the two proposed retail uses are permitted to use, and the accessibility of such; 2) Submit specification sheets for the proposed ground mounted and rooftop mechanical units to ensure full screening; 3) Add the correct number of street trees to each street frontage, or obtain a waiver from the Staff Arborist; 4) The applicant must provide the correct number of street lights and provide regular spacing of such by Final Site Plan Review. 5) Submit a photometric plan and specifications on all proposed lighting; 5) The applicant must reduce the width of the garage entry on the west elevation or obtain a variance from the Board of Zoning Appeals; 6) Submit material samples, colors, and specifications as well as details on

any proposed signage; 7) Applicant comply with the requests of all City Departments; 8) Applicant obtain approval of a lease agreement by the City Commission for all projections and /or encroachments on City property; 9) Applicant revise plan sheets as necessary to ensure all sheets are consistent and show the required property lines and clearly note all projections / encroachments across property lines; and 10) At Final Site Plan Review, the applicant must provide the Special Event Operations Plan for the said hotel.

Motion carried, 7-0.

VOICE VOTE
Yeas: Boyle, Koseck, Williams, Share, Jeffares, Whipple-Boyce, Clein
Nays: None

Zoning Compliance Summary Sheet
Revised Preliminary Site Plan Review
35001 & 35075 Woodward – The Maple

Existing Site: Hunter House restaurant and surface parking lots

Zoning: B-4 (Business Residential) and D-4 (Downtown Overlay)

Land Use: Commercial

Existing Land Use and Zoning of Adjacent Properties:

	North	**South**	**East**	**West**
Existing Land Use	Commercial/ Office	Mixed Use	Commercial	Commercial/ Office
Existing Zoning District	B-4, Business - Residential	B-4, Business - Residential	B-2, General Business	B-4, Business - Residential
Overlay Zoning District	D-4	D-4	D-2	D-4

Land Area:	Existing:	Approx. 0.5 acres (including City lot)
	Proposed:	Approx. 0.5 acres (including City lot)
Dwelling Units:	Existing:	0 units
	Proposed:	42 units
Minimum Lot Area/Unit:	Required:	N/A
	Proposed:	N/A
Min. Floor Area /Unit:	Required:	600 sq. ft. (efficiency or one bedroom) 800 sq. ft. (two bedroom) 1,000 sq. ft. (three or more bedroom)
	Proposed:	Smallest unit 690 sq.ft.

Max. Total Floor Area:	Required:	N/A
	Proposed:	N/A
Min. Open Space:	Required:	N/A
	Proposed:	N/A
Max. Lot Coverage:	Required:	N/A
	Proposed:	N/A
Front Setback:	Required:	0 ft.
	Proposed:	0 ft.
Side Setbacks	Required:	0 ft.
	Proposed:	0 ft.
Rear Setback:	Required:	A minimum of 10 ft. rear yard setback shall be provided from the midpoint of the alley. In the absence of an alley, the rear setback shall be equal to that of an adjacent, preexisting building
	Proposed:	0 ft., equal to the Greenleaf Trust building
Min. Front+Rear Setback	Required:	N/A
	Proposed:	N/A
Max. Bldg. Height:	Permitted:	80 ft., 5 stories
	Proposed:	80 ft., 5 stories
Max Eave Height:	Required:	58 ft.
	Proposed:	56.3 ft.
Floor-Ceiling Height:	Required:	N/A
	Proposed:	N/A
Principal Ped. Entry:	Required:	On a frontage line
	Proposed:	Twelve entrances, 5 on Park Street frontage line (1 residential lobby, 1 office lobby, 3 retail) and 6 on Woodward frontage line and 1 on Hamilton
Absence of Bldg. Façade:	Required:	N/A
	Proposed:	N/A
Opening Width:	Required:	25 ft. maximum
	Proposed:	19 ft. on Hamilton, 25 ft. on Park

Parking:	Required:	15 – 2 or less room units = 19 spaces 27 – 3 or more room units = 41 spaces Total Required: 60
	Proposed:	85 spaces
Min. Parking Space Size:	Required:	180 sq. ft.
	Proposed:	180 sq. ft.
Parking in Frontage:	Required:	Off-street parking contained in the first story shall not be permitted within 20 feet of any building façade on a frontage line or between the building facade and the frontage line.
	Proposed:	None
Loading Area:	Required:	3 off-street loading spaces (40′ x 12′ and 14′ in height)
	Proposed:	**3 off-street loading spaces (39′ x 10′ by 14′ in height).** **The applicant must submit plans showing 3 off-street loading spaces with the required dimensions, or obtain a variance from the Board of Zoning Appeals.**
Required Retail Depth:	Required:	20 ft. minimum (on Maple only)
	Proposed:	Restaurant use along the entirety of the Maple frontage at the required depths
Screening:		
Parking:	Required:	32 in. capped masonry screenwall
	Proposed:	Fully screened by the building
Loading:	Required:	Fully screened from public view
	Proposed:	Fully screened by the building
Rooftop Mechanical:	Required:	Fully screened from public view
	Proposed:	Rooftop screening is 10.6 ft. in height, spec sheets on mechanical required at Final Site Plan Review.
Elect. Transformer:	Required:	Fully screened from public view
	Proposed:	5 ft. Junipers and 6 ft. Arborvitae
Dumpster:	Required:	6 ft. capped masonry screenwall
	Proposed:	All refuse areas are proposed within the building envelope and are screened by solid walls.

FLEIS&VANDENBRINK
DESIGN. BUILD. OPERATE.

January 17, 2020

VIA EMAIL

Ms. Jana L. Ecker
Planning Director
City of Birmingham
151 Martin Street, P.O. Box 3001
Birmingham, MI 48012

RE: 35001-35075 Woodward - The Maple
Birmingham, MI
Traffic Impact Assessment Review

Dear Ms. Ecker:

Fleis & VandenBrink (F&V) staff have completed our review of Traffic Impact Assessment provided for *The Maple* (35001 & 35075 Woodward Ave.). The updated traffic study for this site was based on the revised development plan for this project than includes apartments, office, retail and restaurant (Hunter House) land uses. The traffic study was prepared by Stonefield Engineering & Design, LLC and was received by F&V on January 6, 2019. Based on this review, we have the following comments and observations.

1. The traffic study assumed vehicles using the parking garage site access drives would be generated by the following land uses:

    - Hunter House, via Hamilton Row
    - Hunter House, via Park Street
    - Apartments, via Park Street
    - Office (portion of trips), via Park Street

    The remaining trips generated by the office and all the trips generated by the retail traffic is expected to use adjacent on and off-street parking facilities and was distributed to the adjacent roadway network accordingly.

2. The results of the traffic study show that impact of the proposed development on the adjacent roadway network will be negligible and the additional traffic volumes generated by the proposed development can be accommodated with the exiting* roadway network.

    * Park Street was evaluated as a two-way roadway for this analysis.

3. The study evaluated the projected vehicle queueing on Hamilton Row and Park Street to determine if there would be any blocking at the proposed site access to the parking garages. The results of this analysis is summarized below and shows that generally access will be maintained at the site driveways.

Parking Garage Access Drive	Peak Hour	Percent Time Blocked	Time Blocked During Peak Hour
Hamilton Row	AM	1%	<1 min
	PM	11%	7 min
Park Street	AM	0%	0 min
	PM	0%	0 min

27725 Stansbury Boulevard, Suite 195
Farmington Hills, MI 48334
P: 248.536.0080
F: 248.536.0079
www.fveng.com

The vehicle queues on Hamilton Row extending from Park Street and SB Woodward may block the parking garage site access for approximately 7 minutes during the peak hour, which is not significant. In addition, this access is only for the Hunter House, which can also use the parking access via Park Street.

SUMMARY

- F&V agrees with the methodology and findings of the traffic study presented for this project.

We hope that this report addresses the City's needs regarding this project. If you have any questions, please do not hesitate to contact us at your convenience.

Sincerely,

FLEIS & VANDENBRINK ENGINEERING, INC.

Julie M. Kroll, PE, PTOE
Traffic Engineering Services Manager

Community Impact Study

The Maple Project

35001 and 35075 Woodward Avenue
Birmingham, MI 48009

Prepared By:
Biddison Architecture, P.C.
320 Martin St, LL Suite 10,
Birmingham, MI 48009

The Maple Project, Birmingham, MI
Community Impact Study

Development Team:

Owner/Applicant:
Hesham Gayar
8469 Warwick Grove Court,
Grand Blanc, MI 48439
810.338.3923
e. hesham.gayer@gmail.com

Architect:
Kevin Biddison
Biddison Architecture, P.C.
320 Martin St, LL Suite 10,
Birmingham, MI 48009
248.554.9500
kb@biddison-ad.com

Civil Engineer/Land Surveyor:
Patrick Williams
Nowak & Fraus Engineers
46777 Woodward Ave,
Pontiac, MI 48342
248.332.7931
pwilliams@nfe-engr.com

Traffic:
Tim Ponton
Stonefield Engineering & Design
28454 Woodward,
Royal Oak, MI 48067
248.247.1115
tponton@stonefieldeng.com

Environmental Site Assessment:
Environmental Quality Labs
4075 Phoenix Dr,
Sterling Heights, MI 48314
586.731.1818

Acoustical:
Darren Brown
Kolano & Saha
3559 Sashabaw Road,
Waterford, MI 48329
248.674.4100
djbrown@kandse.com

Geotechnical Engineer:
Carey J. Suhan, PE
Testing Engineers & Consultants
1343 Rochester Road,
Troy, MI 48099-0249
248.588.6200 ext.123
csuhan@tectest.com

MEP Engineer:
Salim Sessine
MA Engineering
400 S Old Woodward Ave Suite 100,
Birmingham, MI 48009
248. 258.1610
SSessine@ma-engineering.com

Structural Engineer:
Michael Paradis
Paradis Associates Inc
418 S Main St,
Rochester, MI 48307
248. 650.4905
michael@paradisassoc.com

The Maple Project, Birmingham, MI
Community Impact Study

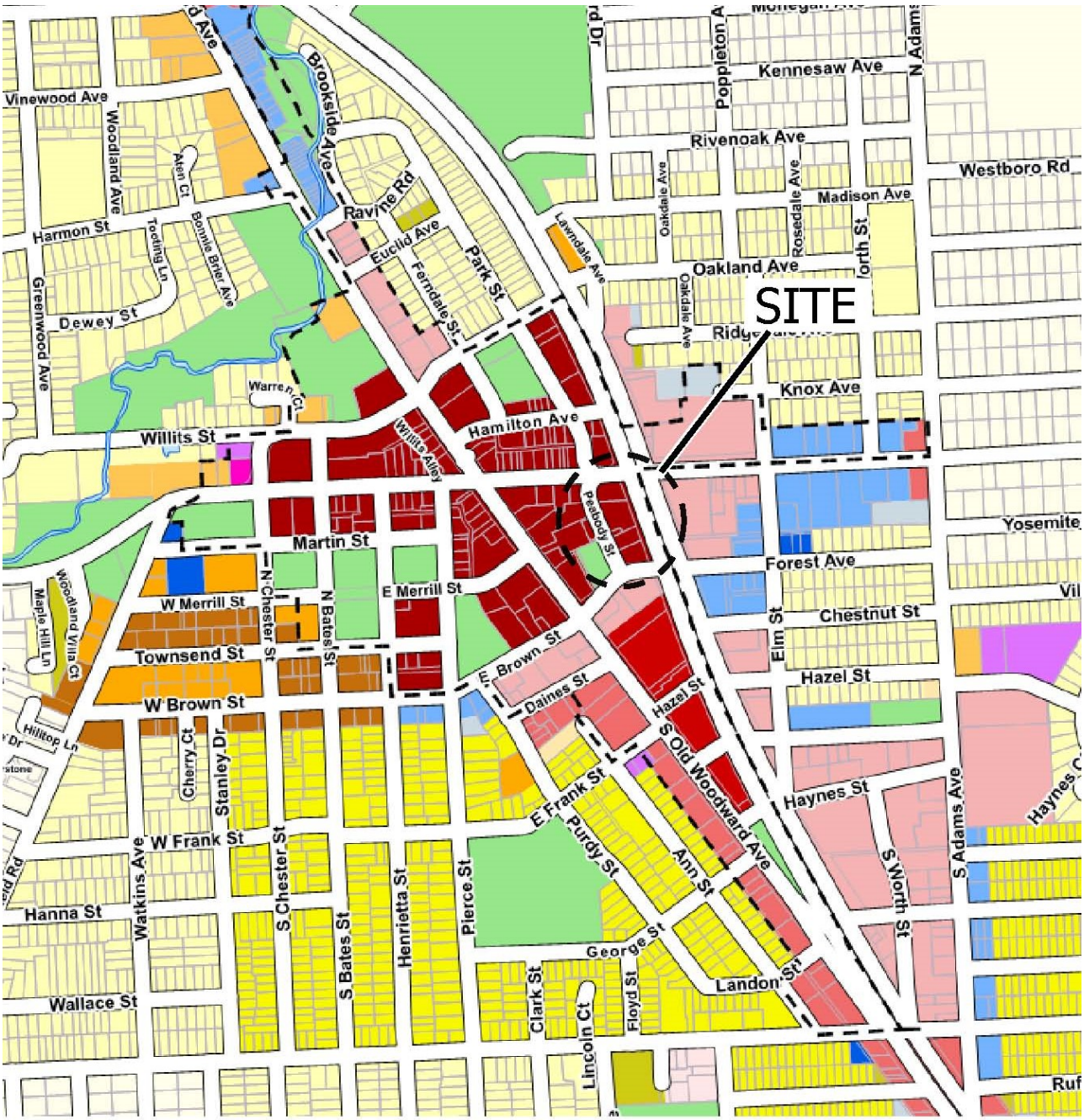
Table of Contents

Section 2. Proof of Ownership

Section 3. Maps - Vicinity, Zoning, and Haul Route

Vicinity Map

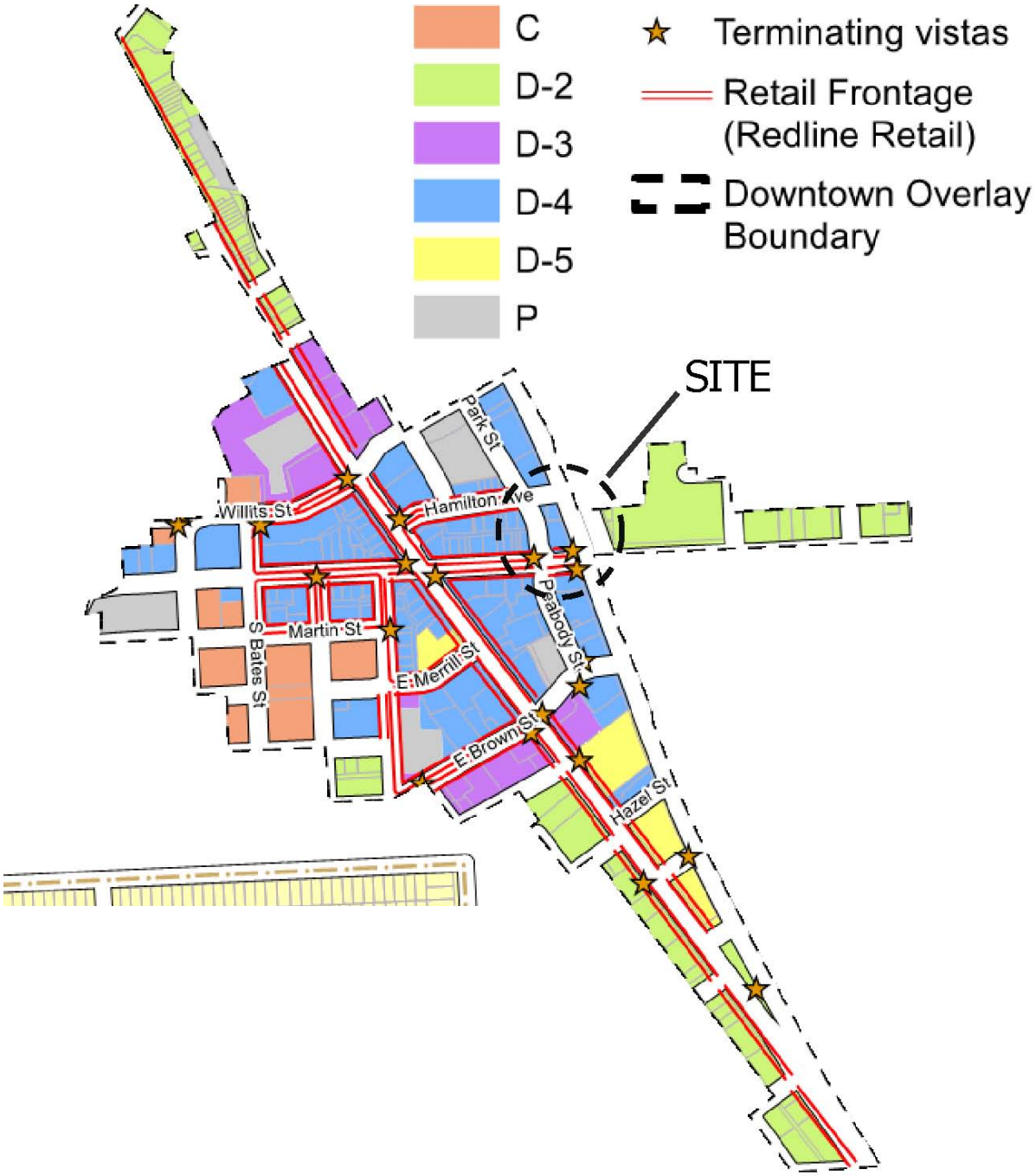
Birmingham Zoning Map



Zoning Districts

R1	Single-Family Residential	
R1-A	Single-Family Residential	
R2	Single-Family Residential	
R3	Single-Family Residential	
R4	Two-Family Residential	
R5	Multiple-Family Residential	
R6	Multiple-Family Residential	
R7	Multiple-Family Residential	
R8	Multiple-Family Residential	
TZ1	Transitional Zoning 1	
TZ3	Transitional Zoning	
MX	Mixed-Use	
B-1	Neighborhood Business	
B-2	General Business	
* B-2	General Business Limited to Grocery Story Use	
B-2B	General Business	
B-3	Office-Residential	
B-4	Business-Residential	
0-2	Office Commercial	
0-1	Office	
P	Parking	
PP	Public Property	
	Downtown Overlay Boundary	

Birmingham Overlay Zoning District Map



Section 4. Zoning Requirements Analysis

Development Standard	Required	Proposed	Variance Required
Zoning Classification	B-4 Business-Residential Overlay District D-4	B-4 Business-Residential Overlay District D-4	No
Front Setback	0' 10' at Residential	0' 10' at Residential	No
Rear setback	0' 10' at Residential	0' 10' at Residential	No
Side Setback	0' 10' at Residential	0' 10' at Residential	No
FAR - percentage	N/A	N/A	N/A
FAR - SQFT	N/A	N/A	N/A
Open Space - Percentage	N/A	N/A	N/A
Open Space - SQFT	N/A	N/A	N/A
Number of residential units	2	42	No
Minimum floor area	600 sq ft (1 bedroom) 800 sq ft (2 bedroom) 1,000 sq ft (3 bedroom)	700-1000 sq ft (1 bedroom) 1080-2200 sq ft (2 bedroom)	No
Parking	1.5 per residential unit 1.5 x 42 = 63	85 total spaces 3 at grade 82 below grade	No
Loading	2 usable loading space	3	No
Screening	Parking to be screened	Parking and dumpsters indoors	

Section 5. C.I.S. Checklist - Supplemental Information

General Information

1. Name and address of applicant and proof of ownership;
See Section 2

2. Name of Development (if applicable);
The Maple

3. Address and Legal description;
35001 and 35075 Woodward Avenue, Birmingham, MI 48009
See survey for legal description

4. Name and address of the land surveyor;
Nowak & Fraus Engineers
46777 Woodward Ave, Pontiac, MI 48342
248.332.7931

5. Legend and notes, including a graphic scale, north point, and date;
See Site Plan

6. A separate location map;
See Section 3 for Vicinity Map and sheet T.101 for Location Map

7. A map showing the boundary lines of adjacent land and the existing zoning of the area proposed to be developed as well as the adjacent land;
See Section 3 for Zoning Map

8. Details of all proposed site plan changes
Removal of existing parking lot and Hunter House Building
Addition of new mixed use building (additional building footprint)
Addition of new underground parking
Addition of new curb cuts for vehicle site entrance and exit along Hamilton & Park Streets.
Trees, sidewalk, and lighting to be replaced
Grading and landscaping to meet city of Birmingham requirements

Planning & Zoning Issues

9. Recommended land use of the subject property as designated on the future land use map of the City's Master Plan;
Reference: Downtown Birmingham 2016 Plan
• Recommended land use for this site is D-3 (Flexible Use Zone) and P (Parking). (Appendix F-2, page 94)

10. Goals and objectives of the city's Master Plans that demonstrate the city's support of the proposed development;

- The proposed project is to be constructed within the boundaries of the Birmingham Overlay District and implement the Downtown Birmingham Plan
- The proposed project encourages a form of development that will achieve the physical qualities necessary to enhance the economic vitality of Downtown Birmingham
- The new building is proposed to the width and property line as required under the B-4 zoning and overlay district D-4

11. Whether or not the project site is located within an area of the city for which an Urban Design Plan has been adopted by the Planning Board in which special design criteria or other supplemental development requirements apply;
Yes, the proposed project is located within the Downtown Overlay District and complies with the Downtown Birmingham 2016 Plan

12. The current zoning classification of the subject property;
Current zoning of the subject property is B-4, Business-Residential
Overlay District D-4
The property will conform to this zoning.

13. The zoning classification required for the proposed development;
B-4, Business-Residential

14. The existing land uses adjacent to the proposed project:
Street Frontage on all sides
North - B-4 Huntington Center - office
East - B-2 Kroger
South - B-4 Green Leaf Trust Building - mixed use
West - B-4 Pazzi - office and Pluto mixed use

15. Complete the attached "Zoning Requirements Analysis" chart;
Refer to Section 4

Land Development Issues

16. A survey and site drainage plan;
Refer to the enclosed engineering plans of the site

17. Identify any sensitive soils on site that will require stabilization or alteration in order to support the proposed development:
No sensitive soils

18. Whether or not the proposed development will occur on a steep slope, and if so, the measures that will be taken to overcome potential erosion, slope stability and runoff;
The proposed development will not occur on a steep slope, current site is flat. Full excavation for two levels underground parking proposed.
During construction of the building, care will be taken to employ soil erosion best management techniques.

19. The volume of excavated soils to be removed from the site and /or delivered to the site, and a map of the proposed haul routes;
Approximately 12,000 CY of in-place soils will be removed from the site for the construction of the new building with underground parking.
Refer haul route map at section 3.

20. Identify the potential hazards and nuisances that may be created by the proposed development and the suggested methods of mitigating such hazards;
The site was previously a gas station
No potential hazards and nuisances.

Private Utilities

21. Indicate the source of all required private utilities to be provided;
Refer to the enclosed utility plan of the site
Electricity provided by DTE
Natural gas provided by CMS Energy
Cable/telephone services provided by AT&T Communication/Comcast/etc.

22. Provide verification that all required utility easements have been secured for necessary private utilities:
Refer to the enclosed utility plan of the site.

Noise Levels

23. Provide a reading of existing ambient noise and estimated future noise levels on the site:
Included in the Appendix is a study completed by Kolano and Saha Consulting Engineers for Sound Level Measurements and Noise Impact Assessment,

24. Indicate whether the project will be exposed to or cause noise levels which exceed those levels prescribed in Chapter 50, Division 4, Section 50-71 through 50-77 of the Birmingham City Code, as amended:
The Noise Impact Assessment Study prepared for the property concludes that the proposed development will be able to comply with the Birmingham Noise Ordinance limits.

25. Indicate whether the site is appropriate for the proposed activities and facilities given the existing ambient noise and the estimated future noise levels of the site:
Based on the information provided the Noise Impact Assessment study through deliberate effort to minimize noisy equipment, the proposed development will be able to comply with the Birmingham Noise Ordinance limits

Air Quality

26. Indicate whether the project is located in the vicinity of a monitoring station where air quality violations have been registered and, if so, provide information as to whether the project will increase air quality problems in the area:

The property is located in the Southeast Michigan Air Quality District. The monitoring station is located in Oak Park. Current Ambient Air Quality Standards are under existing minimum standards as set forth by the EPA.

27. Indicate if the nature of the project or its potential users would be particularly sensitive to existing air pollution levels and, if so, indicate how the project has been designed to mitigate possible adverse effects;
The development is consistent with the other downtown Birmingham projects.
HVAC equipment units will have filters and the exhausts will be designed to meet all current code requirements.

28. Indicate whether the proposal will establish a trend which, if continued, may lead to violation of air quality standards in the future;
We do not anticipate that the development will establish a trend that will adversely affect air quality within the Downtown District.

29. Indicate whether the proposed project will have parking facilities for more than 75 cars and indicate percentage of required parking that is proposed;
The proposed development will have (0) outdoor and (3+42+42=85) indoor parking spaces located in the parking garage.
The code requires 1.5 parking spaces to be provided per residential unit (63 total).

Environmental Design and Historic Values

30. Indicate whether there will be demonstrable destruction or physical alteration of the natural or human made environment on site or in the right of way (ie. clearance of trees, substantial regrading etc.);
Refer to enclosed engineering site plans.
The existing building and parking lot will be demolished.
Two underground parking levels will be added.
The sidewalks and streetscape on will be rebuilt to the appropriate standards.
Addition of new curb cuts for vehicle site entrance and exit along Park and Hamilton.

31. Indicate whether there will be an intrusion of elements out of character or scale with the existing physical environment (ie. significant changes in size, scale of building, floor levels, entrance patterns, height, materials, color or style from that of surrounding developments);
No, the proposed development will be similar in size, material, and material to neighboring buildings.

32. Indicate all elements of the project that are eligible for LEED points if the building were to be LEED certified;
We have determined that LEED certification will not be a part of this development.

33. Indicate whether the proposed structure will block or degrade views, change the skyline or create a new focal point;
The structure will not degrade views. We believe that the building will help frame the main entry to downtown Birmingham.

34. Indicate whether there will be objectionable visual pollution introduced directly or indirectly due to loading docks, trash receptacles or parking, and indicate mitigation measures for same;
Parking, trash receptacles, and recycling are located within the building and will not cause visual pollution.

35. Indicate whether there will be an interference with or impairment of ambient conditions necessary for the enjoyment of the physical environment (ie. vibration, dust, odor, heat, glare etc.);
The proposed development will not generate abnormal vibrations, dust, odor, heat, glare or other noxious elements that would prohibit enjoyment of the existing environment. All venting will be provided up through the roof.

36. Indicate whether the project area and environs contain any properties listed on the National Register of Historic Places or the city's inventory of historic structures:
This property does not appear on the National Register of Historic Places or the City's Inventory of historic structures.

37. Provide any information on the project area that the State Historic Preservation Office (SHPO) may have:
We are not aware of the property appearing on the State registered Historic Properties

38. Indicate whether there will be other properties within the boundaries or in the vicinity of the project that appear to be historic and thus require consultation with the SHPO as to eligibility for the National register;
No surrounding properties appear to be historic.

39. Indicate whether the Department of the Interior has been requested to make a determination of eligibility on properties the SHPO or HDC deems eligible and affe cted by the project;
There is no indication that the Department of the Interior has been requested to make a determination on the historic value of the surrounding properties.

40. Provide proof that the HDC has been given an opportunity to comment on properties that are listed on or have been found eligible for the National Register and which would be affected by the project;
Does not apply

<u>Refuse</u>
41. Indicate whether the existing or planned solid waste disposal system will adequately service the proposed development including space for separation of recyclable materials;
Space for refuse and recycling areas for the building occupants will be provided as per standards of the city and area.

42. Indicate whether the design capacity of the existing or planned solid waste disposal system will be exceeded as a result of the project:
Solid waste generated from this facility will be standard and can be handled easily by local waste management companies

43. Indicate whether existing or planned waste water systems will be able to adeq uately service the proposed development:
Yes. The planned sewer service flow basis of design and capacity of the combined sewer has been reviewed and confirmed by the City Engineer.

44. Indicate whether the design capacity of these facilities will be exceeded as a result of the project;
It is not anticipated that the design capacity of the municipal combined sewer will be exceeded by the development.

45. Indicate the elements of the project that have been incorporated to reduce the amount of water entering the sewer system (such as low flush toilets, Energy Star appliances, restricted flow faucets, greywater recycling etc.) ;
Building design will incorporate restricted flow plumbing fixtures and Energy Star appliances wherever possible.

Storm Sewer

46. Indicate whether existing or planned storm water disposal and treatment systems will adequately serve the proposed development:
Yes

47. Indicate whether the design capacity of these facilities will be exceeded as a result of the project;
It is not anticipated that the design capacity of the municipal sewer system will be exceeded by the proposed development.

48. Indicate the elements of the project that have been incorporated to reduce the amount of storm water entering the sewer system (such as the use of pervious concrete, rain gardens, greywater recycling, green paved etc.):
All care will be taken by ownership to use appropriate storm water management techniques, in accordance with the Birmingham Storm water Ordinance.
http://www.bhamgov.org/government/departments/treasury/storm_water_utility_ordinance.php

Water Service

49. Indicate whether either the municipal water utility or onsite water supply system is adequate to serve the proposed project;
It is anticipated that the existing water main will adequately supply the proposed domestic system and fire suppression system. A five pump will be provided if necessary.

50. Indicate whether the water quality is safe from both a chemical and bacteriological standpoint;
It is not anticipated that there area any water quality concerns with the existing municipal system in the area. The latest published water quality report can be found at the following address:
http://www.bhamgov.org/document_center/Engineering/2016%20Water%20Quality%20Report.pdf

51. Indicate whether the intended location of the service will be compatible with the location and elevation of the main;
The proposed water supply design is compatible with the existing system and will not require rerouting or significant alterations.

Public Safety

52. Whether or not the project location provides adequate access to police, fire and emergency medical services:
The project located directly on Maple Rd, Hamilton Row, Park St, and Woodward Ave., and Park St.
The project location offers direct access for emergency personnel.
A 200 s.f. Fire Command Center will be provided just inside the main entry.
An elevator will be provided that will accommodate a stretcher
Access to the residential units and commercial spaces will be provided via entrances on either side of the building, at grade.
The Building will be constructed in terms of the Michigan Building Code to ensure proper fire rating.

53. Whether or not the proposed project design provides easy access for emergency vehicles and individuals (ie. are there obstacles to access, such as one way roads, narrow bridges etc.);
The project is located on two-way road with direct access to all local arteries.
Park St. will be converted to a two-way street.

54. Whether or not there are plans for a security system which can be expanded, and whether approval for same has been granted by the police department;
A security system is proposed. Approval upon review to meet all police department requirements.

55. Detailed description of all fire access to the building, site, fire hydrants and water connections;
Fire department connection to be coordinated per fire department; Full fire suppression throughout; Access to all floors via fire stairs and elevators; Full state of the art alarm system; Fire command center

56. Whether or not there are plans for adherence to all city and N.F.P.A. fire codes:
All NFPA codes will be followed.

57. Proof that one elevator has been designed to accommodate a medical cart:
All elevators to accommodate a medical cart

58. Detailed specifications on all fire lanes/parking lot surfaces/alleys/streets to demonstrate the ability to accommodate the weight of emergency / fire vehicles;
Existing street access, concrete parking lot surfaces

59. Detailed description of all fire suppression systems:
To be submitted with Construction Documents

60. Provide completed FORM A - Transportation Study Questionnaire (Abbreviated);

See Traffic Impact Assessment as prepared by Stonefield engineering.

61. Provide completed FORM B - Transportation Study Questionnaire if required by the city's transportation consultant;
See Traffic Impact Assessment as prepared by Stonefield engineering.
Does not apply if absent in the study

62. Indicate whether transportation facilities and services will be adequate to meet the needs of all users (i.e. access to public transportation, bicycle accommodations, pedestrian connections, disabled, elderly etc.);
Bus Stop is located in close proximity on Maple
A Bike rack will be provided
Pedestrian access available at on Maple Rd, Park St, and Woodward Ave., and Park St. with full Barrier free access to all levels of the building

63. Indicate how the project will improve the mobility of all groups by providing transportation choices;
Occupants and visitors can easily access the facility by foot via sidewalks, by car from parking on the street, parking inside the facility, and by bus. A Bike rack will be provided for bikers.

64. Indicate how the users of the building will be encouraged to use public transit and non motorized forms of transportation;
A Bus stop is in close proximity on Maple. A Bike rack will be provided on site for occupants and visitors. The Bike rack will be consistent with Birmingham city standards.

65. Indicate the elements that have been incorporated into the site and surrounding right-of-way to encourage mode shift away from private vehicle trips;
A Bus stop in close proximity on Maple.
A Bike rack on site will be provided.

66. Indicate the elements of the project that have been provided to improve the comfort and safety of cyclists (such as secured or covered bicycle parking, lockers, bike lanes/paths, bicycle share program etc.);
A Bike rack will be provided on site.

67. Indicate the elements of the project that have been provided to improve the comfort and safety of pedestrians (such as wheelchair ramps, crosswalk marking, pedestrian activated signal lights, bulb outs, benches, landscaping, lighting etc.);
- Wheelchair and all barrier free access provided
- Crosswalks available road intersections
- Pedestrian activated signals provided at road intersections
- Building and municipal path fully illuminated
- Planting areas and benches

68. Indicate the elements of the project that have been provided to encourage the use of sustainable transportation modes (such as receptacles for electric vehicle charging, parking for scooters/Smart cars etc.):
Not at this time

69. Indicate whether there are any visual indicators of pond and / or stream water quality problems on or near the site;
Not Applicable

70. Indicate whether the project will involve any increase in impervious surface area and if so, indicate the runoff control measures that will be undertaken:
Refer to the enclosed survey and drainage plans paving plans of the site.
Previously the site was mainly a paved parking lot.

71. Indicate whether the project will affect surface water flows on water levels of ponds or other water bodies:
It is not anticipated that the development will impact any existing surface water flows of ponds or other water bodies.

72. Indicate whether the project may affect or be affected by a wetland, flood plain, or floodway;
It is not anticipated that the development will be impacted or propose impact an existing wetland, floodplain, or floodway. Refer to the enclosed engineering site plans

73. Indicate whether the project location or construction will adversely impact unique natural features on or near the site;
It is not anticipated that the development will be impacted or propose impact an existing unique natural features on or near the site.

74. Indicate whether the project will either destroy or isolate a unique natural feature from public access;
The development will not impede the public access to amenities that surround it.

75. Indicate whether any unique natural feature will pose safety hazards for the proposed development;
No existing natural feature will pose any safety hazards for the development.

76. Indicate whether the project will damage or destroy existing wildlife habitats;
Proposed project will not destroy and existing wildlife or habitats

Other Information

77. Any other information as may reasonably be required by the city to assure an adequate analysis of all existing and proposed site features and conditions.
Our office will be happy to supply all additional requested information by the city.

Professional Qualifications

The preparer(s) of the CIS must indicate their professional qualifications, which must include registration in the state of Michigan in their profession where licensing is a state requirement for the practice of the profession (i.e. engineer, surveyor, architect etc.).

Where the state does not require licensing (ie. planner, urban designer, economist etc.), the preparer must demonstrate acceptable credentials including, but not limited to, membership in professional societies, university degrees, documentation illustrating professional experience in preparing CIS related materials for similar projects.

Kevin Biddison, AIA

Section 11. Site Photographs

North

North

East

East

East

South

South

West

West

Section 12. Proposed Security System

TBD

City of Birmingham
A Walkable Community

Combined CIS & Site Plan Review Application

Planning Division

Form will not be processed until it is completely filled out.

1. Applicant

Name: Hesham Gayar
Address: 8469 Warwick Gtove Ct. Grand Blanc, MI 48439

Phone Number: 810 338 3926
Fax Number:
Email address: hesham.gayar@gmail.com

2. Property Owner

Name: Hesham Gayar
Address: 8469 Warwick Ct. Grand Blanc, Mi 48439
Phone Number: 810·338·3926
Fax Number:
Email address: hesham.gayar@gmail.com

3. Applicants Attorney/Contact Person

Name: H. William Freeman, Esq.
Address: 25800 Northwestern Hwy., Suite 1000 Southfield, MI 48075
Phone Number: 248 746 2733
Fax Number:
Email address: wfreeman@swappc.com

4. Project Designer/Developer

Name: Kevin Biddison
Address: 320 Martin St. LL 10 Birmingham, MI 48009
Phone Number: 248 554 9500
Fax Number:
Email address: kb@biddison-ad.com

5. Required Attachments

- Required fee (see Fee Schedule for applicable amount)
- Two (2) folded copies of scaled plans including:
  - Certified land survey
  - Color elevations showing all materials
  - Site plan (including property lines, buildings and structures for the subject site as well as all adjacent properties within 200 ft. of the property line)
  - Landscape plan
  - Photometric plan
  - Interior floor plan
- Photographs of existing site and/or building.
- Current aerial photos of the subject site, including all adjacent properties within 200 ft.
- Warranty Deed with legal description of property.
- Samples of all materials to be used
- Catalog sheets for all proposed lighting, mechanical equipment and outdoor furniture.
- A signed letter from DTE approving the location of all electrical transformers and electrical equipment.
- Completed Checklist.
- Digital copy of plans.
- Additional information as required.

6. Project Information

Address/Location of the property: 35001 and 35075 Woodward Ave. Birmingham, MI 48009
Name of development: The Maple

Sidwell #: 19-25-456-037, 19-25-456-014, 19-25-456-043
Current Use: A-2 Restaurant, Parking

Current zoning: B-4 D-4 Overlay
Is the property located in the floodplain? No

Name of Historic District Site is Located in: N/A

Date of HDC Approval: N/A
Date of DRB Approval: N/A
Area of Site in Acres: .5
Proposed Use: A-2, M, B, R-2
Will proposed project require the division of platted lots? No

Will proposed project require the combination of platted lots?

7. Details of the Proposed Development (attach separate sheet if necessary)

RETAIL/ RESTAURANT 1ST FLOOR
2 Levels of parking
OFFICE 2ND FLOOR
RESIDENTIAL: 3-5TH FLOOR

8. Buildings and Structures

Number of Buildings on Site: 1
Height of Buildings & # of Stories: 5
Use of Buildings: A-2, B, R-2
Height of Rooftop Mechanical Equipment: 80'

9. Floor Use and Area (in Square Feet)

Proposed Commercial Structures: Underground Parking & Mechanical

Total basement floor area: 48,732 Sqft
Number of square feet per upper floor: (2nd-4th) FLOOR -21,675 S.F.
Total floor area: 150,702 Sqft
Floor area ratio (total floor area ÷ total land area): 5

Open space: N/A
Percent of open space: N/A

HOTEL
Office Space: 2nd FLOOR OFFICE: 21,675 S.F.
Retail Space: 1ST FLOOR: 20,900 S.F.
~~Industrial Space~~: RESIDENTIAL: 59,645 S.F
Assembly Space: TBD
Seating Capacity: TBD
Maximum Occupancy Load: TBD

Proposed Residential Structures:

Total number of units: 42
Number of one bedroom units: 23
Number of two bedroom units: 19
Number of three bedroom units: -
Open space: N/A
Percent of open space: N/A

Rental units or condominiums? TBD
Size of one bedroom units: 700-1,000 S.F
Size of two bedroom units: 1,080-2,200 S.F.
Size of three bedroom units: -
Seating Capacity:
Maximum Occupancy Load: TBD

Proposed Additions: N/A

Total basement floor area, if any, of addition:
Number of floors to be added:
Square footage added per floor:
Total building floor area (including addition):
Floor area ratio (total floor area ÷ total land area):

Open Space:
Percent of open space:

Use of addition:
Height of addition:
Office space in addition:
Retail space in addition:
Industrial space in addition:
Assembly space in addition:
Maximum building occupancy load (including addition):

10. Required and Proposed Setbacks

Required front setback: 0
Required rear setback: 0
Required total side setback: 0
Side setback: 0

Proposed front setback: 0
Proposed rear setback 0-9'
Proposed total side setback: 0
Second side setback: 0

11. Required and Proposed Parking

Required number of parking spaces: 27
Typical angle of parking spaces: 90
Typical width of maneuvering lanes: 22'-0"
Location of parking on site: 1St FLR, LL1, LL2
Location of parking off site: N/A
Number of light standards in parking area: 0
Screenwall material: N/A

Proposed number of parking spaces: 85
Typical size of parking spaces: 180 Sqft
Number of spaces <180 sq. ft.: 0
Number of handicap spaces: 4
Shared parking agreement? Yes, TBD
Height of light standards in parking area: N/A
Height of screenwall: N/A

12. Landscaping

Location of landscape areas: To meet City of Birmingham Req. Refer to landscape plan

Proposed landscape material: To meet City of Birmingham Req. Refer to landscape plan

13. Streetscape

Sidewalk width: Refer to site plan

Number of benches: Refer to landscape

Number of planters: Refer to landscape

Number of existing street trees: 11 to be removed

Number of proposed street trees: Refer to landscape

Streetscape plan submitted? Yes

Description of benches or planters: Refer to landscape

Species of existing trees: Refer to landscape

Species of proposed trees: Refer to landscape

14. Loading

Required number of loading spaces: 3

Typical angle of loading spaces: 0

Screenwall material: N/A

Location of loading spaces on site: 1st FLR surface parking

Proposed number of loading spaces: 1

Typical size of loading spaces: 40'-0" X 12'-0"

Height of screenwall: N/A

Typical time loading spaces are used: 24/7

15. Exterior Waste Receptacles

Required number of waste receptacles:

Location of waste receptacles: (2) Hunter House/ (5) BUILDING

Screenwall material: Steel roll up doors at each location

Proposed number of waste receptacles: 6

Size of waste receptacles: 6'-0" X 6'-0"

Height of screenwall: N/A (INTERIOR)

16. Mechanical Equipment

Utilities and Transformers:

Number of ground mounted transformers: 2

Size of transformers (L•W•H): TBD

Number of utility easements:

Screenwall material:

Location of all ground mounted utilities: N/A

Height of screenwall:

Ground Mounted Mechanical Equipment:

Number of ground mounted units: None

Size of ground mounted units (L•W•H): N/A

Screenwall material: N/A

Location of all ground mounted units: N/A

Height of screenwall:

Rooftop Mechanical Equipment:

Number of rooftop units: TBD

Type of rooftop units: TBD

Screenwall material: Metal Panel

Location of screenwall: Roof

Location of all rooftop units: TBD

Size of rooftop units (L•W•H): TBD

Percentage of rooftop covered by mechanical units:

Height of screenwall: 9'-0" +/-

Distance from rooftop units to all screenwalls: TBD

17. Accessory Buildings

Number of accessory buildings: None

Location of accessory buildings: N/A

Size of accessory buildings: N/A

Height of accessory buildings: N/A

18. Building Lighting

Number of light standards on building: TBD
Size of light fixtures (L•W•H): TBD
Maximum wattage per fixture: TBD
Light level at each property line: TBD

Type of light standards on building: TBD
Height from grade: TBD
Proposed wattage per fixture: TBD

19. Site Lighting

Number of light fixtures:
Size of light fixtures (L•W•H):
Maximum wattage per fixture:
Light level at each property line:

Type of light fixtures: TBD
Height from grade: TBD
Proposed wattage per fixture: TBD
Holiday tree lighting receptacles: TBD

20. Adjacent Properties

Number of properties within 200 ft.:

Property #1

Number of buildings on site:
Zoning district:
Use type:
Square footage of principal building:
Square footage of accessory buildings:
Number of parking spaces:

Property Description:
North, south, east or west of property?

Property #2

Number of buildings on site:
Zoning district:
Use type:
Square footage of principal building:
Square footage of accessory buildings:
Number of parking spaces:

Property Description:
North, south, east or west of property?

Property #3

Number of buildings on site:
Zoning district:
Use type:
Square footage of principal building:
Square footage of accessory buildings:
Number of parking spaces:

Property Description:
North, south, east or west of property?

Property #4

Number of buildings on site:
Zoning district:
Use type:
Square footage of principal building:
Square footage of accessory buildings:
Number of parking spaces:

Property Description:
North, south, east or west of property?

Property #5

Number of buildings on site:
Zoning district:
Use type:
Square footage of principal building:
Square footage of accessory buildings:
Number of parking spaces:

Property Description:
North, south, east or west of property?

Property #6

Number of buildings on site: 1
Zoning district: _____
Use type: RETAIL, OFFICE, RESIDENTIAL
Square footage of principal building: _____
Square footage of accessory buildings: N/A
Number of parking spaces: 85

Property Description: SEE ATTACHED LEGAL DESCRIPTION

North, south, east or west of property? _____

The undersigned states the above information is true and correct, and understands that it is the responsibility of the applicant to advise the Planning Division and / or Building Division of any additional changes made to an approved site plan. The undersigned further states that they have reviewed the procedures and guidelines for site plan review in Birmingham, and have complied with same. The undersigned will be in attendance at the Planning Board meeting when this application will be discussed.

Signature of Owner: _____ Date: 11/26/18

Print Name: _____

Signature of Applicant: _____ Date: 11/26/18

Print Name: _____

Signature of Architect: _____ Date: 11/26/18

Print Name: Kevin Biddison

Office Use Only

Application #: _____ Date Received: _____ Fee: _____

Date of Approval: _____ Date of Denial: _____ Accepted by: _____

City of Birmingham
A Walkable Community

Notice Signs - Rental Application
Community Development

1. Applicant
Name: Hesham Gayar
Address: 8469 Warwick Grove CT
Grand Blanc, MI 48439
Phone Number: 810. 338. 3923
Fax Number:

Property Owner
Name: Hesham Gayar
Address: 8469 Warwick Grove Ct.
Grand Blanc, MI 48439
Phone Number: 810.338.3923
Fax Number:

2. Project Information
Address/Location of Property: 35001 & 35076 Woofward Ave, Birmingham, MI 48009
Name of Development: The Maple
Area in Acres: 0.5

Name of Historic District site is in, if any: N/A
Current Use: A-2 Restaurant, Parking
Current Zoning: B-4, D-4 Overlay

3. Date of Board Review
Board of Building Trades Appeals: -
City Commission: -
Historic District Commission: -
Planning Board: -

Board of Zoning Appeals: -
Design Review Board: -
Housing Board of Appeals: -

The undersigned states the above information is true and correct, and understands that it is the responsibility of the applicant to post the Notice Sign(s) at least 15 days prior to the date on which the project will be reviewed by the appropriate board or commission, and to ensure that the Notice Sign(s) remains posted during the entire 15 day mandatory posting period. The undersigned further agrees to pay a rental fee and security deposit for the Notice Sign(s), and to remove all such signs on the day immediately following the date of the hearing at which the project was reviewed. The security deposit will be refunded when the Notice Sign(s) are returned undamaged to the Community Development Department. Failure to return the Notice Sign(s) and/or damage to the Notice Sign(s) will result in forfeiture of the security deposit.

Signature of Applicant: [signature] Date: 11/26/2018

Office Use Only

Application #: Date Received: Fee:

Date of Approval: Date of Denial: Reviewed by:

WARRANTY DEED

File No.: **FT-3703**

THE GRANTOR, **Birmingham Property LLC, a Michigan Limited Liability Company**

whose address is: **35001 & 35075 Woodward, Birmingham, MI 48009**

conveys and Warrants to **Select Commercial Assets Hospitality, LLC, a Michigan Limited Liability Company**

whose address is: **35001 & 35075 Woodward Birmingham, MI 48009**

the following described premises situated in the **City of Birmingham**, County of **Oakland**, and State of **Michigan**, and particularly described as follows:

1. The land referred to in this Commitment is described as follows:

   Land in the City of Birmingham, County of Oakland, State of Michigan described as:

   (SEE EXHIBIT A)

Tax Parcel No.: **08-19-25-456-037 - Parcel 1, 08-19-25-456-014 - Parcel 2**
Commonly known as: **35001 & 35075 Woodward , Birmingham, MI 48009**

for the sum of **FIVE MILLION SIX HUNDRED THOUSAND AND NO/100** Dollars (**$5,600,000.00**)

The Grantor grants to the Grantee the right to make (_____) divisions under section 108 of the land division act, Act 288 of the Public Act of 1967.

If the land being conveyed is unplatted, the following is deemed to be included: "This property may be located within the vicinity of farmland or farm operation. Generally accepted agricultural and management practices which may generate noise, dust, odors, and other associated conditions may be used and are protected by the Michigan Right to Farm Act."

Subject to easements, reservations and restrictions of record.

Dated: 7/22/2015

Signed and Sealed:

Jamal Kalabat, Member

Timothy Dabish, Member

STATE OF Michigan }
} ss
COUNTY OF Oakland }

On this 7/22/2015, before me personally appeared **Birmingham Property LLC, a Michigan Limited Liability Company** by Jamal Kalabat, member and Timothy Dabish, member to me known to be the person(s) described in and who executed the foregoing instrument and acknowledged that he/she/they executed the same as his/her/their free act and deed.

Notary Public: _____
Printed Name: _____
Oakland County, Michigan
My Commission Expires: _____

Drafted by/Returned to
Halabu Law Group, Peter S. Halabu, Esq
255 S. Old Woodward Ave, Suite 310
Birmingham, MI 48009

SHAMIL E. HALABU
Notary Public, State of Michigan
County of Oakland
My Commission Expires: 3/5/2020

CSCU/CD-2700 (10/16)

DEPARTMENT OF LICENSING AND REGULATORY AFFAIRS

LIMITED LIABILITY COMPANY ANNUAL STATEMENT

2017

Due February 15, 2017 **File Online at www.michigan.gov/fileonline**

Identification Number	Limited Liability Company Name
E6181J	SELECT COMMERCIAL ASSETS HOSPITALITY, LLC

1. Resident agent name and mailing address of the registered office

GEHAD HADIDI
75 BARCLAY CIRCLE STE 205
ROCHESTER HILLS MI 48307

RECEIVED
DEC 01 2016
LARA $25.00

If different from 1, change resident agent and mailing address of registered office in MICHIGAN.

Hesham E. GAYAR

FILED
DEC 21 2016
Corporation Division

2. The address of the registered office

75 BARCLAY CIRCLE STE 205
ROCHESTER HILLS MI 48307

If different from 2, change address of registered office (number, street, city, state, zip) in MICHIGAN.

8469 WARWICK GROVES CT.
GRAND BLANC MI 48439

3. Signature of authorized member, manager or agent.	Title	Date	Phone (Optional)
	president	11-22-16	810 338 3823

Filing Fee: $25.00

Annual Statement must be received by agency on or before February 15, 2017.

Annual Statement Must Be Signed

Domestic: Signature of a manager if management is vested in managers, by at least 1 member if management remains in the members or by an authorized agent of the domestic limited liability company.

Foreign: Signature of a person with authority to do so under the laws of the foreign limited liability company's jurisdiction of organization.

Veterans - Pursuant to MCL 450.5101(7), if a majority of the membership interests in the domestic or foreign limited liability company responsible for paying the fee are held by 1 or more honorably discharged veterans of the armed forces of the United States, you may contact the Corporations Division regarding a fee waiver.

Required by Section 207, Act 23, Public Acts of 1993, as amended.

File online at www.michigan.gov/fileonline
or mail your completed statement with a check or money order payable to the State of Michigan.

Return to: Corporations Division
P.O. Box 30768
Lansing MI 48909
(517) 241-6470

TJ

BAT2700LLC_NOV

Kolano and Saha Engineers, Inc.
Consultants in Acoustics, Noise and Vibration

2018-096
November 22, 2019

Mr. Kevin Biddison
Biddison Architecture
320 Martin Street, Suite 10
Birmingham, MI 48009

Subject: **Birmingham CIS - Sound Level Measurements and Noise Impact Assessment 2019 Update**
re: The Maple at 35001 Woodward Mixed Use Development
Birmingham, MI

Dear Mr. Biddison:

At your request and authorization Kolano and Saha Engineers, Inc. (K&SE) conducted an updated investigation to review the environmental noise associated with the proposed 35001 Woodward Mixed Use Development. This investigation includes a review of the measurements at the development site to understand the current ambient noise condition with an evaluation of the proposed development to help assess if noise associated with this development will be compatible at this location.

On-Site Sound Level Measurements

We conducted measurements using a Brüel & Kjær 2270 environmental noise analyzer with a precision outdoor microphone assembly. This instrumentation was calibrated before and after measurements using an acoustic calibrator traceable to the National Institute for Standards and Technology. It was set to measure for a continuous period from May 16th starting at 4:30 PM to May 17th, 2018 at 3:45 PM. The measurement equipment was located on the west side of Woodward Ave., approximately 28 feet from the center of the right turn lane (access to Maple Rd.) and 40 feet from the center of the nearest through lane, and is 80 feet north of Maple Road. See **Exhibit 1** for a plan detailing the measurement location.

The results of the measurements are presented in a graph of sound level versus time in **Exhibit 2**. This graph contains three plot lines; the 5 minute L_{eq} (energy average level), the hourly L_{eq}, and the daytime and nighttime L_{eq} (used to calculate DNL). Spikes in the sound level were caused primarily by local traffic on Woodward Ave.

From this data we calculated the DNL or day-night sound level average. The DNL is an average of both the daytime and nighttime sound levels where the nighttime sound levels have been raised by 10 dB to account for people's greater sensitivity to noise in the nighttime hours. Measurement results, in terms of the day-night sound level average (DNL), were determined and compared to U.S. Government guidelines promulgated by the U.S. Environmental Protection

Agency (EPA) and the department of Housing and Urban Development (HUD). EPA guidelines define DNL 55dB (or less) as desirable goal for residential land use; HUD guidelines consider outdoor noise levels up to DNL 65dB as "normally acceptable" for residential land use. HUD guidelines consider outdoor noise levels between 65dB and 75dB as "normally unacceptable" for residential land use. The results of these measurements show that the site has a measured sound level of **DNL 75 dB(A)**. This is at the upper edge of the normally acceptable range of the HUD guidelines for residential land use. However, this measurement was taken at an elevation of 7 feet above the ground. At higher elevations, road noise will be reduced such that at the 4th & 5th floor elevations, the expected sound level will be approximately DNL 65-70 dB(A). Additionally, the residential levels will have glass or wall railing/barrier elements for the balconies which will help shield some street noise to the building interiors.

Nonetheless, traffic noise from Woodward has the potential to create an adverse noise impact to the residences of the building. It may be desired to provide additional noise isolating construction on the façades of the building that will have direct exposure to the Woodward traffic noise. The windows and balcony doors are likely to be the easiest path for noise to pass through, and could be upgraded with sound rated assemblies. Alternately, raising the height of the balcony glass railings could also help reduce the traffic noise. We recommend that the façade construction or sound barrier railings, be designed to provide sufficient sound attenuation to produce interior traffic noise levels no higher than DNL 45 dB(A). For luxury construction, even lower interior traffic noise levels not exceeding DNL 35 dB(A) should be considered.

City of Birmingham Noise Ordinance

The City of Birmingham addresses noise in their ordinance under *Part II – City Code, Chapter 50 – Environment, Article II. Nuisances, Division 4 – Noise*. This ordinance provides information of Definitions, general prohibitions, specific prohibitions, decibel level prohibitions, general exemptions and test procedures. The objective limits cited in this ordinance (as Table 1) are:

Use of Property Producing the Sound	Use of Property Receiving the Sound	Sunday to Saturday 7:00 a.m. to 7:00 p.m.	Sunday to Saturday 7:00 p.m. to 7:00 a.m.
Residential	Residential	75	60
Commercial	Residential	80	60
Residential	Commercial	80	60
Commercial	Commercial	90	75

Exemptions to these limits include power equipment operations between 7AM and 7PM that do not exceed 100 dB(A) at or beyond the property line, construction noise between 7AM and 7PM Monday-Saturday excluding holidays (with additional provisions), and snow removal which does not exceed 90 dB(A) at or beyond the property line.

Proposed Development Noise Impact

The proposed mixed use building is similar to other developments in Birmingham. The proposed 5 story building is expected to have retail stores and a restaurant on the first floor, offices on the 2nd floor and residences on the 3rd, 4th & 5th floors. Additionally, the building is planned to have 2 levels of below ground parking. The anticipated noise sources for the development are:

Building Wide Heating and Cooling Mechanical Systems

Like other large buildings in Birmingham, centralized roof mounted heating and cooling equipment are expected control the climate of building areas separate from individual resident quarters. With the adjacent buildings expected to be at least 100 feet from the roof top equipment, noise from these elements are not expected to exceed the ordinance limits.

Exhaust Fans

With the anticipated restaurant, a kitchen exhaust fan will be needed. While these elements have some potential to create a noise disturbance, efficient fan selection that permit the required airflow while not operating at a very high speed should minimize any noise issue. Centrifugal fans tend to be quieter than propeller style fans.

Emergency Power Generator

It is expected that an emergency power generator will be part of the building mechanical systems. While this has the potential for excessive noise, with the proper location selection and provisions for an enclosure and exhaust muffling, plus the expected minimal use (weekly or bimonthly maintenance cycles are expected), we expect that a generator can be made to comply with the ordinance and create minimal noise impact. A location adjacent to and facing Woodward Avenue will likely have a lower potential for creating a noise disturbance.

Delivery Vehicles

For retail or food service, multiple deliveries are expected each week. These deliveries are expected to come from small to medium sized commercial vehicles. These deliveries are expected to be comparable to those for restaurants or other moderately sized businesses that already occur in the city.

Parking Garage Exhaust Fan

To ventilate vehicle exhaust gasses, a fan is expected for the below ground parking. Careful selection of this fan (or fans), possibly a centrifugal or mixed flow, with appropriate noise control elements is recommended to help keep pedestrians on these parking levels safe (to be able to hear approaching vehicles) as well to comply with the noise ordinance for above-grade air intakes and discharges.

Conclusion

Based on the information we have been provided, we anticipate that the proposed development will produce no excessive noise contribution to the adjacent community and will be within the Birmingham Noise Ordinance limits. Furthermore, the existing measured site sound levels exceed 65 DNL, the residential 3rd, 4th & 5th floors are also expected be above the 65 DNL and above the "normally acceptable" noise level guidelines promulgated for residential land use by the U.S. Department of HUD. We recommend that the building façade construction or balcony sound barriers be designed to reduce the interior sound levels down to an interior DNL of 45 dB(A) or lower.

Mr. Biddison, we appreciate your calling us for this work. Should you have questions or need additional assistance on this matter, do not hesitate to call.

Sincerely,

KOLANO AND SAHA ENGINEERS, INC.

Darren Brown, P.E.
INCE Board Certified
Consultant

EXHIBIT 1

SITE PLAN DETAILING THE LOCATION OF THE 24-HOUR SOUND LEVEL MEASUREMENTS

Measurements Conducted for: **Biddison Architecture**

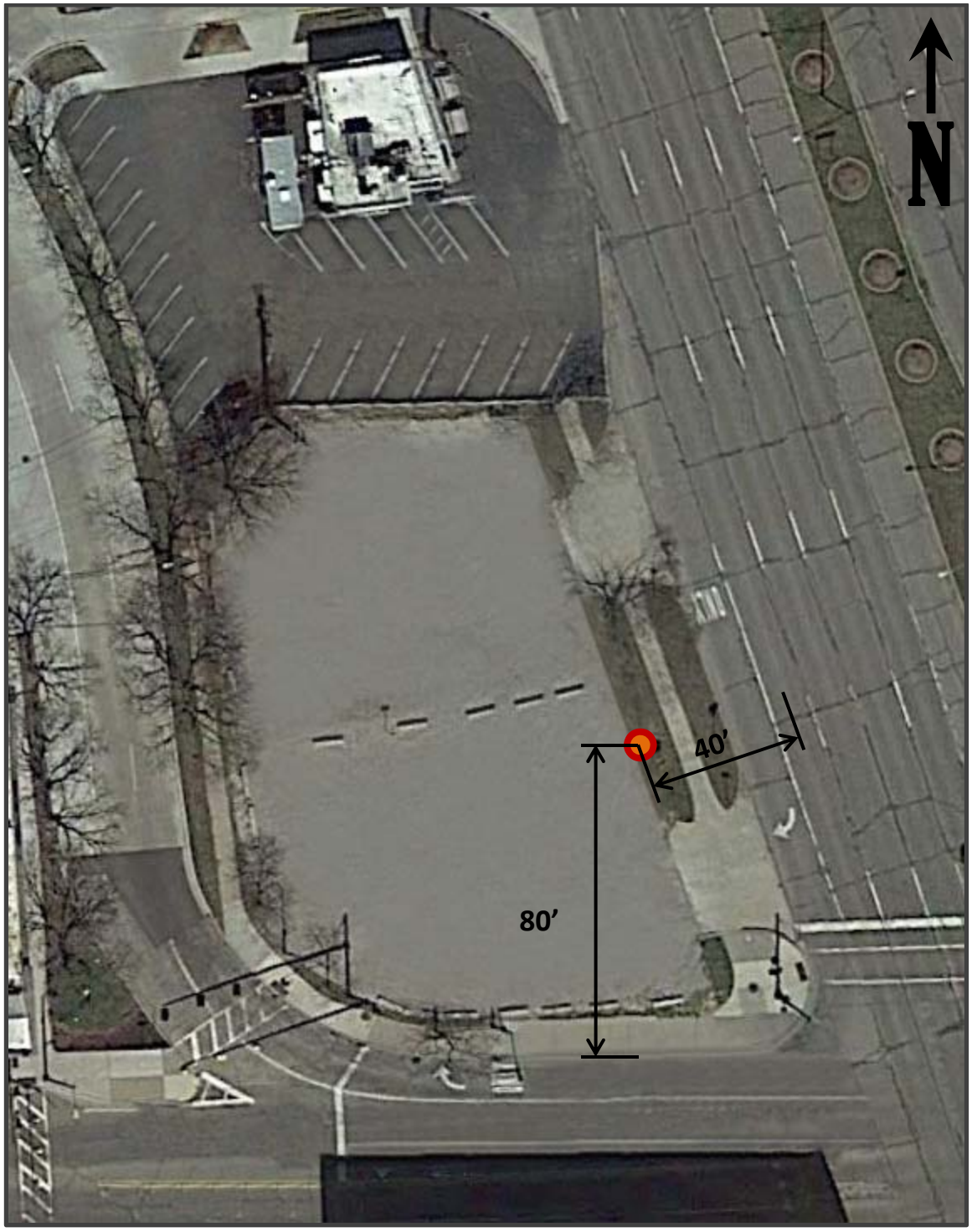


EXHIBIT 2

Ambient Sound Levels at Proposed Loction for The Maple Development in Birmingham, MI
Measured on the West Side of Woodward, 40 Feet from the Nearest Lane of Traffic and 80 Feet North of Maple Road

Measurements Conducted for: Biddison Architecture

Traffic Impact Assessment of Proposed

THE MAPLE

35001 & 35075 Woodward Avenue
Birmingham, Michigan 48009

Prepared For:
Kevin Biddison, AIA
Biddison Architecture + Design
320 Martin Street, Suite 10
Birmingham, MI 48009

Applicant Information:
Hesham Gayar
8469 Warwick Grove Court
Grand Blanc, MI 48439

Prepared: November 26, 2018
Revised: January 6, 2020

STONEFIELD

TABLE OF CONTENTS

TECHNICAL APPENDIX

Executive Summary

The Applicant is proposing to construct a five (5)-story mixed-use building on the subject site which is currently occupied by the Hunter House Hamburgers restaurant and a surface parking lot. The development would consist of 10,150 square feet of gross leasable retail space on the ground level, 21,675 square feet of gross leasable office space on the second floor, 42 apartment units on floors three (3) through five (5), and the existing Hunter House Hamburgers restaurant would be moved into a 1,330-square-foot space located at the northeastern corner of the proposed building. Parking on-site would be provided by a ground-level garage with three (3) parking spaces designated for employees of the Hunter House Hamburgers restaurant and ADA-accessible parking, and a 82 parking space, two (2)-level underground garage with 63 spaces designated for residents, 11 spaces designated for Hunter House Hamburger patrons, and eight (8) spaces designated for office employees. Construction and full occupancy are expected by 2021.

Access to the Hunter House Hamburgers ground-level parking garage would be provided via one (1) full-movement driveway along Hamilton Row, and access to the two (2)-level underground parking garage would be provided via one (1) full-movement driveway along Park Street.

The site is located within the parking assessment district, and as such, no parking is required for the non-residential portion of the development. However, parking for patrons of the Hunter House Hamburger restaurant and a portion of the office employees would be provided within the parking garage. Of the 82 parking spaces provided within the garage, 63 spaces would be designated for residents, 11 spaces would be designated for Hunter House Hamburger patrons, and eight (8) spaces would be designated for office employees.

The trips generated by the proposed development were assigned to the study network based on existing traffic patterns and proposed vehicle parking locations. Any additional trips into and out of the site that are generated by the off-site parking were also added to the study network.

This Traffic Impact Assessment was prepared by Stonefield Engineering & Design, LLC, utilized the City of Birmingham's Traffic Study Questionnaire (Form B), as well as accepted traffic engineering practices for Traffic Impact Assessments.

The key findings and conclusions developed in this study are as follows:

1. The proposed apartments are projected to generate 15 trips (4 in, 11 out) during the weekday morning peak hour and 18 trips (11 in, 7 out) during the weekday evening peak hour. The proposed office is projected to generate 47 trips (40 in, 7 out) during the weekday morning peak hour and 27 trips (4 in, 23 out) during the weekday evening peak hour. The retail uses are projected to generate 10 trips (6 in, 4 out) during the weekday morning peak hour and 100 trips (48 in, 52 out) during the weekday evening peak hour. The Hunter House Hamburgers restaurant is to continue operating on the site and is projected to generate three (3) trips (3 in, 0 out) during the weekday morning peak hour and 38 trips (19 in, 19 out) during the weekday evening peak hour.

2. Traffic for employees of the Hunter House Hamburgers restaurant and ADA parking would utilize the full-movement driveway along Hamilton Row. Traffic for the apartments, patrons of the Hunter House Hamburgers, and a portion of office employees would arrive to and depart from the driveway along Park Street. Traffic for the retail uses and remaining portion of office employees would utilize the parking garages located at 333 Park Street and 222 Peabody Street. Based on parking occupancy count data from March 2017, there is sufficient parking supply to accommodate the parking demand during the weekday morning and evening periods.

3. The site is located within the downtown parking assessment district, and as such, no parking is required for the non-residential portion development. The site would provide three (3) ground-level garage

parking spaces designated for Hunter House Hamburgers, and 82 parking spaces below grade, including 63 parking spaces for residents, 11 spaces dedicated to Hunter House Hamburgers, and eight (8) parking spaces for employees at the subject site.

4. The proposed development would further the City's Multi-Modal Transportation Plan by improving the urban character of the block, expanding the downtown footprint and removing surface parking lots that do not encourage pedestrian travel or interaction. The site's location would provide an additional destination in the vicinity of six (6) SMART bus routes. It is recommended that the office and retail uses provide transit information for its employees to encourage transit use.

5. The proposed development would further the City's Multi-Modal Transportation Plan by completing the sidewalk network along Woodward Avenue between Hamilton Row and Maple Road, whereas a combination of sidewalk and asphalt pavement for a parking lot exists today.

6. The proposed development would further the City's Multi-Modal Transportation Plan by providing outdoor bicycle racks at the entrances to the retail uses and Hunter House Hamburgers for visitor use and covered indoor bicycle storage would be provided within the parking garage for use by office employees and residents of the apartments. The proposed bicycle storage encourages bicycle use at the site and reduces the need for trips via automobile.

7. Gated access is not proposed at any of the parking areas.

8. Based on a Level of Service and Volume/Capacity analysis, the proposed development would not have a significant impact on the traffic operations of the roadway network during the weekday morning and weekday evening peak hours.

9. No traffic infrastructure improvements are warranted by the proposed development; however, the analysis does consider the proposed two-way operation of Park Street approved by the City of Birmingham.

Introduction

The Applicant is proposing to construct a five (5)-story mixed-use building on the subject site which is currently occupied by the Hunter House Hamburgers restaurant and a surface parking lot. The site is bounded by Woodward Avenue to the east, Park Street to the west, Hamilton Row to the north, and Maple Road to the south. The subject site location is shown on a map on **Figure 1** and is shown isometrically on **Figure 2**. The development would consist of 10,150 square feet of gross leasable retail space on the ground level, 21,675 square feet of gross leasable office space on the second floor, 42 apartment units on floors three (3) through five (5), and the existing Hunter House Hamburgers restaurant would be moved into a 1,330-square-foot space located at the northeastern corner of the proposed building. Parking on-site would be provided by a ground-level garage with three (3) parking spaces designated for Hunter House Hamburgers, and a 82 parking space, two (2)-level underground garage with 63 spaces designated for residents, 11 spaces designated for Hunter House Hamburgers, and eight (8) spaces for employees of the proposed development. Construction and full occupancy are expected by 2021.

Access to the Hunter House Hamburgers is currently provided via one (1) full-movement driveway along Hamilton Row and one (1) right-ingress/right-egress driveway along Woodward Avenue, and access to the adjacent surface parking lot is currently provided via two (2) right-ingress/right-egress driveways along Woodward Avenue. Under the proposed development program, access to the Hunter House Hamburgers ground-level parking area would be provided via one (1) full-movement driveway along Hamilton Row, and access to the two (2)-level underground parking garage would be provided via one (1) full-movement driveway along Park Street. The site is located within the downtown parking assessment district, and as such, 63 parking spaces are required for the 42 proposed residential apartment units, and no parking is required for the proposed non-residential portion of the development. A total of 85 parking spaces are proposed.

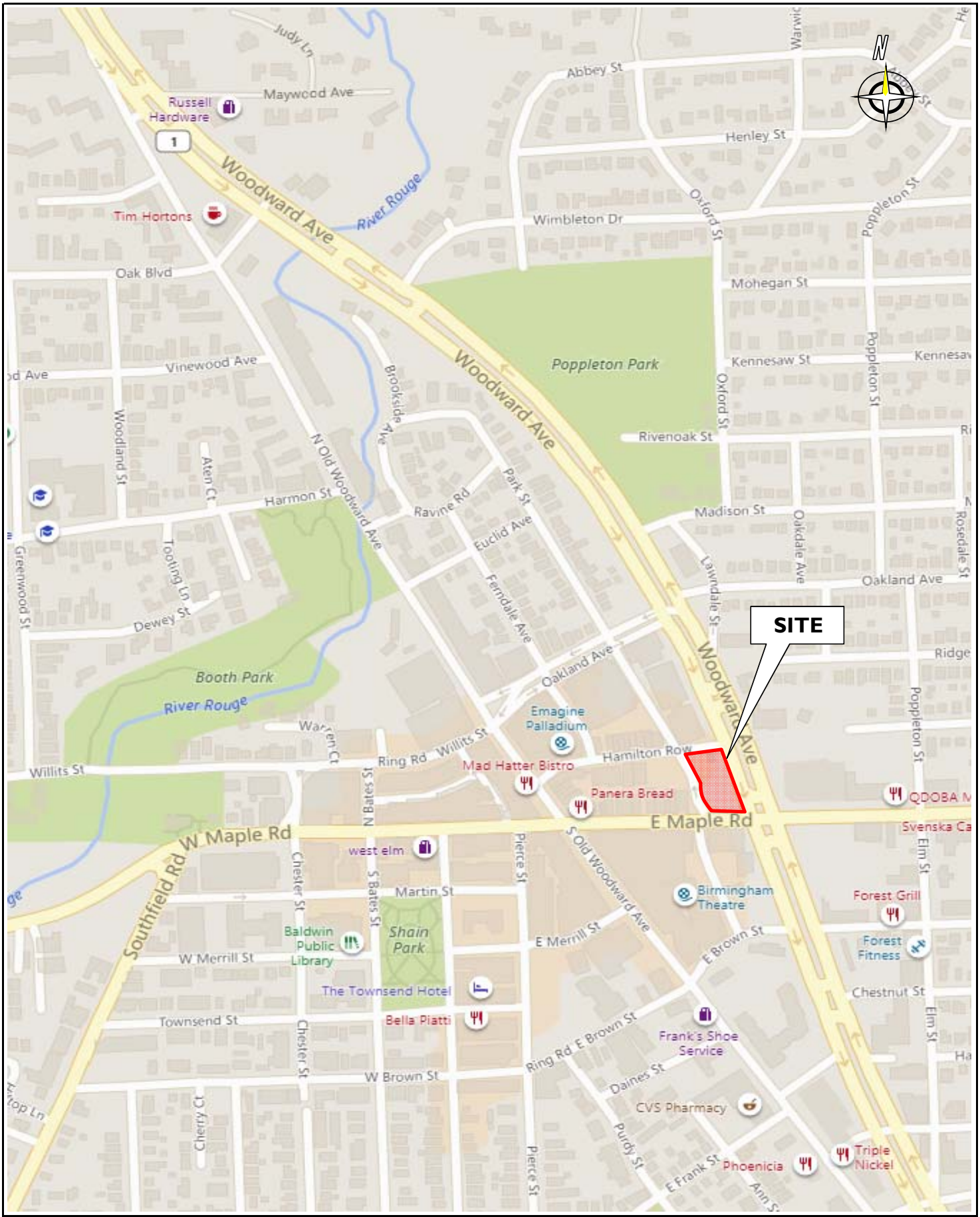
This Traffic Impact Assessment was prepared by Stonefield Engineering & Design, LLC, and utilized the City of Birmingham's Traffic Study Questionnaires (Form B), as well as accepted traffic engineering practices for Traffic Impact Assessments.

Existing Conditions

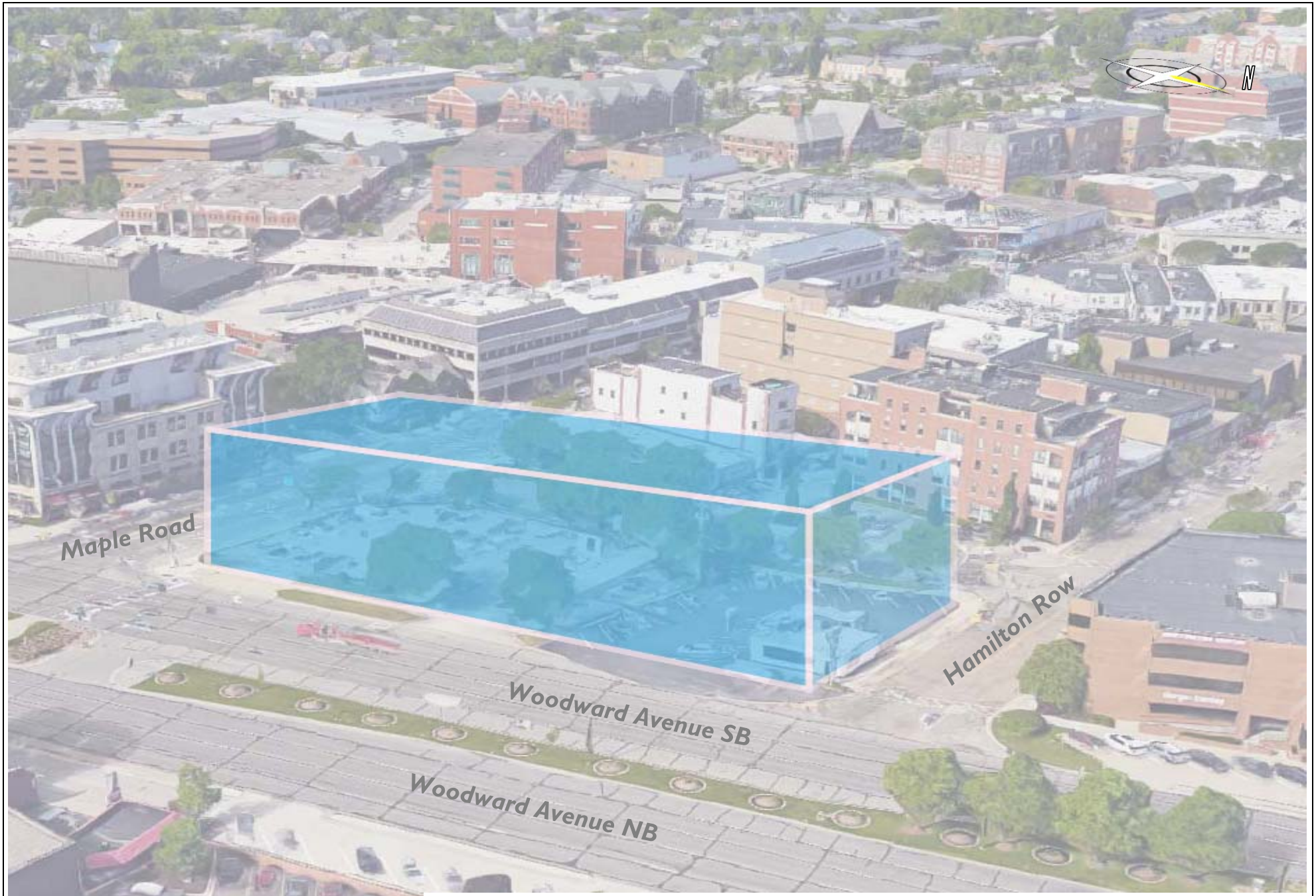
Roadway Characteristics

Woodward Avenue (M-1) is a state trunkline and is classified on the National Functional Classification Map as a Principal Arterial roadway. Woodward Avenue is located along the easterly side of the property with a general north-south orientation and generally provides four (4) lanes of travel in each direction. Woodward Avenue is separated by a raised grass median; crossovers are provided within the median to facilitate U-turns and left turns. Along the site frontage, additional lanes are provided approaching the intersection with East Maple Road to the south. Woodward Avenue has a posted speed limit of 45 mph. Along the site frontage, curb and sidewalk are provided, shoulders are not provided, and on-street parking is not permitted. Woodward Avenue provides north-south mobility throughout Birmingham and surrounding municipalities for a mix of commercial and residential uses along its length.

Hamilton Row is classified on the National Functional Classification Map as a local roadway. Hamilton Row has a general east-west orientation and generally provides one (1) lane of travel in each direction. Hamilton Row does not have a posted speed limit. Along the site frontage, curb and sidewalk are provided along both sides of the roadway, shoulders are not provided, and on-street parking is permitted along the northerly side of the roadway. Hamilton Row provides east-west mobility within in the City of Birmingham for a mix of commercial and residential uses along its length.



STONEFIELD	**The Maple: Mixed-Use Development** **35001-35075 Woodward Avenue** **Birmingham, Oakland County, Michigan** **Traffic Impact Assessment**	**FIGURE 1** **Site Location Map**



STONEFIELD	The Maple: Mixed-Use Development 35001-35075 Woodward Avenue Birmingham, Oakland County, Michigan Traffic Impact Assessment	**FIGURE 2** **Site Location Aerial View**

Maple Road is classified on the National Functional Classification Map as a Principal Arterial roadway. Maple Road has a general east-west orientation and generally provides one (1) lane of travel in each direction with additional lanes provided at key intersections to facilitate turning movements and provide additional capacity. Maple Road has a posted speed limit of 25 mph. Along the site frontage, curb and sidewalk are provided, shoulders are not provided, and on-street parking is not permitted. Maple Road provides east-west mobility in the City of Birmingham and surrounding municipalities for a mix of commercial and residential uses along its length.

Park Street is classified on the National Functional Classification Map as a Major Collector roadway. Park Street has a general north-south orientation and provides two (2) lanes of travel in the northbound direction. Park Street has a posted speed limit of 25 mph. Along the site frontage, curb and sidewalk are provided, shoulders are not provided, and on-street parking is not permitted. It is Stonefield's understanding that the City of Birmingham recently approved a proposal to convert Park Street between Hamilton Row and Maple Road from a one-way roadway to a two-way roadway. In the future condition, Park Street would provide one (1) lane in both directions. Note that presently, Park Street is a two-way roadway north of Hamilton Row.

Woodward Avenue and East Maple Road intersect to form a four (4)-leg signalized intersection. The eastbound and westbound approaches of East Maple Avenue provide one (1) exclusive through lane and one (1) shared though/right-turn lane. The northbound approach of Woodward Avenue provides three (3) exclusive through lanes and one (1) shared though/right-turn lane and the southbound approach of Woodward Avenue provides four (4) exclusive through lanes and one (1) exclusive right-turn lane. Crosswalks and pedestrian signal heads are provided across all legs of the intersection.

Woodward Avenue and Hamilton Row intersect to form a stop-controlled T-intersection with the eastbound approach of Hamilton Row operation under stop control. Hamilton Row provides one (1) exclusive right-turn lane. The southbound approach of Woodward Avenue provides three (3) exclusive through lanes and one (1) shared through/right-turn lane. Crosswalks are provided across the Hamilton Avenue leg of the intersection.

Maple Road, Park Street, and Peabody Street intersect to form a (4)-leg signalized intersection. The eastbound approach of Maple Road provides one (1) shared through/right-turn lane and the westbound approach of Maple Road provides one (1) exclusive left-turn lane, one (1) shared through/right-turn lane, and one (1) channelized right turn lane. The northbound approach of Peabody Street provides one (1) exclusive right-turn lane. Crosswalks and pedestrian signal heads are provided across the eastbound and northbound legs of the intersection.

In the future condition, the southbound approach of Park Street would provide one (1) exclusive right-turn lane, and the westbound approach of Maple Road would provide one (1) exclusive left-turn lane, one (1) exclusive through lane, and one (1) exclusive right-turn lane. A plan sheet details the future lane configuration is provided within the Technical Appendix.

Hamilton Row and Park Street intersect to form a four (4)-leg unsignalized intersection with the eastbound and westbound approaches of Hamilton Row and the southbound approach of Park Street operating under stop control. The eastbound approach of Hamilton Row provides one shared left-turn/through lane and the westbound approach of Hamilton Row provides one (1) shared through/right-turn lane. The northbound approach of Park Street provides one (1) exclusive left-turn lane, one (1) exclusive through lane, and one (1) shared through/right-turn lane. The southbound approach of Park Street provides one (1) shared left-turn/right-turn lane. Crosswalks are provided across all approaches of the intersection.

In the future condition, each approach at the intersection would provide one (1) full-movement lane, and only the eastbound and westbound approaches of Hamilton Row would operate under stop control.

Current Traffic Volumes

Stonefield utilized traffic volume data provided by the City of Birmingham, traffic volume data collected by our office, and volume balancing techniques to determine peak-hour traffic volumes at the study intersections. **Table 1** provides a summary of the traffic data utilized for this study and the year it was collected.

TABLE 1 – BIRMINGHAM TRAFFIC VOLUME DATA

Intersection	Source	Year
Intersection of Woodward Avenue and East Maple Road	City of Birmingham turning movement count data	2016
Intersection of Park Street/Peabody Street and East Maple Road	City of Birmingham turning movement count data	2016
Intersection of Woodward Avenue and North-to-South Crossover	Stonefield Engineering turning movement count data	2018
Intersection of Woodward Avenue and Hamilton Row	Traffic volume balancing	--
Intersection of Park Street and Hamilton Row	City of Birmingham automatic traffic recorder data	2016

Data collected in 2016 and 2018 was grown to the year 2019 to be consistent with the issuance of this report. In accordance with industry guidelines, the 2016 and 2018 traffic volumes were increased by 2.7% annually for three (3) years and one (1) year, respectively. The background growth rate was determined based on two-way AADT volumes collected on Old Woodward Avenue between Maple Road and Oak Avenue in 2007 and 2013. The volumes were 8,830 vehicles in 2007 and 10,355 in 2013, which equates to an annual traffic volume increase of 2.7%

Based on the City of Birmingham data available proximate to the site, it was determined that the data collected at the study intersections would provide the most conservative estimate of the existing traffic volume along the Park Street site frontage. The 2016 volume data at the intersection of Woodward Avenue and Maple Road and the intersection of Park Street/Peabody Street and East Maple Road was utilized to calculate an annual growth rate of approximately 2.7%.

Traffic volumes at the intersection of Woodward Avenue and Hamilton Row were calculated by balancing traffic volumes at the adjacent intersection of Woodward Avenue and the North-to-South Crossover and the intersection of Park Street and Hamilton Row. For the balanced movements at the intersection, the higher volume was utilized to provide a conservative analysis. The calculated 2019 Current Traffic Volumes are shown on **Figure 3**.

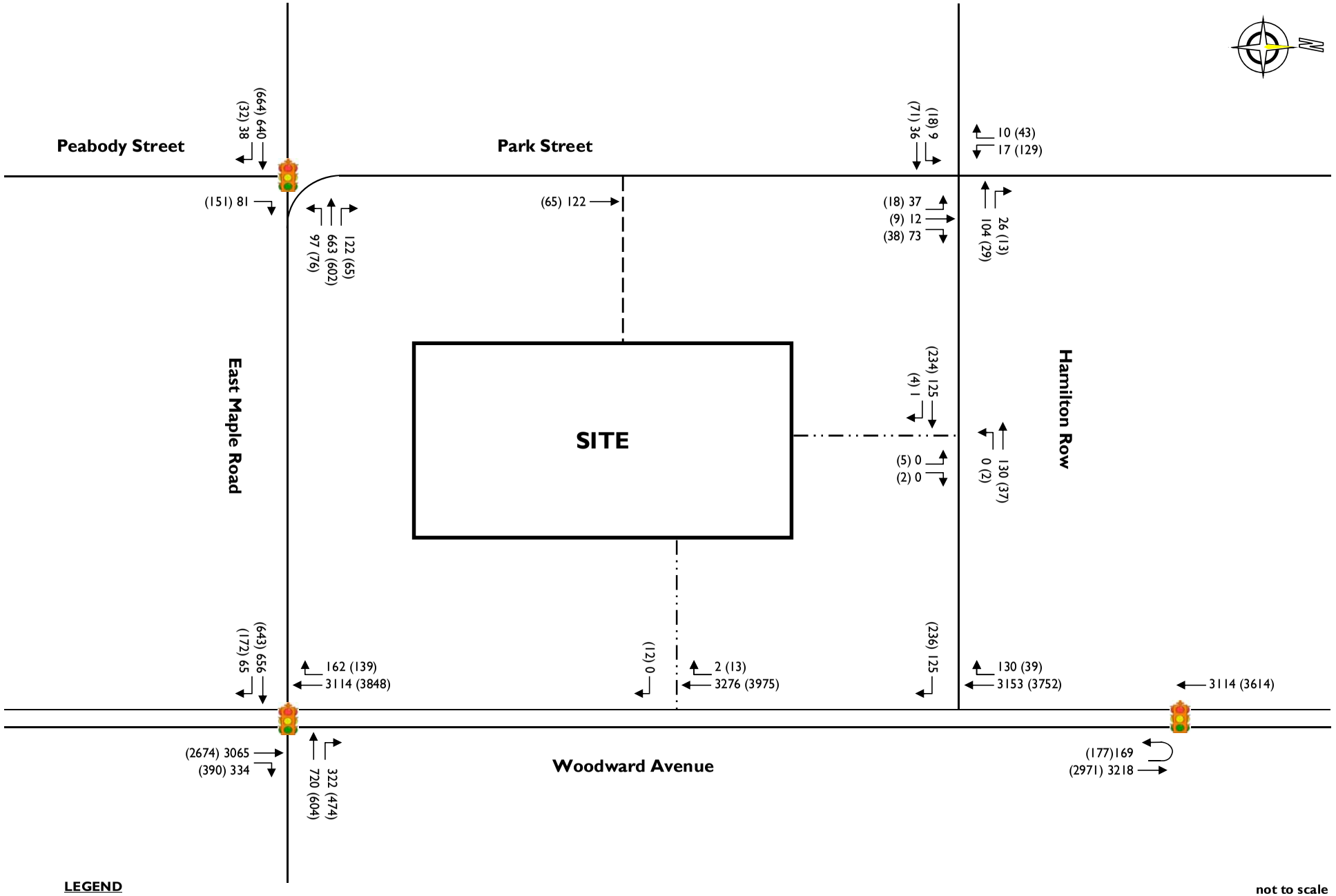
Future Conditions

Background Traffic Volumes

The 2019 Current Traffic Volumes were grown to a future horizon year of 2021, which is a conservative estimate for the proposed development is expected to be fully constructed. In accordance with industry guidelines, the 2019 Current Traffic Volumes were increased by 2.7% annually for two (2) years to determine the 2021 Base Traffic Volumes. These volumes are shown on **Figure 4**.

Other Planned Development Projects

To evaluate the future traffic conditions, it is important to consider the potential site-generated traffic of other projects that could influence the traffic volume at the study intersections. Other planned development projects include those that are either in the entitlement process or have recently been approved for building permits in proximity to the proposed development. Based on coordination with Julie M. Kroll, PE, PTOE from Fleis & Vandenbrink, the City's Traffic consultant engineer, traffic associated with the Peabody Redevelopment



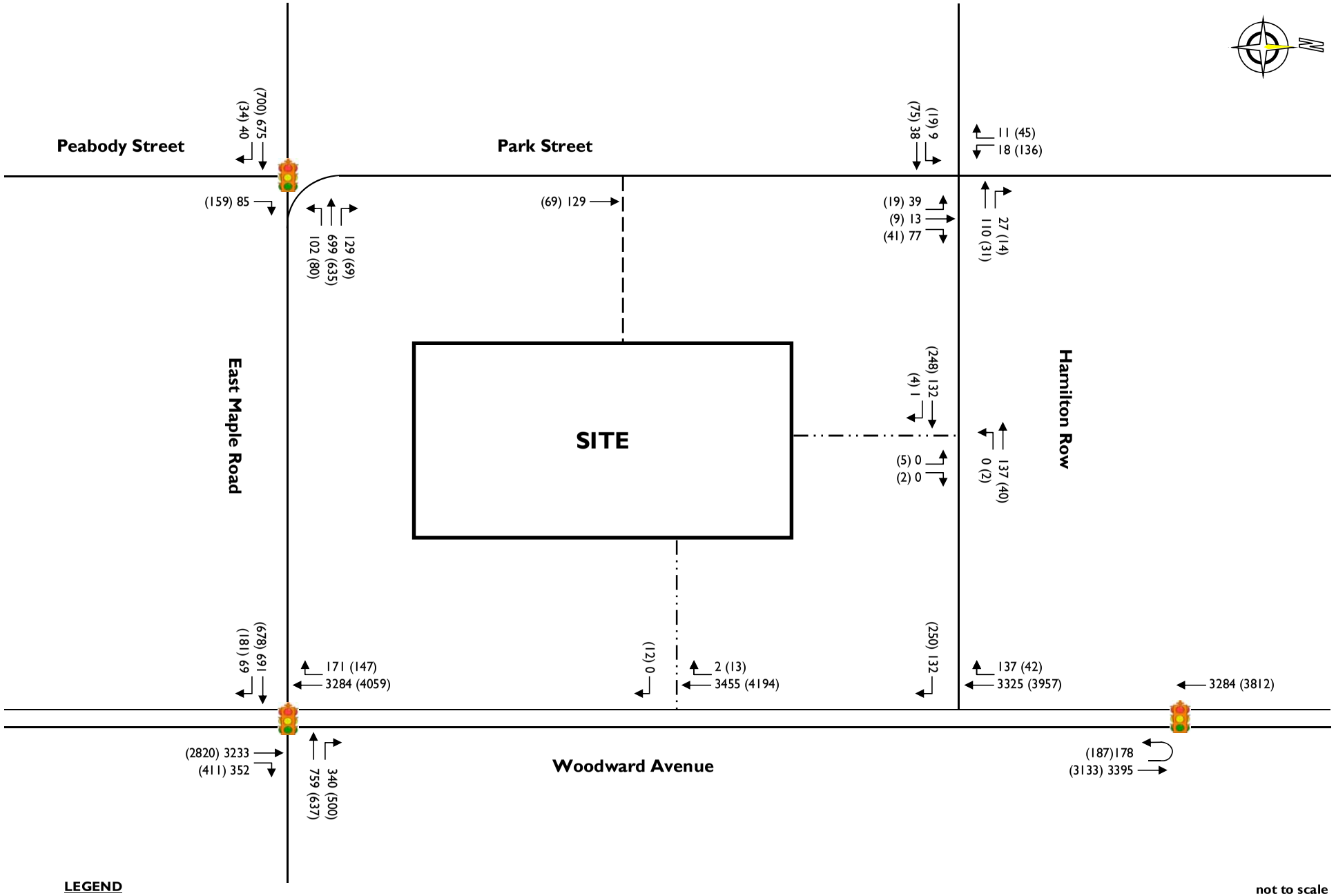
LEGEND

- Existing Roadway
- Proposed Driveway
- Existing Private Driveway
- AM (PM) Peak Hour Volumes
- Signalized Intersection

STONEFIELD

The Maple: Mixed-Use Development
35001-35075 Woodward Avenue
Birmingham, Oakland County, Michigan
Traffic Impact Assessment

FIGURE 3
2019 Current Traffic Volumes



STONEFIELD

The Maple: Mixed-Use Development
35001-35075 Woodward Avenue
Birmingham, Oakland County, Michigan
Traffic Impact Assessment

FIGURE 4
2021 Base Traffic Volumes

located at 34965 Woodward Avenue and 215 Peabody Street would be expected to add traffic volume to the study network. **Figure 5** illustrates the site-generated traffic associated with the Peabody Redevelopment assigned to the study area network.

Future Background Volumes

The site-generated trips associated with the Peabody Redevelopment were added to the 2021 Base Traffic Volumes to calculate the 2021 Future Background Traffic Volumes, which are shown on **Figure 6**.

Hunter House Hamburgers Traffic Redistribution

The Hunter House Hamburgers restaurant is presently operating and generating traffic. These traffic volumes are anticipated to generally remain as-is along the surrounding roadway network. The existing driveway along Woodward Avenue would be closed, and vehicular access to the site for Hunter House Hamburgers would be provided via one (1) full-movement driveway along Hamilton Row and one (1) full-movement driveway along Park Street. As such, traffic from employees during the weekday morning peak hour were rerouted to utilize the driveway along Hamilton Row with all other ingress and egress traffic rerouted to the on-site parking garage along Park Street where 11 spaces dedicated to Hunter House Hamburgers would be provided. It was assumed that employees would not arrive or depart the Hamilton Row driveway during the weekday evening roadway peak hour. **Figure 7** illustrates the rerouting of Hunter House Hamburgers restaurant traffic as a result of the proposed driveway configuration and parking management plan.

Trip Generation

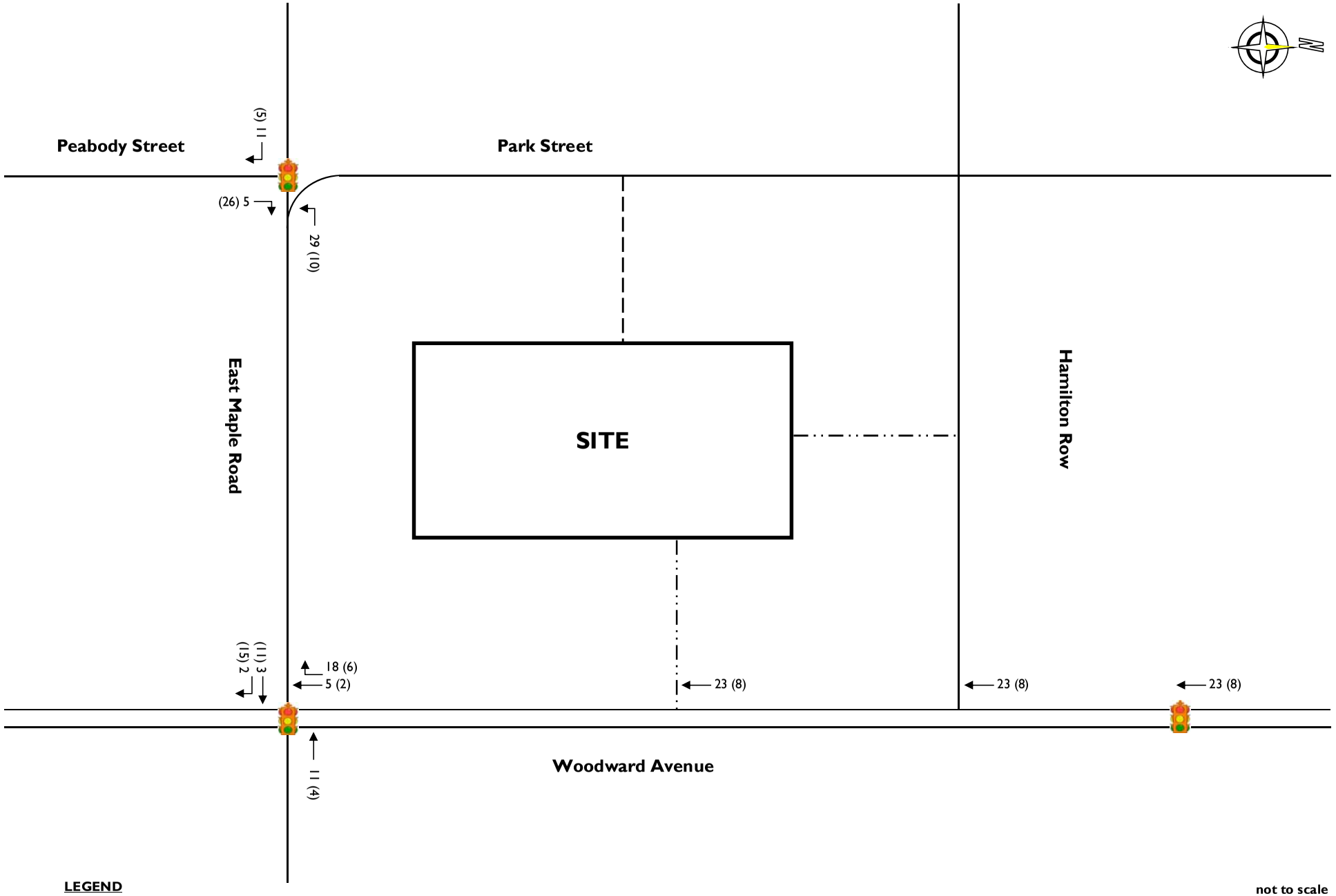
Trip generation projections for the proposed development were prepared utilizing the Institute of Transportation Engineers' (ITE) Trip Generation Manual, 10th Edition. ITE trip generation rates for the following land uses were cited for the proposed development:

1. Land Use 221 "Multifamily Housing (Mid-Rise)" was utilized for the proposed 42 apartment units,
2. Land Use 710 "General Office Building" was utilized for the proposed 21,675 square feet of office space,
3. Land Use 820 "Shopping Center" was utilized for the proposed 10,150 square feet of retail space, and
4. Land Use 933 "Fast-Food Restaurant without Drive-Through Window" was utilized for the 1,330-square-foot Hunter House restaurant.

For the residential apartments, parking would be provided for residents within the underground garage levels at a rate of 1.5 spaces per unit, consistent with the City's requirement. All trips for residential users would utilize the site driveway along Park Street.

As the existing Hunter House restaurant will remain in its current location, provide a smaller building with a reduced parking supply, traffic generated by the restaurant would be expected to not increase in the Future Condition. As such, there would not be new traffic impacts associated with the Hunter House Restaurant as part of this development. The Birmingham Hunter House Hamburgers location opens at 9:00 a.m. on weekdays, just outside the peak period. A reduced trip generation to account for the arrival of opening shift employees is included within the calculations.

Land Use 10 "General Office Building" "is a location where affairs of businesses, commercial or industrial organizations, or professional persons or firms are conducted" and includes "a mixture of tenants including professional services, insurance companies, investment brokers, and tenant services, such as a bank or savings and loan institution, a restaurant, or cafeteria and service retail facilities." As such, this land use encompasses a variety of potential uses for the space and its trip generation projections would be appropriate to utilize given the tenants of the space are unknown at the time of this issuance.



LEGEND

- Existing Roadway
- Proposed Driveway
- Existing Private Driveway
- AM (PM) Peak Hour Volumes
- Signalized Intersection

not to scale

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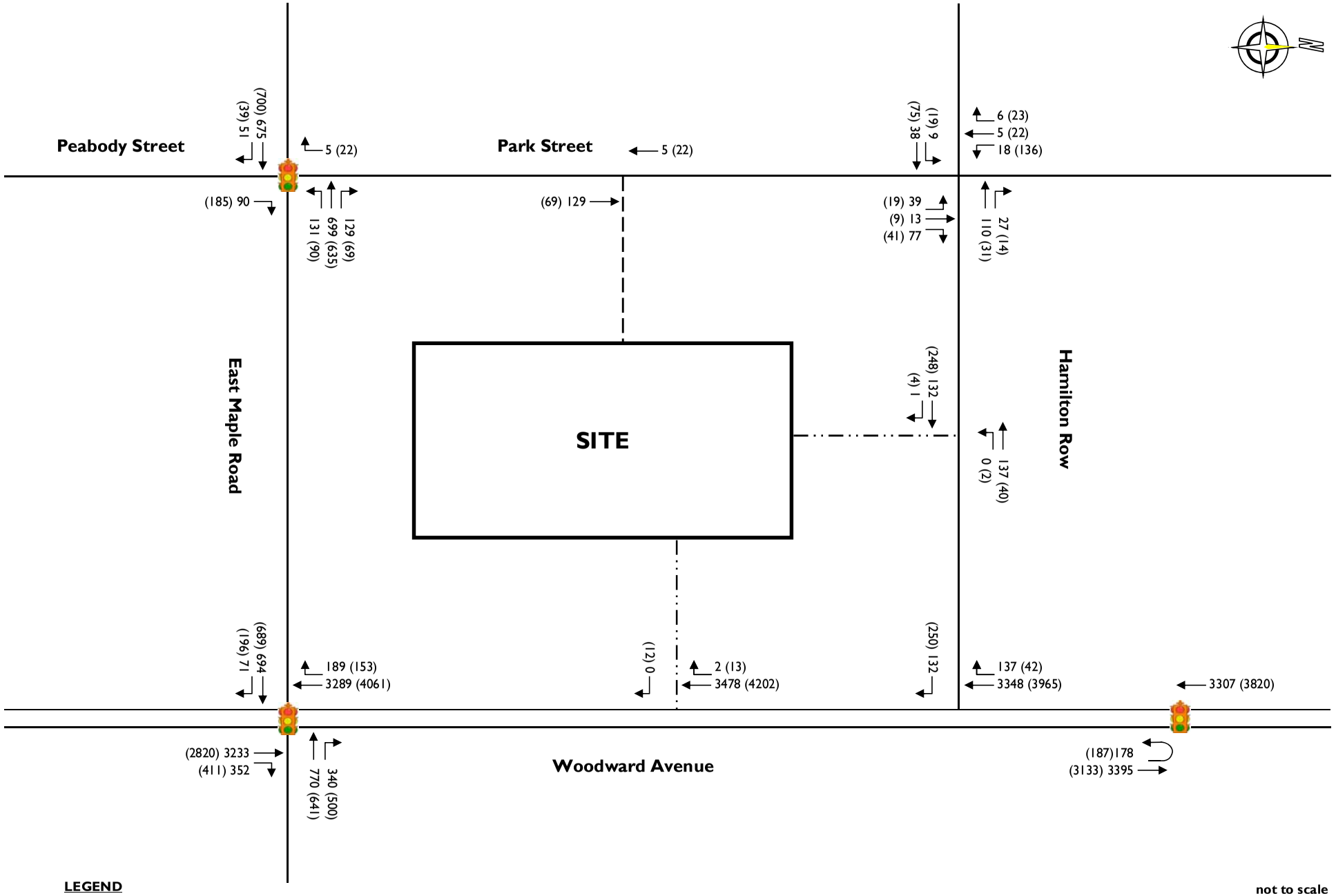
35001-35075 Woodward Avenue
Birmingham, Oakland County, Michigan
Traffic Impact Assessment

FIGURE 5
Other Planned Projects
Traffic Volumes



LEGEND

- Existing Roadway
- Proposed Driveway
- Existing Private Driveway
- AM (PM) Peak Hour Volumes
- Signalized Intersection

not to scale

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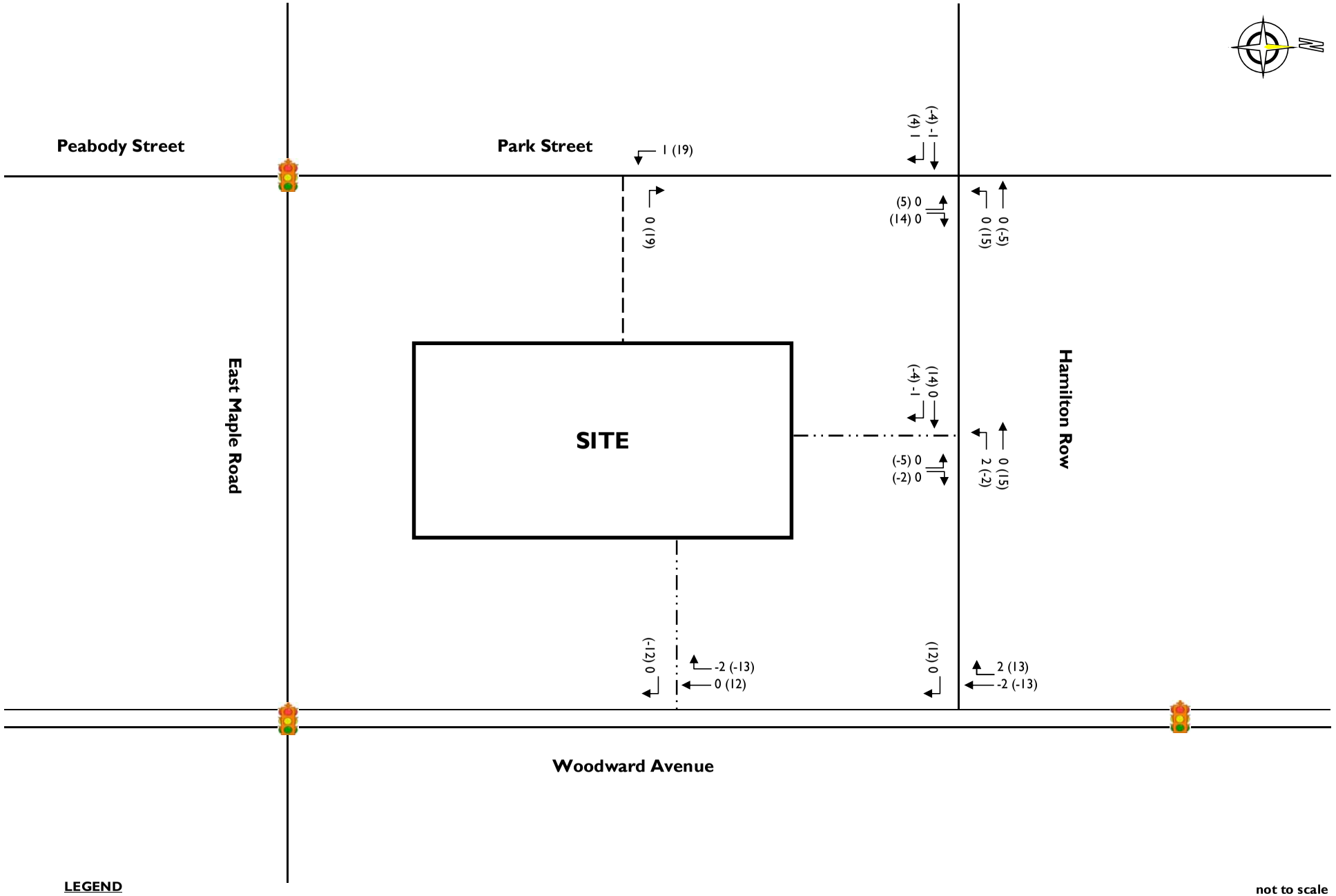
Birmingham, Oakland County, Michigan
Traffic Impact Assessment

FIGURE 6
2021 Future Background Traffic Volumes



LEGEND

- Existing Roadway
- Proposed Driveway
- Existing Private Driveway
- AM (PM) Peak Hour Volumes
- Signalized Intersection

not to scale

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35001-35075 Woodward Avenue
Birmingham, Oakland County, Michigan
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FIGURE 7
Hunter House Future Trip Re-Routing

Land Use 820 "Shopping Center" "is an integrated group of commercial establishments that is planned, developed, owned, and managed as a unit" and includes "office buildings, movie theaters, restaurants, post offices, banks, health clubs, and recreational facilities (for example, ice skating rinks or indoor miniature golf courses)." As such, this land use encompasses a variety of potential uses for the space and its trip generation projections would be appropriate to utilize given the tenants of the space are unknown at the time of this issuance.

Table 2 provides the weekday morning peak hour, weekday evening peak hour, and weekday daily trip generation volumes associated with the proposed development. As per correspondence with the City's reviewing traffic engineering consultant, the weekend peak trip generation for each of the proposed uses is not simultaneous. Therefore, the weekday morning and weekday evening peak-hour analyses would be sufficient for the evaluation of the traffic impacts of the proposed development.

TABLE 2 – TRIP GENERATION PROJECTIONS

Land Use	ITE Code	Amount	Daily	Weekday Morning Peak Hour			Weekday Evening Peak Hour		
				Enter	Exit	Total	Enter	Exit	Total
Hunter House Hamburgers (To remain)	933	1,330 SF	460	3	0	3	19	19	38
Apartments	221	42 Units	207	4	11	15	11	7	18
Office	710	21,675 SF	241	40	7	47	4	23	27
Shopping Center	820	10,150 SF	1,269	6	4	10	48	52	100
Total Trip Increase			**1,717**	**50**	**22**	**72**	**63**	**82**	**145**

As indicated in Table 2, the proposed development would be expected to generate 72 additional trips during the weekday morning peak hour and 145 additional trips during the weekday evening peak hour.

Trip Distribution & Assignment

The projected trips generated by the proposed development were distributed along the adjacent roadway network. The trip distribution was determined utilizing existing travel patterns along the surrounding roadway network, the location of population centers and major arterials, the access management plan of the site, and the location of specific land uses on-site. As the trip generation for each of the land uses consists entirely of new trips, the overall distribution was assumed to be the same for each use/time period.

A review of historical traffic counts available from the Southeast Michigan Council of Governments (SEMCOG) was performed to understand the existing travel patterns. Specifically, SEMCOG counts from October 2006 along Woodward Avenue and East Maple Road were utilized. Based on the traffic count data, the following observations influenced the trip distribution of the development:

1. AM & PM peak-hour volumes along Woodward Avenue were generally equally distributed between the northbound and southbound directions
2. AM & PM peak-hour volumes along Maple Road were greater for the eastbound direction than the westbound direction, indicating an origin of trips to the west.
3. The total traffic volume along Woodward Avenue was approximately 70% higher than the total traffic volume along Maple Road.

The above-referenced data indicates that Woodward Avenue would likely serve a majority of the traffic generated by the site given its size and traffic volumes. Additionally, the Maple Road data indicates a draw from the west, given the higher rate of eastbound traffic. While a portion of that draw is likely from Woodward Avenue, locally the density within the City of Birmingham is located predominately to the west of the site.

Based on these factors, the following entering and exiting trip distribution was utilized:

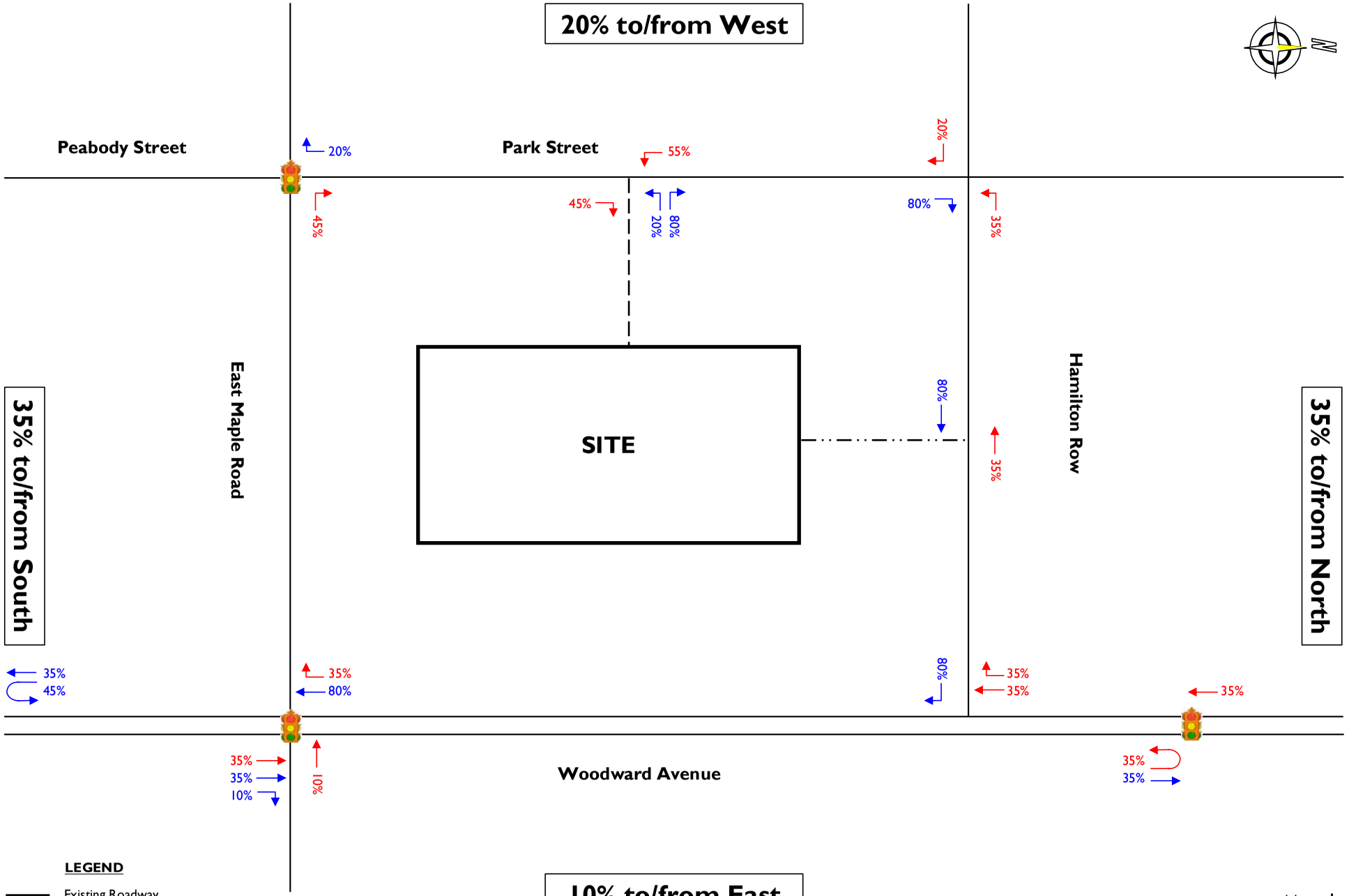
1. 35% to/from the north,
2. 35% to/from the south,
3. 10% to/from the east, and
4. 20% to/from the west.

The driveway along Hamilton Row serves three (3) parking spaces dedicated to Hunter House Hamburgers. The driveway along Park Street would serve residents, Hunter House Hamburgers, and a portion of office employees. Ten percent (10%) of peak-hour office trips were routed to/from the Park Street driveway. The 10% rate was selected based on the available parking for the office use (eight (8) spaces) and the projected parking demand (72 vehicles) based on the City Ordinance requirement.[1]

Parking for the remaining portion of office employees and the retail uses would utilize the parking garages located at 333 Park Street and 222 Peabody Street and as such, traffic for these uses was routed to and from the parking garage. **Figures 8** and **9** illustrates the primary residential trip distribution and primary residential traffic volumes respectively. **Figures 10** and **11** illustrates the primary office trip distribution and primary office traffic volumes respectively. **Figures 12** and **13** illustrates the primary retail trip distribution and primary retail traffic volumes respectively.

Figure 14 provides the total new traffic volume associated with the proposed development during the weekday morning and weekday evening peak hours. The site-generated trips associated with the proposed development and the volumes associated with the Hunter House Hamburgers trip rerouting were added to the 2021 Future Background Traffic Volumes to calculate the 2021 Future Total Traffic Volumes and are provided on **Figure 15**.

[1] Parking requirement for office uses not located in the parking assessment district is one (1) space per 300 square feet of floor area. For the 21,675 square feet of office space, this equates to 72 parking spaces. A supply of eight (8) parking spaces equates to 11.1% of the 72-space requirement, thus a 10% Park Street driveway office use rate was utilized.

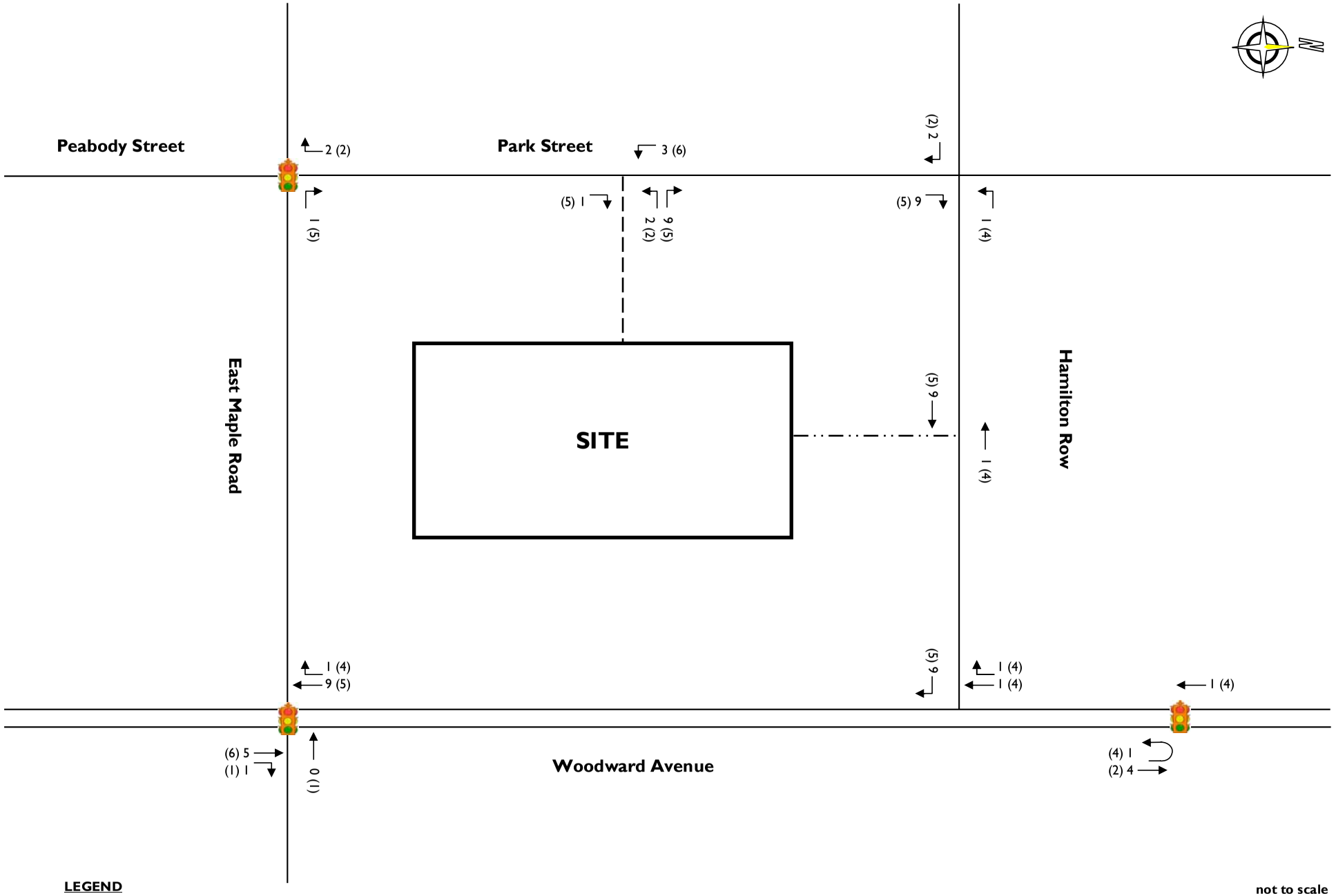


LEGEND

- Existing Roadway
- Proposed Driveway
- Existing Private Driveway
- Entering Trips
- Exiting Trips
- Signalized Intersection

not to scale

STONEFIELD	The Maple: Mixed-Use Development 35001-35075 Woodward Avenue Birmingham, Oakland County, Michigan Traffic Impact Assessment	FIGURE 8 Primary Residential Trip Distribution



LEGEND

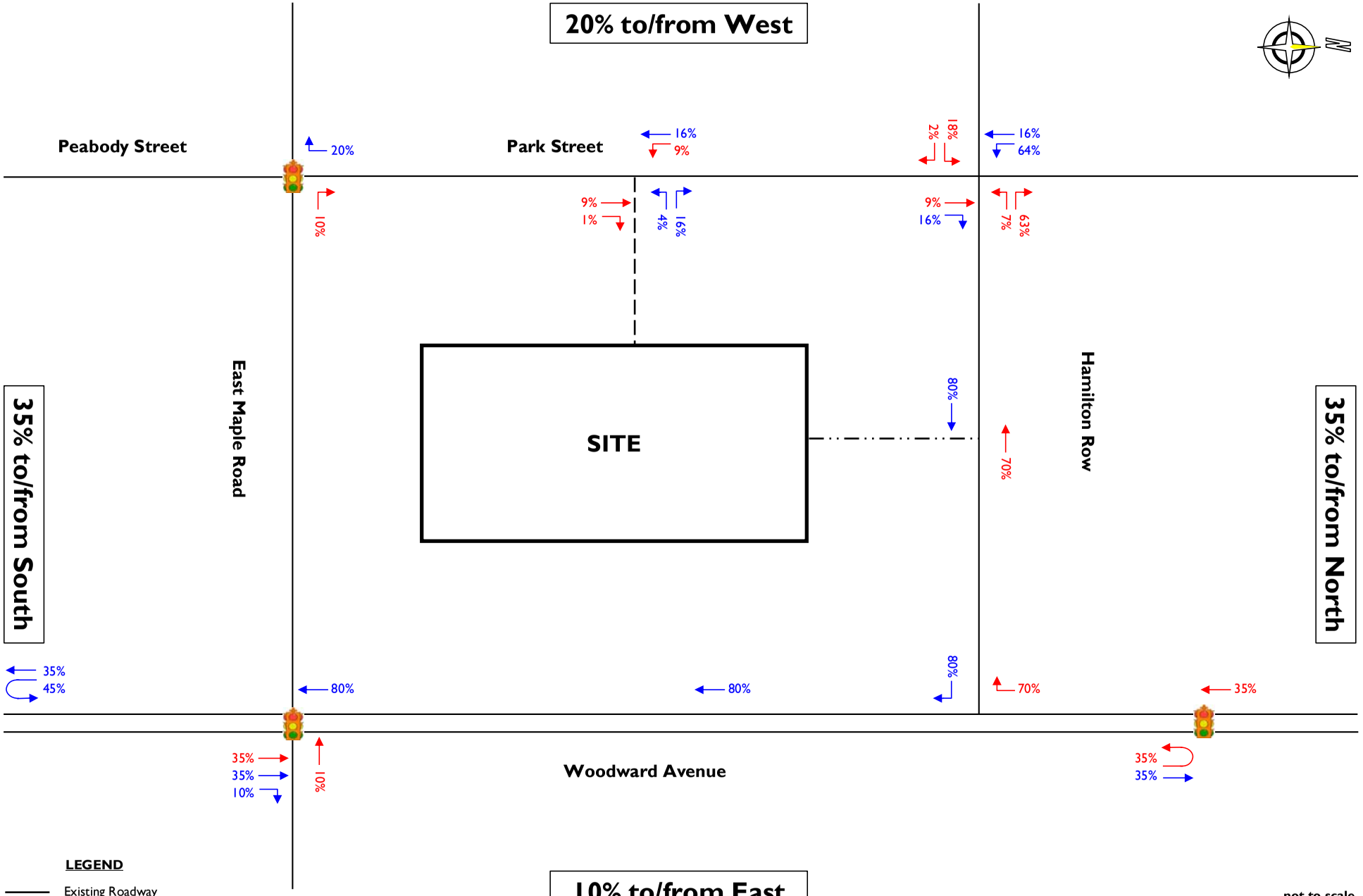
- Existing Roadway
- Proposed Driveway
- Existing Private Driveway
- AM (PM) Peak Hour Volumes
- Signalized Intersection

not to scale

STONEFIELD

The Maple: Mixed-Use Development
35001-35075 Woodward Avenue
Birmingham, Oakland County, Michigan
Traffic Impact Assessment

FIGURE 9
Primary Residential Traffic Volumes



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Birmingham, Oakland County, Michigan
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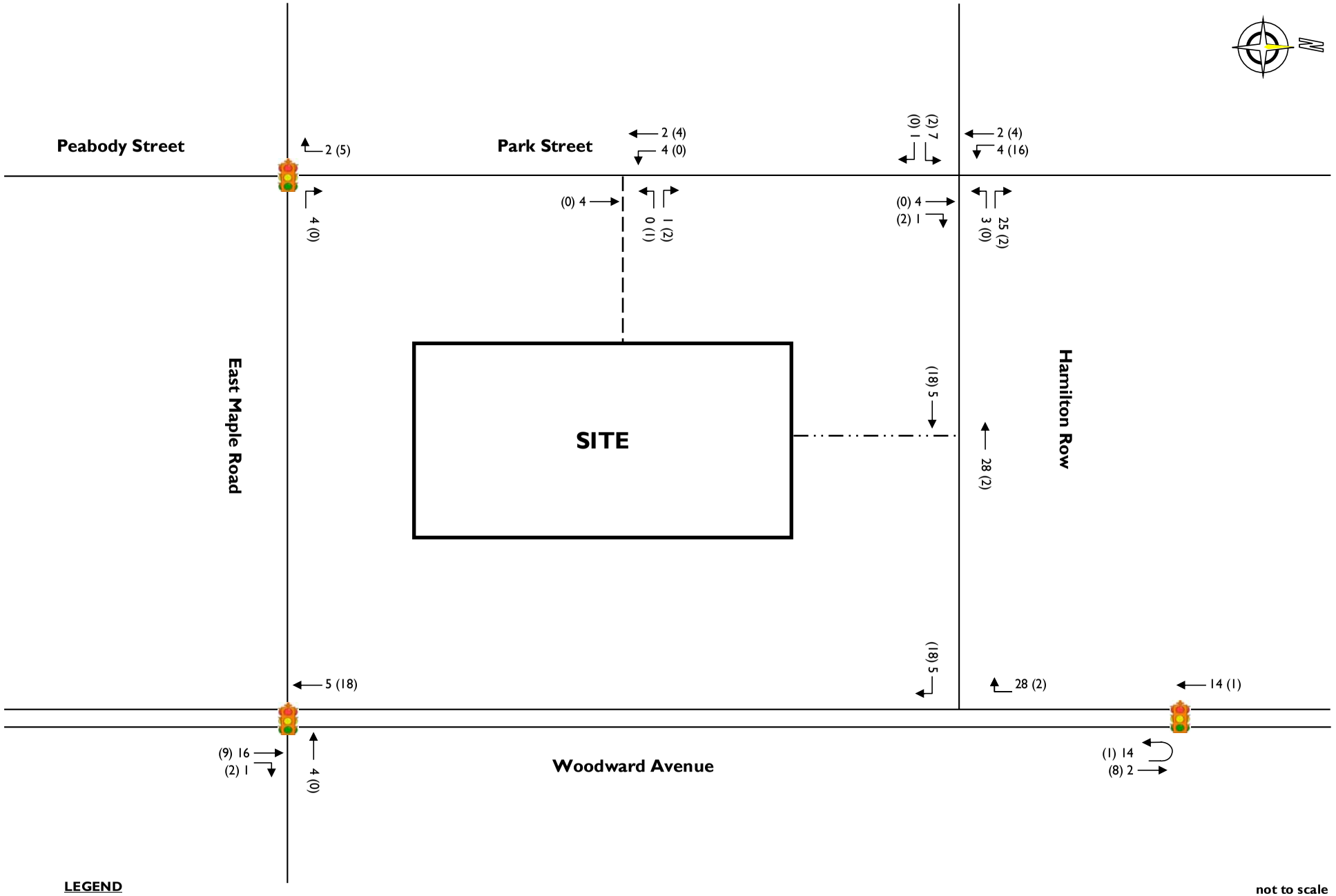
FIGURE 10
Primary Office Trip Distribution



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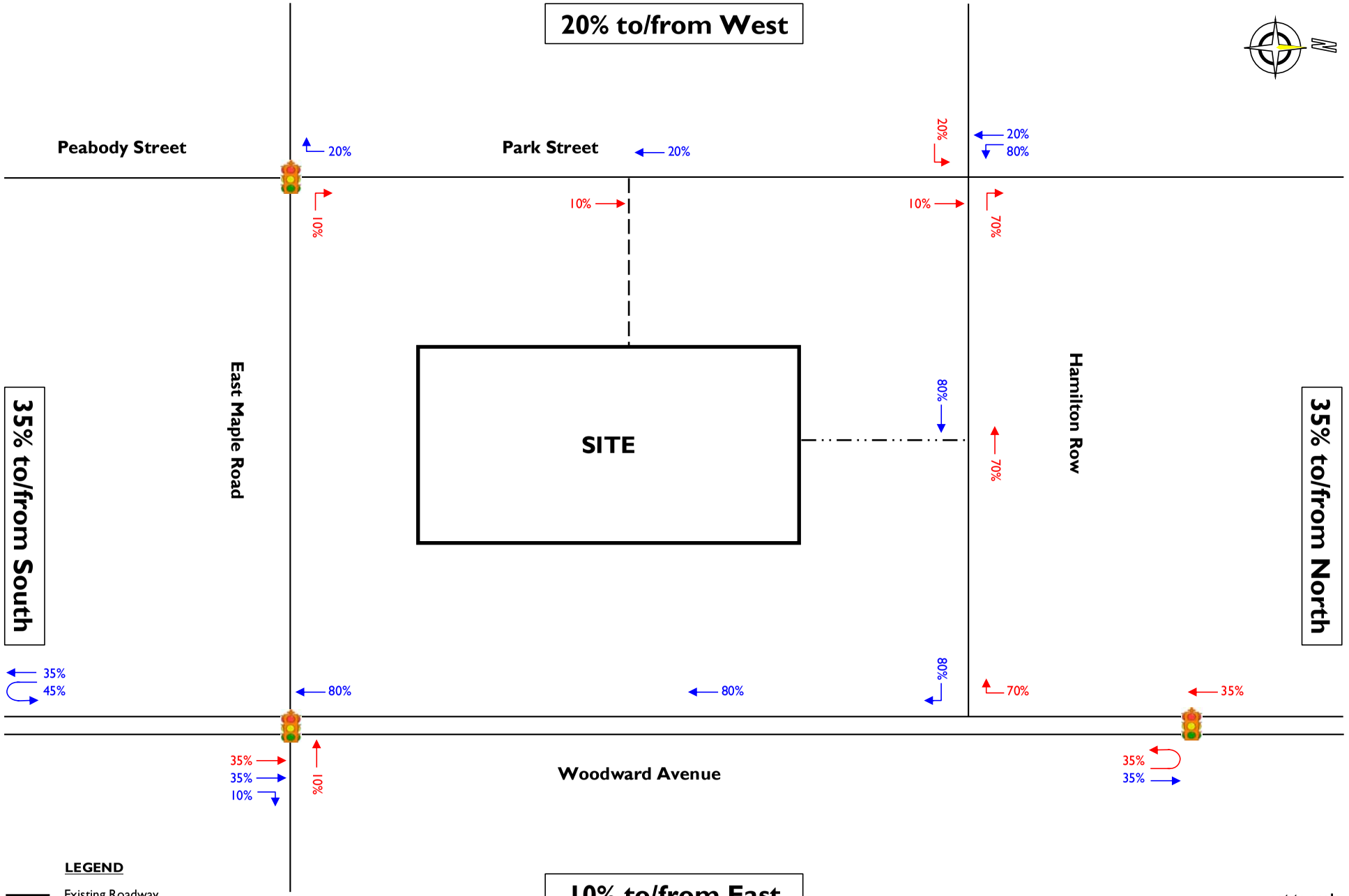
Birmingham, Oakland County, Michigan
Traffic Impact Assessment

FIGURE 11
Primary Office Traffic Volumes



LEGEND

- Existing Roadway
- Proposed Driveway
- Existing Private Driveway
- Entering Trips
- Exiting Trips
- Signalized Intersection

not to scale

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The Maple: Mixed-Use Development
35001-35075 Woodward Avenue
Birmingham, Oakland County, Michigan
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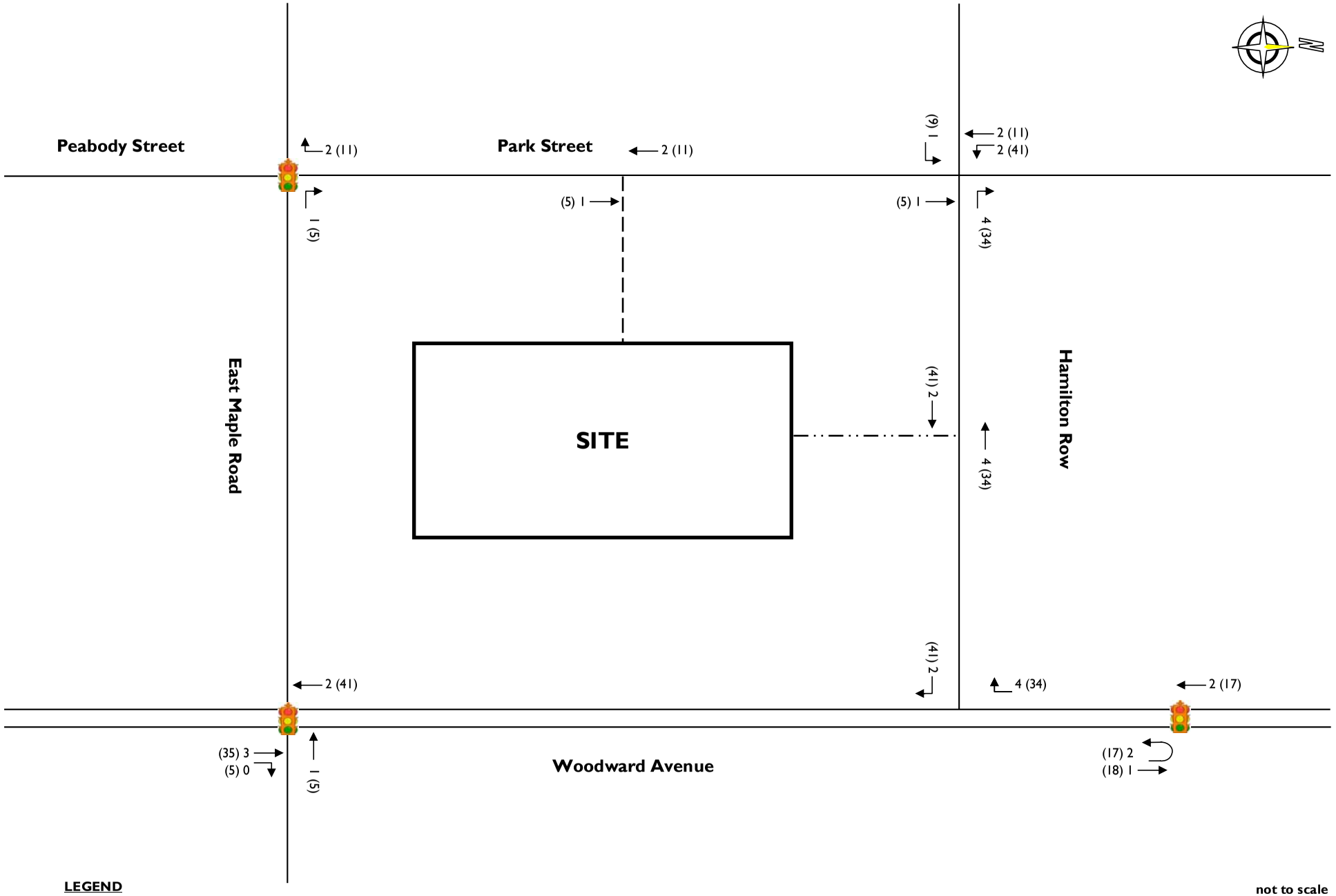
FIGURE 12
Primary Retail Trip Distribution



LEGEND

- Existing Roadway
- Proposed Driveway
- Existing Private Driveway
- AM (PM) Peak Hour Volumes
- Signalized Intersection

not to scale

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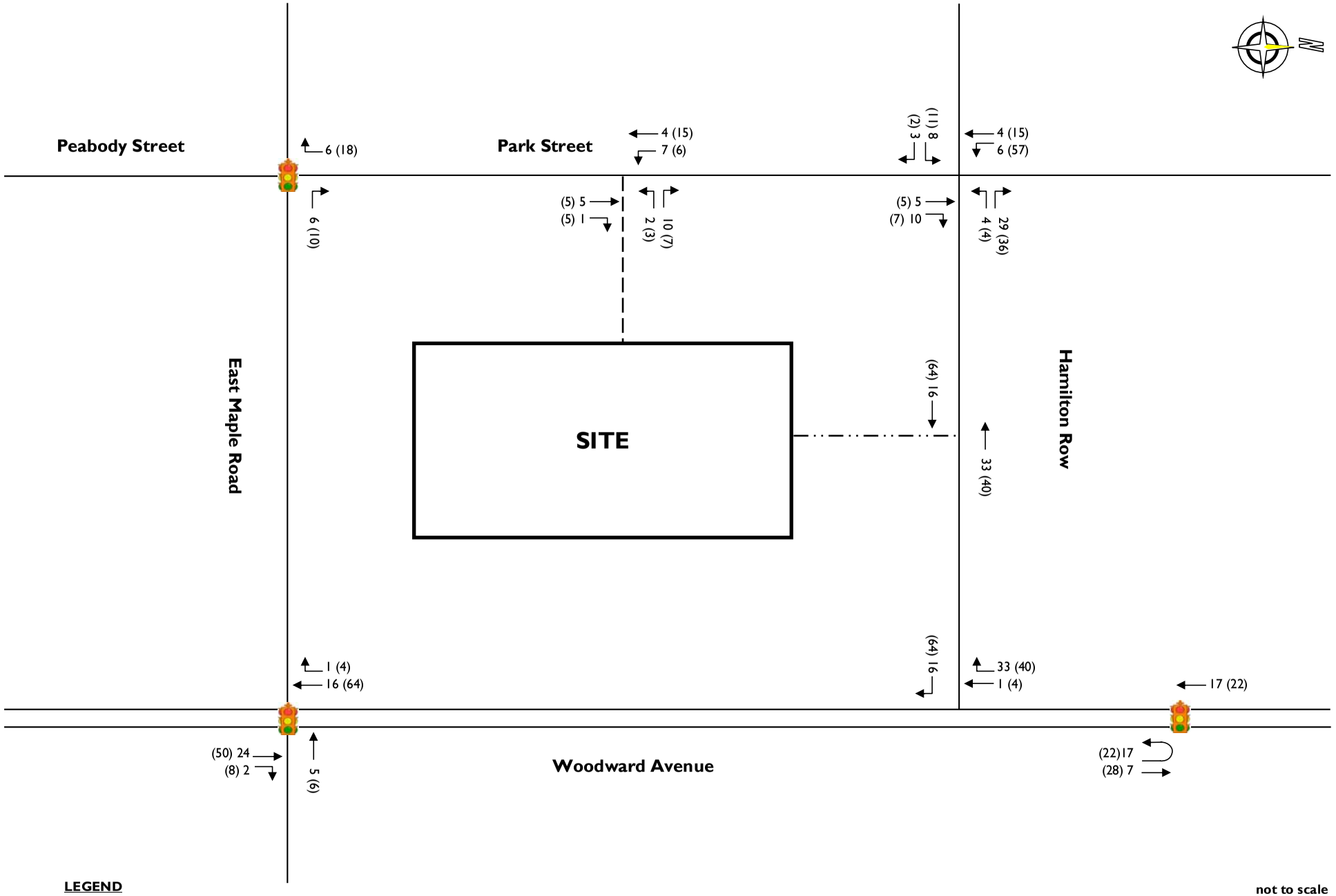
The Maple: Mixed-Use Development
35001-35075 Woodward Avenue
Birmingham, Oakland County, Michigan
Traffic Impact Assessment

FIGURE 13
Primary Retail Traffic Volumes



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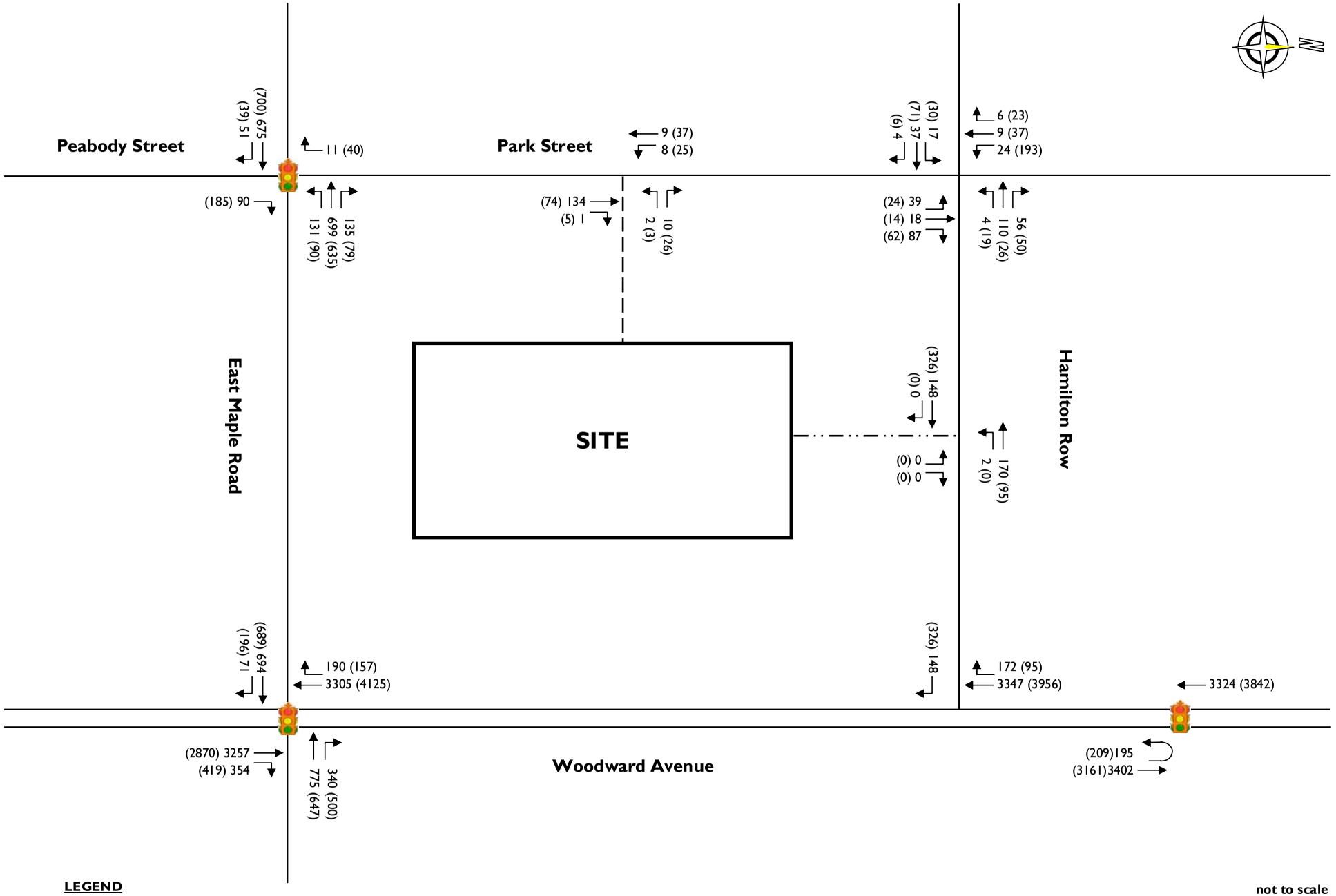
The Maple: Mixed-Use Development
35001-35075 Woodward Avenue
Birmingham, Oakland County, Michigan
Traffic Impact Assessment

FIGURE 14
Total New Traffic Volumes



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The Maple: Mixed-Use Development
35001-35075 Woodward Avenue
Birmingham, Oakland County, Michigan
Traffic Impact Assessment

FIGURE 15
2021 Future Total Traffic Volumes

Traffic Impacts

Level of Service Impacts

A Level of Service and Volume/Capacity analysis was conducted for the 2019 Current Condition, 2021 Future Background Condition, and 2021 Future Total Condition during the weekday morning and weekday evening peak hours at the study intersections and proposed site driveways. The 2019 Current Condition analysis utilized the existing roadway geometry to reflect the existing traffic conditions. For the 2021 Future Conditions, the future layouts of the intersection of Park Street/Peabody Street and Maple Road and the intersection of Park Street and Hamilton Row were utilized to forecast traffic operations under the two-way Park Street orientation.

Under existing conditions, the signalized intersection of northbound Woodward Avenue and Maple Road is calculated to operate at overall Level of Service D with the westbound approach operating under capacity constraints during both peak hours studied. The signalized intersection of southbound Woodward Avenue and Maple Road is calculated to operate at overall Level of Service B during the weekday morning peak hour and overall Level of Service D with southbound through approach calculated to operate at Level of Service E during the weekday evening peak hour. The signalized intersection of Peabody Street/Park Street with Maple Road is calculated to operate at overall Level of Service B during both peak hours studied. The signalized intersection of southbound Woodward Avenue with the north-to-south crossover is calculated to operate at overall Level of Service B during the weekday morning peak hour and overall Level of Service C during the weekday evening peak hour. The turning movements at the unsignalized intersection of Woodward Avenue with Hamilton Row and the site driveways are calculated to operate at Level of Service C or better during both peak hours studied.

The existing layout of the intersection of Park Street with Hamilton Row is not supported by HCM 2000, HCM 2010, nor HCM 6th Edition, and therefore it was analyzed using the SimTraffic 10 Software. The simulation results indicated that this intersection operates at overall Level of Service A during the weekday morning peak hour and at overall Level of Service C during the weekday evening peak hour.

Under the 2021 Future Background Condition, the signalized intersection of northbound Woodward Avenue and Maple Road is calculated to operate generally consistently with the 2019 Current Condition during the weekday evening peak hour and at overall Level of Service E during the weekday morning peak hour with the westbound approach continuing to operate under capacity constraints during both peak hours studied. The signalized intersection of southbound Woodward Avenue and Maple Road is calculated to operate at overall Level of Service C during the weekday morning peak hour and overall Level of Service E with southbound through approach calculated to operate under capacity constraints and the eastbound approach calculated to operate at Level of Service E during the weekday evening peak hour. The signalized intersection of southbound Woodward Avenue with the north-to-south crossover is calculated to operate generally consistently with the 2019 Current Condition during the weekday morning peak hour and at overall Level of Service D during the weekday evening peak hour. It is likely that minor adjustments to the signal timing could be implemented by MDOT should capacity conditions exist in the future. The remaining study intersections and site driveways are calculated to operate generally consistently with the 2019 Current Condition analysis. Consistent with the anticipated roadway changes, the intersection of Park Street and Hamilton Row was analyzed as a two-way-stop-controlled intersection with the Hamilton Row approaches operating under stop control.

As a result of adding the site-generated traffic volume of the proposed mixed-use development during the 2021 Future Total Condition, the study intersections and site driveways are calculated to operate generally consistently with the 2021 Future Background Condition during the weekday morning peak hour with the turning movements at the site driveways calculated to operate at acceptable Level of Service A. During the weekday evening peak hour, the signalized intersection of northbound Woodward Avenue and Maple Road is calculated to operate at overall Level of Service E, the signalized intersection of southbound Woodward Avenue and Maple Road is calculated to operate under capacity constraints, and the eastbound right-turn movement at the unsignalized intersection of southbound Woodward Avenue with Hamilton Row is calculated to operate at Level of Service E. The remaining study intersections and site driveways are calculated to operate generally consistently

with the 2021 Future Background Condition analysis with the turning movements at the site driveways calculated to operate at acceptable Level of A. Therefore, the proposed development would not significantly impact the traffic operations of the adjacent roadway network. The Level of Service results for the study network are summarized on **Table 3**.

Queuing Impacts

A vehicle queuing analysis was performed using SimTraffic 10 software for the 2019 Current Condition, 2021 Future Background Condition, and 2021 Future Total Condition during the weekday morning and weekday evening peak hours at the study intersections and proposed site driveways. The 2019 Current Condition analysis utilized the existing roadway geometry to reflect the existing queueing conditions. For each of the 2021 Future Conditions, the future layouts of the intersection of Park Street/Peabody Street and Maple Road and the intersection of Park Street and Hamilton Row were utilized to forecast queue lengths under the two-way Park Street orientation. During the 2021 Future Total Condition, the queue lengths on the surrounding roadway network were calculated to be generally consistent with the queue lengths during the 2021 Future Background Condition. As such, the proposed development would not significantly impact vehicle queues on the adjacent streets and at the proposed site driveways. The queuing results are summarized on **Table 4**.

STONEFIELD

TABLE 3 - Comparative Level of Service (Delay) Table
X (n) = Level of Service (seconds of delay)

		2019 Current Condition		2021 Future Background Condition		2021 Future Total Condition	
Intersection	**Lane Group**	**AM Peak LOS (Delay)**	**PM Peak LOS (Delay)**	**AM Peak LOS (Delay)**	**PM Peak LOS (Delay)**	**AM Peak LOS (Delay)**	**PM Peak LOS (Delay)**
NB Woodward Avenue & Maple Road *	EB Through	A (1.3)	A (0.9)	A (1.1)	A (0.2)	A (1.1)	A (0.2)
	WB Through/Right	F (148.5)	F (161.2)	F (183.3)	F (169.3)	F (185.4)	F (171.4)
	NB Through/Right	C (32.2)	C (20.5)	D (47.2)	C (25.5)	D (49.9)	C (27.5)
	Overall	**D (53.9)**	**D (49.8)**	**E (71.5)**	**D (54.8)**	**E (73.7)**	**E (56.3)**
SB Woodward Avenue & Maple Road *	EB Through/Right	C (31.1)	D (40.2)	D (35.6)	E (57.9)	D (35.6)	E (57.9)
	WB Through	A (0.2)	A (0.2)	A (0.3)	A (0.2)	A (0.3)	A (0.2)
	SB Through	C (21.6)	E (60.6)	C (23.3)	F (95.8)	C (23.4)	F (103.9)
	SB Right	A (8.8)	A (7.4)	A (8.1)	A (7.2)	A (8.0)	A (7.0)
	Overall	**B (19.4)**	**D (49.4)**	**C (21.1)**	**E (76.9)**	**C (21.2)**	**F (82.8)**
Peabody Street/Park Street & Maple Road *	EB Through	B (16.5)	C (22.6)				
	EB Right	A (5.9)	A (7.2)				
	EB Through/Right			B (16.4)	B (17.0)	B (16.4)	B (17.0)
	WB Left	D (37.9)	C (32.2)	D (40.4)	D (37.4)	D (40.4)	D (37.4)
	WB Through/Right	A (8.3)	A (4.0)	B (17.1)	B (11.8)	B (17.1)	B (11.9)
	WB Right	A (0.1)	A (0.1)	A (0.2)	A (0.1)	A (0.3)	A (0.2)
	NB Right	C (27.3)	C (25.2)	C (30.5)	C (31.6)	C (30.5)	C (31.6)
	SB Right			D (36.5)	D (36.7)	D (36.6)	D (36.9)
	Overall	**B (13.7)**	**B (15.2)**	**B (18.2)**	**B (17.5)**	**B (18.2)**	**B (17.7)**
Park Street & Hamilton Row **	EB Left	A (4.1)	B (11.7)				
	EB Through	A (6.0)	C (20.3)				
	EB Left/Through/Right			B (11.4)	C (15.7)	B (12.1)	C (22.4)
	WB Through	A (3.6)	A (3.5)				
	WB Right	A (2.1)	A (2.5)				
	WB Left/Through/Right			B (11.5)	B (12.3)	B (11.9)	B (14.7)
	NB Left	A (0.1)	A (0.0)				
	NB Through	A (1.0)	A (0.2)				
	NB Right	A (0.4)	A (7.8)				
	NB Left/Through/Right			A (7.3)	A (7.3)	A (7.3)	A (7.4)
	SB Left	A (5.6)	D (34.9)				
	SB Right	A (2.9)	D (29.8)				
	SB Left/Through/Right			A (7.4)	A (7.6)	A (7.5)	A (7.8)
	Overall	**A (2.8)**	**C (22.3)**				
SB Woodward Avenue & Hamilton Row	EB Right	B (11.8)	C (21.9)	B (12.7)	C (23.6)	B (13.1)	E (35.7)
SB Woodward Avenue & Site Driveway	EB Right	A (0.0)	B (12.7)	A (0.0)	B (12.8)		
Park Street & Site Driveway	WB Left/Right					A (9.1)	A (8.9)
	SB Left/Through					A (7.5)	A (7.4)
Site Driveway & Hamilton Row	WB Left	A (0.0)	A (7.8)	A (0.0)	A (7.8)	A (7.6)	A (0.0)
	NB Left/Right	A (0.0)	B (10.2)	A (0.0)	B (10.3)	A (0.0)	A (0.0)
SB Woodward Avenue & NB to SB Crossover *	WB Left	B (15.4)	B (15.2)	B (15.6)	B (14.8)	B (15.9)	B (15.0)
	SB Through	B (15.3)	C (31.6)	B (16.8)	D (48.3)	B (17.0)	D (50.4)
	Overall	**B (15.4)**	**C (30.8)**	**B (16.8)**	**D (46.7)**	**B (16.9)**	**D (48.6)**

* Intersections of Woodward Avenue & Maple Road, Peabody Street/Park Street & Maple Road, and Woodward Avenue & NB to SB Crossover were analyzed using HCM 2000 due to limitations in HCM 6th Edition methodology pertaining to clustering and non-NEMA phasing

** The intersection of Park Street & Hamilton Row was analyzed using SimTraffic 10 for the 2019 Current Condition and HCM 6th TWSC for the 2021 Future Background & Total Conditions.

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TABLE 4 - Comparative Queue Length Table
95th Percentile Queues in Feet

		Weekday Morning Peak Hour			Weekday Evening Peak Hour		
Intersection	**Lane Group**	**2021 Future Background**	**2021 Future Total**	**Δ Vehicles (25ft/veh)**	**2021 Future Background**	**2021 Future Total**	**Δ Vehicles (25ft/veh)**
NB Woodward Avenue & Maple Road	EB Through	15	15	0	11	19	0
	EB Through	15	11	0	0	0	0
	WB Through	560	565	0	571	556	-1
	WB Through/Right	563	560	0	571	555	-1
	NB Through	706	699	0	590	602	0
	NB Through	647	666	1	492	532	2
	NB Through	556	605	2	361	383	1
	NB Through/Right	519	584	3	274	324	2
SB Woodward Avenue & Maple Road	EB Through	147	157	0	135	149	1
	EB Through/Right	178	182	0	170	176	0
	WB Through	45	40	0	21	15	0
	WB Through	19	19	0	14	13	0
	SB Through	361	318	-2	375	347	-1
	SB Through	358	318	-2	366	340	-1
	SB Through	321	300	-1	380	348	-1
	SB Through	250	309	2	397	345	-2
	SB Right	109	110	0	225	359	5
Peabody Street/Park Street & Maple Road	EB Through/Right	625	567	-2	618	610	0
	WB Left	123	131	0	96	95	0
	WB Through	118	118	0	108	94	-1
	WB Right	64	49	-1	47	42	0
	NB Right	244	219	-1	243	238	0
	SB Right	16	21	0	41	64	1
Park Street & Hamilton Row	EB Left/Through/Right	33	33	0	79	54	-1
	WB Left/Through/Right	49	51	0	30	47	1
	NB Left/Through/Right	12	12	0	37	19	-1
	SB Left/Through/Right	13	17	0	108	52	-2
SB Woodward Avenue & Hamilton Row	EB Right	82	61	-1	107	102	0
	SB Through	74	67	0	233	264	1
	SB Through	47	6	-2	235	264	1
	SB Through	25	23	0	246	268	1
	SB Through/Right	14	58	2	245	257	0
Park Street & Site Driveway	WB Left/Right		35	--		43	--
	NB Through/Right		7	--		4	--
	SB Left/Through		10	--		10	--
Site Driveway & Hamilton Row	EB Through/Right	17	0	-1	46	29	-1
	WB Left/Through	13	22	0	5	0	0
	NB Left/Right	0	0	0	26	0	-1
SB Woodward Avenue & NB to SB Crossover	WB Left	71	69	0	75	69	0
	SB Through	272	273	0	260	264	0
	SB Through	276	283	0	259	262	0
	SB Through	291	297	0	262	261	0
	SB Through	299	310	0	291	264	-1

Parking Supply & Parking Demand

The proposed development is located within the City of Birmingham's downtown parking assessment district. Per the City's Zoning Ordinance, "For all nonresidential uses located within the parking assessment district, parking on the site shall not be required." For residential uses, a parking supply rate of 1.5 spaces per unit is required. For the proposed 42 apartment units, this equates to 63 required parking spaces.

Parking would be provided on-site via ground-level parking spaces within the building's footprint and via a two (2)-level underground parking garage. Access to the parking areas would not be gated. The ground-level parking spaces would be located adjacent to the Hunter House Hamburgers restaurant on the northeast portion of the property and provide three (3) ground-level parking spaces, inclusive of one (1) ADA-accessible parking space. The three (3) parking spaces would be designated for the Hunter House Hamburgers restaurant. The upper level and lower level of the underground parking garage would each provide 41 parking spaces, for a total of 82 underground parking spaces and 85 total parking spaces on-site.

Although the site exceeds the minimum parking supply required, an analysis of the total proposed supply of 85 spaces was conducted with respect to the anticipated peak parking demand.

Per the City's Ordinance, if the site were not located within the downtown parking assessment district, the development would require:

1. Hunter House Hamburgers – 1 space per 75 SF – for 1,330 SF this equates to 18 spaces.
2. Residential Apartments – 1.5 spaces per unit – for 42 units this equates to 63 spaces.
3. Office – 1 space per 300 SF – for 21,675 SF this equates to 72 spaces,
4. Retail Store – 1 space per 300 SF – for 10,150 SF this equates to 34 spaces.

For the 42 residential units, 21,675 square feet of office space, 10,150 square feet of retail space, and 1,330-square-foot Hunter House Hamburgers, this equates to 187 spaces. Of the 82 parking spaces provided within the on-site parking garage, 63 spaces would be designated for residents, 11 spaces would be designated for Hunter House Hamburger patrons, and eight (8) spaces would be designated for employees of the site. The remaining office employees, and the retail employees and patrons would park off-site.

A shared parking model was prepared utilizing the parking demand rates calculated above and the Urban Land Institute's (ULI) Shared Parking, 2nd Edition to provide an understanding of the time-of-day peaks of the proposed development. The shared parking model indicates that the weekday midday period represents the time period of most intense use on the site. **Table 5** provides the ULI Shared Parking Model for the proposed development, excluding Hunter House Hamburgers, which provides a separated dedicated parking supply on-site.

The parking demand generated by the site in excess of the on-site supply was compared to available parking within the Park Street Parking Structure and Peabody Parking Structure. Based on data collected in March 2017, there is sufficient parking within the Park Street Parking Structure and the Peabody Parking Structure during the peak weekday morning and weekday evening periods of the development. During the weekday midday peak hour, which represents the peak period for each of the parking structures, the parking supply would be at capacity. **Table 6** provides the parking demand of the proposed development and supply provided within the nearby parking structures.

It is important to note that the parking demand rates utilized within the report are applicable to uses outside the downtown parking assessment area, where developments generally consist of homogeneous, single-use developments and transportation to and from developments is made nearly exclusively by personal vehicle. In a traditional downtown environment, such as the location of the proposed development, trips made by walking, bicycle, transit, or other means are common. Visitors and employees in downtown areas typically park once and walk, making trips to several destinations via walking without parking additional vehicles or contributing to

additional vehicular traffic. It is anticipated existing visitors and employees in Downtown Birmingham would make trips to the proposed development via walking and not contribute to an increased parking demand.

Parking is not required for non-residential uses in the downtown parking assessment district, and the parking supply provided on-site is in excess of the minimum requirement of 63 parking spaces.

TABLE 5 - Proposed Mixed-Use Development Demand (Weekday)
ULI Shared Parking Model

	Office **Peak Demand: 72 spaces**		**Retail** **Peak Demand: 34 spaces**		**Residential Apartments** **Peak Demand: 63 spaces**		**Total Site Parking Demand**
Time of Day	Time-of-day Factor	Parking Demand	Time-of-day Factor	Parking Demand	Time-of-day Factor	Parking Demand	
6:00 AM	3%	2	1%	0	100%	63	65
7:00 AM	30%	22	5%	2	100%	63	87
8:00 AM	75%	54	15%	5	100%	63	122
9:00 AM	95%	68	35%	12	100%	63	143
10:00 AM	100%	72	65%	22	100%	63	157
11:00 AM	100%	72	85%	29	100%	63	164
12:00 PM	90%	65	95%	32	100%	63	160
1:00 PM	90%	65	100%	34	100%	63	162
2:00 PM	100%	72	95%	32	100%	63	167
3:00 PM	100%	72	90%	31	100%	63	166
4:00 PM	90%	65	90%	31	100%	63	159
5:00 PM	50%	36	95%	32	100%	63	131
6:00 PM	25%	18	95%	32	100%	63	113
7:00 PM	10%	7	95%	32	100%	63	102
8:00 PM	7%	5	80%	27	100%	63	95
9:00 PM	3%	2	50%	17	100%	63	82
10:00 PM	1%	1	30%	10	100%	63	74
11:00 PM	0%	0	10%	3	100%	63	66
12:00 AM	0%	0	0%	0	100%	63	63

TABLE 6 - Parking Occupancy (Weekday)
Public Parking Sturcture Parking Supply & Demand

Time of Day	Available Spaces in March 2017			Proposed The Maple Development			Future Parking Supply	
	Park Street Structure	Peabody Street Structure	Total	Parking Demand	On-Site Supply	Off-Site Demand	Park Street Structure	Both Structures
12:00 AM	746	392	1138	63	71	0	746	1138
1:00 AM	750	393	1143					
2:00 AM	751	394	1145					
3:00 AM	751	394	1145					
4:00 AM	763	378	1141					
5:00 AM	801	425	1226					
6:00 AM	796	398	1194	65	71	0	796	1194
7:00 AM	775	380	1155	87	71	16	759	1139
8:00 AM	644	326	970	122	71	51	593	919
9:00 AM	310	149	459	143	71	72	238	387
10:00 AM	72	35	107	157	71	86	-14	21
11:00 AM	40	11	51	164	71	93	-53	-42
12:00 PM	22	8	30	160	71	89	-67	-59
1:00 PM	8	8	16	162	71	91	-83	-75
2:00 PM	16	8	24	167	71	96	-80	-72
3:00 PM	30	15	45	166	71	95	-65	-50
4:00 PM	54	32	86	159	71	88	-34	-2
5:00 PM	146	120	266	131	71	60	86	206
6:00 PM	477	215	692	113	71	42	435	650
7:00 PM	560	237	797	102	71	31	529	766
8:00 PM	602	283	885	95	71	24	578	861
9:00 PM	653	329	982	82	71	11	642	971
10:00 PM	721	362	1083	74	71	3	718	1080
11:00 PM	736	388	1124	66	71	0	736	1124

Multi-Modal Analysis

A review was conducted of the City of Birmingham's Multi-Modal Transportation Plan to identify impacts of the proposed development with respect to non-automobile transportation alternatives. Based on this review, there are several attributes of the proposed development that contribute to positive multi-modal impacts.

Based on the design of the site, the proposed development improves the urban form of the current block as compared to the existing uses. Presently, the majority of the development on-site consists of surface parking, which does not encourage pedestrian travel along the property in a downtown environment. The proposed development would be comprised of a five (5)-story building set back directly along the property lines of the site, which is consistent with the downtown character of the buildings on adjacent blocks located on the opposite sides of Maple Road, Park Street, and Hamilton Road. The construction of the proposed building would help expand the downtown footprint along Woodward Avenue and provide urban continuity between the westerly side of Woodward Avenue and the Kroger Supermarket located at the northeast quadrant of the intersection of Woodward Avenue and Maple Road.

The entrances to the office and residential portions of the site would be located midblock along Park Street. The primary retail use on site would have entrances located on the corner of Maple Road and Park Street, midblock along Park Street, and along Woodward Avenue in close proximity to Maple Road. The entrance to the retail pad on the northeast portion of the property would be located along Woodward Avenue near Hamilton Row. The entrance to Hunter House Hamburgers would remain facing Woodward Avenue near Hamilton Row in the northeast corner of the site. The entrances along Park Street would face toward the center of downtown and is more desirable for pedestrian interaction. The Hunter Hamburger House restaurant entrance location is adjacent to the crosswalk crossing Hamilton Row, and along Woodward Avenue, the sidewalk network would be completed between Hamilton Row and Maple Road, whereas presently the network consists of a mix of sidewalk and asphalt for an existing parking lot.

Per Figure 3.6A within the Multi-Modal Transportation Plan, Maple Road is designated for shared lane markings for bicycle traffic along the site frontage. Bicycle racks would be provided outside at the entrances to the retail uses and Hunter House Hamburgers for visitor use and covered indoor bicycle storage would be provided within the parking garage for use by office employees and residents of the apartments. The proposed bicycle storage encourages non-automobile use via bicycle travel. As Park Street is to be converted to two-way traffic on a permanent basis, an opportunity exists to improve multi-modal facilities along Park Street as part of the two-way conversion process.

SMART offers fixed-route bus service in close proximity to the site frontage via Route 450, Route 460, Routes 461/462 (Fast Woodward), Route 445 and Route 780. Stops are provided for Routes 461/462 along Woodward Avenue at its intersection with Maple Road, stops are provided for Route 445 and Route 780 along Maple Road at its intersection with Old Woodward Avenue, and stops are provided for Route 450 and Route 460 along Old Woodward Avenue. These stops are all located within an approximately two (2)-block walk from the site. Information regarding the nearby bus routes is provided within the Technical Appendix. It is recommended that the proposed office and retail uses provide information for employees regarding available transit options in the area, including wayfinding assistance, schedules, routes, and other general information.

Based on the attributes of development stated above, the proposed development is consistent with the City's Multi-modal Transportation Plan and represents a significant improvement over the existing site.

Key Findings and Conclusions

The key findings and conclusions developed in this study are as follows:

1. The proposed apartments are projected to generate 15 trips (4 in, 11 out) during the weekday morning peak hour and 18 trips (11 in, 7 out) during the weekday evening peak hour. The proposed office is projected to generate 47 trips (40 in, 7 out) during the weekday morning peak hour and 27 trips (4 in, 23 out) during the weekday evening peak hour. The retail uses are projected to generate 10 trips (6 in, 4 out) during the weekday morning peak hour and 100 trips (48 in, 52 out) during the weekday evening peak hour. The Hunter House Hamburgers restaurant is to continue operating on the site and is projected to generate three (3) trips (3 in, 0 out) during the weekday morning peak hour and 38 trips (19 in, 19 out) during the weekday evening peak hour.

2. Traffic for employees of the Hunter House Hamburgers restaurant and ADA parking would utilize the full-movement driveway along Hamilton Row. Traffic for the apartments, patrons of the Hunter House Hamburgers, and a portion of office employees would arrive to and depart from the driveway along Park Street. Traffic for the retail uses and remaining portion of office employees would utilize the parking garages located at 333 Park Street and 222 Peabody Street. Based on parking occupancy count data from March 2017, there is sufficient parking supply to accommodate the parking demand during the weekday morning and evening periods.

3. The site is located within the downtown parking assessment district, and as such, no parking is required for the non-residential portion development. The site would provide three (3) ground-level garage parking spaces designated for Hunter House Hamburgers, and 82 parking spaces below grade, including 63 parking spaces for residents, 11 spaces dedicated to Hunter House Hamburgers, and eight (8) parking spaces for employees at the subject site.

4. The proposed development would further the City's Multi-Modal Transportation Plan by improving the urban character of the block, expanding the downtown footprint and removing surface parking lots that do not encourage pedestrian travel or interaction. The site's location would provide an additional destination in the vicinity of six (6) SMART bus routes. It is recommended that the office and retail uses provide transit information for its employees to encourage transit use.

5. The proposed development would further the City's Multi-Modal Transportation Plan by completing the sidewalk network along Woodward Avenue between Hamilton Row and Maple Road, whereas a combination of sidewalk and asphalt pavement for a parking lot exists today.

6. The proposed development would further the City's Multi-Modal Transportation Plan by providing outdoor bicycle racks at the entrances to the retail uses and Hunter House Hamburgers for visitor use and covered indoor bicycle storage would be provided within the parking garage for use by office employees and residents of the apartments. The proposed bicycle storage encourages bicycle use at the site and reduces the need for trips via automobile.

7. Gated access is not proposed at any of the parking areas.

8. Based on a Level of Service and Volume/Capacity analysis, the proposed development would not have a significant impact on the traffic operations of the roadway network during the weekday morning and weekday evening peak hours.

9. No traffic infrastructure improvements are warranted by the proposed development; however, the analysis does consider the proposed two-way operation of Park Street approved by the City of Birmingham.

TECHNICAL APPENDIX

PROFESSIONAL RESUME

CHARLES D. OLIVO, PE
PRINCIPAL/FOUNDER

Education

BS Civil Engineering
University of Notre Dame, 2002

Licensure

Professional Engineer
Michigan
Indiana
Ohio
New Jersey
New York
Pennsylvania
Connecticut
Maine
Massachusetts
Rhode Island
Maryland
North Carolina
New Hampshire

Professional Traffic Operations Engineer

Associations

Institute of Transportation Engineers (ITE)

American Society of Civil Engineers (ASCE)

Urban Land Institute (ULI)

Mr. Charles Olivo is accomplished in numerous aspects of Civil, Infrastructure, Highway, and Traffic and Transportation Engineering having completed projects for private development/redevelopment entities, public jurisdictional agencies, and local municipalities. Serving clients throughout the Northeast and Midwest, he has professional experience designing and managing the unique and diverse elements of land development and infrastructure design. Mr. Olivo is involved with engineering design from project inception and conceptual development through the entitlement and construction process. His experience in the Civil Engineering field has involved the shaping of development parcels inclusive of both on-site and off-site impacts and access management features.

Preparation of detailed traffic and civil engineering findings during the Due Diligence/Site Assessment process for over 300 development sites to serve as the cornerstone of project viability and create a critical reference point during feasibility assessment. Through thorough research of local development codes and an understanding of development opportunities and constraints, Mr. Olivo has successfully prepared numerous Site and Traffic Analyses for development/redevelopment projects and programs.

Preparation of engineered Site Plan and Traffic Roadway Plan documents to serve as essential components in the land use permitting and entitlement process. Mr. Olivo has been integrally involved in the preparation of over 300 construction document sets, studies, analyses, and assessments associated with land development projects. He has established a reputation of high-quality design, innovative thinking, and understanding of client objectives throughout his experience.

Mr. Olivo has been a key advocate in urban infill development and the advancement of smart growth techniques. He has been the transportation engineer of record for numerous development and redevelopment plans.

Mr. Olivo has been qualified as a traffic and site Engineering Expert and provided testimony before approximately 100 Land Use Boards throughout the country. In addition, he has presented to client groups, public governing bodies, and civic associations to explain the impacts of private development/redevelopment projects and the proposed improvement/mitigation measures associated with these projects.

Mr. Olivo's project experience includes traffic analysis, traffic signal and intersection improvement design, zoning review, site investigation and due diligence, concept preparation, stormwater management and stormwater conveyance system design, grading utility design, soil erosion and sediments, control design, and project coordination.

CITY OF BIRMINGHAM TRAFFIC IMPACT ASSESSMENT FORM (FORM B)

FORM B - FULL TRAFFIC STUDY QUESTIONNAIRE

Applicant: _____ Case#:_____

Date: 01/06/2020 Address:_____

1. Proposed Project

Brief description of the proposed project: Proposed construction of a five (5)-story mixed-use building. The existing Hunter House Hamburgers restaurant would remain on-site within the proposed building. Access is proposed via one (1) full-movement driveway along Park Street and one (1) full-movement driveway along Hamilton Row. An underground parking garage would provide 82 parking spaces for residents and a surface lot would provide three (3) spaces for employees of Hunter House Hamburgers restaurant.

Use of building(s): Residential, retail, office

Gross square footage: 95,356 SF (excluding parking)

Net square footage:_____

Number of parking spaces: 85

Site plan attached: Included with CIS

2. Existing Traffic

Provide Map 1 depicting recent a.m. and p.m. peak hour turning movement counts at all critical intersections within the project's impact area. Critical intersections should be defined in consultation with the City's Traffic Consultant. In general, small projects will have critical intersection within 0.5 to 1 mile from the site. Large projects may have an impact area expending two or more miles form the site.

Provide Map 2 depicting all roadways within the impact area of the project, the number of lanes on each road, and the most recent a.m. peak hour, p.m. peak hour and ADT counts on each road that are available from the City or Road Commission.

Using methodologies in the Highway Capacity Manual, Special Report 209, by the Transportation Research Board, provide tables below depicting the existing stopped time delay per vehicle and Level of Service for each critical intersection during a.m. and p.m. peak hours:

Included within Traffic Impact Assessment

Intersection:

A.M. Peak Hour:_____ P.M. Peak Hour:_____

Ex. Stopped Time Delay/Vehicle:_____ Ex. Stopped Time Delay/Vehicle:_____

Level of Service:_____ Level of Service:_____

Intersection:

A.M. Peak Hour:_____ P.M. Peak Hour:_____

Ex. Stopped Time Delay/Vehicle:_____ Ex. Stopped Time Delay/Vehicle:_____

Level of Service:_____ Level of Service:_____

Intersection:

A.M. Peak Hour:_____ P.M. Peak Hour:_____
Ex. Stopped Time Delay/Vehicle:_____ Ex. Stopped Time Delay/Vehicle:_____
Level of Service:_____ Level of Service:_____

3. Background Growth and Other Development Traffic

Determine the historical growth rate of traffic on roadways in the impact area by examining traffic counts over the last 3 to 5 years. Once an annual growth rate has been identified, apply the growth rate to existing traffic for the number of years until project completion. Show the background growth assignment on Map 4.

In some cases it may be necessary to assign trips for other large projects in the impact area to the road network in conjunction with or in lieu of using a background growth rate. This would be done to more accurately reflect future conditions. Consult with the City's Traffic Consultant.

Using the Highway Capacity Manual, provide tables as below depicting the Stopped Time Delay and Level of Service for each critical intersection for the existing plus background/other development scenario. For multi-phase projects, provide a separate table for each phase.

Included within Traffic Impact Assessment

Intersection 1

A.M. Peak Hour:_____ P.M. Peak Hour:_____
Ex. Stopped Time Delay/Vehicle: _____ Ex. Stopped Time Delay/Vehicle: _____
Level of Service: _____ Level of Service: _____

A.M. Peak Hour:_____ P.M. Peak Hour:_____
Dev. Scenario Stopped Time Delay/Vehicle: _____ Dev. Stopped Time Delay/Vehicle: _____
Dev. Scenario Level of Service: _____ Dev. Scenario Level of Service:_____

Intersection 2

A.M. Peak Hour:_____ P.M. Peak Hour:_____
Ex. Stopped Time Delay/Vehicle: _____ Ex. Stopped Time Delay/Vehicle: _____
Level of Service: _____ Level of Service: _____

A.M. Peak Hour:_____ P.M. Peak Hour:_____
Dev. Scenario Stopped Time Delay/Vehicle: _____ Dev. Stopped Time Delay/Vehicle: _____
Dev. Scenario Level of Service: _____ Dev. Scenario Level of Service:_____

4. Project Traffic

Determine the number of trips generated by the proposed project, identify the directional distribution of the trips and assign the trips to the road network. Show the directional distribution on Map 5.

On Map 6, show the assignment of a.m. and p.m. peak hour trips from the project and show the number of a.m. and p.m. peak hour trips for the total of existing background/other development and project traffic.

Provide Map 7 (see below) for each critical intersection showing separately: number of turning movements made by existing traffic; existing plus background/other development; and existing plus background/other development plus project.

Using the Highway Capacity Manual, provide a table showing the stopped time delay and level of service for each critical intersection for the total traffic scenario (existing plus background/other plus project). Use the same form as example in section 3 above. For multi-phase projects, provide a separate table for each phase.

5. Driveway Movements (a.m. and p.m. peak hours)

Driveway: Park Street
Left In: AM - 8, PM - 25
Right In: AM - 1, PM - 5
Left Out: AM - 2, PM - 3
Right Out: AM - 10, PM - 26

Driveway: Hamilton Row
Left In: AM - 2, PM - 0
Right In: AM - 0, PM - 0
Left Out: AM - 0, PM - 0
Right Out: AM - 0, PM - 0

Driveway: _____
Left In: _____
Right In: _____
Left Out: _____
Right Out: _____

Driveway: _____
Left In: _____
Right In: _____
Left Out: _____
Right Out: _____

6. Recommended Improvements

Attach a separate sheet outlining recommended improvements to intersections and roadways necessary to accommodate future volumes. Provide appropriate capacity analyses to demonstrate the impact of the improvement(s).

7. Transportation Standards

Using the City Design and Construction standards or where appropriate, County Road Commission and Michigan Department of Transportation standards, identify and evaluate the following:

Passing lanes: N/A

Tapers: N/A

Turn Lanes: N/A

Vehicle stacking analysis (if drive-up facilities are proposed): N/A

8. Sight Distance

Provide evaluations of sight distances at project driveways to demonstrate that they meet applicable City, County or State criteria.

*All maps and tables referenced above should be provided in the applicant's traffic study.
**Some projects with a low a.m. peak hour trip generation my not require Level of Service analysis for the a.m. peak hour. Consult with the City' Traffic Consultant.

Map 7

CRITICAL INTERSECTION
PHASE _____ (if applicable) Not Applicable

C C C

B B B
A A A

_____	____
C B A	A B C
C B A	A B C
C B A	A B C
_____	____

A A A

B B B
C C C

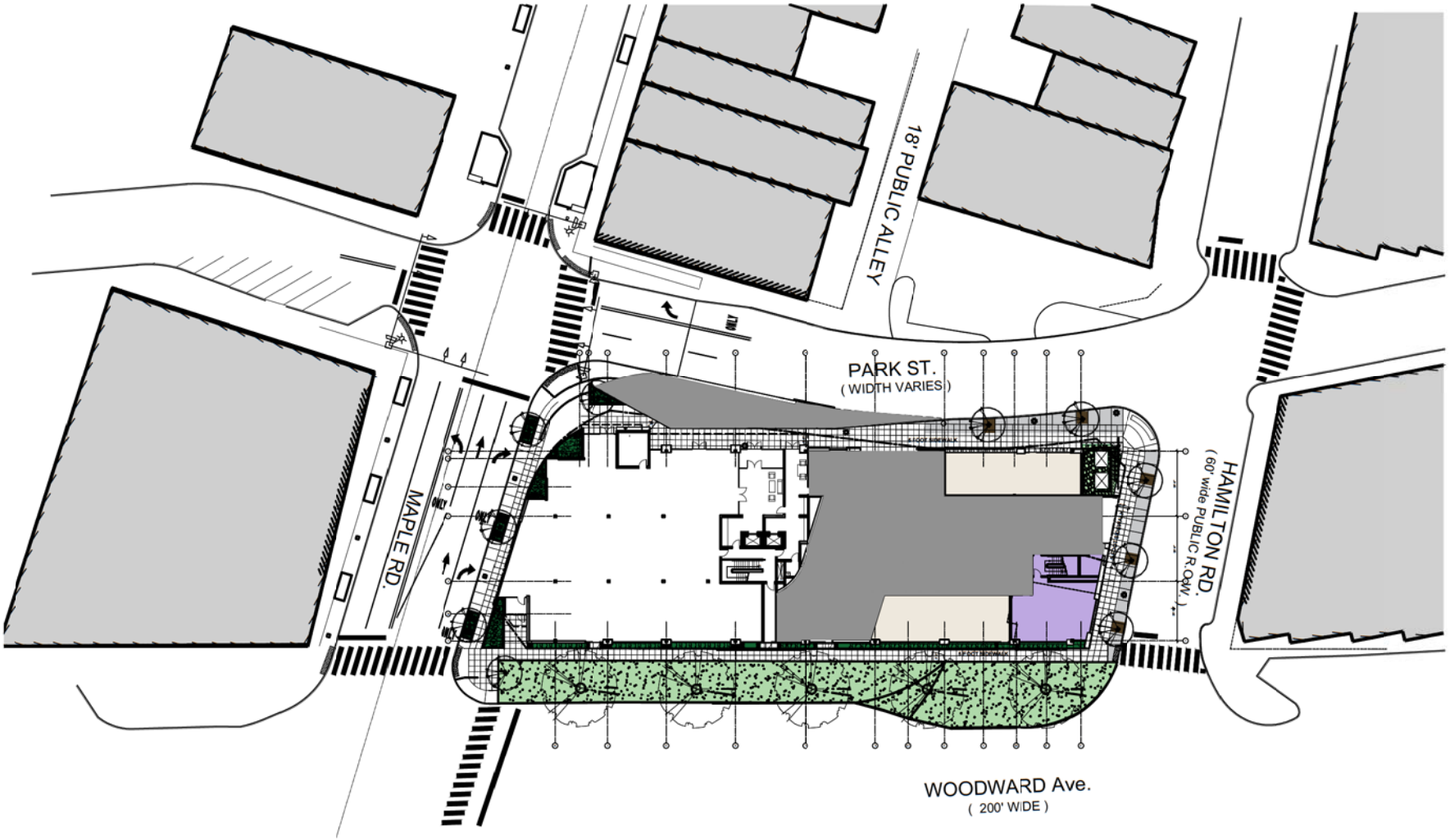
A = Existing traffic

B = Existing plus background/other traffic

C = Existing plus background/other plus project traffic

Note: In addition to the above information, the Petitioner must acknowledge and address all of the pertinent goals, objectives, requirements and standards enumerated in the Birmingham Master Traffic Study.

SITE PLAN



ARCHITECTURAL SITE PLAN
SCALE: 1"=20'-0"

biddison | architecture + design
320 Martin St., Suite 10
Birmingham, MI 48009
t.248.554.9500

Consultants

Project title

PROPOSED BUILDING FOR:
The Maple

35001 and 35075 Woodward Ave.
Birmingham, Michigan

Issued dr/ch

SITE PLAN REVISION 02.20.19
SITE PLAN REVISION 05.13.19

Sheet title

ARCHITECTURAL SITE PLAN

STATE OF MICHIGAN
KEVIN L. BIDDISON
ARCHITECT

Project no.

1971.16

Sheet no.

SP.101

A10

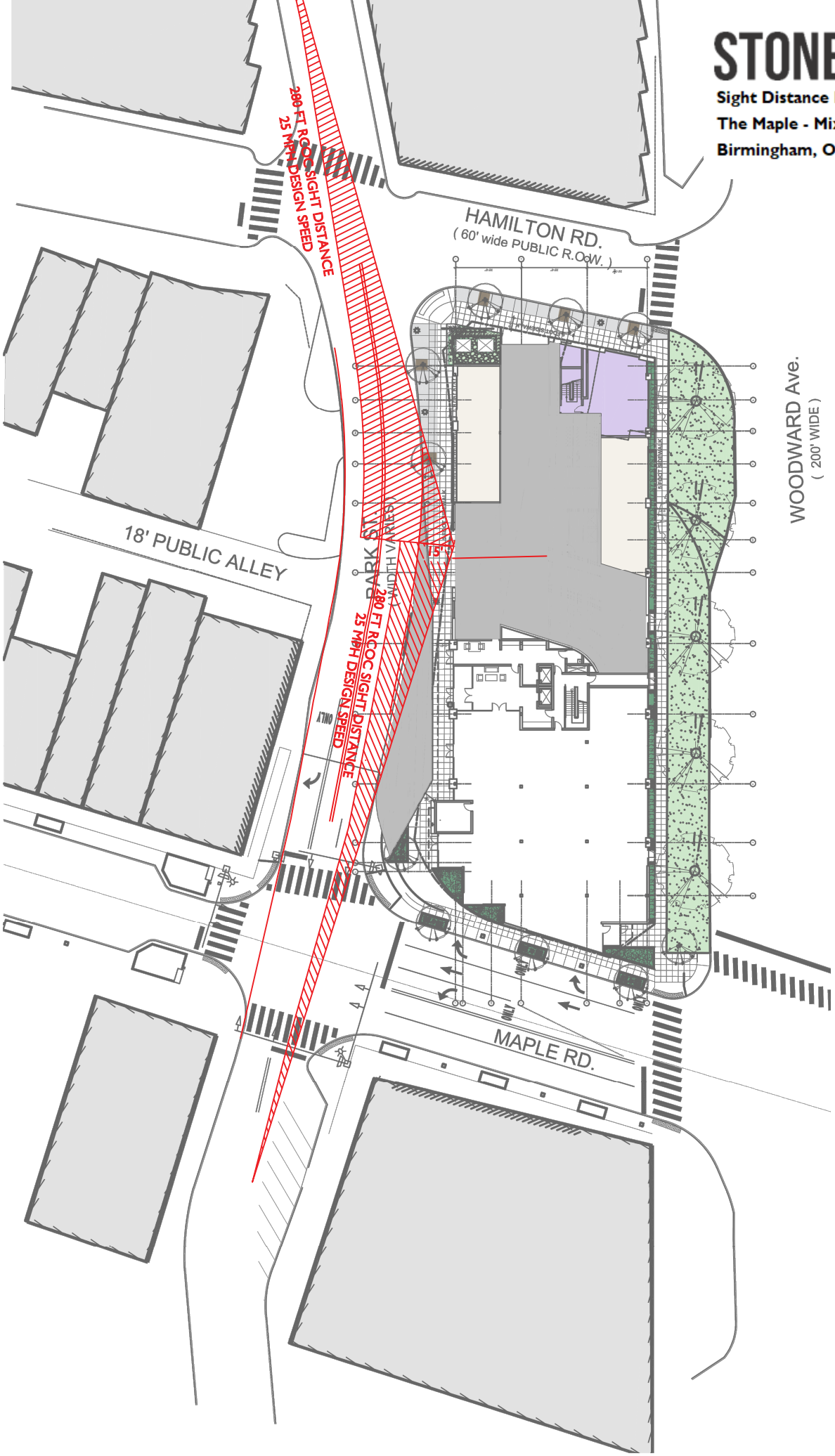
SIGHT DISTANCE EVALUATION

STONEFIELD

Sight Distance Evaluation Exhibit - Park Street

The Maple - Mixed-Use Development

Birmingham, Oakland County, Michigan

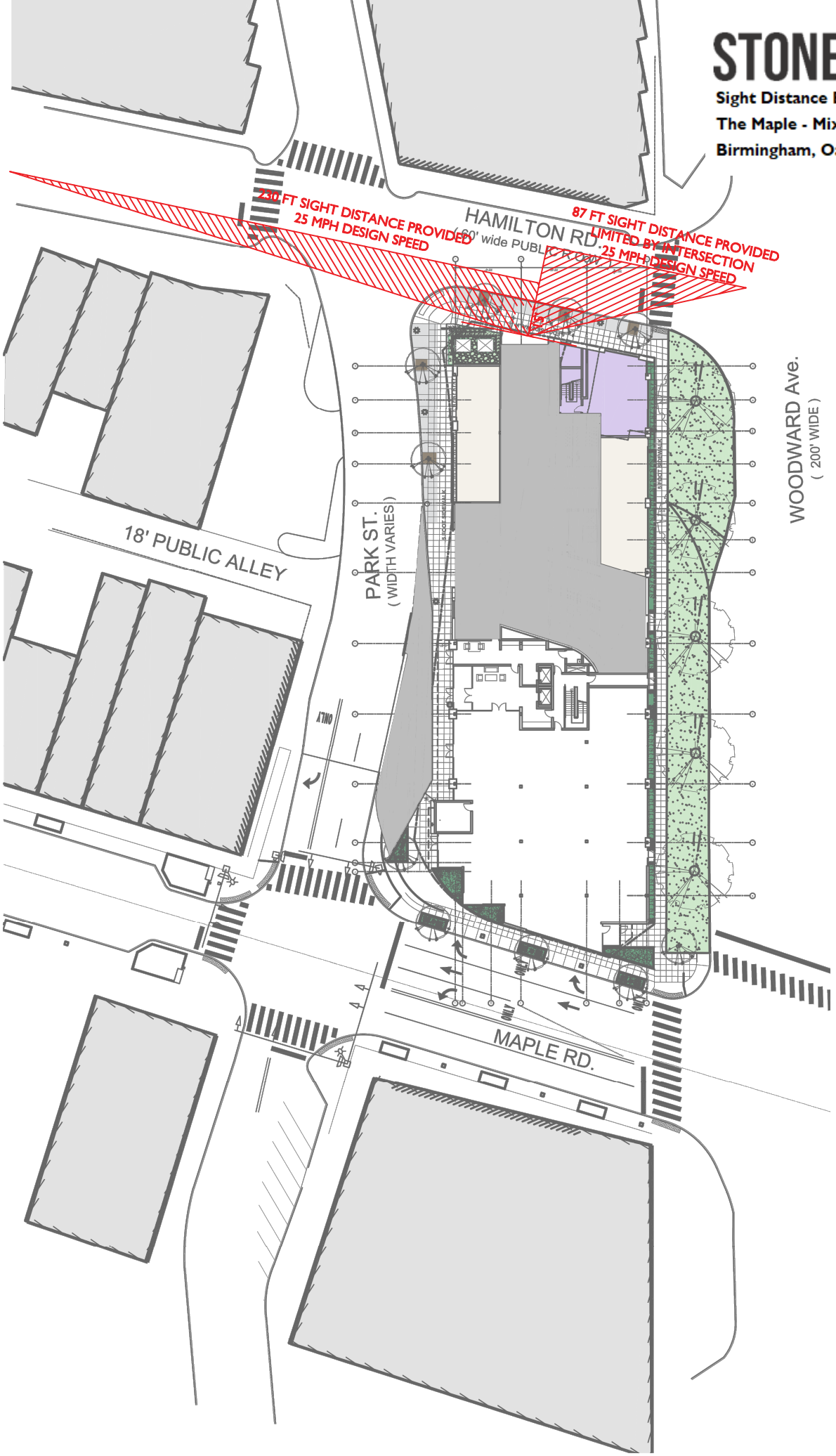


STONEFIELD

Sight Distance Evaluation Exhibit - Hamilton Row

The Maple - Mixed-Use Development

Birmingham, Oakland County, Michigan



PEABODY STREET/PARK STREET & MAPLE ROAD
FUTURE INTERSECTION LANE GEOMETRY

PARK STREET

OPTION L
(5) - 10 FOOT WIDE LANES

RAY PROJECT NO. 23365

FLEIS&VANDENBRINK
DESIGN. BUILD. OPERATE.

TURNING MOVEMENT COUNT DATA

Traffic Data Collection, LLC

www:tdccounts.com

Phone: 586.786-5407

Traffic Study Performed For:

STONEFIELD

Project: Birmingham Traffic Impact Study
Study:4 Hr. Video Turning Movement Count
Weather: Sunny/Cldy. Dry Deg's 80's
Count By Miovision Video VCU 61A SW

File Name : TMC_1 SB M1 & NB-SB XO_8-8-18
Site Code : TMC_1
Start Date : 8/8/2018
Page No : 1

4 Hour traffic study was conducted during typical weekday (Tuesday-Thursday) from 7:00 AM - 9:00 AM morning & 4:00 PM - 6:00 PM afternoon peak hours, while school was not in session.

Groups Printed- Pass Cars - Single Units - Heavy Trucks

	SB M-1 (Woodward Ave.) Southbound				NB>SB Crossover								
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
07:00 AM	451	8	0	459	0	15	0	15	0	0	0	0	474
07:15 AM	502	10	0	512	0	21	0	21	0	0	0	0	533
07:30 AM	610	14	0	624	0	25	0	25	0	0	0	0	649
07:45 AM	637	13	0	650	0	42	0	42	0	0	0	0	692
Total	2200	45	0	2245	0	103	0	103	0	0	0	0	2348
08:00 AM	588	26	0	614	0	30	0	30	0	0	0	0	644
08:15 AM	593	25	0	618	0	45	0	45	0	0	0	0	663
08:30 AM	616	34	0	650	0	47	0	47	0	0	0	0	697
08:45 AM	618	32	0	650	0	43	0	43	0	0	0	0	693
Total	2415	117	0	2532	0	165	0	165	0	0	0	0	2697
*** BREAK ***													
04:00 PM	549	43	0	592	0	47	0	47	0	0	0	0	639
04:15 PM	582	54	0	636	0	38	0	38	0	0	0	0	674
04:30 PM	591	60	0	651	0	45	0	45	0	0	0	0	696
04:45 PM	676	50	0	726	0	38	0	38	0	0	0	0	764
Total	2398	207	0	2605	0	168	0	168	0	0	0	0	2773
05:00 PM	676	56	0	732	0	43	0	43	0	0	0	0	775
05:15 PM	727	68	0	795	0	48	0	48	0	0	0	0	843
05:30 PM	656	55	0	711	0	43	0	43	0	0	0	0	754
05:45 PM	618	56	0	674	0	41	0	41	0	0	0	0	715
Total	2677	235	0	2912	0	175	0	175	0	0	0	0	3087
Grand Total	9690	604	0	10294	0	611	0	611	0	0	0	0	10905
Apprch %	94.1	5.9	0		0	100	0		0	0	0		
Total %	88.9	5.5	0	94.4	0	5.6	0	5.6	0	0	0	0	
Pass Cars	9495	596	0	10091	0	589	0	589	0	0	0	0	10680
% Pass Cars	98	98.7	0	98	0	96.4	0	96.4	0	0	0	0	97.9
Single Units	151	8	0	159	0	17	0	17	0	0	0	0	176
% Single Units	1.6	1.3	0	1.5	0	2.8	0	2.8	0	0	0	0	1.6
Heavy Trucks	44	0	0	44	0	5	0	5	0	0	0	0	49
% Heavy Trucks	0.5	0	0	0.4	0	0.8	0	0.8	0	0	0	0	0.4

TDC Traffic Comments: Signalized "T" intersection, no ped. signals. Video VCU camera was located within SW intersection quadrant. Note: SB left turn movements have been recorded for SB>NB M-1 Crossover, north of Hamilton ROW.

Traffic Data Collection, LLC

www:tdccounts.com

Phone: 586.786-5407

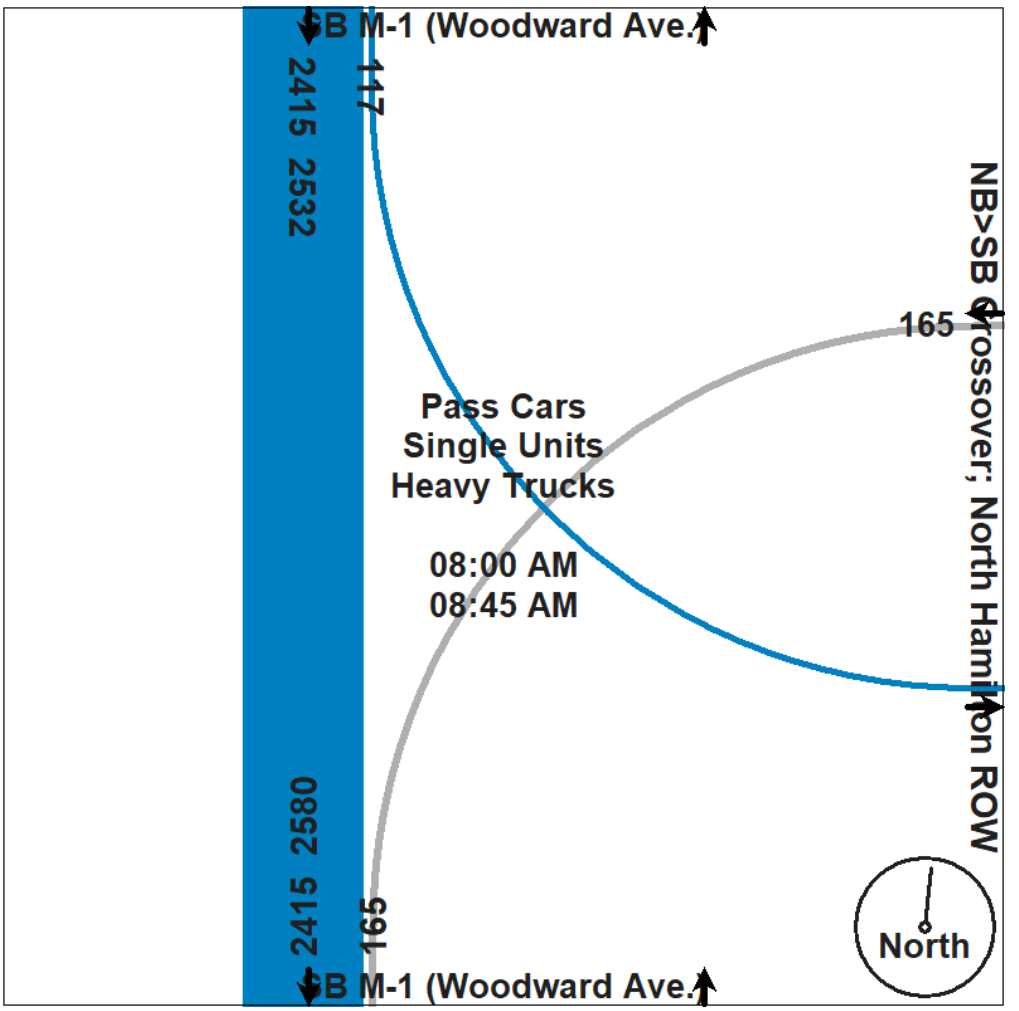
Traffic Study Performed For:

STONEFIELD

Project: Birmingham Traffic Impact Study
Study:4 Hr. Video Turning Movement Count
Weather: Sunny/Cldy. Dry Deg's 80's
Count By Miovision Video VCU 61A SW

File Name : TMC_1 SB M1 & NB-SB XO_8-8-18
Site Code : TMC_1
Start Date : 8/8/2018
Page No : 3

	SB M-1 (Woodward Ave.) Southbound			NB>SB Crossover						
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 08:00 AM										
08:00 AM	588	26	614	0	30	30	0	0	0	644
08:15 AM	593	25	618	0	45	45	0	0	0	663
08:30 AM	616	**34**	**650**	0	**47**	**47**	0	0	0	**697**
08:45 AM	**618**	32	650	0	43	43	0	0	0	693
Total Volume	2415	117	2532	0	165	165	0	0	0	2697
% App. Total	95.4	4.6		0	100		0	0		
PHF	.977	.860	.974	.000	.878	.878	.000	.000	.000	.967
Pass Cars	2351	115	2466	0	157	157	0	0	0	2623
% Pass Cars	97.3	98.3	97.4	0	95.2	95.2	0	0	0	97.3
Single Units	44	2	46	0	6	6	0	0	0	52
% Single Units	1.8	1.7	1.8	0	3.6	3.6	0	0	0	1.9
Heavy Trucks	20	0	20	0	2	2	0	0	0	22
% Heavy Trucks	0.8	0	0.8	0	1.2	1.2	0	0	0	0.8



Traffic Data Collection, LLC

www:tdccounts.com

Phone: 586.786-5407

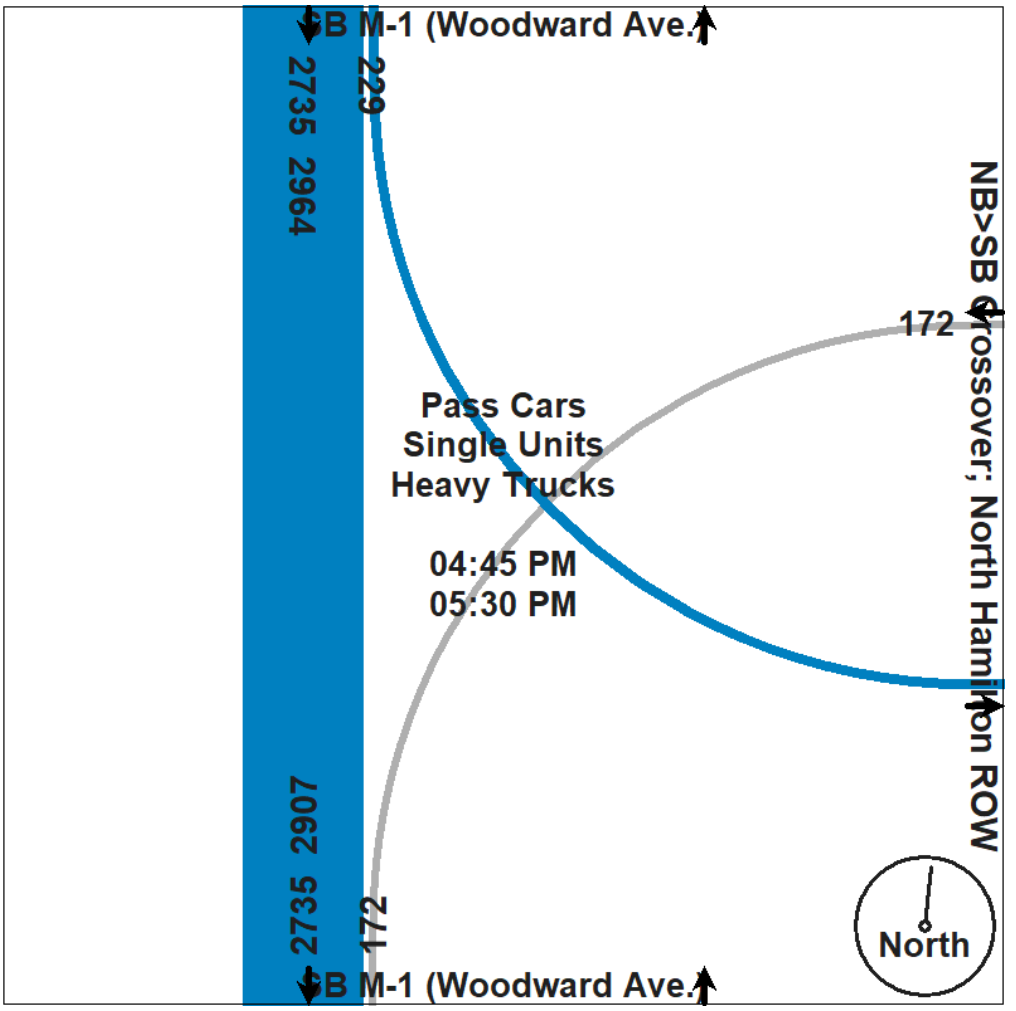
Traffic Study Performed For:

STONEFIELD

Project: Birmingham Traffic Impact Study
Study:4 Hr. Video Turning Movement Count
Weather: Sunny/Cldy. Dry Deg's 80's
Count By Miovision Video VCU 61A SW

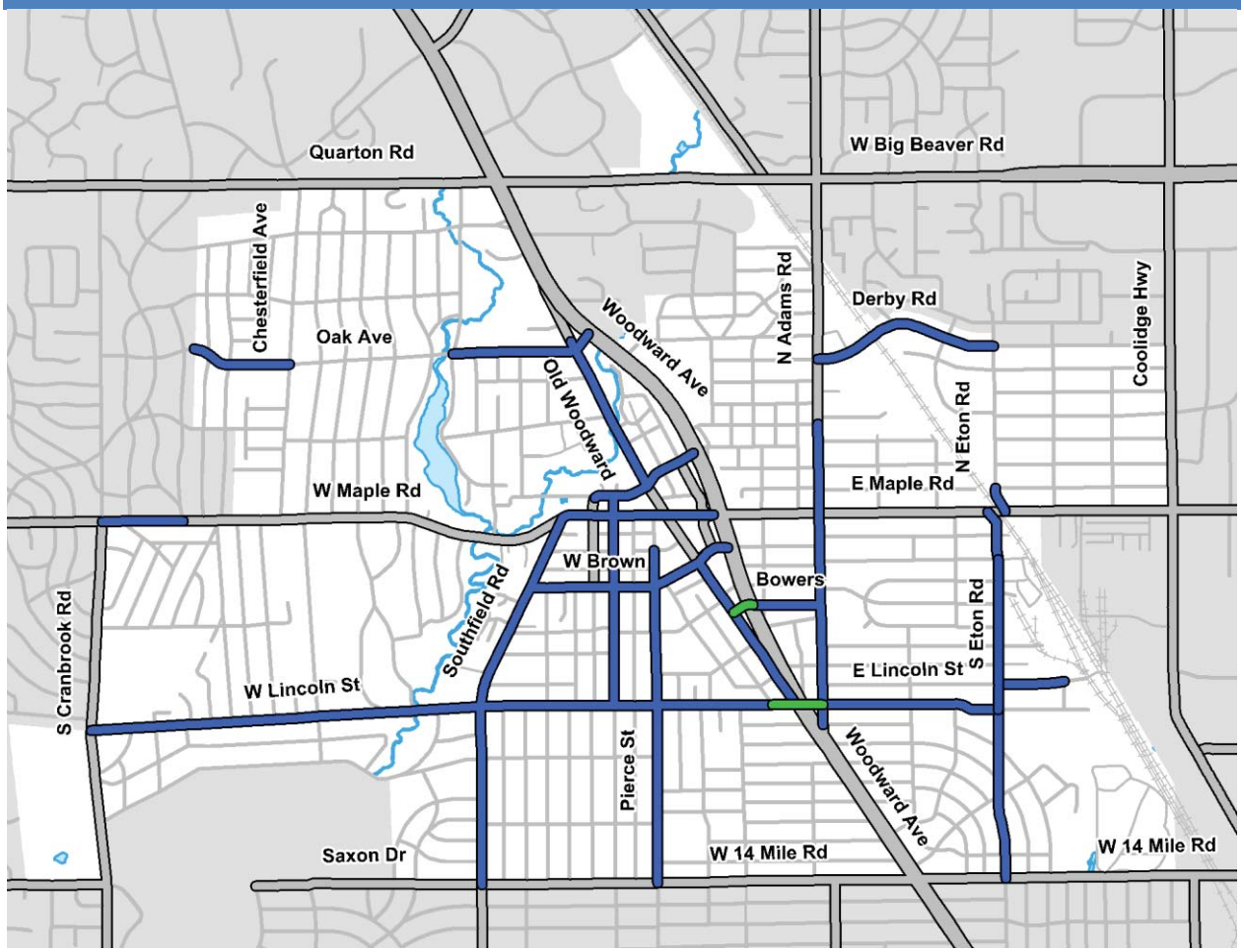
File Name : TMC_1 SB M1 & NB-SB XO_8-8-18
Site Code : TMC_1
Start Date : 8/8/2018
Page No : 4

	SB M-1 (Woodward Ave.) Southbound			NB>SB Crossover						
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:45 PM										
04:45 PM	676	50	726	0	38	38	0	0	0	764
05:00 PM	676	56	732	0	43	43	0	0	0	775
05:15 PM	**727**	**68**	**795**	0	**48**	**48**	0	0	0	**843**
05:30 PM	656	55	711	0	43	43	0	0	0	754
Total Volume	2735	229	2964	0	172	172	0	0	0	3136
% App. Total	92.3	7.7		0	100		0	0		
PHF	.941	.842	.932	.000	.896	.896	.000	.000	.000	.930
Pass Cars	2705	227	2932	0	170	170	0	0	0	3102
% Pass Cars	98.9	99.1	98.9	0	98.8	98.8	0	0	0	98.9
Single Units	27	2	29	0	2	2	0	0	0	31
% Single Units	1.0	0.9	1.0	0	1.2	1.2	0	0	0	1.0
Heavy Trucks	3	0	3	0	0	0	0	0	0	3
% Heavy Trucks	0.1	0	0.1	0	0	0	0	0	0	0.1



EXCERPTS FROM CITY'S MULTI-MODAL TRANSPORTATION PLAN

FIGURE 3.6A PROPOSED SHARED LANE MARKINGS

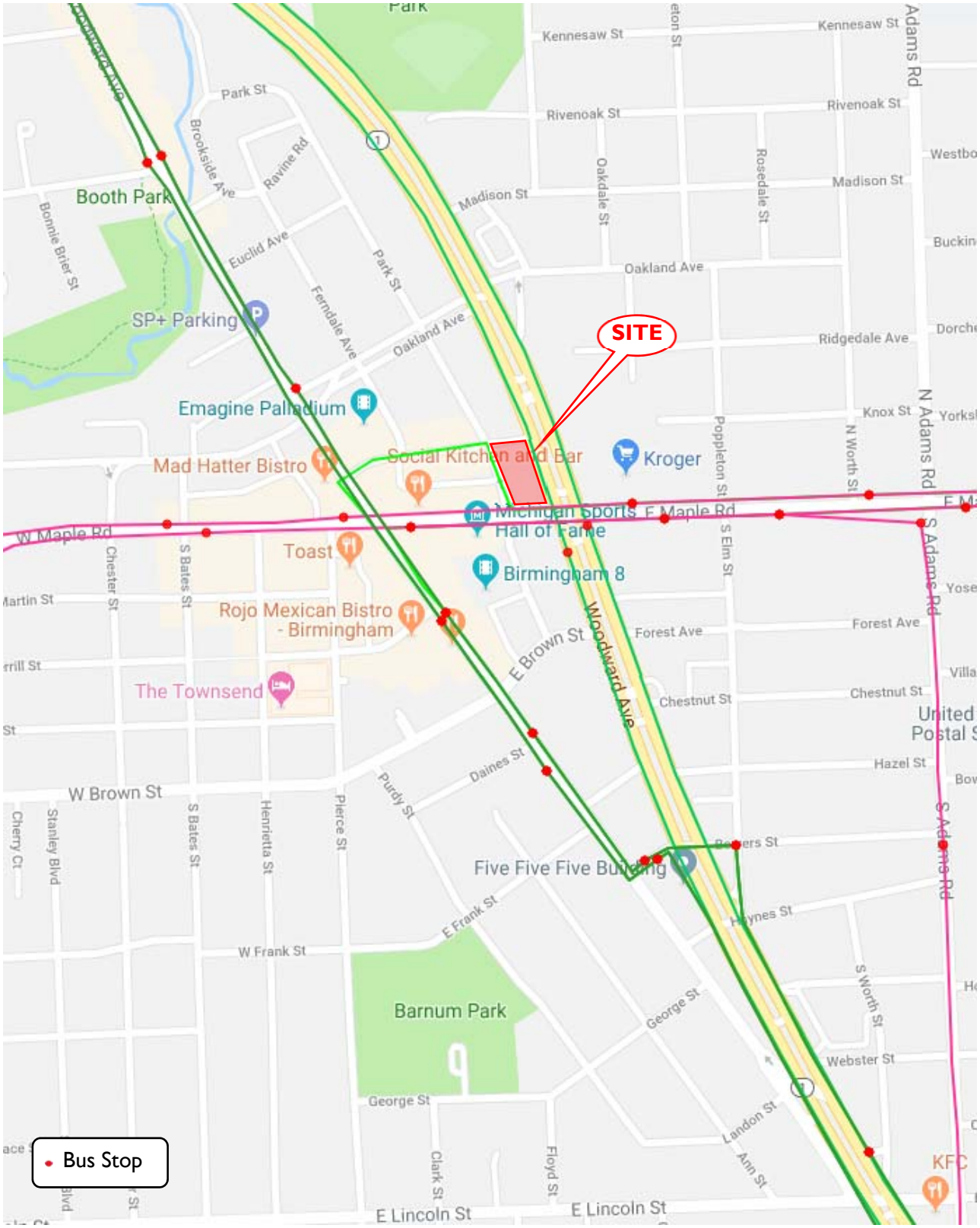


Shared Lane Markings

- Proposed Shared Lane Markings
- Proposed Colored Shared Lane Markings

APPROXIMATELY 10.7 MILES OF NEW SHARED LANES MARKINGS ARE PROPOSED AND 0.2 MILES OF COLORED SHARED LANE MARKINGS ARE PROPOSED

SMART BUS STOPS & ROUTES IN SITE VICINITY



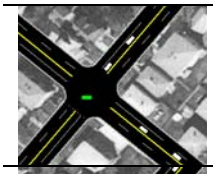
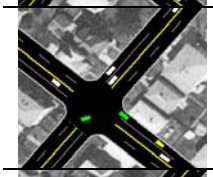
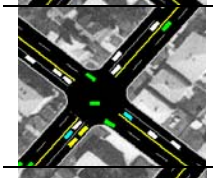
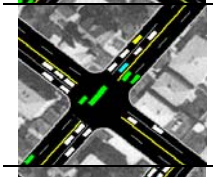
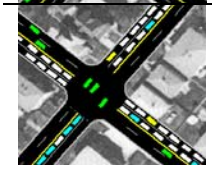
SMART Bus Routes Proximate to Site Location
(Route #: 445, 450, 460, 461, 462 & 780)

SYNCHRO 10 LEVEL OF SERVICE/CAPACITY ANALYSIS

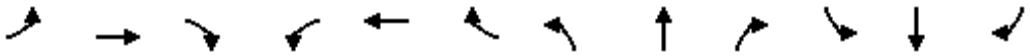
LEVEL OF SERVICE /AVERAGE CONTROL DELAY CRITERIA

The ability of a roadway to effectively accommodate traffic demand is determined through an assessment of the volume-to-capacity ratio, delay and Level of Service of the lane group and/or intersection. The volume-to-capacity ratio is the ratio of traffic flow rate to capacity for a given transportation facility. As defined within the Highway Capacity Manual, 6th Edition (HCM), intersection delay is the total additional travel time experienced by drivers, passengers, or pedestrians as a result of control measures and interaction with other users of the facility, divided by the volume departing from the corresponding cross section of the facility. Level of service is a qualitative measure describing operational conditions within a traffic stream, based on service measures such as speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience.

For an unsignalized intersection, LOS A indicates operations with delay less than 10 seconds per vehicle, while LOS F describes operations with delay in excess of 50 seconds per vehicle. For a signalized intersection, LOS A indicates operations with delay less than 10 seconds per vehicle and LOS F denotes operations with delay in excess of 80 seconds per vehicle.

	Level Of Service (LOS)	Signalized Delay Range (average control delay in sec/veh)	Unsignalized Delay Range (average control delay in sec/veh)
	A	<=10	<=10
	B	>10 and <=20	>10 and <=15
	C	>20 and <=35	>15 and <=25
	D	>35 and <=55	>25 and <=35
	E	>55 and <=80	>35 and <=50
	F	>80	>50

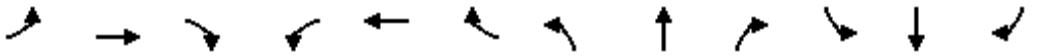
Source: Highway Capacity Manual, 6th Edition



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	656	0	0	720	322	0	3065	334	0	0	0
Future Volume (vph)	0	656	0	0	720	322	0	3065	334	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.0			10.0			6.0				
Lane Util. Factor		0.95			0.95			0.86				
Frpb, ped/bikes		1.00			0.99			1.00				
Flpb, ped/bikes		1.00			1.00			1.00				
Frt		1.00			0.95			0.99				
Flt Protected		1.00			1.00			1.00				
Satd. Flow (prot)		3725			3522			6630				
Flt Permitted		1.00			1.00			1.00				
Satd. Flow (perm)		3725			3522			6630				
Peak-hour factor, PHF	0.93	0.93	0.93	0.86	0.86	0.86	0.95	0.95	0.95	0.92	0.92	0.92
Adj. Flow (vph)	0	705	0	0	837	374	0	3226	352	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	21	0	0	0	0
Lane Group Flow (vph)	0	705	0	0	1211	0	0	3558	0	0	0	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type		NA			NA			NA				
Protected Phases		8			4			2				
Permitted Phases												
Actuated Green, G (s)		29.0			25.0			49.0				
Effective Green, g (s)		29.0			25.0			49.0				
Actuated g/C Ratio		0.32			0.28			0.54				
Clearance Time (s)		6.0			10.0			6.0				
Lane Grp Cap (vph)		1200			978			3609				
v/s Ratio Prot		0.19			c0.34			c0.54				
v/s Ratio Perm												
v/c Ratio		0.59			1.24			0.99				
Uniform Delay, d1		25.5			32.5			20.2				
Progression Factor		0.00			1.00			1.00				
Incremental Delay, d2		1.3			116.0			12.0				
Delay (s)		1.3			148.5			32.2				
Level of Service		A			F			C				
Approach Delay (s)		1.3			148.5			32.2			0.0	
Approach LOS		A			F			C			A	

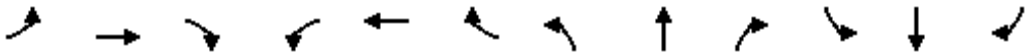
Intersection Summary			
HCM 2000 Control Delay	53.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.07		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	89.9%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	656	65	0	720	0	0	0	0	0	3114	162
Future Volume (vph)	0	656	65	0	720	0	0	0	0	0	3114	162
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		10.0			6.0						6.0	6.0
Lane Util. Factor		0.95			0.95						0.86	1.00
Frpb, ped/bikes		1.00			1.00						1.00	0.98
Flpb, ped/bikes		1.00			1.00						1.00	1.00
Frt		0.99			1.00						1.00	0.85
Flt Protected		1.00			1.00						1.00	1.00
Satd. Flow (prot)		3630			3762						6812	1657
Flt Permitted		1.00			1.00						1.00	1.00
Satd. Flow (perm)		3630			3762						6812	1657
Peak-hour factor, PHF	0.93	0.93	0.93	0.95	0.95	0.95	0.92	0.92	0.92	0.95	0.95	0.95
Adj. Flow (vph)	0	705	70	0	758	0	0	0	0	0	3278	171
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	39
Lane Group Flow (vph)	0	775	0	0	758	0	0	0	0	0	3278	132
Confl. Peds. (#/hr)	22		11	11		22	3		1	1		3
Heavy Vehicles (%)	3%	3%	3%	1%	1%	1%	2%	2%	2%	1%	1%	1%
Turn Type		NA			NA						NA	Perm
Protected Phases		4			8						2	
Permitted Phases												2
Actuated Green, G (s)		25.0			29.0						49.0	49.0
Effective Green, g (s)		25.0			29.0						49.0	49.0
Actuated g/C Ratio		0.28			0.32						0.54	0.54
Clearance Time (s)		10.0			6.0						6.0	6.0
Lane Grp Cap (vph)		1008			1212						3708	902
v/s Ratio Prot		c0.21			0.20						c0.48	
v/s Ratio Perm												0.08
v/c Ratio		0.77			0.63						0.88	0.15
Uniform Delay, d1		29.8			25.9						18.0	10.1
Progression Factor		0.90			0.00						1.07	0.85
Incremental Delay, d2		4.2			0.2						2.3	0.2
Delay (s)		31.1			0.2						21.6	8.8
Level of Service		C			A						C	A
Approach Delay (s)		31.1			0.2			0.0			21.0	
Approach LOS		C			A			A			C	

Intersection Summary			
HCM 2000 Control Delay	19.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	89.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			



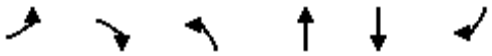
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	640	38	97	663	122	0	0	81	0	0	0
Future Volume (vph)	0	640	38	97	663	122	0	0	81	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	11	11	11	11	11	11	11	11	11	11	11	11
Total Lost time (s)		6.0	5.0	6.0	6.0	4.0			6.0			
Lane Util. Factor		1.00	1.00	1.00	0.95	0.95			1.00			
Frpb, ped/bikes		1.00	0.94	1.00	1.00	0.98			1.00			
Flpb, ped/bikes		1.00	1.00	1.00	1.00	1.00			1.00			
Frt		1.00	0.85	1.00	1.00	0.85			0.86			
Flt Protected		1.00	1.00	0.95	1.00	1.00			1.00			
Satd. Flow (prot)		1450	1369	1605	1600	1343			1490			
Flt Permitted		1.00	1.00	0.95	1.00	1.00			1.00			
Satd. Flow (perm)		1450	1369	1605	1600	1343			1490			
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.78	0.78	0.78	0.92	0.92	0.92
Adj. Flow (vph)	0	674	40	102	698	128	0	0	104	0	0	0
RTOR Reduction (vph)	0	0	13	0	1	0	0	0	80	0	0	0
Lane Group Flow (vph)	0	674	27	102	710	115	0	0	24	0	0	0
Confl. Peds. (#/hr)	12		13	13		12						
Heavy Vehicles (%)	2%	2%	2%	3%	3%	3%	1%	1%	1%	2%	2%	2%
Parking (#/hr)		10										
Turn Type		NA	Perm	Prot	NA	Free			Over			
Protected Phases		6		5	2 10				5			
Permitted Phases			6			Free						
Actuated Green, G (s)		57.0	57.0	21.0	61.0	90.0			21.0			
Effective Green, g (s)		57.0	58.0	21.0	59.0	90.0			21.0			
Actuated g/C Ratio		0.63	0.64	0.23	0.66	1.00			0.23			
Clearance Time (s)		6.0	6.0	6.0					6.0			
Vehicle Extension (s)		0.2	0.2	0.2					0.2			
Lane Grp Cap (vph)		918	882	374	1048	1343			347			
v/s Ratio Prot		c0.46		c0.06	c0.44				0.02			
v/s Ratio Perm			0.02			0.09						
v/c Ratio		0.73	0.03	0.27	0.68	0.09			0.07			
Uniform Delay, d1		11.3	5.8	28.2	9.6	0.0			26.9			
Progression Factor		1.00	1.00	1.29	0.55	1.00			1.00			
Incremental Delay, d2		5.2	0.1	1.5	3.0	0.1			0.4			
Delay (s)		16.5	5.9	37.9	8.3	0.1			27.3			
Level of Service		B	A	D	A	A			C			
Approach Delay (s)		15.9			10.6			27.3			0.0	
Approach LOS		B			B			C			A	

Intersection Summary			
HCM 2000 Control Delay	13.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	51.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

4: Park Street & Hamilton Row Performance by movement

Movement	EBL	EBT	WBT	WBR	NBL	NBT	NBR	SBL	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0
Total Delay (hr)	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Total Del/Veh (s)	4.1	6.0	3.6	2.1	0.1	1.0	0.4	5.6	2.9	2.8
Total Stops	9	34	102	28	0	0	0	14	12	199
Travel Time (hr)	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.6
Avg Speed (mph)	15	14	6	6	21	20	16	14	15	13



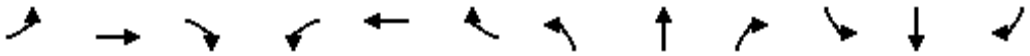
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	125	0	0	3153	130
Future Volume (Veh/h)	0	125	0	0	3153	130
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.84	0.84	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	149	0	0	3319	137
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				327	192	
pX, platoon unblocked	0.62	0.62	0.62			
vC, conflicting volume	3388	898	3456			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1808	0	1918			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	78	100			
cM capacity (veh/h)	45	678	195			

Direction, Lane #	EB 1	SB 1	SB 2	SB 3	SB 4
Volume Total	149	948	948	948	611
Volume Left	0	0	0	0	0
Volume Right	149	0	0	0	137
cSH	678	1700	1700	1700	1700
Volume to Capacity	0.22	0.56	0.56	0.56	0.36
Queue Length 95th (ft)	21	0	0	0	0
Control Delay (s)	11.8	0.0	0.0	0.0	0.0
Lane LOS	B				
Approach Delay (s)	11.8	0.0			
Approach LOS	B				

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	59.5%	ICU Level of Service	B
Analysis Period (min)	15		

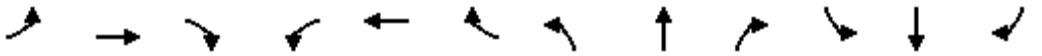
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	169	0	0	0	0	3114
Future Volume (vph)	169	0	0	0	0	3114
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	16	12	12	12	12	12
Total Lost time (s)	5.0					5.7
Lane Util. Factor	1.00					0.86
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	2132					6812
Flt Permitted	0.95					1.00
Satd. Flow (perm)	2132					6812
Peak-hour factor, PHF	0.88	0.88	1.00	1.00	0.95	0.95
Adj. Flow (vph)	192	0	0	0	0	3278
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	192	0	0	0	0	3278
Heavy Vehicles (%)	1%	0%	0%	0%	0%	1%
Turn Type	Prot					NA
Protected Phases	8					6
Permitted Phases						
Actuated Green, G (s)	25.0					54.3
Effective Green, g (s)	25.0					54.3
Actuated g/C Ratio	0.28					0.60
Clearance Time (s)	5.0					5.7
Lane Grp Cap (vph)	592					4109
v/s Ratio Prot	c0.09					c0.48
v/s Ratio Perm						
v/c Ratio	0.32					0.80
Uniform Delay, d1	25.8					13.7
Progression Factor	0.57					1.00
Incremental Delay, d2	0.6					1.7
Delay (s)	15.4					15.3
Level of Service	B					B
Approach Delay (s)	15.4		0.0			15.3
Approach LOS	B		A			B

Intersection Summary			
HCM 2000 Control Delay	15.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.7
Intersection Capacity Utilization	95.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			



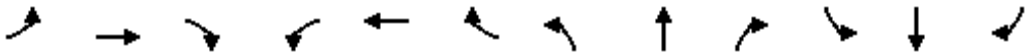
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	643	0	0	604	474	0	2674	390	0	0	0
Future Volume (vph)	0	643	0	0	604	474	0	2674	390	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.0			10.0			6.0				
Lane Util. Factor		0.95			0.95			0.86				
Frpb, ped/bikes		1.00			0.97			1.00				
Flpb, ped/bikes		1.00			1.00			1.00				
Frt		1.00			0.93			0.98				
Flt Protected		1.00			1.00			1.00				
Satd. Flow (prot)		3689			3399			6596				
Flt Permitted		1.00			1.00			1.00				
Satd. Flow (perm)		3689			3399			6596				
Peak-hour factor, PHF	0.95	0.95	0.95	0.94	0.94	0.94	0.95	0.95	0.95	0.92	0.92	0.92
Adj. Flow (vph)	0	677	0	0	643	504	0	2815	411	0	0	0
RTOR Reduction (vph)	0	0	0	0	1	0	0	26	0	0	0	0
Lane Group Flow (vph)	0	677	0	0	1146	0	0	3200	0	0	0	0
Confl. Peds. (#/hr)						39			10			
Heavy Vehicles (%)	3%	3%	3%	1%	1%	1%	2%	2%	2%	2%	2%	2%
Turn Type		NA			NA			NA				
Protected Phases		8			4			2				
Permitted Phases												
Actuated Green, G (s)		28.0			24.0			50.0				
Effective Green, g (s)		28.0			24.0			50.0				
Actuated g/C Ratio		0.31			0.27			0.56				
Clearance Time (s)		6.0			10.0			6.0				
Lane Grp Cap (vph)		1147			906			3664				
v/s Ratio Prot		0.18			c0.34			c0.49				
v/s Ratio Perm												
v/c Ratio		0.59			1.27			0.87				
Uniform Delay, d1		26.2			33.0			17.3				
Progression Factor		0.00			1.00			1.00				
Incremental Delay, d2		0.9			128.2			3.2				
Delay (s)		0.9			161.2			20.5				
Level of Service		A			F			C				
Approach Delay (s)		0.9			161.2			20.5			0.0	
Approach LOS		A			F			C			A	

Intersection Summary			
HCM 2000 Control Delay	49.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	88.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	643	172	0	604	0	0	0	0	0	3848	139
Future Volume (vph)	0	643	172	0	604	0	0	0	0	0	3848	139
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		10.0			6.0						6.0	6.0
Lane Util. Factor		0.95			0.95						0.86	1.00
Frpb, ped/bikes		0.99			1.00						1.00	0.97
Flpb, ped/bikes		1.00			1.00						1.00	1.00
Frt		0.97			1.00						1.00	0.85
Flt Protected		1.00			1.00						1.00	1.00
Satd. Flow (prot)		3542			3762						6812	1632
Flt Permitted		1.00			1.00						1.00	1.00
Satd. Flow (perm)		3542			3762						6812	1632
Peak-hour factor, PHF	0.95	0.95	0.95	0.94	0.94	0.94	0.92	0.92	0.92	0.94	0.94	0.94
Adj. Flow (vph)	0	677	181	0	643	0	0	0	0	0	4094	148
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	38
Lane Group Flow (vph)	0	858	0	0	643	0	0	0	0	0	4094	110
Confl. Peds. (#/hr)			18									16
Heavy Vehicles (%)	3%	3%	3%	1%	1%	1%	2%	2%	2%	1%	1%	1%
Turn Type		NA			NA						NA	Perm
Protected Phases		4			8						2	
Permitted Phases												2
Actuated Green, G (s)		24.0			28.0						50.0	50.0
Effective Green, g (s)		24.0			28.0						50.0	50.0
Actuated g/C Ratio		0.27			0.31						0.56	0.56
Clearance Time (s)		10.0			6.0						6.0	6.0
Lane Grp Cap (vph)		944			1170						3784	906
v/s Ratio Prot		c0.24			0.17						c0.60	
v/s Ratio Perm												0.07
v/c Ratio		0.91			0.55						1.08	0.12
Uniform Delay, d1		31.9			25.8						20.0	9.5
Progression Factor		0.92			0.00						1.06	0.77
Incremental Delay, d2		10.9			0.2						39.4	0.1
Delay (s)		40.2			0.2						60.6	7.4
Level of Service		D			A						E	A
Approach Delay (s)		40.2			0.2			0.0			58.7	
Approach LOS		D			A			A			E	

Intersection Summary			
HCM 2000 Control Delay	49.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	88.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			



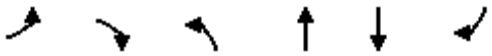
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	664	32	76	602	65	0	0	151	0	0	0
Future Volume (vph)	0	664	32	76	602	65	0	0	151	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	11	11	11	11	11	11	12	12	12	12	12	12
Total Lost time (s)		6.0	5.0	6.0	6.0	4.0			6.0			
Lane Util. Factor		1.00	1.00	1.00	0.95	0.95			1.00			
Frpb, ped/bikes		1.00	0.91	1.00	1.00	0.98			1.00			
Flpb, ped/bikes		1.00	1.00	1.00	1.00	1.00			1.00			
Frt		1.00	0.85	1.00	1.00	0.85			0.86			
Flt Protected		1.00	1.00	0.95	1.00	1.00			1.00			
Satd. Flow (prot)		1450	1325	1637	1634	1365			1483			
Flt Permitted		1.00	1.00	0.95	1.00	1.00			1.00			
Satd. Flow (perm)		1450	1325	1637	1634	1365			1483			
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.83	0.83	0.83	0.92	0.92	0.92
Adj. Flow (vph)	0	699	34	80	634	68	0	0	182	0	0	0
RTOR Reduction (vph)	0	0	13	0	0	0	0	0	132	0	0	0
Lane Group Flow (vph)	0	699	21	80	641	61	0	0	50	0	0	0
Confl. Peds. (#/hr)	23		24	24		23	45					45
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	5%	5%	5%	2%	2%	2%
Parking (#/hr)		10										
Turn Type		NA	Perm	Prot	NA	Free			Over			
Protected Phases		6		5	2 10				5			
Permitted Phases			6			Free						
Actuated Green, G (s)		53.4	53.4	24.6	71.2	90.0			24.6			
Effective Green, g (s)		53.4	54.4	24.6	69.2	90.0			24.6			
Actuated g/C Ratio		0.59	0.60	0.27	0.77	1.00			0.27			
Clearance Time (s)		6.0	6.0	6.0					6.0			
Vehicle Extension (s)		0.2	0.2	0.2					0.2			
Lane Grp Cap (vph)		860	800	447	1256	1365			405			
v/s Ratio Prot		c0.48		c0.05	c0.39				0.03			
v/s Ratio Perm			0.02			0.04						
v/c Ratio		0.81	0.03	0.18	0.51	0.04			0.12			
Uniform Delay, d1		14.4	7.2	25.0	4.0	0.0			24.6			
Progression Factor		1.00	1.00	1.26	0.68	1.00			1.00			
Incremental Delay, d2		8.3	0.1	0.8	1.3	0.1			0.6			
Delay (s)		22.6	7.2	32.2	4.0	0.1			25.2			
Level of Service		C	A	C	A	A			C			
Approach Delay (s)		21.9			6.6			25.2			0.0	
Approach LOS		C			A			C			A	

Intersection Summary			
HCM 2000 Control Delay	15.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	56.8%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

4: Park Street & Hamilton Row Performance by movement

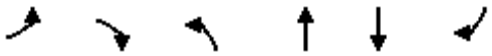
Movement	EBL	EBT	WBT	WBR	NBL	NBT	NBR	SBL	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.2	0.3	0.2
Total Delay (hr)	0.0	0.4	0.0	0.0	0.0	0.0	0.1	1.3	0.4	2.2
Total Del/Veh (s)	11.7	20.3	3.5	2.5	0.0	0.2	7.8	34.9	29.8	22.3
Total Stops	13	65	28	13	0	0	10	137	44	310
Travel Time (hr)	0.1	0.5	0.0	0.0	0.0	0.0	0.1	1.7	0.5	3.0
Avg Speed (mph)	10	7	7	6	21	23	7	5	5	6



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	236	0	0	3752	39
Future Volume (Veh/h)	0	236	0	0	3752	39
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.87	0.87	1.00	1.00	0.93	0.93
Hourly flow rate (vph)	0	271	0	0	4034	42
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				327	192	
pX, platoon unblocked	0.44	0.44	0.44			
vC, conflicting volume	4055	1030	4076			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1562	0	1610			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	43	100			
cM capacity (veh/h)	46	478	180			

Direction, Lane #	EB 1	SB 1	SB 2	SB 3	SB 4
Volume Total	271	1153	1153	1153	618
Volume Left	0	0	0	0	0
Volume Right	271	0	0	0	42
cSH	478	1700	1700	1700	1700
Volume to Capacity	0.57	0.68	0.68	0.68	0.36
Queue Length 95th (ft)	87	0	0	0	0
Control Delay (s)	21.9	0.0	0.0	0.0	0.0
Lane LOS	C				
Approach Delay (s)	21.9	0.0			
Approach LOS	C				

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	72.8%	ICU Level of Service	C
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	12	0	0	3975	13
Future Volume (Veh/h)	0	12	0	0	3975	13
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	1.00	1.00	0.93	0.93
Hourly flow rate (vph)	0	13	0	0	4274	14
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				225	294	
pX, platoon unblocked	0.44	0.44	0.44			
vC, conflicting volume	4281	1076	4288			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2100	0	2115			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	97	100			
cM capacity (veh/h)	20	481	116			

Direction, Lane #	EB 1	SB 1	SB 2	SB 3	SB 4
Volume Total	13	1221	1221	1221	625
Volume Left	0	0	0	0	0
Volume Right	13	0	0	0	14
cSH	481	1700	1700	1700	1700
Volume to Capacity	0.03	0.72	0.72	0.72	0.37
Queue Length 95th (ft)	2	0	0	0	0
Control Delay (s)	12.7	0.0	0.0	0.0	0.0
Lane LOS	B				
Approach Delay (s)	12.7	0.0			
Approach LOS	B				

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	64.9%	ICU Level of Service	C
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	0.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	234	4	2	37	5	2
Future Vol, veh/h	234	4	2	37	5	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	87	87	84	84	85	85
Heavy Vehicles, %	1	0	0	1	0	0
Mvmt Flow	269	5	2	44	6	2

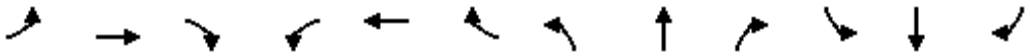
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	274	0	320	272
Stage 1	-	-	-	-	272	-
Stage 2	-	-	-	-	48	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1301	-	678	772
Stage 1	-	-	-	-	778	-
Stage 2	-	-	-	-	980	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1301	-	677	772
Mov Cap-2 Maneuver	-	-	-	-	677	-
Stage 1	-	-	-	-	778	-
Stage 2	-	-	-	-	978	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.4	10.2
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	702	-	-	1301	-
HCM Lane V/C Ratio	0.012	-	-	0.002	-
HCM Control Delay (s)	10.2	-	-	7.8	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	177	0	0	0	0	3614
Future Volume (vph)	177	0	0	0	0	3614
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	16	12	12	12	12	12
Total Lost time (s)	5.0					5.7
Lane Util. Factor	1.00					0.86
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	2153					6880
Flt Permitted	0.95					1.00
Satd. Flow (perm)	2153					6880
Peak-hour factor, PHF	0.90	0.90	1.00	1.00	0.93	0.93
Adj. Flow (vph)	197	0	0	0	0	3886
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	197	0	0	0	0	3886
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Turn Type	Prot					NA
Protected Phases	8					6
Permitted Phases						
Actuated Green, G (s)	28.0					51.3
Effective Green, g (s)	28.0					51.3
Actuated g/C Ratio	0.31					0.57
Clearance Time (s)	5.0					5.7
Lane Grp Cap (vph)	669					3921
v/s Ratio Prot	c0.09					c0.56
v/s Ratio Perm						
v/c Ratio	0.29					0.99
Uniform Delay, d1	23.5					19.1
Progression Factor	0.62					1.00
Incremental Delay, d2	0.6					12.4
Delay (s)	15.2					31.6
Level of Service	B					C
Approach Delay (s)	15.2		0.0			31.6
Approach LOS	B		A			C

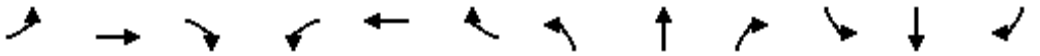
Intersection Summary			
HCM 2000 Control Delay	30.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.7
Intersection Capacity Utilization	98.7%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	694	0	0	770	340	0	3233	352	0	0	0
Future Volume (vph)	0	694	0	0	770	340	0	3233	352	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.0			10.0			6.0				
Lane Util. Factor		0.95			0.95			0.86				
Frpb, ped/bikes		1.00			0.99			1.00				
Flpb, ped/bikes		1.00			1.00			1.00				
Frt		1.00			0.95			0.99				
Flt Protected		1.00			1.00			1.00				
Satd. Flow (prot)		3725			3524			6630				
Flt Permitted		1.00			1.00			1.00				
Satd. Flow (perm)		3725			3524			6630				
Peak-hour factor, PHF	0.93	0.93	0.93	0.86	0.86	0.86	0.95	0.95	0.95	0.92	0.92	0.92
Adj. Flow (vph)	0	746	0	0	895	395	0	3403	371	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	21	0	0	0	0
Lane Group Flow (vph)	0	746	0	0	1290	0	0	3754	0	0	0	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type		NA			NA			NA				
Protected Phases		8			4			2				
Permitted Phases												
Actuated Green, G (s)		29.0			25.0			49.0				
Effective Green, g (s)		29.0			25.0			49.0				
Actuated g/C Ratio		0.32			0.28			0.54				
Clearance Time (s)		6.0			10.0			6.0				
Lane Grp Cap (vph)		1200			978			3609				
v/s Ratio Prot		0.20			c0.37			c0.57				
v/s Ratio Perm												
v/c Ratio		0.62			1.32			1.04				
Uniform Delay, d1		25.9			32.5			20.5				
Progression Factor		0.00			1.00			1.00				
Incremental Delay, d2		1.1			150.8			26.7				
Delay (s)		1.1			183.3			47.2				
Level of Service		A			F			D				
Approach Delay (s)		1.1			183.3			47.2			0.0	
Approach LOS		A			F			D			A	

Intersection Summary			
HCM 2000 Control Delay	71.5	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.13		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	94.4%	ICU Level of Service	F
Analysis Period (min)	15		

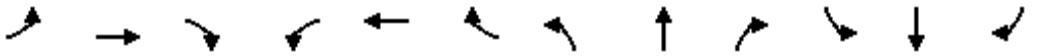
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	694	71	0	770	0	0	0	0	0	3289	189
Future Volume (vph)	0	694	71	0	770	0	0	0	0	0	3289	189
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	10	10	10	12	12	12	12	12	12	12	12	12
Total Lost time (s)		10.0			6.0						6.0	6.0
Lane Util. Factor		0.95			0.95						0.86	1.00
Frpb, ped/bikes		1.00			1.00						1.00	0.98
Flpb, ped/bikes		1.00			1.00						1.00	1.00
Frt		0.99			1.00						1.00	0.85
Flt Protected		1.00			1.00						1.00	1.00
Satd. Flow (prot)		3386			3762						6812	1657
Flt Permitted		1.00			1.00						1.00	1.00
Satd. Flow (perm)		3386			3762						6812	1657
Peak-hour factor, PHF	0.93	0.93	0.93	0.95	0.95	0.95	0.92	0.92	0.92	0.95	0.95	0.95
Adj. Flow (vph)	0	746	76	0	811	0	0	0	0	0	3462	199
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	39
Lane Group Flow (vph)	0	822	0	0	811	0	0	0	0	0	3462	160
Confl. Peds. (#/hr)	22		11	11		22	3		1	1		3
Heavy Vehicles (%)	3%	3%	3%	1%	1%	1%	2%	2%	2%	1%	1%	1%
Turn Type		NA			NA						NA	Perm
Protected Phases		4			8						2	
Permitted Phases												2
Actuated Green, G (s)		25.0			29.0						49.0	49.0
Effective Green, g (s)		25.0			29.0						49.0	49.0
Actuated g/C Ratio		0.28			0.32						0.54	0.54
Clearance Time (s)		10.0			6.0						6.0	6.0
Lane Grp Cap (vph)		940			1212						3708	902
v/s Ratio Prot		c0.24			0.22						c0.51	
v/s Ratio Perm												0.10
v/c Ratio		0.87			0.67						0.93	0.18
Uniform Delay, d1		31.0			26.4						19.0	10.3
Progression Factor		0.89			0.00						1.03	0.76
Incremental Delay, d2		8.1			0.3						3.6	0.3
Delay (s)		35.6			0.3						23.3	8.1
Level of Service		D			A						C	A
Approach Delay (s)		35.6			0.3			0.0			22.4	
Approach LOS		D			A			A			C	

Intersection Summary			
HCM 2000 Control Delay	21.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	94.4%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	675	51	131	699	129	0	0	90	0	0	5
Future Volume (vph)	0	675	51	131	699	129	0	0	90	0	0	5
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	11	11	11	10	10	10	12	12	12	12	12	12
Total Lost time (s)		6.0		6.0	6.0	6.0			6.0			6.0
Lane Util. Factor		1.00		1.00	1.00	1.00			1.00			1.00
Frpb, ped/bikes		1.00		1.00	1.00	0.97			1.00			1.00
Flpb, ped/bikes		1.00		1.00	1.00	1.00			1.00			1.00
Frt		0.99		1.00	1.00	0.85			0.86			0.86
Flt Protected		1.00		0.95	1.00	1.00			1.00			1.00
Satd. Flow (prot)		1431		1550	1631	1343			1542			1526
Flt Permitted		1.00		0.95	1.00	1.00			1.00			1.00
Satd. Flow (perm)		1431		1550	1631	1343			1542			1526
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.78	0.78	0.78	0.92	0.92	0.92
Adj. Flow (vph)	0	711	54	138	736	136	0	0	115	0	0	5
RTOR Reduction (vph)	0	3	0	0	0	66	0	0	93	0	0	5
Lane Group Flow (vph)	0	762	0	138	736	70	0	0	22	0	0	1
Confl. Peds. (#/hr)	12		13	13		12						
Heavy Vehicles (%)	2%	2%	2%	3%	3%	3%	1%	1%	1%	2%	2%	2%
Parking (#/hr)		10										
Turn Type		NA		Prot	NA	Perm			Over			Prot
Protected Phases		6 14		5	2				5			14
Permitted Phases						2						
Actuated Green, G (s)		61.0		17.0	46.0	46.0			17.0			9.0
Effective Green, g (s)		61.0		17.0	46.0	46.0			17.0			9.0
Actuated g/C Ratio		0.68		0.19	0.51	0.51			0.19			0.10
Clearance Time (s)				6.0	6.0	6.0			6.0			6.0
Vehicle Extension (s)				0.2	0.2	0.2			0.2			0.2
Lane Grp Cap (vph)		969		292	833	686			291			152
v/s Ratio Prot		c0.53		c0.09	c0.45				0.01			0.00
v/s Ratio Perm						0.05						
v/c Ratio		0.79		0.47	0.88	0.10			0.07			0.00
Uniform Delay, d1		10.0		32.5	19.6	11.3			30.0			36.5
Progression Factor		1.00		1.11	0.31	0.00			1.00			1.00
Incremental Delay, d2		6.4		4.4	11.1	0.2			0.5			0.0
Delay (s)		16.4		40.4	17.1	0.2			30.5			36.5
Level of Service		B		D	B	A			C			D
Approach Delay (s)		16.4			18.0			30.5			36.5	
Approach LOS		B			B			C			D	

Intersection Summary			
HCM 2000 Control Delay	18.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	58.5%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

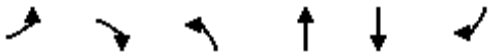
Intersection	
Int Delay, s/veh	7.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	9	38	0	0	110	27	39	13	77	18	5	6
Future Vol, veh/h	9	38	0	0	110	27	39	13	77	18	5	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	84	84	84	82	82	82	88	88	88	91	91	91
Heavy Vehicles, %	0	0	0	0	0	0	0	0	1	1	0	0
Mvmt Flow	11	45	0	0	134	33	44	15	88	20	5	7

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	280	240	9	218	199	59	12	0	0	103	0	0
Stage 1	49	49	-	147	147	-	-	-	-	-	-	-
Stage 2	231	191	-	71	52	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.11	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.209	-	-
Pot Cap-1 Maneuver	676	665	1079	743	700	1012	1620	-	-	1495	-	-
Stage 1	969	858	-	860	779	-	-	-	-	-	-	-
Stage 2	776	746	-	944	856	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	537	637	1079	681	671	1012	1620	-	-	1495	-	-
Mov Cap-2 Maneuver	537	637	-	681	671	-	-	-	-	-	-	-
Stage 1	941	847	-	835	756	-	-	-	-	-	-	-
Stage 2	600	724	-	882	845	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11.4	11.5	2.2	4.6
HCM LOS	B	B		

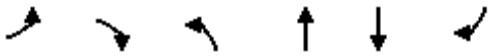
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1620	-	-	615	719	1495	-	-
HCM Lane V/C Ratio	0.027	-	-	0.091	0.232	0.013	-	-
HCM Control Delay (s)	7.3	0	-	11.4	11.5	7.4	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.3	0.9	0	-	-



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	132	0	0	3348	137
Future Volume (Veh/h)	0	132	0	0	3348	137
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.84	0.84	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	157	0	0	3524	144
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				329	192	
pX, platoon unblocked	0.57	0.57	0.57			
vC, conflicting volume	3596	953	3668			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1806	0	1931			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	75	100			
cM capacity (veh/h)	41	623	177			

Direction, Lane #	EB 1	SB 1	SB 2	SB 3	SB 4
Volume Total	157	1007	1007	1007	647
Volume Left	0	0	0	0	0
Volume Right	157	0	0	0	144
cSH	623	1700	1700	1700	1700
Volume to Capacity	0.25	0.59	0.59	0.59	0.38
Queue Length 95th (ft)	25	0	0	0	0
Control Delay (s)	12.7	0.0	0.0	0.0	0.0
Lane LOS	B				
Approach Delay (s)	12.7	0.0			
Approach LOS	B				

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	62.7%	ICU Level of Service	B
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	0	3478	2
Future Volume (Veh/h)	0	0	0	0	3478	2
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	0	0	0	3661	2
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				250	271	
pX, platoon unblocked	0.58	0.58	0.58			
vC, conflicting volume	3662	916	3663			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1940	0	1942			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	34	628	176			

Direction, Lane #	EB 1	SB 1	SB 2	SB 3	SB 4
Volume Total	0	1046	1046	1046	525
Volume Left	0	0	0	0	0
Volume Right	0	0	0	0	2
cSH	1700	1700	1700	1700	1700
Volume to Capacity	0.00	0.62	0.62	0.62	0.31
Queue Length 95th (ft)	0	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0
Lane LOS	A				
Approach Delay (s)	0.0	0.0			
Approach LOS	A				

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	51.2%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	132	1	0	137	0	0
Future Vol, veh/h	132	1	0	137	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	84	84	82	82	85	85
Heavy Vehicles, %	1	0	0	1	0	0
Mvmt Flow	157	1	0	167	0	0

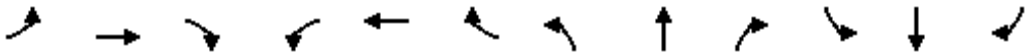
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	158	0	325	158
Stage 1	-	-	-	-	158	-
Stage 2	-	-	-	-	167	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1434	-	673	893
Stage 1	-	-	-	-	875	-
Stage 2	-	-	-	-	867	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1434	-	673	893
Mov Cap-2 Maneuver	-	-	-	-	673	-
Stage 1	-	-	-	-	875	-
Stage 2	-	-	-	-	867	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	1434	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	0	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	-	-	-	0	-

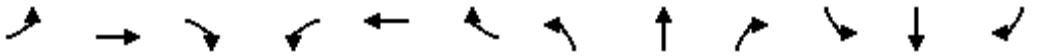
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	178	0	0	0	0	3307
Future Volume (vph)	178	0	0	0	0	3307
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	16	12	12	12	12	12
Total Lost time (s)	5.0					5.7
Lane Util. Factor	1.00					0.86
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	2132					6812
Flt Permitted	0.95					1.00
Satd. Flow (perm)	2132					6812
Peak-hour factor, PHF	0.88	0.88	1.00	1.00	0.95	0.95
Adj. Flow (vph)	202	0	0	0	0	3481
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	202	0	0	0	0	3481
Heavy Vehicles (%)	1%	0%	0%	0%	0%	1%
Turn Type	Prot					NA
Protected Phases	8					6
Permitted Phases						
Actuated Green, G (s)	25.0					54.3
Effective Green, g (s)	25.0					54.3
Actuated g/C Ratio	0.28					0.60
Clearance Time (s)	5.0					5.7
Lane Grp Cap (vph)	592					4109
v/s Ratio Prot	c0.09					c0.51
v/s Ratio Perm						
v/c Ratio	0.34					0.85
Uniform Delay, d1	25.9					14.5
Progression Factor	0.58					1.00
Incremental Delay, d2	0.5					2.3
Delay (s)	15.6					16.8
Level of Service	B					B
Approach Delay (s)	15.6		0.0			16.8
Approach LOS	B		A			B

Intersection Summary			
HCM 2000 Control Delay	16.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.7
Intersection Capacity Utilization	100.3%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	689	0	0	641	500	0	2820	411	0	0	0
Future Volume (vph)	0	689	0	0	641	500	0	2820	411	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.0			10.0			6.0				
Lane Util. Factor		0.95			0.95			0.86				
Frpb, ped/bikes		1.00			0.97			1.00				
Flpb, ped/bikes		1.00			1.00			1.00				
Frt		1.00			0.93			0.98				
Flt Protected		1.00			1.00			1.00				
Satd. Flow (prot)		3689			3400			6596				
Flt Permitted		1.00			1.00			1.00				
Satd. Flow (perm)		3689			3400			6596				
Peak-hour factor, PHF	0.95	0.95	0.95	0.94	0.94	0.94	0.95	0.95	0.95	0.92	0.92	0.92
Adj. Flow (vph)	0	725	0	0	682	532	0	2968	433	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	24	0	0	0	0
Lane Group Flow (vph)	0	725	0	0	1214	0	0	3377	0	0	0	0
Confl. Peds. (#/hr)						39			10			
Heavy Vehicles (%)	3%	3%	3%	1%	1%	1%	2%	2%	2%	2%	2%	2%
Turn Type		NA			NA			NA				
Protected Phases		8			4			2				
Permitted Phases												
Actuated Green, G (s)		29.0			25.0			49.0				
Effective Green, g (s)		29.0			25.0			49.0				
Actuated g/C Ratio		0.32			0.28			0.54				
Clearance Time (s)		6.0			10.0			6.0				
Lane Grp Cap (vph)		1188			944			3591				
v/s Ratio Prot		0.20			c0.36			c0.51				
v/s Ratio Perm												
v/c Ratio		0.61			1.29			0.94				
Uniform Delay, d1		25.7			32.5			19.1				
Progression Factor		0.00			1.00			1.00				
Incremental Delay, d2		0.2			136.8			6.4				
Delay (s)		0.2			169.3			25.5				
Level of Service		A			F			C				
Approach Delay (s)		0.2			169.3			25.5			0.0	
Approach LOS		A			F			C			A	

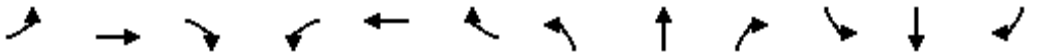
Intersection Summary			
HCM 2000 Control Delay	54.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.06		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	93.7%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	689	196	0	641	0	0	0	0	0	4061	153
Future Volume (vph)	0	689	196	0	641	0	0	0	0	0	4061	153
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	10	10	10	12	12	12	12	12	12	12	12	12
Total Lost time (s)		10.0			6.0						6.0	6.0
Lane Util. Factor		0.95			0.95						0.86	1.00
Frpb, ped/bikes		0.99			1.00						1.00	0.97
Flpb, ped/bikes		1.00			1.00						1.00	1.00
Frt		0.97			1.00						1.00	0.85
Flt Protected		1.00			1.00						1.00	1.00
Satd. Flow (prot)		3299			3762						6812	1632
Flt Permitted		1.00			1.00						1.00	1.00
Satd. Flow (perm)		3299			3762						6812	1632
Peak-hour factor, PHF	0.95	0.95	0.95	0.94	0.94	0.94	0.92	0.92	0.92	0.94	0.94	0.94
Adj. Flow (vph)	0	725	206	0	682	0	0	0	0	0	4320	163
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	39
Lane Group Flow (vph)	0	931	0	0	682	0	0	0	0	0	4320	124
Confl. Peds. (#/hr)			18									16
Heavy Vehicles (%)	3%	3%	3%	1%	1%	1%	2%	2%	2%	1%	1%	1%
Turn Type		NA			NA						NA	Perm
Protected Phases		4			8						2	
Permitted Phases												2
Actuated Green, G (s)		25.0			29.0						49.0	49.0
Effective Green, g (s)		25.0			29.0						49.0	49.0
Actuated g/C Ratio		0.28			0.32						0.54	0.54
Clearance Time (s)		10.0			6.0						6.0	6.0
Lane Grp Cap (vph)		916			1212						3708	888
v/s Ratio Prot		c0.28			0.18						c0.63	
v/s Ratio Perm												0.08
v/c Ratio		1.02			0.56						1.17	0.14
Uniform Delay, d1		32.5			25.3						20.5	10.1
Progression Factor		0.90			0.00						0.99	0.70
Incremental Delay, d2		28.6			0.2						75.4	0.1
Delay (s)		57.9			0.2						95.8	7.2
Level of Service		E			A						F	A
Approach Delay (s)		57.9			0.2			0.0			92.6	
Approach LOS		E			A			A			F	

Intersection Summary			
HCM 2000 Control Delay	76.9	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.11		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	93.7%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	700	39	90	635	69	0	0	185	0	0	22
Future Volume (vph)	0	700	39	90	635	69	0	0	185	0	0	22
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	11	11	11	10	10	10	12	12	12	12	12	12
Total Lost time (s)		6.0		6.0	6.0	6.0			6.0			6.0
Lane Util. Factor		1.00		1.00	1.00	1.00			1.00			1.00
Frpb, ped/bikes		1.00		1.00	1.00	0.96			1.00			1.00
Flpb, ped/bikes		1.00		1.00	1.00	1.00			1.00			1.00
Frt		0.99		1.00	1.00	0.85			0.86			0.86
Flt Protected		1.00		0.95	1.00	1.00			1.00			1.00
Satd. Flow (prot)		1433		1580	1663	1354			1483			1526
Flt Permitted		1.00		0.95	1.00	1.00			1.00			1.00
Satd. Flow (perm)		1433		1580	1663	1354			1483			1526
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.83	0.83	0.83	0.92	0.92	0.92
Adj. Flow (vph)	0	737	41	95	668	73	0	0	223	0	0	24
RTOR Reduction (vph)	0	2	0	0	0	36	0	0	181	0	0	22
Lane Group Flow (vph)	0	776	0	95	668	37	0	0	42	0	0	2
Confl. Peds. (#/hr)	23		24	24		23	45					45
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	5%	5%	5%	2%	2%	2%
Parking (#/hr)		10										
Turn Type		NA		Prot	NA	Perm			Over			Prot
Protected Phases		6 14		5	2				5			14
Permitted Phases						2						
Actuated Green, G (s)		61.0		17.0	46.0	46.0			17.0			9.0
Effective Green, g (s)		61.0		17.0	46.0	46.0			17.0			9.0
Actuated g/C Ratio		0.68		0.19	0.51	0.51			0.19			0.10
Clearance Time (s)				6.0	6.0	6.0			6.0			6.0
Vehicle Extension (s)				0.2	0.2	0.2			0.2			0.2
Lane Grp Cap (vph)		971		298	849	692			280			152
v/s Ratio Prot		c0.54		c0.06	0.40				0.03			0.00
v/s Ratio Perm						0.03						
v/c Ratio		0.80		0.32	0.79	0.05			0.15			0.02
Uniform Delay, d1		10.2		31.5	18.0	11.1			30.5			36.5
Progression Factor		1.00		1.11	0.30	0.00			1.00			1.00
Incremental Delay, d2		6.8		2.5	6.5	0.1			1.1			0.2
Delay (s)		17.0		37.4	11.8	0.1			31.6			36.7
Level of Service		B		D	B	A			C			D
Approach Delay (s)		17.0			13.7			31.6			36.7	
Approach LOS		B			B			C			D	

Intersection Summary			
HCM 2000 Control Delay	17.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	63.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

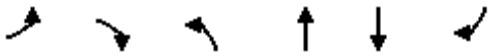
Intersection	
Int Delay, s/veh	8.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	19	75	0	0	31	14	19	9	41	136	22	23
Future Vol, veh/h	19	75	0	0	31	14	19	9	41	136	22	23
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	87	87	87	84	84	84	90	90	90	86	86	86
Heavy Vehicles, %	0	0	0	0	0	0	0	0	1	1	0	0
Mvmt Flow	22	86	0	0	37	17	21	10	46	158	26	27

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	458	454	40	474	444	33	53	0	0	56	0	0
Stage 1	356	356	-	75	75	-	-	-	-	-	-	-
Stage 2	102	98	-	399	369	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.11	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.209	-	-
Pot Cap-1 Maneuver	516	505	1037	504	511	1046	1566	-	-	1555	-	-
Stage 1	666	633	-	939	836	-	-	-	-	-	-	-
Stage 2	909	818	-	631	624	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	433	445	1037	392	451	1046	1566	-	-	1555	-	-
Mov Cap-2 Maneuver	433	445	-	392	451	-	-	-	-	-	-	-
Stage 1	657	567	-	926	824	-	-	-	-	-	-	-
Stage 2	842	807	-	479	558	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	15.7	12.3	2	5.7
HCM LOS	C	B		

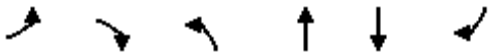
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1566	-	-	443	548	1555	-	-
HCM Lane V/C Ratio	0.013	-	-	0.244	0.098	0.102	-	-
HCM Control Delay (s)	7.3	0	-	15.7	12.3	7.6	0	-
HCM Lane LOS	A	A	-	C	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.9	0.3	0.3	-	-



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	250	0	0	3965	42
Future Volume (Veh/h)	0	250	0	0	3965	42
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.87	0.87	1.00	1.00	0.93	0.93
Hourly flow rate (vph)	0	287	0	0	4263	45
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				327	192	
pX, platoon unblocked	0.43	0.43	0.43			
vC, conflicting volume	4286	1088	4308			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2052	0	2104			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	39	100			
cM capacity (veh/h)	21	474	115			

Direction, Lane #	EB 1	SB 1	SB 2	SB 3	SB 4
Volume Total	287	1218	1218	1218	654
Volume Left	0	0	0	0	0
Volume Right	287	0	0	0	45
cSH	474	1700	1700	1700	1700
Volume to Capacity	0.61	0.72	0.72	0.72	0.38
Queue Length 95th (ft)	99	0	0	0	0
Control Delay (s)	23.6	0.0	0.0	0.0	0.0
Lane LOS	C				
Approach Delay (s)	23.6	0.0			
Approach LOS	C				

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	76.6%	ICU Level of Service	D
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	12	0	0	4202	13
Future Volume (Veh/h)	0	12	0	0	4202	13
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.93	0.93
Hourly flow rate (vph)	0	13	0	0	4518	14
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				244	275	
pX, platoon unblocked	0.44	0.44	0.44			
vC, conflicting volume	4525	1136	4532			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2614	0	2630			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	97	100			
cM capacity (veh/h)	9	475	72			

Direction, Lane #	EB 1	SB 1	SB 2	SB 3	SB 4
Volume Total	13	1291	1291	1291	659
Volume Left	0	0	0	0	0
Volume Right	13	0	0	0	14
cSH	475	1700	1700	1700	1700
Volume to Capacity	0.03	0.76	0.76	0.76	0.39
Queue Length 95th (ft)	2	0	0	0	0
Control Delay (s)	12.8	0.0	0.0	0.0	0.0
Lane LOS	B				
Approach Delay (s)	12.8	0.0			
Approach LOS	B				

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	68.1%	ICU Level of Service	C
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	0.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	248	4	2	40	5	2
Future Vol, veh/h	248	4	2	40	5	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	87	87	84	84	85	85
Heavy Vehicles, %	1	0	0	1	0	0
Mvmt Flow	285	5	2	48	6	2

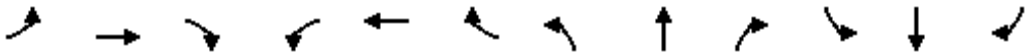
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	290	0	340	288
Stage 1	-	-	-	-	288	-
Stage 2	-	-	-	-	52	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1283	-	660	756
Stage 1	-	-	-	-	766	-
Stage 2	-	-	-	-	976	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1283	-	659	756
Mov Cap-2 Maneuver	-	-	-	-	659	-
Stage 1	-	-	-	-	766	-
Stage 2	-	-	-	-	974	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.4	10.3
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	684	-	-	1283	-
HCM Lane V/C Ratio	0.012	-	-	0.002	-
HCM Control Delay (s)	10.3	-	-	7.8	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	187	0	0	0	0	3820
Future Volume (vph)	187	0	0	0	0	3820
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	16	12	12	12	12	12
Total Lost time (s)	5.0					5.7
Lane Util. Factor	1.00					0.86
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	2153					6880
Flt Permitted	0.95					1.00
Satd. Flow (perm)	2153					6880
Peak-hour factor, PHF	0.90	0.90	1.00	1.00	0.93	0.93
Adj. Flow (vph)	208	0	0	0	0	4108
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	208	0	0	0	0	4108
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Turn Type	Prot					NA
Protected Phases	8					6
Permitted Phases						
Actuated Green, G (s)	28.0					51.3
Effective Green, g (s)	28.0					51.3
Actuated g/C Ratio	0.31					0.57
Clearance Time (s)	5.0					5.7
Lane Grp Cap (vph)	669					3921
v/s Ratio Prot	c0.10					c0.60
v/s Ratio Perm						
v/c Ratio	0.31					1.05
Uniform Delay, d1	23.6					19.4
Progression Factor	0.60					1.00
Incremental Delay, d2	0.5					28.9
Delay (s)	14.8					48.3
Level of Service	B					D
Approach Delay (s)	14.8		0.0			48.3
Approach LOS	B		A			D

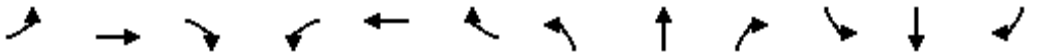
Intersection Summary			
HCM 2000 Control Delay	46.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.7
Intersection Capacity Utilization	103.8%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	694	0	0	775	340	0	3257	354	0	0	0
Future Volume (vph)	0	694	0	0	775	340	0	3257	354	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.0			10.0			6.0				
Lane Util. Factor		0.95			0.95			0.86				
Frpb, ped/bikes		1.00			0.99			1.00				
Flpb, ped/bikes		1.00			1.00			1.00				
Frt		1.00			0.95			0.99				
Flt Protected		1.00			1.00			1.00				
Satd. Flow (prot)		3725			3525			6630				
Flt Permitted		1.00			1.00			1.00				
Satd. Flow (perm)		3725			3525			6630				
Peak-hour factor, PHF	0.93	0.93	0.93	0.86	0.86	0.86	0.95	0.95	0.95	0.92	0.92	0.92
Adj. Flow (vph)	0	746	0	0	901	395	0	3428	373	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	21	0	0	0	0
Lane Group Flow (vph)	0	746	0	0	1296	0	0	3781	0	0	0	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type		NA			NA			NA				
Protected Phases		8			4			2				
Permitted Phases												
Actuated Green, G (s)		29.0			25.0			49.0				
Effective Green, g (s)		29.0			25.0			49.0				
Actuated g/C Ratio		0.32			0.28			0.54				
Clearance Time (s)		6.0			10.0			6.0				
Lane Grp Cap (vph)		1200			979			3609				
v/s Ratio Prot		0.20			c0.37			c0.57				
v/s Ratio Perm												
v/c Ratio		0.62			1.32			1.05				
Uniform Delay, d1		25.9			32.5			20.5				
Progression Factor		0.00			1.00			1.00				
Incremental Delay, d2		1.1			152.9			29.4				
Delay (s)		1.1			185.4			49.9				
Level of Service		A			F			D				
Approach Delay (s)		1.1			185.4			49.9			0.0	
Approach LOS		A			F			D			A	

Intersection Summary			
HCM 2000 Control Delay	73.7	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.14		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	94.9%	ICU Level of Service	F
Analysis Period (min)	15		

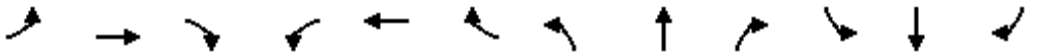
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	694	71	0	775	0	0	0	0	0	3305	190
Future Volume (vph)	0	694	71	0	775	0	0	0	0	0	3305	190
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	10	10	10	12	12	12	12	12	12	12	12	12
Total Lost time (s)		10.0			6.0						6.0	6.0
Lane Util. Factor		0.95			0.95						0.86	1.00
Frpb, ped/bikes		1.00			1.00						1.00	0.98
Flpb, ped/bikes		1.00			1.00						1.00	1.00
Frt		0.99			1.00						1.00	0.85
Flt Protected		1.00			1.00						1.00	1.00
Satd. Flow (prot)		3386			3762						6812	1657
Flt Permitted		1.00			1.00						1.00	1.00
Satd. Flow (perm)		3386			3762						6812	1657
Peak-hour factor, PHF	0.93	0.93	0.93	0.95	0.95	0.95	0.92	0.92	0.92	0.95	0.95	0.95
Adj. Flow (vph)	0	746	76	0	816	0	0	0	0	0	3479	200
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	39
Lane Group Flow (vph)	0	822	0	0	816	0	0	0	0	0	3479	161
Confl. Peds. (#/hr)	22		11	11		22	3		1	1		3
Heavy Vehicles (%)	3%	3%	3%	1%	1%	1%	2%	2%	2%	1%	1%	1%
Turn Type		NA			NA						NA	Perm
Protected Phases		4			8						2	
Permitted Phases												2
Actuated Green, G (s)		25.0			29.0						49.0	49.0
Effective Green, g (s)		25.0			29.0						49.0	49.0
Actuated g/C Ratio		0.28			0.32						0.54	0.54
Clearance Time (s)		10.0			6.0						6.0	6.0
Lane Grp Cap (vph)		940			1212						3708	902
v/s Ratio Prot		c0.24			0.22						c0.51	
v/s Ratio Perm												0.10
v/c Ratio		0.87			0.67						0.94	0.18
Uniform Delay, d1		31.0			26.4						19.1	10.3
Progression Factor		0.89			0.00						1.02	0.74
Incremental Delay, d2		8.1			0.3						3.9	0.3
Delay (s)		35.6			0.3						23.4	8.0
Level of Service		D			A						C	A
Approach Delay (s)		35.6			0.3			0.0			22.6	
Approach LOS		D			A			A			C	

Intersection Summary			
HCM 2000 Control Delay	21.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	94.9%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	675	51	131	699	135	0	0	90	0	0	11
Future Volume (vph)	0	675	51	131	699	135	0	0	90	0	0	11
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	11	11	11	10	10	10	12	12	12	12	12	12
Total Lost time (s)		6.0		6.0	6.0	6.0			6.0			6.0
Lane Util. Factor		1.00		1.00	1.00	1.00			1.00			1.00
Frpb, ped/bikes		1.00		1.00	1.00	0.97			1.00			1.00
Flpb, ped/bikes		1.00		1.00	1.00	1.00			1.00			1.00
Frt		0.99		1.00	1.00	0.85			0.86			0.86
Flt Protected		1.00		0.95	1.00	1.00			1.00			1.00
Satd. Flow (prot)		1431		1550	1631	1343			1542			1526
Flt Permitted		1.00		0.95	1.00	1.00			1.00			1.00
Satd. Flow (perm)		1431		1550	1631	1343			1542			1526
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.78	0.78	0.78	0.92	0.92	0.92
Adj. Flow (vph)	0	711	54	138	736	142	0	0	115	0	0	12
RTOR Reduction (vph)	0	3	0	0	0	69	0	0	93	0	0	11
Lane Group Flow (vph)	0	762	0	138	736	73	0	0	22	0	0	1
Confl. Peds. (#/hr)	12		13	13		12						
Heavy Vehicles (%)	2%	2%	2%	3%	3%	3%	1%	1%	1%	2%	2%	2%
Parking (#/hr)		10										
Turn Type		NA		Prot	NA	Perm			Over			Prot
Protected Phases		6 14		5	2				5			14
Permitted Phases						2						
Actuated Green, G (s)		61.0		17.0	46.0	46.0			17.0			9.0
Effective Green, g (s)		61.0		17.0	46.0	46.0			17.0			9.0
Actuated g/C Ratio		0.68		0.19	0.51	0.51			0.19			0.10
Clearance Time (s)				6.0	6.0	6.0			6.0			6.0
Vehicle Extension (s)				0.2	0.2	0.2			0.2			0.2
Lane Grp Cap (vph)		969		292	833	686			291			152
v/s Ratio Prot		c0.53		c0.09	c0.45				0.01			0.00
v/s Ratio Perm						0.05						
v/c Ratio		0.79		0.47	0.88	0.11			0.07			0.01
Uniform Delay, d1		10.0		32.5	19.6	11.4			30.0			36.5
Progression Factor		1.00		1.11	0.31	0.00			1.00			1.00
Incremental Delay, d2		6.4		4.4	11.1	0.3			0.5			0.1
Delay (s)		16.4		40.4	17.1	0.3			30.5			36.6
Level of Service		B		D	B	A			C			D
Approach Delay (s)		16.4			17.9			30.5			36.6	
Approach LOS		B			B			C			D	

Intersection Summary			
HCM 2000 Control Delay	18.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	58.5%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

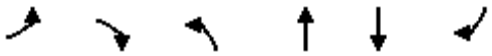
Intersection	
Int Delay, s/veh	7.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	17	37	4	4	110	56	39	18	87	24	9	6
Future Vol, veh/h	17	37	4	4	110	56	39	18	87	24	9	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	84	84	84	82	82	82	88	88	88	91	91	91
Heavy Vehicles, %	0	0	0	0	0	0	0	0	1	1	0	0
Mvmt Flow	20	44	5	5	134	68	44	20	99	26	10	7

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	325	273	14	248	227	70	17	0	0	119	0	0
Stage 1	66	66	-	158	158	-	-	-	-	-	-	-
Stage 2	259	207	-	90	69	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.11	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.209	-	-
Pot Cap-1 Maneuver	632	637	1072	710	676	998	1613	-	-	1475	-	-
Stage 1	950	844	-	849	771	-	-	-	-	-	-	-
Stage 2	750	734	-	922	841	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	477	607	1072	644	644	998	1613	-	-	1475	-	-
Mov Cap-2 Maneuver	477	607	-	644	644	-	-	-	-	-	-	-
Stage 1	922	829	-	824	748	-	-	-	-	-	-	-
Stage 2	556	712	-	853	826	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.1	11.9	2	4.6
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1613	-	-	578	729	1475	-	-
HCM Lane V/C Ratio	0.027	-	-	0.119	0.284	0.018	-	-
HCM Control Delay (s)	7.3	0	-	12.1	11.9	7.5	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.4	1.2	0.1	-	-



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	148	0	0	3347	172
Future Volume (Veh/h)	0	148	0	0	3347	172
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.84	0.84	1.00	1.00	0.95	0.95
Hourly flow rate (vph)	0	176	0	0	3523	181
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				327	192	
pX, platoon unblocked	0.57	0.57	0.57			
vC, conflicting volume	3614	971	3704			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1802	0	1961			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	72	100			
cM capacity (veh/h)	41	618	171			

Direction, Lane #	EB 1	SB 1	SB 2	SB 3	SB 4
Volume Total	176	1007	1007	1007	684
Volume Left	0	0	0	0	0
Volume Right	176	0	0	0	181
cSH	618	1700	1700	1700	1700
Volume to Capacity	0.28	0.59	0.59	0.59	0.40
Queue Length 95th (ft)	29	0	0	0	0
Control Delay (s)	13.1	0.0	0.0	0.0	0.0
Lane LOS	B				
Approach Delay (s)	13.1	0.0			
Approach LOS	B				

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	64.2%	ICU Level of Service	C
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	2	10	134	1	8	9
Future Vol, veh/h	2	10	134	1	8	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	0	0	1	0	0	0
Mvmt Flow	2	11	152	1	9	10

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	181	153	0	0	153	0
Stage 1	153	-	-	-	-	-
Stage 2	28	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	813	898	-	-	1440	-
Stage 1	880	-	-	-	-	-
Stage 2	1000	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	808	898	-	-	1440	-
Mov Cap-2 Maneuver	808	-	-	-	-	-
Stage 1	880	-	-	-	-	-
Stage 2	994	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.1	0	3.5
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	882	1440	-
HCM Lane V/C Ratio	-	-	0.015	0.006	-
HCM Control Delay (s)	-	-	9.1	7.5	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0	0	-

Intersection	
Int Delay, s/veh	0.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	148	0	2	170	0	0
Future Vol, veh/h	148	0	2	170	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	84	84	82	82	85	85
Heavy Vehicles, %	1	0	0	1	0	0
Mvmt Flow	176	0	2	207	0	0

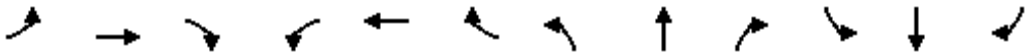
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	176	0	387	176
Stage 1	-	-	-	-	176	-
Stage 2	-	-	-	-	211	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1412	-	620	872
Stage 1	-	-	-	-	859	-
Stage 2	-	-	-	-	829	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1412	-	619	872
Mov Cap-2 Maneuver	-	-	-	-	619	-
Stage 1	-	-	-	-	859	-
Stage 2	-	-	-	-	827	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	1412	-
HCM Lane V/C Ratio	-	-	-	0.002	-
HCM Control Delay (s)	0	-	-	7.6	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	-	-	-	0	-

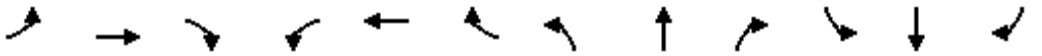
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	195	0	0	0	0	3324
Future Volume (vph)	195	0	0	0	0	3324
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	16	12	12	12	12	12
Total Lost time (s)	5.0					5.7
Lane Util. Factor	1.00					0.86
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	2132					6812
Flt Permitted	0.95					1.00
Satd. Flow (perm)	2132					6812
Peak-hour factor, PHF	0.88	0.88	1.00	1.00	0.95	0.95
Adj. Flow (vph)	222	0	0	0	0	3499
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	222	0	0	0	0	3499
Heavy Vehicles (%)	1%	0%	0%	0%	0%	1%
Turn Type	Prot					NA
Protected Phases	8					6
Permitted Phases						
Actuated Green, G (s)	25.0					54.3
Effective Green, g (s)	25.0					54.3
Actuated g/C Ratio	0.28					0.60
Clearance Time (s)	5.0					5.7
Lane Grp Cap (vph)	592					4109
v/s Ratio Prot	c0.10					c0.51
v/s Ratio Perm						
v/c Ratio	0.38					0.85
Uniform Delay, d1	26.2					14.6
Progression Factor	0.58					1.00
Incremental Delay, d2	0.6					2.4
Delay (s)	15.9					17.0
Level of Service	B					B
Approach Delay (s)	15.9		0.0			17.0
Approach LOS	B		A			B

Intersection Summary			
HCM 2000 Control Delay	16.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.7
Intersection Capacity Utilization	100.7%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	689	0	0	647	500	0	2870	419	0	0	0
Future Volume (vph)	0	689	0	0	647	500	0	2870	419	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.0			10.0			6.0				
Lane Util. Factor		0.95			0.95			0.86				
Frpb, ped/bikes		1.00			0.97			1.00				
Flpb, ped/bikes		1.00			1.00			1.00				
Frt		1.00			0.93			0.98				
Flt Protected		1.00			1.00			1.00				
Satd. Flow (prot)		3689			3402			6596				
Flt Permitted		1.00			1.00			1.00				
Satd. Flow (perm)		3689			3402			6596				
Peak-hour factor, PHF	0.95	0.95	0.95	0.94	0.94	0.94	0.95	0.95	0.95	0.92	0.92	0.92
Adj. Flow (vph)	0	725	0	0	688	532	0	3021	441	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	24	0	0	0	0
Lane Group Flow (vph)	0	725	0	0	1220	0	0	3438	0	0	0	0
Confl. Peds. (#/hr)						39			10			
Heavy Vehicles (%)	3%	3%	3%	1%	1%	1%	2%	2%	2%	2%	2%	2%
Turn Type		NA			NA			NA				
Protected Phases		8			4			2				
Permitted Phases												
Actuated Green, G (s)		29.0			25.0			49.0				
Effective Green, g (s)		29.0			25.0			49.0				
Actuated g/C Ratio		0.32			0.28			0.54				
Clearance Time (s)		6.0			10.0			6.0				
Lane Grp Cap (vph)		1188			945			3591				
v/s Ratio Prot		0.20			c0.36			c0.52				
v/s Ratio Perm												
v/c Ratio		0.61			1.29			0.96				
Uniform Delay, d1		25.7			32.5			19.5				
Progression Factor		0.00			1.00			1.00				
Incremental Delay, d2		0.2			138.9			8.0				
Delay (s)		0.2			171.4			27.5				
Level of Service		A			F			C				
Approach Delay (s)		0.2			171.4			27.5			0.0	
Approach LOS		A			F			C			A	

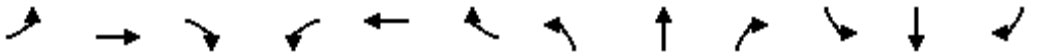
Intersection Summary			
HCM 2000 Control Delay	56.3	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.07		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	94.5%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	689	196	0	647	0	0	0	0	0	4125	157
Future Volume (vph)	0	689	196	0	647	0	0	0	0	0	4125	157
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	10	10	10	12	12	12	12	12	12	12	12	12
Total Lost time (s)		10.0			6.0						6.0	6.0
Lane Util. Factor		0.95			0.95						0.86	1.00
Frpb, ped/bikes		0.99			1.00						1.00	0.97
Flpb, ped/bikes		1.00			1.00						1.00	1.00
Frt		0.97			1.00						1.00	0.85
Flt Protected		1.00			1.00						1.00	1.00
Satd. Flow (prot)		3299			3762						6812	1632
Flt Permitted		1.00			1.00						1.00	1.00
Satd. Flow (perm)		3299			3762						6812	1632
Peak-hour factor, PHF	0.95	0.95	0.95	0.94	0.94	0.94	0.92	0.92	0.92	0.94	0.94	0.94
Adj. Flow (vph)	0	725	206	0	688	0	0	0	0	0	4388	167
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	39
Lane Group Flow (vph)	0	931	0	0	688	0	0	0	0	0	4388	128
Confl. Peds. (#/hr)			18									16
Heavy Vehicles (%)	3%	3%	3%	1%	1%	1%	2%	2%	2%	1%	1%	1%
Turn Type		NA			NA						NA	Perm
Protected Phases		4			8						2	
Permitted Phases												2
Actuated Green, G (s)		25.0			29.0						49.0	49.0
Effective Green, g (s)		25.0			29.0						49.0	49.0
Actuated g/C Ratio		0.28			0.32						0.54	0.54
Clearance Time (s)		10.0			6.0						6.0	6.0
Lane Grp Cap (vph)		916			1212						3708	888
v/s Ratio Prot		c0.28			0.18						c0.64	
v/s Ratio Perm												0.08
v/c Ratio		1.02			0.57						1.18	0.14
Uniform Delay, d1		32.5			25.3						20.5	10.1
Progression Factor		0.90			0.00						0.99	0.68
Incremental Delay, d2		28.6			0.2						83.6	0.1
Delay (s)		57.9			0.2						103.9	7.0
Level of Service		E			A						F	A
Approach Delay (s)		57.9			0.2			0.0			100.3	
Approach LOS		E			A			A			F	

Intersection Summary			
HCM 2000 Control Delay	82.8	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.13		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	94.5%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	700	39	90	635	79	0	0	185	0	0	40
Future Volume (vph)	0	700	39	90	635	79	0	0	185	0	0	40
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	11	11	11	10	10	10	12	12	12	12	12	12
Total Lost time (s)		6.0		6.0	6.0	6.0			6.0			6.0
Lane Util. Factor		1.00		1.00	1.00	1.00			1.00			1.00
Frpb, ped/bikes		1.00		1.00	1.00	0.96			1.00			1.00
Flpb, ped/bikes		1.00		1.00	1.00	1.00			1.00			1.00
Frt		0.99		1.00	1.00	0.85			0.86			0.86
Flt Protected		1.00		0.95	1.00	1.00			1.00			1.00
Satd. Flow (prot)		1433		1580	1663	1354			1483			1526
Flt Permitted		1.00		0.95	1.00	1.00			1.00			1.00
Satd. Flow (perm)		1433		1580	1663	1354			1483			1526
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.83	0.83	0.83	0.92	0.92	0.92
Adj. Flow (vph)	0	737	41	95	668	83	0	0	223	0	0	43
RTOR Reduction (vph)	0	2	0	0	0	41	0	0	181	0	0	39
Lane Group Flow (vph)	0	776	0	95	668	42	0	0	42	0	0	4
Confl. Peds. (#/hr)	23		24	24		23	45					45
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	5%	5%	5%	2%	2%	2%
Parking (#/hr)		10										
Turn Type		NA		Prot	NA	Perm			Over			Prot
Protected Phases		6 14		5	2				5			14
Permitted Phases						2						
Actuated Green, G (s)		61.0		17.0	46.0	46.0			17.0			9.0
Effective Green, g (s)		61.0		17.0	46.0	46.0			17.0			9.0
Actuated g/C Ratio		0.68		0.19	0.51	0.51			0.19			0.10
Clearance Time (s)				6.0	6.0	6.0			6.0			6.0
Vehicle Extension (s)				0.2	0.2	0.2			0.2			0.2
Lane Grp Cap (vph)		971		298	849	692			280			152
v/s Ratio Prot		c0.54		c0.06	0.40				0.03			0.00
v/s Ratio Perm						0.03						
v/c Ratio		0.80		0.32	0.79	0.06			0.15			0.03
Uniform Delay, d1		10.2		31.5	18.0	11.1			30.5			36.6
Progression Factor		1.00		1.11	0.30	0.00			1.00			1.00
Incremental Delay, d2		6.8		2.5	6.5	0.2			1.1			0.3
Delay (s)		17.0		37.4	11.9	0.2			31.6			36.9
Level of Service		B		D	B	A			C			D
Approach Delay (s)		17.0			13.6			31.6			36.9	
Approach LOS		B			B			C			D	

Intersection Summary			
HCM 2000 Control Delay	17.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	63.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

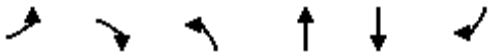
Intersection	
Int Delay, s/veh	9.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	30	71	6	19	26	50	24	14	62	193	37	23
Future Vol, veh/h	30	71	6	19	26	50	24	14	62	193	37	23
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	87	87	87	84	84	84	90	90	90	86	86	86
Heavy Vehicles, %	0	0	0	0	0	0	0	0	1	1	0	0
Mvmt Flow	34	82	7	23	31	60	27	16	69	224	43	27

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	655	644	57	654	623	51	70	0	0	85	0	0
Stage 1	505	505	-	105	105	-	-	-	-	-	-	-
Stage 2	150	139	-	549	518	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.11	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.209	-	-
Pot Cap-1 Maneuver	382	394	1015	383	405	1023	1544	-	-	1518	-	-
Stage 1	553	544	-	906	812	-	-	-	-	-	-	-
Stage 2	857	785	-	524	536	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	291	327	1015	269	337	1023	1544	-	-	1518	-	-
Mov Cap-2 Maneuver	291	327	-	269	337	-	-	-	-	-	-	-
Stage 1	543	460	-	890	797	-	-	-	-	-	-	-
Stage 2	762	771	-	362	453	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	22.4	14.7	1.8	5.9
HCM LOS	C	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1544	-	-	328	483	1518	-	-
HCM Lane V/C Ratio	0.017	-	-	0.375	0.234	0.148	-	-
HCM Control Delay (s)	7.4	0	-	22.4	14.7	7.8	0	-
HCM Lane LOS	A	A	-	C	B	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	1.7	0.9	0.5	-	-



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	326	0	0	3956	95
Future Volume (Veh/h)	0	326	0	0	3956	95
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.87	0.87	1.00	1.00	0.93	0.93
Hourly flow rate (vph)	0	375	0	0	4254	102
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				327	192	
pX, platoon unblocked	0.43	0.43	0.43			
vC, conflicting volume	4305	1114	4356			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2097	0	2215			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	21	100			
cM capacity (veh/h)	20	474	104			

Direction, Lane #	EB 1	SB 1	SB 2	SB 3	SB 4
Volume Total	375	1215	1215	1215	710
Volume Left	0	0	0	0	0
Volume Right	375	0	0	0	102
cSH	474	1700	1700	1700	1700
Volume to Capacity	0.79	0.71	0.71	0.71	0.42
Queue Length 95th (ft)	180	0	0	0	0
Control Delay (s)	35.7	0.0	0.0	0.0	0.0
Lane LOS	E				
Approach Delay (s)	35.7	0.0			
Approach LOS	E				

Intersection Summary			
Average Delay	2.8		
Intersection Capacity Utilization	81.8%	ICU Level of Service	D
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	2.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	3	26	74	5	25	37
Future Vol, veh/h	3	26	74	5	25	37
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	1	0	0	0
Mvmt Flow	3	29	82	6	28	41

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	182	85	0	0	88	0
Stage 1	85	-	-	-	-	-
Stage 2	97	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	812	980	-	-	1520	-
Stage 1	943	-	-	-	-	-
Stage 2	932	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	797	980	-	-	1520	-
Mov Cap-2 Maneuver	797	-	-	-	-	-
Stage 1	943	-	-	-	-	-
Stage 2	914	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.9	0	3
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	957	1520	-
HCM Lane V/C Ratio	-	-	0.034	0.018	-
HCM Control Delay (s)	-	-	8.9	7.4	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0.1	-

Intersection	
Int Delay, s/veh	0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	326	0	0	95	0	0
Future Vol, veh/h	326	0	0	95	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	87	87	84	84	85	85
Heavy Vehicles, %	1	0	0	1	0	0
Mvmt Flow	375	0	0	113	0	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	375	0	488	375
Stage 1	-	-	-	-	375	-
Stage 2	-	-	-	-	113	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1195	-	543	676
Stage 1	-	-	-	-	699	-
Stage 2	-	-	-	-	917	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1195	-	543	676
Mov Cap-2 Maneuver	-	-	-	-	543	-
Stage 1	-	-	-	-	699	-
Stage 2	-	-	-	-	917	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	1195	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	0	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	-	-	-	0	-

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	209	0	0	0	0	3842
Future Volume (vph)	209	0	0	0	0	3842
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	16	12	12	12	12	12
Total Lost time (s)	5.0					5.7
Lane Util. Factor	1.00					0.86
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	2153					6880
Flt Permitted	0.95					1.00
Satd. Flow (perm)	2153					6880
Peak-hour factor, PHF	0.90	0.90	1.00	1.00	0.93	0.93
Adj. Flow (vph)	232	0	0	0	0	4131
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	232	0	0	0	0	4131
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Turn Type	Prot					NA
Protected Phases	8					6
Permitted Phases						
Actuated Green, G (s)	28.0					51.3
Effective Green, g (s)	28.0					51.3
Actuated g/C Ratio	0.31					0.57
Clearance Time (s)	5.0					5.7
Lane Grp Cap (vph)	669					3921
v/s Ratio Prot	c0.11					c0.60
v/s Ratio Perm						
v/c Ratio	0.35					1.05
Uniform Delay, d1	23.9					19.4
Progression Factor	0.60					1.00
Incremental Delay, d2	0.6					31.1
Delay (s)	15.0					50.4
Level of Service	B					D
Approach Delay (s)	15.0		0.0			50.4
Approach LOS	B		A			D

Intersection Summary			
HCM 2000 Control Delay	48.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.7
Intersection Capacity Utilization	104.5%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

SIMTRAFFIC PERFORMANCE REPORTS

1: NB Woodward Avenue & Maple Road Performance by movement

Movement	EBT	WBT	WBR	NBT	NBR	All
Denied Delay (hr)	0.0	131.1	56.0	0.2	0.0	187.3
Denied Del/Veh (s)	0.0	648.4	637.9	0.2	0.4	133.1
Total Delay (hr)	0.2	27.8	9.7	27.4	1.6	66.8
Total Del/Veh (s)	1.3	193.4	157.5	32.1	17.3	50.1
Total Stops	1	536	246	2299	192	3274
Travel Time (hr)	0.8	160.9	66.7	35.8	3.0	267.3
Avg Speed (mph)	17	2	2	10	13	6

2: SB Woodward Avenue & Maple Road Performance by movement

Movement	EBT	EBR	WBT	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.1	0.0	0.0	0.1
Denied Del/Veh (s)	0.2	0.2	0.4	0.0	0.0	0.1
Total Delay (hr)	5.3	0.5	0.5	14.6	0.4	21.3
Total Del/Veh (s)	29.4	26.1	3.7	17.0	7.9	17.1
Total Stops	361	41	17	1456	70	1945
Travel Time (hr)	6.3	0.6	1.0	17.5	0.7	26.2
Avg Speed (mph)	4	4	11	7	9	7

3: Peabody Street/Park Street & Maple Road Performance by movement

Movement	EBT	EBR	WBL	WBT	WBR	NBR	All
Denied Delay (hr)	1.6	0.1	0.0	0.0	0.0	3.8	5.5
Denied Del/Veh (s)	9.3	9.6	0.2	0.3	0.0	162.9	13.9
Total Delay (hr)	4.7	0.2	1.7	0.7	0.0	5.6	13.0
Total Del/Veh (s)	26.9	18.8	82.6	4.7	1.4	262.9	32.7
Total Stops	390	38	70	68	3	44	613
Travel Time (hr)	8.7	0.4	1.8	1.5	0.2	9.5	22.3
Avg Speed (mph)	8	10	1	12	14	0	5

4: Park Street & Hamilton Row Performance by movement

Movement	EBL	EBT	WBT	WBR	NBL	NBT	NBR	SBL	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0
Total Delay (hr)	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Total Del/Veh (s)	4.1	6.0	3.6	2.1	0.1	1.0	0.4	5.6	2.9	2.8
Total Stops	9	34	102	28	0	0	0	14	12	199
Travel Time (hr)	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.6
Avg Speed (mph)	15	14	6	6	21	20	16	14	15	13

5: SB Woodward Avenue & Hamilton Row Performance by movement

Movement	EBR	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	0.0
Total Delay (hr)	0.6	6.5	0.1	7.3
Total Del/Veh (s)	22.0	7.4	3.0	7.7
Total Stops	98	425	10	533
Travel Time (hr)	0.8	9.1	0.4	10.2
Avg Speed (mph)	3	12	13	11

6: SB Woodward Avenue & Site Driveway Performance by movement

Movement	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0
Total Delay (hr)	4.7	0.0	4.7
Total Del/Veh (s)	5.2	9.0	5.2
Total Stops	396	0	396
Travel Time (hr)	6.2	0.0	6.2
Avg Speed (mph)	10	6	10

8: Site Driveway & Hamilton Row Performance by movement

Movement	EBT	EBR	WBT	All
Denied Delay (hr)	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	0.0
Total Delay (hr)	0.0	0.0	0.0	0.1
Total Del/Veh (s)	1.3	0.6	0.8	1.0
Total Stops	4	0	1	5
Travel Time (hr)	0.1	0.0	0.2	0.3
Avg Speed (mph)	9	11	11	10

9: SB Woodward Avenue & NB to SB Cross-over Performance by movement

Movement	WBL	WBT	SBT	All
Denied Delay (hr)	0.0	0.0	5.0	5.1
Denied Del/Veh (s)	0.4	0.0	5.8	5.5
Total Delay (hr)	0.5	0.0	16.2	16.7
Total Del/Veh (s)	10.6	0.1	18.5	18.1
Total Stops	35	0	1353	1388
Travel Time (hr)	0.6	0.0	24.5	25.1
Avg Speed (mph)	2	13	7	7

Total Zone Performance

Denied Delay (hr)	198.0
Denied Del/Veh (s)	84.3
Total Delay (hr)	130.0
Total Del/Veh (s)	2052.9
Total Stops	8353
Travel Time (hr)	358.2
Avg Speed (mph)	7

1: NB Woodward Avenue & Maple Road Performance by movement

Movement	EBT	WBT	WBR	NBT	NBR	All
Denied Delay (hr)	0.0	92.3	74.7	0.2	0.0	167.2
Denied Del/Veh (s)	0.0	533.4	548.5	0.2	0.4	126.2
Total Delay (hr)	0.2	22.8	14.8	17.7	1.3	56.9
Total Del/Veh (s)	1.4	171.4	143.7	23.3	12.5	45.3
Total Stops	2	477	336	1574	184	2573
Travel Time (hr)	0.7	116.9	91.2	25.2	2.9	236.9
Avg Speed (mph)	17	2	2	13	15	7

2: SB Woodward Avenue & Maple Road Performance by movement

Movement	EBT	EBR	WBT	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.3	0.0	0.3
Denied Del/Veh (s)	0.1	0.2	0.0	0.3	0.1	0.2
Total Delay (hr)	5.6	1.4	0.3	18.9	0.3	26.5
Total Del/Veh (s)	35.7	32.9	2.7	17.7	8.1	18.5
Total Stops	345	96	11	1642	54	2148
Travel Time (hr)	6.5	1.7	0.7	22.8	0.6	32.3
Avg Speed (mph)	3	3	13	7	9	6

3: Peabody Street/Park Street & Maple Road Performance by movement

Movement	EBT	EBR	WBL	WBT	WBR	NBR	All
Denied Delay (hr)	3.5	0.2	0.0	0.0	0.0	54.5	58.1
Denied Del/Veh (s)	18.9	17.1	0.0	0.0	0.0	1257.2	145.2
Total Delay (hr)	9.8	0.4	1.4	0.5	0.0	9.0	21.1
Total Del/Veh (s)	52.5	46.0	85.2	3.5	1.0	577.3	56.2
Total Stops	600	51	58	47	2	1	759
Travel Time (hr)	15.7	0.7	1.5	1.3	0.1	63.6	82.9
Avg Speed (mph)	5	5	1	14	15	0	3

4: Park Street & Hamilton Row Performance by movement

Movement	EBL	EBT	WBT	WBR	NBL	NBT	NBR	SBL	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.2	1.1	4.4
Denied Del/Veh (s)	0.2	0.2	0.0	0.0	0.0	0.0	0.0	82.6	89.9	43.5
Total Delay (hr)	0.1	1.0	0.0	0.0	0.0	0.0	0.2	5.9	1.7	9.0
Total Del/Veh (s)	32.7	51.9	3.8	2.1	0.0	2.9	24.8	156.8	138.3	90.8
Total Stops	16	70	26	10	0	1	16	84	26	249
Travel Time (hr)	0.2	1.2	0.0	0.0	0.0	0.0	0.2	9.5	2.9	14.1
Avg Speed (mph)	5	3	6	7	21	14	3	1	1	2

5: SB Woodward Avenue & Hamilton Row Performance by movement

Movement	EBT	EBR	SBT	SBR	All
Denied Delay (hr)	0.0	0.2	0.0	0.0	0.2
Denied Del/Veh (s)	0.0	3.9	0.0	0.2	0.2
Total Delay (hr)	0.0	3.0	10.3	0.1	13.4
Total Del/Veh (s)	21.5	48.2	10.0	6.8	12.1
Total Stops	0	161	1250	10	1421
Travel Time (hr)	0.0	3.6	13.3	0.1	17.0
Avg Speed (mph)	1	1	10	9	8

6: SB Woodward Avenue & Site Driveway Performance by movement

Movement	EBR	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	0.0	0.0	0.0
Total Delay (hr)	0.0	6.8	0.0	6.8
Total Del/Veh (s)	4.9	6.2	4.3	6.2
Total Stops	11	697	3	711
Travel Time (hr)	0.0	8.7	0.0	8.7
Avg Speed (mph)	3	9	8	8

8: Site Driveway & Hamilton Row Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	0.0	0.0	0.0	0.1	0.1	0.1
Total Delay (hr)	0.7	0.0	0.0	0.0	0.0	0.0	0.7
Total Del/Veh (s)	11.2	1.1	1.2	0.8	2.9	4.0	9.5
Total Stops	46	0	1	0	4	2	53
Travel Time (hr)	0.9	0.0	0.0	0.1	0.0	0.0	1.0
Avg Speed (mph)	3	10	10	11	6	5	4

9: SB Woodward Avenue & NB to SB Cross-over Performance by movement

Movement	WBL	WBT	SBT	All
Denied Delay (hr)	0.0	0.0	37.6	37.6
Denied Del/Veh (s)	0.5	0.0	37.2	35.4
Total Delay (hr)	0.5	0.0	27.1	27.6
Total Del/Veh (s)	9.5	0.4	26.9	26.1
Total Stops	34	0	1748	1782
Travel Time (hr)	0.6	0.0	68.4	69.0
Avg Speed (mph)	2	12	5	5

Total Zone Performance

Denied Delay (hr)	267.8
Denied Del/Veh (s)	106.4
Total Delay (hr)	161.9
Total Del/Veh (s)	2259.4
Total Stops	9696
Travel Time (hr)	462.0
Avg Speed (mph)	6

1: NB Woodward Avenue & Maple Road Performance by movement

Movement	EBT	WBT	WBR	NBT	NBR	All
Denied Delay (hr)	0.0	124.0	54.9	0.4	0.1	179.4
Denied Del/Veh (s)	0.0	578.8	585.2	0.5	0.7	121.2
Total Delay (hr)	0.3	27.3	10.4	34.9	2.5	75.3
Total Del/Veh (s)	1.4	169.2	147.8	38.8	26.2	53.1
Stop/Veh	0.00	0.98	1.03	0.85	0.69	0.75
Travel Time (hr)	0.9	153.5	66.5	43.8	4.0	268.7
Avg Speed (mph)	17	2	2	9	10	6

2: SB Woodward Avenue & Maple Road Performance by movement

Movement	EBT	EBR	WBT	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.1	0.0	0.0	0.1
Denied Del/Veh (s)	0.2	0.2	0.3	0.0	0.0	0.1
Total Delay (hr)	6.8	0.6	0.5	10.8	0.2	18.8
Total Del/Veh (s)	34.9	29.4	3.2	11.8	3.4	14.0
Stop/Veh	0.62	0.59	0.03	0.44	0.31	0.42
Travel Time (hr)	7.8	0.7	1.0	13.9	0.6	24.0
Avg Speed (mph)	3	3	12	10	13	8

3: Peabody Street/Park Street & Maple Road Performance by movement

Movement	EBT	EBR	WBL	WBT	WBR	NBR	SBT	SBR	All
Denied Delay (hr)	5.2	0.3	0.0	0.0	0.0	1.0	0.0	0.0	6.5
Denied Del/Veh (s)	27.5	24.6	0.0	0.1	0.0	39.8		0.0	14.8
Total Delay (hr)	9.7	0.6	1.0	0.8	0.0	4.0	0.0	0.0	16.2
Total Del/Veh (s)	50.7	45.7	35.0	5.2	1.2	172.0		39.9	36.6
Stop/Veh	0.89	0.82	0.92	0.15	0.17	0.67		1.00	0.57
Travel Time (hr)	17.4	1.2	1.2	1.8	0.3	5.2	0.0	0.1	27.1
Avg Speed (mph)	5	5	3	12	15	1	22	2	5

4: Park Street & Hamilton Row Performance by movement

Movement	EBL	EBT	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.0
Total Delay (hr)	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
Total Del/Veh (s)	4.7	5.9	4.2	2.3	1.5	0.3	0.2	1.9	0.1	0.1	2.9
Stop/Veh	1.00	0.98	0.99	1.00	0.06	0.00	0.02	0.12	0.00	0.00	0.60
Travel Time (hr)	0.0	0.2	0.2	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.7
Avg Speed (mph)	15	14	7	7	16	23	17	19	24	20	13

5: SB Woodward Avenue & Hamilton Row Performance by movement

Movement	EBR	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	0.0
Total Delay (hr)	0.5	4.7	0.1	5.2
Total Del/Veh (s)	14.9	5.0	2.0	5.2
Stop/Veh	0.97	0.01	0.00	0.05
Travel Time (hr)	0.7	7.4	0.4	8.4
Avg Speed (mph)	3	16	14	15

6: SB Woodward Avenue & Site Driveway Performance by movement

Movement	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0
Total Delay (hr)	3.2	0.0	3.2
Total Del/Veh (s)	3.3	0.2	3.3
Stop/Veh	0.08	0.00	0.08
Travel Time (hr)	4.8	0.0	4.8
Avg Speed (mph)	13	15	13

8: Site Driveway & Hamilton Row Performance by movement

Movement	EBT	EBR	WBT	All
Denied Delay (hr)	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	0.0
Total Delay (hr)	0.0	0.0	0.0	0.0
Total Del/Veh (s)	0.8	0.4	0.5	0.6
Stop/Veh	0.02	0.00	0.00	0.01
Travel Time (hr)	0.1	0.0	0.2	0.4
Avg Speed (mph)	11	11	11	11

9: SB Woodward Avenue & NB to SB Cross-over Performance by movement

Movement	WBL	WBT	SBT	All
Denied Delay (hr)	0.0	0.0	0.6	0.7
Denied Del/Veh (s)	0.4	0.0	0.7	0.7
Total Delay (hr)	0.4	0.0	14.5	14.9
Total Del/Veh (s)	9.4	0.3	15.5	15.2
Stop/Veh	0.20	0.00	0.39	0.38
Travel Time (hr)	0.5	0.0	18.6	19.1
Avg Speed (mph)	2	13	9	8

Total Zone Performance

Denied Delay (hr)	186.7
Denied Del/Veh (s)	75.1
Total Delay (hr)	133.9
Total Del/Veh (s)	2161.6
Stop/Veh	38.90
Travel Time (hr)	353.1
Avg Speed (mph)	7

1: NB Woodward Avenue & Maple Road Performance by movement

Movement	EBT	WBT	WBR	NBT	NBR	All
Denied Delay (hr)	0.0	63.6	50.0	0.2	0.0	113.8
Denied Del/Veh (s)	0.0	360.6	362.2	0.2	0.4	82.8
Total Delay (hr)	0.2	21.6	15.6	21.4	1.6	60.5
Total Del/Veh (s)	1.3	147.5	136.2	27.2	13.9	45.5
Total Stops	2	504	334	1858	211	2909
Travel Time (hr)	0.7	87.3	67.5	29.1	3.3	188.0
Avg Speed (mph)	18	2	2	12	15	7

2: SB Woodward Avenue & Maple Road Performance by movement

Movement	EBT	EBR	WBT	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.2	0.0	0.3
Denied Del/Veh (s)	0.3	0.2	0.0	0.2	0.1	0.2
Total Delay (hr)	6.1	1.5	0.3	17.0	0.2	25.1
Total Del/Veh (s)	36.4	33.3	2.1	15.8	4.4	17.1
Total Stops	373	99	10	1652	50	2184
Travel Time (hr)	7.0	1.8	0.7	21.0	0.5	31.0
Avg Speed (mph)	3	3	15	8	12	7

3: Peabody Street/Park Street & Maple Road Performance by movement

Movement	EBT	EBR	WBL	WBT	WBR	NBR	SBR	All
Denied Delay (hr)	17.3	0.9	0.0	0.0	0.0	53.2	0.0	71.5
Denied Del/Veh (s)	88.8	88.0	0.0	0.0	0.0	1053.3	0.0	161.3
Total Delay (hr)	12.8	0.6	0.7	0.7	0.0	9.0	0.3	24.0
Total Del/Veh (s)	67.1	63.7	36.3	4.9	0.9	370.4	46.3	58.4
Total Stops	640	32	66	82	7	3	20	850
Travel Time (hr)	32.7	1.6	0.8	1.6	0.1	62.4	0.3	99.6
Avg Speed (mph)	4	4	3	12	16	0	2	3

4: Park Street & Hamilton Row Performance by movement

Movement	EBL	EBT	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.2	0.1
Total Delay (hr)	0.1	0.5	0.0	0.0	0.0	0.0	0.1	0.4	0.1	0.1	1.3
Total Del/Veh (s)	13.3	26.0	4.9	2.0	3.3	3.9	8.8	12.4	9.3	7.5	12.8
Total Stops	18	76	30	12	2	1	8	57	6	8	218
Travel Time (hr)	0.1	0.7	0.1	0.0	0.0	0.0	0.1	0.8	0.1	0.1	2.1
Avg Speed (mph)	9	6	6	8	13	13	7	9	12	12	8

5: SB Woodward Avenue & Hamilton Row Performance by movement

Movement	EBT	EBR	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.3	0.0	0.0	0.0
Total Delay (hr)	0.0	2.3	8.5	0.0	10.9
Total Del/Veh (s)	14.5	35.9	8.2	4.5	9.7
Total Stops	2	194	1132	10	1338
Travel Time (hr)	0.0	2.6	11.6	0.1	14.3
Avg Speed (mph)	2	2	11	11	10

6: SB Woodward Avenue & Site Driveway Performance by movement

Movement	EBR	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	0.0	0.0	0.0
Total Delay (hr)	0.0	5.5	0.0	5.5
Total Del/Veh (s)	3.6	5.0	1.8	4.9
Total Stops	11	697	2	710
Travel Time (hr)	0.0	7.3	0.0	7.3
Avg Speed (mph)	4	10	10	10

8: Site Driveway & Hamilton Row Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.1	0.1	0.0
Total Delay (hr)	0.4	0.0	0.0	0.0	0.0	0.0	0.4
Total Del/Veh (s)	5.7	0.8	7.7	0.5	8.1	4.4	4.9
Total Stops	32	0	0	0	5	3	40
Travel Time (hr)	0.6	0.0	0.0	0.1	0.0	0.0	0.7
Avg Speed (mph)	6	11	4	11	3	4	6

9: SB Woodward Avenue & NB to SB Cross-over Performance by movement

Movement	WBL	WBT	SBT	All
Denied Delay (hr)	0.0	0.0	104.7	104.7
Denied Del/Veh (s)	0.1	0.0	99.6	94.9
Total Delay (hr)	0.5	0.0	30.1	30.6
Total Del/Veh (s)	9.4	0.3	29.8	28.8
Total Stops	35	0	1635	1670
Travel Time (hr)	0.6	0.0	138.6	139.2
Avg Speed (mph)	2	12	5	5

Total Zone Performance

Denied Delay (hr)	290.3
Denied Del/Veh (s)	110.9
Total Delay (hr)	158.2
Total Del/Veh (s)	2363.7
Total Stops	9919
Travel Time (hr)	482.2
Avg Speed (mph)	6

1: NB Woodward Avenue & Maple Road Performance by movement

Movement	EBT	WBT	WBR	NBT	NBR	All
Denied Delay (hr)	0.0	107.4	46.9	0.6	0.1	155.0
Denied Del/Veh (s)	0.0	484.6	496.2	0.7	0.9	102.6
Total Delay (hr)	0.2	27.0	10.5	39.5	2.7	80.0
Total Del/Veh (s)	1.3	161.5	142.8	42.7	29.2	55.4
Total Stops	2	644	268	2974	243	4131
Travel Time (hr)	0.8	136.8	58.6	48.9	4.2	249.3
Avg Speed (mph)	18	2	2	8	10	6

2: SB Woodward Avenue & Maple Road Performance by movement

Movement	EBT	EBR	WBT	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	0.2	0.1	0.0	0.0	0.0
Total Delay (hr)	6.0	0.6	0.4	13.6	0.3	20.9
Total Del/Veh (s)	32.1	25.9	2.6	14.8	4.8	15.5
Total Stops	405	44	14	1778	67	2308
Travel Time (hr)	7.0	0.8	0.9	18.3	0.8	27.8
Avg Speed (mph)	3	4	13	11	14	9

3: Peabody Street/Park Street & Maple Road Performance by movement

Movement	EBT	EBR	WBL	WBT	WBR	NBR	SBR	All
Denied Delay (hr)	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.9
Denied Del/Veh (s)	4.7	3.3	0.0	0.1	0.0	0.6	0.0	2.1
Total Delay (hr)	6.2	0.4	1.1	0.8	0.0	3.2	0.1	11.8
Total Del/Veh (s)	33.7	28.1	34.5	5.2	1.0	129.6	27.9	26.6
Total Stops	508	36	102	88	14	69	8	825
Travel Time (hr)	9.6	0.7	1.3	1.8	0.3	3.4	0.1	17.1
Avg Speed (mph)	7	8	3	12	15	1	3	6

4: Park Street & Hamilton Row Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.1	0.1
Total Delay (hr)	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	5.1	5.5	2.1	3.4	4.5	2.3	1.5	0.7	0.2	2.1	0.3	0.1
Total Stops	20	38	3	4	108	56	2	0	0	4	0	0
Travel Time (hr)	0.1	0.1	0.0	0.0	0.2	0.1	0.1	0.0	0.1	0.1	0.0	0.0
Avg Speed (mph)	14	15	16	7	7	7	15	20	16	19	24	20

4: Park Street & Hamilton Row Performance by movement

Movement	All
Denied Delay (hr)	0.0
Denied Del/Veh (s)	0.0
Total Delay (hr)	0.3
Total Del/Veh (s)	2.7
Total Stops	235
Travel Time (hr)	0.9
Avg Speed (mph)	13

5: SB Woodward Avenue & Hamilton Row Performance by movement

Movement	EBR	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	0.0
Total Delay (hr)	0.2	4.6	0.1	4.9
Total Del/Veh (s)	4.5	4.9	2.1	4.8
Total Stops	144	31	1	176
Travel Time (hr)	0.4	7.4	0.4	8.1
Avg Speed (mph)	7	16	14	15

7: Park Street & Site Driveway Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	0.1	0.0		0.0	0.0	0.0
Total Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	2.7	2.1	0.2		1.9	0.2	0.5
Total Stops	1	14	0	0	1	0	16
Travel Time (hr)	0.0	0.0	0.2	0.0	0.0	0.0	0.3
Avg Speed (mph)	8	7	14	11	15	19	14

8: Site Driveway & Hamilton Row Performance by movement

Movement	EBT	WBL	WBT	All
Denied Delay (hr)	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	0.0
Total Delay (hr)	0.0	0.0	0.0	0.0
Total Del/Veh (s)	0.5	0.6	0.5	0.5
Total Stops	0	0	0	0
Travel Time (hr)	0.1	0.0	0.3	0.4
Avg Speed (mph)	12	11	11	11

9: SB Woodward Avenue & NB to SB Cross-over Performance by movement

Movement	WBL	WBT	SBT	All
Denied Delay (hr)	0.1	0.0	0.6	0.6
Denied Del/Veh (s)	0.9	0.0	0.6	0.7
Total Delay (hr)	0.5	0.0	14.9	15.4
Total Del/Veh (s)	8.9	0.3	15.9	15.5
Total Stops	36	0	1342	1378
Travel Time (hr)	0.6	0.0	19.0	19.6
Avg Speed (mph)	2	13	8	8

Total Zone Performance

Denied Delay (hr)	156.6
Denied Del/Veh (s)	61.8
Total Delay (hr)	133.4
Total Del/Veh (s)	1975.6
Total Stops	9069
Travel Time (hr)	323.5
Avg Speed (mph)	7

1: NB Woodward Avenue & Maple Road Performance by movement

Movement	EBT	WBT	WBR	NBT	NBR	All
Denied Delay (hr)	0.0	115.4	81.0	0.2	0.0	196.6
Denied Del/Veh (s)	0.0	607.1	572.1	0.2	0.4	139.5
Total Delay (hr)	0.2	23.0	15.5	23.3	1.9	64.0
Total Del/Veh (s)	1.4	185.2	166.6	28.9	16.2	49.0
Total Stops	3	440	306	2005	235	2989
Travel Time (hr)	0.7	140.1	98.0	31.2	3.7	273.8
Avg Speed (mph)	17	2	2	11	14	6

2: SB Woodward Avenue & Maple Road Performance by movement

Movement	EBT	EBR	WBT	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.2	0.0	0.2
Denied Del/Veh (s)	0.1	0.1	0.0	0.2	0.1	0.2
Total Delay (hr)	6.0	1.6	0.2	27.0	0.3	35.1
Total Del/Veh (s)	36.7	33.9	2.0	24.7	6.4	24.0
Total Stops	375	103	6	2543	65	3092
Travel Time (hr)	6.9	1.9	0.6	32.8	0.7	42.9
Avg Speed (mph)	3	3	15	7	13	6

3: Peabody Street/Park Street & Maple Road Performance by movement

Movement	EBT	EBR	WBL	WBT	WBR	NBR	SBT	SBR	All
Denied Delay (hr)	27.2	1.7	0.0	0.0	0.0	58.1	0.0	0.0	87.0
Denied Del/Veh (s)	138.6	148.3	0.0	0.0	0.0	1067.0	0.0	0.0	200.5
Total Delay (hr)	13.5	0.7	0.6	0.6	0.0	9.0	0.0	0.4	24.9
Total Del/Veh (s)	71.0	63.5	35.6	4.8	1.0	354.1	0.3	36.1	62.6
Total Stops	653	36	59	70	10	1	0	34	863
Travel Time (hr)	43.2	2.6	0.8	1.4	0.1	67.3	0.0	0.5	115.9
Avg Speed (mph)	4	4	3	12	15	0	21	2	3

4: Park Street & Hamilton Row Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.2
Total Delay (hr)	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Total Del/Veh (s)	7.2	8.8	3.5	6.4	6.4	2.7	1.7	0.4	0.3	2.6	1.0	0.8
Total Stops	25	74	7	20	25	46	3	0	1	27	1	1
Travel Time (hr)	0.1	0.4	0.0	0.0	0.1	0.1	0.0	0.0	0.1	0.6	0.1	0.1
Avg Speed (mph)	12	12	14	5	5	7	14	19	15	18	22	19

4: Park Street & Hamilton Row Performance by movement

Movement	All
Denied Delay (hr)	0.0
Denied Del/Veh (s)	0.1
Total Delay (hr)	0.5
Total Del/Veh (s)	3.5
Total Stops	230
Travel Time (hr)	1.6
Avg Speed (mph)	15

5: SB Woodward Avenue & Hamilton Row Performance by movement

Movement	EBT	EBR	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	0.0	0.6	10.6	0.2	11.4
Total Del/Veh (s)	1.2	6.6	10.3	7.8	9.9
Total Stops	0	302	1310	29	1641
Travel Time (hr)	0.0	1.0	13.6	0.4	15.0
Avg Speed (mph)	12	6	9	9	9

7: Park Street & Site Driveway Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.2	0.1	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	3.0	2.1	0.2	0.2	1.6	0.5	0.9
Total Stops	2	29	0	0	1	0	32
Travel Time (hr)	0.0	0.0	0.1	0.0	0.1	0.1	0.3
Avg Speed (mph)	7	7	14	12	15	19	14

8: Site Driveway & Hamilton Row Performance by movement

Movement	EBT	WBT	All
Denied Delay (hr)	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0
Total Delay (hr)	0.1	0.0	0.1
Total Del/Veh (s)	0.8	0.8	0.8
Total Stops	9	2	11
Travel Time (hr)	0.3	0.2	0.5
Avg Speed (mph)	12	11	12

9: SB Woodward Avenue & NB to SB Cross-over Performance by movement

Movement	WBL	WBT	SBT	All
Denied Delay (hr)	0.0	0.0	166.9	166.9
Denied Del/Veh (s)	0.8	0.0	152.8	145.3
Total Delay (hr)	0.5	0.0	30.1	30.6
Total Del/Veh (s)	9.6	0.3	29.6	28.6
Total Stops	37	0	1818	1855
Travel Time (hr)	0.7	0.0	200.7	201.4
Avg Speed (mph)	2	13	5	5

Total Zone Performance

Denied Delay (hr)	450.8
Denied Del/Veh (s)	165.1
Total Delay (hr)	166.7
Total Del/Veh (s)	2247.4
Total Stops	10713
Travel Time (hr)	651.4
Avg Speed (mph)	6

SIMTRAFFIC QUEUING & BLOCKING REPORTS

Intersection: 1: NB Woodward Avenue & Maple Road

Movement	EB	EB	WB	WB	NB	NB	NB	NB
Directions Served	T	T	T	TR	T	T	T	TR
Maximum Queue (ft)	24	15	569	572	640	602	485	410
Average Queue (ft)	4	1	543	543	496	433	299	214
95th Queue (ft)	17	8	559	559	656	574	431	345
Link Distance (ft)	14	14	523	523	616	616	616	616
Upstream Blk Time (%)	4	1	94	88	3	0		
Queuing Penalty (veh)	13	2	0	0	0	0		
Storage Bay Dist (ft)								
Storage Blk Time (%)								
Queuing Penalty (veh)								

Intersection: 2: SB Woodward Avenue & Maple Road

Movement	EB	EB	WB	WB	SB	SB	SB	SB	SB
Directions Served	T	TR	T	T	T	T	T	T	R
Maximum Queue (ft)	139	169	74	33	242	249	243	237	125
Average Queue (ft)	107	148	21	3	225	223	209	179	48
95th Queue (ft)	133	178	48	19	241	247	253	243	97
Link Distance (ft)	96	96	14	14	147	147	147	147	147
Upstream Blk Time (%)	27	39	25	5	24	23	20	14	0
Queuing Penalty (veh)	98	142	89	17	154	149	129	94	1
Storage Bay Dist (ft)									
Storage Blk Time (%)									
Queuing Penalty (veh)									

Intersection: 3: Peabody Street/Park Street & Maple Road

Movement	EB	EB	WB	WB	WB	NB
Directions Served	T	R	L	TR	R	R
Maximum Queue (ft)	504	48	91	152	114	221
Average Queue (ft)	265	18	59	77	10	155
95th Queue (ft)	517	48	90	174	61	266
Link Distance (ft)	478			96	96	203
Upstream Blk Time (%)	11		2	12	1	37
Queuing Penalty (veh)	0		0	54	3	0
Storage Bay Dist (ft)		25	75			
Storage Blk Time (%)	37	0	10	12		
Queuing Penalty (veh)	14	3	74	11		

Intersection: 4: Park Street & Hamilton Row

Movement	EB	WB	NB	SB
Directions Served	LT	TR	TR	LTR
Maximum Queue (ft)	30	55	8	32
Average Queue (ft)	15	27	0	18
95th Queue (ft)	29	47	8	40
Link Distance (ft)	285	2	82	294
Upstream Blk Time (%)		8		
Queuing Penalty (veh)		11		
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 5: SB Woodward Avenue & Hamilton Row

Movement	EB	SB	SB	SB	SB
Directions Served	R	T	T	T	TR
Maximum Queue (ft)	91	211	211	187	180
Average Queue (ft)	46	80	73	60	43
95th Queue (ft)	89	232	220	190	159
Link Distance (ft)	58	135	135	135	135
Upstream Blk Time (%)	10	11	9	6	4
Queuing Penalty (veh)	13	87	71	47	29
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 6: SB Woodward Avenue & Site Driveway

Movement	SB	SB	SB	SB
Directions Served	T	T	T	TR
Maximum Queue (ft)	139	129	120	120
Average Queue (ft)	83	75	59	35
95th Queue (ft)	154	154	147	116
Link Distance (ft)	35	35	35	35
Upstream Blk Time (%)	19	17	14	8
Queuing Penalty (veh)	152	139	114	67
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 8: Site Driveway & Hamilton Row

Movement	EB	WB
Directions Served	TR	LT
Maximum Queue (ft)	36	14
Average Queue (ft)	4	1
95th Queue (ft)	22	9
Link Distance (ft)	2	58
Upstream Blk Time (%)	2	0
Queuing Penalty (veh)	2	0
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 9: SB Woodward Avenue & NB to SB Cross-over

Movement	WB	SB	SB	SB	SB
Directions Served	L	T	T	T	T
Maximum Queue (ft)	63	278	286	272	276
Average Queue (ft)	47	259	254	204	182
95th Queue (ft)	70	272	291	303	306
Link Distance (ft)	4	244	244	244	244
Upstream Blk Time (%)	45	30	18	9	10
Queuing Penalty (veh)	77	0	0	0	0
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Zone Summary

Zone wide Queuing Penalty: 1855

Intersection: 1: NB Woodward Avenue & Maple Road

Movement	EB	WB	WB	NB	NB	NB	NB
Directions Served	T	T	TR	T	T	T	TR
Maximum Queue (ft)	29	568	563	581	498	374	296
Average Queue (ft)	3	540	540	366	324	208	157
95th Queue (ft)	16	553	550	498	451	308	257
Link Distance (ft)	14	523	523	616	616	616	616
Upstream Blk Time (%)	4	94	91	0			
Queuing Penalty (veh)	11	0	0	0			
Storage Bay Dist (ft)							
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 2: SB Woodward Avenue & Maple Road

Movement	EB	EB	WB	WB	SB	SB	SB	SB	SB
Directions Served	T	TR	T	T	T	T	T	T	R
Maximum Queue (ft)	142	190	29	20	226	226	225	225	126
Average Queue (ft)	108	158	9	2	226	225	225	220	38
95th Queue (ft)	128	177	29	12	232	230	234	248	93
Link Distance (ft)	96	96	14	14	147	147	147	147	147
Upstream Blk Time (%)	38	55	14	3	22	23	26	27	0
Queuing Penalty (veh)	156	226	43	9	181	189	212	215	3
Storage Bay Dist (ft)									
Storage Blk Time (%)									
Queuing Penalty (veh)									

Intersection: 3: Peabody Street/Park Street & Maple Road

Movement	EB	EB	WB	WB	WB	NB
Directions Served	T	R	L	TR	R	R
Maximum Queue (ft)	517	52	95	146	58	248
Average Queue (ft)	412	20	50	57	4	220
95th Queue (ft)	615	51	89	142	37	235
Link Distance (ft)	478			96	96	203
Upstream Blk Time (%)	33		1	7	1	100
Queuing Penalty (veh)	0		0	26	2	0
Storage Bay Dist (ft)		25	75			
Storage Blk Time (%)	51	0	6	8		
Queuing Penalty (veh)	16	3	41	6		

Intersection: 4: Park Street & Hamilton Row

Movement	EB	WB	NB	SB
Directions Served	LT	TR	TR	LTR
Maximum Queue (ft)	119	33	61	299
Average Queue (ft)	49	15	16	210
95th Queue (ft)	104	32	48	385
Link Distance (ft)	285	2	82	294
Upstream Blk Time (%)		2	0	38
Queuing Penalty (veh)		1	0	0
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 5: SB Woodward Avenue & Hamilton Row

Movement	EB	SB	SB	SB	SB
Directions Served	R	T	T	T	TR
Maximum Queue (ft)	113	202	201	201	201
Average Queue (ft)	86	148	161	165	157
95th Queue (ft)	103	276	270	267	272
Link Distance (ft)	58	135	135	135	135
Upstream Blk Time (%)	78	14	17	18	17
Queuing Penalty (veh)	189	138	160	169	160
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 6: SB Woodward Avenue & Site Driveway

Movement	EB	SB	SB	SB	SB
Directions Served	R	T	T	T	TR
Maximum Queue (ft)	32	118	117	116	116
Average Queue (ft)	9	108	113	112	105
95th Queue (ft)	32	151	142	141	155
Link Distance (ft)	34	35	35	35	35
Upstream Blk Time (%)	2	20	22	24	21
Queuing Penalty (veh)	0	202	220	239	217
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 8: Site Driveway & Hamilton Row

Movement	EB	WB	NB
Directions Served	TR	LT	LR
Maximum Queue (ft)	53	15	28
Average Queue (ft)	37	1	5
95th Queue (ft)	59	8	22
Link Distance (ft)	2	58	39
Upstream Blk Time (%)	60		0
Queuing Penalty (veh)	146		0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 9: SB Woodward Avenue & NB to SB Cross-over

Movement	WB	SB	SB	SB	SB
Directions Served	L	T	T	T	T
Maximum Queue (ft)	65	259	259	259	259
Average Queue (ft)	47	259	258	258	252
95th Queue (ft)	73	264	267	269	300
Link Distance (ft)	4	244	244	244	244
Upstream Blk Time (%)	46	43	41	36	40
Queuing Penalty (veh)	81	0	0	0	0
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Zone Summary

Zone wide Queuing Penalty: 3262

Intersection: 1: NB Woodward Avenue & Maple Road

Movement	EB	EB	WB	WB	NB	NB	NB	NB
Directions Served	T	T	T	TR	T	T	T	TR
Maximum Queue (ft)	24	23	577	578	650	639	565	554
Average Queue (ft)	3	3	543	544	548	485	368	288
95th Queue (ft)	15	15	560	563	706	647	556	519
Link Distance (ft)	15	15	523	523	616	616	616	616
Upstream Blk Time (%)	3	3	96	89	10	2	1	2
Queuing Penalty (veh)	9	10	0	0	0	0	0	0
Storage Bay Dist (ft)								
Storage Blk Time (%)								
Queuing Penalty (veh)								

Intersection: 2: SB Woodward Avenue & Maple Road

Movement	EB	EB	WB	WB	SB	SB	SB	SB	SB
Directions Served	T	TR	T	T	T	T	T	T	R
Maximum Queue (ft)	164	173	68	24	245	230	236	234	94
Average Queue (ft)	127	153	18	5	218	216	201	165	40
95th Queue (ft)	147	178	45	19	236	242	247	219	78
Link Distance (ft)	110	110	15	15	159	159	159	159	159
Upstream Blk Time (%)	38	45	21	7	13	12	9	3	
Queuing Penalty (veh)	147	172	77	26	94	87	61	24	
Storage Bay Dist (ft)									
Storage Blk Time (%)									
Queuing Penalty (veh)									

Intersection: 3: Peabody Street/Park Street & Maple Road

Movement	EB	WB	WB	WB	NB	SB
Directions Served	TR	L	T	R	R	R
Maximum Queue (ft)	528	124	127	112	216	35
Average Queue (ft)	422	72	66	19	118	2
95th Queue (ft)	625	123	118	64	244	16
Link Distance (ft)	500	110	110	110	206	93
Upstream Blk Time (%)	31	4	1	0	25	
Queuing Penalty (veh)	0	13	5	1	0	
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 4: Park Street & Hamilton Row

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	39	61	26	22
Average Queue (ft)	17	27	2	2
95th Queue (ft)	33	49	12	13
Link Distance (ft)	285	15	94	294
Upstream Blk Time (%)		11		
Queuing Penalty (veh)		15		
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 5: SB Woodward Avenue & Hamilton Row

Movement	EB	SB	SB	SB	SB
Directions Served	R	T	T	T	TR
Maximum Queue (ft)	88	149	98	56	24
Average Queue (ft)	45	13	8	2	1
95th Queue (ft)	82	74	47	25	14
Link Distance (ft)	59	135	135	135	135
Upstream Blk Time (%)	7	0	0		
Queuing Penalty (veh)	9	1	0		
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 6: SB Woodward Avenue & Site Driveway

Movement	SB	SB	SB	SB
Directions Served	T	T	T	TR
Maximum Queue (ft)	118	119	100	82
Average Queue (ft)	59	48	21	4
95th Queue (ft)	125	116	74	31
Link Distance (ft)	28	28	28	28
Upstream Blk Time (%)	7	5	2	0
Queuing Penalty (veh)	60	48	17	3
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 8: Site Driveway & Hamilton Row

Movement	EB
Directions Served	TR
Maximum Queue (ft)	31
Average Queue (ft)	2
95th Queue (ft)	14
Link Distance (ft)	15
Upstream Blk Time (%)	1
Queuing Penalty (veh)	1
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 9: SB Woodward Avenue & NB to SB Cross-over

Movement	WB	SB	SB	SB	SB
Directions Served	L	T	T	T	T
Maximum Queue (ft)	64	280	276	268	271
Average Queue (ft)	47	260	253	196	181
95th Queue (ft)	73	271	287	296	303
Link Distance (ft)	4	244	244	244	244
Upstream Blk Time (%)	43	25	14	4	5
Queuing Penalty (veh)	76	0	0	0	0
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Zone Summary

Zone wide Queuing Penalty: 956

Intersection: 1: NB Woodward Avenue & Maple Road

Movement	EB	WB	WB	NB	NB	NB	NB
Directions Served	T	T	TR	T	T	T	TR
Maximum Queue (ft)	15	573	567	593	508	400	313
Average Queue (ft)	1	539	538	425	362	245	176
95th Queue (ft)	11	571	571	590	492	361	274
Link Distance (ft)	15	523	523	616	616	616	616
Upstream Blk Time (%)	2	93	88	1			
Queuing Penalty (veh)	7	0	0	0			
Storage Bay Dist (ft)							
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 2: SB Woodward Avenue & Maple Road

Movement	EB	EB	WB	WB	SB	SB	SB	SB	SB
Directions Served	T	TR	T	T	T	T	T	T	R
Maximum Queue (ft)	145	184	26	24	218	222	227	232	127
Average Queue (ft)	116	157	5	3	217	222	226	226	32
95th Queue (ft)	135	170	21	14	224	225	240	253	81
Link Distance (ft)	106	106	15	15	162	162	162	162	162
Upstream Blk Time (%)	37	52	7	4	17	18	21	20	
Queuing Penalty (veh)	165	231	22	14	146	155	174	167	
Storage Bay Dist (ft)									
Storage Blk Time (%)									
Queuing Penalty (veh)									

Intersection: 3: Peabody Street/Park Street & Maple Road

Movement	EB	WB	WB	WB	NB	SB
Directions Served	TR	L	T	R	R	R
Maximum Queue (ft)	558	105	119	102	255	60
Average Queue (ft)	490	51	59	10	223	16
95th Queue (ft)	618	96	108	47	243	41
Link Distance (ft)	500	106	106	106	206	93
Upstream Blk Time (%)	54	1	1	0	97	
Queuing Penalty (veh)	0	2	3	0	0	
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 4: Park Street & Hamilton Row

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	111	31	54	120
Average Queue (ft)	38	14	9	43
95th Queue (ft)	79	30	37	108
Link Distance (ft)	285	15	94	294
Upstream Blk Time (%)		4		
Queuing Penalty (veh)		2		
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 5: SB Woodward Avenue & Hamilton Row

Movement	EB	SB	SB	SB	SB
Directions Served	R	T	T	T	TR
Maximum Queue (ft)	116	202	201	201	200
Average Queue (ft)	87	109	131	145	126
95th Queue (ft)	107	233	235	246	245
Link Distance (ft)	59	135	135	135	135
Upstream Blk Time (%)	56	6	7	9	7
Queuing Penalty (veh)	143	56	74	90	71
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 6: SB Woodward Avenue & Site Driveway

Movement	EB	SB	SB	SB	SB
Directions Served	R	T	T	T	TR
Maximum Queue (ft)	36	119	114	110	105
Average Queue (ft)	9	108	108	104	86
95th Queue (ft)	31	151	141	140	144
Link Distance (ft)	29	23	23	23	23
Upstream Blk Time (%)	1	14	15	17	13
Queuing Penalty (veh)	0	150	161	178	138
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 8: Site Driveway & Hamilton Row

Movement	EB	WB	NB
Directions Served	TR	LT	LR
Maximum Queue (ft)	45	7	28
Average Queue (ft)	25	0	7
95th Queue (ft)	46	5	26
Link Distance (ft)	15	59	39
Upstream Blk Time (%)	29		0
Queuing Penalty (veh)	75		0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 9: SB Woodward Avenue & NB to SB Cross-over

Movement	WB	SB	SB	SB	SB
Directions Served	L	T	T	T	T
Maximum Queue (ft)	71	259	259	259	259
Average Queue (ft)	49	259	259	259	256
95th Queue (ft)	75	260	259	262	291
Link Distance (ft)	4	244	244	244	244
Upstream Blk Time (%)	45	48	48	47	51
Queuing Penalty (veh)	85	0	0	0	0
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Zone Summary

Zone wide Queuing Penalty: 2310

Intersection: 1: NB Woodward Avenue & Maple Road

Movement	EB	EB	WB	WB	NB	NB	NB	NB
Directions Served	T	T	T	TR	T	T	T	TR
Maximum Queue (ft)	23	27	586	580	643	655	597	586
Average Queue (ft)	3	2	546	542	590	525	404	337
95th Queue (ft)	15	11	565	560	699	666	605	584
Link Distance (ft)	15	15	523	523	616	616	616	616
Upstream Blk Time (%)	3	2	95	88	15	5	2	3
Queuing Penalty (veh)	9	6	0	0	0	0	0	0
Storage Bay Dist (ft)								
Storage Blk Time (%)								
Queuing Penalty (veh)								

Intersection: 2: SB Woodward Avenue & Maple Road

Movement	EB	EB	WB	WB	SB	SB	SB	SB	SB
Directions Served	T	TR	T	T	T	T	T	T	R
Maximum Queue (ft)	162	162	74	24	326	325	313	307	173
Average Queue (ft)	124	153	13	4	250	248	228	212	45
95th Queue (ft)	157	182	40	19	318	318	300	309	110
Link Distance (ft)	113	113	15	15	245	245	245	245	245
Upstream Blk Time (%)	27	39	14	7	5	4	2	2	0
Queuing Penalty (veh)	105	153	56	25	33	28	14	15	0
Storage Bay Dist (ft)									
Storage Blk Time (%)									
Queuing Penalty (veh)									

Intersection: 3: Peabody Street/Park Street & Maple Road

Movement	EB	WB	WB	WB	NB	SB
Directions Served	TR	L	T	R	R	R
Maximum Queue (ft)	529	135	133	90	221	23
Average Queue (ft)	316	76	66	13	105	6
95th Queue (ft)	567	131	118	49	219	21
Link Distance (ft)	500	113	113	113	206	93
Upstream Blk Time (%)	11	5	2	0	6	
Queuing Penalty (veh)	0	17	6	0	0	
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 4: Park Street & Hamilton Row

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	43	64	27	27
Average Queue (ft)	19	29	2	3
95th Queue (ft)	33	51	12	17
Link Distance (ft)	285	15	94	294
Upstream Blk Time (%)		13		
Queuing Penalty (veh)		24		
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 5: SB Woodward Avenue & Hamilton Row

Movement	EB	SB	SB	SB	SB
Directions Served	R	T	T	T	TR
Maximum Queue (ft)	71	114	81	49	100
Average Queue (ft)	39	8	0	2	8
95th Queue (ft)	61	67	6	23	58
Link Distance (ft)	60	135	135	135	135
Upstream Blk Time (%)	1	0			0
Queuing Penalty (veh)	2	1			2
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 7: Park Street & Site Driveway

Movement	WB	NB	SB
Directions Served	LR	TR	LT
Maximum Queue (ft)	29	15	16
Average Queue (ft)	12	1	1
95th Queue (ft)	35	7	10
Link Distance (ft)	52	93	94
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 8: Site Driveway & Hamilton Row

Movement	WB
Directions Served	LT
Maximum Queue (ft)	40
Average Queue (ft)	2
95th Queue (ft)	22
Link Distance (ft)	60
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 9: SB Woodward Avenue & NB to SB Cross-over

Movement	WB	SB	SB	SB	SB
Directions Served	L	T	T	T	T
Maximum Queue (ft)	60	290	274	266	267
Average Queue (ft)	49	261	254	202	202
95th Queue (ft)	69	273	283	297	310
Link Distance (ft)	4	244	244	244	244
Upstream Blk Time (%)	44	26	15	5	6
Queuing Penalty (veh)	86	0	0	0	0
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Zone Summary

Zone wide Queuing Penalty: 622

Intersection: 1: NB Woodward Avenue & Maple Road

Movement	EB	WB	WB	NB	NB	NB	NB
Directions Served	T	T	TR	T	T	T	TR
Maximum Queue (ft)	29	568	568	628	548	418	381
Average Queue (ft)	3	539	538	451	397	257	204
95th Queue (ft)	19	556	555	602	532	383	324
Link Distance (ft)	15	523	523	616	616	616	616
Upstream Blk Time (%)	4	95	91	0	0		
Queuing Penalty (veh)	15	0	0	0	0		
Storage Bay Dist (ft)							
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 2: SB Woodward Avenue & Maple Road

Movement	EB	EB	WB	WB	SB	SB	SB	SB	SB
Directions Served	T	TR	T	T	T	T	T	T	R
Maximum Queue (ft)	156	186	20	25	326	325	324	323	310
Average Queue (ft)	127	164	3	2	324	323	320	317	153
95th Queue (ft)	149	176	15	13	347	340	348	345	359
Link Distance (ft)	113	113	15	15	245	245	245	245	245
Upstream Blk Time (%)	32	51	5	3	22	22	22	29	6
Queuing Penalty (veh)	144	228	17	10	189	195	192	249	49
Storage Bay Dist (ft)									
Storage Blk Time (%)									
Queuing Penalty (veh)									

Intersection: 3: Peabody Street/Park Street & Maple Road

Movement	EB	WB	WB	WB	NB	SB
Directions Served	TR	L	T	R	R	R
Maximum Queue (ft)	557	98	110	80	252	78
Average Queue (ft)	506	45	52	10	224	27
95th Queue (ft)	610	95	94	42	238	64
Link Distance (ft)	500	113	113	113	206	93
Upstream Blk Time (%)	62	1	1	0	99	0
Queuing Penalty (veh)	0	3	1	0	0	0
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 4: Park Street & Hamilton Row

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	70	58	32	70
Average Queue (ft)	30	25	4	19
95th Queue (ft)	54	47	19	52
Link Distance (ft)	285	15	94	294
Upstream Blk Time (%)		10		
Queuing Penalty (veh)		9		
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 5: SB Woodward Avenue & Hamilton Row

Movement	EB	SB	SB	SB	SB
Directions Served	R	T	T	T	TR
Maximum Queue (ft)	98	202	201	201	201
Average Queue (ft)	67	183	181	168	168
95th Queue (ft)	102	264	264	268	257
Link Distance (ft)	60	135	135	135	135
Upstream Blk Time (%)	11	19	19	17	17
Queuing Penalty (veh)	36	195	197	173	170
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 7: Park Street & Site Driveway

Movement	WB	NB	SB
Directions Served	LR	TR	LT
Maximum Queue (ft)	43	6	25
Average Queue (ft)	19	0	1
95th Queue (ft)	43	4	10
Link Distance (ft)	52	93	94
Upstream Blk Time (%)	0		
Queuing Penalty (veh)	0		
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 8: Site Driveway & Hamilton Row

Movement	EB
Directions Served	TR
Maximum Queue (ft)	38
Average Queue (ft)	7
95th Queue (ft)	29
Link Distance (ft)	15
Upstream Blk Time (%)	2
Queuing Penalty (veh)	5
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 9: SB Woodward Avenue & NB to SB Cross-over

Movement	WB	SB	SB	SB	SB
Directions Served	L	T	T	T	T
Maximum Queue (ft)	63	259	259	259	259
Average Queue (ft)	50	258	259	259	259
95th Queue (ft)	69	264	262	261	264
Link Distance (ft)	4	244	244	244	244
Upstream Blk Time (%)	51	46	44	42	57
Queuing Penalty (veh)	107	0	0	0	0
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Zone Summary

Zone wide Queuing Penalty: 2185

2016 Annual Air Quality Report

Michigan

Department of Environmental Quality

For information or assistance regarding this publication, contact the Department Of Environmental Quality, Air Quality Division, P.O. Box 30260, Lansing, MI 48909-7760 or the DEQ Environmental Assistance Center toll-free number (800-662-9278)

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AQES, Air Monitoring Unit Staff:

Peter DeHart
Jason Duncan
Craig Fitzner
Marc Foreman
Eric Gafner
Tom Gauthier
Navnit Ghuman
Eric Hansen
Cynthia Hodges, editor
Steve Irrer
Susan Kilmer
Dan Ling
Bryan Lomerson
Mark Lotoszinski
Matthew Nowak
Matt Riselay
Amy Robinson
Debbie Sherrod

AQES, Biowatch Unit Staff: David Gregory

AQES, SIP Unit Staff: Mary Maupin

AQES, Strategy Develop Unit Staff: Jim Haywood

AQES, Toxics Unit Staff: Mike Depa, Doreen Lehner, Bob Sills, Keisha Williams

AQES, Section Secretary: Lorraine Hickman

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Cover Photos: Top – Foliage near Kalkaska, Courtesy of Andrew Kent, Lower Right and Lower Left – Leaves, Courtesy of Peter DeHart

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APPENDICES

2016 Air Quality Report

Introduction

The federal Clean Air Act (CAA) requires the United States Environmental Protection Agency (USEPA) to establish National Ambient Air Quality Standards (NAAQS) for six criteria pollutants considered harmful to public health and the environment. Criteria pollutants are the pollutants for which the USEPA must describe the characteristics and potential health and welfare effects.These standards define the maximum permissible concentration of criteria pollutants in the air (see **Table 1.1**).

The six criteria pollutants are monitored by the Michigan Department of Environmental Quality (DEQ), Air Quality Division (AQD). These criteria pollutants are:

- Carbon monoxide (CO),
- Lead (Pb),
- Nitrogen dioxide (NO_2),
- Ozone (O_3),
- Particulate matter smaller than 10 and 2.5 microns in diameter (PM_{10} and $PM_{2.5}$, respectively), and
- Sulfur dioxide (SO_2).

Chapters 2 through **7** provide information on each of the six criteria pollutants and include:

- Michigan's monitoring requirements for 2016,
- Attainment/nonattainment status,
- Monitoring site locations (tables show all the monitors active in 2016), and
- Air quality trends from 2011-2016 broken down by location.[1]

The 2016 data for each criteria pollutant is available in **Appendix A.**

The AQD also monitors air toxics. Air toxics are other hazardous air pollutants that can affect human health and the environment.[2] This data can be found in **Appendix B.**

The purpose of this report is to provide a snapshot of Michigan's 2016 air quality data, air quality trends, overview of the monitoring network (available in much greater detail in the 2016 Network Review),[3] air toxics monitoring program, and other AQD programs, such as MIair and the Emissions Inventory.[4]

[1] Air quality trends are based on actual statewide monitored readings, which are also listed in the USEPA's Air Quality Subsystem Quick Look Report Data at https://www3.epa.gov/airtrends/
[2] A fact sheet and a Citizen's guide to participation are available on the DEQ's website at http://www.michigan.gov/documents/deq/deq-ess-caap-citizensguidetomiairpollutioncontrol_195548_7.pdf and http://www.michigan.gov/documents/deq/deq-ead-guide-aqdguide_273529_7.pdf.
[3] Available online at http://www.michigan.gov/documents/deq/deq-aqd-toxics-2016_Air_Mon_Network_Review_489490_7.pdf
[4] Online information about criteria pollutants and air toxics, along with this and previous Annual Air Quality Reports, are available via the AQD's website at http://www.michigan.gov/deq/0,4561,7-135-3310_4195---,00.html

Chapter 1: Background Information

This chapter provides a summary of the development of the NAAQS (see Appendix D) and how compliance with these standards is determined. Also included is an overview of Michigan's air sampling network, long-term air quality trends, and the variety of monitoring techniques and requirements used to ensure quality data is obtained.

National Ambient Air Quality Standards (NAAQS)

Under Section 109 of the CAA, the USEPA established a primary and secondary NAAQS for each pollutant for which air quality criteria have been issued. The primary standard is designed to protect the public health with an adequate margin of safety, including the health of the most susceptible individuals in a population, such as children, the elderly, and those with chronic respiratory ailments. Factors in selecting the margin of safety for the primary standard include the nature and severity of the health effects involved and the size of the sensitive population at risk. Secondary standards are chosen to protect public welfare (personal comfort and well-being) and the environment by limiting economic damage, impacts on visibility and climate, and harmful effects on soil, water, crops, vegetation, wildlife, and buildings.

In addition, the NAAQS have various averaging times to address health impacts. Short averaging times reflect the potential for acute (immediate) effects, whereas long-term averaging times are designed to protect against chronic (long-term) effects.

NAAQS have been established for CO, Pb, NO_2, PM, O_3, and SO_2. **Table 1.1** lists the primary and secondary NAAQS, averaging time and concentration level for each criteria pollutant in effect in 2016. The concentrations are listed as parts per million (ppm), micrograms per cubic meter ($\mu g/m^3$), and/or milligrams per cubic meter (mg/m^3).

Table 1.1: NAAQS in Effect during 2016 for Criteria Pollutants

Pollutant	Primary (health-related)		Secondary (welfare-related)	
	Level	Averaging Time	Level	Averaging Time
Carbon Monoxide (CO)	9 ppm (10 mg/m^3)	8-hour average, not to be exceeded more than once per year *(1971)*	None*	
	35 ppm (40 mg/m^3)	1-hour average, not to be exceeded more than once per year *(1971)*		
Lead (Pb)	0.15 $\mu g/m^3$	Maximum rolling 3-month average *(2008)*	Same as Primary	
Nitrogen Dioxide (NO_2)	0.053 ppm (100 $\mu g/m^3$)	Annual mean *(1971)*	Same as Primary	
	0.100 ppm	98th percentile of 1-hour average, averaged over 3 years *(2010)*	None	
Particulate Matter (PM_{10})	150 $\mu g/m^3$	24-hour average, not to be exceeded more than once per year over 3 years *(1987)*	Same as Primary	
Particulate Matter ($PM_{2.5}$)	12.0 $\mu g/m^3$	Annual mean, averaged over 3 years *(2012)*	15.0 $\mu g/m^3$	Annual mean
	35 $\mu g/m^3$	98th percentile of 24-hour concentration, averaged over 3 years *(2006)*	Same as Primary	
Ozone (O_3)	0.070 ppm	Annual 4th highest 8-hour daily max averaged over 3 years *(2015)*	Same as Primary	
Sulfur Dioxide (SO_2)	0.075 ppm	99th percentile of 1-hour daily max averaged over 3 years *(2010)*	0.5 ppm	3 hours

*In 1985, the USEPA revoked the secondary standard for CO (for public welfare) due to a lack of evidence of adverse effects on public welfare at or near ambient concentrations.

To demonstrate compliance with the NAAQS, the USEPA has defined specific criteria for each pollutant, which are summarized in **Table 1.2.**

Table 1.2: Criteria for the Determination of Compliance with the NAAQS

POLLUTANT	CRITERIA FOR COMPLIANCE
CO	Compliance with the CO standard is met when the second highest, non-overlapping, 35 ppm, 1-hour average standard and/or the 9 ppm, 8-hour average standard is not exceeded more than once per year.
Pb	Compliance with the Pb standard is met when daily values collected for 3 consecutive months are averaged and do not exceed the 0.15 µg/m^3 standard.
NO_2	Compliance is met when the annual arithmetic mean concentration does not exceed the 0.053 ppm standard and the 98th percentile* of the daily maximum 1-hour concentration averaged over 3 years does not exceed 100 ppb.
PM	PM_{10}: The 24-hour PM_{10} primary and secondary standards are met when 150 µg/m^3 is not exceeded more than once per year on average over 3 years.
	$PM_{2.5}$: The annual $PM_{2.5}$ primary and secondary standards are met when the annual arithmetic mean concentration is less than or equal to 12 µg/m^3 and 15 µg/m^3, respectively. The 24-hour $PM_{2.5}$ primary and secondary standards are met when the 3-year average of the 98th percentile** 24-hour concentration is less than or equal to 35 µg/m^3.
O_3	The 8-hour O_3 primary and secondary standards are met when the 3-year average of the 4th highest daily maximum 8-hour average concentration is less than or equal to 0.070 ppm.
SO_2	To determine compliance, the 99th percentile*** 1-hour concentration averaged over a 3-year period does not exceed 0.075 ppm, and the 3-hour average concentration shall not exceed 0.5 ppm more than once per calendar year.

***98th percentile daily maximum 1-hour value* is the value below which nominally 98 percent of all daily maximum 1-hour concentration values fall, using the ranking and selection method specified in section 5.2 of appendix S of CFR Part 50.

** *98th percentile* is the daily value out of a year of $PM_{2.5}$ monitoring data below which 98 percent of all daily values fall using the ranking and selection method specified in section 4.5(a) of appendix N of CFR Part 50.

*** *99th percentile daily maximum 1-hour value* is the value below which nominally 99 percent of all daily maximum 1-hour concentration values fall, using the ranking and selection method specified in section 5 of appendix T of CFR Part 50.

As part of the USEPA's grant to the DEQ, the AQD provides an annual Network Review document[5] of all monitoring data collected from the previous year and recommendations on any network changes. These recommendations are based on each monitor's exceedance history, changes in population distribution, and modifications to federal monitoring requirements under the CAA. Under the amended air monitoring regulations that began in 2007, states are required to solicit public comment (in May of each year) on their future air monitoring network design prior to submitting the annual review to the USEPA in July.

Michigan Air Sampling Network

The Michigan Air Sampling Network (MASN) is operated by the DEQ's AQD, along with other governmental agencies. For instance, the O_3 and $PM_{2.5}$ monitors in Manistee County and Chippewa County are tribal monitors handled by the Little River Band of Ottawa Indians and the Inter-tribal Council of Michigan, respectively. **Figure 1.1** shows the 2016 MASN monitoring sites. **Figures 1.2** and **1.3** are pictures of two monitoring stations; one at Coloma and the other at New Mount Herman 48217 (NMH 48217), respectively.

[5] Most recent Network Reviews are available online at: http://www.michigan.gov/documents/deq/deq-aqd-toxics-2016_Air_Mon_Network_Review_489490_7.pdf

The MASN consists of federal reference method (FRM) monitors that enable continuous monitoring for the gaseous pollutants CO, NO_2, O_3, and SO_2, PM monitors that measure particulate concentrations over a 24-hour period, and high volume samplers for Pb. In addition, continuous $PM_{2.5}$ and PM_{10} monitors provide real-time hourly data. $PM_{2.5}$ chemical speciation monitors determine the chemical composition of $PM_{2.5}$. The MASN data is also used to provide timely reporting to the DEQ's air quality reporting web page (discussed in **Chapter 9**). The types of monitoring conducted in 2016 and the MASN locations are shown in **Table 1.3.**

The **NCore network** began January 1, 2011, as part of the USEPA's 2006 amended air monitoring requirements. NCore is a multi-pollutant network that integrates several advance measurement systems for particles, pollutant gases, and meteorology. This information will support scientific studies ranging across technological, health, and atmospheric process disciplines. Michigan has two NCore sites; Allen Park and Grand Rapids-Monroe Street. Further information on the effects of these criteria pollutants is provided in **Chapters 2** through **7**.

The **Near-Road Monitoring Network** focuses on vehicle emissions and how they disperse near roadways. In 2011 Michigan took over the USEPA's pre-existing near-roadway site at Eliza Howell Park in Detroit. A second near-road site was added in Livonia in January 2015. Data from these sites are presented in **Chapters 2** and **5.**

Figure 1.1: 2016 MASN Monitoring Sites

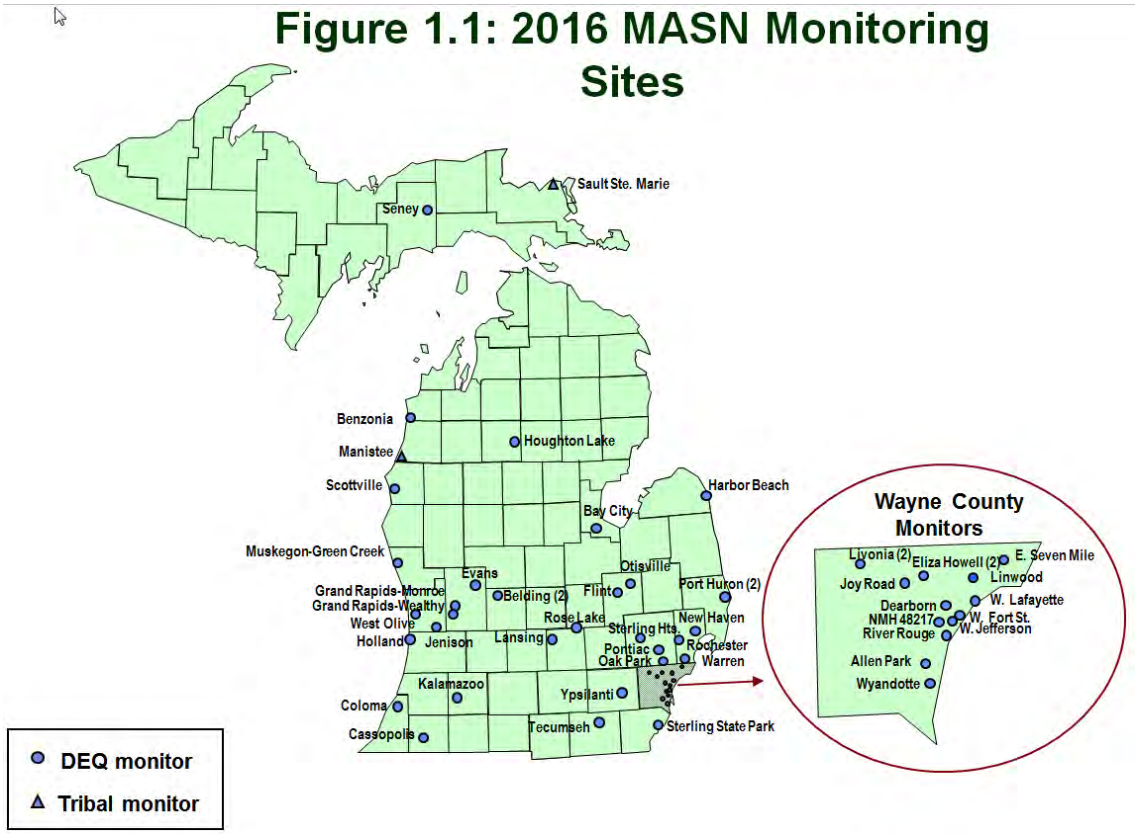


Figure 1.2: Coloma Monitoring Site

Figure 1.3: New Mount Hermon (NMH 48217) Monitoring Site

Table 1.3 Types of Monitoring Conducted in 2016 and MASN Location

Area	AIRS ID	Site Name	CO	NO_2	Trace NO_y	O_3	PM_{10}	$PM_{2.5}$	$PM_{2.5}$ TEOM	$PM_{2.5}$ Speciation	SO_2	Trace SO_2	VOC	Carbonyls	Trace Metals	Wind Speed & Direction, Temp.	Relative Humidity	Solar Radiation	Barometric Pressure
Detroit-Ann Arbor	260910007	Tecumseh				√		√	√	√+E						√			√
	260990009	New Haven				√		√								√	√	√	
	260991003	Warren				√													
	261250001	Oak Park				√		√								√			
	261470005	Port Huron				√		√	√		√					√			
	261470031	Port Huron-Rural St.													√@+Pb				
	261610008	Ypsilanti				√		√	√							√			√
	261630001	Allen Park	√*		√	√	√	√	√	√+A		√			√@+Pb	√	√		√
	261630005	River Rouge					√							√	√@	√			
	261630015	Detroit-W. Fort St.					√	√		√	√		√	√	√@	√	√		√
	261630016	Detroit-Linwood						√											
	261630019	Detroit-E. 7 Mile		√		√		√								√	√		√
	261630025	Livonia						√											
	261630027	Detroit-W. Jefferson													√@				
	261630033	Dearborn					√	√	√	√+EA			√	√	√ + Pb	√	√		√
	261630036	Wyandotte						√											
	261630039	Detroit-W. Lafayette						√	√							√			
	261630093	Eliza Howell-Roadway	√	√		√										√			
	261630094	Eliza Howell-Downwind	√	√		√										√	√		√
	261630095	Livonia-Roadway	√	√				√								√	√		√
	261630097	NMH 48217							√		√		√		√ + Pb				
Flint	260490021	Flint				√		√	√							√			√
	260492001	Otisville				√										√			
Grand Rapids	261390005	Jenison				√										√			
	261390011	West Olive									√					√			
	260810007	Grand Rapids-Wealthy						√											
	260810020	Grand Rapids-Monroe	√*		√	√	√	√	√	√		√			√@+Pb	√			√
	260810022	Evans				√										√			
Lansing/East Lansing	260650012	Lansing		√		√		√	√		√					√			√
	260370001	Rose Lake				√													
Monroe Co	261150006	Sterling State Park						√			√					√			
Huron Co	260630007	Harbor Beach				√										√			
Bay Co	260170014	Bay City						√	√							√			
Missaukee Co	261130001	Houghton Lake		√		√		√	√							√			√
Allegan Co	260050003	Holland				√		√								√	√	√	√
Benzie Co	260190003	Benzonia				√													
Berrien Co	260210014	Coloma				√		√								√			
Cass Co	260270003	Cassopolis				√										√			
Kalamazoo Co	260770008	Kalamazoo				√		√	√							√			
Manistee Co	261010922	Manistee $				√		√								√		√	√
Mason Co	261050007	Scottville				√										√			
Muskegon Co	261210039	Muskegon-Green				√										√			
Schoolcraft Co	261530001	Seney Nat'l Wildlife				√			√							√	√	√	√
Chippewa Co	260330901	Sault Ste. Marie $				√		√	√							√			
Ionia Co	260670002	Belding-Reed St.													√@+Pb	√			
	260670003	Belding-Merrick St.													√@+Pb				

√ = Data Collected
= Mn only
@ = Mn, As, Cd, Ni
Pb = Lead
$ = Tribal monitor
* = Trace CO monitor
E = EC/OC monitor
A = Aethalometer monitor

Quality Assurance

The AQD's Air Monitoring Unit (AMU) ensures that all data collected and reported is of high quality and meets federal requirements. The AMU has a quality system in place that includes a Quality Assurance Project Plan (QAPP), standard operating procedures (SOPs), standardized forms and documentation policies, and a robust audit and assessment program.

The monitoring network adheres to the requirements in Title 40 of the Code of Federal Regulations (CFR), Parts 50, 53, and 58. This ensures that the monitors are correctly sited, operated in accordance to the federal reference methods, and adhere to the quality assurance requirements.

Quality assurance checks are conducted by site operators at the frequencies required in the regulations and unit procedures. Independent audits are conducted by the AMU's Quality Assurance (QA) Team, which has a separate reporting line of supervision. The quality assurance checks and audits are reported to the USEPA each quarter.

External audits are conducted annually by the USEPA. The USEPA conducts Performance Evaluation Program (PEP) audits for $PM_{2.5}$ samplers and the National Performance Audit Program (NPAP) checks for the gaseous monitors. The USEPA also conducts program-wide Technical Systems Audits (TSAs) every three years to evaluate overall program operations, and assess adequacy of documentation and records retention. External audits are also conducted on the laboratory operations for certain analytical techniques using performance evaluation samples.

Long-term Trends

Congress passed the CAA in 1970; however, Michigan has had a long-standing history of environmental awareness well before the Act was established. In 1887, Detroit was the first city in Michigan to adopt an air quality ordinance, which declared that the dense smoke from burning coal was a public nuisance.

The USEPA is required to review the criteria pollutant standards every five years. Over time, based upon toxicological data, the standards (NAAQS) have been tightened to better protect public health (see Appendix D). Areas that meet the NAAQS are considered to be in "attainment." Locations where air pollution levels persistently exceed the NAAQS may be designated as "nonattainment." The tightening standards are why some areas in the state may be designated to nonattainment from attainment even though monitoring shows that air quality continues to improve.

Due to the vast availability of historical data, criteria pollutant data from Southeast Michigan are shown in **Figures 1.4** through **1.9.** These figures show how the ambient levels and the standards for these pollutants have changed over the last 35-plus years. Since Southeast Michigan is highly industrialized, it is a good indicator of the air quality improvement for the rest of the state.

Figure 1.4 shows the ozone levels at the Detroit E. 7 Mile Road site. This graph shows how the standard changed from a 1-hour average of 0.120 ppm to an 8-hour average of 0.08 ppm in 1997. The standard was further lowered to 0.075 ppm in 2008 and to 0.070 ppm at the end of 2015.

Figure 1.4: Historical Ozone at DEQ's Detroit E. 7 Mile Site

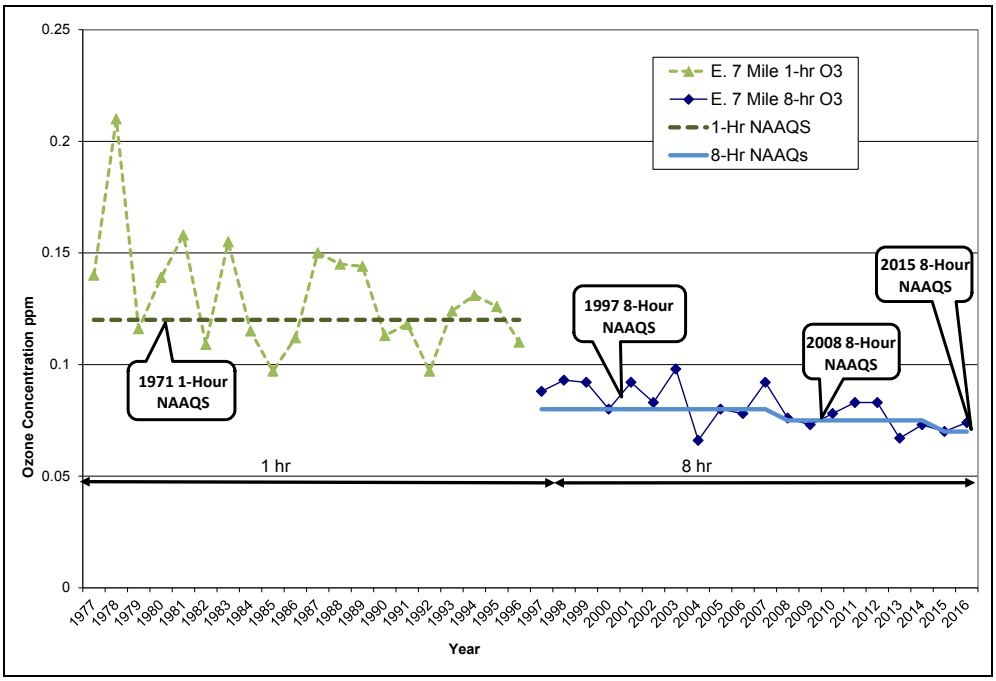


Figure 1.5 shows the SO_2 trend for the old annual standard and the new 1-hour standard for W. Fort Street (SWHS) in Detroit. In 2010, the USEPA changed the standard from an annual average to 99th percentile of a 1-hour standard in which the SO_2 concentration cannot exceed 0.075 ppm averaged over 3 years. This resulted in nonattainment status for a portion of Wayne County (see **Chapter 4** for additional details). Even though the area is in nonattainment for the 1-hour SO_2 standard, levels of SO_2 have decreased significantly over the years.

Figure 1.5: Historical Annual and 1-hour SO_2 Averages at Detroit–W. Fort Street (SWHS)

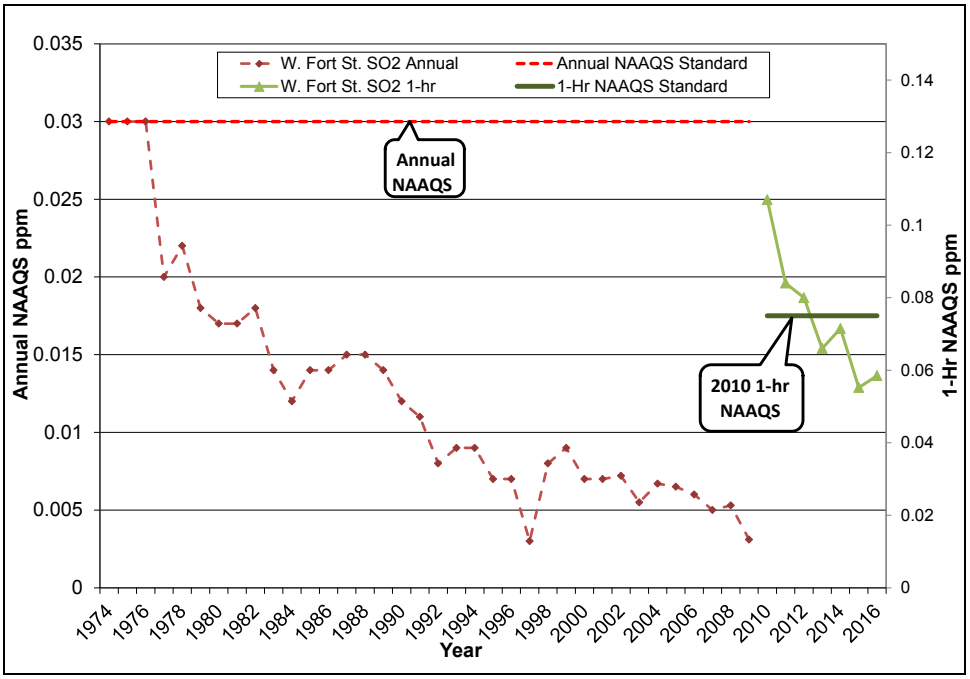


Figure 1.6 shows the CO trend at Allen Park to be well below the 1-hour standard of 35 ppm, which has not changed since 1971.

Figure 1.6: Historical 1-hour CO Averages at Allen Park

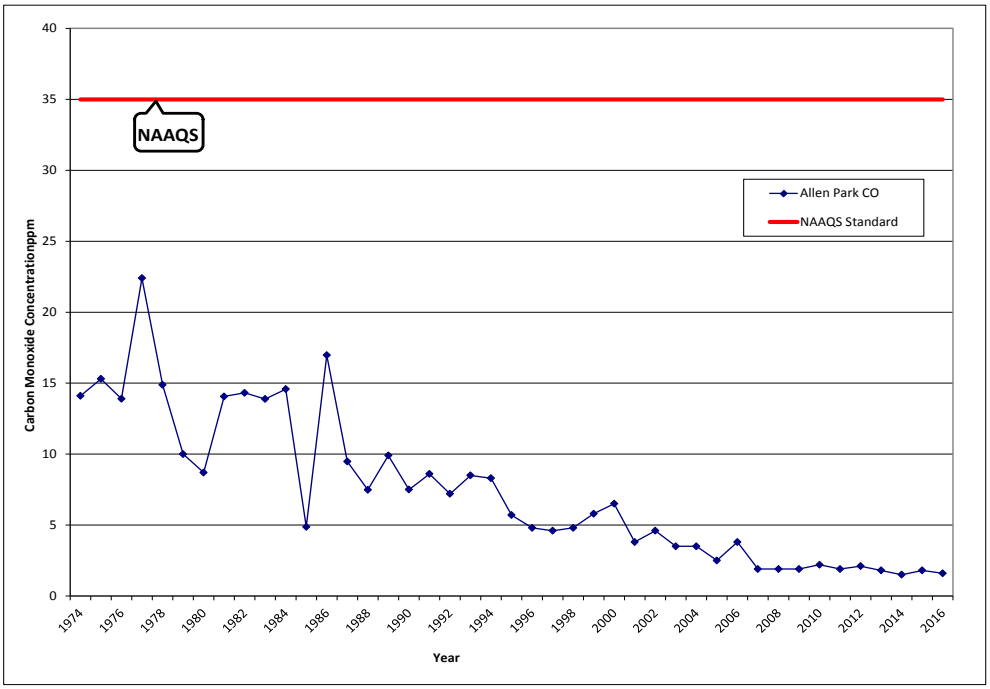


Figure 1.7 shows the trend for lead at Dearborn. Lead is of concern because it is harmful to the neurological development of children. The largest decrease in lead in the air is due to the removal of lead in gasoline. By 1975, most newly manufactured vehicles no longer required leaded gasoline, and as a result, there was a dramatic decrease in ambient lead levels. In 1996, the USEPA banned the sale of leaded fuel for use in on-road vehicles. The graph also shows the decrease in the lead standard that occurred in 2008.

Figure 1.7: Historical Quarterly/3-month Averages for Lead at Dearborn

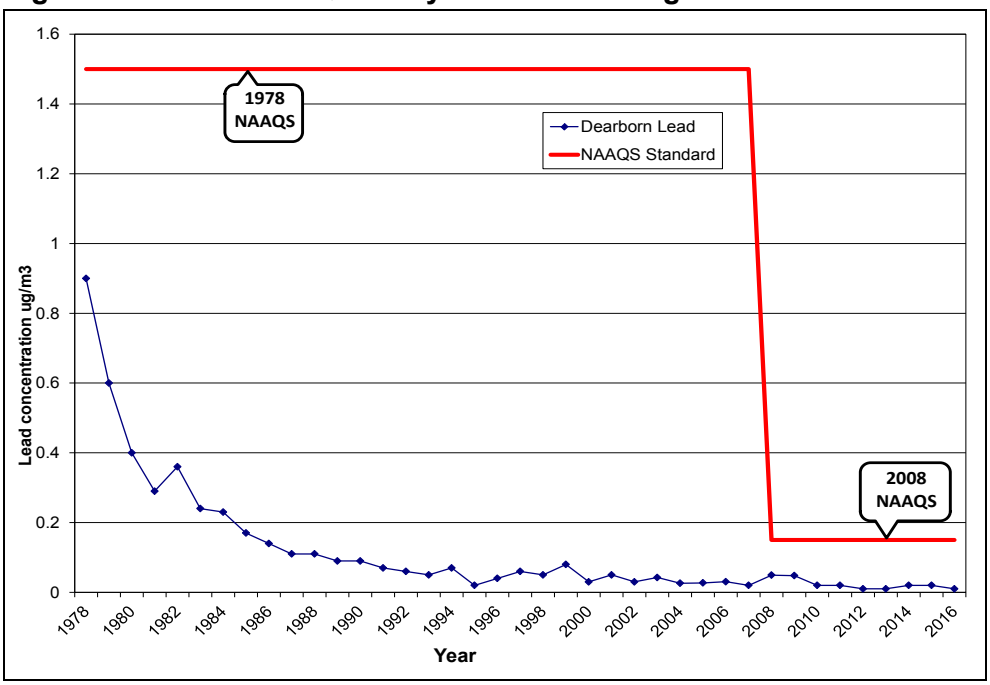


Figure 1.8 shows the trend for NO_2, which has been well below the annual standard of 53 ppb, and shows a downward trend. In 2010, the USEPA added a 1-hour standard of the 98th percentile not to exceed 100 ppb averaged over 3 years. One-hour NO_2 concentrations in Michigan have also remained well below the standard.

Figure 1.8: Historical Annual NO_2 at E. 7 Mile Road

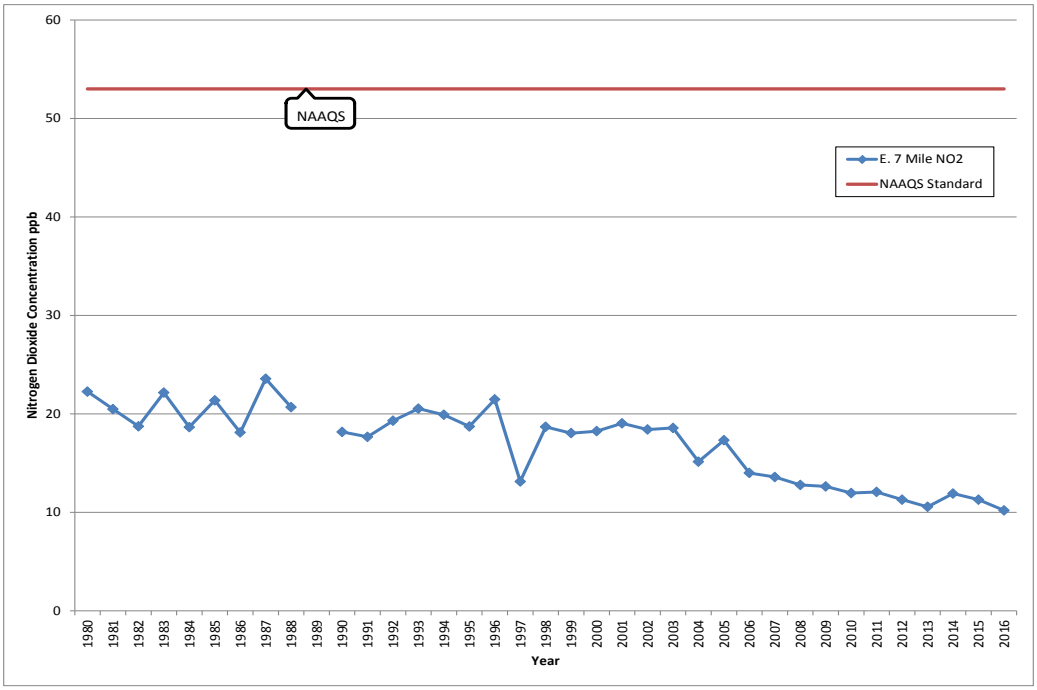
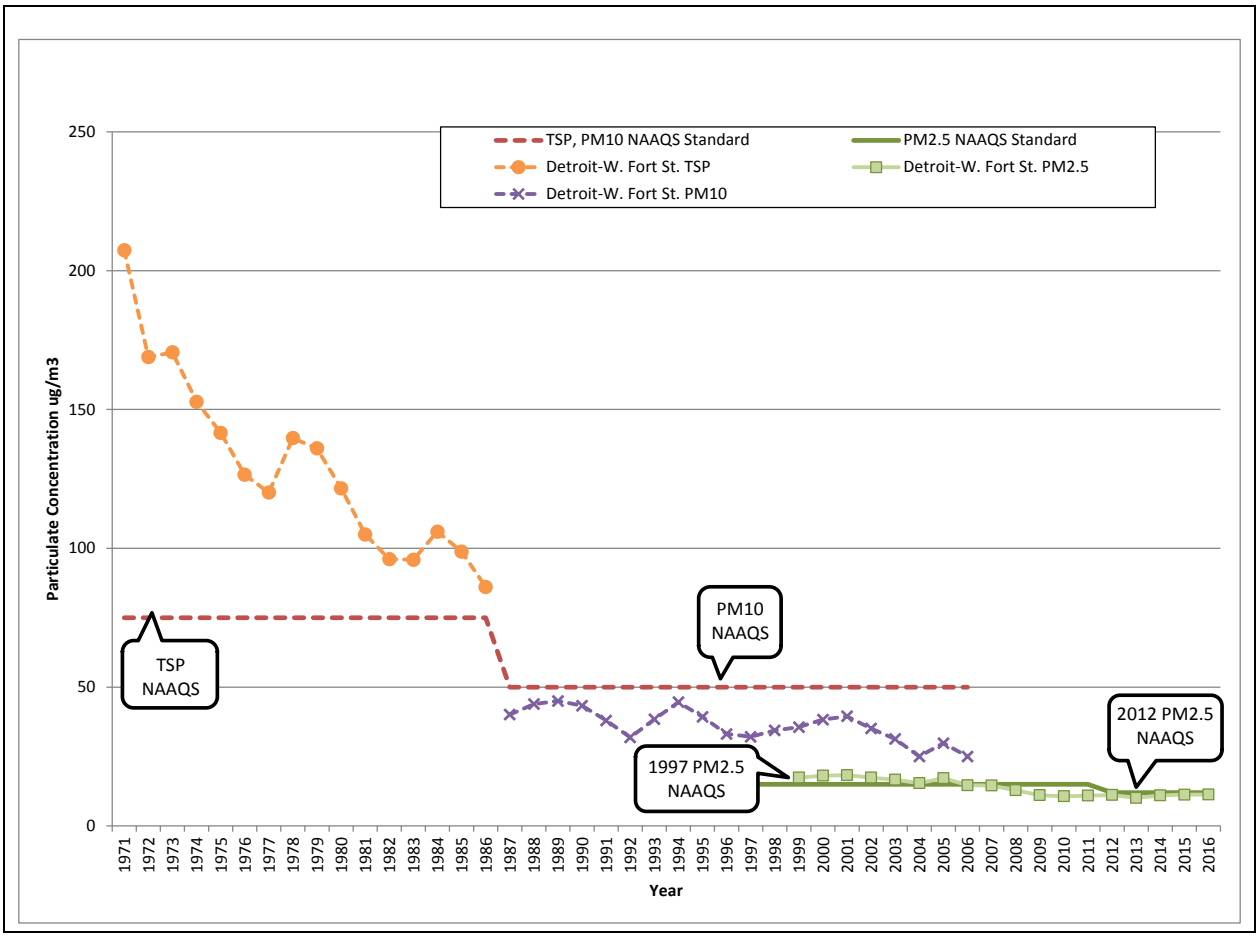


Figure 1.9 shows the trends for particulate matter. In 1971, the USEPA promulgated an annual and 24-hour particulate standard based on total suspended particulates (TSP). In 1987, the USEPA changed the standard to $PM_{10.}$ Health studies indicated that particles smaller than 10 microns affect respiration. In 1997, the USEPA added additional NAAQS for a smaller particle fraction size, $PM_{2.5}$, which can get deeper into the lungs and possibly into the blood stream. In 2006, the USEPA revoked the PM_{10} annual standard but kept the PM_{10} 24-hour standard. The $PM_{2.5}$ 24-hour standard was also reduced from 65 µg/m^3 to 35 µg/m^3. In 2012, the USEPA again reduced the annual standard from 15 µg/m^3 to 12 µg/m^3. Particulate trends show that particulate concentrations have decreased and the state is in compliance for all particulate NAAQS; however, Michigan has had past nonattainment issues in Southeast Michigan for TSP, PM_{10} and $PM_{2.5}$.

Figure 1.9: Historical Annual Particulate Matter at W. Fort St. (SWHS).



Chapter 2: Carbon Monoxide (CO)

Carbon monoxide is a gas formed during incomplete burning of fuel. CO is colorless, odorless, and tasteless, and is lethal at elevated concentrations. Levels peak during colder months primarily due to cold temperatures that affect combustion efficiency of engines. The CO NAAQS is 9 ppm for the second highest 8-hour average and 35 ppm for the second highest 1-hour average. Its sources and effects are provided below.

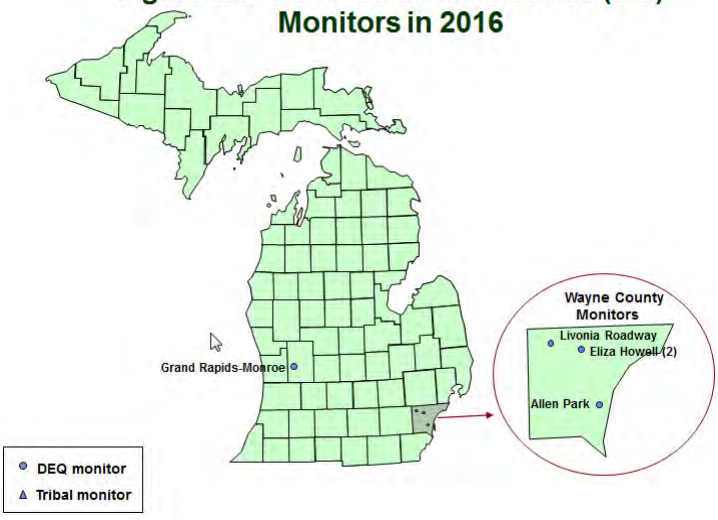
Sources: CO is given off whenever fuel or other carbon-based materials are burned. Outdoor exposure sources include automobile exhaust, industrial processes (metal processing and chemical production), and non-vehicle fuel combustion. Natural sources include volcanos, forest fires and photochemical reactions in the atmosphere. Indoor exposure sources include wood stoves and fireplaces, gas ranges with continuous pilot flame ignition, unvented gas or kerosene heaters, and cigarette smoke.

Effects: CO enters the bloodstream through the lungs, where it displaces oxygen delivered to the organs and tissues. Elevated levels can cause visual impairment, interfere with mental acuity by reducing learning ability and manual dexterity, and can decrease work performance in the completion of complex tasks. In extreme cases, unconsciousness and death can occur. CO also alters atmospheric photochemistry contributing to the formation of ground-level O_3, which can trigger serious respiratory problems.

Population most at risk: Those who suffer from cardiovascular (heart and respiratory) disease, fetuses, infants and the elderly are most at risk for exposure to elevated levels of CO. People with angina and peripheral vascular disease are especially at risk, as their circulatory systems are already compromised and less efficient at carrying oxygen; however, elevated CO levels can also affect healthy people.

Figure 2.1 shows the location of each CO monitor that operated in 2016. The Eliza Howell Park and Livonia sites are required under the Near-Roadway Network. A second downwind site at Eliza Howell Park provides a comparison to the near-roadway sites. The other two sites, Grand Rapids and Allen Park, are where trace CO (lower detection levels 1 ppm-50 ppm) is being monitored as part of the NCore Network.

Figure 2.1: Trace Carbon Monoxide (CO) Monitors in 2016



Figures 2.2 and **2.3** show CO emission sources and CO emissions by county (courtesy of the USEPA's State and County Emission Summaries).

Figure 2.2: CO Emissions by Source Sector

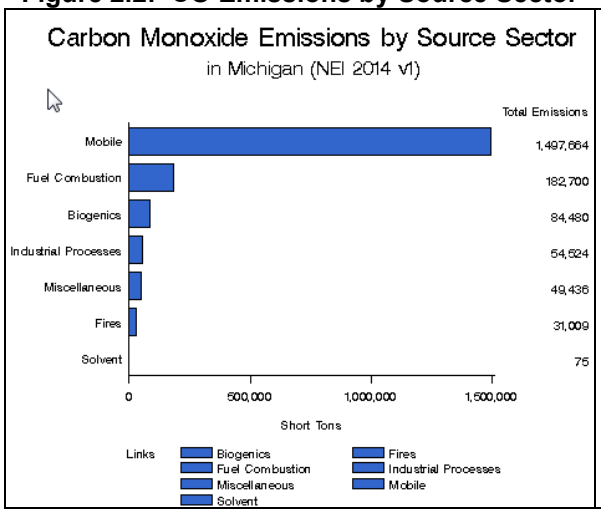
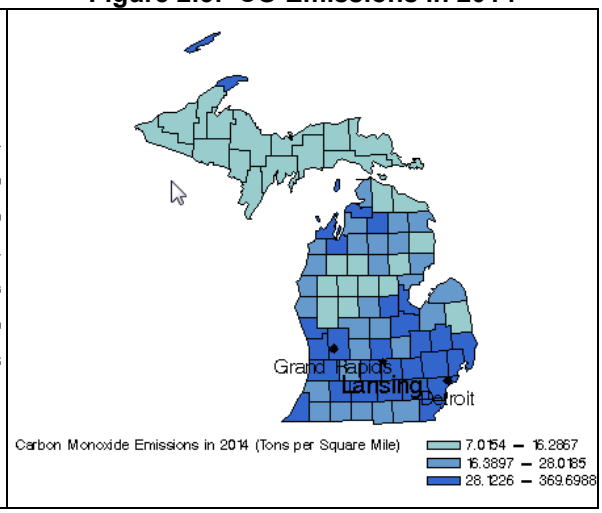
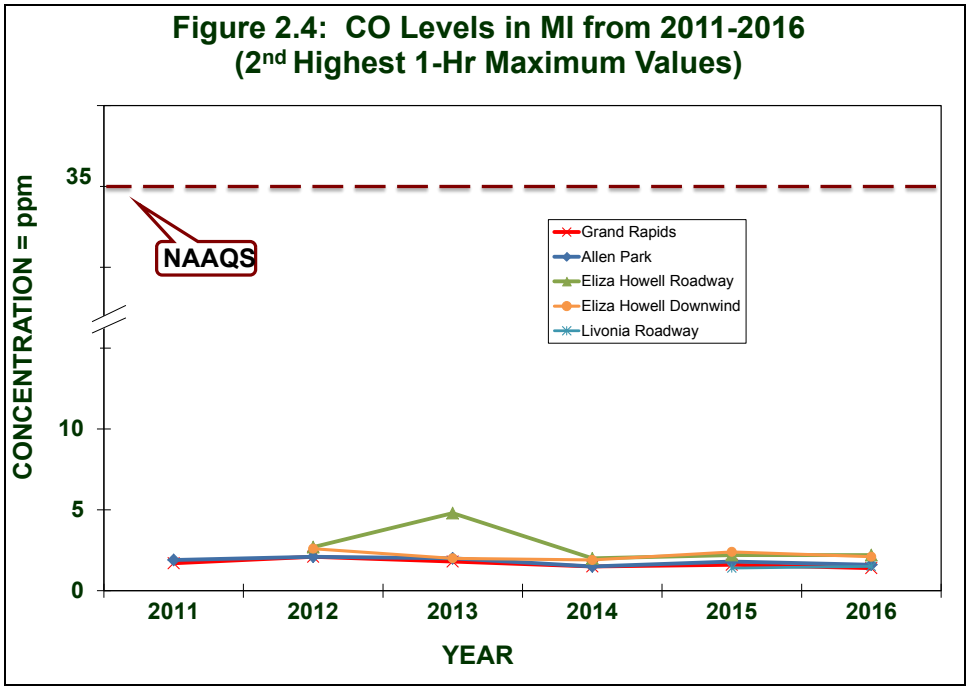


Figure 2.3: CO Emissions in 2014



Near-roadway Monitoring: On August 31, 2011, the USEPA approved design changes to part of the CO ambient monitoring network. This network, now referred to as the near-roadway network, is focused on high traffic urban roads in Core-Based Statistical Areas (CBSAs) with more than one million people. The DEQ took over two of the USEPA's pre-existing, near-roadway sites at Eliza Howell Park, Detroit in June 2011. In January 2015, the second required near-road site started sampling in Livonia.

Figure 2.4 shows the maximum second highest 1-hour CO level trends for Michigan from 2011-2016, which demonstrates that there have not been any exceedances of the 1-hour CO NAAQS.



Chapter 3: Lead (Pb)

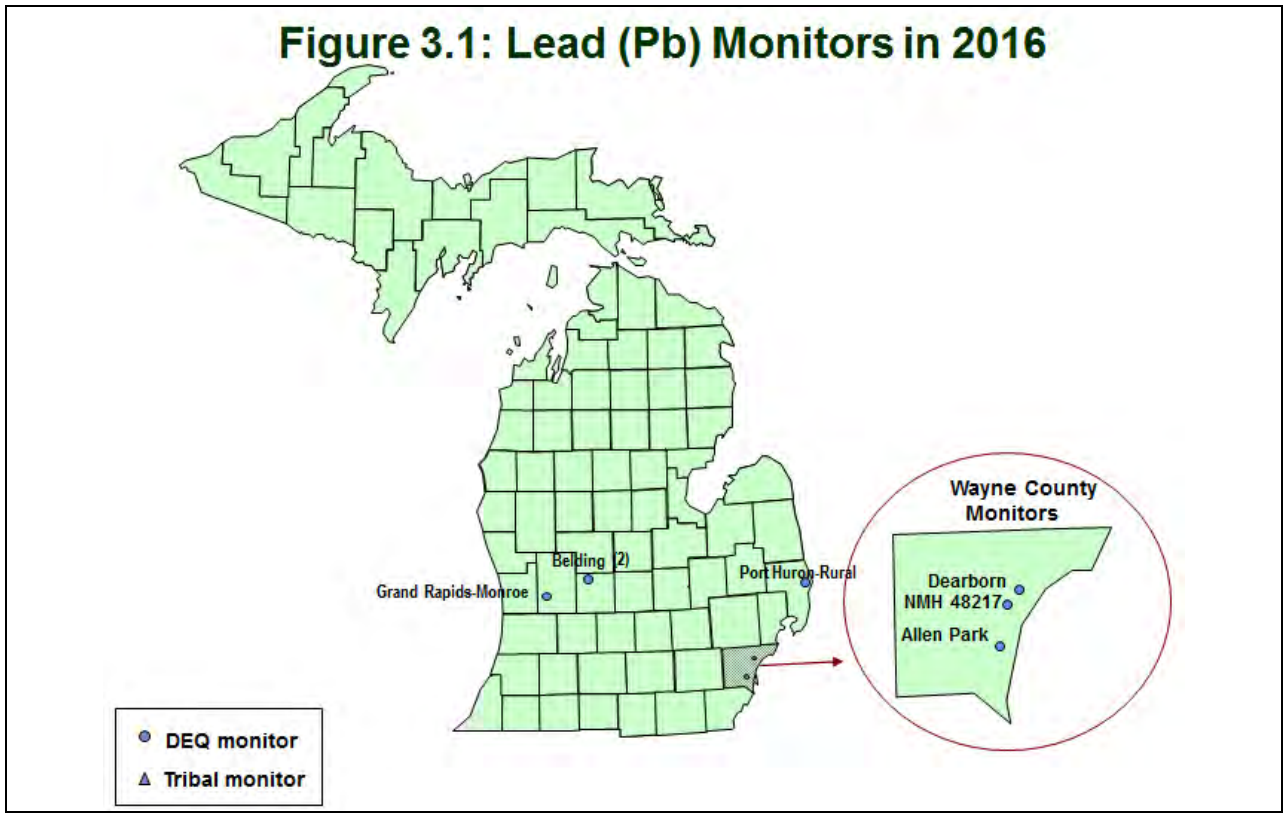
Lead is a highly toxic metal found in coal, oil, and other fuels. It is also found in older paints, municipal solid waste and sewage sludge, and may be released to the atmosphere during combustion. On November 12, 2008, the USEPA lowered the Pb NAAQS from a maximum quarterly average of 1.5 µg/m^3 to a 3-month rolling average of 0.15 µg/m^3. Its sources and effects are presented below.

Sources: With the phase-out of leaded gas in the 1970s, the major sources of lead emissions have been due to ore and metals processing and piston-engine aircraft operating on leaded aviation fuel. Other industrial sources include lead acid battery manufacturers, waste incinerators, and utilities. The highest air concentrations of lead are usually found near lead smelters.

Effects: Exposure occurs through the inhalation or ingestion of Pb in food, water, soil, or dust particles. Pb primarily accumulates in the body's blood, bones, and soft tissues, and adversely affects the kidneys, liver, nervous system, and other organs.

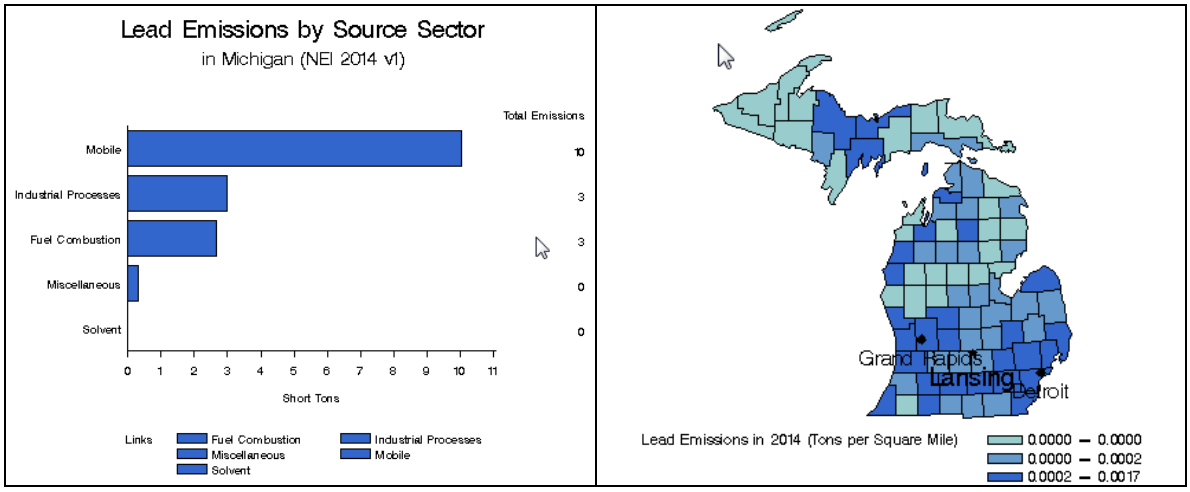
Population most at risk: Fetuses and children are most at risk since low levels of lead may cause central nervous system damage. Excessive lead exposure during the early years of life is associated with lower IQ scores and neurological impairment (seizures, mental development, and behavioral disorders). Even at low doses, lead exposure is associated with changes in fundamental enzymatic, metabolic, and homeostatic mechanisms in the body, and Pb may be a factor in high blood pressure and subsequent heart disease.

Figure 3.1 shows the location of the lead monitors in the MASN in 2016.



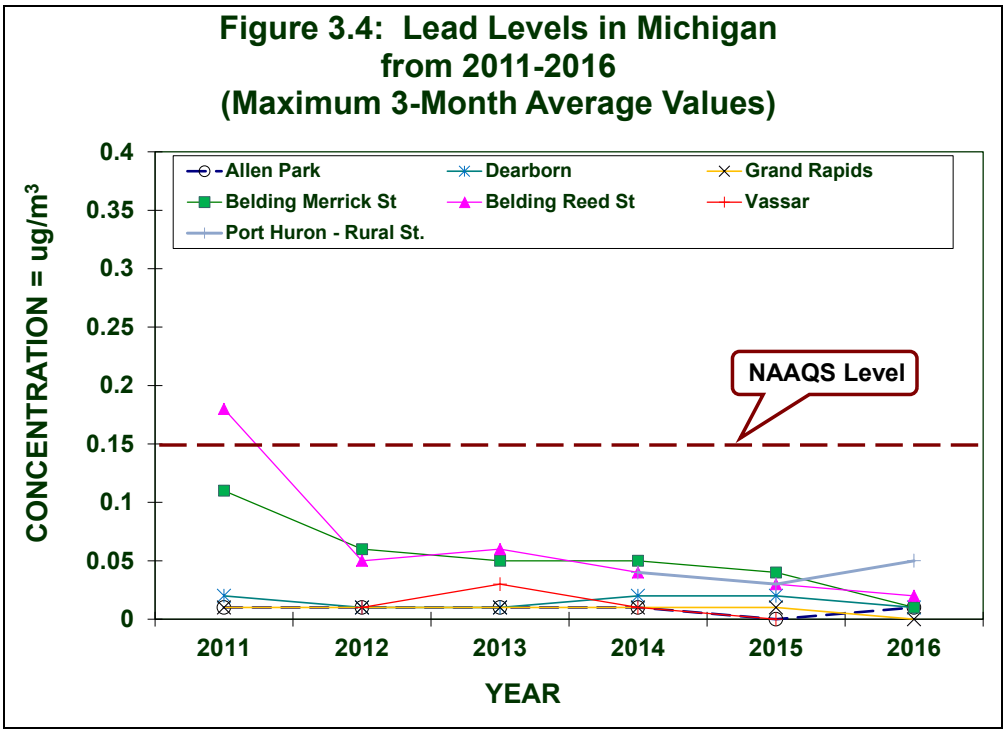
Figures 3.2 and **3.3** show Pb emission sources and Pb emissions by county (courtesy of the USEPA's State and County Emission Summaries).

Figure 3.2: Lead Emissions by Source Sector **Figure 3.3: Lead Emissions in 2014**



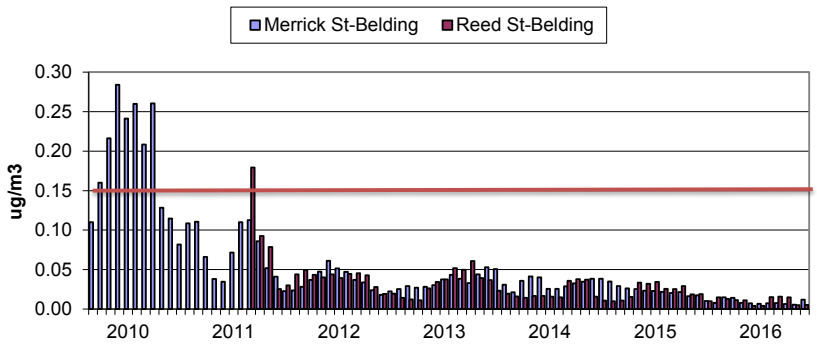
On November 12, 2008, the USEPA modified the Pb NAAQS by reducing the level of the standard from a maximum quarterly average of 1.5 µg/m^3 to a 3-month rolling average of 0.15 µg/m^3. The monitoring network design was modified to consist of source-oriented monitors and population-oriented monitors.

Figure 3.4 shows the maximum 3-month rolling average values for lead from 2011 to 2016.



As part of the 2008 lead NAAQS, the DEQ is required to monitor near stationary lead sources emitting more than 1/2 ton per year. The DEQ currently has three point-source lead monitoring sites: Rural St. in Port Huron (started November 2012), Merrick St. in Belding (started January 2010), and Reed St. in Belding (started July 2011). The Merrick St. monitor located in Belding recorded a violation of the new health standard in 2010, as shown in **Figure 3.5.** Hence a second site, Reed St., was added in July 2011 at Belding, which also recorded a violation in 2011. Values for both the sites have been below the NAAQS for the past five years. The DEQ's redesignation request for Belding will be effective July 31, 2017, unless the USEPA receives adverse comments.

Figure 3.5: 2010-2016 Belding Air Lead Levels



All other lead monitor sites in Michigan are well below the standard. The Dearborn site is part of the National Air Toxics Trend Sites (NATTS) and monitors lead and trace metals, both as total suspended particulate (TSP) and PM_{10}. Lead measurements as $PM_{2.5}$ are also made throughout the $PM_{2.5}$ speciation network.

Chapter 4: Sulfur Dioxide (SO_2)

Sulfur dioxide is a gas formed by the burning of sulfur-containing material. Odorless at typical ambient concentrations, SO_2 can react with other atmospheric chemicals to form sulfuric acid. At higher concentrations it has a pungent, irritating odor similar to a struck match. When sulfur-bearing fuel is burned, the sulfur is oxidized to form SO_2, which then reacts with other pollutants to form aerosols. These aerosols can form particles in the air causing increases in $PM_{2.5}$ levels. In liquid form, it is found in clouds, fog, rain, aerosol particles, and in surface films on these particles. In June 2010, the USEPA changed the primary SO_2 standard to a 99th percentile of 1-hour concentrations not to exceed 0.075 ppm, averaged over a 3-year period. The secondary standard has not changed and is a 3-hour average that cannot exceed 0.5 ppm once per year. Its sources and effects are presented below.

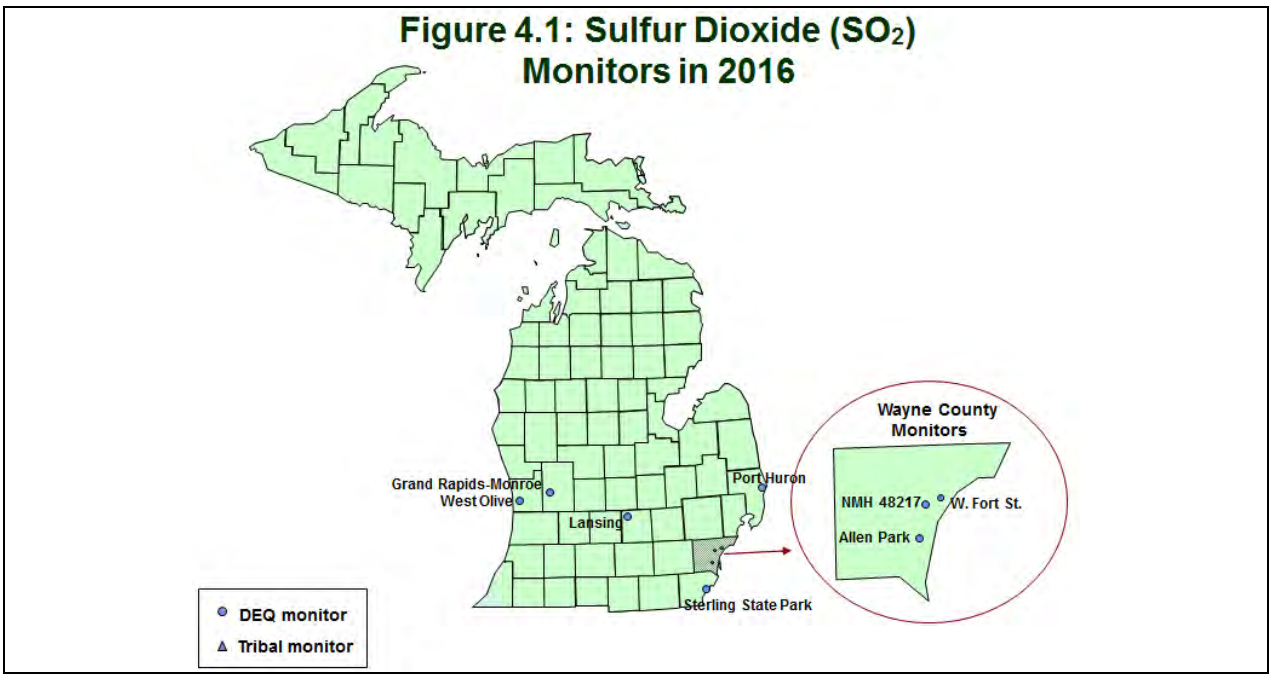
Sources: Coal-burning power plants are the largest source of SO_2 emissions. Other sources include petroleum refineries, ore smelters, pulp and paper mills, steel mills and non-road transportation sources. SO_2 and particulate matter are often emitted together.

Effects: Exposure to elevated levels can affect breathing, can cause respiratory illnesses, aggravate existing cardiovascular and pulmonary diseases, and alter the body's immune system. SO_2 and NOx together are the major precursors to acid rain and are associated with the acidification of soils, lakes, and streams, as well as accelerated corrosion of buildings and monuments.

Population most at risk: Asthmatics, children, and the elderly are especially sensitive to SO_2 exposure. Asthmatics receiving short-term exposures during moderate exertion may experience reduced lung function and symptoms, such as wheezing, chest tightness, or shortness of breath. Depending on the concentration, SO_2 may also cause symptoms in people who do not have asthma.

Figure 4.1 shows the location of each SO_2 monitor that operated in 2016. The two NCore Sites, Allen Park and Grand Rapids, have trace SO_2 monitors that have lower detection limits than traditional SO_2 monitors.

Figure 4.1: Sulfur Dioxide (SO_2) Monitors in 2016



Figures 4.2 and **4.3** show SO_2 emission sources and SO_2 emissions by county (courtesy of the USEPA's State and County Emission Summaries).

Figure 4.2: SO_2 Emissions by Source Sector

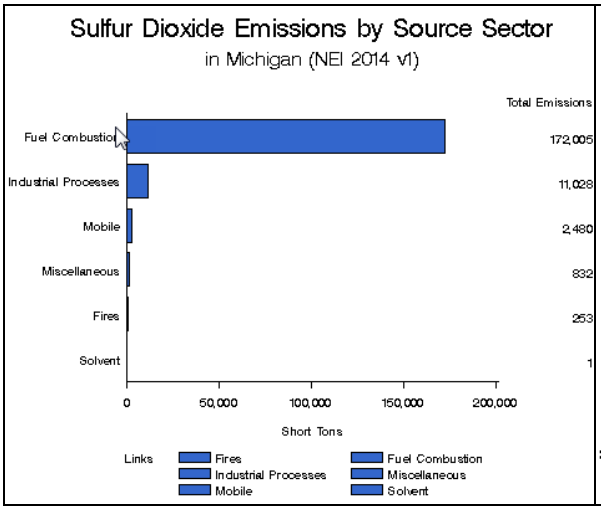
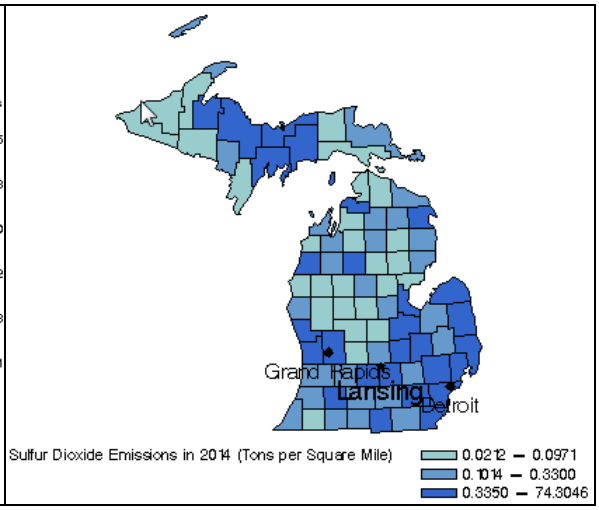


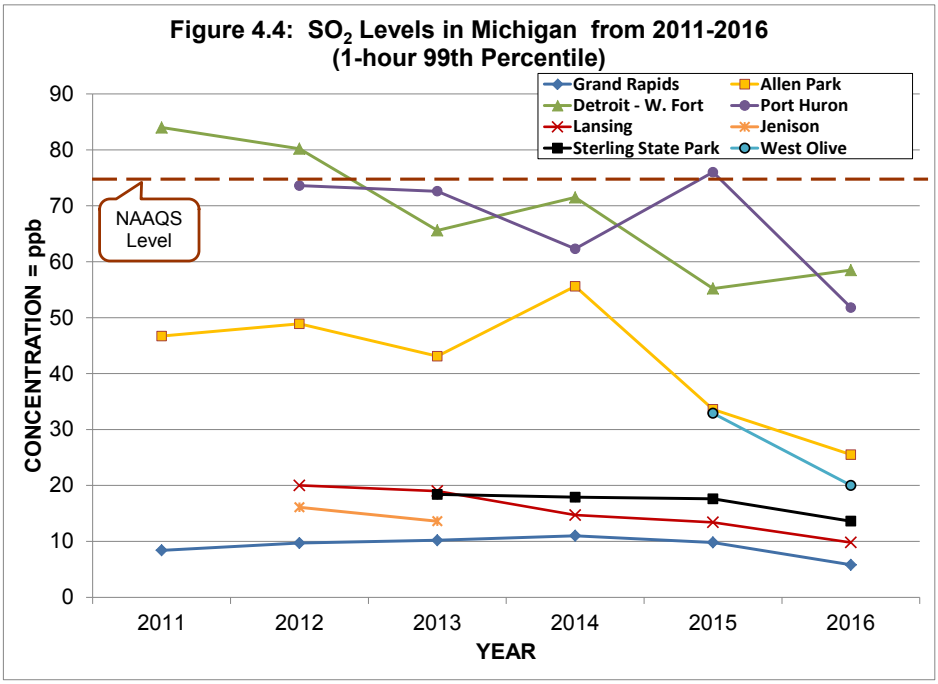
Figure 4.3: SO_2 Emissions in 2014



Historically, Michigan had been in attainment for SO_2 since 1982 with levels consistently well below the annual SO_2 NAAQS. However, in 2010, the USEPA changed the SO_2 NAAQS to a 1-hour standard, which showed that the SO_2 monitor at W. Fort Street (SWHS) in Detroit did not meet the new NAAQS. SO_2 concentrations have decrease at this site and are currently under the NAAQS, although modeling concentrations are not below the NAAQS. In September 2016, a portion of St. Clair County was also designated as nonattainment by the USEPA.

The NCore sites, Grand Rapids and Allen Park, monitor for trace SO_2. For trend purposes, all SO_2 data are graphed together in **Figure 4.4**. Jenison and Port Huron were added to the SO_2 network in December 2011, and Sterling State Park in Monroe County was added to the SO_2 network in December 2012. The Jenison monitor was shut down on January 1, 2014 and later moved to West Olive, which started sampling in January 2015.

Figure 4.4: SO_2 Levels in Michigan from 2011-2016 (1-hour 99th Percentile)



Chapter 5: Nitrogen Dioxide (NO_2)

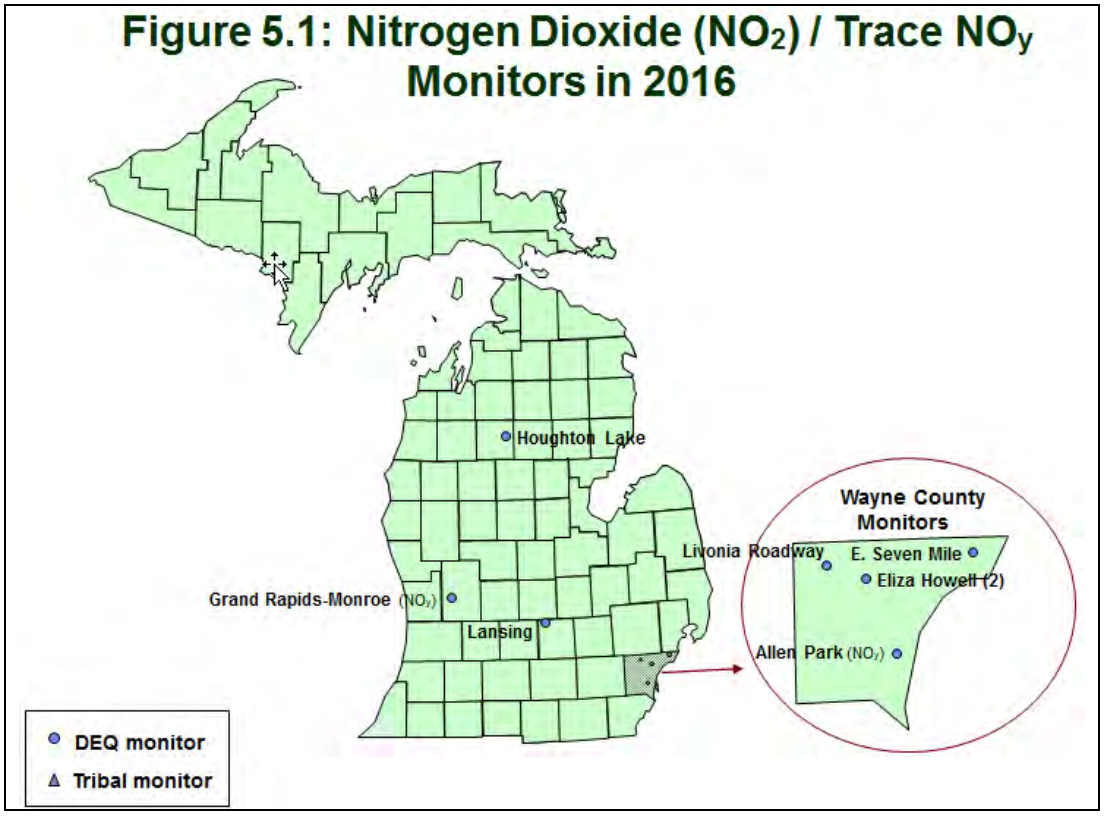
Nitrogen dioxide is a reddish-brown, highly reactive gas formed through oxidation of nitric oxide (NO). Upon dilution, it becomes yellow or invisible. High concentrations produce a pungent odor and lower levels have an odor similar to bleach. NO_X is the term used to describe the sum of NO, NO_2, and other nitrogen oxides. NO_X can lead to the formation of O_3 and NO_2, and can react with other substances in the atmosphere to form particulate matter or acidic products that are deposited in rain (acid rain), fog, or snow. Since 1971, the primary and secondary standard for NO_2 was an annual mean of 0.053 ppm. In January 2010, the USEPA added a 1-hour NO_2 standard of 100 ppb, taking the form of the 98th percentile averaged over three years. The sources and effects of NO_2 are as follows:

Sources: NO_X compounds and their transformed products occur both naturally and as a result of human activities. Natural sources of NO_X are lightning, forest fires, bacterial processes in soil, and stratospheric intrusion. Stratospheric intrusion is when the stratospheric air descends towards the surface of the earth and mixes with the air at breathing level. Ammonia and other nitrogen compounds produced naturally are important in the cycling of nitrogen through the ecosystem. The major sources of man-made (anthropogenic) NO_x emissions come from high-temperature combustion processes such as those occurring in automobiles and power plants. Home heaters and gas stoves produce substantial amounts of NO_2 in indoor settings.

Effects: Exposure to NO_2 occurs through the respiratory system, irritating the lungs. Short-term NO_2 exposures (i.e., less than three hours) can produce coughing and changes in airway responsiveness and pulmonary function. Evidence suggests that long-term exposures to NO_2 may lead to increased susceptibility to respiratory infection and may cause structural alterations in the lungs. Exercise increases the ventilation rate and hence exposure to NO_2. Nitrate particles and NO_2 can block the transmission of light, resulting in visibility impairment (i.e., smog or haze). Deposition of nitrogen can lead to fertilization, eutrophication, or acidification of terrestrial, wetland, and aquatic systems.

Population most at risk: Individuals with pre-existing respiratory illnesses and asthmatics are more sensitive to the effects of NO_2 than the general population. Short-term NO_2 exposure can increase respiratory illnesses in children.

Figure 5.1 shows the location of all NO_2 monitors that operated in 2016. The E. 7 Mile monitor in Detroit is a downwind urban scale site that measures NO_2. The Detroit Eliza Howell (roadway and downwind sites) and Livonia sites measure NO_2 in a near-road environment. The NCore sites, Grand Rapids and Allen Park, monitor trace NO_Y, which includes NO_X, nitric acid and organic and inorganic nitrates (however, only NO_2 monitors can be used for attainment/ nonattainment purposes). In addition, in 2010, the AQD added NO_2 monitors at Lansing and Houghton Lake to provide background information for modeling applications.



Figures 5.2 and **5.3** show NO_2 emission sources and NO_2 emissions by county (courtesy of the USEPA's State and County Emission Summaries).

Figure 5.2: NO_2 Emissions by Source Sector

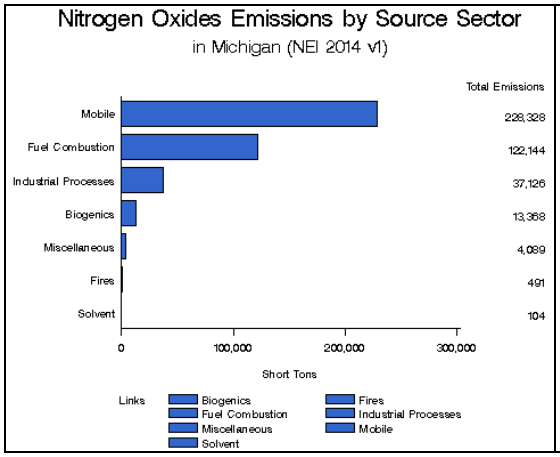
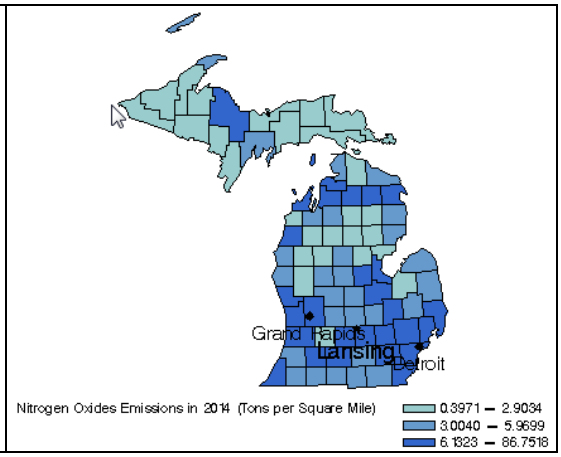
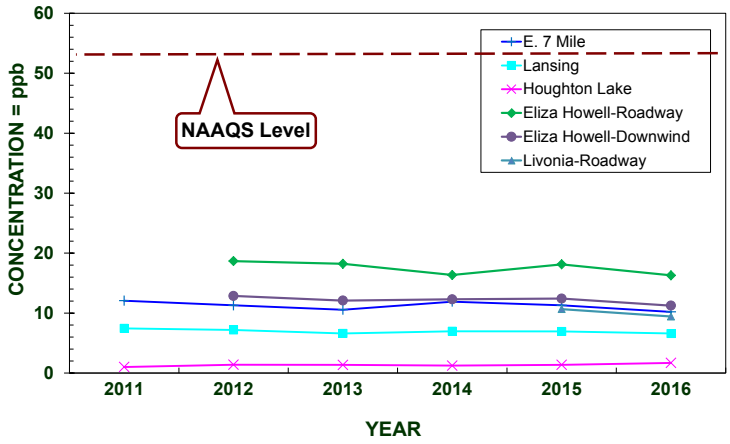


Figure 5.3: NO_2 Emissions in 2014



Michigan's ambient NO_2 levels have always been well below the NAAQS. Since March 3, 1978, all areas in Michigan have been in attainment for the annual NO_2 NAAQS. As shown in **Figure 5.4**, all monitoring sites have had an annual NO_2 concentration at less than half of the 0.053 ppm NAAQS. As such, when the USEPA lowered the NO_2 NAAQS in 2010, they designated Michigan as unclassifiable / attainment, since the existing NO_2 network did not provide adequate evidence that the NAAQS was met in all areas; however, there were no violations of the NO_2 standard. Thus, unclassifiable/attainment better reflects the current air quality conditions.

Figure 5.4: NO_2 Levels in MI from 2011-2016 (Annual Arithmetic Mean)*

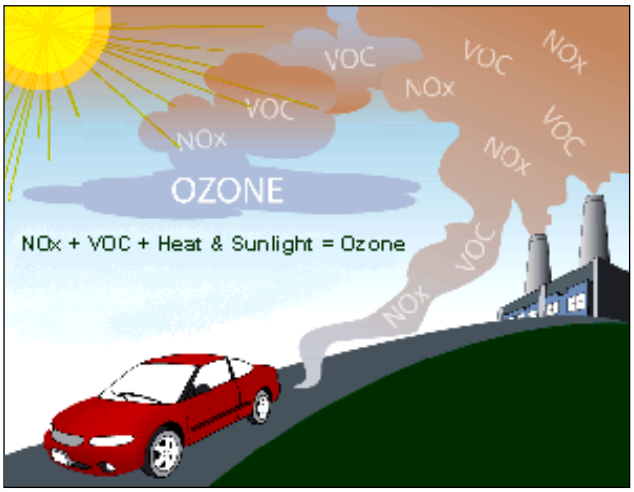


*Since Allen Park and Grand Rapids are monitoring NO_Y, those sites are not included in graph.

Even though there are no nonattainment areas for NO_2 in Michigan and monitoring for attainment purposes is not required, monitors continue to operate to support photochemical model validation work.

Chapter 6: Ozone (O_3)

Ground-level O_3 is created by reactions involving nitrogen oxides (NO_X) and volatile organic compounds (VOCs), or hydrocarbons, in the presence of sunlight as the illustration to the right depicts (image courtesy of the USEPA). These reactions usually occur during the hot summer months as ultraviolet radiation from the sun initiates a sequence of photochemical reactions. In Earth's upper atmosphere (the stratosphere), O_3 helps by absorbing much of the sun's ultraviolet radiation, but in the lower atmosphere (the troposphere), ozone is an air pollutant. O_3 is also a key ingredient of urban smog and can be transported hundreds of miles under certain meteorological conditions. Ozone levels are often higher in rural areas than in cities due to transport to regions downwind from the actual emissions of NO_X and VOCs. Shoreline monitors along Lake Michigan often measure high ozone concentrations due to transport from upwind states. The ozone NAAQS was revised by the USEPA and became effective in November 2015. It is a 3-year average of the 4th highest daily maximum 8-hour average concentration that must not exceed 0.070 ppm. The sources and effects of ozone follow.

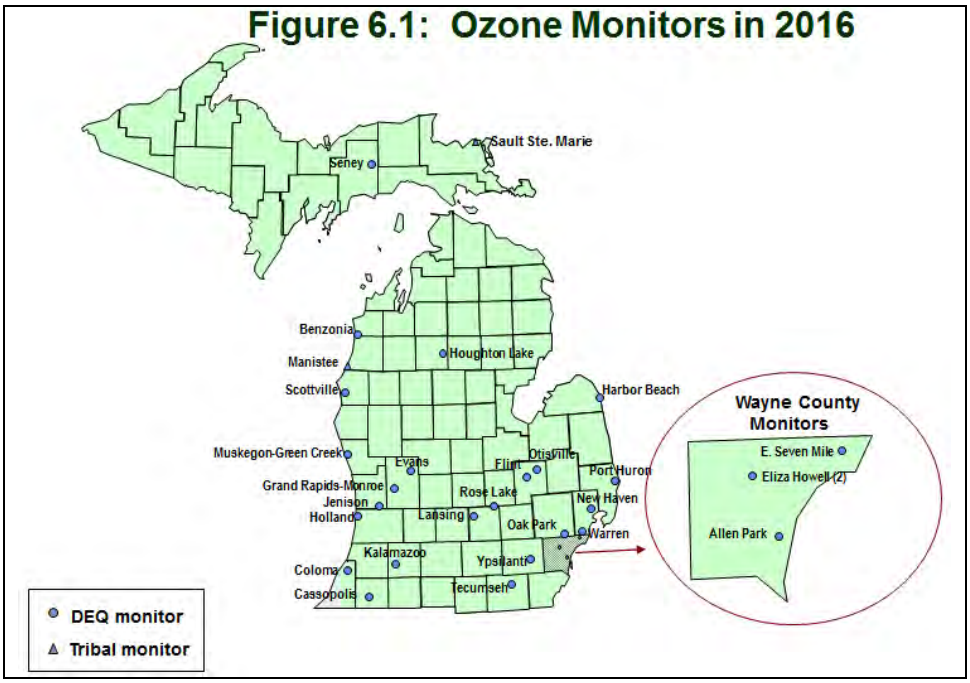


Sources: Major sources of NO_X and VOCs are engine exhaust, emissions from industrial facilities, combustion from power plants, gasoline vapors, chemical solvents, and biogenic emissions from natural sources. Ground-level O_3 can also be transported hundreds of miles under certain wind regimes. As a result, the long-range transport of air pollutants impacts the air quality of regions downwind from the actual area of formation.

Effects: Elevated O_3 exposure can irritate airways, reduce lung function, aggravate asthma and chronic lung diseases like emphysema and bronchitis, and inflame and damage the cells lining the lungs. Other effects include increased respiratory related hospital admissions with symptoms such as chest pain, shortness of breath, throat irritation, and cough. O_3 may also reduce the immune system's ability to fight off bacterial infections in the respiratory system, and long-term, repeated exposure may cause permanent lung damage. O_3 also impacts vegetation and forest ecosystems, including agricultural crop and forest yield reductions, diminished resistance to pests and pathogens, and reduced survivability of tree seedlings.

Population most at risk: Individuals most susceptible to the effects of O_3 exposure include those with a pre-existing or chronic respiratory disease, children who are active outdoors and adults who actively exercise or work outdoors.

Figure 6.1 shows the location of the DEQ's O_3 monitors in Michigan.



Figures 6.2 and **6.3** show VOC emission sources and VOC emissions by county (courtesy of the USEPA's State and County Emission Summaries).

Figure 6.2: VOC Emissions by Source Sector

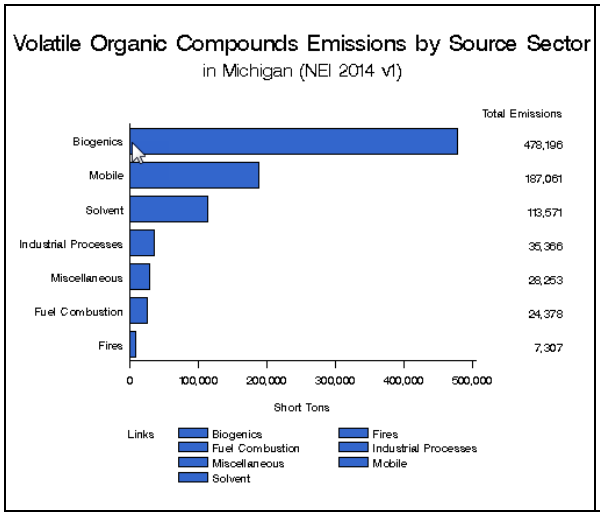
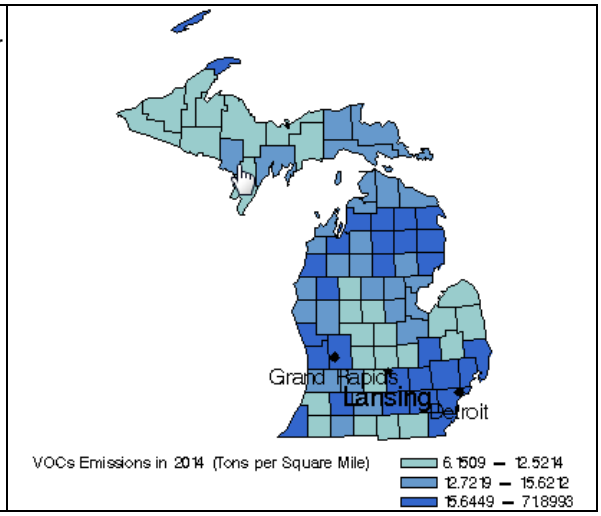


Figure 6.3: VOC Emissions in 2014



The USEPA revised the primary 8-hour ozone NAAQS to 0.070 ppm in November 2015, which became effective for the 2016 ozone season. To attain the 2015 standard, the 3-year average of the 4th highest daily maximum 8-hour average concentration within an area must not exceed 0.070 ppm. The secondary 8-hour ozone NAAQS was also revised, making it identical to the primary standard.

In 2016, several monitors violated the 2015 standard of 0.070 ppm. The AQD has recommended several counties be designated as nonattainment, but the USEPA has not made their final designations for the 2015 standard.

The O_3 monitoring season in Michigan is currently from April 1 through September 30, the hottest portion of the year. Starting in 2017, the ozone season will be extended to March 1 through October 31, based on the 2015 NAAQS. During this time O_3 monitoring data is available for the public via the AQD's web site (discussed in **Chapter 9**). However, year round O_3 monitoring is conducted at the following four sites: Allen Park, Grand Rapids, Houghton Lake and Lansing. This data helps in attainment designations, and urban air quality and population exposure assessments.

Figure 6.1 shows all O_3 air quality monitors active in Michigan at the beginning of the 2016 ozone season.

Table 6.1: 3-Year Average of the 4th Highest 8-hour Ozone Values from 2012-2014, 2013-2015, 2014-2016 (concentrations in ppm). Numbers in bold indicate 3-year averages over the 2015 ozone standard of 0.070 ppm for 2013-2016, for 2012-2014 and 2013-2015 bold numbers indicate values below 0.075 ppm.

Areas	County	Monitor Sites	2012-2014*	2013-2015*	2014-2016*
Detroit-Ann Arbor	Lenawee	Tecumseh	0.073	0.065	0.067
	Macomb	New Haven	0.074	0.071	**0.072**
		Warren	0.072	0.066	0.067
	Oakland	Oak Park	0.071	0.066	0.069
	St. Clair	Port Huron	0.074	0.072	**0.073**
	Washtenaw	Ypsilanti	0.073	0.066	0.067
	Wayne	Allen Park	0.068	0.064	0.065
		Detroit-E. 7 Mile	0.074	0.070	**0.072**
Flint	Genesee	Flint	0.072	0.066	0.068
		Otisville	0.072	0.067	0.069
Grand Rapids	Ottawa	Jenison	0.075	0.068	0.070
	Kent	Grand Rapids	0.071	0.067	0.069
		Evans	0.070	0.066	0.067
Muskegon Co	Muskegon	Muskegon	**0.079**	0.074	**0.075**
Allegan Co	Allegan	Holland	**0.083**	0.075	**0.075**
Huron	Huron	Harbor Beach	0.071	0.065	0.068
Kalamazoo-Battle Creek	Kalamazoo	Kalamazoo	0.073	0.067	0.069
Lansing-East Lansing	Ingham	Lansing	0.070	0.065	0.067
	Clinton	Rose Lake	0.069	0.064	0.067
Benton Harbor	Berrien	Coloma	**0.079**	0.073	**0.074**
Benzie Co	Benzie	Benzonia	0.073	0.068	0.069
Cass Co	Cass	Cassopolis	0.073	0.068	0.070
Chippewa Co	Chippewa	Sault Ste. Marie	0.065	0.059	0.059
Mason Co	Mason	Scottville	0.074	0.068	0.070
Missaukee Co	Missaukee	Houghton Lake	0.070	0.064	0.067
Manistee Co	Manistee	Manistee	0.072	0.067	0.068
Schoolcraft Co	Schoolcraft	Seney	0.073	0.068	0.070

* Only 2014-2016 data are subject to the 2015 NAAQS level of 0.070 ppm; the previous year's level was 0.075 ppm from the 2008 NAAQS standard.

Tables 6.2 and **6.3** highlight the number of days when two or more O_3 monitors exceeded 0.070 ppm. It also specifies in which month they occurred and the temperature range.

Table 6.2: 2016 West Michigan Ozone Season

Daily High Temperature Range			2016 WEST MICHIGAN OZONE SEASON											
			April		May		June		July		August		September	
			Days	O_3 Days	Days	O_3 Days	Days	O_3 Days	Days	O_3 Days	Days	O_3 Days	Days	O_3 Days
	>=	95	0	0	0	0	0	0	0	0	0	0	0	0
90	<=	94	0	0	0	0	6	4	8	2	4	2	1	0
85	<=	89	0	0	6	2	6	1	12	0	6	0	2	0
80	<=	84	2	1	3	1	8	0	6	0	16	0	6	0
75	<=	79	2	2	3	0	6	0	3	0	5	0	10	0
70	<=	74	2	0	5	0	2	0	2	0	0	0	5	0
65	<=	69	2	0	7	0	1	0	0	0	0	0	3	0
60	<=	64	5	0	1	0	1	0	0	0	0	0	3	0
55	<=	59	1	0	2	0	0	0	0	0	0	0	0	0
50	<=	54	4	0	3	0	0	0	0	0	0	0	0	0
49	<=		12	0	1	0	0	0	0	0	0	0	0	0
Totals			30	3	31	3	30	5	31	2	31	2	30	0

Days: Number of days during month when the daily high temperature falls within the specified temperature range.
O_3 Days: Number of days, during specified temperature range, when two or more area monitors exceeded 70 ppb.

For West Michigan, there were three O_3 exceedance days in April, three days in May, five days in June, two days in July, two days in August and no days in September when ozone exceeded 0.070 ppm at two or more ozone monitors. The temperatures for those days ranged between 75°F and above 94°F.

Table 6.3: 2016 Southeast Michigan Ozone Season

Daily High Temperature Range			2016 SOUTHEAST MICHIGAN OZONE SEASON											
			April		May		June		July		August		September	
			Days	O_3 Days	Days	O_3 Days	Days	O_3 Days	Days	O_3 Days	Days	O_3 Days	Days	O_3 Days
	>=	95	0	0	0	0	0	0	2	0	3	1	0	0
90	<=	94	0	0	0	0	5	1	7	1	4	1	2	0
85	<=	89	0	0	6	2	6	0	14	0	12	0	1	0
80	<=	84	1	1	2	0	10	2	2	0	9	0	10	0
75	<=	79	1	1	3	0	5	0	6	0	3	0	7	0
70	<=	74	2	0	6	0	4	0	0	0	0	0	6	0
65	<=	69	3	0	6	0	0	0	0	0	0	0	1	0
60	<=	64	4	0	3	0	0	0	0	0	0	0	3	0
55	<=	59	6	0	2	0	0	0	0	0	0	0	0	0
50	<=	54	5	0	3	0	0	0	0	0	0	0	0	0
49	<=		8	0	0	0	0	0	0	0	0	0	0	0
Totals			30	2	31	2	30	3	31	1	31	2	30	0

Days: Number of days during month when the daily high temperature falls within the specified temperature range.
O_3 Days: Number of days, during specified temperature range, when two or more area monitors exceeded 70 ppb.

For Southeast Michigan, there were two O_3 exceedance days in April, two days in May, three days in June, one day in July, two days in August and no days in September when ozone exceeded 0.075 ppm at two or more ozone monitors. The temperature for those days ranged between 75°F and above 95°F.

Table 6.4 gives a breakdown of the O_3 days and the specific monitors that went over the standard in western, central/upper, and eastern Michigan.

Table 6.4: 8-Hour Exceedance Days (>0.070 ppm) and Locations

Date	Monitors with Exceedances of the Ozone Standard			Total
	Western Michigan	Central/Upper Michigan	Eastern Michigan	
04/16/2016	Holland, Benzonia,	Lansing, Rose Lake, Houghton Lake, Seney		6
04/17/2016	Holland, Coloma, Cassopolis, Kalamazoo, GR-Monroe, Scottville, Muskegon	Rose Lake, Houghton Lake, Seney	Flint, Oak Park, Ypsilanti	13
04/18/2016	Holland, Benzonia, Coloma, Cassopolis, Kalamazoo, GR-Monroe, Evans, Scottville, Muskegon, Jenison	Lansing, Rose Lake, Houghton Lake	Flint, Otisville, Harbor Beach, Tecumseh, Warren, Oak Park, Port Huron, Ypsilanti, E. 7 Mile, Eliza Howell-Downwind	23
05/23/2016	Coloma, Cassopolis	Seney	Otisville	4
05/24/2016	Benzonia, Coloma, Cassopolis, Kalamazoo, GR-Monroe, Evans, Manistee, Scottville, Muskegon, Jenison	Lansing, Rose Lake, Houghton Lake	Flint, Otisville, Harbor Beach, Tecumseh, New Haven, Warren, Oak Park, Port Huron, Allen Park, E. 7 Mile, Eliza Howell-Downwind	24
05/25/2016	Holland, Muskegon		Otisville, Harbor Beach, New Haven, Port Huron, E. 7 Mile	7
05/26/2016			Harbor Beach	1
06/04/2016			Flint	1
06/10/2016	Holland, Coloma, Cassopolis, Kalamazoo, GR-Monroe, Evans, Scottville, Muskegon, Jenison	Lansing, Rose Lake, Houghton Lake	Flint, Otisville, Oak Park, Allen Park, E. 7 Mile	17
06/11/2016	Holland, Coloma, Cassopolis, Jenison			4
06/15/2016	Coloma, Cassopolis			2
06/18/2016			Ypsilanti	1
06/19/2016	Holland, Benzonia, Coloma, Cassopolis, Kalamazoo, GR-Monroe, Evans, Scottville, Muskegon, Jenison	Lansing, Rose Lake, Houghton Lake, Seney	Flint, New Haven, Warren, Oak Park, Port Huron, E. 7 Mile	20
06/20/2016	Coloma			1
06/25/2016	Holland, Coloma, Cassopolis, Kalamazoo, GR-Monroe, Muskegon	Seney		7
06/30/2016	Coloma		New Haven, E. 7 Mile	3
07/06/2016	Holland, Jenison			2
07/12/2016			Harbor Beach	1
07/13/2016		Seney		1
07/20/2016	Kalamazoo, GR-Monroe, Evans, Jenison	Seney		5
07/27/2016			New Haven, E. 7 Mile	2
08/03/2016	Benzonia, GR-Monroe, Scottville			3
08/04/2016	Benzonia, Manistee	Seney	Flint, Otisville	5
08/10/2016	Kalamazoo	Lansing, Rose Lake	New Haven, Warren, Oak Park, Allen Park, E. 7 Mile, Eliza Howell-Downwind	9
			TOTAL	162

On May 24, 2016, there were 24 monitors and on April 18, 2016, there were 23 monitor readings that exceeded the level of the standard. The site with the most exceedances in the western region of Michigan was Coloma with 11. The central/upper Michigan site with the most exceedances was Seney with 8. The monitor at E. 7 Mile had 8 exceedances in eastern Michigan.

Figure 6.4: O_3 Levels in Detroit-Warren-Flint CSA from 2011-2016 (4th Highest 8-Hour O_3 Values)

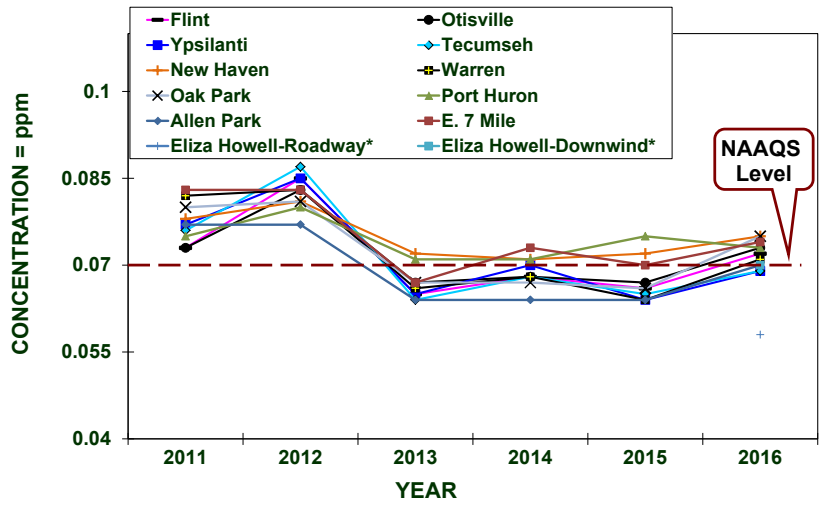


Figure 6.4 shows the 4th highest 8-hour O_3 values for Southeast Michigan monitoring sites from 2011-2016. New Haven, Port Huron and Detroit E. 7 Mile site violated the 3-year standard.

*Note: The two Eliza Howell sites are part of a two-year special study. Ozone monitoring will not continue after the 2-year study.

Figure 6.5: O_3 Levels in the Grand Rapids-Muskegon-Holland CSA from 2011-2016 (4th Highest 8-Hour O_3 Values)

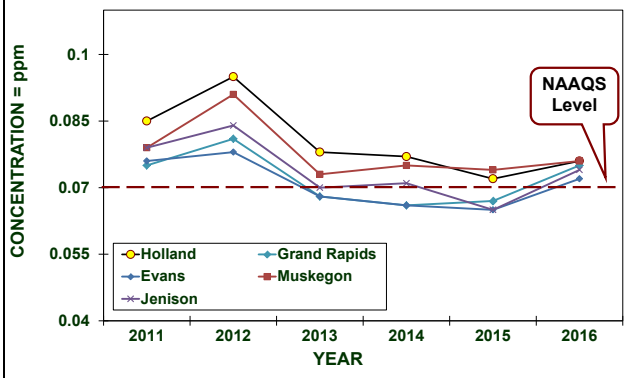


Figure 6.6: O_3 Levels in the Kalamazoo-Portage MSA, Lansing-E. Lansing-Owosso CSA, Niles-Benton Harbor MSA, & South Bend-Mishawaka (IN-MI) MSAs from 2011-2016 (4th Highest 8-Hour O_3 Values)

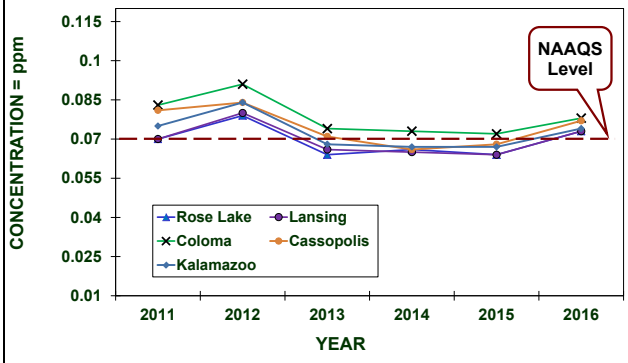


Figure 6.7: O_3 Levels in MI's Northern Lower and Upper Peninsula Areas from 2011-2016 (4th Highest 8-Hour O_3 Values)

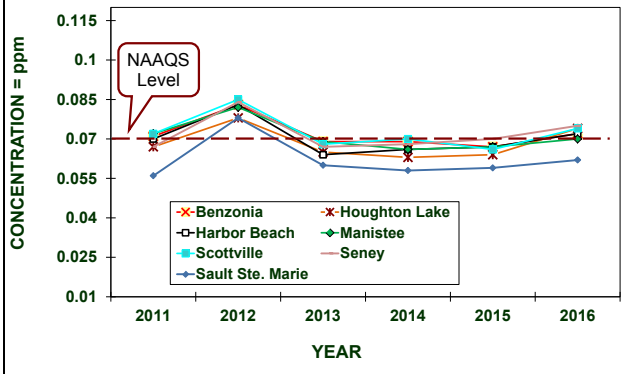


Figure 6.5 shows the 4th highest 8-hour O_3 values for Grand Rapids-Muskegon-Holland CSA. Muskegon and Holland violated the 3-year standard.

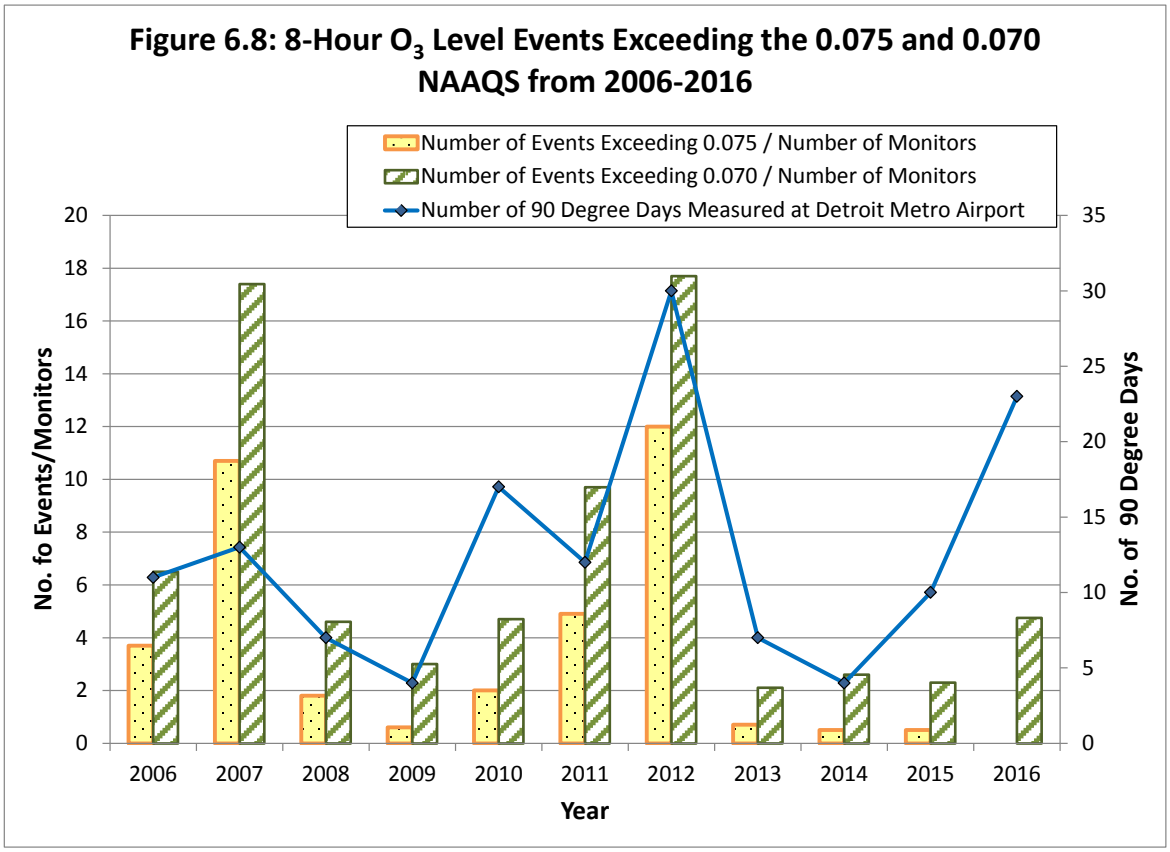
Figure 6.6 shows 4th highest 8-hour O_3 values for mid-Michigan. Coloma violated the 3-year standard.

Figure 6.7 shows 4th highest 8-hour O_3 values for Northern Lower and Upper Peninsula. No sites violated the 3-year standard.

Figure 6.8 shows 8-hour O_3 readings ≥ 0.070 ppm and ≥ 0.075 with the number of 90°F days (≥ 90°F) measured at the Detroit Metropolitan Airport. The total number of Southeastern Michigan area 8-hour readings above the standard (events) was divided by the number of monitors that were in operation each year to provide a relative indication of the frequency of elevated 8-hour O_3 values.

Since the ozone NAAQS level changed from 0.075 ppm to 0.070 ppm for the 2016 ozone season, Figure 6.8 shows the events/monitors at the 0.075 ppm level and the additional days that would be included at the 0.070 ppm level. Since 2016 is subject to the 0.070 NAAQS standard, it only shows the events exceeding the 0.070 ppm level.

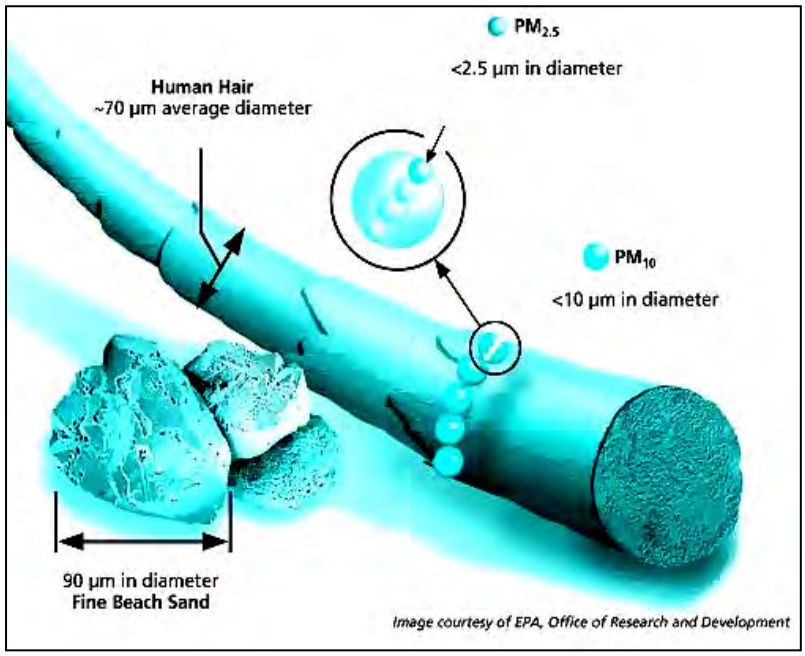
Figure 6.8: 8-Hour O_3 Level Events Exceeding the 0.075 and 0.070 NAAQS from 2006-2016



This comparison shows the influence of temperature with respect to elevated O_3 levels. Over the past 10 years, a typical summer would have an average of 12.5 days with the maximum daily temperature exceeding 90°F. Over the time period from 2006 through 2016, the highest number of 90°F days occurred in 2012 (30 days), while the lowest number occurred in 2009 and 2014 (four days).

Chapter 7: Particulate Matter (PM_{10}, $PM_{2.5}$, $PM_{2.5}$ Chemical Speciation and TSP)

Particulate matter (PM) is a general term used for a mixture of solid particles and liquid droplets (aerosols) found in the air. These are further categorized according to size; larger particles with diameters of less than 50 micrometers (μm) are classified as total suspended particulates (TSP). PM_{10} consists of "coarse particles" less than 10 μm in diameter (about one-seventh the diameter of a human hair) and $PM_{2.5}$ are much smaller "fine particles" equal to or less than 2.5 μm in diameter. PM_{10} has a 24-hour average standard of 150 $\mu g/m^3$ not to be exceeded more than once per year over 3 years. $PM_{2.5}$ has an annual average standard of 12 $\mu g/m^3$, and a 98th percentile 24-hour concentration of 35 $\mu g/m^3$ averaged over 3 years. The sources and effects of PM are as follows:



Sources: PM can be emitted directly (primary) or may form in the atmosphere (secondary). Most man-made particulate emissions are classified as TSP. PM_{10} consists of primary particles that can originate from power plants, various manufacturing processes, wood stoves and fireplaces, agriculture and forestry practices, fugitive dust sources (road dust and windblown soil), and forest fires. $PM_{2.5}$ can come directly from primary particle emissions or through secondary reactions that include VOCs, SO_2, and NO_X emissions originating from power plants, motor vehicles (especially diesel trucks and buses), industrial facilities, and other types of combustion sources.

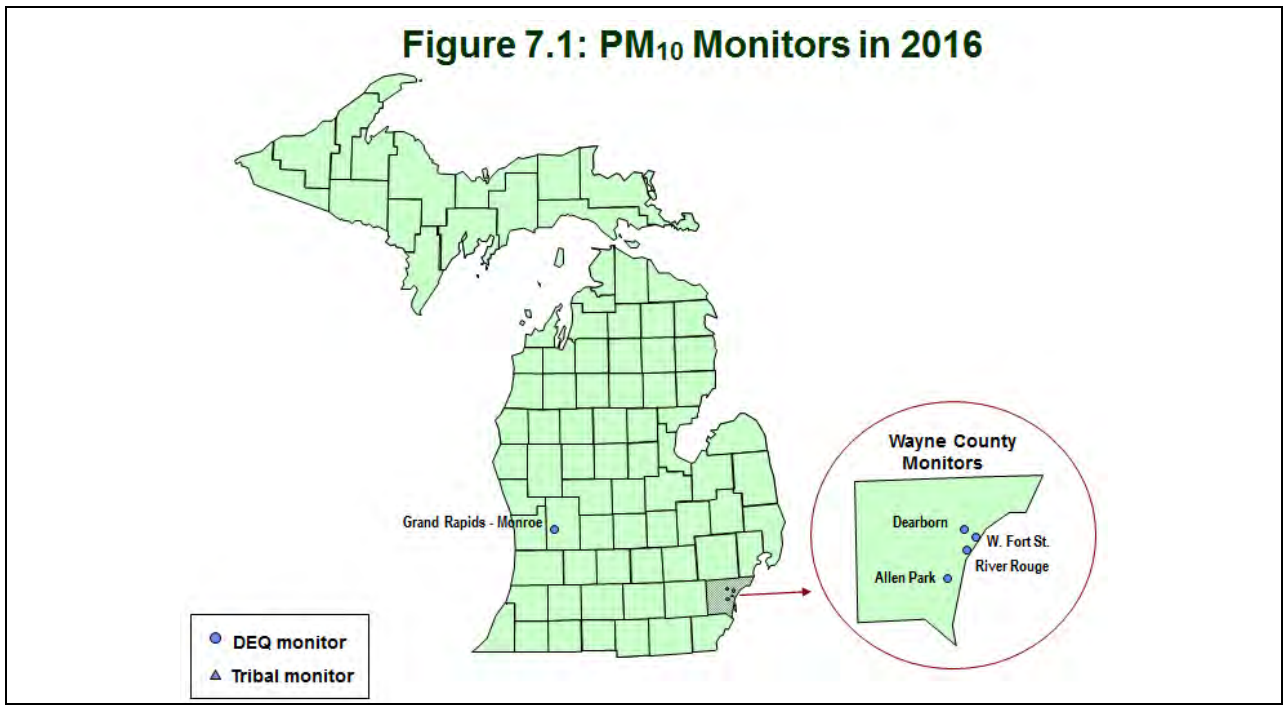
Effects: Exposure to PM affects breathing and the cellular defenses of the lungs, aggravates existing respiratory and cardiovascular ailments, and has been linked with heart and lung disease. Smaller particles (PM_{10} or smaller) pose the greatest problems, because they can penetrate deep in the lungs and possibly into the bloodstream. PM is the major cause of reduced visibility in many parts of the United States. $PM_{2.5}$ is considered a primary visibility-reducing component of urban and regional haze. Airborne particles impact vegetation ecosystems and damage paints, building materials and surfaces. Deposition of acid aerosols and salts increases corrosion of metals and impacts plant tissue.

Population most at risk: People with heart or lung disease, the elderly, and children are at highest risk from exposure to PM.

PM_{10}

Since October 1996, all areas in Michigan have been in attainment with the PM_{10} NAAQS. Due to the recent focus upon $PM_{2.5}$ and because of the relatively low concentrations of PM_{10} measured in recent years, Michigan's PM_{10} network has been reduced to a minimum level. **Table 1-3** identifies the locations of PM_{10} monitoring stations that were operating in Michigan during 2016. These monitors are located mostly in the state's largest populated urban areas: four in the Detroit area and one in Grand Rapids. To better characterize the nature of particulate matter in Michigan, many of the existing PM_{10} monitors are co-located with $PM_{2.5}$ monitors in population-oriented areas.

Figure 7.1 shows the location of each PM_{10} monitor.



Figures 7.2 and **7.3** show PM_{10} emission sources and PM_{10} emissions by county (courtesy of the USEPA's State and County Emission Summaries).

Figure 7.2: PM_{10} Emissions by Source Sector

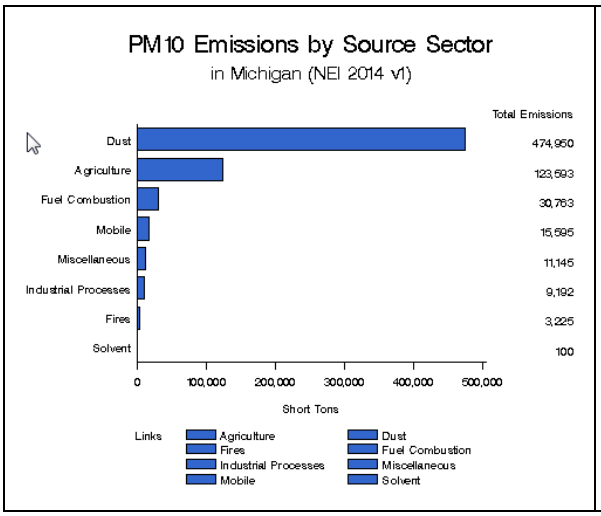


Figure 7.3: PM_{10} Emissions in 2014

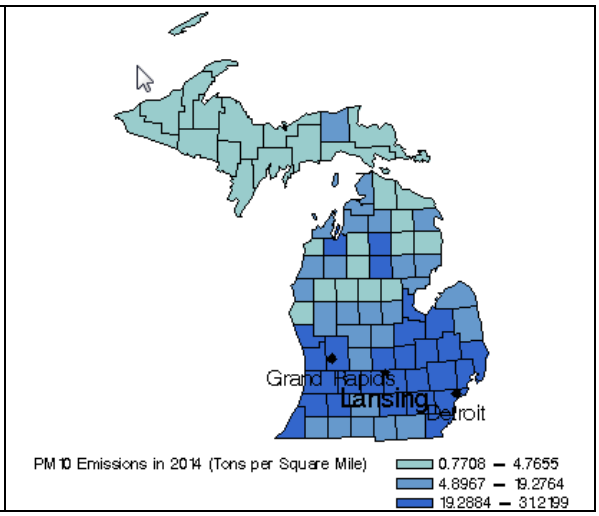
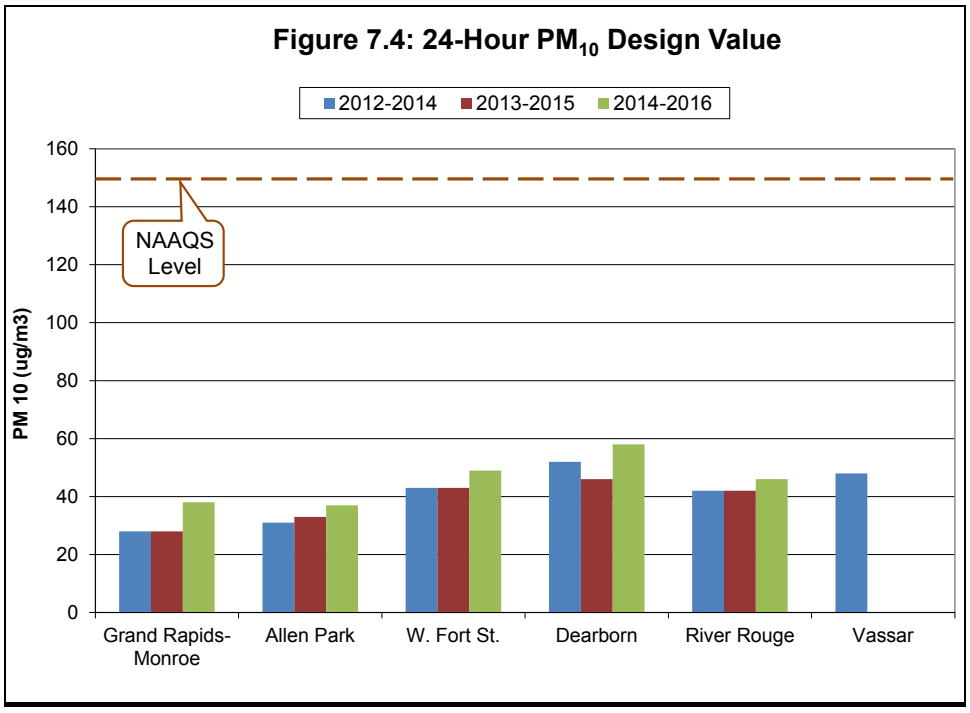


Figure 7.4 shows the PM_{10} levels in Michigan compared to the 24-hour average of 150 µg/m^3. This standard must not be exceeded on average more than once per year over a 3-year period. The design value is the 4th highest value over a 3-year period. The PM_{10} levels at all sites in Michigan are well below the national standard.



$PM_{2.5}$

The USEPA designated Michigan in attainment of the 1997 annual $PM_{2.5}$ standard of 15 µg/m^3 and the 2006 24-hour $PM_{2.5}$ standard of 35 µg/m^3 in August 2013. In December 2012, the USEPA revised the annual primary standard to 12 µg/m^3 while the annual secondary standard remained at 15 µg/m^3. The primary and secondary 24-hour standard remained at 35 µg/m^3. In December 2014, the USEPA determined that no area in Michigan violated the 2012 standard and the state was classified as unclassifiable/attainment.

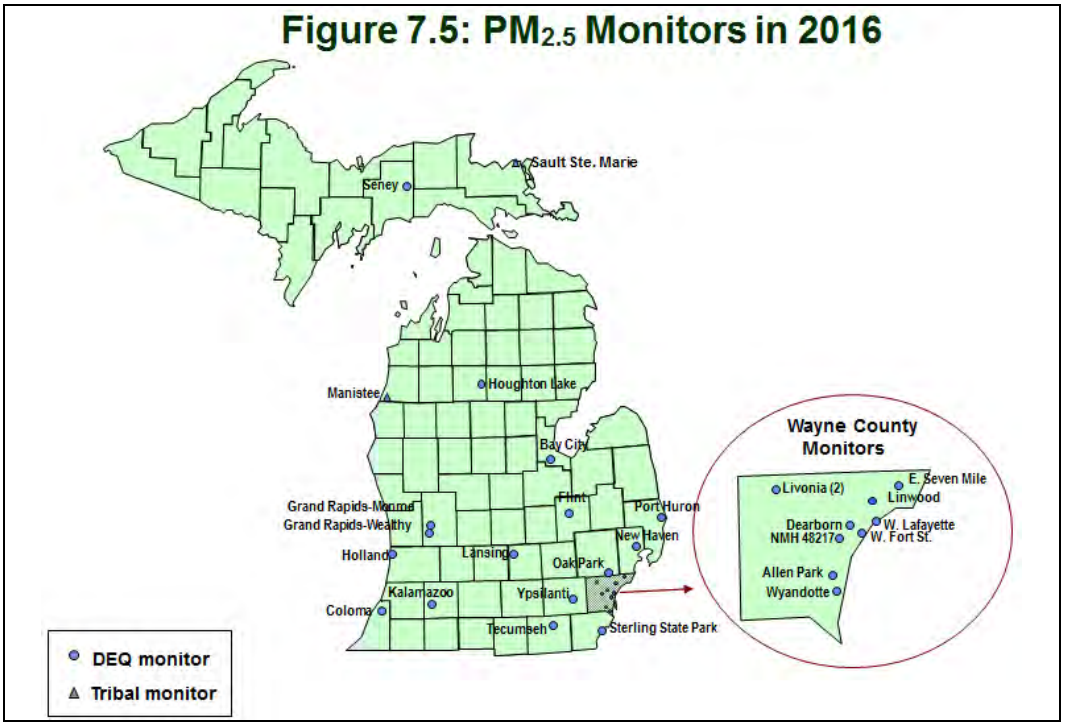
Fine particulate matter ($PM_{2.5}$) is measured using three techniques: Federal Reference Method (FRM), Continuous Methods, and Chemical Speciation Methods. These methods are described in more detail below.

$PM_{2.5}$ FRM Monitoring: The concentrations of $PM_{2.5}$ measured over a 24-hour time period are determined using the filter-based gravimetric FRM. Only data generated by the FRM monitors are used for comparisons to the NAAQS in Michigan. The sites are located in urban, commercial, and residential areas where people are exposed to $PM_{2.5}$.

Continuous $PM_{2.5}$ Monitoring: Continuous monitoring is beneficial as it provides real-time hourly data that supplements the $PM_{2.5}$ data collected by FRM monitors. This data forms the basis of the information reported on AirNow and MIair.

Chemical Speciation Monitoring: Speciated monitoring provides a better understanding of the chemical composition of $PM_{2.5}$ material and better characterizes background levels.

Figure 7.5 shows the location of each $PM_{2.5}$ monitor.



$PM_{2.5}$ FRM Monitoring Network: $PM_{2.5}$ FRM monitors are deployed to characterize background or regional $PM_{2.5}$ transport collectively from upwind sources. A $PM_{2.5}$ monitor was added to the new near-roadway site in Livonia that started in January 2015.

Four $PM_{2.5}$ FRM monitoring sites are co-located with PM_{10} monitors to allow for $PM_{2.5}$ and PM_{10} comparisons.[6] Co-located PM_{10} and $PM_{2.5}$ sites include Grand Rapids-Monroe, Dearborn, Allen Park, and Detroit's W. Fort Street (SWHS).

Continuous $PM_{2.5}$ Network: Short-term measurements of $PM_{2.5}$ or PM_{10} are updated on an hourly basis using Tapered Element Oscillating Microbalance (TEOM) instruments. At least one continuous TEOM is required at the NCore $PM_{2.5}$ monitoring site in a metropolitan area with a population greater than one million. Both Detroit (Allen Park) and Grand Rapids (Monroe) meet this requirement.[7] Under the revised 2006 air monitoring regulations, 50 percent of the FRM monitoring sites are now required to have a continuous $PM_{2.5}$ monitor. For Michigan, there are 26 FRM monitoring sites, 13 of which also have TEOMs. The DEQ initially operated all TEOM units with an inlet temperature of 50ºC, but this high inlet temperature was volatilizing nitrate levels during the winter months. Therefore, the DEQ began operating TEOMs with a 30°C inlet temperature October through March and a 50°C inlet temperature between April and September.

$PM_{2.5}$ Chemical Speciation Monitoring Network: Single event Met-One Speciation Air Sampling System (SASS) monitors are used throughout Michigan's speciation network and are placed in population-oriented stations in both urban and rural locations. $PM_{2.5}$ chemical speciation samples are collected over a 24-hour period and analyzed to determine various components of $PM_{2.5}$. There are five SASS monitors operating in Michigan**.** Houghton Lake, Port Huron and Sterling State Park monitors were shut down on January 24, 2015 due to lack of

[6] Requirements for $PM_{2.5}$ FRM sites are obtained from the Revised Requirements for Designation of Reference and Equivalent Methods for $PM_{2.5}$ and Ambient Air Quality Surveillance for PM [62 FR 38763]; Guidance for Using Continuous Monitors in $PM_{2.5}$ Monitoring Networks [EPA-454/R-98-012, May 1998]; and Appendix N to Part 50 - Interpretation of the National Ambient Air Quality Standards for PM [40 CFR Part 50, July 1, 1998].

[7] Under the Guidance for Using Continuous Monitors in $PM_{2.5}$ Monitoring Networks [EPA-454/R-98-012, May 1998].

funding. The primary objectives of the chemical speciation monitoring sites are to provide data that will be used to determine sources of poor air quality and to support the development of attainment strategies. Historical speciation data for Michigan indicates that $PM_{2.5}$ is made up of 30 percent nitrate compounds, 30 percent sulfate compounds, 30 percent organic carbon,[8] and 10 percent unidentified or trace elements.

Continuous $PM_{2.5}$ Speciation Monitoring (EC/OC and Aethalometer) Network: To determine diurnal changes in $PM_{2.5}$ composition, the DEQ operates two aethalometers and two elemental carbon/organic carbon (EC/OC) monitors.

- Aethalometers measure carbon black, a combustion by-product typical of transportation sources, by concentrating particulate on a filter tape and measuring changes in optical transmissivity and absorption. The DEQ's aethalometers are located at Allen Park and Dearborn.
- The EC/OC instruments measure elemental carbon using pyrolysis coupled with a nondispersive infrared detector to separate the elemental and organic carbon fractions. EC/OC instruments are located at Dearborn and Tecumseh.

$PM_{10\text{-}2.5}$

The 2006 amended air monitoring regulations specified that measurements of PM_{10}-$PM_{2.5}$ needed to be added to the NCore sites.[9] The DEQ began PM_{10}-$PM_{2.5}$ monitoring at Allen Park and Grand Rapids-Monroe Street in 2010.

Table 1.3 in chapter 1 shows all of Michigan's $PM_{2.5}$ FRM monitoring stations operating in 2016 and denotes which sites have TEOM, SASS, Aethalometer or EC/OC monitors in operation.

Figures 7.6 and **7.7** show $PM_{2.5}$ emission sources and $PM_{2.5}$ emissions by county (from the USEPA's State and County Emission Summaries).

Figure 7.6: $PM_{2.5}$ Emissions by Source Sector

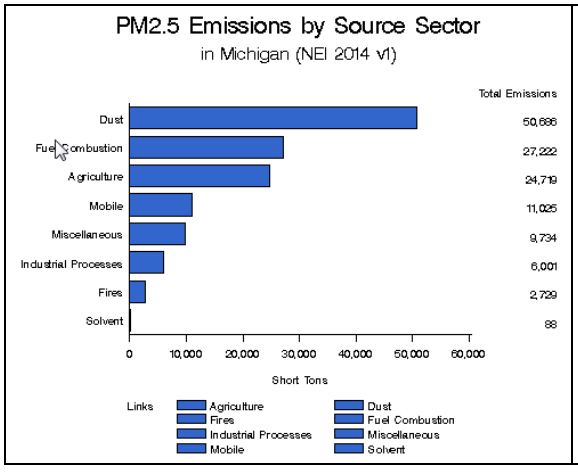
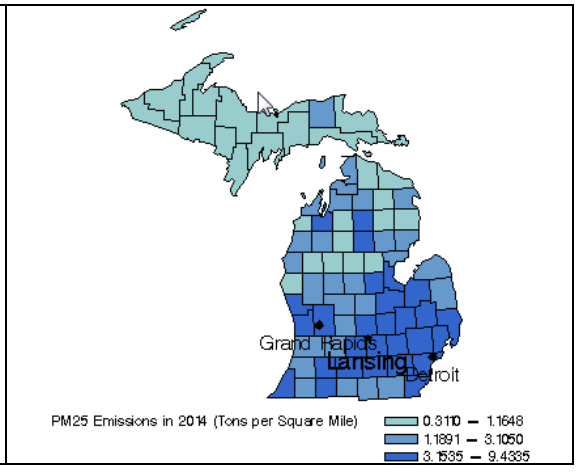


Figure 7.7: $PM_{2.5}$ Emissions in 2014



[8] To better understand the chemical composition of the organic carbon fraction, a number of studies have been conducted in Southeast Michigan to further investigate organic carbon. Information can be found in the Michigan 2012 Ambient Air Monitoring Network Review, available at http://www.michigan.gov/documents/deq/deq-aqd-aqe-2012-Air-Mon-Network-Review_357137_7.pdf

[9] Current information can be found at https://www3.epa.gov/ttn/amtic/ncoreguidance.html.

Table 7.1 provides the 3-year average of the annual mean $PM_{2.5}$ concentrations for 2013-2015. Michigan's levels are below the 12 µg/m^3 primary standard.[10] Stations labeled #2 provide a precision estimate of the overall measurement and operate on a one-in-six sampling schedule. All other monitors are sampled on a one-in-three-day schedule, except for Allen Park #1 and Detroit–W. Lafayette, which sample daily.

Table 7.1: 3-Year Average of the Annual Mean $PM_{2.5}$ Concentrations

Areas	County	Monitoring Sites	2014	2015	2016	2014-2016 Mean
Detroit-Ann Arbor	Lenawee	Tecumseh	8.78	8.58	7.46	8.3
	Livingston					
	Macomb	New Haven	9.10	9.73	7.51	8.8
	Oakland	Oak Park	9.33	9.37	7.87	8.9
	St. Clair	Port Huron	9.40	9.51	7.77	8.9
	Washtenaw	Ypsilanti #1	9.79	9.56	7.84	9.1
		Ypsilanti #2	9.37	9.08	8.06	8.8
	Wayne	Allen Park	10.13	9.66	8.72	9.5
		Detroit-Linwood	9.74	10.18	8.94	9.6
		Detroit-E. 7 Mile	9.64	9.79	8.11	9.2
		Detroit-W. Fort St.	10.99	11.26	11.32	11.2
		Detroit-W. Lafayette	9.68	9.12	8.38	9.1
		Wyandotte	9.71	8.62	7.70	8.7
		Dearborn #1	11.77	11.50	10.67	11.3
		Dearborn #2	11.64	11.65	10.52	11.3
		Livonia	9.46	9.31	8.16	9.0
		Livonia-Roadway		9.53	8.53	9.0
Flint	Genesee	Flint	8.92	8.16	7.18	8.1
	Lapeer					
Grand Rapids	Ottawa	Jenison				
	Kent	Grand Rapids-Wealthy	9.91	9.37	8.79	9.4
		Grand Rapids #1	9.49	9.30	8.16	9.0
		Grand Rapids #2	9.30	10.37	8.48	9.4
Allegan Co	Allegan	Holland	8.68	7.88	6.99	7.9
Monroe Co	Monroe	Luna Pier				
		Sterling State Park	9.03*	9.26	7.75	8.5
Kalamazoo-Battle Creek	Calhoun					
	Kalamazoo	Kalamazoo #1	9.64	8.90	8.09	8.9
		Kalamazoo #2	9.45	9.34	8.25	9.0
	Van Buren					
Lansing-East Lansing	Ingham	Lansing	9.38	8.56	7.31	8.4
	Clinton					
	Eaton					
Benton Harbor	Berrien	Coloma	8.49	8.15	7.35	8.0
Bay Co	Bay	Bay City	8.17	7.74	6.84	7.6
Missaukee Co	Missaukee	Houghton Lake	5.62	5.59	4.87	5.4
Manistee Co	Manistee	Manistee	6.16	6.37	5.50	6.0
Chippewa Co	Chippewa	Sault Ste. Marie #1	6.23	5.79*	5.04*	5.7
		Sault Ste. Marie #2	5.67	6.18*	5.03*	5.6

*Indicates mean does not meet completeness criteria.

[10] For comparison to the standard, the average annual means is rounded to the nearest 0.1 µg/m^3.

Table 7.2 provides the 24-hour 98th percentile $PM_{2.5}$ concentrations for 2013-2015 showing Michigan's levels are below the 35 µg/m^3 standard (3-year average).[11]

Table 7.2: 24-Hour 98th Percentile $PM_{2.5}$ Values Averaged over 3 Years

Areas	County	Monitoring Sites	2014	2015	2016	2014-2016 Mean
Detroit-Ann Arbor	Lenawee	Tecumseh	22.8	25.2	15.1	21
	Livingston					
	Macomb	New Haven	27.0	31.6	20.1	26
	Oakland	Oak Park	23.3	29.6	19.8	24
	St. Clair	Port Huron	25.2	28.7	19.1	24
	Washtenaw	Ypsilanti #1	24.5	25.9	17.6	23
		Ypsilanti #2	23.7	20.6	17.4	21
	Wayne	Allen Park	26.4	23.1	20.3	23
		Detroit-Linwood	23.6	27.1	22.5	24
		Detroit-E. 7 Mile	22.0	25.6	19.5	22
		Detroit-W. Fort St.	23.8	27.1	25.6	26
		Detroit-W. Lafayette	25.5	22.4	20.5	23
		Wyandotte	25.6	21.1	18.8	22
		Dearborn #1	26.5	28.1	25.8	27
		Dearborn #2	26.7	24.7	24.7	25
		Livonia	25.7	26.8	19.9	24
		Livonia-Roadway		25.2	21.4	23
Flint	Genesee	Flint	24.3	22.3	18.8	22
	Lapeer					
Grand Rapids	Ottawa	Jenison				
	Kent	Grand Rapids-Wealthy	24.3	25.5	22.7	24
		Grand Rapids #1	23.0	25.6	19.5	23
		Grand Rapids #2	26.9	24.3	19.5	24
Allegan Co	Allegan	Holland	23.4	21.2	17.2	21
Monroe Co	Monroe	Luna Pier				
		Sterling State Park	23.9*	25.7	18.3	23
Kalamazoo-Battle Creek	Calhoun					
	Kalamazoo	Kalamazoo #1	23.9	22.3	20.1	22
		Kalamazoo #2	30.6	21.3	20.2	24
	Van Buren					
Lansing-East Lansing	Ingham	Lansing	22.1	24.5	18.0	22
	Clinton					
	Eaton					
Benton Harbor	Berrien	Coloma	19.8	19.4	17.2	19
Bay Co	Bay	Bay City	21.1	23.3	19.6	21
Missaukee Co	Missaukee	Houghton Lake	16.3	17.9	12.4	16
Manistee Co	Manistee	Manistee	17.3	19.3	12.6	16
Chippewa Co	Chippewa	Sault Ste. Marie #1	15.3	15.8	11.3	14
		Sault Ste. Marie #2	12.7	16.4	10.8	13

*Indicates mean does not meet completeness criteria.

Figures 7.8 through **7.11** illustrate the current annual mean $PM_{2.5}$ trend for each monitoring site in Michigan. For clarity, the monitoring sites within the Detroit-Warren-Flint CSA have been

[11] The 98th percentile value was obtained from the USEPA AQS. For the purpose of comparing calculated values, the 3-year 24-hour average is rounded to the nearest 1 µg/m^3.

broken down into two graphs. **Figure 7.8** shows those sites in Wayne County, and **Figure 7.9** shows the remaining counties within the CSA.

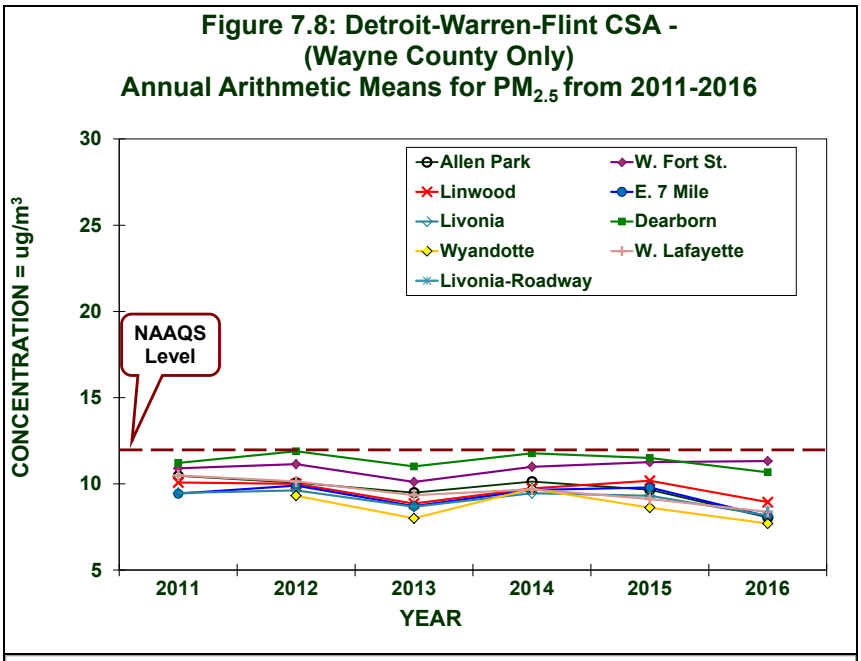


Figure 7.8 shows the 2016 levels in Wayne County remained below the $PM_{2.5}$ NAAQS standard. Historically, Dearborn has had the highest readings in the state, but W. Fort St. now has the highest readings.

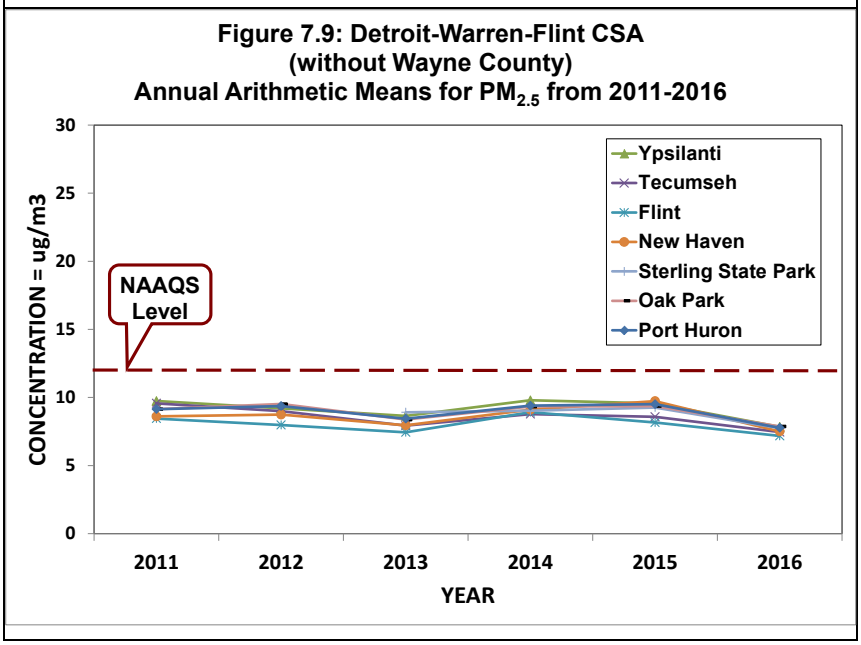


Figure 7.9 contains the remainder of those sites in the Detroit-Warren-Flint CSA that are outside of Wayne County. These sites also show readings in 2016 to be below the $PM_{2.5}$ NAAQS.

Figure 7.10: West MI - Grand Rapids-Muskegon-Holland CSA, Kalamazoo & Benton Harbor MSAs Annual Arithmetic Means for $PM_{2.5}$ from 2011-2016

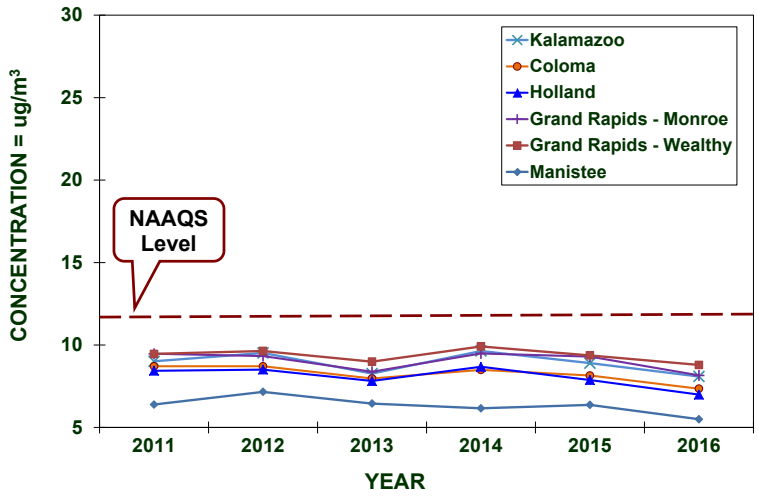


Figure 7.10 combines the $PM_{2.5}$ monitoring sites located in West Michigan-Grand Rapids-Muskegon-Holland CSA, Kalamazoo and Benton Harbor MSAs. All sites are below the annual $PM_{2.5}$ NAAQS.

Figure 7.11: Lansing-E. Lansing CSA, Saginaw-Bay City CSA, Cadillac MiSA & Upper Peninsula Annual Arithmetic Means for $PM_{2.5}$ from 2011-2016

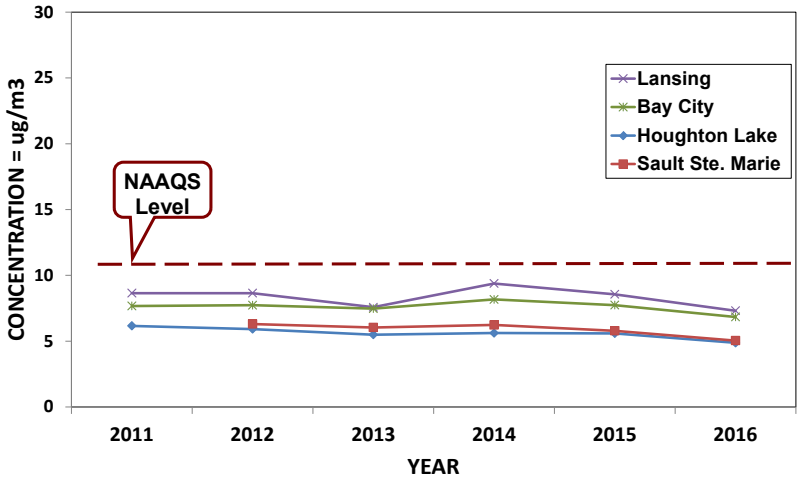


Figure 7.11 displays the remaining monitoring sites in the Northern Lower and Upper Peninsula. All of these sites are below the annual $PM_{2.5}$ NAAQS standard.

Chapter 8: Toxic Air Pollutants

In addition to the six criteria pollutants discussed in previous chapters, the AQD monitors for a wide variety of substances classified as toxic air pollutants, and/or Hazardous Air Pollutants (HAPs). Under the Clean Air Act, the USEPA specifically addresses a group of 187 HAPs. Under Michigan's air regulations, Toxic Air Contaminants (TACs) are defined as all non-criteria pollutants that may be *"…harmful to public health or the environment when present in the outdoor atmosphere in sufficient quantities and duration."* The definition of TACs lists 41 substances that are not TACs, indicating that all others are TACs. The sources and effects of toxics are as follows:

Sources: Air toxics come from a variety of mobile, stationary, and indoor man-made sources as well as outdoor natural sources. Mobile sources include motor vehicles, stationary sources include industrial factories and power plants, indoor sources include household cleaners, and natural sources include forest fires and eruptions from volcanoes.

Effects: Once air toxics enter the body, there is a wide range of potential health effects. They include the aggravation of asthma; irritation to the eyes, nose, and throat; carcinogenicity; developmental toxicity (birth defects); nervous system effects, and various other effects on internal organs. Some effects appear after a shorter period of exposure, while others may appear after long-term exposure or after a long period of time has passed since the exposure ended. Most toxic effects are not unique to one substance, and some effects may be of concern only after the substance has deposited to the ground or to a water body (e.g., mercury, dioxin), followed by exposure through an oral pathway such as the eating of fish or produce. This further complicates the assessment of air toxics concerns due to the broad range of susceptibility that various people may have.

Population most at risk: People with asthma, children, and the elderly are at the highest risk from exposure to air toxics**.**

Air Toxics can be categorized as:

- *Metals:* Examples include aluminum, arsenic, beryllium, barium, cadmium, chromium, cobalt, copper, iron, mercury, manganese, molybdenum, nickel, lead, vanadium, and zinc.
- *Organic Substances*: Further divided into sub-categories that include -
    - VOCs, include benzene (found in gasoline), perchlorethylene (emitted from some dry cleaning facilities), and methylene chloride (a solvent and paint stripper used by industry);
    - carbonyl compounds (formaldehyde, acetone, and acetaldehyde);
    - semi-volatile compounds (SVOCs);
    - polycyclic aromatic hydrocarbons (PAHs)/polynuclear aromatic hydrocarbons (PNAs);
    - pesticides and;
    - polychlorinated biphenyls (PCBs).
- *Other substances*: Asbestos, dioxin, and radionuclides such as radon.

Because air toxics are such a large and diverse group of substances, regulatory agencies sometimes further refine these classifications to address specific concerns.

For example:

- Some initiatives have targeted those substances that are *persistent, bioaccumulative* and *toxic* (PBT), such as mercury, which accumulates in body tissues.
- The USEPA has developed an Integrated *Urban Air Toxics Strategy* with a focus on 30 substances (the Urban HAPs List).[12]

The evaluation of air toxics levels is difficult due to several factors.

- There are no health-protective NAAQS. Instead, air quality assessments utilize various short- and long-term screening levels and health benchmark levels estimated to be safe considering the critical effects of concern for specific substances.
- There is incomplete toxicity information for many substances. For some air toxics, the analytical detection limits are too high to consistently measure the amount present, and in some cases, the risk assessment-based "safe" levels are below the detection limits.
- Data gaps are present regarding the potential for interactive toxic effects for co-exposure to multiple substances present in emissions and in ambient air. Air toxics also pose a challenge due to monitoring and analytical methods that are either unavailable for some compounds or cost-prohibitive for others (e.g., dioxins).

These factors make it difficult to accurately assess the potential health concerns of all air toxics. Nevertheless, it is feasible and important to characterize the potential health hazards and risks associated with many air toxics.

Table 8.1 shows the monitoring stations and what air toxic was monitored at each station in 2016. This table can also be found in **Appendix B** with the Air Toxics Monitoring Summary.

The $PM_{2.5}$ speciation network was reduced due to USEPA funding cuts. In January 2015, the DEQ shut down three monitors at Houghton Lake in Missaukee County, Sterling State Park in Monroe County, and Port Huron in St. Clair County.

Table 8.1: 2016 Toxics Sampling Sites

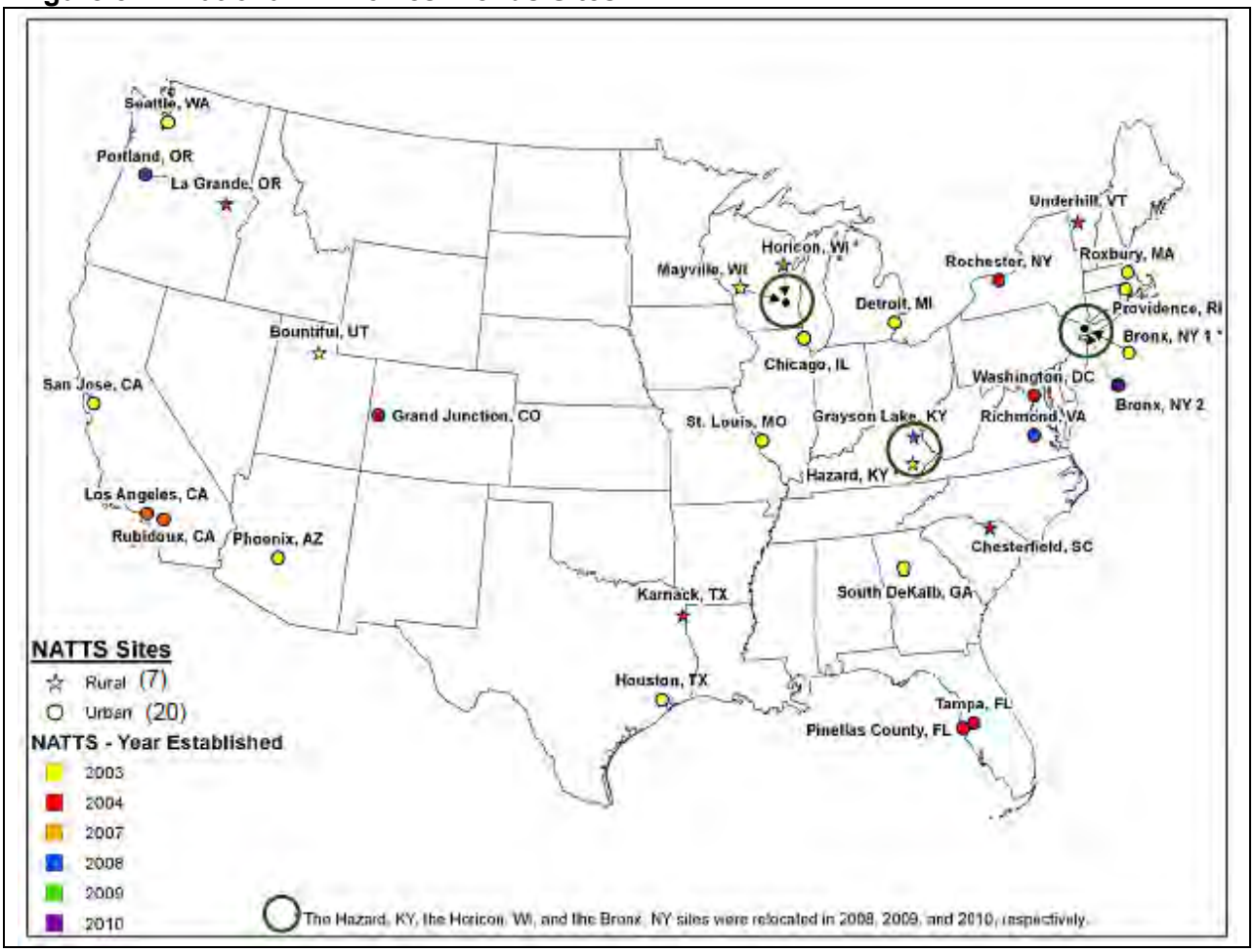
Site Name	VOC	Carbonyl	PAHs	Metals TSP	Metals PM_{10}	Speciated $PM_{2.5}$
Allen Park				x	x	x
Dearborn	x	x	x	x	x	x
Detroit-W. Fort St.	x	x		x	Mn	x
Detroit-W. Jefferson				x		
Grand Rapids-Monroe				x		x
Belding-Merrick St.				x		
Belding-Reed St.				x		
NMH 48217	x		x	x		
Port Huron-Rural St.				x		
River Rouge		x		x	Mn	
Tecumseh						x

[12] USEPA's Air Toxics Website: Urban Strategy is located at https://www.epa.gov/urban-air-toxics/urban-air-toxic-pollutants.

National Monitoring Efforts and Data Analysis

The USEPA administers national programs that identify air toxics levels, detect trends, and prioritize air toxics research. The DEQ participates in these programs. In addition, the AQD operates a site in Dearborn that is part of the USEPA's NATTS. The purpose of the NATTS network is to detect trends in high-risk air toxics such as benzene, formaldehyde, chromium, and 1,3-butadiene and to measure the progress of air toxics regulatory programs at the national level. Currently, the NATTS network contains 27 stations; 20 urban and 7 rural (see **Figure 8.1**). The USEPA requires that the NATTS sites measure VOCs, carbonyls, PAHs and trace metals on a once-every-six-day sampling schedule. Hexavalent chromium is no longer required at NATTS sites and data collection was discontinued July 2013. The Dearborn NATTS site measures trace metals as TSP, $PM_{10,}$ and $PM_{2.5}$.

Figure 8.1: National Air Toxics Trends Sites.



Chapter 9: MIair – Air Quality Information in Real-Time

MIair is the internet tool that provides real-time air quality information via the DEQ's webpage. The www.deqmiair.org hotlink opens to the current Air Quality Index (AQI) map and displays air quality forecasts for "today" and "tomorrow." **MIair** also hosts EnviroFlash, the automated air quality notification system.

Air Quality Index

The Air Quality Index (AQI) is a simple tool developed to communicate current air quality information to the public. The current day's color-coded AQI values, ranging from Good to Hazardous (**Table 9.1**), are displayed in a forecast table and as dots on a Michigan map.

As can be seen from the annual summaries in **Appendix C**, air quality in Michigan is generally in the Good or Moderate range. An area will occasionally fall into the Unhealthy for Sensitive Groups range, but rarely reaches Unhealthy levels.

MIair includes an "Actions to Protect Health" link: http://www.deqmiair.org/assets/AQIActionsToProtectHealth_2011.pdf which contains activity recommendations based on the AQI levels.

Air Quality Forecasts

AQD meteorologists provide air pollution forecasts to alert the public when air pollution levels may become elevated. *Action!* Days are declared when levels are expected to reach or exceed the Unhealthy for Sensitive Groups AQI health indicator. On *Action!* Days, businesses, industry, government and the public are encouraged to reduce air pollution levels by limiting vehicle use, refueling only after 6 PM, carpooling, walking, biking or taking public transit, deferring the use of gasoline-powered lawn and recreation equipment, limiting the use of volatile chemicals and curtailing all burning. More information on voluntary air pollution control measures can be found under the *Action!* Days tab on **MIair**.

Air Quality Notification

EnviroFlash is a free service that provides automated air quality (AQI) and ultraviolet (UV) forecasts to subscribers. Those enrolled receive e-mail or mobile phone text messages when the health level they select is predicted to occur. AIRNow iPhone and Android applications deliver ozone and fine particle air quality forecasts plus detailed real-time information that can be used to better protect health when planning daily activities. To learn more about this program, select the **MIair** button from Michigan's Air Quality page www.michigan.gov/air. To receive notices chose the "Air Quality Notification" tab and click the "Enroll in AQI EnviroFlash" link. Michigan's EnviroFlash network has the potential to reach up to 98% of the state's population.

AIRNow

The DEQ supplies Michigan air monitoring data to AIRNow, the USEPA's nation-wide air quality mapping system. Information about AIRNow is available at www.epa.gov/airnow or you can select the AIRNow hot link at the bottom of each **MIair** webpage.

Table 9.1: AQI Colors and Health Statements

AQI Color, Category & Value	PARTICULATE MATTER ($\mu g/m^3$) 24-hour	OZONE (ppm) 8-hour / 1-hour	CARBON MONOXIDE (ppm) 8-hour	SULFUR DIOXIDE (ppm) 24-hour	NITROGEN DIOXIDE (ppm) 1-hour
GREEN: Good 1- 50	None	None	None	None	None
YELLOW: ***Moderate*** **51- 100**	Unusually sensitive people should consider reducing prolonged or heavy exertion.	Unusually sensitive people should consider reducing prolonged or heavy exertion.	None	None	None
ORANGE: Unhealthy For Sensitive Groups 101- 150	People with heart or lung disease, Children, and Older adults should reduce prolonged or heavy exertion.	People with heart or lung disease, Children & older adults, and People who are active outdoors should reduce prolonged or heavy exertion.	People with heart disease, such as angina, should limit heavy exertion and avoid sources of CO, such as heavy traffic.	People with asthma should consider limiting outdoor exertion.	None
RED: Unhealthy 151- 200	People with heart or lung disease, Children, and Older adults should avoid prolonged or heavy exertion. Everyone should reduce prolonged or heavy exertion.	People with heart or lung disease, Children & older adults, and People who are active outdoors should avoid prolonged or heavy exertion. Everyone should reduce prolonged or heavy exertion.	People with heart disease, such as angina, should reduce moderate exertion and avoid sources of CO, such as heavy traffic.	Children, Asthmatics, and People with heart or lung disease should reduce outdoor exertion.	None
PURPLE: Very Unhealthy 201- 300	People with heart or lung disease, Children, and Older adults should avoid all physical exertion outdoors. Everyone else should limit outdoor exertion.	People with heart or lung disease, Children & older adults, and People who are active outdoors should avoid all physical exertion outdoors. Everyone else should limit outdoor exertion.	People with heart disease, such as angina, should avoid exertion and sources of CO, such as heavy traffic.	Children, Asthmatics, and People with heart or lung disease should avoid outdoor exertion; Everyone should reduce outdoor exertion.	Children and People with respiratory disease, such as asthma, should reduce outdoor exertion.
MAROON: Hazardous 301- 500	People with heart or lung disease, Children, and Older adults should remain indoors. Everyone should avoid prolonged or heavy exertion.	People with heart or lung disease, Children, and Older adults should remain indoors. Everyone should avoid all outdoor exertion.	People with heart disease, such as angina, should avoid exertion and sources of CO, such as heavy traffic. Everyone else should limit heavy exertion.	Children, Asthmatics, and People with heart or lung disease should remain indoors. Everyone should avoid outdoor exertion.	Children and People with respiratory disease, such as asthma, should avoid outdoor exertion.

Chapter 10: Meteorological Information

Figures 10.1 through **10.3** shows average daily temperatures and **Figures 10.4** through **10.6** shows total monthly precipitation amounts compared to their climatic norms for sites in the Northern, Southern Lower and Upper Peninsula. These figures were constructed by averaging data from several National Weather Service stations and therefore are not meant to be representative of any one single location in Michigan. Instead, they are intended to depict the regional trends that occurred during the year 2016.

Figure 10.1: Southern Lower Peninsula Observed Average Daily Temperatures vs. Normal Average Daily Temperatures

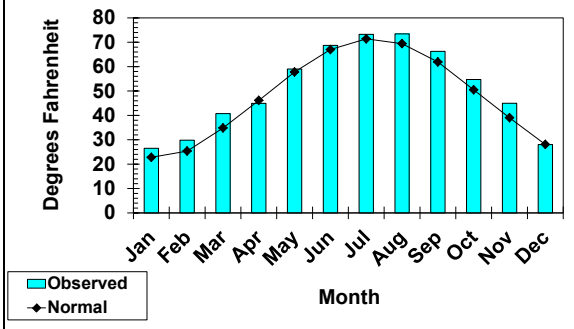


Figure 10.2: Northern Lower Peninsula Observed Average Daily Temperatures vs. Normal Average Daily Temperatures

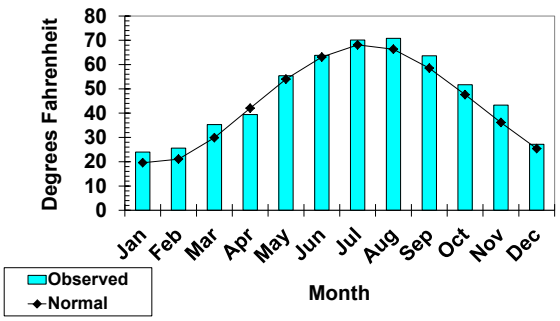


Figure 10.3: Upper Peninsula Observed Average Daily Temperatures vs. Normal Average Daily Temperatures

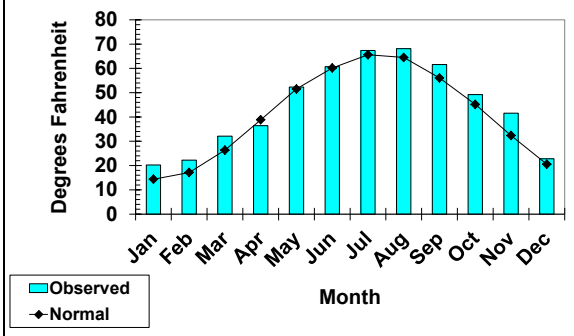


Figure 10.4: Southern Lower Peninsula Observed Monthly Precipitation vs. Normal Monthly Precipitation

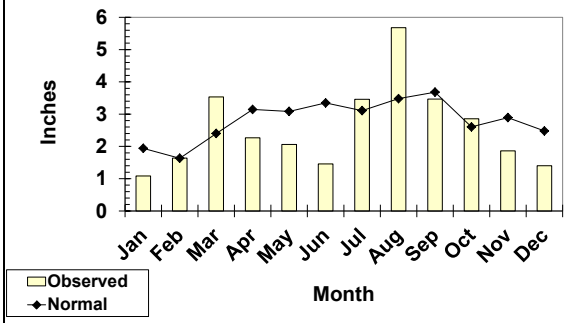


Figure 10.5: Northern Lower Peninsula Observed Monthly Precipitation vs. Normal Monthly Precipitation

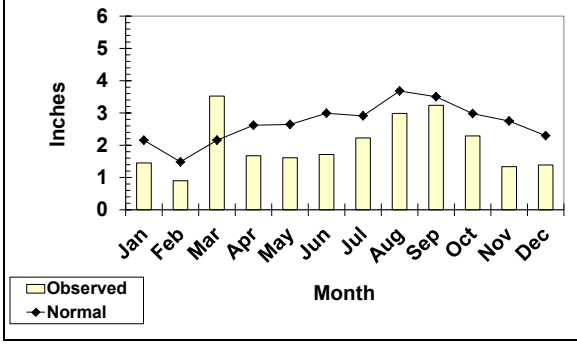
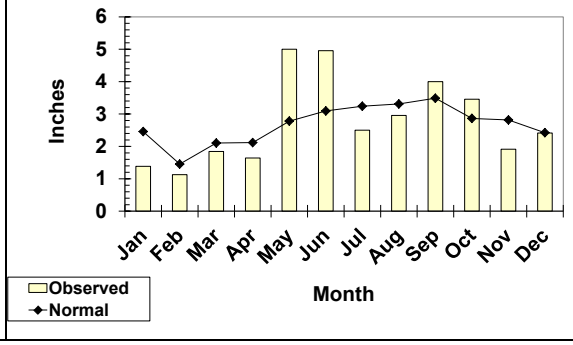


Figure 10.6: Upper Peninsula Observed Monthly Precipitation vs. Normal Monthly Precipitation



The weather plays a significant role in air quality, and can either help increase or decrease the amount of pollution in the air. High temperatures, sun and longer days (i.e., more daylight hours) are conducive to ozone formation, whereas rain tends to wash pollutants out of the air. *Action!* Days are declared when levels are expected to reach or exceed the Unhealthy for Sensitive Groups AQI health indicator; specifically, when meteorological conditions are conducive for the formation of elevated ground-level O_3 or $PM_{2.5}$ concentrations.

Table 10.1 Shows that there were several *Action!* Days declared during the summer of 2016.

Table 10.1: *Action!* Days Declared During Summer 2016

Location	Year	Number	Dates
Ann Arbor	2016	8	6/18, 6/19, 6/25, 7/12, 7/23, 8/4, 8/10, 8/11
Benton Harbor	2016	7	5/23, 6/10, 6/11, 6/19, 7/23, 8/4, 8/10
Detroit	2016	9	6/11, 6/18, 6/19, 6/25, 7/12, 7/23, 8/4, 8/10, 8/11
Flint	2016	3	6/10, 6/25, 8/4
Grand Rapids	2016	9	5/23, 6/10, 6/11, 6/19, 6/25, 7/23, 8/4, 8/10, 8/11
Kalamazoo	2016	1	6/11
Ludington	2016	5	5/23, 6/19, 6/25, 7/23, 8/4
Saginaw	2016	1	8/4
Traverse City	2016	1	6/19

Chapter 11: Special Projects

Near-Road Air Toxics Grant: The DEQ is currently working on two special projects. The first project is a Community Scale Air Toxics Ambient Monitoring (CSATAM) grant. In 2015, the DEQ applied for a CSATAM grant to study near-roadway emissions at three sites in Detroit: Eliza Howell Near-Road, Eliza Howell Downwind, and Livonia Near-Road. The grant involves two years of monitoring at these sites, with an intensive 3-month sampling period when additional samples and increased sampling frequency will be employed. The additional measurements at these sites are listed in **Table 11.1**. The 3-month intensive sampling period will allow for the analysis of toxic compounds that are more labor intensive to collect. The schedule for the intensive period has been delayed due to road construction at the Livonia Near-Road site, but will run from May through July 2017.

Table 11.1. Types of Measurements, Duration and Purpose at Near-Road Sites

Measurement	Duration	Purpose
Hourly Black Carbon (BC[1])	2 years	Characterize diesel PM
Hourly BTEX	2 years	Characterize benzene and mobile source indicators
Hourly PM	2 years	Characterize hourly particulate matter
Hourly NO/NO_2/NOx	2 years	Mandated near-road measurement
Hourly CO	2 years	Mandated near-road measurement
Hourly Ozone	2 years	Help differentiate NOx and NO_2 concentrations
Hourly UFP[2]	6-12 months	Determine Ultra Fine Particulate Matter (UFP) levels, which have acute and likely chronic health affects
Hourly PM_{10} toxic metals	1 month	Use high–time-resolution measurements to apportion roadway influence, upwind versus downwind, and variations with traffic
Every other day 24-hour TSP toxic metals	3 months	Obtain full suite of toxics metals, for comparison among near-road and urban sites, apportion roadway influence
Every other day 24-hour carbonyls	3 months	Obtain toxics formaldehyde, acetaldehyde, acrolein to best determine risk from these air toxics
Meteorology	2 years	Provide capability to differentiate upwind from downwind
Traffic counts	2 years	Provide data on traffic patterns to link traffic mix and speed to air toxics concentrations

[1] BC is a marker for diesel particulate matter (DPM), which the USEPA has concluded ranks with the other substances that the national-scale assessment suggests pose the greatest relative risk; see https://cfpub.epa.gov/ncea/risk/recordisplay.cfm?deid=29060

[2] Mobile sources are a key source of exposure to ambient UFP emissions. Epidemiological studies have so far been inconclusive regarding UFP toxicity, but more data are needed, as discussed in detail in Health Effects Institute Perspectives.

[3] Understanding the Health Effects of Ambient Ultrafine Particles is available at: https://www.healtheffects.org/system/files/Perspectives3.pdf

Community Monitoring Project: The second special purpose monitoring project resulted from a request from community members in the Detroit 48217 ZIP code for an air monitoring station in their neighborhood. The 48217 community has many industrial sources located in and around it. The DEQ has agreed to place an air monitoring station in their community for a 1-year study. The monitor site, known as "NMH 48217," is located at New Mount Herman Church at 3225 South Deacon Street in Detroit. The site monitors for SO_2, $PM_{2.5}$, VOCs, PAHs, TSP metals, hydrochloric acid, sulfuric acid, and hydrogen cyanide. Sampling started in August 2016 for some instruments, with all instruments being online by the end of September 2016. The data

will be analyzed at the end of the 1-year study, and a determination will be made whether to shut down all or some of the parameters that are being collected at this site. **Figure 11.1** shows the 1-hour maximum SO_2 per day and **Figure 11.2** shows the daily $PM_{2.5}$ concentrations. See Appendix B-1 for a summary of the other air pollutants sampled at this site.

Figure 11.1. 1-Hour Maximum SO_2 Concentrations per Day at NMH 48217

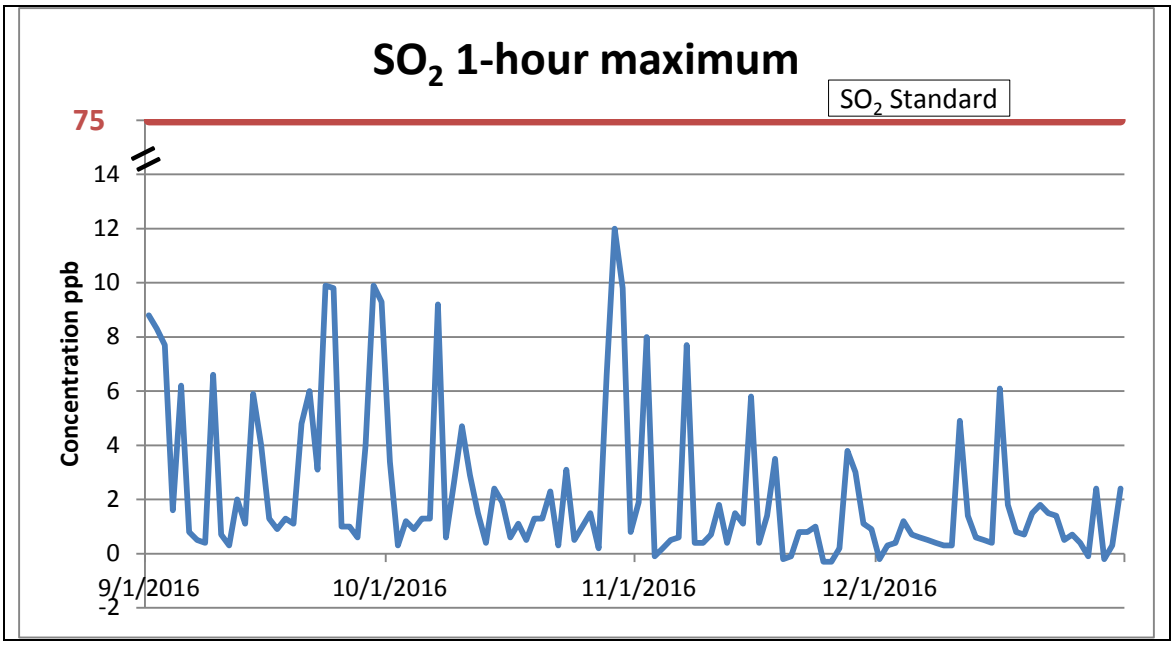
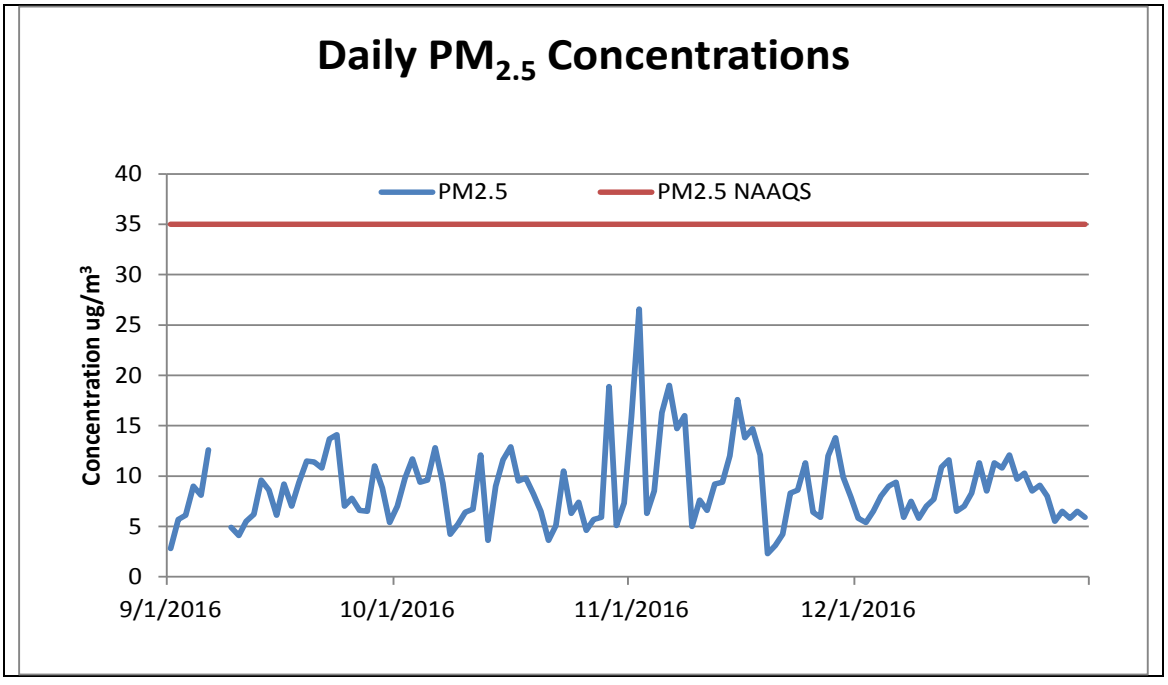


Figure 11.2. Daily $PM_{2.5}$ Concentrations at NMH 48217



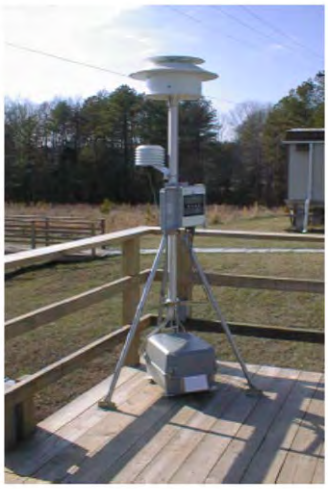
Appendix A: Criteria Pollutant Summary for 2016

Appendix A utilizes the USEPA's 2016 Air Quality System (AQS) Quick Look Report Data to present a summary of ambient air quality data collected for the criteria pollutants at monitoring locations throughout Michigan. Concentrations of non-gaseous pollutants are generally given in $\mu g/m^3$ and in ppm for gaseous pollutants. The following define some of the terms listed in the **Appendix A** reports.

Site I.D.: The AQS site ID is the USEPA's code number for these sites.

POC: The Parameter Occurrence Code or POC is used to assist in distinguishing different uses of monitors, i.e., under Pb, NO_2, and SO_2, POC #1-5 are used to help differentiate between individual monitors. For PM, the POC numbers are used more for the type of monitoring, such as:

- 1 - FRM;
- 2 - co-located FRM;
- 3 - TEOM hourly PM_{10} and $PM_{2.5}$ measurements; and
- 5 - $PM_{2.5}$ speciation monitors (shown at right is a Met One SASS – speciation air sampling system).



 # OBS: For Pb, TSP, $PM_{2.5}$, and PM_{10}, the # OBS (number of observations) refers to the number of valid 24-hour values gathered.

For continuous monitors (CO, NO_2, O_3, $PM_{2.5}$ TEOM, and SO_2), # OBS refers to the total valid hourly averages obtained from the analyzer.

Values: The value is listed for each criteria pollutant per its NAAQS (primary and secondary). The number of exceedances per site for the primary and secondary standards utilize running averages for continuous monitors (except for O_3) and does not include averages considered invalid due to limited sampling times. For example, a particulate-mean based only on six months could not be considered as violating the annual standard. As noted, each site is allowed one short-term standard exceedance before a violation is determined.

>: The "greater than" symbol (>) heads the column reporting values or observations above the corresponding primary or secondary standards.

CRITERIA POLLUTANT SUMMARY FOR 2016

CO Measured in ppm

Site ID	POC	City	County	Year	# OBS	1-hr Highest Value	1-hr 2nd Highest Value	1-hr OBS > 35	8-hr Highest Value	8-hr 2nd Highest Value	8-hr OBS > 9
260810020	1	Grand Rapids-Monroe	Kent	2016	7625	1.5	1.4	0	0.9	0.9	0
261630001	1	Allen Park	Wayne	2016	8153	1.9	1.6	0	1.4	1.1	0
261630093	1	Eliza Howell-Roadway	Wayne	2016	8021	2.2	2.2	0	2.0	1.5	0
261630094	1	Eliza Howell-Downwind	Wayne	2016	8381	2.2	2.1	0	2.0	1.5	0
261630095	1	Livonia-Roadway	Wayne	2016	8380	1.7	1.5	0	1.3	1.3	0

Pb (24-Hour) Measured in $\mu g/m^3$

Site ID	POC	City	County	Year	# OBS	Highest rolling 3-month Arith Mean	Highest Value (24-hr)	2nd Highest Value (24-hr)
260670002	1	Belding-Reed St.	Ionia	2016	61	0.02	0.167	0.117
260670003	1	Belding-Merrick St.	Ionia	2016	61	0.01	0.099	0.082
260810020	1	Grand Rapids-Monroe	Kent	2016	61	0.00	0.010	0.008
261470031	1	Port Huron-Rural St.	St. Clair	2016	60	0.07	0.237	0.129
261630001	1	Allen Park	Wayne	2016	57	0.01	0.018	0.009
261630033	1	Dearborn	Wayne	2016	58	0.01	0.034	0.031
261630097	1	NMH 48217*	Wayne	2016	20	0.01	0.008	0.007

*Indicates the site is part of a one-year special study

NO_2 Measured in ppb

Site ID	POC	City	County	Year	# OBS	1-Hr Highest Value	1-Hr 2nd Highest Value	98th Percentile 1-hr	Annual Arith Mean
260650012	1	Lansing	Ingham	2016	6895	53.0	45.0	38.0	6.60
261130001	1	Houghton Lake	Missaukee	2016	8295	15.0	12.0	9.0	1.69
261630019	2	Detroit-E. 7 Mile	Wayne	2016	8368	55.2	54.0	42.3	10.20
261630093	1	Eliza Howell-Roadway	Wayne	2016	8179	47.0	47.0	44.0	16.29
261630094	1	Eliza Howell Downwind	Wayne	2016	8448	62.0	61.0	40.4	11.24
261630095	1	Livonia–Roadway	Wayne	2016	8095	51.0	49.0	41.0	9.43

NO_Y Measured in ppb

Site ID	POC	City	County	Year	# OBS	1-Hr Highest Value	1-Hr 2nd Highest Value	Annual Arith Mean
260810020	1	Grand Rapids-Monroe	Kent	2016	7407	200.7	179.8	13.48
261630001	1	Allen Park	Wayne	2016	8215	204.7	203.1	17.20

O_3 (1-Hour) Measured in ppm

Site ID	POC	City	County	Year	Num Meas	Num Req	Highest Value	2nd Highest Value	3rd Highest Value	4th Highest Value	Day Max >/= 0.125 Measured	Values >/= 0.125 Estimated	Missed Days < 0.125 Standard
260050003	1	Holland	Allegan	2016	181	183	0.97	0.089	0.082	0.080	0	0	0
260190003	1	Benzonia	Benzie	2016	168	183	0.084	0.082	0.080	0.079	0	0	3
260210014	1	Coloma	Berrien	2016	182	183	0.093	0.090	0.086	0.084	0	0	1
260270003	2	Cassopolis	Cass	2016	183	183	0.087	0.082	0.082	0.081	0	0	0
260330901	1	Sault Ste. Marie	Chippewa	2016	170	183	0.079	0.076	0.073	0.068	0	0	0
260370001	2	Rose Lake	Clinton	2016	181	183	0.083	0.081	0.080	0.079	0	0	0
260490021	1	Flint	Genesee	2016	182	183	0.085	0.084	0.080	0.079	0	0	1
260492001	1	Otisville	Genesee	2016	183	183	0.093	0.083	0.082	0.080	0	0	0
260630007	1	Harbor Beach	Huron	2016	183	183	0.086	0.086	0.081	0.080	0	0	0
260650012	2	Lansing	Ingham	2016	171	183	0.083	0.081	0.079	0.077	0	0	2
260770008	1	Kalamazoo	Kalamazoo	2016	180	183	0.080	0.078	0.078	0.078	0	0	0
260810020	1	Grand Rapids-Monroe	Kent	2016	183	183	0.087	0.085	0.083	0.078	0	0	0
260810022	1	Evans	Kent	2016	181	183	0.084	0.080	0.080	0.078	0	0	0
260910007	1	Tecumseh	Lenawee	2016	183	183	0.078	0.078	0.077	0.076	0	0	0
260990009	1	New Haven	Macomb	2016	183	183	0.094	0.092	0.090	0.087	0	0	0
260991003	1	Warren	Macomb	2016	183	183	0.084	0.080	0.080	0.078	0	0	0
261010922	1	Manistee	Manistee	2016	183	183	0.092	0.079	0.076	0.075	0	0	0
261050007	1	Scottville	Mason	2016	181	183	0.095	0.094	0.084	0.081	0	0	0
261130001	1	Houghton Lake	Missaukee	2016	182	183	0.080	0.078	0.077	0.077	0	0	1
261210039	1	Muskegon	Muskegon	2016	178	183	0.108	0.099	0.089	0.081	0	0	3
261250001	2	Oak Park	Oakland	2016	183	183	0.087	0.083	0.082	0.081	0	0	0
261390005	1	Jenison	Ottawa	2016	168	183	0.087	0.086	0.083	0.079	0	0	0
261470005	1	Port Huron	St .Clair	2016	183	183	0.088	0.084	0.082	0.081	0	0	0
261530001	1	Seney	Schoolcraft	2016	183	183	0.090	0.086	0.080	0.080	0	0	0
261610008	1	Ypsilanti	Washtenaw	2016	181	183	0.081	0.079	0.077	0.077	0	0	2
261630001	2	Allen Park	Wayne	2016	183	183	0.086	0.082	0.080	0.078	0	0	0
261630019	2	Detroit-E. 7 Mile	Wayne	2016	176	183	0.084	0.083	0.083	0.082	0	0	2
261630093	1	Eliza Howell-Roadway*	Wayne	2016	180	183	0.072	0.072	0.068	0.068	0	0	0
261630094	1	Eliza Howell-Downwind*	Wayne	2016	182	182	0.079	0.078	0.078	0.078	0	0	1

* Indicates sampling is part of a two-year special study.

O_3 (8-Hour) Measured in ppm

Site ID	POC	City	County	Year	% OBS	Valid Days Measured	Highest Value	2nd Highest Value	3rd Highest Value	4th Highest Value	Day Max > 0.070
260050003	1	Holland	Allegan	2016	97	178	0.085	0.079	0.076	0.076	9
260190003	1	Benzonia	Benzie	2016	92	169	0.083	0.075	0.074	0.072	6
260210014	1	Coloma	Berrien	2016	98	179	0.082	0.079	0.079	0.078	11
260270003	2	Cassopolis	Cass	2016	99	182	0.079	0.078	0.078	0.077	9
260330901	1	Sault Ste. Marie	Chippewa	2016	92	168	0.071	0.065	0.064	0.062	1
260370001	2	Rose Lake	Clinton	2016	98	179	0.077	0.076	0.074	0.073	7
260490021	1	Flint	Genesee	2016	98	180	0.079	0.076	0.076	0.072	7
260492001	1	Otisville	Genesee	2016	99	182	0.079	0.077	0.075	0.073	6

O_3 (8-Hour) Measured in ppm (continued)

Site ID	POC	City	County	Year	% OBS	Valid Days Measured	Highest Value	2nd Highest Value	3rd Highest Value	4th Highest Value	Day Max > 0.070
260630007	1	Harbor Beach	Huron	2016	99	182	0.076	0.074	0.072	0.072	5
260650012	2	Lansing	Ingham	2016	93	171	0.078	0.078	0.075	0.073	6
260770008	1	Kalamazoo	Kalamazoo	2016	98	179	0.076	0.075	0.074	0.074	8
260810020	1	Grand Rapids	Kent	2016	100	183	0.079	0.076	0.075	0.075	8
260810022	1	Evans	Kent	2016	98	180	0.079	0.074	0.074	0.072	5
260910007	1	Tecumseh	Lenawee	2016	98	180	0.076	0.074	0.069	0.069	2
260990009	1	New Haven	Macomb	2016	99	182	0.084	0.078	0.076	0.075	6
260991003	1	Warren	Macomb	2016	99	182	0.079	0.076	0.072	0.071	4
261010922	1	Manistee	Manistee	2016	98	180	0.080	0.071	0.070	0.070	2
261050007	1	Scottville	Mason	2016	98	179	0.079	0.075	0.074	0.074	6
261130001	1	Houghton Lake	Missaukee	2016	99	182	0.075	0.075	0.075	0.074	6
261210039	1	Muskegon	Muskegon	2016	97	177	0.089	0.087	0.079	0.076	7
261250001	2	Oak Park	Oakland	2016	99	178	0.078	0.076	0.075	0.075	6
261390005	1	Jenison	Ottawa	2016	89	163	0.080	0.075	0.075	0.074	7
261470005	1	Port Huron	St .Clair	2016	99	181	0.082	0.077	0.077	0.073	4
261530001	1	Seney	Schoolcraft	2016	99	182	0.084	0.077	0.076	0.075	8
261610008	1	Ypsilanti	Washtenaw	2016	98	180	0.072	0.071	0.071	0.069	3
261630001	2	Allen Park	Wayne	2016	99	182	0.078	0.074	0.074	0.070	3
261630019	2	Detroit-E. 7 Mile	Wayne	2016	95	174	0.080	0.075	0.074	0.074	8
261630093	1	Eliza Howell-Roadway*	Wayne	2016	98	179	0.066	0.061	0.059	0.058	0
261630094	1	Eliza Howell-Downwind*	Wayne	2016	99	181	0.075	0.073	0.071	0.070	3

***** Indicates sampling is part of a two-year special study.

$PM_{2.5}$ (24-Hour) Measured in $\mu g/m^3$ at Local Conditions

Site ID	POC	Monitor	City	County	Year	# OBS	Highest Value	2nd Highest Value	3rd Highest Value	4th Highest Value	98%	Wtd. Arith. Mean
260050003	1	FRM	Holland	Allegan	2016	119	26.6	18.8	17.2	17.1	17.2	6.99
260170014	1	FRM	Bay City	Bay	2016	120	26.5	19.7	19.6	17.0	19.6	6.84
260210014	1	FRM	Coloma	Berrien	2016	121	29.1	18.8	17.2	16.7	17.2	7.35
260330901	1	FRM	Sault Ste. Marie	Chippewa	2016	72	12.7	11.3	11.2	10.0	11.3	5.04*
260330901	2	FRM	Sault Ste. Marie	Chippewa	2016	38	10.8	10.0	8.2	8.2	10.8	5.03*
260490021	1	FRM	Flint	Genesee	2016	119	24.3	21.8	18.8	17.9	18.8	7.18
260650012	1	FRM	Lansing	Ingham	2016	117	19.6	19.2	18.0	17.0	18.0	7.31
260770008	1	FRM	Kalamazoo	Kalamazoo	2016	116	20.4	20.3	20.1	20.0	20.1	8.09
260770008	2	FRM	Kalamazoo	Kalamazoo	2016	61	20.8	20.2	18.9	15.8	20.2	8.25
260810007	1	FRM	Grand Rapids-Wealthy	Kent	2016	121	25.6	23.1	22.7	22.6	22.7	8.79
260810020	1	FRM	Grand Rapids-Monroe	Kent	2016	118	26.9	22.3	19.5	18.6	19.5	8.16
260810020	2	FRM	Grand Rapids-Monroe	Kent	2016	61	21.3	19.5	18.4	17.4	19.5	8.48
260910007	1	FRM	Tecumseh	Lenawee	2016	112	21.6	19.1	15.1	15.1	15.1	7.46
260990009	1	FRM	New Haven	Macomb	2016	121	22.0	21.3	20.1	17.2	20.1	7.51

*Indicates the mean does not satisfy summary criteria

$PM_{2.5}$ (24-Hour) Measured in $\mu g/m^3$ at Local Conditions (continued)

Site ID	POC	Monitor	City	County	Year	# OBS	Highest Value	2nd Highest Value	3rd Highest Value	4th Highest Value	98%	Wtd. Arith. Mean
261010922	1	FRM	Manistee	Manistee	2016	112	18.5	13.9	12.6	12.3	12.6	5.50
261130001	1	FRM	Houghton Lake	Missaukee	2016	118	16.1	15.5	12.4	12.3	12.4	4.87
261150006	1	FRM	Sterling State Park	Monroe	2016	120	20.4	20.2	18.3	17.4	18.3	7.75
261250001	1	FRM	Oak Park	Oakland	2016	119	24.2	20.6	19.8	19.6	19.8	7.87
261470005	1	FRM	Port Huron	St. Clair	2016	121	21.9	21.0	19.7	16.7	19.1	7.77
261610008	1	FRM	Ypsilanti	Washtenaw	2016	119	21.8	18.6	17.6	16.2	17.6	7.84
261610008	2	FRM	Ypsilanti	Washtenaw	2016	61	20.8	17.4	16.6	16.3	17.4	8.06
261630001	1	FRM	Allen Park	Wayne	2016	356	25.8	23.7	22.9	22.3	20.3	8.72
261630015	1	FRM	Detroit-W. Fort St.	Wayne	2016	121	26.3	26.2	25.6	24.1	25.6	11.32
261630016	1	FRM	Detroit-Linwood	Wayne	2016	120	24.8	23.3	22.5	19.5	22.5	8.94
261630019	1	FRM	Detroit-E. 7 Mile	Wayne	2016	118	22.0	20.9	19.5	19.0	19.5	8.11
261630025	1	FRM	Livonia	Wayne	2016	118	22.1	20.5	19.9	17.2	19.9	8.16
261630033	1	FRM	Dearborn	Wayne	2016	121	28.8	26.8	25.8	24.6	25.8	10.67
261630033	2	FRM	Dearborn	Wayne	2016	60	27.1	24.7	19.9	19.8	24.7	10.52
261630036	1	FRM	Wyandotte	Wayne	2016	116	19.8	19.3	18.8	18.3	18.8	7.70
261630039	1	FRM	Detroit-W. Lafayette	Wayne	2016	337	22.2	21.9	21.8	21.6	20.5	8.38
261630095	1	FRM	Livonia-Roadway	Wayne	2016	121	23.8	22.3	21.4	20.0	21.4	8.53

$PM_{2.5}$ TEOM (1-Hour) Measured in $\mu g/m^3$

Site ID	POC	Monitor	City	County	Year	# OBS	Highest Value	2nd Highest Value	3rd Highest Value	4th Highest Value	Wtd. Arith. Mean
260170014	3	TEOM	Bay City	Bay	2016	8378	41.0	38.0	38.0	37.0	7.28
260330901	3	BAM	Sault Ste. Marie	Chippewa	2016	8975	81.8	57.3	39.4	39.3	7.09*
260490021	3	TEOM	Flint	Genesee	2016	8533	58.0	53.0	51.0	40.0	7.59
260650012	3	TEOM	Lansing	Ingham	2016	8138	78.0	65.0	65.0	60.0	8.26
260770008	3	TEOM	Kalamazoo	Kalamazoo	2016	8600	57.0	53.0	47.0	47.0	8.04
260810020	3	TEOM	Grand Rapids-Monroe	Kent	2016	8623	131.0	109.0	80.0	65.0	8.53
260910007	3	TEOM	Tecumseh	Lenawee	2016	8462	70.0	52.0	46.0	46.0	7.77
261130001	3	TEOM	Houghton Lake	Missaukee	2016	8629	75.0	40.0	28.0	28.0	6.06
261470005	3	TEOM	Port Huron	St. Clair	2016	8655	53.0	48.0	48.0	46.0	7.91
261530001	3	TEOM	Seney	Schoolcraft	2016	8201	29.0	27.0	26.0	23.0	5.25
261610008	3	TEOM	Ypsilanti	Washtenaw	2016	7827	96.0	79.0	55.0	51.0	8.03
261630001	3	TEOM	Allen Park	Wayne	2016	8218	115.0	104.0	100.0	91.0	9.38
261630033	3	TEOM	Dearborn	Wayne	2016	7073	80.0	77.0	64.0	63.0	10.07
261630039	3	TEOM	Detroit–W. Lafayette	Wayne	2016	7884	150.0	134.0	114.0	97.0	9.86
261630093	3	BAM	Eliza Howell-Roadway**	Wayne	2016	5009	97.3	94.1	72.1	67.2	12.22*
261630098	3	BAM	Eliza Howell–Downwind**	Wayne	2016	2502	127.1	61.5	43.7	42.8	7.84*
261630097	3	TEOM	NMH 48217***	Wayne	2016	2856	66.6	42.1	42.1	39.7	8.88*

*Indicates the mean does not satisfy summary criteria, less than one year of data
**Indicates sampling is part of a 2-year special study
***Indicates the site is part of a 1-year special study

PM_{10} (24-Hour) Measured in $\mu g/m^3$

Site ID	POC	Monitor	City	County	Year	# OBS	# Req.	Valid Days	% OBS	Highest Value	2nd Highest Value	3rd Highest Value	4th Highest Value	Wtd Arith Mean
260810020	1	GRAV	Grand Rapids-Monroe	Kent	2016	56	61	56	92	68	56	38	34	15.6
261630001	1	GRAV	Allen Park	Wayne	2016	59	61	58	95	61	48	37	33	19.0
261630005	1	GRAV	River Rouge	Wayne	2016	59	61	59	97	63	53	41	36	21.0
261630015	1	GRAV	Detroit-W. Fort St.	Wayne	2016	61	61	60	98	96	92	74	53	27.9
261630033	1	GRAV	Dearborn	Wayne	2016	61	61	60	98	81	58	58	56	27.5
261630033	9	GRAV	Dearborn	Wayne	2016	30	31	29	94	81	58	45	44	27.9

PM_{10} TEOM (1-Hour) Measured in $\mu g/m^3$

Site ID	POC	Monitor	City	County	Year	# OBS	Highest Value	2nd Highest Value	3rd Highest Value	4th Highest Value	Wtd. Arith. Mean
261630033	3	TEOM	Dearborn	Wayne	2016	8720	288	268	249	213	21.8

SO_2 Measured in ppb

Site ID	POC	City	County	Year	# OBS	1-hr Highest Value	1-hr 2nd Highest Value	99th %ile 1-hr	24-hr Highest Value	24-hr 2nd Highest Value	OBS >0.5	Arith Mean
260650012	1	Lansing	Ingham	2016	8187	126.8	11.1	9.8	7.4	4.0	0	0.87
260810020	2	Grand Rapids-Monroe	Kent	2016	8137	6.8	6.4	5.8	1.8	1.8	0	0.45
261150006	1	Sterling State Park	Monroe	2016	8378	26.0	23.1	13.6	8.0	4.2	0	0.83
261390011	1	West Olive	Ottawa	2016	8352	40.8	26.1	20.0	7.7	5.6	0	0.41
261470005	1	Port Huron	St. Clair	2016	8260	67.7	60.0	51.8	15.5	12.7	0	1.21
261630001	1	Allen Park	Wayne	2016	8288	45.6	36.8	25.5	10.0	5.0	0	0.78
261630015	1	Detroit-W. Fort St.	Wayne	2016	8334	77.1	73.2	58.5	35.2	17.2	0	1.52
261630097	1	NMH 48217**	Wayne	2016	2788	23.1	17.9	17.9	5.7	3.8	0	0.64*

*Indicates the mean does not satisfy summary criteria, less than 1 year of data

**Indicates the site is part of a 1-year special study

Appendix B: 2016 Air Toxics Monitoring Summary for Metals, VOCs, Carbonyl Compounds, PAHs, Hexavalent Chromium & Speciated $PM_{2.5}$

Appendix B provides summary statistics of ambient air concentrations of various substances monitored in Michigan during 2016. At each monitoring site, air samples were taken over a 24-hour period (midnight to midnight). These air samples represent the average air concentration during that 24-hour period. The frequency of air samples collected is typically done once every 6 or 12 days. Sometimes the sampled air concentration is lower than the laboratory's analytical method detection level (MDL). When the concentration is lower than the MDL, two options are used to estimate the air concentration. The calculation of the minimum average ("Average (ND=0)") uses 0.0 µg/m³ for a value less than the MDL. In the calculation of the maximum average ("Average (ND=MDL/2)") the MDL divided by 2 (i.e., ½ the MDL) is substituted for air concentrations less than the MDL.

Table B shows the monitoring stations and what types of air toxics were monitored at each station in 2016. The following terms and acronyms are used in **Appendix B-1** and **B-2** data tables:

- Num Obs: Number of Observations (number of daily air samples taken during the year)
- Obs>MDL: Number of daily samples above the MDL
- Average (ND=0): average air concentration in 2016, assuming daily samples below MDL were equal to 0.0 µg/m³.
- Average (ND=MDL/2): average air concentration in 2016, assuming daily samples below MDL were equal to one half the MDL.
- MDL: Analytical MDL in units of µg/m³
- Max1: Highest daily air concentration during 2016
- Max2: Second highest daily air concentration during 2016
- Max3: Third highest daily air concentration during 2016
- µg/m³: Micrograms per cubic meter (1,000,000 µg = 1 g)

SITE NAME	VOC	Carbonyl	PAHs	Metals TSP	Metals PM_{10}	Speciated $PM_{2.5}$
Allen Park				x	x	x
Dearborn	x	x	x	x	x	x
Detroit-W. Fort St.	x	x		x	Mn	x
Detroit-W. Jefferson				x		
Grand Rapids-Monroe				x		x
Belding-Merrick St.				x		
Belding-Reed St.				x		
NMH 48217	x		x	x		
Port Huron-Rural St.				x		
River Rouge		x		x	Mn	
Tecumseh						x

VOC = volatile organic compound; PAHs = polycyclic aromatic hydrocarbon; TSP = total suspended particulate; PM_{10} = particulate matter with aerodynamic diameter less than 10 µm; Mn = manganese

APPENDIX B-1

Allen Park (261630001) Concentrations in micrograms per cubic meter (µg/m^3)								
Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
Arsenic (Tsp) Stp	57	57	0.00177	0.00177	8.65E-06	0.00791	0.00602	0.00587
Arsenic Pm10 Stp	60	59	0.0013	0.0013	1.00E-05	0.00565	0.00381	0.00327
Cadmium (Tsp) Stp	57	57	0.000229	0.000229	8.65E-06	0.002	0.00106	0.00037
Cadmium Pm10 Stp	60	60	0.00032	0.00032	1.00E-05	0.00233	0.0015	0.00123
Lead (Tsp) Lc Frm/Fem	57	57	0.00498	0.00498	0	0.0185	0.00936	0.00922
Lead Pm10 Lc	58	58	0.00316	0.00316	0	0.0168	0.00682	0.00676
Manganese (Tsp) Stp	57	57	0.0254	0.0254	5.84E-05	0.09	0.0625	0.0597
Manganese Pm10 Stp	60	60	0.00982	0.00982	7.13E-05	0.0406	0.0296	0.0241
Nickel (Tsp) Stp	57	57	0.00146	0.00146	5.58E-05	0.00406	0.00289	0.00266
Nickel Pm10 Stp	60	60	0.000891	0.000891	6.83E-05	0.00349	0.00264	0.00181

Dearborn (261630033) Concentrations in micrograms per cubic meter (µg/m^3)								
Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
1,1,2,2-Tetrachloroethane	60	0	0	0.103	0.206	0	0	0
1,1,2-Trichloroethane	60	0	0	0.0546	0.109	0	0	0
1,1-Dichloroethane	60	0	0	0.0243	0.0486	0	0	0
1,1-Dichloroethylene	60	0	0	0.0456	0.0912	0	0	0
1,2,4-Trichlorobenzene	60	0	0	0.13	0.26	0	0	0
1,2,4-Trimethylbenzene	60	60	0.596	0.596	0.118	1.74	1.61	1.56
1,2-Dichlorobenzene	60	0	0	0.0812	0.162	0	0	0
1,2-Dichloropropane	60	0	0	0.0439	0.0878	0	0	0
1,3,5-Trimethylbenzene	60	60	0.186	0.186	0.118	0.541	0.526	0.511
1,3-Butadiene	60	59	0.0822	0.0827	0.0575	0.327	0.241	0.17
1,3-Dichlorobenzene	60	0	0	0.0721	0.144	0	0	0
1,4-Dichlorobenzene	60	9	0.0129	0.0717	0.138	0.253	0.126	0.0902
2,5-Dimethylbenzaldehyde	67	0	0	0.00822	0.0164	0	0	0
Acenaphthene (Tsp) Stp	67	67	0.0103	0.0103	0.0002	0.05	0.0413	0.039
Acenaphthylene (Tsp) Stp	67	60	0.000459	0.00046	1.50E-05	0.0023	0.00129	0.0012
Acetaldehyde	67	67	1.92	1.92	0.0106	4.78	3.28	3.1
Acetone	67	67	3.01	3.01	0.122	9.59	6.05	5.91
Acetonitrile	60	60	1.29	1.29	0.0856	4.13	3.04	2.28
Acetylene	60	60	1.02	1.02	0.0309	3.28	2.86	2.4
Acrylonitrile	60	0	0	0.0326	0.0651	0	0	0
Anthracene (Tsp) Stp	67	67	0.000579	0.000579	7.61E-05	0.00187	0.00184	0.00159
Arsenic (Tsp) Stp	85	85	0.00192	0.00192	8.67E-06	0.00596	0.00573	0.00505
Arsenic Pm10 Stp	91	91	0.00164	0.00164	9.93E-06	0.00604	0.00568	0.00472
Barium (Tsp) Stp	85	85	0.0497	0.0497	0.000344	0.124	0.119	0.119
Barium Pm10 Stp	91	91	0.0144	0.0144	0.000422	0.0925	0.0631	0.0479

Dearborn (261630033) Concentrations in micrograms per cubic meter (µg/m^3)								
Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
Benzaldehyde	67	67	0.205	0.205	0.0173	0.43	0.421	0.421
Benzene	60	60	0.682	0.682	0.0671	1.84	1.55	1.38
Benzo[A]Anthracene (Tsp) Stp	67	67	0.000177	0.000177	6.01E-05	0.0012	0.000772	0.000566
Benzo[A]Pyrene (Tsp) Stp	67	67	0.000164	0.000164	6.31E-05	0.000836	0.000599	0.000482
Benzo[B]Fluoranthene (Tsp) Stp	67	67	0.000411	0.000411	7.41E-05	0.00199	0.00145	0.00119
Benzo[G,H,I]Perylene (Tsp) Stp	67	67	0.000214	0.000214	4.21E-05	0.000708	0.00069	0.000534
Benzo[K]Fluoranthene (Tsp) Stp	67	41	8.23E-05	9.38E-05	5.91E-05	0.000489	0.000406	0.000291
Beryllium (Tsp) Stp	85	85	9.22E-05	9.22E-05	5.78E-06	3.70E-04	3.70E-04	3.60E-04
Beryllium Pm10 Stp	91	65	2.05E-05	2.15E-05	6.97E-06	0.00014	0.00013	0.00009
Bromochloromethane	60	20	0.1	0.123	0.0688	0.466	0.445	0.434
Bromodichloromethane	60	1	0.000893	0.0635	0.127	0.0536	0	0
Bromoform	60	0	0	0.124	0.248	0	0	0
Bromomethane	60	60	0.0618	0.0618	9.71E-02	0.0893	0.0854	0.0816
Butyraldehyde	67	67	0.483	0.483	1.73E-02	1.94	1.32	1.26
Cadmium (Tsp) Stp	85	85	0.000413	0.000413	8.67E-06	0.00164	0.00136	0.0012
Cadmium Pm10 Stp	91	91	0.000329	0.000329	9.93E-06	0.00181	0.00125	0.00118
Carbon Disulfide	60	60	0.138	0.138	0.0623	0.595	0.514	0.433
Carbon Tetrachloride	60	60	0.659	0.659	0.101	0.856	0.805	0.786
Chlorobenzene	60	1	0.00046	0.0457	0.0921	0.0276	0	0
Chloroethane	60	50	0.0708	0.0771	0.0765	0.193	0.19	0.187
Chloroform	60	60	0.333	0.333	0.0586	0.596	0.522	0.522
Chloromethane	60	60	1.24	1.24	0.0702	1.65	1.54	1.48
Chloroprene	60	0	0	0.0181	3.62E-02	0	0	0
Chromium (Tsp) Stp	85	85	0.00713	0.00713	0.000138	0.022	0.0206	0.0204
Chromium Pm10 Stp	91	91	0.00975	0.00975	1.68E-04	0.0397	0.039	0.0386
Chrysene (Tsp) Stp	67	67	0.000459	0.000459	7.41E-05	0.00183	0.00145	0.00131
Cis-1,2-Dichloroethene	60	0	0	0.0278	0.0555	0	0	0
Cis-1,3-Dichloropropene	60	0	0	0.0454	0.0908	0	0	0
Cobalt (Tsp) Stp	85	85	2.89E-04	2.89E-04	2.02E-05	7.10E-04	6.80E-04	6.40E-04
Cobalt Pm10 Stp	91	91	0.000133	0.000133	2.99E-05	0.00048	0.00045	0.00036
Copper (Tsp) Stp	85	85	0.0241	0.0241	0.00023	0.0694	0.0656	0.06
Copper Pm10 Stp	91	91	0.0298	0.0298	0.000281	0.0886	0.0808	0.0808
Crotonaldehyde	67	0	0	0	0	0	0	0
Dibenzo[A,H]Anthracene (Tsp) Stp	67	66	3.76E-05	3.77E-05	0.000017	0.000157	0.000137	0.000129
Dibromochloromethane	60	2	0.00128	0.0877	0.179	0.0511	0.0256	0
Dichlorodifluoromethane	60	60	2.73	2.73	0.0989	3.3	3.13	3.13
Dichloromethane	60	60	2.34	2.34	0.0729	8.65	6.57	5.66
Ethyl Acrylate	60	0	0	0.0553	0.111	0	0	0
Ethylbenzene	60	60	0.355	0.355	0.0825	3.07	0.803	0.786
Ethylene Dibromide	60	0	0	0.0807	0.161	0	0	0
Ethylene Dichloride	60	54	0.0602	0.0628	0.0526	0.113	0.105	0.089

Dearborn (261630033) Concentrations in micrograms per cubic meter (µg/m^3)								
Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
Fluoranthene (Tsp) Stp	67	67	0.00474	0.00474	0.000285	0.0226	0.0204	0.0193
Fluorene (Tsp) Stp	67	59	0.00952	0.00952	0.00048	0.0438	0.0381	0.0367
Formaldehyde	67	67	3.53	3.53	0.0118	9.06	7.79	7.75
Freon 114	60	60	0.189	0.189	0.217	0.426	0.412	0.412
Hexachlorobutadiene	60	2	0.0016	0.218	0.448	0.064	0.032	0
Hexanaldehyde	67	67	0.105	0.105	0.0201	0.266	0.25	0.238
Indeno[1,2,3-Cd]Pyrene (Tsp) Stp	67	67	0.000203	0.000203	4.51E-05	0.00071	0.000702	0.000571
Iron (Tsp) Stp	85	85	1.72	1.72	3.15E-03	5.47	5.33	4.91
Iron Pm10 Stp	91	91	0.724	0.724	0.00386	2.75	2.61	2.56
Isovaleraldehyde	67	0	0	0.00529	0.0106	0	0	0
Lead (Tsp) Lc Frm/Fem	86	85	0.01	0.01	0	0.0368	0.0342	0.0318
Lead Pm10 Lc	91	91	0.0075	0.0075	1.07E-05	0.0283	0.0265	0.0211
M/P Xylene	60	60	1.03	1.03	1.74E-01	9.81	2.48	2.31
Manganese (Tsp) Stp	85	85	0.107	0.107	5.78E-05	0.382	0.353	0.333
Manganese Pm10 Stp	91	91	0.0346	0.0346	6.97E-05	0.142	0.137	0.108
Methyl Chloroform	60	24	0.0103	0.0348	8.18E-02	0.0436	0.0382	0.0327
Methyl Ethyl Ketone	67	67	0.527	0.527	0.0144	1.75	0.959	0.932
Methyl Isobutyl Ketone	60	60	0.304	0.304	0.0901	0.57	0.57	0.549
Methyl Methacrylate	60	1	0.000818	0.0552	0.111	0.0491	0	0
Methyl Tert-Butyl Ether	60	2	0.00072	0.0164	0.0325	0.0216	0.0216	0
Molybdenum (Tsp) Stp	85	85	0.00104	0.00104	0.00001	0.00804	0.00781	0.00246
Molybdenum Pm10 Stp	91	91	0.000758	0.000758	1.06E-05	0.00748	0.00228	0.00223
Naphthalene (Tsp) Stp	67	67	0.11	0.11	0.00154	0.311	0.297	0.296
Nickel (Tsp) Stp	85	85	0.00266	0.00266	5.48E-05	0.015	0.0137	0.00643
Nickel Pm10 Stp	91	91	0.00156	0.00156	6.64E-05	0.0173	0.00531	0.0052
N-Octane	60	60	0.277	0.277	0.0841	0.678	0.608	0.589
O-Xylene	60	60	0.402	0.402	0.0869	2.79	1.04	0.947
Phenanthrene (Tsp) Stp	67	67	0.0184	0.0184	0.000165	0.0749	0.0732	0.0718
Propionaldehyde	67	67	0.346	0.346	0.00946	0.905	0.653	0.651
Propylene	60	60	0.634	0.634	0.093	2.08	2.07	1.32
Pyrene (Tsp) Stp	67	67	0.00209	0.00209	1.07E-04	0.00908	0.00576	0.00576
Styrene	60	60	2.74	2.74	8.95E-02	15	13.1	11.2
Tert-Butyl Ethyl Ether	60	0	0	0.0251	0.0502	0	0	0
Tetrachloroethylene	60	55	0.208	0.213	0.109	0.583	0.576	0.482
Tolualdehydes	61	61	0.145	0.145	0.038	0.354	0.295	0.29
Toluene	60	60	1.27	1.27	0.0641	4.56	4.3	3.73
Trans-1,2-Dichloroethylene	60	1	0.000397	0.0238	0.0476	0.0238	0	0
Trans-1,3-Dichloropropene	60	0	0	0.0613	0.123	0	0	0
Trichloroethylene	60	10	0.0113	0.0471	0.086	0.102	0.0967	0.0806
Trichlorofluoromethane	60	60	1.69	1.69	0.112	3.61	2.98	2.79
Valeraldehyde	67	67	0.0999	0.0999	0.014	0.254	0.24	0.226
Vanadium (Tsp) Stp	85	85	0.00401	0.00401	0.00002	0.0151	0.0138	0.0108
Vanadium Pm10 Stp	91	87	0.00154	0.00154	0.0000243	0.00584	0.00576	0.00483
Vinyl Chloride	60	16	0.0112	0.0412	0.0818	0.0613	0.0588	0.0537
Zinc (Tsp) Stp	85	85	0.186	0.186	0.00114	0.72	0.671	0.553
Zinc Pm10 Stp	91	91	0.103	0.103	0.00139	0.607	0.472	0.399

Detroit-W. Fort St. (N. Delray-SWHS) (261630015) Concentrations in micrograms per cubic meter (µg/m^3)								
Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
1,1,2,2-Tetrachloroethane	31	0	0	0.16	0.32	0	0	0
1,1,2-Trichloroethane	31	0	0	0.0486	0.0972	0	0	0
1,1-Dichloroethane	31	0	0	0.085	0.17	0	0	0
1,1-Dichloroethylene	31	0	0	0.0761	0.152	0	0	0
1,2,4-Trichlorobenzene	31	1	1.9	2.57	1.38	59	0	0
1,2,4-Trimethylbenzene	31	8	3.02	3.13	0.304	89	1	0.98
1,2-Dichlorobenzene	31	1	0.21	0.387	0.366	6.5	0	0
1,2-Dichloropropane	31	0	0	0.55	1.1	0	0	0
1,3,5-Trimethylbenzene	31	1	0.839	0.955	0.24	26	0	0
1,3-Butadiene	31	0	0	0.06	0.12	0	0	0
1,3-Dichlorobenzene	31	1	0.135	0.271	0.281	4.2	0	0
1,4-Dichlorobenzene	31	1	0.206	0.391	0.382	6.4	0	0
2,2,4-Trimethylpentane	31	6	0.119	0.177	0.145	0.98	0.73	0.56
Acetaldehyde	31	31	1.93	1.93	0	4.55	4.04	3.27
Acetone	31	31	4.06	4.06	0	18.3	9.08	7.4
Acetonitrile	31	14	0.541	0.678	0.499	5.7	1.7	1.4
Acrylonitrile	31	1	0.03	0.413	0.79	0.93	0	0
Arsenic (Tsp) Stp	61	61	0.00186	0.00186	8.49E-06	0.00655	0.00394	0.00379
Benzaldehyde	31	30	0.143	0.143	0	0.412	0.334	0.273
Benzene	31	30	0.778	0.78	0.0946	2.2	1.4	1.3
Bromodichloromethane	31	0	0	0.075	0.15	0	0	0
Bromoform	31	0	0	0.173	0.346	0	0	0
Bromomethane	31	0	0	0.11	0.22	0	0	0
Cadmium (Tsp) Stp	61	61	0.000256	0.000256	8.49E-06	0.00171	0.00076	0.00075
Carbon Tetrachloride	31	6	0.0971	0.189	0.228	0.62	0.58	0.51
Chlorobenzene	31	1	0.0274	0.127	0.205	0.85	0	0
Chloroethane	31	1	0.00774	0.0658	0.12	0.24	0	0
Chloroform	31	30	0.674	0.676	0.12	1.2	0.93	0.92
Chloromethane	31	31	1.27	1.27	0.159	2.2	1.8	1.7
Chloroprene	31	0	0	0.055	0.11	0	0	0
Cis-1,2-Dichloroethene	31	0	0	0.0611	0.122	0	0	0
Cis-1,3-Dichloropropene	31	0	0	0.065	0.13	0	0	0
Crotonaldehyde	31	4	0.0064	0.0064	0	0.0668	0.0512	0.0409
Dibromochloromethane	31	0	0	0.146	0.292	0	0	0
Dichlorodifluoromethane	31	31	2.33	2.33	0.25	3	2.7	2.7
Dichloromethane	31	30	0.631	0.637	0.37	0.93	0.92	0.81
Ethylbenzene	31	6	0.155	0.272	0.29	1.2	1	0.77
Ethylene Dibromide	31	0	0	0.148	0.296	0	0	0
Ethylene Dichloride	31	0	0	0.0955	0.191	0	0	0
Formaldehyde	31	31	3.06	3.06	0	7.76	7.43	6.84
Freon 113	31	2	0.0332	0.136	0.22	0.52	0.51	0
Freon 114	31	0	0	0.171	0.343	0	0	0
Hexachlorobutadiene	31	1	0.839	1.27	0.891	26	0	0
Hexanaldehyde	31	22	0.0874	0.0874	0	0.37	0.216	0.195

Detroit-W. Fort St. (N. Delray-SWHS) (261630015) Concentrations in micrograms per cubic meter (µg/m^3)								
Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
M/P Xylene	31	15	0.83	1.02	0.731	3.8	3.6	2.5
Manganese (Tsp) Stp	61	61	0.0588	0.0588	5.67E-05	0.181	0.176	0.16
Manganese Pm10 Stp	59	59	0.0229	0.0229	7.08E-05	0.101	0.0865	0.0523
Methyl Chloroform	31	0	0	0.105	0.21	0	0	0
Methyl Ethyl Ketone	31	22	3.01	3.17	1.1	54	6.8	2.2
Methyl Isobutyl Ketone	31	8	11.1	11.4	0.858	330	4.2	3.4
Methyl Tert-Butyl Ether	31	0	0	0.095	0.19	0	0	0
N-Hexane	31	27	1.13	1.14	0.0861	6.7	4.2	3.6
Nickel (Tsp) Stp	61	61	0.00271	0.00271	5.38E-05	0.00673	0.00667	0.00556
O-Xylene	31	8	0.232	0.355	0.33	1.4	1.2	1.1
Propionaldehyde	31	31	0.358	0.358	0	0.868	0.726	0.643
Styrene	31	1	0.0645	0.434	0.764	2	0	0
Tetrachloroethylene	31	1	0.0271	0.139	0.23	0.84	0	0
Tolualdehydes	31	2	0.0032	0.0032	0	0.0565	0.0428	0
Toluene	31	30	1.54	1.55	0.44	4.8	4.4	3.5
Trans-1,2-Dichloroethylene	31	0	0	0.0748	0.15	0	0	0
Trans-1,3-Dichloropropene	31	0	0	0.0446	0.0893	0	0	0
Trichloroethylene	31	1	0.0194	0.0997	0.166	0.6	0	0
Trichlorofluoromethane	31	31	1.21	1.21	0.23	1.6	1.6	1.4
Valeraldehyde	31	31	0.217	0.217	0	0.715	0.509	0.439
Vinyl Chloride	31	0	0	0.065	0.13	0	0	0

Detroit, W. Jefferson, South Delray (261630027) Concentrations in micrograms per cubic meter (µg/m^3)								
Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
Arsenic (Tsp) Stp	59	59	0.00199	0.00199	8.68E-06	0.00655	0.00574	0.00363
Cadmium (Tsp) Stp	59	59	0.000336	0.000336	8.68E-06	0.00125	0.00092	0.00092
Manganese (Tsp) Stp	59	59	0.118	0.118	5.86E-05	0.889	0.626	0.331
Nickel (Tsp) Stp	59	59	0.00289	0.00289	5.58E-05	0.0129	0.00951	0.0069

Port Huron-Nat'l Guard Arm. (261470005), Speciated $PM_{2.5}$ (µg/m^3)								
Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
Arsenic (Tsp) Stp	60	60	0.00134	0.00134	8.58E-06	0.00538	0.00486	0.00469
Cadmium (Tsp) Stp	60	60	0.000354	0.000354	8.58E-06	0.00205	0.00182	0.00165
Lead (Tsp) Lc Frm/Fem	60	60	0.0267	0.0267	0	0.237	0.13	0.121
Manganese (Tsp) Stp	60	60	0.0107	0.0107	5.73E-05	0.0275	0.0266	0.025
Nickel (Tsp) Stp	60	60	0.00139	0.00139	5.38E-05	0.00303	0.00261	0.0023

River Rouge (261630005) Concentrations in micrograms per cubic meter (µg/m^3)								
Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
Acetaldehyde	32	32	1.81	1.81	0	4.73	3.54	2.86
Acetone	32	32	2.94	2.94	0	7.91	6.07	4.95
Arsenic (Tsp) Stp	57	57	0.00169	0.00169	8.58E-06	0.00542	0.00408	0.00358
Benzaldehyde	32	32	0.166	0.166	0	0.313	0.301	0.289
Cadmium (Tsp) Stp	57	57	0.000415	0.000415	8.58E-06	0.00193	0.0014	0.00103
Crotonaldehyde	32	10	0.0201	0.0201	0	0.103	0.0959	0.0905
Formaldehyde	32	32	4.87	4.87	0	10.4	9.43	8.98
Hexanaldehyde	32	32	0.349	0.349	0.00E+00	0.816	0.764	0.699
Manganese (Tsp) Stp	57	57	0.0577	0.0577	5.74E-05	0.22	0.14	0.127
Manganese Pm10 Stp	58	58	0.0193	0.0193	7.19E-05	0.0928	0.0497	0.0457
Nickel (Tsp) Stp	57	57	0.00184	0.00184	5.44E-05	0.00455	0.00452	0.00387
Propionaldehyde	32	32	0.351	0.351	0	0.956	0.761	0.545
Tolualdehydes	32	2	0.00303	0.00303	0	0.0505	0.0463	0
Valeraldehyde	32	32	0.3	0.3	0	0.848	0.654	0.53

Grand Rapids-Monroe St. (260810020) Concentrations in micrograms per cubic meter (µg/m^3)								
Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
Arsenic (Tsp) Stp	61	61	0.00128	0.00128	8.54E-06	0.00311	0.00284	0.00252
Cadmium (Tsp) Stp	61	61	0.000107	0.000107	8.54E-06	0.00035	0.00028	0.00025
Lead (Tsp) Lc Frm/Fem	61	61	0.00379	0.00379	0	0.0103	0.00827	0.00703
Manganese (Tsp) Stp	61	61	0.0122	0.0122	5.74E-05	0.0499	0.0384	0.0347
Nickel (Tsp) Stp	61	61	0.00136	0.00136	5.30E-05	0.00403	0.00318	0.00305

Belding-Merrick St. (260670003) Concentrations in micrograms per cubic meter (µg/m^3)								
Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
Arsenic (Tsp) Stp	61	61	0.00136	0.00136	8.51E-06	0.0117	0.00371	0.00341
Cadmium (Tsp) Stp	61	61	0.000141	0.000141	8.51E-06	0.00082	0.00066	0.00034
Lead (Tsp) Lc Frm/Fem	61	61	0.01	0.01	0	0.0992	0.0822	0.0251
Manganese (Tsp) Stp	61	61	0.00755	0.00755	5.69E-05	0.0338	0.0267	0.0207
Nickel (Tsp) Stp	61	61	0.000818	0.000818	5.43E-05	0.00163	0.0016	0.00153

Belding-Reed St. (260670002) Concentrations in micrograms per cubic meter (µg/m^3)								
Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
Arsenic (Tsp) Stp	61	61	0.000966	0.000966	8.48E-06	0.00324	0.00254	0.00241
Cadmium (Tsp) Stp	61	61	0.000133	0.000133	8.48E-06	0.00051	0.00048	0.00047
Lead (Tsp) Lc Frm/Fem	61	61	0.00982	0.00982	0	0.168	0.118	0.0316
Manganese (Tsp) Stp	61	61	0.00678	0.00678	5.75E-05	0.0292	0.0279	0.0195
Nickel (Tsp) Stp	61	61	0.000825	0.000825	5.38E-05	0.00458	0.00195	0.00152

NMH 48217 (261630097) Concentrations in micrograms per cubic meter (µg/m^3)								
Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
1,1,2,2-Tetrachloroethane	16	0	0	1.72	3.43	0	0	0
1,1,2-Trichloroethane	16	0	0	1.36	2.73	0	0	0
1,1-Dichloroethane	16	0	0	1.01	2.02	0	0	0
1,1-Dichloroethylene	16	0	0	0.991	1.98	0	0	0
1,2,4-Trichlorobenzene	16	0	0	1.86	3.71	0	0	0
1,2,4-Trimethylbenzene	16	0	0	1.23	2.46	0	0	0
1,2-Dichlorobenzene	16	0	0	1.5	3.01	0	0	0
1,2-Dichloropropane	16	0	0	1.16	2.31	0	0	0
1,3,5-Trimethylbenzene	16	0	0	1.23	2.46	0	0	0
1,3-Butadiene	16	0	0	0.553	1.11	0	0	0
1,3-Dichlorobenzene	16	0	0	1.5	3.01	0	0	0
1,4-Dichlorobenzene	16	0	0	1.5	3.01	0	0	0
2,2,4-Trimethylpentane	16	0	0	1.17	2.34	0	0	0
2-Methylnaphthalene (Tsp) Stp	7	7	0.0521	0.0521	0.01	0.069	0.063	0.06
Acetone	1	1	34.2	34.2	4.75	34.2		
Acetonitrile	16	0	0	0.788	1.58	0	0	0
Arsenic (Tsp) Stp	22	22	0.00133	0.00133	0.00000832	0.00283	0.00267	0.00264
Barium (Tsp) Stp	22	22	0.0174	0.0174	0.000337	0.0389	0.0372	0.0331
Benzene	16	1	0.134	0.883	1.6	2.14	0	0
Benzyl Chloride	16	0	0	1.29	2.59	0	0	0
Beryllium (Tsp) Stp	22	22	0.0000231	0.0000231	0.00000564	0.00007	0.00005	0.00005
Bromodichloromethane	16	0	0	1.68	3.35	0	0	0
Bromoform	16	0	0	2.58	5.17	0	0	0
Bromomethane	16	0	0	0.971	1.94	0	0	0
Cadmium (Tsp) Stp	22	22	0.000197	0.000197	0.00000832	0.00043	0.00035	0.00029
Carbon Disulfide	16	0	0	0.778	1.56	0	0	0
Carbon Tetrachloride	16	0	0	1.57	3.15	0	0	0
Chlorobenzene	16	0	0	1.15	2.3	0	0	0
Chloroethane	16	0	0	0.66	1.32	0	0	0
Chloroform	16	0	0	1.22	2.44	0	0	0
Chloromethane	16	11	0.768	0.929	1.03	1.2	1.18	1.18
Chromium (Tsp) Stp	22	22	0.00271	0.00271	0.000135	0.00533	0.00508	0.0039
Cis-1,2-Dichloroethene	16	0	0	0.991	1.98	0	0	0
Cis-1,3-Dichloropropene	16	0	0	1.13	2.27	0	0	0
Cobalt (Tsp) Stp	22	22	0.000144	0.000144	0.0000205	0.0003	0.00026	0.00021
Copper (Tsp) Stp	22	22	0.208	0.208	0.000225	0.402	0.322	0.29
Dibromochloromethane	16	0	0	2.13	4.26	0	0	0
Dichlorodifluoromethane	16	11	1.76	2.15	2.47	2.72	2.67	2.67
Dichloromethane	16	0	0	1.63	3.25	0	0	0
Diethyl Phthalate (Tsp) Stp	2	2	0.054	0.054	0.01	0.058	0.05	
Ethylbenzene	16	0	0	1.09	2.17	0	0	0
Ethylene Dibromide	16	0	0	1.92	3.84	0	0	0
Ethylene Dichloride	16	0	0	1.01	2.02	0	0	0
Hexachlorobutadiene	16	0	0	2.67	5.33	0	0	0
Iron (Tsp) Stp	22	22	0.476	0.476	0.00309	1.13	1.09	1.08
Lead (Tsp) Lc Frm/Fem	20	20	0.00417	0.00417	0	0.00835	0.00772	0.00744

NMH 48217 (261630097) Concentrations in micrograms per cubic meter (µg/m^3)								
Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
M/P Xylene	16	0	0	2.17	4.34	0	0	0
Manganese (Tsp) Stp	22	22	0.0234	0.0234	0.0000564	0.0597	0.053	0.0489
Methanol	16	10	14.5	15.4	5.81	56.2	49.5	24.5
Methyl Chloroform	16	0	0	1.36	2.73	0	0	0
Methyl Ethyl Ketone	16	3	0.557	1.66	2.77	3.01	2.95	2.95
Methyl Isobutyl Ketone	16	0	0	1.02	2.05	0	0	0
Methyl Tert-Butyl Ether	16	0	0	0.902	1.8	0	0	0
Molybdenum (Tsp) Stp	22	22	0.000563	0.000563	0.00001	0.00143	0.00121	0.00091
Naphthalene (Tsp) Stp	14	14	0.0724	0.0724	0.01	0.146	0.113	0.113
N-Hexane	16	2	0.384	1.15	1.76	3.88	2.26	0
Nickel (Tsp) Stp	22	22	0.00256	0.00256	0.0000523	0.00767	0.00643	0.00376
O-Xylene	16	0	0	1.09	2.17	0	0	0
Propylene	16	0	0	0.807	1.61	0	0	0
Styrene	16	0	0	1.07	2.13	0	0	0
Tetrachloroethylene	16	0	0	1.7	3.39	0	0	0
Toluene	16	5	1.6	2.24	1.88	7.35	6.22	4.56
Trans-1,2-Dichloroethylene	16	0	0	0.991	1.98	0	0	0
Trans-1,3-Dichloropropene	16	0	0	1.13	2.27	0	0	0
Trichloroethylene	16	0	0	1.34	2.69	0	0	0
Trichlorofluoromethane	16	0	0	1.4	2.81	0	0	0
Vanadium (Tsp) Stp	22	22	0.00116	0.00116	0.00002	0.00278	0.00243	0.00203
Vinyl Chloride	16	0	0	0.639	1.28	0	0	0
Zinc (Tsp) Stp	22	22	0.0525	0.0525	0.00111	0.21	0.109	0.0947

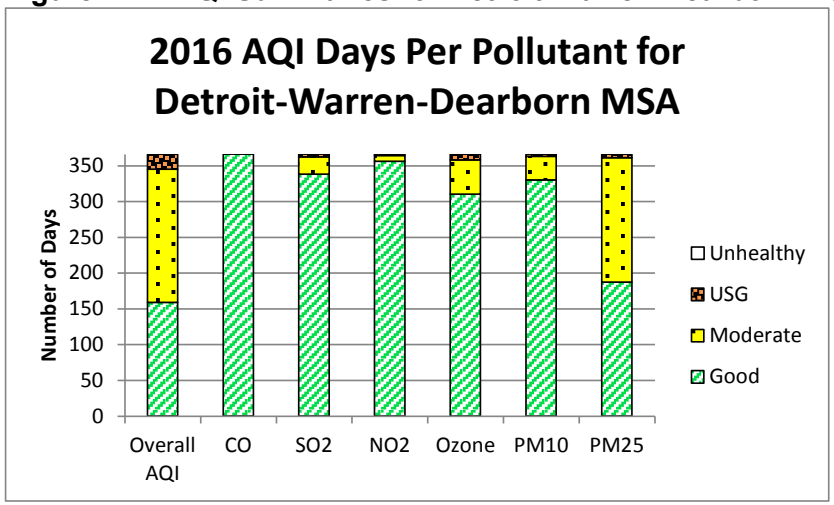
APPENDIX B-2

Appendix B-2 will be appended with $PM_{2.5}$ speciated data summaries when complete 2016 data are available from the lab.

Appendix C: 2016 AQI Pie Charts

Appendix C contains pie charts that were created to show the AQI values for each of Michigan's 2016 monitoring sites and includes the total number of days measurements were taken, along with the pollutant distribution of the AQI values for those measurements. It is important to note that not all pollutants are measured at each site. In fact, some sites only obtain AQI measurements for that portion of the year corresponding to the ozone season; therefore, the number of days for each site may not be equivalent to 365. **Figures C.1** through **C.7** are grouped by Metropolitan Statistical Area (MSA). MSAs are geographic regions based on population and employment data that the US Census compiles. They are defined by the US Office of Management and Budget. More information on MSAs can be found on the US Census website: www.census.gov **Figures C.5** and **C.6** show the remaining sites (not part of a CSA) located in Michigan's Upper and Lower Peninsulas.

Figure C.1: AQI Summaries for Detroit-Warren-Dearborn MSA



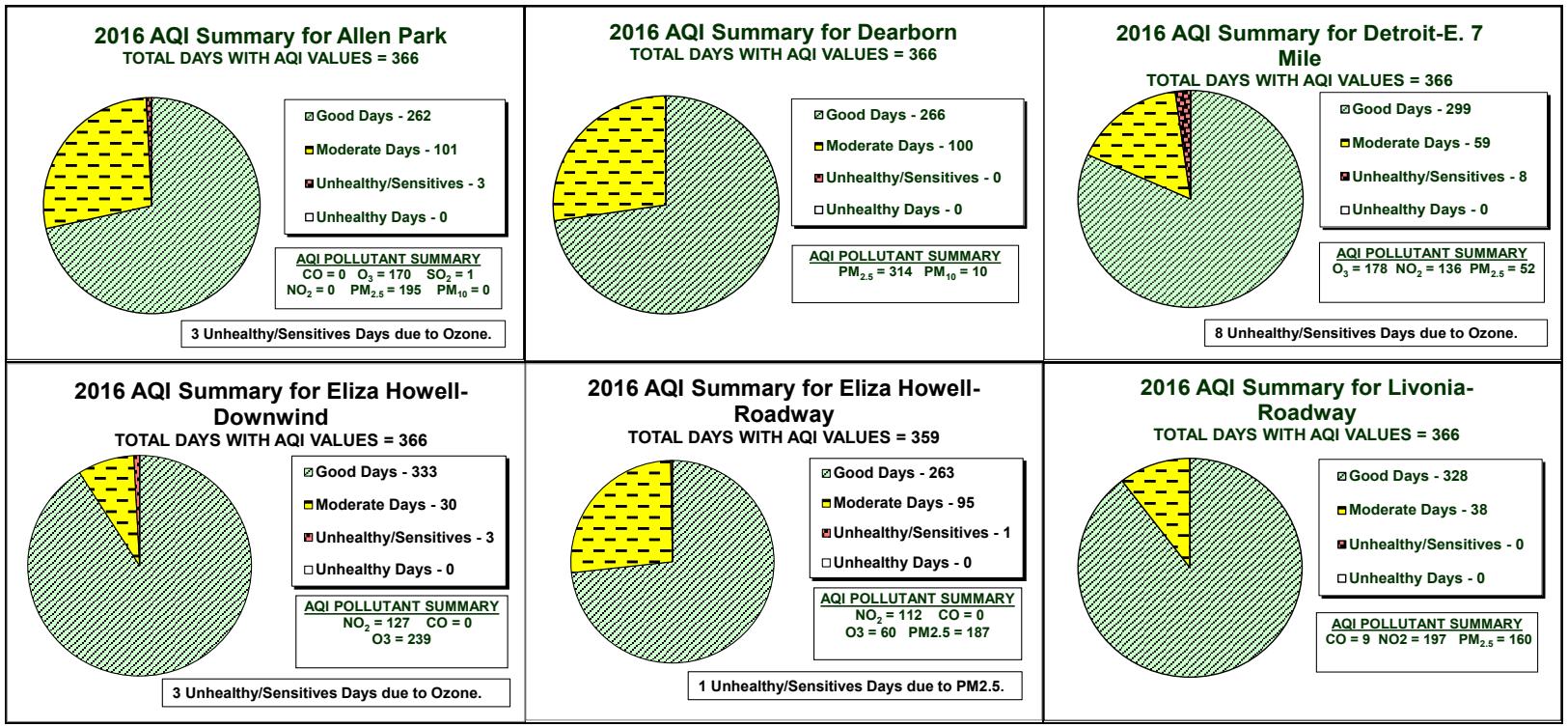


Figure C1, continued: AQI Summaries for Detroit-Warren-Dearborn-MSA

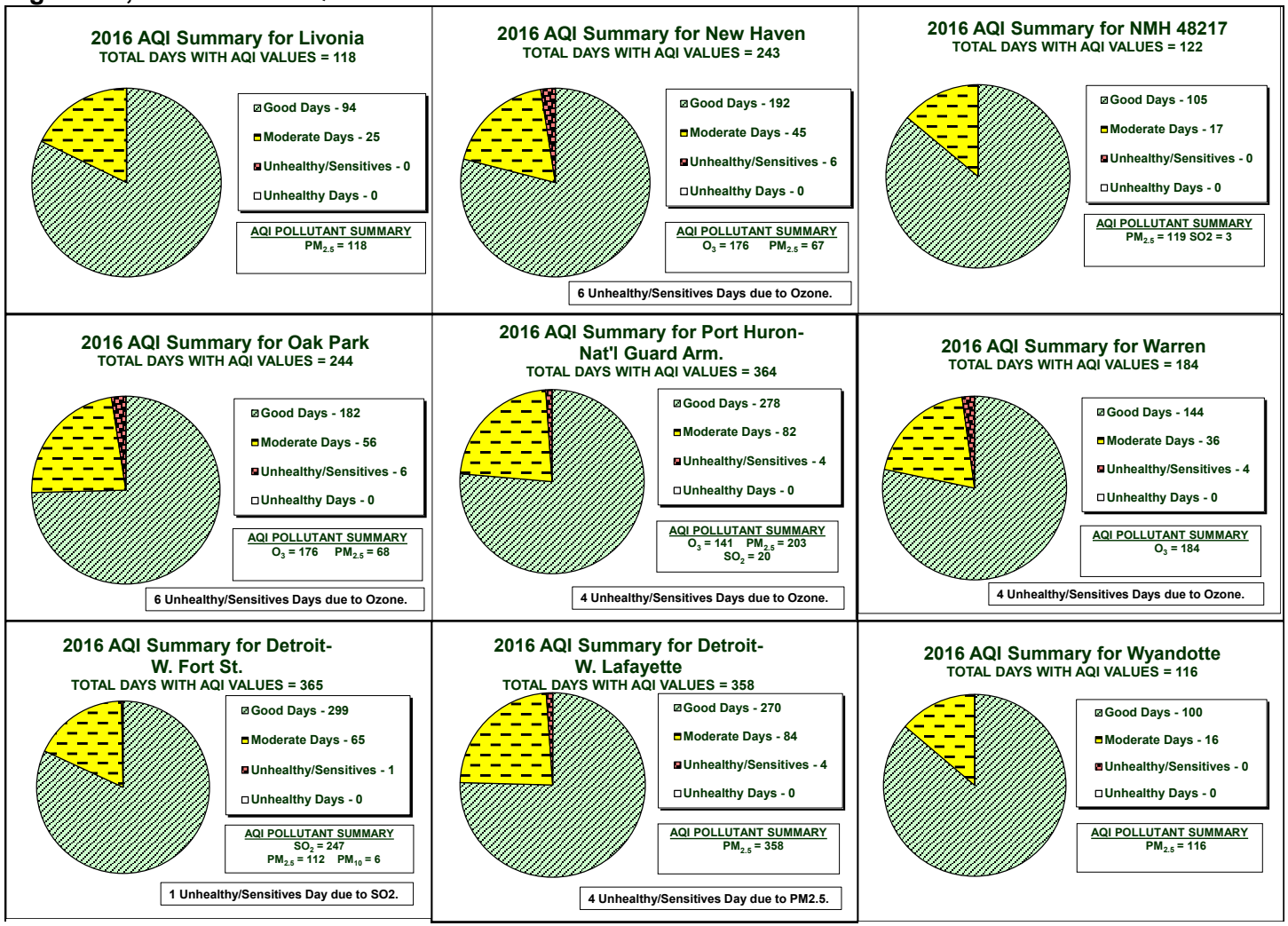


Figure C2: AQI Summaries for Flint MSA

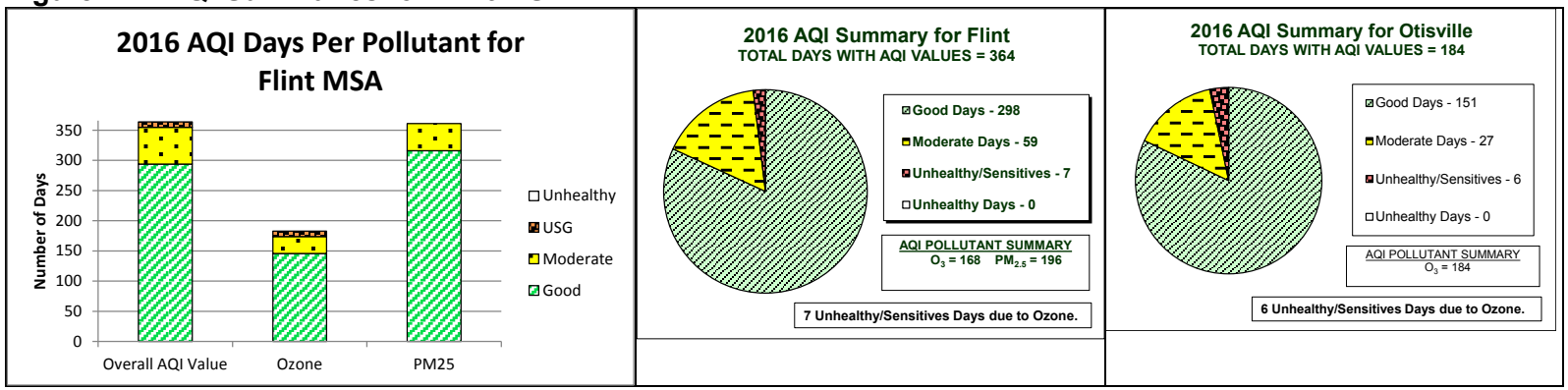


Figure C3: AQI Summaries for Lansing-East Lansing-MSA

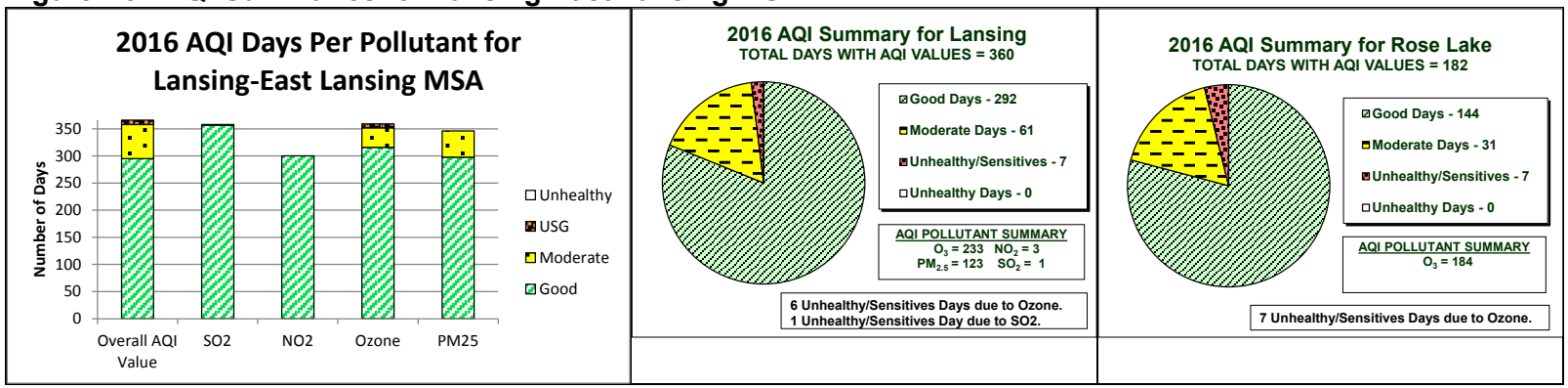
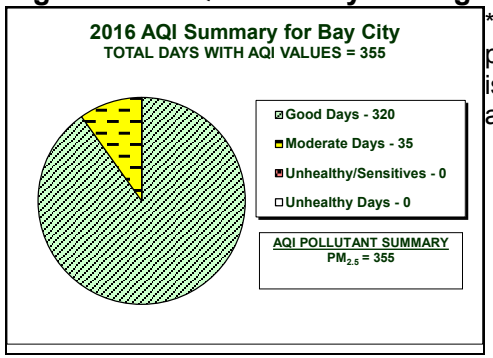


Figure C4: AQI Summary for Saginaw-Midland-Bay City-MSA



*Note: This site does not have AQI per pollutant graphs since only one pollutant is monitored in one location in these areas.

Figure C5: AQI Summaries for Grand Rapids-Wyoming MSA

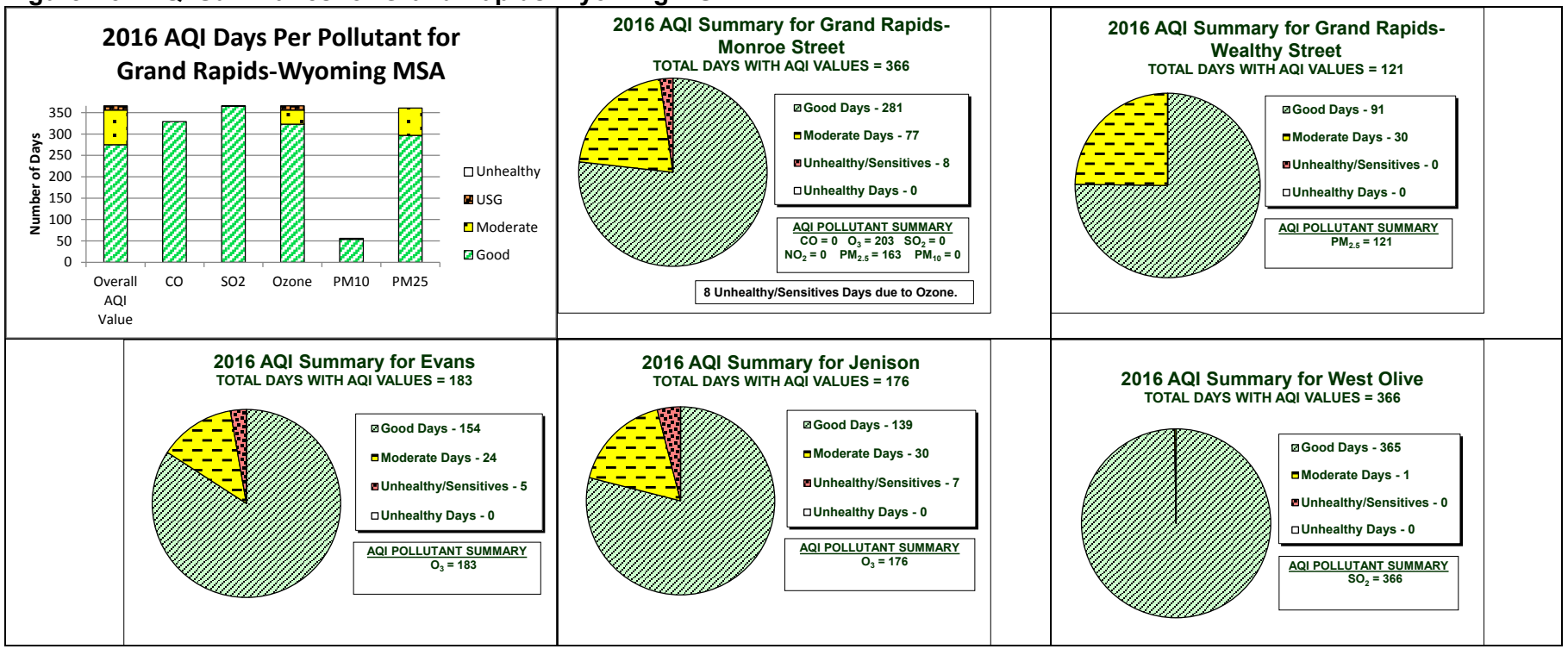
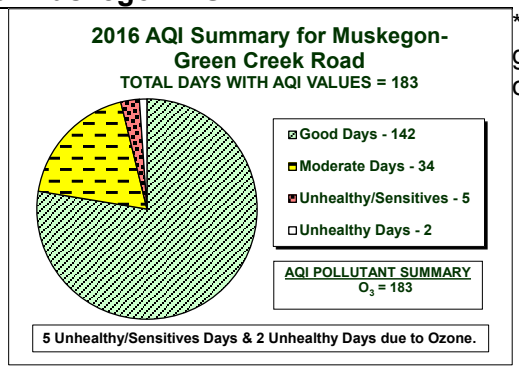


Figure C6: Muskegon MSA



*Note: This site does not have AQI per pollutant graphs since only one pollutant is monitored in one location in these areas.

Figure C7: Ann Arbor MSA

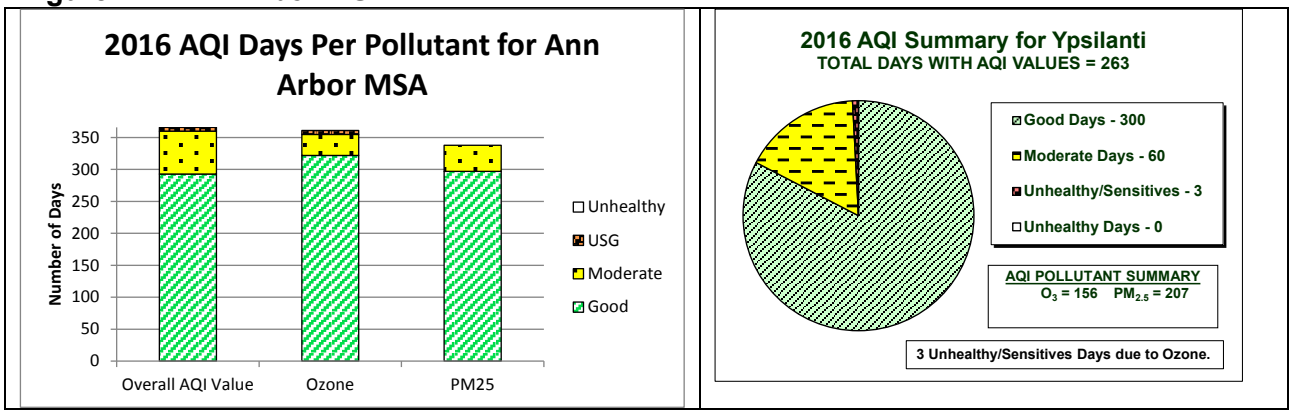


Figure C8: AQI Summary for Upper Peninsula

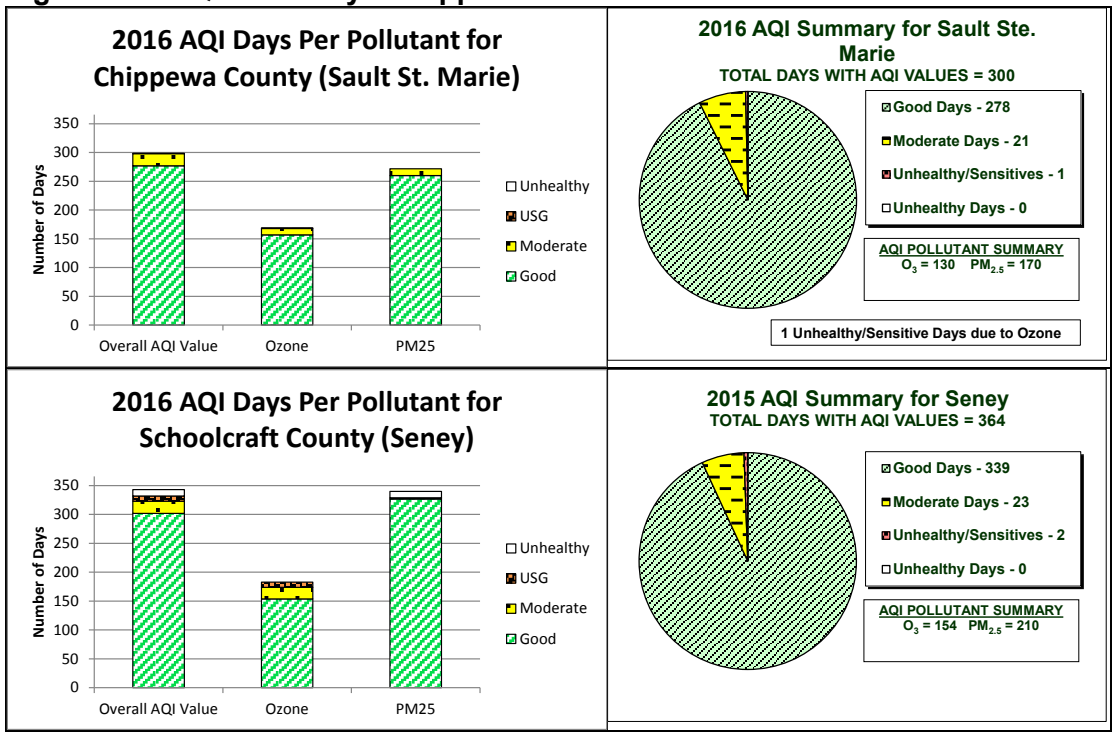
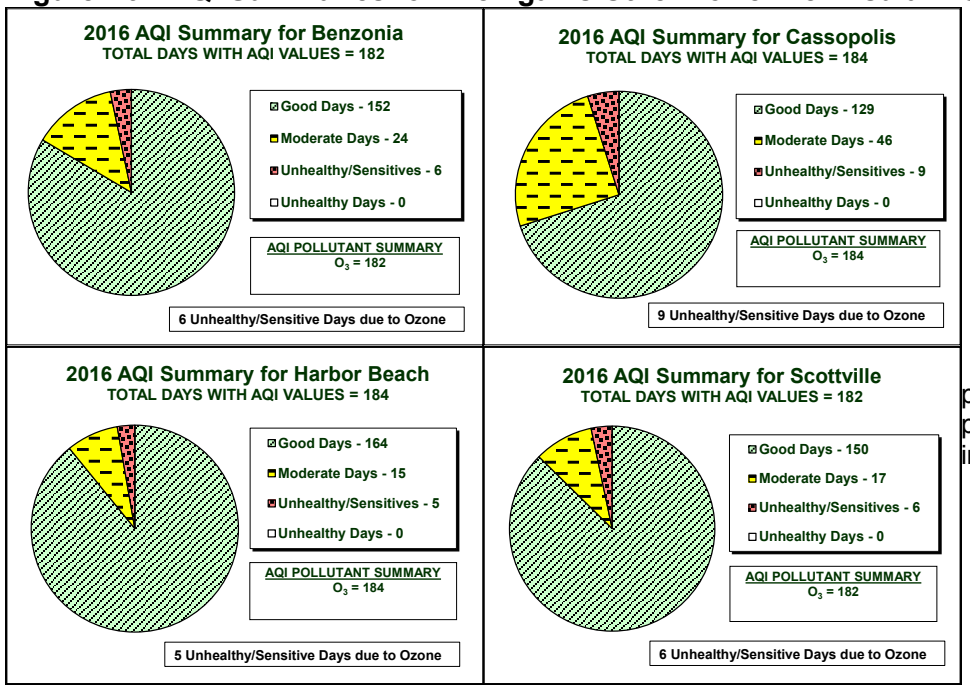


Figure C9: AQI Summaries for Michigan's Other Lower Peninsula Areas



*Note: These sites do not have AQI per pollutant graphs since only one pollutant is monitored in one location in these areas.

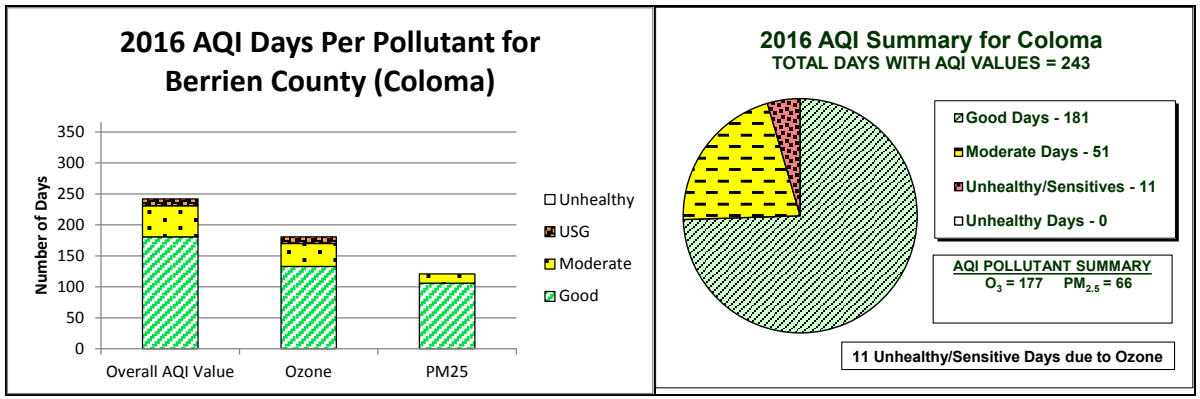


Figure C9, continued: AQI Summaries for Michigan's Other Lower Peninsula Areas

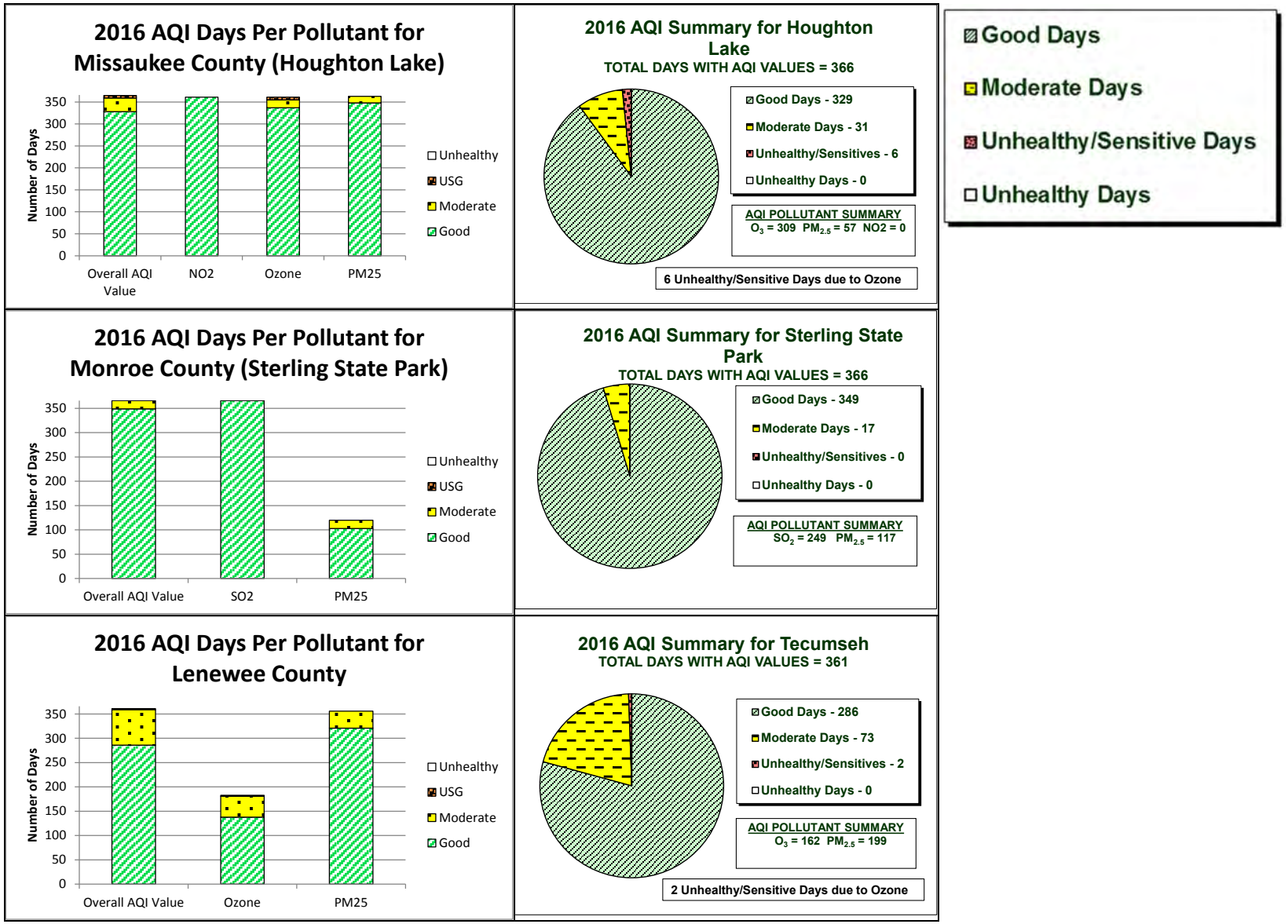
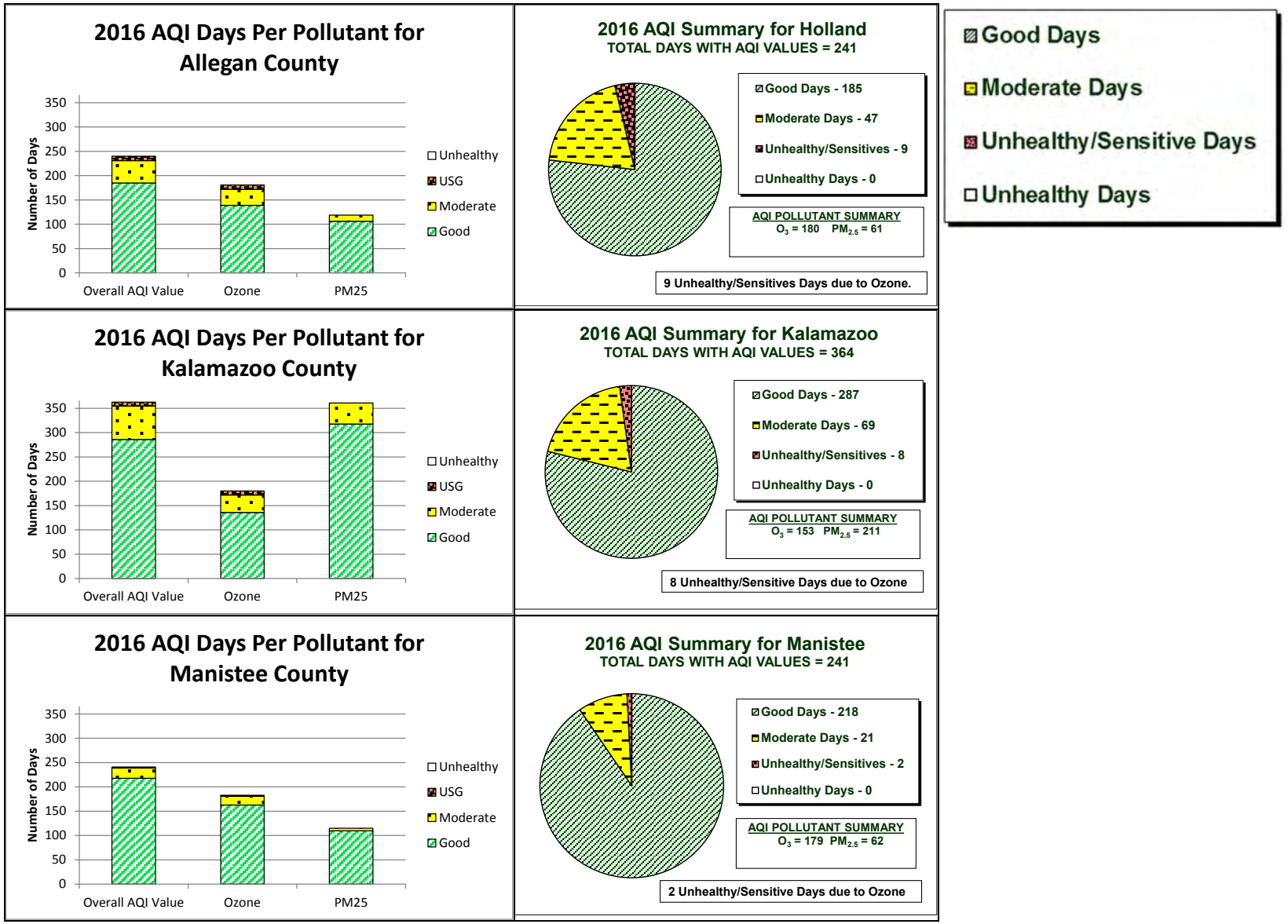


Figure C9, continued: AQI Summaries for Michigan's Other Lower Peninsula Areas



Appendix D: NAAQS Changes

	1971	1978	1979	1987	1997	2006	2008	2010	2012	2015
CO	1-hour maximum not to exceed 35 ppm more than once in a year. 8-hour maximum not to exceed 9 ppm more than once in a year.									
Lead		Calendar quarter average of 1.5 µg/m^3 not to be exceeded					3-month average of 0.15 µg/m^3 not to be exceeded			
NO_2	Annual average of 53 ppb or less.							98th percentile of the 1-hour concentration averaged over 3 yrs is 100 ppb or less		
SO_2	24-Hour concentration of 0.14 ppm not exceeded more than once per year. Annual average of 0.03 ppm or less.							1-hour average of 99th percentile is 75 ppb or less, averaged over 3 yrs. Previous revoked		
Ozone	Total photochemical oxidants: 1-hour max of 0.08 ppm not exceeded once per yr		1-hour maximum concentration is 0.12 ppm one or less hour per yr		4th highest daily maximum 8-hour concentration averaged over 3 yrs is 0.08 ppm or less		4th highest daily maximum 8-hour concentration averaged over 3 yrs is 0.075 ppm or less			4th highest daily maximum 8-hour concentration averaged over 3 yrs is 0.070 ppm or less
TSP & PM_{10}	TSP: 24-hour average not to exceed 260 µg/m^3 more than once per yr Annual geometric mean of 75 µg/m^3			PM_{10}: 24-hour average not to exceed 150 µg/m^3 more than once per yr on average over a 3-yr period Annual mean of 50 µg/m^3 or less average over 3 yrs		Annual average revoked 24-hour average retained				
$PM_{2.5}$					Annual mean of 15.0 µg/m^3 or less average over 3 yrs. 98th percentile of 24-hour average of 65 µg/m^3 or less averaged over 3 yrs	Annual mean retained. 98th percentile of 24-hour average of 35 µg/m^3 or less averaged over 3 yrs		Annual mean of 12.0 µg/m^3 or less average over 3 yrs. 98th percentile of 24-hour average retained		

Appendix E: Acronyms and Their Definitions

>	Greater than
<	Less than
≥	Greater than or equal to
≤	Less than or equal to
%	Percent
$\mu g/m^3$	Micrograms per cubic meter
µm	micrometer
AIRS ID	Aerometric Information Retrieval System Identification Number
AMU	Air Monitoring Unit
AQD	Air Quality Division
AQES	Air Quality Evaluation Section
AQI	Air Quality Index
AQS	Air Quality System (EPA air monitoring data archive)
As	Arsenic
BAM	Beta Attenuation Monitor (hourly $PM_{2.5}$ measurement monitor)
BC	Black Carbon
BTEX	Benzene, Toluene, Ethylbenzene and Xylene
CAA	Clean Air Act
CBSA	Core-Based Statistical Area
Cd	Cadmium
CFR	Code of Federal Regulations
CO	Carbon monoxide
CSA	Consolidated Statistical Area
DEQ	Michigan Department of Environmental Quality
EC/OC	Elemental carbon/Organic carbon
FDMS	Filter Dynamic Measurement System
FEM	Federal Equivalent Method
FIA	Family Independence Agency
FR	Federal Register
FRM	Federal Reference Method
HAP	Hazardous Air Pollutant
hr	Hour
Lc	Local Conditions
MASN	Michigan Air Sampling Network
MDL	Method Detection Limit
mg/m^3	Milligrams per meter cubed
MI	Michigan
MiSA	Micropolitan Statistical Area
Mn	Manganese
MSA	Metropolitan Statistical Area
NAAQS	National Ambient Air Quality Standard
NAMS	National Air Monitoring Station
NATTS	National Air Toxics Trend Sites
NCore	National Core Monitoring Sites
ND	Non-detect
NEI	National Emission Inventory
Ni	Nickel

Appendix E: Acronyms and Their Definitions, Continued

NMH 48217	New Mount Hermon 48217
NO	Nitric oxide
NO_2	Nitrogen dioxide
NO_X	Oxides of Nitrogen
NO_Y	Oxides of nitrogen + nitric acid + organic and inorganic nitrates
NPAP	National Performance Audit Program
O_3	Ozone
Obs or OBS	Observations
PAH	Polynuclear Aromatic Hydrocarbon
Pb	Lead
PBT	Persistent, Bioaccumulative and Toxic
PCB	Polychlorinated biphenyls
PEP	Performance Evaluation Program
PM	Particulate matter
$PM_{2.5}$	Particulate matter with an aerodynamic diameter less than or equal to 2.5 microns
PM_{10}	Particulate matter with a diameter of 10 microns or less
$PM_{10-2.5}$	Coarse PM equal to the concentration difference between PM_{10} and $PM_{2.5}$
PNA	Polynuclear aromatic hydrocarbons
POC	Parameter Occurrence Code
ppb	parts per billion
ppm	parts per million = mg/kg, mg/L, µg/g (1 ppm = 1,000 ppb)
QA	Quality assurance
QAPP	Quality Assurance Project Plan
SASS	Speciation Air Sampling System ($PM_{2.5}$ Speciation Sampler)
SO_2	Sulfur dioxide
SOP	Standard Operating Procedures
STN	Speciation Trend Network ($PM_{2.5}$)
Stp	Standard Temperature and Pressure
SVOC	Semi-Volatile Compound
SWHS	Southwestern High School
TAC	Toxic Air Contaminant
TEOM	Tapered element oscillating microbalance (hourly $PM_{2.5}$ measurement monitor)
tpy	ton per year
TRI	Toxic Release Inventory
TSP	Technical Systems Audit
TSP	Total Suspended Particulate
US	United States
USEPA	United States Environmental Protection Agency
UV	Ultra-violet
VOC	Volatile organic compounds
Vs	Versus

Air Quality Division District Office Contact Information

Cadillac District – Cadillac Office (Northwest Lower Peninsula) 120 W Chapin Street Cadillac, MI 49601-2158 231-775-3960 Fax: 231-775-4050 *Counties: Benzie, Grand Traverse, Kalkaska, Lake, Leelanau, Manistee, Mason, Missaukee, Osceola, and Wexford*	**Cadillac District - Gaylord Office** (Northeast Lower Peninsula) 2100 West M-32 Gaylord, MI 49735-9282 989-731-4920 Fax: 989-731-6181 *Counties: Alcona, Alpena, Antrim, Charlevoix, Cheboygan, Crawford, Emmet, Montmorency, Oscoda, Otsego, Presque Isle, and Roscommon*
Detroit District (Wayne County) Cadillac Place, Suite 2-300 3058 West Grand Blvd. Detroit, MI 48202-6058 313-456-4700 Fax: 313-456-4692 *Counties: Wayne*	**Grand Rapids District** (Central West Michigan) 350 Ottawa Avenue, NW Unit 10 Grand Rapids, MI 49503 616-356-0500 Fax: 616-356-0201 *Counties: Barry, Ionia, Kent, Mecosta, Montcalm, Muskegon, Newaygo, Oceana, and Ottawa*
Jackson District (South Central Michigan) State Office Building, 4th Floor 301 E Louis B Glick Highway Jackson, MI 49201-1556 517-780-7690 Fax: 517-780-7855 *Counties: Hillsdale, Jackson, Lenawee, Monroe, and Washtenaw*	**Kalamazoo District** (Southwest Michigan) 7953 Adobe Road Kalamazoo, MI 49009-5026 269-567-3500 Fax: 269-567-3555 *Counties: Allegan, Berrien, Branch, Calhoun, Cass, Kalamazoo, St. Joseph, and Van Buren*
Lansing District (Central Michigan) P.O. Box 30242 Constitution Hall, 525 W. Allegan St., 1 South Lansing, MI 48909-7760 517-284-6651 Fax:517-241-3571 *Counties: Clinton, Eaton, Genesee, Gratiot, Ingham, Lapeer, Livingston, and Shiawassee*	**Saginaw Bay District** (Central East Michigan) 401 Ketchum Street, Suite B Bay City, MI 48708 989-894-6200 Fax: 989-891-9237 *Counties: Arenac, Bay, Clare, Gladwin, Huron, Iosco, Isabella, Midland, Ogemaw, Saginaw, Sanilac, and Tuscola*
Southeast Michigan District (Southeast Michigan) 27700 Donald Court Warren, MI 48092-2793 586-753-3700 Fax: 586-753-3731 *Counties: Macomb, Oakland, and St. Clair*	**Upper Peninsula District** (Entire Upper Peninsula) 1504 West Washington Street Marquette, MI 49855 906-228-4853 Fax: 906-228-4940 *Counties: All counties in the Upper Peninsula*

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44075 Phoenix Drive
Sterling Heights, Michigan 48314-1420
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www.EQualityLabs.com

CLIENT: ASSOCIATED ENVIRONMENTAL SERVICES
7 WEST SQUARE LAKE RD.
BLOOMFIELD HILLS, MI 48302

SAMPLE NO. 5363

SAMPLE DESCRIPTION: 35001 WOODWARD
SOIL SAMPLE AES GP-5 5-6'
DATE REPORTED: 12/16/03
DATE RECEIVED: 12/05/03
SAMPLE TEMP: 4^0C
DATE ANALYZED: 12/08/03
DATE COLLECTED: 12/05/03
ANALYZED BY: AG

8260/5035 SCAN

COMPOUND NAME	RESULT (ppB)	RDL (ppB)
	DRY WEIGHT CORRECTED	
1,2-DICHLOROPROPANE	ND	50
1,3-DICHLOROPROPANE	ND	50
2,2-DICHLOROPROPANE	ND	50
1,1-DICHLOROPROPENE	ND	50
cis-1,3-DICHLOROPROPENE	ND	50
trans-1,3-DICHLOROPROPENE	ND	50
ETHYLBENZENE	ND	50
HEXACHLOROBUTADIENE	ND	100
ISOPROPYLBENZENE	ND	250
METHYLENE CHLORIDE	ND	250
NAPHTHALENE	ND	250
n-PROPYLBENZENE	ND	100
STYRENE	ND	50
1,1,1,2-TETRACHLOROETHANE	ND	100
1,1,2,2-TETRACHLOROETHANE	ND	100
TETRACHLOROETHYLENE	360	50
TOLUENE	ND	100
1,2,3-TRICHLOROBENZENE	ND	330
1,2,4-TRICHLOROBENZENE	ND	330
1,1,1-TRICHLOROETHANE	ND	50
1,1,2-TRICHLOROETHANE	ND	50
TRICHLOROETHYLENE	ND	50
TRICHLOROFLUOROMETHANE	ND	100
1,2,3-TRICHLOROPROPANE	ND	100
1,2,4-TRIMETHYLBENZENE	ND	100
1,3,5-TRIMETHYLBENZENE	ND	100
VINYL CHLORIDE	ND	40
XYLENES TOTAL	ND	150
2-METHYLNAPHTHALENE	ND	250

*NOTE: "ND" DENOTES THAT ANALYTE RESULT IS BELOW THE REPORTED REGULATORY DERIVED TARGET LIMIT OF DETECTION.

THOMAS S. MEGNA, PRESIDENT

ALA GAJDA, LAB SUPERVISOR

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CLIENT: ASSOCIATED ENVIRONMENTAL SERVICES
7 WEST SQUARE LAKE RD.
BLOOMFIELD HILLS, MI 48302

SAMPLE NO. 5364

SAMPLE DESCRIPTION: 35001 WOODWARD
SOIL SAMPLE AES GP-6 4-5'
DATE REPORTED: 12/16/03
DATE RECEIVED: 12/05/03
SAMPLE TEMP: 4^0C
DATE ANALYZED: 12/08/03
DATE COLLECTED: 12/05/03
ANALYZED BY: AG

8260/5035 SCAN

COMPOUND NAME	RESULT (ppB) DRY WEIGHT CORRECTED	RDL (ppB)
BENZENE	ND	50
BROMOBENZENE	ND	100
BROMOCHLOROMETHANE	ND	100
BROMODICHLOROMETHANE	ND	100
BROMOFORM	ND	100
BROMOMETHANE	ND	250
n-BUTYLBENZENE	ND	50
sec-BUTYLBENZENE	ND	50
tert-BUTYLBENZENE	ND	50
CARBON TETRACHLORIDE	ND	50
CHLOROBENZENE	ND	50
CHLOROETHANE	ND	250
CHLOROFORM	ND	50
CHLOROMETHANE	ND	250
2-CHLOROTOLUENE	ND	50
4-CHLOROTOLUENE	ND	50
DIBROMOCHLOROMETHANE	ND	100
1,2-DIBROMO-3-CHLOROPROPANE	ND	250
1,2-DIBROMOETHANE	ND	250
DIBROMOMETHANE	ND	250
1,2-DICHLOROBENZENE	ND	100
1,3-DICHLOROBENZENE	ND	100
1,4-DICHLOROBENZENE	ND	100
DICHLORODIFLUOROMETHANE	ND	100
1,1-DICHLORETHANE	ND	50
1,2-DICHLORETHANE	ND	50
1,1-DICHLORETHENE	ND	50
cis-1,2-DICHLOROETHENE	ND	50
trans-1,2-DICHLOROETHENE	ND	50

*NOTE: "ND" DENOTES THAT ANALYTE RESULT IS BELOW THE REPORTED REGULATORY DERIVED TARGET LIMIT OF DETECTION.

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SOIL SAMPLE AES GP-6 4-5'
DATE REPORTED: 12/16/03
DATE RECEIVED: 12/05/03
SAMPLE TEMP: 4^0C
DATE ANALYZED: 12/08/03
DATE COLLECTED: 12/05/03
ANALYZED BY: AG

8260/5035 SCAN

COMPOUND NAME	RESULT (ppB)	RDL (ppB)
	DRY WEIGHT CORRECTED	
1,2-DICHLOROPROPANE	ND	50
1,3-DICHLOROPROPANE	ND	50
2,2-DICHLOROPROPANE	ND	50
1,1-DICHLOROPROPENE	ND	50
cis-1,3-DICHLOROPROPENE	ND	50
trans-1,3-DICHLOROPROPENE	ND	50
ETHYLBENZENE	ND	50
HEXACHLOROBUTADIENE	ND	100
ISOPROPYLBENZENE	ND	250
METHYLENE CHLORIDE	ND	250
NAPHTHALENE	ND	250
n-PROPYLBENZENE	ND	100
STYRENE	ND	50
1,1,1,2-TETRACHLOROETHANE	ND	100
1,1,2,2-TETRACHLOROETHANE	ND	100
TETRACHLOROETHYLENE	ND	50
TOLUENE	ND	100
1,2,3-TRICHLOROBENZENE	ND	330
1,2,4-TRICHLOROBENZENE	ND	330
1,1,1-TRICHLOROETHANE	ND	50
1,1,2-TRICHLOROETHANE	ND	50
TRICHLOROETHYLENE	ND	50
TRICHLOROFLUOROMETHANE	ND	100
1,2,3-TRICHLOROPROPANE	ND	100
1,2,4-TRIMETHYLBENZENE	ND	100
1,3,5-TRIMETHYLBENZENE	ND	100
VINYL CHLORIDE	ND	40
XYLENES TOTAL	ND	150
2-METHYLNAPHTHALENE	ND	250

***NOTE: "ND" DENOTES THAT ANALYTE RESULT IS BELOW THE REPORTED REGULATORY DERIVED TARGET LIMIT OF DETECTION.**

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7 WEST SQUARE LAKE RD.
BLOOMFIELD HILLS, MI 48302

SAMPLE NO. 5365

SAMPLE DESCRIPTION: 35001 WOODWARD
SOIL SAMPLE AES GP-7 3-4'
DATE REPORTED: 12/16/03
DATE RECEIVED: 12/05/03
SAMPLE TEMP: 4^0C
DATE ANALYZED: 12/08/03
DATE COLLECTED: 12/05/03
ANALYZED BY: AG

8260/5035 SCAN

COMPOUND NAME	RESULT (ppB) DRY WEIGHT CORRECTED	RDL (ppB)
BENZENE	290	50
BROMOBENZENE	ND	100
BROMOCHLOROMETHANE	ND	100
BROMODICHLOROMETHANE	ND	100
BROMOFORM	ND	100
BROMOMETHANE	ND	250
n-BUTYLBENZENE	11000	50
sec-BUTYLBENZENE	3740	50
tert-BUTYLBENZENE	ND	50
CARBON TETRACHLORIDE	ND	50
CHLOROBENZENE	ND	50
CHLOROETHANE	ND	250
CHLOROFORM	ND	50
CHLOROMETHANE	ND	250
2-CHLOROTOLUENE	ND	50
4-CHLOROTOLUENE	ND	50
DIBROMOCHLOROMETHANE	ND	100
1,2-DIBROMO-3-CHLOROPROPANE	ND	250
1,2-DIBROMOETHANE	ND	250
DIBROMOMETHANE	ND	250
1,2-DICHLOROBENZENE	ND	100
1,3-DICHLOROBENZENE	ND	100
1,4-DICHLOROBENZENE	ND	100
DICHLORODIFLUOROMETHANE	ND	100
1,1-DICHLORETHANE	ND	50
1,2-DICHLORETHANE	ND	50
1,1-DICHLORETHENE	ND	50
cis-1,2-DICHLOROETHENE	ND	50
trans-1,2-DICHLOROETHENE	ND	50

*NOTE: "ND" DENOTES THAT ANALYTE RESULT IS BELOW THE REPORTED REGULATORY DERIVED TARGET LIMIT OF DETECTION.

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7 WEST SQUARE LAKE RD.
BLOOMFIELD HILLS, MI 48302

SAMPLE NO. 5365

SAMPLE DESCRIPTION: 35001 WOODWARD
SOIL SAMPLE AES GP-7 3-4'
DATE REPORTED: 12/16/03
DATE RECEIVED: 12/05/03
SAMPLE TEMP: 4°C
DATE ANALYZED: 12/08/03
DATE COLLECTED: 12/05/03
ANALYZED BY: AG

8260/5035 SCAN

COMPOUND NAME	RESULT (ppB)	RDL (ppB)
	DRY WEIGHT CORRECTED	
1,2-DICHLOROPROPANE	ND	50
1,3-DICHLOROPROPANE	ND	50
2,2-DICHLOROPROPANE	ND	50
1,1-DICHLOROPROPENE	ND	50
cis-1,3-DICHLOROPROPENE	ND	50
trans-1,3-DICHLOROPROPENE	ND	50
ETHYLBENZENE	9290	50
HEXACHLOROBUTADIENE	ND	100
ISOPROPYLBENZENE	3720	250
METHYLENE CHLORIDE	ND	250
NAPHTHALENE	22400	250
n-PROPYLBENZENE	13900	100
STYRENE	ND	50
1,1,1,2-TETRACHLOROETHANE	ND	100
1,1,2,2-TETRACHLOROETHANE	ND	100
TETRACHLOROETHYLENE	ND	50
TOLUENE	580	100
1,2,3-TRICHLOROBENZENE	ND	330
1,2,4-TRICHLOROBENZENE	ND	330
1,1,1-TRICHLOROETHANE	ND	50
1,1,2-TRICHLOROETHANE	ND	50
TRICHLOROETHYLENE	ND	50
TRICHLOROFLUOROMETHANE	ND	100
1,2,3-TRICHLOROPROPANE	ND	100
1,2,4-TRIMETHYLBENZENE	197000	100
1,3,5-TRIMETHYLBENZENE	128000	100
VINYL CHLORIDE	ND	40
XYLENES TOTAL	72100	150
2-METHYLNAPHTHALENE	31700	250

***NOTE: "ND" DENOTES THAT ANALYTE RESULT IS BELOW THE REPORTED REGULATORY DERIVED TARGET LIMIT OF DETECTION.**

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44075 Phoenix Drive
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586-731-1818
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CLIENT: ASSOCIATED ENVIRONMENTAL SERVICES
7 WEST SQUARE LAKE RD.
BLOOMFIELD HILLS, MI 48302

SAMPLE NO. 5366

SAMPLE DESCRIPTION: 35001 WOODWARD
SOIL SAMPLE AES GP-7 6-7'
DATE REPORTED: 12/16/03
DATE RECEIVED: 12/05/03
SAMPLE TEMP: 4^0C
DATE ANALYZED: 12/08/03
DATE COLLECTED: 12/05/03
ANALYZED BY: AG

8260/5035 SCAN

COMPOUND NAME	RESULT (ppB) DRY WEIGHT CORRECTED	RDL (ppB)
BENZENE	270	50
BROMOBENZENE	ND	100
BROMOCHLOROMETHANE	ND	100
BROMODICHLOROMETHANE	ND	100
BROMOFORM	ND	100
BROMOMETHANE	ND	250
n-BUTYLBENZENE	6770	50
sec-BUTYLBENZENE	2100	50
tert-BUTYLBENZENE	ND	50
CARBON TETRACHLORIDE	ND	50
CHLOROBENZENE	ND	50
CHLOROETHANE	ND	250
CHLOROFORM	ND	50
CHLOROMETHANE	ND	250
2-CHLOROTOLUENE	ND	50
4-CHLOROTOLUENE	ND	50
DIBROMOCHLOROMETHANE	ND	100
1,2-DIBROMO-3-CHLOROPROPANE	ND	250
1,2-DIBROMOETHANE	ND	250
DIBROMOMETHANE	ND	250
1,2-DICHLOROBENZENE	ND	100
1,3-DICHLOROBENZENE	ND	100
1,4-DICHLOROBENZENE	ND	100
DICHLORODIFLUOROMETHANE	ND	100
1,1-DICHLORETHANE	ND	50
1,2-DICHLORETHANE	ND	50
1,1-DICHLORETHENE	ND	50
cis-1,2-DICHLOROETHENE	ND	50
trans-1,2-DICHLOROETHENE	ND	50

*NOTE: "ND" DENOTES THAT ANALYTE RESULT IS BELOW THE REPORTED REGULATORY DERIVED TARGET LIMIT OF DETECTION.

THOMAS S. MEGNA, PRESIDENT
ALA GAJDA, LAB SUPERVISOR
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ENVIRONMENTAL QUALITY LABORATORIES, INC.

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7 WEST SQUARE LAKE RD.
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SAMPLE NO. 5366

SAMPLE DESCRIPTION: 35001 WOODWARD
SOIL SAMPLE AES GP-7 6-7'
DATE REPORTED: 12/16/03
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DATE ANALYZED: 12/08/03
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ANALYZED BY: AG

8260/5035 SCAN

COMPOUND NAME	RESULT (ppB)	RDL (ppB)
	DRY WEIGHT CORRECTED	
1,2-DICHLOROPROPANE	ND	50
1,3-DICHLOROPROPANE	ND	50
2,2-DICHLOROPROPANE	ND	50
1,1-DICHLOROPROPENE	ND	50
cis-1,3-DICHLOROPROPENE	ND	50
trans-1,3-DICHLOROPROPENE	ND	50
ETHYLBENZENE	19400	50
HEXACHLOROBUTADIENE	ND	100
ISOPROPYLBENZENE	4660	250
METHYLENE CHLORIDE	ND	250
NAPHTHALENE	18600	250
n-PROPYLBENZENE	16700	100
STYRENE	ND	50
1,1,1,2-TETRACHLOROETHANE	ND	100
1,1,2,2-TETRACHLOROETHANE	ND	100
TETRACHLOROETHYLENE	ND	50
TOLUENE	160	100
1,2,3-TRICHLOROBENZENE	ND	330
1,2,4-TRICHLOROBENZENE	ND	330
1,1,1-TRICHLOROETHANE	ND	50
1,1,2-TRICHLOROETHANE	ND	50
TRICHLOROETHYLENE	ND	50
TRICHLOROFLUOROMETHANE	ND	100
1,2,3-TRICHLOROPROPANE	ND	100
1,2,4-TRIMETHYLBENZENE	55200	100
1,3,5-TRIMETHYLBENZENE	39100	100
VINYL CHLORIDE	ND	40
XYLENES TOTAL	54200	150
2-METHYLNAPHTHALENE	17700	250

***NOTE: "ND" DENOTES THAT ANALYTE RESULT IS BELOW THE REPORTED REGULATORY DERIVED TARGET LIMIT OF DETECTION.**

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7 WEST SQUARE LAKE RD.
BLOOMFIELD HILLS, MI 48302

SAMPLE NO. 5367

SAMPLE DESCRIPTION: 35001 WOODWARD
SOIL SAMPLE AES GP-7 12-13'
DATE REPORTED: 12/16/03
DATE RECEIVED: 12/05/03
SAMPLE TEMP: 4^0C
DATE ANALYZED: 12/08/03
DATE COLLECTED: 12/05/03
ANALYZED BY: AG

8260/5035 SCAN

COMPOUND NAME	RESULT (ppB) DRY WEIGHT CORRECTED	RDL (ppB)
BENZENE	ND	50
BROMOBENZENE	ND	100
BROMOCHLOROMETHANE	ND	100
BROMODICHLOROMETHANE	ND	100
BROMOFORM	ND	100
BROMOMETHANE	ND	250
n-BUTYLBENZENE	ND	50
sec-BUTYLBENZENE	ND	50
tert-BUTYLBENZENE	ND	50
CARBON TETRACHLORIDE	ND	50
CHLOROBENZENE	ND	50
CHLOROETHANE	ND	250
CHLOROFORM	ND	50
CHLOROMETHANE	ND	250
2-CHLOROTOLUENE	ND	50
4-CHLOROTOLUENE	ND	50
DIBROMOCHLOROMETHANE	ND	100
1,2-DIBROMO-3-CHLOROPROPANE	ND	250
1,2-DIBROMOETHANE	ND	250
DIBROMOMETHANE	ND	250
1,2-DICHLOROBENZENE	ND	100
1,3-DICHLOROBENZENE	ND	100
1,4-DICHLOROBENZENE	ND	100
DICHLORODIFLUOROMETHANE	ND	100
1,1-DICHLORETHANE	ND	50
1,2-DICHLORETHANE	ND	50
1,1-DICHLORETHENE	ND	50
cis-1,2-DICHLOROETHENE	ND	50
trans-1,2-DICHLOROETHENE	ND	50

*NOTE: "ND" DENOTES THAT ANALYTE RESULT IS BELOW THE REPORTED REGULATORY DERIVED TARGET LIMIT OF DETECTION.

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SAMPLE NO. 5367

SAMPLE DESCRIPTION: 35001 WOODWARD
SOIL SAMPLE AES GP-7 12-13'
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ANALYZED BY: AG

8260/5035 SCAN

COMPOUND NAME	RESULT (ppB)	RDL (ppB)
	DRY WEIGHT CORRECTED	
1,2-DICHLOROPROPANE	ND	50
1,3-DICHLOROPROPANE	ND	50
2,2-DICHLOROPROPANE	ND	50
1,1-DICHLOROPROPENE	ND	50
cis-1,3-DICHLOROPROPENE	ND	50
trans-1,3-DICHLOROPROPENE	ND	50
ETHYLBENZENE	ND	50
HEXACHLOROBUTADIENE	ND	100
ISOPROPYLBENZENE	ND	250
METHYLENE CHLORIDE	ND	250
NAPHTHALENE	ND	250
n-PROPYLBENZENE	ND	100
STYRENE	ND	50
1,1,1,2-TETRACHLOROETHANE	ND	100
1,1,2,2-TETRACHLOROETHANE	ND	100
TETRACHLOROETHYLENE	ND	50
TOLUENE	ND	100
1,2,3-TRICHLOROBENZENE	ND	330
1,2,4-TRICHLOROBENZENE	ND	330
1,1,1-TRICHLOROETHANE	ND	50
1,1,2-TRICHLOROETHANE	ND	50
TRICHLOROETHYLENE	ND	50
TRICHLOROFLUOROMETHANE	ND	100
1,2,3-TRICHLOROPROPANE	ND	100
1,2,4-TRIMETHYLBENZENE	ND	100
1,3,5-TRIMETHYLBENZENE	ND	100
VINYL CHLORIDE	ND	40
XYLENES TOTAL	ND	150
2-METHYLNAPHTHALENE	ND	250

*NOTE: "ND" DENOTES THAT ANALYTE RESULT IS BELOW THE REPORTED REGULATORY DERIVED TARGET LIMIT OF DETECTION.

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7 WEST SQUARE LAKE RD.
BLOOMFIELD HILLS, MI 48302

SAMPLE NO. 5368

SAMPLE DESCRIPTION: 35001 WOODWARD
SOIL SAMPLE AES GP-1 8.5-9'
DATE REPORTED: 12/16/03
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SAMPLE TEMP: 4^0C
DATE ANALYZED: 12/08/03
DATE COLLECTED: 12/05/03
ANALYZED BY: AG

8260/5035 SCAN

COMPOUND NAME	RESULT (ppB)	RDL (ppB)
	DRY WEIGHT CORRECTED	
BENZENE	ND	50
BROMOBENZENE	ND	100
BROMOCHLOROMETHANE	ND	100
BROMODICHLOROMETHANE	ND	100
BROMOFORM	ND	100
BROMOMETHANE	ND	250
n-BUTYLBENZENE	ND	50
sec-BUTYLBENZENE	ND	50
tert-BUTYLBENZENE	ND	50
CARBON TETRACHLORIDE	ND	50
CHLOROBENZENE	ND	50
CHLOROETHANE	ND	250
CHLOROFORM	ND	50
CHLOROMETHANE	ND	250
2-CHLOROTOLUENE	ND	50
4-CHLOROTOLUENE	ND	50
DIBROMOCHLOROMETHANE	ND	100
1,2-DIBROMO-3-CHLOROPROPANE	ND	250
1,2-DIBROMOETHANE	ND	250
DIBROMOMETHANE	ND	250
1,2-DICHLOROBENZENE	ND	100
1,3-DICHLOROBENZENE	ND	100
1,4-DICHLOROBENZENE	ND	100
DICHLORODIFLUOROMETHANE	ND	100
1,1-DICHLORETHANE	ND	50
1,2-DICHLORETHANE	ND	50
1,1-DICHLORETHENE	ND	50
cis-1,2-DICHLOROETHENE	ND	50
trans-1,2-DICHLOROETHENE	ND	50

*NOTE: "ND" DENOTES THAT ANALYTE RESULT IS BELOW THE REPORTED REGULATORY DERIVED TARGET LIMIT OF DETECTION.

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8260/5035 SCAN

COMPOUND NAME	RESULT (ppB) DRY WEIGHT CORRECTED	RDL (ppB)
1,2-DICHLOROPROPANE	ND	50
1,3-DICHLOROPROPANE	ND	50
2,2-DICHLOROPROPANE	ND	50
1,1-DICHLOROPROPENE	ND	50
cis-1,3-DICHLOROPROPENE	ND	50
trans-1,3-DICHLOROPROPENE	ND	50
ETHYLBENZENE	ND	50
HEXACHLOROBUTADIENE	ND	100
ISOPROPYLBENZENE	ND	250
METHYLENE CHLORIDE	ND	250
NAPHTHALENE	ND	250
n-PROPYLBENZENE	ND	100
STYRENE	ND	50
1,1,1,2-TETRACHLOROETHANE	ND	100
1,1,2,2-TETRACHLOROETHANE	ND	100
TETRACHLOROETHYLENE	ND	50
TOLUENE	ND	100
1,2,3-TRICHLOROBENZENE	ND	330
1,2,4-TRICHLOROBENZENE	ND	330
1,1,1-TRICHLOROETHANE	ND	50
1,1,2-TRICHLOROETHANE	ND	50
TRICHLOROETHYLENE	ND	50
TRICHLOROFLUOROMETHANE	ND	100
1,2,3-TRICHLOROPROPANE	ND	100
1,2,4-TRIMETHYLBENZENE	ND	100
1,3,5-TRIMETHYLBENZENE	ND	100
VINYL CHLORIDE	ND	40
XYLENES TOTAL	ND	150
2-METHYLNAPHTHALENE	ND	250

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CLIENT: ASSOCIATED ENVIRONMENTAL SERVICES SAMPLE NO. 5369
7 WEST SQUARE LAKE RD.
BLOOMFIELD HILLS, MI 48302

SAMPLE DESCRIPTION: 35001 WOODWARD
SOIL SAMPLE AES GP-2 10-11'
DATE REPORTED: 12/16/03
DATE RECEIVED: 12/05/03
SAMPLE TEMP: 4^0C
DATE ANALYZED: 12/08/03
DATE COLLECTED:12/05/03
ANALYZED BY: AG 8260/5035 SCAN

COMPOUND NAME	RESULT (ppB) DRY WEIGHT CORRECTED	RDL (ppB)
BENZENE	ND	50
BROMOBENZENE	ND	100
BROMOCHLOROMETHANE	ND	100
BROMODICHLOROMETHANE	ND	100
BROMOFORM	ND	100
BROMOMETHANE	ND	250
n-BUTYLBENZENE	ND	50
sec-BUTYLBENZENE	ND	50
tert-BUTYLBENZENE	ND	50
CARBON TETRACHLORIDE	ND	50
CHLOROBENZENE	ND	50
CHLOROETHANE	ND	250
CHLOROFORM	ND	50
CHLOROMETHANE	ND	250
2-CHLOROTOLUENE	ND	50
4-CHLOROTOLUENE	ND	50
DIBROMOCHLOROMETHANE	ND	100
1,2-DIBROMO-3-CHLOROPROPANE	ND	250
1,2-DIBROMOETHANE	ND	250
DIBROMOMETHANE	ND	250
1,2-DICHLOROBENZENE	ND	100
1,3-DICHLOROBENZENE	ND	100
1,4-DICHLOROBENZENE	ND	100
DICHLORODIFLUOROMETHANE	ND	100
1,1-DICHLORETHANE	ND	50
1,2-DICHLORETHANE	ND	50
1,1-DICHLORETHENE	ND	50
cis-1,2-DICHLOROETHENE	ND	50
trans-1,2-DICHLOROETHENE	ND	50

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SOIL SAMPLE AES GP-2 10-11'

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SAMPLE TEMP: 4^0C
DATE ANALYZED: 12/08/03
DATE COLLECTED: 12/05/03
ANALYZED BY: AG

8260/5035 SCAN

COMPOUND NAME	RESULT (ppB)	RDL (ppB)
	DRY WEIGHT CORRECTED	
1,2-DICHLOROPROPANE	ND	50
1,3-DICHLOROPROPANE	ND	50
2,2-DICHLOROPROPANE	ND	50
1,1-DICHLOROPROPENE	ND	50
cis-1,3-DICHLOROPROPENE	ND	50
trans-1,3-DICHLOROPROPENE	ND	50
ETHYLBENZENE	ND	50
HEXACHLOROBUTADIENE	ND	100
ISOPROPYLBENZENE	ND	250
METHYLENE CHLORIDE	ND	250
NAPHTHALENE	ND	250
n-PROPYLBENZENE	ND	100
STYRENE	ND	50
1,1,1,2-TETRACHLOROETHANE	ND	100
1,1,2,2-TETRACHLOROETHANE	ND	100
TETRACHLOROETHYLENE	ND	50
TOLUENE	ND	100
1,2,3-TRICHLOROBENZENE	ND	330
1,2,4-TRICHLOROBENZENE	ND	330
1,1,1-TRICHLOROETHANE	ND	50
1,1,2-TRICHLOROETHANE	ND	50
TRICHLOROETHYLENE	ND	50
TRICHLOROFLUOROMETHANE	ND	100
1,2,3-TRICHLOROPROPANE	ND	100
1,2,4-TRIMETHYLBENZENE	ND	100
1,3,5-TRIMETHYLBENZENE	ND	100
VINYL CHLORIDE	ND	40
XYLENES TOTAL	ND	150
2-METHYLNAPHTHALENE	ND	250

*NOTE: "ND" DENOTES THAT ANALYTE RESULT IS BELOW THE REPORTED REGULATORY DERIVED TARGET LIMIT OF DETECTION.

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BLOOMFIELD HILLS, MI 48302

SAMPLE NO. 5370

SAMPLE DESCRIPTION: 35001 WOODWARD
SOIL SAMPLE AES GP-3 10-11'
DATE REPORTED: 12/16/03
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SAMPLE TEMP: 4^0C
DATE ANALYZED: 12/08/03
DATE COLLECTED: 12/05/03
ANALYZED BY: AG

8260/5035 SCAN

COMPOUND NAME	RESULT (ppB)	RDL (ppB)
	DRY WEIGHT CORRECTED	
BENZENE	ND	50
BROMOBENZENE	ND	100
BROMOCHLOROMETHANE	ND	100
BROMODICHLOROMETHANE	ND	100
BROMOFORM	ND	100
BROMOMETHANE	ND	250
n-BUTYLBENZENE	ND	50
sec-BUTYLBENZENE	ND	50
tert-BUTYLBENZENE	ND	50
CARBON TETRACHLORIDE	ND	50
CHLOROBENZENE	ND	50
CHLOROETHANE	ND	250
CHLOROFORM	ND	50
CHLOROMETHANE	ND	250
2-CHLOROTOLUENE	ND	50
4-CHLOROTOLUENE	ND	50
DIBROMOCHLOROMETHANE	ND	100
1,2-DIBROMO-3-CHLOROPROPANE	ND	250
1,2-DIBROMOETHANE	ND	250
DIBROMOMETHANE	ND	250
1,2-DICHLOROBENZENE	ND	100
1,3-DICHLOROBENZENE	ND	100
1,4-DICHLOROBENZENE	ND	100
DICHLORODIFLUOROMETHANE	ND	100
1,1-DICHLORETHANE	ND	50
1,2-DICHLORETHANE	ND	50
1,1-DICHLORETHENE	ND	50
cis-1,2-DICHLOROETHENE	ND	50
trans-1,2-DICHLOROETHENE	ND	50

*NOTE: "ND" DENOTES THAT ANALYTE RESULT IS BELOW THE REPORTED REGULATORY DERIVED TARGET LIMIT OF DETECTION.

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ANALYZED BY: AG

8260/5035 SCAN

COMPOUND NAME	RESULT (ppB)	RDL (ppB)
	DRY WEIGHT CORRECTED	
1,2-DICHLOROPROPANE	ND	50
1,3-DICHLOROPROPANE	ND	50
2,2-DICHLOROPROPANE	ND	50
1,1-DICHLOROPROPENE	ND	50
cis-1,3-DICHLOROPROPENE	ND	50
trans-1,3-DICHLOROPROPENE	ND	50
ETHYLBENZENE	ND	50
HEXACHLOROBUTADIENE	ND	100
ISOPROPYLBENZENE	ND	250
METHYLENE CHLORIDE	ND	250
NAPHTHALENE	ND	250
n-PROPYLBENZENE	ND	100
STYRENE	ND	50
1,1,1,2-TETRACHLOROETHANE	ND	100
1,1,2,2-TETRACHLOROETHANE	ND	100
TETRACHLOROETHYLENE	ND	50
TOLUENE	ND	100
1,2,3-TRICHLOROBENZENE	ND	330
1,2,4-TRICHLOROBENZENE	ND	330
1,1,1-TRICHLOROETHANE	ND	50
1,1,2-TRICHLOROETHANE	ND	50
TRICHLOROETHYLENE	ND	50
TRICHLOROFLUOROMETHANE	ND	100
1,2,3-TRICHLOROPROPANE	ND	100
1,2,4-TRIMETHYLBENZENE	ND	100
1,3,5-TRIMETHYLBENZENE	ND	100
VINYL CHLORIDE	ND	40
XYLENES TOTAL	ND	150
2-METHYLNAPHTHALENE	ND	250

*NOTE: "ND" DENOTES THAT ANALYTE RESULT IS BELOW THE REPORTED REGULATORY DERIVED TARGET LIMIT OF DETECTION.

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ALA GAJDA, LAB SUPERVISOR

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CLIENT: ASSOCIATED ENVIRONMENTAL SERVICES
7 WEST SQUARE LAKE RD.
BLOOMFIELD HILLS, MI 48302

SAMPLE NO. 5371

SAMPLE DESCRIPTION: 35001 WOODWARD
SOIL SAMPLE AES GP-4 10-11'
DATE REPORTED: 12/16/03
DATE RECEIVED: 12/05/03
SAMPLE TEMP: 4^0C
DATE ANALYZED: 12/08/03
DATE COLLECTED: 12/05/03
ANALYZED BY: AG

8260/5035 SCAN

COMPOUND NAME	RESULT (ppB)	RDL (ppB)
	DRY WEIGHT CORRECTED	
BENZENE	ND	50
BROMOBENZENE	ND	100
BROMOCHLOROMETHANE	ND	100
BROMODICHLOROMETHANE	ND	100
BROMOFORM	ND	100
BROMOMETHANE	ND	250
n-BUTYLBENZENE	ND	50
sec-BUTYLBENZENE	ND	50
tert-BUTYLBENZENE	ND	50
CARBON TETRACHLORIDE	ND	50
CHLOROBENZENE	ND	50
CHLOROETHANE	ND	250
CHLOROFORM	ND	50
CHLOROMETHANE	ND	250
2-CHLOROTOLUENE	ND	50
4-CHLOROTOLUENE	ND	50
DIBROMOCHLOROMETHANE	ND	100
1,2-DIBROMO-3-CHLOROPROPANE	ND	250
1,2-DIBROMOETHANE	ND	250
DIBROMOMETHANE	ND	250
1,2-DICHLOROBENZENE	ND	100
1,3-DICHLOROBENZENE	ND	100
1,4-DICHLOROBENZENE	ND	100
DICHLORODIFLUOROMETHANE	ND	100
1,1-DICHLORETHANE	ND	50
1,2-DICHLORETHANE	ND	50
1,1-DICHLORETHENE	ND	50
cis-1,2-DICHLOROETHENE	ND	50
trans-1,2-DICHLOROETHENE	ND	50

*NOTE: "ND" DENOTES THAT ANALYTE RESULT IS BELOW THE REPORTED REGULATORY DERIVED TARGET LIMIT OF DETECTION.

THOMAS S. MEGNA, PRESIDENT

ALA GAJDA, LAB SUPERVISOR

las

ENVIRONMENTAL QUALITY LABORATORIES, INC.

44075 Phoenix Drive
Sterling Heights, Michigan 48314-1420
586-731-1818
Outside Michigan Dial 1-800-368-5227
Fax Line 586-731-2590
www.EQualityLabs.com

CLIENT: ASSOCIATED ENVIRONMENTAL SERVICES
7 WEST SQUARE LAKE RD.
BLOOMFIELD HILLS, MI 48302

SAMPLE NO. 5371

SAMPLE DESCRIPTION: 35001 WOODWARD
SOIL SAMPLE AES GP-4 10-11'

DATE REPORTED: 12/16/03
DATE RECEIVED: 12/05/03
SAMPLE TEMP: 4^0C
DATE ANALYZED: 12/08/03
DATE COLLECTED: 12/05/03
ANALYZED BY: AG

8260/5035 SCAN

COMPOUND NAME	RESULT (ppB)	RDL (ppB)
	DRY WEIGHT CORRECTED	
1,2-DICHLOROPROPANE	ND	50
1,3-DICHLOROPROPANE	ND	50
2,2-DICHLOROPROPANE	ND	50
1,1-DICHLOROPROPENE	ND	50
cis-1,3-DICHLOROPROPENE	ND	50
trans-1,3-DICHLOROPROPENE	ND	50
ETHYLBENZENE	ND	50
HEXACHLOROBUTADIENE	ND	100
ISOPROPYLBENZENE	ND	250
METHYLENE CHLORIDE	ND	250
NAPHTHALENE	ND	250
n-PROPYLBENZENE	ND	100
STYRENE	ND	50
1,1,1,2-TETRACHLOROETHANE	ND	100
1,1,2,2-TETRACHLOROETHANE	ND	100
TETRACHLOROETHYLENE	64.0	50
TOLUENE	ND	100
1,2,3-TRICHLOROBENZENE	ND	330
1,2,4-TRICHLOROBENZENE	ND	330
1,1,1-TRICHLOROETHANE	ND	50
1,1,2-TRICHLOROETHANE	ND	50
TRICHLOROETHYLENE	ND	50
TRICHLOROFLUOROMETHANE	ND	100
1,2,3-TRICHLOROPROPANE	ND	100
1,2,4-TRIMETHYLBENZENE	ND	100
1,3,5-TRIMETHYLBENZENE	ND	100
VINYL CHLORIDE	ND	40
XYLENES TOTAL	ND	150
2-METHYLNAPHTHALENE	ND	250

*NOTE: "ND" DENOTES THAT ANALYTE RESULT IS BELOW THE REPORTED REGULATORY DERIVED TARGET LIMIT OF DETECTION.

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CLIENT: ASSOCIATED ENVIRONMENTAL SERVICES
7 WEST SQUARE LAKE RD.
BLOOMFIELD HILLS, MI 48302

SAMPLE NO. 5372

SAMPLE DESCRIPTION: 35001 WOODWARD
SOIL SAMPLE AES GP-5 10-11'

DATE REPORTED: 12/16/03
DATE RECEIVED: 12/05/03
SAMPLE TEMP: 4^0C
DATE ANALYZED: 12/08/03
DATE COLLECTED: 12/05/03
ANALYZED BY: AG

8260/5035 SCAN

COMPOUND NAME	RESULT (ppB) DRY WEIGHT CORRECTED	RDL (ppB)
BENZENE	ND	50
BROMOBENZENE	ND	100
BROMOCHLOROMETHANE	ND	100
BROMODICHLOROMETHANE	ND	100
BROMOFORM	ND	100
BROMOMETHANE	ND	250
n-BUTYLBENZENE	ND	50
sec-BUTYLBENZENE	ND	50
tert-BUTYLBENZENE	ND	50
CARBON TETRACHLORIDE	ND	50
CHLOROBENZENE	ND	50
CHLOROETHANE	ND	250
CHLOROFORM	ND	50
CHLOROMETHANE	ND	250
2-CHLOROTOLUENE	ND	50
4-CHLOROTOLUENE	ND	50
DIBROMOCHLOROMETHANE	ND	100
1,2-DIBROMO-3-CHLOROPROPANE	ND	250
1,2-DIBROMOETHANE	ND	250
DIBROMOMETHANE	ND	250
1,2-DICHLOROBENZENE	ND	100
1,3-DICHLOROBENZENE	ND	100
1,4-DICHLOROBENZENE	ND	100
DICHLORODIFLUOROMETHANE	ND	100
1,1-DICHLORETHANE	ND	50
1,2-DICHLORETHANE	ND	50
1,1-DICHLORETHENE	ND	50
cis-1,2-DICHLOROETHENE	ND	50
trans-1,2-DICHLOROETHENE	ND	50

*NOTE: "ND" DENOTES THAT ANALYTE RESULT IS BELOW THE REPORTED REGULATORY DERIVED TARGET LIMIT OF DETECTION.

THOMAS S. MEGNA, PRESIDENT

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BLOOMFIELD HILLS, MI 48302

SAMPLE NO. 5372

SAMPLE DESCRIPTION: 35001 WOODWARD
SOIL SAMPLE AES GP-5 10-11'
DATE REPORTED: 12/16/03
DATE RECEIVED: 12/05/03
SAMPLE TEMP: 4^0C
DATE ANALYZED: 12/08/03
DATE COLLECTED: 12/05/03
ANALYZED BY: AG

8260/5035 SCAN

COMPOUND NAME	RESULT (ppB)	RDL (ppB)
	DRY WEIGHT CORRECTED	
1,2-DICHLOROPROPANE	ND	50
1,3-DICHLOROPROPANE	ND	50
2,2-DICHLOROPROPANE	ND	50
1,1-DICHLOROPROPENE	ND	50
cis-1,3-DICHLOROPROPENE	ND	50
trans-1,3-DICHLOROPROPENE	ND	50
ETHYLBENZENE	ND	50
HEXACHLOROBUTADIENE	ND	100
ISOPROPYLBENZENE	ND	250
METHYLENE CHLORIDE	ND	250
NAPHTHALENE	ND	250
n-PROPYLBENZENE	ND	100
STYRENE	ND	50
1,1,1,2-TETRACHLOROETHANE	ND	100
1,1,2,2-TETRACHLOROETHANE	ND	100
TETRACHLOROETHYLENE	ND	50
TOLUENE	ND	100
1,2,3-TRICHLOROBENZENE	ND	330
1,2,4-TRICHLOROBENZENE	ND	330
1,1,1-TRICHLOROETHANE	ND	50
1,1,2-TRICHLOROETHANE	ND	50
TRICHLOROETHYLENE	ND	50
TRICHLOROFLUOROMETHANE	ND	100
1,2,3-TRICHLOROPROPANE	ND	100
1,2,4-TRIMETHYLBENZENE	ND	100
1,3,5-TRIMETHYLBENZENE	ND	100
VINYL CHLORIDE	ND	40
XYLENES TOTAL	ND	150
2-METHYLNAPHTHALENE	ND	250

*NOTE: "ND" DENOTES THAT ANALYTE RESULT IS BELOW THE REPORTED REGULATORY DERIVED TARGET LIMIT OF DETECTION.

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CLIENT: ASSOCIATED ENVIRONMENTAL SERVICES
7 WEST SQUARE LAKE RD.
BLOOMFIELD HILLS, MI 48302

SAMPLE NO. 5373

SAMPLE DESCRIPTION: 35001 WOODWARD
SOIL SAMPLE AES GP-6 7-8'
DATE REPORTED: 12/16/03
DATE RECEIVED: 12/05/03
SAMPLE TEMP: 4^0C
DATE ANALYZED: 12/08/03
DATE COLLECTED: 12/05/03
ANALYZED BY: AG

8260/5035 SCAN

COMPOUND NAME	RESULT (ppB) DRY WEIGHT CORRECTED	RDL (ppB)
BENZENE	ND	50
BROMOBENZENE	ND	100
BROMOCHLOROMETHANE	ND	100
BROMODICHLOROMETHANE	ND	100
BROMOFORM	ND	100
BROMOMETHANE	ND	250
n-BUTYLBENZENE	ND	50
sec-BUTYLBENZENE	ND	50
tert-BUTYLBENZENE	ND	50
CARBON TETRACHLORIDE	ND	50
CHLOROBENZENE	ND	50
CHLOROETHANE	ND	250
CHLOROFORM	ND	50
CHLOROMETHANE	ND	250
2-CHLOROTOLUENE	ND	50
4-CHLOROTOLUENE	ND	50
DIBROMOCHLOROMETHANE	ND	100
1,2-DIBROMO-3-CHLOROPROPANE	ND	250
1,2-DIBROMOETHANE	ND	250
DIBROMOMETHANE	ND	250
1,2-DICHLOROBENZENE	ND	100
1,3-DICHLOROBENZENE	ND	100
1,4-DICHLOROBENZENE	ND	100
DICHLORODIFLUOROMETHANE	ND	100
1,1-DICHLORETHANE	ND	50
1,2-DICHLORETHANE	ND	50
1,1-DICHLORETHENE	ND	50
cis-1,2-DICHLOROETHENE	ND	50
trans-1,2-DICHLOROETHENE	ND	50

*NOTE: "ND" DENOTES THAT ANALYTE RESULT IS BELOW THE REPORTED REGULATORY DERIVED TARGET LIMIT OF DETECTION.

THOMAS S. MEGNA, PRESIDENT

ALA GAJDA, LAB SUPERVISOR

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CLIENT: ASSOCIATED ENVIRONMENTAL SERVICES
7 WEST SQUARE LAKE RD.
BLOOMFIELD HILLS, MI 48302

SAMPLE NO. 5373

SAMPLE DESCRIPTION: 35001 WOODWARD
SOIL SAMPLE AES GP-6 7-8'
DATE REPORTED: 12/16/03
DATE RECEIVED: 12/05/03
SAMPLE TEMP: 4^0C
DATE ANALYZED: 12/08/03
DATE COLLECTED: 12/05/03
ANALYZED BY: AG

8260/5035 SCAN

COMPOUND NAME	RESULT (ppB)	RDL (ppB)
	DRY WEIGHT CORRECTED	
1,2-DICHLOROPROPANE	ND	50
1,3-DICHLOROPROPANE	ND	50
2,2-DICHLOROPROPANE	ND	50
1,1-DICHLOROPROPENE	ND	50
cis-1,3-DICHLOROPROPENE	ND	50
trans-1,3-DICHLOROPROPENE	ND	50
ETHYLBENZENE	ND	50
HEXACHLOROBUTADIENE	ND	100
ISOPROPYLBENZENE	ND	250
METHYLENE CHLORIDE	ND	250
NAPHTHALENE	ND	250
n-PROPYLBENZENE	ND	100
STYRENE	ND	50
1,1,1,2-TETRACHLOROETHANE	ND	100
1,1,2,2-TETRACHLOROETHANE	ND	100
TETRACHLOROETHYLENE	ND	50
TOLUENE	150	100
1,2,3-TRICHLOROBENZENE	ND	330
1,2,4-TRICHLOROBENZENE	ND	330
1,1,1-TRICHLOROETHANE	ND	50
1,1,2-TRICHLOROETHANE	ND	50
TRICHLOROETHYLENE	ND	50
TRICHLOROFLUOROMETHANE	ND	100
1,2,3-TRICHLOROPROPANE	ND	100
1,2,4-TRIMETHYLBENZENE	ND	100
1,3,5-TRIMETHYLBENZENE	ND	100
VINYL CHLORIDE	ND	40
XYLENES TOTAL	ND	150
2-METHYLNAPHTHALENE	ND	250

*NOTE: "ND" DENOTES THAT ANALYTE RESULT IS BELOW THE REPORTED REGULATORY DERIVED TARGET LIMIT OF DETECTION.

THOMAS S. MEGNA, PRESIDENT

ALA GAJDA, LAB SUPERVISOR

las

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Sterling Heights, Michigan 48314-1420
(586) 731-1818 • (800) 368-5227 • Fax (586) 731-2590

N° 0001

Chain of Custody
Analysis Request

1
Consultant: ASSOC. ENV. SERVICES
Sampler: C. DITMAR Phone:
Project: 35001 WOODWARD
Fax:

	2 Sample Identification		Collection Date	Collection Time	Grab	Composite	**4** Matrix: Soil	Water	Other	Total # of Containers	**5** Analysis Requested: VOC	PNA	MET HOMETALS					**6** Remarks
5359	AESGP-1	5.5-6.5	12/5/03	0925	X		X			2	X	X	X					
5360	AESGP-2	6-7		0950	X		X			2	X	X	X					
5361	AESGP-3	6-7		1015	X		X			2	X	X	X					
5362	AESGP-4	6.5-7		1035	X		X			2	X	X	X					
5363	AESGP-5	5-6		1045	X		X			2	X	X	X					
5364	AESGP-6	4-5		1155	X		X			2	X	X	X					
5365	AESGP-7	3-4		1155	X		X			2	X	X	X					HIGH PID !!
5366	AESGP-7	6-7		1210	X		X			2	X	X	X					HIGH PID !!
5367	AESGP-7	12-15		1235	X		X			2	X	X	X					

7
Turnaround time requested, (please circle): Emergency, Routine
(Call to confirm Emergency turnaround time).
Rush analysis results via:
Fax#: _____ -or- Phone #: _____

8 - This section MUST be signed each time the sample changes hands! -

Relinquished by	Date	Time	Received by	Date	Time
[signature]	12/5/03	1550	[signature]	12-5-03	1:37PM
[signature]	12-5-03	2:42	[signature]	12-5-03	24

9
CONDITION OF SAMPLES UPON RECEIPT AT EQL.
Sample Temp: _____ Preserve? _____ Damaged? _____
Comments: _____

In case we have questions when the samples arrive, call:
Name: NICK Maloof Phone: 248.758.2310
Send report to: NICK Maloof

ENVIRONMENTAL QUALITY LABORATORIES, INC
44075 Phoenix Drive
Sterling Heights, Michigan 48314-1420
(586) 731-1818 • (800) 368-5227 • Fax (586) 731-2590

No [illegible]

Chain of Custody
Analysis Request

1
Consultant: ASSOC. ENVIRON. SVCS
Sampler: C. DITTMAR Phone: _____
Project: 35001 WOODWARD
_____ Fax: _____

2 | **3** Collection | **4** Matrix | **5** Analysis Requested | **6**

	Sample Identification		Date	Time	Grab	Composite	Soil	Water	Other	Total # of Containers	VOC's	BNA's	ME 10 METALS	Remarks
5368	AESGP-1	5-5-9	12/5/03	0935	X		X			2	X	X	X	
5369	AESGP-2	10-11		1000	X		X			2	X	X	X	
5370	AESGP-3	10-11		1020	X		X			2	X	X	X	
5371	AESGP-4	10-11		1040	X		X			2	X	X	X	
5372	AESGP-5	10-11		1105	X		X			2	X	X	X	
5373	AESGP-6	7-8		1140	X		X			2	X	X	X	

7
Turnaround time requested, (please circle): Emergency, Routine
(Call to confirm Emergency turnaround time).
Rush analysis results via:
Fax#: _____ -or- Phone #: _____

8 - This section MUST be signed each time the sample changes hands! -

Relinquished by	Date	Time	Received by	Date	Time
[signature]	12/5/03	1330	[signature]	12-5-03	1:32PM
[signature]	12-5-03	2:42	[signature]	12-5-03	2:42

9
CONDITION OF SAMPLES UPON RECEIPT AT EQL.
Sample Temp: _____ Preserve? _____ Damaged? _____
Comments: _____

In case we have questions when the samples arrive, call:
Name: NICK MALOOF Phone: 248.758.2510
Send report to: NICK MALOOF

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44075 Phoenix Drive
Sterling Heights, Michigan 48314-1420
586-731-1818
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Fax Line 586-731-2590
www.EQualityLabs.com

CLIENT: ASSOCIATED ENVIRONMENTAL
PROJECT NAME AND NUMBER: 35001 WOODWARD

DATE RECEIVED: 12/5/03
LAB NO.'S IN BATCH: 5359-5373
MATRIX: SOIL

METHOD 8260 UNITS = ppB

	CONC. OF SPIKE	MATRIX SPIKE	MATRIX SPIKE DUP	% RECOV	% RPD	SAMPLE RECEIVING SPIKE	DATE ANALYZED	TRIP/ METHOD BLANK	ANALYSTS INITIALS	% RECOV CONTROL LIMITS
1,1-DC-ETHENE	20	18	N/A	90	N/A	5359	12/8/2003	<RDL	AG	44-123
TRICHLOROETHENE	20	20	N/A	100	N/A	5359	12/8/2003	<RDL	AG	74-117
CHLOROBENZENE	20	21	N/A	105	N/A	5359	12/8/2003	<RDL	AG	82-136
BENZENE	20	20	N/A	100	N/A	5359	12/8/2003	<RDL	AG	80-120
TOLUENE	20	21	N/A	105	N/A	5359	12/8/2003	<RDL	AG	83-129

THOMAS S. MEGNA, PRESIDENT _____

ALA GAJDA, LAB SUPERVISOR _____

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CLIENT: ASSOCIATED ENVIRONMENTAL
PROJECT NAME AND NUMBER: 35001 WOODWARD

DATE RECEIVED: 12/5/03
LAB NO.'S IN BATCH: 5359-5373
MATRIX: WATER

UNITS	ppB	ppB			ppB	ppB	ppM				
ELEMENT	REF. STD VALUE	OBS. VALUE	% RECOV		METHOD BLANK VALUE	KNOWN METHOD STANDARD	OBS. METHOD STANDARD	% RECOVERY	DATE ANALYZED	ANALYSTS INITIALS	%RECOV CONTROL LIMITS
CHROME	370	390	105		<5	1.00	1.02	102	12/10/2003	JL	74-126
COPPER	113	130	115		<25	1.00	1.03	103	12/10/2003	JL	79-124
ZINC	177	190	107		<10	1.00	1.00	100	12/10/2003	JL	75-125
ARSENIC	362	300	83		<20	1.00	0.98	98	12/11/2003	JL	73-117
SELENIUM	267	220	83		<5	1.00	0.80	80	12/10/2003	JL	74-115
SILVER	216	190	88		<0.5	0.20	0.16	80	12/11/2003	JL	77-120
CADMIUM	70.5	78	110		<0.5	1.00	1.04	104	12/10/2003	JL	87-120
BARIUM	1620	1705	105		<100	1.00	1.04	104	12/10/2003	JL	79-121
LEAD	276	250	91		<3	1.00	0.93	93	12/10/2003	JL	81-117

THOMAS S. MEGNA, PRESIDENT _____ ALA GAJDA , LAB SUPERVISOR _____

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Sterling Heights, Michigan 48314-1420
(586) 731-1818 • (800) 368-5227 • Fax (586) 731-2590

№ 03381

Chain of Custody
Analysis Request

1
Consultant: Assoc. Env. Services
Sampler: C. DIXMAR Phone:
Project: 35001 WOODWARD
Fax:

4 Matrix: Soil, Water, Other

2 Sample Identification	Collection Date	Collection Time	Grab	Composite	Soil	Water	Other	Total # of Containers	**5** Analysis Requested: VOC	PNA	MI HOMERALS						**6** Remarks
AESGP-1 5.5-6.5	12/5/03	0925	X		X			2	X	X	X						
AESGP-2 6-7		0950	X		X			2	X	X	X						
AESGP-3 6-7		1015	X		X			2	X	X	X						
AESGP-4 6.5-7		1035	X		X			2	X	X	X						
AESGP-5 5-6		1045	X		X			2	X	X	X						
AESGP-6 4-5		1135	X		X			2	X	X	X						
AESGP-7 3-4		1155	X		X			2	X	X	X						HIGH PID !!
AESGP-7 6-7		1210	X		X			2	X	X	X						HIGH PID !!
AESGP-7 12-13		1235	X		X			2	X	X	X						

7
Turnaround time requested, (please circle): Emergency, Routine
(Call to confirm Emergency turnaround time).
Rush analysis results via:
Fax#: _____ -or- Phone #: _____

8 - This section MUST be signed each time the sample changes hands! -

Relinquished by	Date	Time	Received by	Date	Time
[signature]	12/5/03	1530	[signature]	12-5-03	1:37PM
[signature]	12-5-03	2:42	[signature]	12-5-03	2:42

9
CONDITION OF SAMPLES UPON RECEIPT AT EQL.
Sample Temp: _____ Preserve? _____ Damaged? _____
Comments: _____

In case we have questions when the samples arrive, call:
Name: NICK Maloof Phone: 248.758.2310
Send report to: NICK Maloof

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Sterling Heights, Michigan 48314-1420
(586) 731-1818 • (800) 368-5227 • Fax (586) 731-2590

№ 03382

Chain of Custody
Analysis Request

1 Consultant: ASSOC. ENVIRON. SVCS
Sampler: C. DITTMAR Phone:
Project: 35001 WOODWARD
Fax:

2 Sample Identification		Collection Date	Collection Time	Grab	Composite	4 Matrix: Soil	Water	Other	Total # of Containers	5 Analysis Requested: VOCs	PNAs	ME 10 METALS						Remarks
AESGP-1	8,5-9	12/5/03	0935	X		X			2	X	X	X						6
AESGP-2	10-11		1000	X		X			2	X	X	X						
AESGP-3	10-11		1020	X		X			2	X	X	X						
AESGP-4	10-11		1040	X		X			2	X	X	X						
AESGP-5	10-11		1105	X		X			2	X	X	X						
AESGP-6	7-8		1140	X		X			2	X	X	X						

7
Turnaround time requested, (please circle): Emergency, Routine
(Call to confirm Emergency turnaround time).
Rush analysis results via:
Fax#: _____ -or- Phone #: _____

8 – This section MUST be signed each time the sample changes hands! –

Relinquished by	Date	Time	Received by	Date	Time
	12/5/03	1330		12-5-03	1:37PM
	12-5-03	2:42		12-5-03	2:42

9
CONDITION OF SAMPLES UPON RECEIPT AT EQL.
Sample Temp: _____ Preserve? _____ Damaged? _____
Comments: _____

In case we have questions when the samples arrive, call:
Name: NICK MALOOF Phone: 248.758.2510
Send report to: NICK MALOOF

ENVIRONMENTAL QUALITY LABORATORIES, INC.
44075 Phoenix Drive
Sterling Heights, Michigan 48314-1420
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Fax Line 586-731-2590
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CLIENT NAME: ASSOCIATED ENVIRONMENTAL SERVICES
7 WEST SQUARE LAKE RD.
BLOOMFIELD HILLS, MI 48302

PROJECT NAME/NO.: 35001 WOODWARD

DATE REPORTED	DATE RECEIVED	SAMPLE TEMP	DATE EXTRACTED	DATE ANALYZED
12/17/03	12/12/03	4°C	12/15/03	12/15/03

ANALYZED BY: TM REFERENCED METHOD: 8310 SCAN DRY WEIGHT CORRECTED (SOILS ONLY)
RESULTS REPORTED IN ppBillion

LAB NO.	RDL SOIL	RDL WATER	5526 SOIL GP-8	5527 SOIL GP-8	5528 SOIL GP-10	5529 SOIL GP-10	5530 SOIL GP-11	5531 SOIL GP-11
COMPOUND NAME	ppB	ppB	1-2'	11-12'	5-6'	11-12'	4-5'	11-12'
Naphthalene	330	5.0	ND	ND	ND	ND	ND	ND
Acenaphthylene	330	5.0	ND	ND	ND	ND	ND	ND
Acenaphthene	330	5.0	ND	ND	ND	ND	ND	ND
Fluorene	330	5.0	ND	ND	ND	ND	ND	ND
Phenanthrene	330	5.0	ND	ND	ND	ND	ND	ND
Anthracene	330	5.0	ND	ND	ND	ND	ND	ND
Fluoranthene	330	5.0	ND	ND	ND	ND	ND	ND
Pyrene	330	5.0	ND	ND	ND	ND	ND	ND
Benzo(a)anthracene	330	1.0	ND	ND	ND	ND	ND	ND
Chrysene	330	5.0	ND	ND	ND	ND	ND	ND
Benzo(b)fluoranthene	330	2.0	ND	ND	ND	ND	ND	ND
Benzo(k)fluoranthene	330	5.0	ND	ND	ND	ND	ND	ND
Benzo(a)pyrene	330	2.0	ND	ND	ND	ND	ND	ND
Dibenzo(ah)anthracene	330	2.0	ND	ND	ND	ND	ND	ND
Benzo(qhi)perylene	330	5.0	ND	ND	ND	ND	ND	ND
Indeno(123-cd)pyrene	330	2.0	ND	ND	ND	ND	ND	ND
2-Methylnaphthalene	330	5.0	ND	ND	ND	ND	ND	ND

NOTE: "ND" DENOTES THAT ANALYTE RESULT IS BELOW THE REPORTED REGULATORY DERIVED TARGET LIMIT OF DETECTION.

THOMAS S. MEGNA, PRESIDENT _____ ALA GAJDA, LAB SUPERVISOR _____

REFERENCES: 40 CFR PART 136. CURRENT EDITION. las

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CLIENT NAME: ASSOCIATED ENVIRONMENTAL SERVICES
7 WEST SQUARE LAKE RD.
BLOOMFIELD HILLS, MI 48302

PROJECT NAME/NO.: 35001 WOODWARD

DATE RECEIVED	SAMPLE TEMP	DATE ANALYZED	DATE REPORTED
12/12/03	4°C	12/15/03 12/16/03	12/17/03

ANALYZED BY: JD METALS REFERENCED METHOD: 6000/7000

ALL WATER RESULTS REPORTED IN ppBILLION
ALL SOIL RESULTS REPORTED IN ppMILLION
DRY WEIGHT CORRECTED (SOILS ONLY)

LAB NO.		RDL SOIL	RDL WATER	5526 SOIL	5527 SOIL	5528 SOIL	5529 SOIL	5530 SOIL	5531 SOIL
COMPOUND NAME		ppM	ppB	GP-8 1-2'	GP-8 11-12'	GP-10 5-6'	GP-10 11-12'	GP-11 4-5'	GP-11 11-12'
BARIUM	6010	1.0	1000	11.0	8.7	4.3	20.0	3.6	18.0
CADMIUM	6010	0.05	0.5	0.2	1.7	2.6	1.9	1.8	2.5
CHROME, TOTAL	6010	0.5	50.0	3.9	3.6	2.5	7.5	2.4	7.6
COPPER	6010	1.0	25.0	3.3	5.2	5.0	5.8	3.6	7.0
LEAD	7421	1.0	3.0	2.3	2.3	3.0	2.8	3.0	3.0
SILVER	6010	0.5	0.5	ND	ND	ND	ND	ND	ND
ZINC	6010	1.0	10.0	11.0	15.0	18.0	21.0	9.0	21.0
ARSENIC	6010	0.1	5.0	0.8	1.0	1.0	1.0	1.0	1.0
SELENIUM	7740	0.2	5.0	ND	ND	ND	ND	ND	ND
MERCURY	7470	0.1	0.2	ND	ND	ND	ND	ND	ND

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THOMAS S. MEGNA, PRESIDENT _____ ALA GADJA, LAB SUPERVISOR _____

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CLIENT: ASSOCIATED ENVIRONMENTAL SERVICES
7 WEST SQUARE LAKE RD.
BLOOMFIELD HILLS, MI 48302

SAMPLE NO. 5526

SAMPLE DESCRIPTION: 35001 WOODWARD
SOIL SAMPLE AES GP-8 1-2'

DATE REPORTED: 12/17/03
DATE RECEIVED: 12/12/03
SAMPLE TEMP: 4°C
DATE ANALYZED: 12/15/03
DATE COLLECTED: 12/12/03
ANALYZED BY: AG

8260/5035 SCAN

COMPOUND NAME	RESULT (ppB) DRY WEIGHT CORRECTED	RDL (ppB)
BENZENE	ND	50
BROMOBENZENE	ND	100
BROMOCHLOROMETHANE	ND	100
BROMODICHLOROMETHANE	ND	100
BROMOFORM	ND	100
BROMOMETHANE	ND	250
n-BUTYLBENZENE	ND	50
sec-BUTYLBENZENE	ND	50
tert-BUTYLBENZENE	ND	50
CARBON TETRACHLORIDE	ND	50
CHLOROBENZENE	ND	50
CHLOROETHANE	ND	250
CHLOROFORM	ND	50
CHLOROMETHANE	ND	250
2-CHLOROTOLUENE	ND	50
4-CHLOROTOLUENE	ND	50
DIBROMOCHLOROMETHANE	ND	100
1,2-DIBROMO-3-CHLOROPROPANE	ND	250
1,2-DIBROMOETHANE	ND	250
DIBROMOMETHANE	ND	250
1,2-DICHLOROBENZENE	ND	100
1,3-DICHLOROBENZENE	ND	100
1,4-DICHLOROBENZENE	ND	100
DICHLORODIFLUOROMETHANE	ND	100
1,1-DICHLORETHANE	ND	50
1,2-DICHLORETHANE	ND	50
1,1-DICHLORETHENE	ND	50
cis-1,2-DICHLOROETHENE	ND	50
trans-1,2-DICHLOROETHENE	ND	50

*NOTE: "ND" DENOTES THAT ANALYTE RESULT IS BELOW THE REPORTED REGULATORY DERIVED TARGET LIMIT OF DETECTION.

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ALA GAJDA, LAB SUPERVISOR

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SAMPLE NO. 5526

SAMPLE DESCRIPTION: 35001 WOODWARD
SOIL SAMPLE AES GP-8 1-2'
DATE REPORTED: 12/17/03
DATE RECEIVED: 12/12/03
SAMPLE TEMP: 4^0C
DATE ANALYZED: 12/15/03
DATE COLLECTED: 12/12/03
ANALYZED BY: AG

8260/5035 SCAN

COMPOUND NAME	RESULT (ppB)	RDL (ppB)
	DRY WEIGHT CORRECTED	
1,2-DICHLOROPROPANE	ND	50
1,3-DICHLOROPROPANE	ND	50
2,2-DICHLOROPROPANE	ND	50
1,1-DICHLOROPROPENE	ND	50
cis-1,3-DICHLOROPROPENE	ND	50
trans-1,3-DICHLOROPROPENE	ND	50
ETHYLBENZENE	ND	50
HEXACHLOROBUTADIENE	ND	100
ISOPROPYLBENZENE	ND	250
METHYLENE CHLORIDE	ND	250
NAPHTHALENE	ND	250
n-PROPYLBENZENE	ND	100
STYRENE	ND	50
1,1,1,2-TETRACHLOROETHANE	ND	100
1,1,2,2-TETRACHLOROETHANE	ND	100
TETRACHLOROETHYLENE	ND	50
TOLUENE	ND	100
1,2,3-TRICHLOROBENZENE	ND	330
1,2,4-TRICHLOROBENZENE	ND	330
1,1,1-TRICHLOROETHANE	ND	50
1,1,2-TRICHLOROETHANE	ND	50
TRICHLOROETHYLENE	ND	50
TRICHLOROFLUOROMETHANE	ND	100
1,2,3-TRICHLOROPROPANE	ND	100
1,2,4-TRIMETHYLBENZENE	ND	100
1,3,5-TRIMETHYLBENZENE	ND	100
VINYL CHLORIDE	ND	40
XYLENES TOTAL	ND	150
2-METHYLNAPHTHALENE	ND	250
MTBE	ND	250

*NOTE: "ND" DENOTES THAT ANALYTE RESULT IS BELOW THE REPORTED REGULATORY DERIVED TARGET LIMIT OF DETECTION.

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7 WEST SQUARE LAKE RD.
BLOOMFIELD HILLS, MI 48302

SAMPLE NO. 5527

SAMPLE DESCRIPTION: 35001 WOODWARD
SOIL SAMPLE AES GP-8 11-12'
DATE REPORTED: 12/17/03
DATE RECEIVED: 12/12/03
SAMPLE TEMP: 4^0C
DATE ANALYZED: 12/15/03
DATE COLLECTED: 12/12/03
ANALYZED BY: AG

8260/5035 SCAN

COMPOUND NAME	RESULT (ppB) DRY WEIGHT CORRECTED	RDL (ppB)
BENZENE	ND	50
BROMOBENZENE	ND	100
BROMOCHLOROMETHANE	ND	100
BROMODICHLOROMETHANE	ND	100
BROMOFORM	ND	100
BROMOMETHANE	ND	250
n-BUTYLBENZENE	ND	50
sec-BUTYLBENZENE	ND	50
tert-BUTYLBENZENE	ND	50
CARBON TETRACHLORIDE	ND	50
CHLOROBENZENE	ND	50
CHLOROETHANE	ND	250
CHLOROFORM	ND	50
CHLOROMETHANE	ND	250
2-CHLOROTOLUENE	ND	50
4-CHLOROTOLUENE	ND	50
DIBROMOCHLOROMETHANE	ND	100
1,2-DIBROMO-3-CHLOROPROPANE	ND	250
1,2-DIBROMOETHANE	ND	250
DIBROMOMETHANE	ND	250
1,2-DICHLOROBENZENE	ND	100
1,3-DICHLOROBENZENE	ND	100
1,4-DICHLOROBENZENE	ND	100
DICHLORODIFLUOROMETHANE	ND	100
1,1-DICHLORETHANE	ND	50
1,2-DICHLORETHANE	ND	50
1,1-DICHLORETHENE	ND	50
cis-1,2-DICHLOROETHENE	ND	50
trans-1,2-DICHLOROETHENE	ND	50

*NOTE: "ND" DENOTES THAT ANALYTE RESULT IS BELOW THE REPORTED REGULATORY DERIVED TARGET LIMIT OF DETECTION.

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SAMPLE NO. 5527

SAMPLE DESCRIPTION: 35001 WOODWARD
SOIL SAMPLE AES GP-8 11-12'
DATE REPORTED: 12/17/03
DATE RECEIVED: 12/12/03
SAMPLE TEMP: 4^0C
DATE ANALYZED: 12/15/03
DATE COLLECTED: 12/12/03
ANALYZED BY: AG

8260/5035 SCAN

COMPOUND NAME	RESULT (ppB)	RDL (ppB)
	DRY WEIGHT CORRECTED	
1,2-DICHLOROPROPANE	ND	50
1,3-DICHLOROPROPANE	ND	50
2,2-DICHLOROPROPANE	ND	50
1,1-DICHLOROPROPENE	ND	50
cis-1,3-DICHLOROPROPENE	ND	50
trans-1,3-DICHLOROPROPENE	ND	50
ETHYLBENZENE	ND	50
HEXACHLOROBUTADIENE	ND	100
ISOPROPYLBENZENE	ND	250
METHYLENE CHLORIDE	ND	250
NAPHTHALENE	ND	250
n-PROPYLBENZENE	ND	100
STYRENE	ND	50
1,1,1,2-TETRACHLOROETHANE	ND	100
1,1,2,2-TETRACHLOROETHANE	ND	100
TETRACHLOROETHYLENE	ND	50
TOLUENE	ND	100
1,2,3-TRICHLOROBENZENE	ND	330
1,2,4-TRICHLOROBENZENE	ND	330
1,1,1-TRICHLOROETHANE	ND	50
1,1,2-TRICHLOROETHANE	ND	50
TRICHLOROETHYLENE	ND	50
TRICHLOROFLUOROMETHANE	ND	100
1,2,3-TRICHLOROPROPANE	ND	100
1,2,4-TRIMETHYLBENZENE	ND	100
1,3,5-TRIMETHYLBENZENE	230	100
VINYL CHLORIDE	ND	40
XYLENES TOTAL	460	150
2-METHYLNAPHTHALENE	ND	250
MTBE	ND	250

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CLIENT: ASSOCIATED ENVIRONMENTAL SERVICES
7 WEST SQUARE LAKE RD.
BLOOMFIELD HILLS, MI 48302

SAMPLE NO. 5528

SAMPLE DESCRIPTION: 35001 WOODWARD
SOIL SAMPLE AES GP-10 5-6'
DATE REPORTED: 12/17/03
DATE RECEIVED: 12/12/03
SAMPLE TEMP: 4^0C
DATE ANALYZED: 12/15/03
DATE COLLECTED: 12/12/03
ANALYZED BY: AG

8260/5035 SCAN

COMPOUND NAME	RESULT (ppB) DRY WEIGHT CORRECTED	RDL (ppB)
BENZENE	770	50
BROMOBENZENE	ND	100
BROMOCHLOROMETHANE	ND	100
BROMODICHLOROMETHANE	ND	100
BROMOFORM	ND	100
BROMOMETHANE	ND	250
n-BUTYLBENZENE	13700	50
sec-BUTYLBENZENE	4340	50
tert-BUTYLBENZENE	ND	50
CARBON TETRACHLORIDE	ND	50
CHLOROBENZENE	ND	50
CHLOROETHANE	ND	250
CHLOROFORM	ND	50
CHLOROMETHANE	ND	250
2-CHLOROTOLUENE	ND	50
4-CHLOROTOLUENE	ND	50
DIBROMOCHLOROMETHANE	ND	100
1,2-DIBROMO-3-CHLOROPROPANE	ND	250
1,2-DIBROMOETHANE	ND	250
DIBROMOMETHANE	ND	250
1,2-DICHLOROBENZENE	ND	100
1,3-DICHLOROBENZENE	ND	100
1,4-DICHLOROBENZENE	ND	100
DICHLORODIFLUOROMETHANE	ND	100
1,1-DICHLORETHANE	ND	50
1,2-DICHLORETHANE	ND	50
1,1-DICHLORETHENE	ND	50
cis-1,2-DICHLOROETHENE	ND	50
trans-1,2-DICHLOROETHENE	ND	50

*NOTE: "ND" DENOTES THAT ANALYTE RESULT IS BELOW THE REPORTED REGULATORY DERIVED TARGET LIMIT OF DETECTION.

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SAMPLE NO. 5528

SAMPLE DESCRIPTION: 35001 WOODWARD
SOIL SAMPLE AES GP-10 5-6'
DATE REPORTED: 12/17/03
DATE RECEIVED: 12/12/03
SAMPLE TEMP: 4°C
DATE ANALYZED: 12/15/03
DATE COLLECTED: 12/12/03
ANALYZED BY: AG

8260/5035 SCAN

COMPOUND NAME	RESULT (ppB)	RDL (ppB)
	DRY WEIGHT CORRECTED	
1,2-DICHLOROPROPANE	ND	50
1,3-DICHLOROPROPANE	ND	50
2,2-DICHLOROPROPANE	ND	50
1,1-DICHLOROPROPENE	ND	50
cis-1,3-DICHLOROPROPENE	ND	50
trans-1,3-DICHLOROPROPENE	ND	50
ETHYLBENZENE	51400	50
HEXACHLOROBUTADIENE	ND	100
ISOPROPYLBENZENE	10400	250
METHYLENE CHLORIDE	ND	250
NAPHTHALENE	50200	250
n-PROPYLBENZENE	37370	100
STYRENE	ND	50
1,1,1,2-TETRACHLOROETHANE	ND	100
1,1,2,2-TETRACHLOROETHANE	ND	100
TETRACHLOROETHYLENE	ND	50
TOLUENE	540	100
1,2,3-TRICHLOROBENZENE	ND	330
1,2,4-TRICHLOROBENZENE	ND	330
1,1,1-TRICHLOROETHANE	ND	50
1,1,2-TRICHLOROETHANE	ND	50
TRICHLOROETHYLENE	ND	50
TRICHLOROFLUOROMETHANE	ND	100
1,2,3-TRICHLOROPROPANE	ND	100
1,2,4-TRIMETHYLBENZENE	91300	100
1,3,5-TRIMETHYLBENZENE	71800	100
VINYL CHLORIDE	ND	40
XYLENES TOTAL	118000	150
2-METHYLNAPHTHALENE	43700	250
MTBE	ND	250

*NOTE: "ND" DENOTES THAT ANALYTE RESULT IS BELOW THE REPORTED REGULATORY DERIVED TARGET LIMIT OF DETECTION.

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SAMPLE NO. 5529

SAMPLE DESCRIPTION: 35001 WOODWARD
SOIL SAMPLE AES GP-11 4-5'
DATE REPORTED: 12/17/03
DATE RECEIVED: 12/12/03
SAMPLE TEMP: 4^0C
DATE ANALYZED: 12/15/03
DATE COLLECTED: 12/12/03
ANALYZED BY: AG

8260/5035 SCAN

COMPOUND NAME	RESULT (ppB)	RDL (ppB)
	DRY WEIGHT CORRECTED	
BENZENE	ND	50
BROMOBENZENE	ND	100
BROMOCHLOROMETHANE	ND	100
BROMODICHLOROMETHANE	ND	100
BROMOFORM	ND	100
BROMOMETHANE	ND	250
n-BUTYLBENZENE	ND	50
sec-BUTYLBENZENE	ND	50
tert-BUTYLBENZENE	ND	50
CARBON TETRACHLORIDE	ND	50
CHLOROBENZENE	ND	50
CHLOROETHANE	ND	250
CHLOROFORM	ND	50
CHLOROMETHANE	ND	250
2-CHLOROTOLUENE	ND	50
4-CHLOROTOLUENE	ND	50
DIBROMOCHLOROMETHANE	ND	100
1,2-DIBROMO-3-CHLOROPROPANE	ND	250
1,2-DIBROMOETHANE	ND	250
DIBROMOMETHANE	ND	250
1,2-DICHLOROBENZENE	ND	100
1,3-DICHLOROBENZENE	ND	100
1,4-DICHLOROBENZENE	ND	100
DICHLORODIFLUOROMETHANE	ND	100
1,1-DICHLORETHANE	ND	50
1,2-DICHLORETHANE	ND	50
1,1-DICHLORETHENE	ND	50
cis-1,2-DICHLOROETHENE	ND	50
trans-1,2-DICHLOROETHENE	ND	50

*NOTE: "ND" DENOTES THAT ANALYTE RESULT IS BELOW THE REPORTED REGULATORY DERIVED TARGET LIMIT OF DETECTION.

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SAMPLE NO. 5529

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DATE REPORTED: 12/17/03
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DATE ANALYZED: 12/15/03
DATE COLLECTED: 12/12/03
ANALYZED BY: AG

8260/5035 SCAN

COMPOUND NAME	RESULT (ppB)	RDL (ppB)
	DRY WEIGHT CORRECTED	
1,2-DICHLOROPROPANE	ND	50
1,3-DICHLOROPROPANE	ND	50
2,2-DICHLOROPROPANE	ND	50
1,1-DICHLOROPROPENE	ND	50
cis-1,3-DICHLOROPROPENE	ND	50
trans-1,3-DICHLOROPROPENE	ND	50
ETHYLBENZENE	400	50
HEXACHLOROBUTADIENE	ND	100
ISOPROPYLBENZENE	ND	250
METHYLENE CHLORIDE	ND	250
NAPHTHALENE	510	250
n-PROPYLBENZENE	180	100
STYRENE	ND	50
1,1,1,2-TETRACHLOROETHANE	ND	100
1,1,2,2-TETRACHLOROETHANE	ND	100
TETRACHLOROETHYLENE	ND	50
TOLUENE	ND	100
1,2,3-TRICHLOROBENZENE	ND	330
1,2,4-TRICHLOROBENZENE	ND	330
1,1,1-TRICHLOROETHANE	ND	50
1,1,2-TRICHLOROETHANE	ND	50
TRICHLOROETHYLENE	ND	50
TRICHLOROFLUOROMETHANE	ND	100
1,2,3-TRICHLOROPROPANE	ND	100
1,2,4-TRIMETHYLBENZENE	1450	100
1,3,5-TRIMETHYLBENZENE	460	100
VINYL CHLORIDE	ND	40
XYLENES TOTAL	2230	150
2-METHYLNAPHTHALENE	ND	250
MTBE	ND	250

*NOTE: "ND" DENOTES THAT ANALYTE RESULT IS BELOW THE REPORTED REGULATORY DERIVED TARGET LIMIT OF DETECTION.

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CLIENT: ASSOCIATED ENVIRONMENTAL SERVICES
7 WEST SQUARE LAKE RD.
BLOOMFIELD HILLS, MI 48302

SAMPLE NO. 5530

SAMPLE DESCRIPTION: 35001 WOODWARD
SOIL SAMPLE AES GP-11 4-5'
DATE REPORTED: 12/17/03
DATE RECEIVED: 12/12/03
SAMPLE TEMP: 4^0C
DATE ANALYZED: 12/15/03
DATE COLLECTED: 12/12/03
ANALYZED BY: AG

8260/5035 SCAN

COMPOUND NAME	RESULT (ppB) DRY WEIGHT CORRECTED	RDL (ppB)
BENZENE	480	50
BROMOBENZENE	ND	100
BROMOCHLOROMETHANE	ND	100
BROMODICHLOROMETHANE	ND	100
BROMOFORM	ND	100
BROMOMETHANE	ND	250
n-BUTYLBENZENE	5360	50
sec-BUTYLBENZENE	1930	50
tert-BUTYLBENZENE	ND	50
CARBON TETRACHLORIDE	ND	50
CHLOROBENZENE	ND	50
CHLOROETHANE	ND	250
CHLOROFORM	ND	50
CHLOROMETHANE	ND	250
2-CHLOROTOLUENE	ND	50
4-CHLOROTOLUENE	ND	50
DIBROMOCHLOROMETHANE	ND	100
1,2-DIBROMO-3-CHLOROPROPANE	ND	250
1,2-DIBROMOETHANE	ND	250
DIBROMOMETHANE	ND	250
1,2-DICHLOROBENZENE	ND	100
1,3-DICHLOROBENZENE	ND	100
1,4-DICHLOROBENZENE	ND	100
DICHLORODIFLUOROMETHANE	ND	100
1,1-DICHLORETHANE	ND	50
1,2-DICHLORETHANE	ND	50
1,1-DICHLORETHENE	ND	50
cis-1,2-DICHLOROETHENE	ND	50
trans-1,2-DICHLOROETHENE	ND	50

*NOTE: "ND" DENOTES THAT ANALYTE RESULT IS BELOW THE REPORTED REGULATORY DERIVED TARGET LIMIT OF DETECTION.

THOMAS S. MEGNA, PRESIDENT
ALA GAJDA, LAB SUPERVISOR
las

ENVIRONMENTAL QUALITY LABORATORIES, INC.

44075 Phoenix Drive
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7 WEST SQUARE LAKE RD.
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SAMPLE NO. 5530

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DATE ANALYZED: 12/15/03
DATE COLLECTED: 12/12/03
ANALYZED BY: AG

8260/5035 SCAN

COMPOUND NAME	RESULT (ppB)	RDL (ppB)
	DRY WEIGHT CORRECTED	
1,2-DICHLOROPROPANE	ND	50
1,3-DICHLOROPROPANE	ND	50
2,2-DICHLOROPROPANE	ND	50
1,1-DICHLOROPROPENE	ND	50
cis-1,3-DICHLOROPROPENE	ND	50
trans-1,3-DICHLOROPROPENE	ND	50
ETHYLBENZENE	28600	50
HEXACHLOROBUTADIENE	ND	100
ISOPROPYLBENZENE	5290	250
METHYLENE CHLORIDE	ND	250
NAPHTHALENE	18900	250
n-PROPYLBENZENE	ND	100
STYRENE	ND	50
1,1,1,2-TETRACHLOROETHANE	ND	100
1,1,2,2-TETRACHLOROETHANE	ND	100
TETRACHLOROETHYLENE	ND	50
TOLUENE	ND	100
1,2,3-TRICHLOROBENZENE	ND	330
1,2,4-TRICHLOROBENZENE	ND	330
1,1,1-TRICHLOROETHANE	ND	50
1,1,2-TRICHLOROETHANE	ND	50
TRICHLOROETHYLENE	ND	50
TRICHLOROFLUOROMETHANE	ND	100
1,2,3-TRICHLOROPROPANE	ND	100
1,2,4-TRIMETHYLBENZENE	63900	100
1,3,5-TRIMETHYLBENZENE	38800	100
VINYL CHLORIDE	ND	40
XYLENES TOTAL	59900	150
2-METHYLNAPHTHALENE	10900	250
MTBE	ND	250

***NOTE: "ND" DENOTES THAT ANALYTE RESULT IS BELOW THE REPORTED REGULATORY DERIVED TARGET LIMIT OF DETECTION.**

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CLIENT: ASSOCIATED ENVIRONMENTAL SERVICES
7 WEST SQUARE LAKE RD.
BLOOMFIELD HILLS, MI 48302

SAMPLE NO. 5531

SAMPLE DESCRIPTION: 35001 WOODWARD
SOIL SAMPLE AES GP-11 11-12'
DATE REPORTED: 12/17/03
DATE RECEIVED: 12/12/03
SAMPLE TEMP: 4^0C
DATE ANALYZED: 12/15/03
DATE COLLECTED: 12/12/03
ANALYZED BY: AG

8260/5035 SCAN

COMPOUND NAME	RESULT (ppB) DRY WEIGHT CORRECTED	RDL (ppB)
BENZENE	ND	50
BROMOBENZENE	ND	100
BROMOCHLOROMETHANE	ND	100
BROMODICHLOROMETHANE	ND	100
BROMOFORM	ND	100
BROMOMETHANE	ND	250
n-BUTYLBENZENE	ND	50
sec-BUTYLBENZENE	ND	50
tert-BUTYLBENZENE	ND	50
CARBON TETRACHLORIDE	ND	50
CHLOROBENZENE	ND	50
CHLOROETHANE	ND	250
CHLOROFORM	ND	50
CHLOROMETHANE	ND	250
2-CHLOROTOLUENE	ND	50
4-CHLOROTOLUENE	ND	50
DIBROMOCHLOROMETHANE	ND	100
1,2-DIBROMO-3-CHLOROPROPANE	ND	250
1,2-DIBROMOETHANE	ND	250
DIBROMOMETHANE	ND	250
1,2-DICHLOROBENZENE	ND	100
1,3-DICHLOROBENZENE	ND	100
1,4-DICHLOROBENZENE	ND	100
DICHLORODIFLUOROMETHANE	ND	100
1,1-DICHLORETHANE	ND	50
1,2-DICHLORETHANE	ND	50
1,1-DICHLORETHENE	ND	50
cis-1,2-DICHLOROETHENE	ND	50
trans-1,2-DICHLOROETHENE	ND	50

*NOTE: "ND" DENOTES THAT ANALYTE RESULT IS BELOW THE REPORTED REGULATORY DERIVED TARGET LIMIT OF DETECTION.

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SAMPLE NO. 5531

SAMPLE DESCRIPTION: 35001 WOODWARD
SOIL SAMPLE AES GP-11 11-12'
DATE REPORTED: 12/17/03
DATE RECEIVED: 12/12/03
SAMPLE TEMP: 4^0C
DATE ANALYZED: 12/15/03
DATE COLLECTED: 12/12/03
ANALYZED BY: AG

8260/5035 SCAN

COMPOUND NAME	RESULT (ppB)	RDL (ppB)
	DRY WEIGHT CORRECTED	
1,2-DICHLOROPROPANE	ND	50
1,3-DICHLOROPROPANE	ND	50
2,2-DICHLOROPROPANE	ND	50
1,1-DICHLOROPROPENE	ND	50
cis-1,3-DICHLOROPROPENE	ND	50
trans-1,3-DICHLOROPROPENE	ND	50
ETHYLBENZENE	ND	50
HEXACHLOROBUTADIENE	ND	100
ISOPROPYLBENZENE	ND	250
METHYLENE CHLORIDE	ND	250
NAPHTHALENE	ND	250
n-PROPYLBENZENE	ND	100
STYRENE	ND	50
1,1,1,2-TETRACHLOROETHANE	ND	100
1,1,2,2-TETRACHLOROETHANE	ND	100
TETRACHLOROETHYLENE	ND	50
TOLUENE	ND	100
1,2,3-TRICHLOROBENZENE	ND	330
1,2,4-TRICHLOROBENZENE	ND	330
1,1,1-TRICHLOROETHANE	ND	50
1,1,2-TRICHLOROETHANE	ND	50
TRICHLOROETHYLENE	ND	50
TRICHLOROFLUOROMETHANE	ND	100
1,2,3-TRICHLOROPROPANE	ND	100
1,2,4-TRIMETHYLBENZENE	140	100
1,3,5-TRIMETHYLBENZENE	ND	100
VINYL CHLORIDE	ND	40
XYLENES TOTAL	160	150
2-METHYLNAPHTHALENE	ND	250
MTBE	ND	250

*NOTE: "ND" DENOTES THAT ANALYTE RESULT IS BELOW THE REPORTED REGULATORY DERIVED TARGET LIMIT OF DETECTION.

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44075 Phoenix Drive
Sterling Heights, Michigan 48314-1420
(586) 731-1818 • (800) 368-5227 • Fax (586) 731-2590

№ 02136

Chain of Custody
Analysis Request

1
Consultant: Assoc. Env. Services
Sampler: C. DIXMAR Phone: 248·758·2310
Project: 35001 Woodward
Fax:

2 **4** **5**

Sample Identification		Collection Date	Collection Time	Grab	Composite	Matrix: Soil	Matrix: Water	Matrix: Other	Total # of Containers	Analysis Requested: VOCs	PNAs	MI 10 MBTALS	Remarks
526 AESGP-8	1-2'	12/13/03	0940	X		X			2	X	X	X	**6** NEED Results
527 AESGP-8	11-12'		1010	X		X			2	X	X	X	By 12/16 End of
528 AESGP-10	5-6'		1142	X		X			2	X	X	X	day. Fit in normal
529 AESGP-10	11-12'		1158	X		X			2	X	X	X	Sequence if possible
530 AESGP-11	4-5'		1315	X		X			2	X	X	X	
531 AESGP-11	11-12'		1325	X		X			2	X	X	X	

7
Turnaround time requested, (please circle): Emergency, Routine
(Call to confirm Emergency turnaround time).
Rush analysis results via:
Fax#: 248·758·2311 -or- Phone #:

8 - This section MUST be signed each time the sample changes hands! -

Relinquished by	Date	Time	Received by	Date	Time
Charles W. Dittmar	12/12/03	1:45PM		12-12-03	1:45PM
	12-12-03	2:25	Jan Jankens	12-12-03	2:15

9
CONDITION OF SAMPLES UPON RECEIPT AT EQL.
Sample Temp: _____ Preserve? _____ Damaged? _____
Comments:

In case we have questions when the samples arrive, call:
Name: Nick Maloof Phone: 248·758·2310
Send report to: NICK MALOOF

ENVIRONMENTAL QUALITY LABORATORIES, INC.
44075 Phoenix Drive
Sterling Heights, Michigan 48314-1420
586-731-1818
Outside Michigan Dial 1-800-368-5227
Fax Line 586-731-2590
www.EQualityLabs.com

CLIENT: ASSOCIATED ENVIRONMENTAL
PROJECT NAME AND NUMBER: 35001 WOODWARD

DATE RECEIVED: 12/12/03
LAB NO.'S IN BATCH: 5526-5531
MATRIX: SOIL

METHOD 8260 UNITS = ppB

	CONC. OF SPIKE	MATRIX SPIKE	MATRIX SPIKE DUP	% RECOV	% RPD	SAMPLE RECEIVING SPIKE	DATE ANALYZED	TRIP/ METHOD BLANK	ANALYSTS INITIALS	% RECOV CONTROL LIMITS
1,1-DC-ETHENE	20	13	N/A	65	N/A	5526	12/15/2003	<RDL	AG	44-123
TRICHLOROETHENE	20	16	N/A	80	N/A	5526	12/15/2003	<RDL	AG	74-117
CHLOROBENZENE	20	18	N/A	90	N/A	5526	12/15/2003	<RDL	AG	82-136
BENZENE	20	16	N/A	80	N/A	5526	12/15/2003	<RDL	AG	80-120
TOLUENE	20	18	N/A	90	N/A	5526	12/15/2003	<RDL	AG	83-129

THOMAS S. MEGNA, PRESIDENT _____

ALA GAJDA, LAB SUPERVISOR _____

ENVIRONMENTAL QUALITY LABORATORIES, INC
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Sterling Heights, Michigan 48314-1420
(586) 731-1818 • (800) 368-5227 • Fax (586) 731-2590

№ 02736

Chain of Custody
Analysis Request

1
Consultant: Assoc. Env. Services
Sampler: C. Dittmar Phone: 248-758-2310
Project: 35001 Woodward
Fax:

2 Sample Identification		Collection Date	Collection Time	Grab	Composite	4 Matrix: Soil	Water	Other	Total # of Containers	5 Analysis Requested: VOCs	PNAs	MI 10 Metals						Remarks
526 AESGP-8	1-2'	12/10/03	0940	X		X			2	X	X	X						6 Need Results By 12/16 End of day. Fit in normal sequence if possible
527 AESGP-8	11-12'		1010	X		X			2	X	X	X						
528 AESGP-10	5-6'		1142	X		X			2	X	X	X						
529 AESGP-10	11-12'		1158	X		X			2	X	X	X						
530 AESGP-11	4-5'		1315	X		X			2	X	X	X						
531 AESGP-11	11-12'		1325	X		X			2	X	X	X						

7
Turnaround time requested, (please circle): Emergency, Routine
(Call to confirm Emergency turnaround time).
Rush analysis results via:
Fax#: 248-758-2311 -or- Phone #:

8 – This section MUST be signed each time the sample changes hands! –

Relinquished by	Date	Time	Received by	Date	Time
[signature]	12/12/03	1:45PM	[signature]	12-12-03	1:45PM
[signature]	12-12-03	2:20	[signature]	12-12-03	2:15

9
CONDITION OF SAMPLES UPON RECEIPT AT EQL.
Sample Temp: _____ Preserve? _____ Damaged? _____
Comments:

In case we have questions when the samples arrive, call:
Name: Nick Maloof Phone: 248-758-2310
Send report to: NICK MALOOF

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CLIENT: ASSOCIATED ENVIRONMENTAL SERVICES
7 WEST SQUARE LAKE RD.
BLOOMFIELD HILLS, MI 48302

SAMPLE NO. 5249

SAMPLE DESCRIPTION: 35001 WOODWARD
WATER SAMPLE MW-1
DATE REPORTED: 12/12/03
DATE RECEIVED: 12/04/03
SAMPLE TEMP: 4^0C
DATE ANALYZED: 12/04/03
ANALYZED BY: AG
DILUTION 1:10

8260 SCAN

COMPOUND NAME	RESULT (ppB)	RDL (ppB)
BENZENE	949	10
BROMOBENZENE	ND	10
BROMOCHLOROMETHANE	ND	10
BROMODICHLOROMETHANE	ND	10
BROMOFORM	ND	10
BROMOMETHANE	ND	10
n-BUTYLBENZENE	ND	10
sec-BUTYLBENZENE	ND	10
tert-BUTYLBENZENE	ND	10
CARBON TETRACHLORIDE	ND	10
CHLOROBENZENE	ND	10
CHLOROETHANE	ND	10
CHLOROMETHANE	ND	10
CHLOROFORM	ND	10
2-CHLOROTOLUENE	ND	10
4-CHLOROTOLUENE	ND	10
DIBROMOCHLOROMETHANE	ND	10
1,2-DIBROMO-3-CHLOROPROPANE	ND	10
1,2-DIBROMOETHANE	ND	10
DIBROMOMETHANE	ND	50
1,2-DICHLOROBENZENE	ND	10
1,3-DICHLOROBENZENE	ND	10
1,4-DICHLOROBENZENE	ND	10
DICHLORODIFLUOROMETHANE	ND	10
1,1-DICHLOROETHANE	ND	10
1,2-DICHLOROETHANE	ND	10
1,1-DICHLOROETHENE	ND	10
cis-1,2-DICHLOROETHENE	ND	10
trans-1,2-DICHLOROETHENE	ND	10

*NOTE: "ND" DENOTES THAT ANALYTE RESULT IS BELOW THE REPORTED REGULATORY DERIVED TARGET LIMIT OF DETECTION.

NOTE: ELEVATED RDL DUE TO DILUTIONS REQUIRED TO OVERCOME MATRIX INTERFERENCES AND QUANTITATE TARGET ANALYTES.

THOMAS S. MEGNA, PRESIDENT

ALA GAJDA, LAB SUPERVISOR

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SAMPLE TEMP: 4^0C
DATE ANALYZED: 12/04/03
ANALYZED BY: AG
DILUTION 1:10

8260 SCAN

COMPOUND NAME	RESULTS (ppB)	RDL (ppB)
1,2-DICHLOROPROPANE	ND	10
1,3-DICHLOROPROPANE	ND	10
2,2-DICHLOROPROPANE	ND	10
1,1-DICHLOROPROPENE	ND	10
cis-1,3-DICHLOROPROPENE	ND	10
trans-1,3-DICHLOROPROPENE	ND	10
ETHYLBENZENE	296	10
HEXACHLOROBUTADIENE	ND	10
ISOPROPYLBENZENE	ND	50
METHYLENE CHLORIDE	ND	50
NAPHTHALENE	160	50
n-PROPYLBENZENE	29.0	10
STYRENE	ND	10
1,1,1,2-TETRACHLOROETHANE	ND	10
1,1,2,2-TETRACHLOROETHANE	ND	10
TETRACHLOROETHYLENE	ND	10
TOLUENE	28.0	10
1,2,3-TRICHLOROBENZENE	ND	50
1,2,4-TRICHLOROBENZENE	ND	50
1,1,1-TRICHLOROETHANE	ND	10
1,1,2-TRICHLOROETHANE	ND	10
TRICHLOROETHYLENE	ND	10
TRICHLOROFLUOROMETHANE	ND	10
1,2,3-TRICHLOROPROPANE	ND	10
1,2,4-TRIMETHYLBENZENE	ND	10
1,3,5-TRIMETHYLBENZENE	ND	10
VINYL CHLORIDE	ND	10
XYLENES TOTAL	52.0	30
2-METHYLNAPHTHALENE	ND	50

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CLIENT: ASSOCIATED ENVIRONMENTAL SERVICES
7 WEST SQUARE LAKE RD.
BLOOMFIELD HILLS, MI 48302

SAMPLE NO. 5250

SAMPLE DESCRIPTION: 35001 WOODWARD
WATER SAMPLE MW-2

DATE REPORTED: 12/12/03
DATE RECEIVED: 12/04/03
SAMPLE TEMP: 4°C
DATE ANALYZED: 12/04/03
ANALYZED BY: AG

8260 SCAN

COMPOUND NAME	RESULT (ppB)	RDL (ppB)
BENZENE	4.0	1.0
BROMOBENZENE	ND	1.0
BROMOCHLOROMETHANE	ND	1.0
BROMODICHLOROMETHANE	ND	1.0
BROMOFORM	ND	1.0
BROMOMETHANE	ND	1.0
n-BUTYLBENZENE	ND	1.0
sec-BUTYLBENZENE	ND	1.0
tert-BUTYLBENZENE	ND	1.0
CARBON TETRACHLORIDE	ND	1.0
CHLOROBENZENE	ND	1.0
CHLOROETHANE	ND	1.0
CHLOROMETHANE	ND	1.0
CHLOROFORM	ND	1.0
2-CHLOROTOLUENE	ND	1.0
4-CHLOROTOLUENE	ND	1.0
DIBROMOCHLOROMETHANE	ND	1.0
1,2-DIBROMO-3-CHLOROPROPANE	ND	1.0
1,2-DIBROMOETHANE	ND	1.0
DIBROMOMETHANE	ND	5.0
1,2-DICHLOROBENZENE	ND	1.0
1,3-DICHLOROBENZENE	ND	1.0
1,4-DICHLOROBENZENE	ND	1.0
DICHLORODIFLUOROMETHANE	ND	1.0
1,1-DICHLOROETHANE	ND	1.0
1,2-DICHLOROETHANE	ND	1.0
1,1-DICHLOROETHENE	ND	1.0
cis-1,2-DICHLOROETHENE	ND	1.0
trans-1,2-DICHLOROETHENE	ND	1.0

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SAMPLE NO. 5250

SAMPLE DESCRIPTION: 35001 WOODWARD
WATER SAMPLE MW-2

DATE REPORTED: 12/12/03
DATE RECEIVED: 12/04/03
SAMPLE TEMP: 4^0C
DATE ANALYZED: 12/04/03
ANALYZED BY: AG

COMPOUND NAME	8260 SCAN RESULTS (ppB)	PAGE 2 RDL (ppB)
1,2-DICHLOROPROPANE	ND	1.0
1,3-DICHLOROPROPANE	ND	1.0
2,2-DICHLOROPROPANE	ND	1.0
1,1-DICHLOROPROPENE	ND	1.0
cis-1,3-DICHLOROPROPENE	ND	1.0
trans-1,3-DICHLOROPROPENE	ND	1.0
ETHYLBENZENE	ND	1.0
HEXACHLOROBUTADIENE	ND	1.0
ISOPROPYLBENZENE	ND	5.0
METHYLENE CHLORIDE	ND	5.0
NAPHTHALENE	ND	5.0
n-PROPYLBENZENE	ND	1.0
STYRENE	ND	1.0
1,1,1,2-TETRACHLOROETHANE	ND	1.0
1,1,2,2-TETRACHLOROETHANE	ND	1.0
TETRACHLOROETHYLENE	ND	1.0
TOLUENE	ND	1.0
1,2,3-TRICHLOROBENZENE	ND	5.0
1,2,4-TRICHLOROBENZENE	ND	5.0
1,1,1-TRICHLOROETHANE	ND	1.0
1,1,2-TRICHLOROETHANE	ND	1.0
TRICHLOROETHYLENE	ND	1.0
TRICHLOROFLUOROMETHANE	ND	1.0
1,2,3-TRICHLOROPROPANE	ND	1.0
1,2,4-TRIMETHYLBENZENE	ND	1.0
1,3,5-TRIMETHYLBENZENE	ND	1.0
VINYL CHLORIDE	ND	1.0
XYLENES TOTAL	ND	3.0
2-METHYLNAPHTHALENE	ND	5.0

***NOTE: "ND" DENOTES THAT ANALYTE RESULT IS BELOW THE REPORTED REGULATORY DERIVED TARGET LIMIT OF DETECTION.**

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ENVIRONMENTAL QUALITY LABORATORIES, INC.

44075 Phoenix Drive
Sterling Heights, Michigan 48314-1420
586-731-1818
Outside Michigan Dial 1-800-368-5227
Fax Line 586-731-2590
www.EQualityLabs.com

CLIENT: ASSOCIATED ENVIRONMENTAL SERVICES
7 WEST SQUARE LAKE RD.
BLOOMFIELD HILLS, MI 48302

SAMPLE NO. 5251

SAMPLE DESCRIPTION: 35001 WOODWARD
WATER SAMPLE MW-4
DATE REPORTED: 12/12/03
DATE RECEIVED: 12/04/03
SAMPLE TEMP: 4°C
DATE ANALYZED: 12/04/03
ANALYZED BY: AG
DILUTION 1:10

8260 SCAN

COMPOUND NAME	RESULT (ppB)	RDL (ppB)
BENZENE	10900	10
BROMOBENZENE	ND	10
BROMOCHLOROMETHANE	ND	10
BROMODICHLOROMETHANE	ND	10
BROMOFORM	ND	10
BROMOMETHANE	ND	10
n-BUTYLBENZENE	ND	10
sec-BUTYLBENZENE	12.0	10
tert-BUTYLBENZENE	ND	10
CARBON TETRACHLORIDE	ND	10
CHLOROBENZENE	ND	10
CHLOROETHANE	ND	10
CHLOROMETHANE	ND	10
CHLOROFORM	ND	10
2-CHLOROTOLUENE	ND	10
4-CHLOROTOLUENE	ND	10
DIBROMOCHLOROMETHANE	ND	10
1,2-DIBROMO-3-CHLOROPROPANE	ND	10
1,2-DIBROMOETHANE	ND	10
DIBROMOMETHANE	ND	50
1,2-DICHLOROBENZENE	ND	10
1,3-DICHLOROBENZENE	ND	10
1,4-DICHLOROBENZENE	ND	10
DICHLORODIFLUOROMETHANE	ND	10
1,1-DICHLOROETHANE	ND	10
1,2-DICHLOROETHANE	ND	10
1,1-DICHLOROETHENE	ND	10
cis-1,2-DICHLOROETHENE	ND	10
trans-1,2-DICHLOROETHENE	ND	10

*NOTE: "ND" DENOTES THAT ANALYTE RESULT IS BELOW THE REPORTED REGULATORY DERIVED TARGET LIMIT OF DETECTION.

NOTE: ELEVATED RDL DUE TO DILUTIONS REQUIRED TO OVERCOME MATRIX INTERFERENCES AND QUANTITATE TARGET ANALYTES.

THOMAS S. MEGNA, PRESIDENT

ALA GAJDA, LAB SUPERVISOR

las

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BLOOMFIELD HILLS, MI 48302
SAMPLE DESCRIPTION: 35001 WOODWARD
WATER SAMPLE MW-4
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SAMPLE TEMP: 4^0C
DATE ANALYZED: 12/04/03
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DILUTION 1:10 8260 SCAN

COMPOUND NAME	RESULTS (ppB)	RDL (ppB)
1,2-DICHLOROPROPANE	ND	10
1,3-DICHLOROPROPANE	ND	10
2,2-DICHLOROPROPANE	ND	10
1,1-DICHLOROPROPENE	ND	10
cis-1,3-DICHLOROPROPENE	ND	10
trans-1,3-DICHLOROPROPENE	ND	10
ETHYLBENZENE	1300	10
HEXACHLOROBUTADIENE	ND	10
ISOPROPYLBENZENE	68.0	50
METHYLENE CHLORIDE	ND	50
NAPHTHALENE	628	50
n-PROPYLBENZENE	190	10
STYRENE	ND	10
1,1,1,2-TETRACHLOROETHANE	ND	10
1,1,2,2-TETRACHLOROETHANE	ND	10
TETRACHLOROETHYLENE	ND	10
TOLUENE	208	10
1,2,3-TRICHLOROBENZENE	ND	50
1,2,4-TRICHLOROBENZENE	ND	50
1,1,1-TRICHLOROETHANE	ND	10
1,1,2-TRICHLOROETHANE	ND	10
TRICHLOROETHYLENE	ND	10
TRICHLOROFLUOROMETHANE	ND	10
1,2,3-TRICHLOROPROPANE	ND	10
1,2,4-TRIMETHYLBENZENE	1900	10
1,3,5-TRIMETHYLBENZENE	460	10
VINYL CHLORIDE	ND	10
XYLENES TOTAL	1990	30
2-METHYLNAPHTHALENE	180	50

*NOTE: "ND" DENOTES THAT ANALYTE RESULT IS BELOW THE REPORTED REGULATORY DERIVED TARGET LIMIT OF DETECTION.
NOTE: ELEVATED RDL DUE TO DILUTIONS REQUIRED TO OVERCOME MATRIX INTERFERENCES AND QUANTITATE TARGET ANALYTES.

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SAMPLE NO. 5252

SAMPLE DESCRIPTION: 35001 WOODWARD
WATER SAMPLE MW-5

DATE REPORTED: 12/12/03
DATE RECEIVED: 12/04/03
SAMPLE TEMP: 4°C
DATE ANALYZED: 12/04/03
ANALYZED BY: AG

8260 SCAN

COMPOUND NAME	RESULT (ppB)	RDL (ppB)
BENZENE	195	1.0
BROMOBENZENE	ND	1.0
BROMOCHLOROMETHANE	ND	1.0
BROMODICHLOROMETHANE	ND	1.0
BROMOFORM	ND	1.0
BROMOMETHANE	ND	1.0
n-BUTYLBENZENE	ND	1.0
sec-BUTYLBENZENE	ND	1.0
tert-BUTYLBENZENE	ND	1.0
CARBON TETRACHLORIDE	ND	1.0
CHLOROBENZENE	ND	1.0
CHLOROETHANE	ND	1.0
CHLOROMETHANE	ND	1.0
CHLOROFORM	ND	1.0
2-CHLOROTOLUENE	ND	1.0
4-CHLOROTOLUENE	ND	1.0
DIBROMOCHLOROMETHANE	ND	1.0
1,2-DIBROMO-3-CHLOROPROPANE	ND	1.0
1,2-DIBROMOETHANE	ND	1.0
DIBROMOMETHANE	ND	5.0
1,2-DICHLOROBENZENE	ND	1.0
1,3-DICHLOROBENZENE	ND	1.0
1,4-DICHLOROBENZENE	ND	1.0
DICHLORODIFLUOROMETHANE	ND	1.0
1,1-DICHLOROETHANE	ND	1.0
1,2-DICHLOROETHANE	ND	1.0
1,1-DICHLOROETHENE	ND	1.0
cis-1,2-DICHLOROETHENE	ND	1.0
trans-1,2-DICHLOROETHENE	ND	1.0

*NOTE: "ND" DENOTES THAT ANALYTE RESULT IS BELOW THE REPORTED REGULATORY DERIVED TARGET LIMIT OF DETECTION.

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WATER SAMPLE MW-5

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COMPOUND NAME	8260 SCAN RESULTS (ppB)	PAGE 2 RDL (ppB)
1,2-DICHLOROPROPANE	ND	1.0
1,3-DICHLOROPROPANE	ND	1.0
2,2-DICHLOROPROPANE	ND	1.0
1,1-DICHLOROPROPENE	ND	1.0
cis-1,3-DICHLOROPROPENE	ND	1.0
trans-1,3-DICHLOROPROPENE	ND	1.0
ETHYLBENZENE	ND	1.0
HEXACHLOROBUTADIENE	ND	1.0
ISOPROPYLBENZENE	ND	5.0
METHYLENE CHLORIDE	ND	5.0
NAPHTHALENE	ND	5.0
n-PROPYLBENZENE	ND	1.0
STYRENE	ND	1.0
1,1,1,2-TETRACHLOROETHANE	ND	1.0
1,1,2,2-TETRACHLOROETHANE	ND	1.0
TETRACHLOROETHYLENE	ND	1.0
TOLUENE	ND	1.0
1,2,3-TRICHLOROBENZENE	ND	5.0
1,2,4-TRICHLOROBENZENE	ND	5.0
1,1,1-TRICHLOROETHANE	ND	1.0
1,1,2-TRICHLOROETHANE	ND	1.0
TRICHLOROETHYLENE	ND	1.0
TRICHLOROFLUOROMETHANE	ND	1.0
1,2,3-TRICHLOROPROPANE	ND	1.0
1,2,4-TRIMETHYLBENZENE	ND	1.0
1,3,5-TRIMETHYLBENZENE	ND	1.0
VINYL CHLORIDE	ND	1.0
XYLENES TOTAL	ND	3.0
2-METHYLNAPHTHALENE	ND	5.0

*NOTE: "ND" DENOTES THAT ANALYTE RESULT IS BELOW THE REPORTED REGULATORY DERIVED TARGET LIMIT OF DETECTION.

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SAMPLE NO. 5253

SAMPLE DESCRIPTION: 35001 WOODWARD
WATER SAMPLE MW-6

DATE REPORTED: 12/12/03
DATE RECEIVED: 12/04/03
SAMPLE TEMP: 4^0C
DATE ANALYZED: 12/04/03
ANALYZED BY: AG

8260 SCAN

COMPOUND NAME	RESULT (ppB)	RDL (ppB)
BENZENE	ND	1.0
BROMOBENZENE	ND	1.0
BROMOCHLOROMETHANE	ND	1.0
BROMODICHLOROMETHANE	ND	1.0
BROMOFORM	ND	1.0
BROMOMETHANE	ND	1.0
n-BUTYLBENZENE	ND	1.0
sec-BUTYLBENZENE	ND	1.0
tert-BUTYLBENZENE	ND	1.0
CARBON TETRACHLORIDE	ND	1.0
CHLOROBENZENE	ND	1.0
CHLOROETHANE	ND	1.0
CHLOROMETHANE	ND	1.0
CHLOROFORM	ND	1.0
2-CHLOROTOLUENE	ND	1.0
4-CHLOROTOLUENE	ND	1.0
DIBROMOCHLOROMETHANE	ND	1.0
1,2-DIBROMO-3-CHLOROPROPANE	ND	1.0
1,2-DIBROMOETHANE	ND	1.0
DIBROMOMETHANE	ND	5.0
1,2-DICHLOROBENZENE	ND	1.0
1,3-DICHLOROBENZENE	ND	1.0
1,4-DICHLOROBENZENE	ND	1.0
DICHLORODIFLUOROMETHANE	ND	1.0
1,1-DICHLOROETHANE	ND	1.0
1,2-DICHLOROETHANE	ND	1.0
1,1-DICHLOROETHENE	ND	1.0
cis-1,2-DICHLOROETHENE	ND	1.0
trans-1,2-DICHLOROETHENE	ND	1.0

*NOTE: "ND" DENOTES THAT ANALYTE RESULT IS BELOW THE REPORTED REGULATORY DERIVED TARGET LIMIT OF DETECTION.

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WATER SAMPLE MW-6

DATE REPORTED: 12/12/03
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COMPOUND NAME	8260 SCAN RESULTS (ppB)	PAGE 2 RDL (ppB)
1,2-DICHLOROPROPANE	ND	1.0
1,3-DICHLOROPROPANE	ND	1.0
2,2-DICHLOROPROPANE	ND	1.0
1,1-DICHLOROPROPENE	ND	1.0
cis-1,3-DICHLOROPROPENE	ND	1.0
trans-1,3-DICHLOROPROPENE	ND	1.0
ETHYLBENZENE	ND	1.0
HEXACHLOROBUTADIENE	ND	1.0
ISOPROPYLBENZENE	ND	5.0
METHYLENE CHLORIDE	ND	5.0
NAPHTHALENE	ND	5.0
n-PROPYLBENZENE	ND	1.0
STYRENE	ND	1.0
1,1,1,2-TETRACHLOROETHANE	ND	1.0
1,1,2,2-TETRACHLOROETHANE	ND	1.0
TETRACHLOROETHYLENE	ND	1.0
TOLUENE	ND	1.0
1,2,3-TRICHLOROBENZENE	ND	5.0
1,2,4-TRICHLOROBENZENE	ND	5.0
1,1,1-TRICHLOROETHANE	ND	1.0
1,1,2-TRICHLOROETHANE	ND	1.0
TRICHLOROETHYLENE	ND	1.0
TRICHLOROFLUOROMETHANE	ND	1.0
1,2,3-TRICHLOROPROPANE	ND	1.0
1,2,4-TRIMETHYLBENZENE	ND	1.0
1,3,5-TRIMETHYLBENZENE	ND	1.0
VINYL CHLORIDE	ND	1.0
XYLENES TOTAL	ND	3.0
2-METHYLNAPHTHALENE	ND	5.0

***NOTE: "ND" DENOTES THAT ANALYTE RESULT IS BELOW THE REPORTED REGULATORY DERIVED TARGET LIMIT OF DETECTION.**

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SAMPLE NO. 5254

SAMPLE DESCRIPTION: 35001 WOODWARD
WATER SAMPLE MW-7

DATE REPORTED: 12/12/03
DATE RECEIVED: 12/04/03
SAMPLE TEMP: 4^0C
DATE ANALYZED: 12/04/03
ANALYZED BY: AG

8260 SCAN

COMPOUND NAME	RESULT (ppB)	RDL (ppB)
BENZENE	ND	1.0
BROMOBENZENE	ND	1.0
BROMOCHLOROMETHANE	ND	1.0
BROMODICHLOROMETHANE	ND	1.0
BROMOFORM	ND	1.0
BROMOMETHANE	ND	1.0
n-BUTYLBENZENE	ND	1.0
sec-BUTYLBENZENE	ND	1.0
tert-BUTYLBENZENE	ND	1.0
CARBON TETRACHLORIDE	ND	1.0
CHLOROBENZENE	ND	1.0
CHLOROETHANE	ND	1.0
CHLOROMETHANE	ND	1.0
CHLOROFORM	ND	1.0
2-CHLOROTOLUENE	ND	1.0
4-CHLOROTOLUENE	ND	1.0
DIBROMOCHLOROMETHANE	ND	1.0
1,2-DIBROMO-3-CHLOROPROPANE	ND	1.0
1,2-DIBROMOETHANE	ND	1.0
DIBROMOMETHANE	ND	5.0
1,2-DICHLOROBENZENE	ND	1.0
1,3-DICHLOROBENZENE	ND	1.0
1,4-DICHLOROBENZENE	ND	1.0
DICHLORODIFLUOROMETHANE	ND	1.0
1,1-DICHLOROETHANE	ND	1.0
1,2-DICHLOROETHANE	ND	1.0
1,1-DICHLOROETHENE	ND	1.0
cis-1,2-DICHLOROETHENE	ND	1.0
trans-1,2-DICHLOROETHENE	ND	1.0

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8260 SCAN — PAGE 2

COMPOUND NAME	RESULTS (ppB)	RDL (ppB)
1,2-DICHLOROPROPANE	ND	1.0
1,3-DICHLOROPROPANE	ND	1.0
2,2-DICHLOROPROPANE	ND	1.0
1,1-DICHLOROPROPENE	ND	1.0
cis-1,3-DICHLOROPROPENE	ND	1.0
trans-1,3-DICHLOROPROPENE	ND	1.0
ETHYLBENZENE	2.0	1.0
HEXACHLOROBUTADIENE	ND	1.0
ISOPROPYLBENZENE	ND	5.0
METHYLENE CHLORIDE	ND	5.0
NAPHTHALENE	ND	5.0
n-PROPYLBENZENE	ND	1.0
STYRENE	ND	1.0
1,1,1,2-TETRACHLOROETHANE	ND	1.0
1,1,2,2-TETRACHLOROETHANE	ND	1.0
TETRACHLOROETHYLENE	ND	1.0
TOLUENE	ND	1.0
1,2,3-TRICHLOROBENZENE	ND	5.0
1,2,4-TRICHLOROBENZENE	ND	5.0
1,1,1-TRICHLOROETHANE	ND	1.0
1,1,2-TRICHLOROETHANE	ND	1.0
TRICHLOROETHYLENE	ND	1.0
TRICHLOROFLUOROMETHANE	ND	1.0
1,2,3-TRICHLOROPROPANE	ND	1.0
1,2,4-TRIMETHYLBENZENE	8.0	1.0
1,3,5-TRIMETHYLBENZENE	1.0	1.0
VINYL CHLORIDE	ND	1.0
XYLENES TOTAL	ND	3.0
2-METHYLNAPHTHALENE	ND	5.0

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SAMPLE NO. 5255

SAMPLE DESCRIPTION: 35001 WOODWARD
WATER SAMPLE MW-8

DATE REPORTED: 12/12/03
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DATE ANALYZED: 12/04/03
ANALYZED BY: AG

8260 SCAN

COMPOUND NAME	RESULT (ppB)	RDL (ppB)
BENZENE	2.0	1.0
BROMOBENZENE	ND	1.0
BROMOCHLOROMETHANE	ND	1.0
BROMODICHLOROMETHANE	ND	1.0
BROMOFORM	ND	1.0
BROMOMETHANE	ND	1.0
n-BUTYLBENZENE	ND	1.0
sec-BUTYLBENZENE	ND	1.0
tert-BUTYLBENZENE	ND	1.0
CARBON TETRACHLORIDE	ND	1.0
CHLOROBENZENE	ND	1.0
CHLOROETHANE	ND	1.0
CHLOROMETHANE	ND	1.0
CHLOROFORM	ND	1.0
2-CHLOROTOLUENE	ND	1.0
4-CHLOROTOLUENE	ND	1.0
DIBROMOCHLOROMETHANE	ND	1.0
1,2-DIBROMO-3-CHLOROPROPANE	ND	1.0
1,2-DIBROMOETHANE	ND	1.0
DIBROMOMETHANE	ND	5.0
1,2-DICHLOROBENZENE	ND	1.0
1,3-DICHLOROBENZENE	ND	1.0
1,4-DICHLOROBENZENE	ND	1.0
DICHLORODIFLUOROMETHANE	ND	1.0
1,1-DICHLOROETHANE	ND	1.0
1,2-DICHLOROETHANE	ND	1.0
1,1-DICHLOROETHENE	ND	1.0
cis-1,2-DICHLOROETHENE	ND	1.0
trans-1,2-DICHLOROETHENE	ND	1.0

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8260 SCAN — PAGE 2

COMPOUND NAME	RESULTS (ppB)	RDL (ppB)
1,2-DICHLOROPROPANE	ND	1.0
1,3-DICHLOROPROPANE	ND	1.0
2,2-DICHLOROPROPANE	ND	1.0
1,1-DICHLOROPROPENE	ND	1.0
cis-1,3-DICHLOROPROPENE	ND	1.0
trans-1,3-DICHLOROPROPENE	ND	1.0
ETHYLBENZENE	ND	1.0
HEXACHLOROBUTADIENE	ND	1.0
ISOPROPYLBENZENE	ND	5.0
METHYLENE CHLORIDE	ND	5.0
NAPHTHALENE	ND	5.0
n-PROPYLBENZENE	ND	1.0
STYRENE	ND	1.0
1,1,1,2-TETRACHLOROETHANE	ND	1.0
1,1,2,2-TETRACHLOROETHANE	ND	1.0
TETRACHLOROETHYLENE	ND	1.0
TOLUENE	ND	1.0
1,2,3-TRICHLOROBENZENE	ND	5.0
1,2,4-TRICHLOROBENZENE	ND	5.0
1,1,1-TRICHLOROETHANE	ND	1.0
1,1,2-TRICHLOROETHANE	ND	1.0
TRICHLOROETHYLENE	ND	1.0
TRICHLOROFLUOROMETHANE	ND	1.0
1,2,3-TRICHLOROPROPANE	ND	1.0
1,2,4-TRIMETHYLBENZENE	ND	1.0
1,3,5-TRIMETHYLBENZENE	ND	1.0
VINYL CHLORIDE	ND	1.0
XYLENES TOTAL	ND	3.0
2-METHYLNAPHTHALENE	ND	5.0

*NOTE: "ND" DENOTES THAT ANALYTE RESULT IS BELOW THE REPORTED REGULATORY ~~DERIVED~~ TARGET LIMIT OF DETECTION.

THOMAS S. MEGNA, PRESIDENT

ALA GAJDA, LAB SUPERVISOR

las

ENVIRONMENTAL QUALITY LABORATORIES, INC.

44075 Phoenix Drive
Sterling Heights, Michigan 48314-1420
586-731-1818
Outside Michigan Dial 1-800-368-5227
Fax Line 586-731-2590
www.EQualityLabs.com

CLIENT: ASSOCIATED ENVIRONMENTAL SERVICES
7 WEST SQUARE LAKE RD.
BLOOMFIELD HILLS, MI 48302

SAMPLE NO. 5256

SAMPLE DESCRIPTION: 35001 WOODWARD
WATER SAMPLE MW-10

DATE REPORTED: 12/12/03
DATE RECEIVED: 12/04/03
SAMPLE TEMP: 4^0C
DATE ANALYZED: 12/04/03
ANALYZED BY: AG

8260 SCAN

COMPOUND NAME	RESULT (ppB)	RDL (ppB)
BENZENE	1.0	1.0
BROMOBENZENE	ND	1.0
BROMOCHLOROMETHANE	ND	1.0
BROMODICHLOROMETHANE	ND	1.0
BROMOFORM	ND	1.0
BROMOMETHANE	ND	1.0
n-BUTYLBENZENE	ND	1.0
sec-BUTYLBENZENE	ND	1.0
tert-BUTYLBENZENE	ND	1.0
CARBON TETRACHLORIDE	ND	1.0
CHLOROBENZENE	ND	1.0
CHLOROETHANE	ND	1.0
CHLOROMETHANE	ND	1.0
CHLOROFORM	ND	1.0
2-CHLOROTOLUENE	ND	1.0
4-CHLOROTOLUENE	ND	1.0
DIBROMOCHLOROMETHANE	ND	1.0
1,2-DIBROMO-3-CHLOROPROPANE	ND	1.0
1,2-DIBROMOETHANE	ND	1.0
DIBROMOMETHANE	ND	5.0
1,2-DICHLOROBENZENE	ND	1.0
1,3-DICHLOROBENZENE	ND	1.0
1,4-DICHLOROBENZENE	ND	1.0
DICHLORODIFLUOROMETHANE	ND	1.0
1,1-DICHLOROETHANE	ND	1.0
1,2-DICHLOROETHANE	ND	1.0
1,1-DICHLOROETHENE	ND	1.0
cis-1,2-DICHLOROETHENE	ND	1.0
trans-1,2-DICHLOROETHENE	ND	1.0

*NOTE: "ND" DENOTES THAT ANALYTE RESULT IS BELOW THE REPORTED REGULATORY DERIVED TARGET LIMIT OF DETECTION.

THOMAS S. MEGNA, PRESIDENT

ALA GAJDA, LAB SUPERVISOR

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CLIENT: ASSOCIATED ENVIRONMENTAL SERVICES
7 WEST SQUARE LAKE RD.
BLOOMFIELD HILLS, MI 48302

SAMPLE NO. 5256

SAMPLE DESCRIPTION: 35001 WOODWARD
WATER SAMPLE MW-10

DATE REPORTED: 12/12/03
DATE RECEIVED: 12/04/03
SAMPLE TEMP: 4^{0}C
DATE ANALYZED: 12/04/03
ANALYZED BY: AG

8260 SCAN — PAGE 2

COMPOUND NAME	RESULTS (ppB)	RDL (ppB)
1,2-DICHLOROPROPANE	ND	1.0
1,3-DICHLOROPROPANE	ND	1.0
2,2-DICHLOROPROPANE	ND	1.0
1,1-DICHLOROPROPENE	ND	1.0
cis-1,3-DICHLOROPROPENE	ND	1.0
trans-1,3-DICHLOROPROPENE	ND	1.0
ETHYLBENZENE	5.0	1.0
HEXACHLOROBUTADIENE	ND	1.0
ISOPROPYLBENZENE	1.0	5.0
METHYLENE CHLORIDE	ND	5.0
NAPHTHALENE	ND	5.0
n-PROPYLBENZENE	ND	1.0
STYRENE	ND	1.0
1,1,1,2-TETRACHLOROETHANE	ND	1.0
1,1,2,2-TETRACHLOROETHANE	ND	1.0
TETRACHLOROETHYLENE	ND	1.0
TOLUENE	ND	1.0
1,2,3-TRICHLOROBENZENE	ND	5.0
1,2,4-TRICHLOROBENZENE	ND	5.0
1,1,1-TRICHLOROETHANE	ND	1.0
1,1,2-TRICHLOROETHANE	ND	1.0
TRICHLOROETHYLENE	ND	1.0
TRICHLOROFLUOROMETHANE	ND	1.0
1,2,3-TRICHLOROPROPANE	ND	1.0
1,2,4-TRIMETHYLBENZENE	14.0	1.0
1,3,5-TRIMETHYLBENZENE	11.0	1.0
VINYL CHLORIDE	ND	1.0
XYLENES TOTAL	6.0	3.0
2-METHYLNAPHTHALENE	ND	5.0

*NOTE: "ND" DENOTES THAT ANALYTE RESULT IS BELOW THE REPORTED REGULATORY DERIVED TARGET LIMIT OF DETECTION.

THOMAS S. MEGNA, PRESIDENT

ALA GAJDA, LAB SUPERVISOR

las

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CLIENT NAME: ASSOCIATED ENVIRONMENTAL SERVICES
7 WEST SQUARE LAKE RD.
BLOOMFIELD HILLS, MI 48302

PROJECT NAME/NO.: 35001 WOODWARD

DATE REPORTED	DATE RECEIVED	SAMPLE TEMP	DATE EXTRACTED	DATE ANALYZED
12/12/03	12/04/03	4^0C	12/05/03	12/05/03

ANALYZED BY: TM REFERENCED METHOD: 8310 SCAN

DRY WEIGHT CORRECTED (SOILS ONLY)
RESULTS REPORTED IN ppBillion

LAB NO.	RDL SOIL	RDL WATER	5249 WATER MW-1	5250 WATER MW-2	5251 WATER MW-4	5252 WATER MW-5	5253 WATER MW-6	5254 WATER MW-7	5255 WATER MW-8	5256 WATER MW-10
COMPOUND NAME	ppB	ppB								
Naphthalene	330	5.0	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthylene	330	5.0	ND	ND	6.5	ND	ND	ND	ND	ND
Acenaphthene	330	5.0	ND	ND	ND	ND	ND	ND	ND	ND
Fluorene	330	5.0	ND	ND	ND	ND	ND	ND	ND	ND
Phenanthrene	330	5.0	ND	ND	ND	ND	ND	ND	ND	ND
Anthracene	330	5.0	ND	ND	ND	ND	ND	ND	ND	ND
Fluoranthene	330	5.0	ND	ND	ND	ND	ND	ND	ND	ND
Pyrene	330	5.0	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(a)anthracene	330	1.0	ND	ND	ND	ND	ND	ND	ND	ND
Chrysene	330	5.0	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(b)fluoranthene	330	2.0	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(k)fluoranthene	330	5.0	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(a)pyrene	330	2.0	ND	ND	ND	ND	ND	ND	ND	ND
Dibenzo(ah)anthracene	330	2.0	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(qhi)perylene	330	5.0	ND	ND	ND	ND	ND	ND	ND	ND
Indeno(123-cd)pyrene	330	2.0	ND	ND	ND	ND	ND	ND	ND	ND
2-Methylnaphthalene	330	5.0	ND	ND	ND	ND	ND	ND	ND	ND

NOTE: "ND" DENOTES THAT ANALYTE RESULT IS BELOW THE REPORTED REGULATORY DERIVED TARGET LIMIT OF DETECTION.

THOMAS S. MEGNA, PRESIDENT ALA GAJDA, LAB SUPERVISOR

REFERENCES: 40 CFR PART 136. CURRENT EDITION. las

ENVIRONMENTAL QUALITY LABORATORIES, INC.
44075 Phoenix Drive
Sterling Heights, Michigan 48314-1420
586-731-1818
Outside Michigan Dial 1-800-368-5227
Fax Line 586-731-2590
www.EQualityLabs.com

CLIENT NAME: ASSOCIATED ENVIRONMENTAL SERVICES
7 WEST SQUARE LAKE RD.
BLOOMFIELD HILLS, MI 48302

PROJECT NAME/NO.: 35001 WOODWARD

DATE RECEIVED	SAMPLE TEMP	DATE ANALYZED	DATE REPORTED
12/04/03	4°C	12/05/03 12/08/03 SILVER	12/12/03

ANALYZED BY: JD METALS REFERENCED METHOD: 6000/7000

ALL WATER RESULTS REPORTED IN ppBILLION
ALL SOIL RESULTS REPORTED IN ppMILLION
DRY WEIGHT CORRECTED (SOILS ONLY)

LAB NO.		RDL SOIL	RDL WATER	5249 WATER	5250 WATER	5251 WATER	5252 WATER	5253 WATER	5254 WATER
COMPOUND	NAME	ppM	ppB	MW-1	MW-2	MW-4	MW-5	MW-6	MW-7
BARIUM	6010	1.0	1000	ND	ND	ND	ND	ND	ND
CADMIUM	6010	0.05	0.5	9.0	9.0	8.0	11.0	9.0	13.0
CHROME, TOTAL	6010	0.5	50.0	ND	ND	ND	ND	ND	ND
COPPER	6010	1.0	25.0	20.0	ND	ND	ND	ND	21.0
LEAD	7421	1.0	3.0	11.0	10.0	37.0	ND	18.0	19.0
SILVER	6010	0.5	0.5	1.0	0.7	0.5	2.0	1.6	0.7
ZINC	6010	1.0	10.0	41.0	51.0	46.0	81.0	47.0	106
ARSENIC	6010	0.1	5.0	ND	ND	4.0	6.0	ND	6.0
SELENIUM	7740	0.2	5.0	ND	ND	ND	ND	ND	ND
MERCURY	7470	0.1	0.2	ND	ND	ND	ND	ND	ND

NOTE: "ND" DENOTES THAT ANALYTE RESULT IS BELOW THE REPORTED REGULATORY DERIVED TARGET LIMIT OF DETECTION.

THOMAS S. MEGNA, PRESIDENT ALA GADJA, LAB SUPERVISOR

REFERENCES: 40 CFR PART 136. CURRENT EDITION. las

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44075 Phoenix Drive
Sterling Heights, Michigan 48314-1420
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Outside Michigan Dial 1-800-368-5227
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www.EQualityLabs.com

CLIENT NAME: ASSOCIATED ENVIRONMENTAL SERVICES
7 WEST SQUARE LAKE RD.
BLOOMFIELD HILLS, MI 48302

PROJECT NAME/NO.: 35001 WOODWARD

DATE RECEIVED	SAMPLE TEMP	DATE ANALYZED	DATE REPORTED
12/04/03	4°C	12/05/03 12/08/03 SILVER	12/12/03

ANALYZED BY: JD METALS REFERENCED METHOD: 6000/7000

ALL WATER RESULTS REPORTED IN ppBILLION
ALL SOIL RESULTS REPORTED IN ppMILLION
DRY WEIGHT CORRECTED (SOILS ONLY)

LAB NO.		RDL SOIL	RDL WATER	5255 WATER MW-8	5256 WATER MW-10
COMPOUND	NAME	ppM	ppB		
BARIUM	6010	1.0	1000	ND	ND
CADMIUM	6010	0.05	0.5	10.0	17.0
CHROME, TOTAL	6010	0.5	50.0	ND	ND
COPPER	6010	1.0	25.0	ND	30.0
LEAD	7421	1.0	3.0	19.0	13.0
SILVER	6010	0.5	0.5	ND	1.0
ZINC	6010	1.0	10.0	75.0	56.0
ARSENIC	6010	0.1	5.0	ND	6.0
SELENIUM	7740	0.2	5.0	ND	ND
MERCURY	7470	0.1	0.2	ND	ND

NOTE: "ND" DENOTES THAT ANALYTE RESULT IS BELOW THE REPORTED REGULATORY DERIVED TARGET LIMIT OF DETECTION.

THOMAS S. MEGNA, PRESIDENT ALA GADJA, LAB SUPERVISOR

REFERENCES: 40 CFR PART 136. CURRENT EDITION. las

ENVIRONMENTAL QUALITY LABORATORIES, INC
44075 Phoenix Drive
Sterling Heights, Michigan 48314-1420
(586) 731-1818 • (800) 368-5227 • Fax (586) 731-2590

№ 02913

Chain of Custody
Analysis Request

1
Consultant: ASSOCIATED ENVIRONMENTAL
Sampler: C. DITTMAR Phone: 248.758.2310
Project: 55001 WOODWARD
Fax: 248.758.2311

2 Sample Identification		Collection Date	Collection Time	Grab	Composite	4 Matrix: Soil	Water	Other	5 Total # of Containers	Analysis Requested: VOC	PNA	MI 10 METALS
MW-1	5249	12/3/05	1340	X			X		4	X	X	X
MW-2	5250		1220	X			X		4	X	X	X
MW-4	5251		1410	X			X		4	X	X	X
MW-5	5252		1315	X			X		4	X	X	X
MW-6	5253		1250	X			X		4	X	X	X
MW-7	5254		1510	X			X		4	X	X	X
MW-8	5255		1455	X			X		4	X	X	X
MW-10	5256		1435	X			X		4	X	X	X

6 Remarks
METALS NOT FIELD FILTERED OR PRESERVED.
VOCs NO ACID

7
Turnaround time requested, (please circle): Emergency, Routine
(Call to confirm Emergency turnaround time).
Rush analysis results via:
Fax#: _____ -or- Phone #: _____

8 - This section MUST be signed each time the sample changes hands! -

Relinquished by	Date	Time	Received by	Date	Time
Charles W Dittmar	12/5/05	1530	[illegible]	12/5/05	15:30
Chuck Vita	12/5/05	4:20 PM	Dawn Lambert	12-6-05	7:15 AM

9
CONDITION OF SAMPLES UPON RECEIPT AT EQL.
Sample Temp: _____ Preserve? _____ Damaged? _____
Comments: _____

In case we have questions when the samples arrive, call:
Name: NICK MALONE Phone: 248 758.2310
Send report to: NICK MALONE

ENVIRONMENTAL QUALITY LABORATORIES, INC.
44075 Phoenix Drive
Sterling Heights, Michigan 48314-1420
586-731-1818
Outside Michigan Dial 1-800-368-5227
Fax Line 586-731-2590
www.EQualityLabs.com

CLIENT: ASSOCIATED ENVIRONMENTAL
PROJECT NAME AND NUMBER: 35001 WOODWARD

DATE RECEIVED: 12/4/03
LAB NO.'S IN BATCH: 5249-5256
MATRIX: WATER

METHOD 8260 UNITS = ppB

	CONC. OF SPIKE	MATRIX SPIKE	MATRIX SPIKE DUP	% RECOV	% RPD	SAMPLE RECEIVING SPIKE	DATE ANALYZED	TRIP/ METHOD BLANK	ANALYSTS INITIALS	% RECOV CONTROL LIMITS
1,1-DC-ETHENE	20	19	N/A	95	N/A	5250	12/4/2003	<RDL	AG	45-122
TRICHLOROETHENE	20	19	N/A	95	N/A	5250	12/4/2003	<RDL	AG	72-112
CHLOROBENZENE	20	22	N/A	110	N/A	5250	12/4/2003	<RDL	AG	81-126
BENZENE	20	20	N/A	100	N/A	5250	12/4/2003	<RDL	AG	80-120
TOLUENE	20	21	N/A	105	N/A	5250	12/4/2003	<RDL	AG	83-129

THOMAS S. MEGNA, PRESIDENT _____

ALA GAJDA, LAB SUPERVISOR _____

ENVIRONMENTAL QUALITY LABORATORIES, INC
44075 Phoenix Drive
Sterling Heights, Michigan 48314-1420
(586) 731-1818 • (800) 368-5227 • Fax (586) 731-2590

Chain of Custody
Analysis Request

No. 02973

1
Consultant: ASSOCIATED ENVIRONMENTAL
Sampler: C. DITTMAR Phone: 248·758·2310
Project: 35001 WOODWARD
Fax: 248·758·2311

2 Sample Identification		Collection Date	Collection Time	Grab	Composite	4 Matrix: Soil	Water	Other	Total # of Containers	5 Analysis Requested: VOA	PNA	MI 10 METALS
MW-1	5249	12/3/03	1340	X			X		4	X	X	X
MW-2	5250	"	1220	X			X		4	X	X	X
MW-4	5251	"	1410	X			X		4	X	X	X
MW-5	5252	"	1315	X			X		4	X	X	X
MW-6	5253	"	1250	X			X		4	X	X	X
MW-7	5254	"	1510	X			X		4	X	X	X
MW-8	5255	"	1455	X			X		4	X	X	X
MW-10	5256	"	1425	X			X		4	X	X	X

6 Remarks
METALS NOT FIELD FILTERED OR PRESERVED.
VOCs NO ACID

7
Turnaround time requested, (please circle): Emergency / Routine
(Call to confirm Emergency turnaround time).
Rush analysis results via:
Fax#: _____ -or- Phone #: _____

8 This section MUST be signed each time the sample changes hands!

Relinquished by	Date	Time	Received by	Date	Time
Charles W Dittmar	12/5/03	1530	Mark Pelot	12/5/03	1530
Mark Pelot	12/5/03	4:20PM	Jean Lambert	12-4-03	7:15 AM

9
CONDITION OF SAMPLES UPON RECEIPT AT EQL.
Sample Temp: _____ Preserve? _____ Damaged? _____
Comments: _____

In case we have questions when the samples arrive, call:
Name: NICK MALOOF Phone: 248·758·2310
Send report to: NICK MALOOF

ATTACHMENT C

ISI MAGNETOMETER SURVEY REPORT

December 11, 2003 **ISI Project No. 03-1342**
Report

Mr. Nicholas Maloof
Associated Environmental Services, LLC.
7 West Square Lake Road
Bloomfield Hills, MI 48302

Subject: Magnetometer Survey
Sunoco Gas Station
Maple and Woodward Avenue
Birmingham, Michigan

Dear Mr. Maloof:

Imaging Subsurface, Inc. (ISI) appreciates the opportunity to perform a magnetometer survey at the subject project site. The survey was performed in accordance with our proposal no. P-03-1342 and discussion on November 28th, 2003. The objective of the survey was to identify potential locations of underground storage tanks (USTs) within the surveyed area.

SITE CONDITIONS:

The site comprised of an open parking lot adjacent to an existing building (**Figure 1**). The survey area was immediately south and east of the building. An open grass covered area with trees was present on the east side and a brick wall was on the south to west side of the surveyed area. An overhead power line with a transformer was present in the eastern part of the surveyed area. The survey area was covered with asphalt pavement. The survey area was bounded by sidewalk for Maple Road on south side and sidewalk for Woodward Avenue on the east side. A brick wall present along the northern boundary.

The limits of the survey area were identified by the Associated Environmental Services, LLC. (AES) representative. The AES representative also provided a site map showing the area to be surveyed at the site. The area to be surveyed was covered with asphalt pavement. The surveyed area was approximately 100 ft × 140 ft wide.

EQUIPMENT AND METHOD:

ISI used a proton precession magnetometer unit manufactured by Scintrex, Ontario, Canada. The equipment was tested at the ISI office prior to mobilization to the site.

The survey was performed on December 3rd, 2003. The survey was performed along predetermined grid pattern. The survey lines were marked at the site prior to performing the

survey. The grid pattern was established running north-south and east-west within the area specified by the AES representative. The grid lines were established at every 5 ft and the magnetic measurements were made at every 2.5 ft along the grid lines. Some of the grid lines were within the road and building areas. No measurements were made in areas within the road and the building.

Total magnetic field intensity and vertical magnetic field gradient were measured at each observation point. Data were recorded in the data logger. Diurnal variations in the magnetic field during the survey were measured along each grid line. The measured data were corrected for the diurnal variations.

RESULTS AND CONCLUSIONS:

The magnetic data collected during the field survey were processed to filter out the effects of diurnal variations. The processed data were used to prepare the contour diagrams. The total magnetic field and vertical magnetic gradient variations the within the surveyed area are presented in a contour form in **Figures 2** and **3** respectively.

Figures 2 and **3** show a significantly strong anomaly close to the southern boundary of the surveyed area and along the overhead power line. Very strong anomaly is present close to a pole and guardrails. The anomalies are labeled as A through D. Anomalies A through C were associated with metallic objects observed above ground. However, anomaly D was not associated with any above ground metallic object. Therefore, ISI suggests to explore the subsurface to confirm the presence or absence of metallic object within the area identified by anomaly D.

Based on the data collected during the magnetometer survey performed on December 3rd, 2003, ISI **suggests** to investigate the source for the strong anomaly labeled as D. Anomalies A through C do not suggest presence of large steel objects in the subsurface.

ISI highly appreciates the opportunity to provide the geophysical surveying services to you. If you have any questions, please call me at **(313) 342-8871**.

Thank you.

Yours sincerely
IMAGING SUBSURFACE, INC.

Rakesh Sarman, Ph.D., C.P.G.
Technical Director

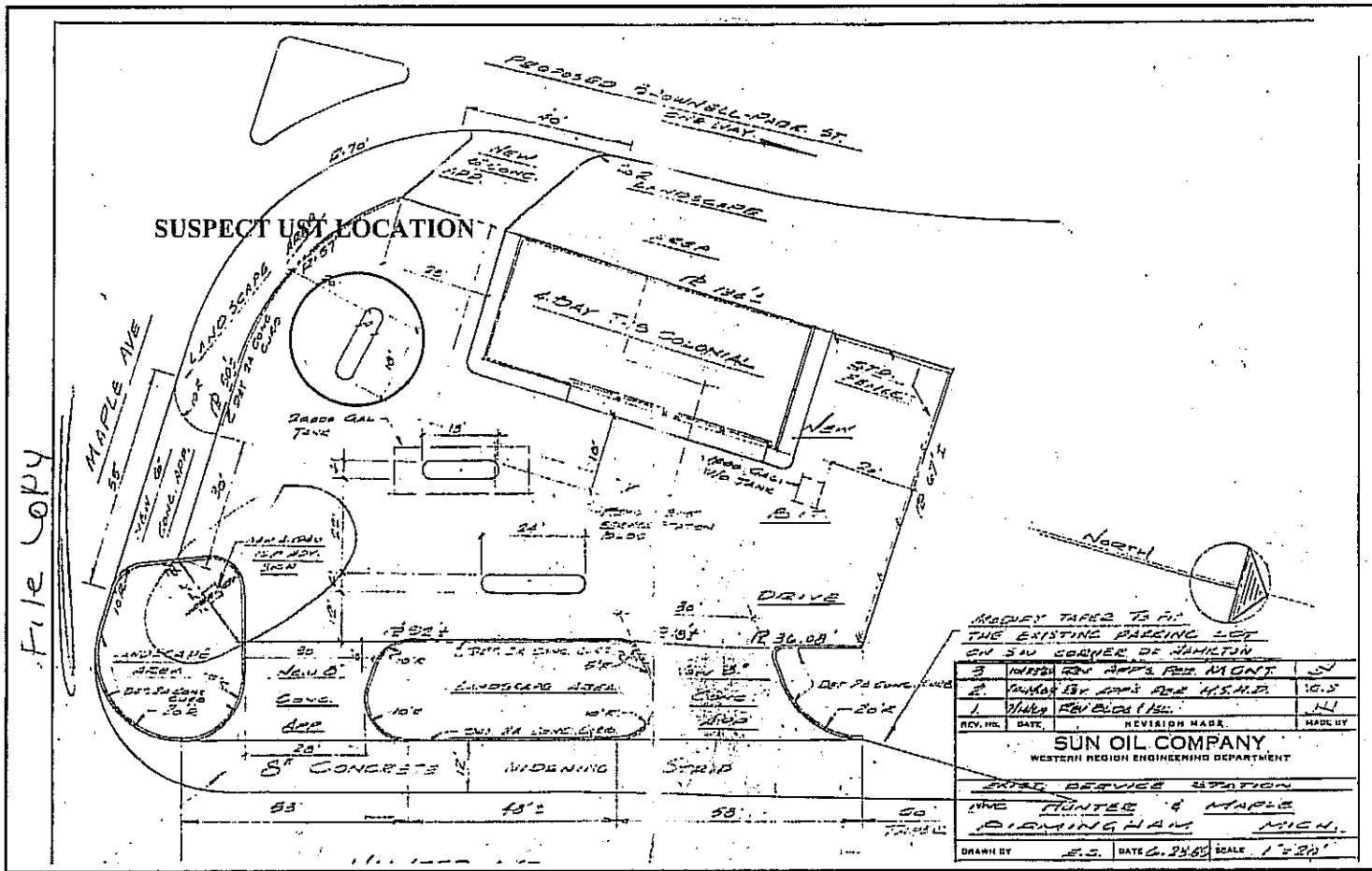


FIGURE 1: SUSPECT UST MAP

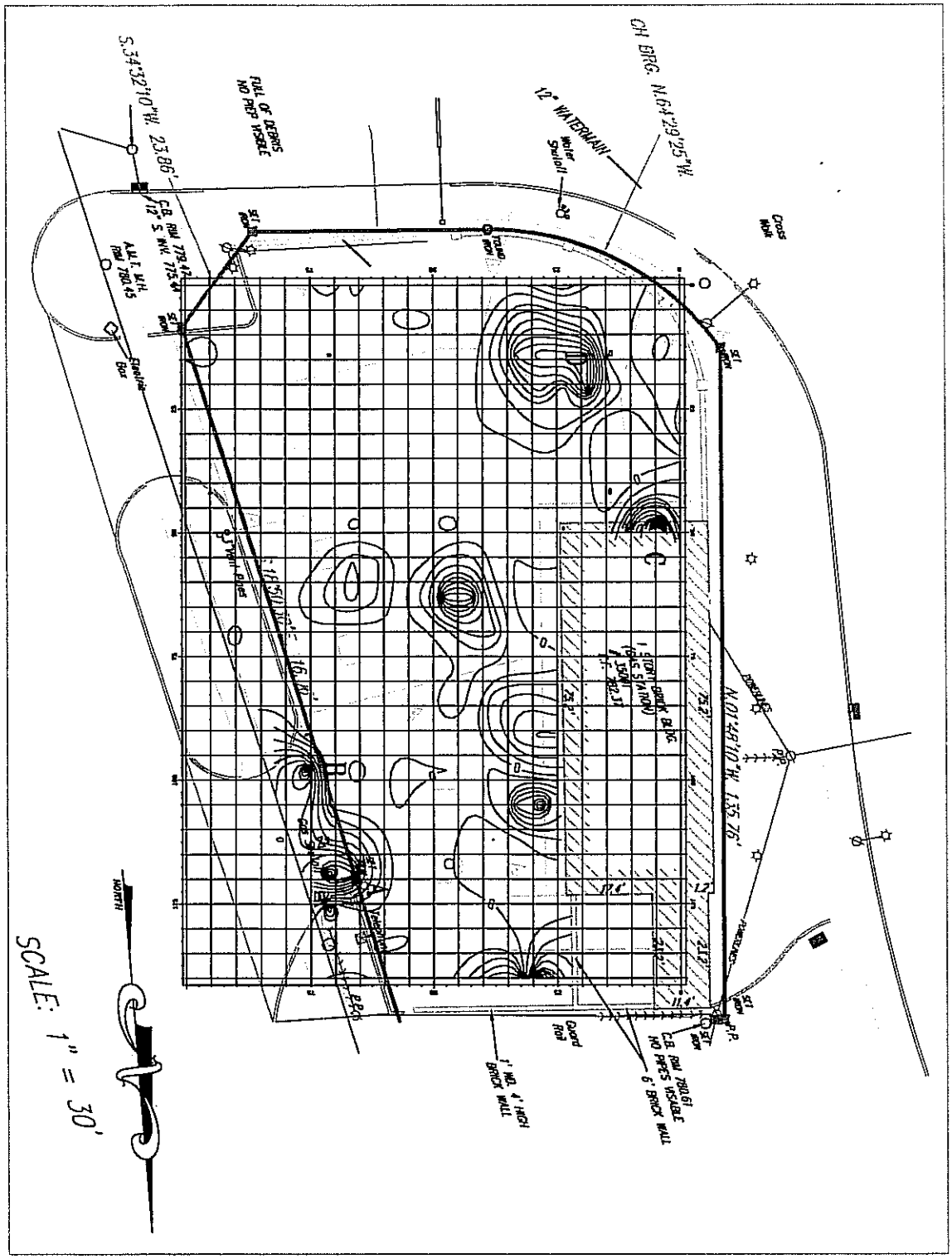
Birmingham Property, LLC
35001 North Woodward Avenue
Birmingham, Michigan

PROJECT: 2003112.01
DATE: 12/18/03
PREPARED BY: NGM

ASSOCIATED ENVIRONMENTAL SERVICES, LLC
Environmental Services • Land Development • Real Estate Consulting
Seven West Square Lake Road
Bloomfield Hills, Michigan 48302
Tel (248) 758-2310
Fax (248) 758-2311

REFERENCE
SUN OIL COMPANY
SITE PLAN MAP
Dated: June 23, 1969, revised (final) October 23, 1969

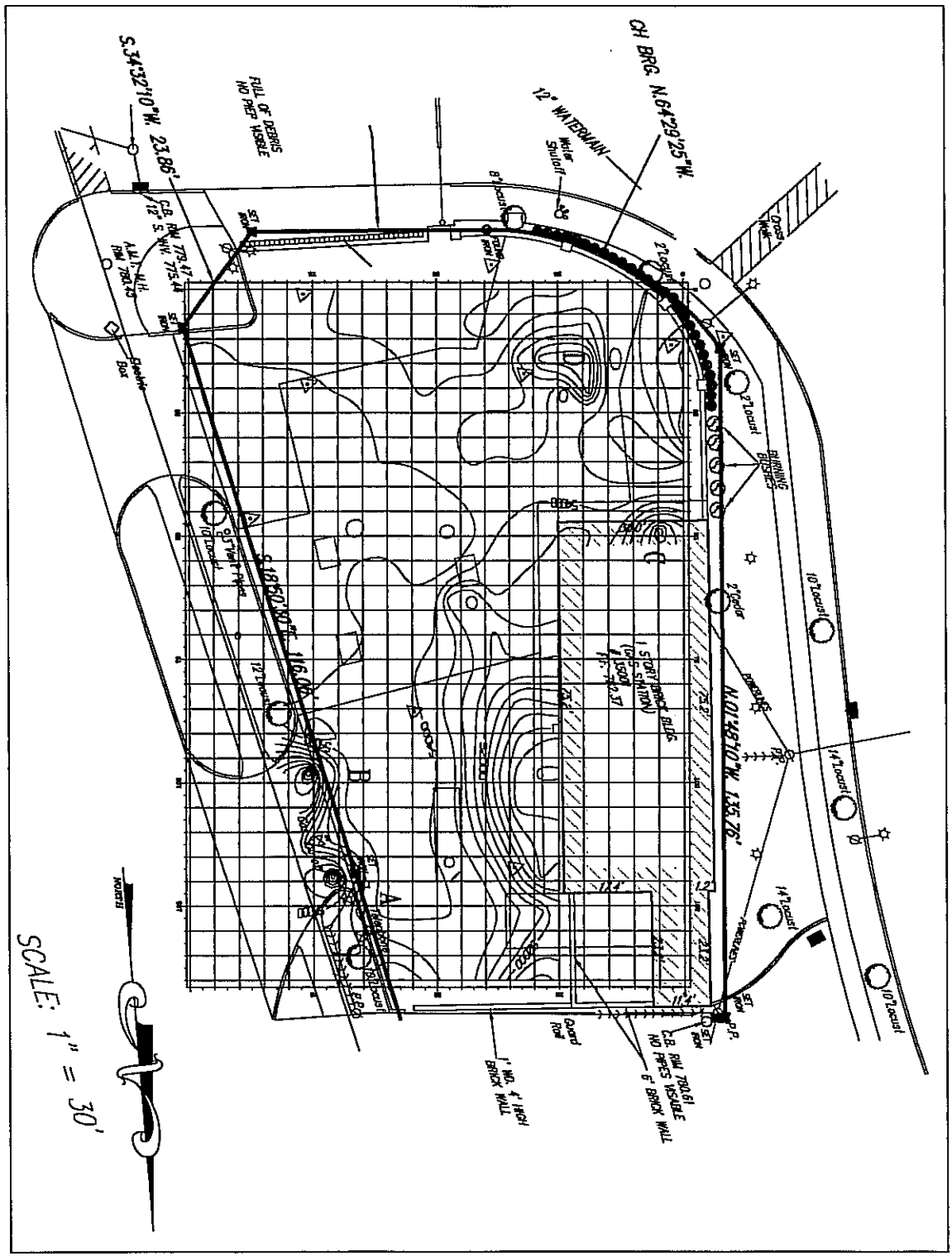
BIRMINGHAM, OAKLAND COUNTY, MICHIGAN



VERTICAL MAGNETIC GRADIENT ANOMALY MAP

TITLE	SUNOCO GAS STATION SITE MAPLE AND WOODWARD AVENUE BIRMINGHAM, MICHIGAN SITE DETAILS PROVIDED BY CLIENT
PROJ. NO.	03-1342
SCALE	1" = 30'
DRAWN BY	RS
CHECKED BY	RS
DATE	12/11/03
DRAWING NO.	FIGURE 3

IMAGING SUBSURFACE, INC.
P.O. BOX 1019, NOVI, MI 48376-1019 WWW.ISURF.COM
- GEOTECHNICAL INVESTIGATIONS
- GEOPHYSICAL SURVEYING
- [illegible]
- MATERIAL TESTING
- ENVIRONMENTAL SAMPLING



TOTAL MAGNETIC FIELD ANOMALY MAP

TITLE	SUNOCO GAS STATION SITE MAPLE AND WOODWARD AVENUE BIRMINGHAM, MICHIGAN SITE DETAILS PROVIDED BY CLIENT
PROJ. NO.	03-1342
SCALE	1" = 30'
DRAWN BY	RDS
APPROVED BY	RDS
DATE	12/11/03
DRAWING NO.	FIGURE 2

IMAGING SUBSURFACE, INC.
P.O. BOX 1019, NOVI, MI 48376-1019 WWW.ISIBIZ.COM
- GEOTECHNICAL INVESTIGATIONS
- GEOPHYSICAL SURVEYING
- [illegible]
- MATERIAL TESTING
- [illegible]

December 11, 2003

ISI Project No. 03-1342A
ReportA

Mr. Nicholas Maloof
Associated Environmental Services, LLC.
7 West Square Lake Road
Bloomfield Hills, MI 48302

Subject: Magnetometer Survey
Hunter House Site
Maple and Woodward Avenue
Birmingham, Michigan

Dear Mr. Maloof:

Imaging Subsurface, Inc. (ISI) appreciates the opportunity to perform a magnetometer survey at the subject project site. The survey was performed in accordance with our proposal no. P-03-1342 and discussion on December 3rd, 2003. The objective of the survey was to identify potential locations of underground storage tanks (USTs) within the surveyed area.

SITE CONDITIONS:

The site comprised of an open parking lot adjacent to an existing building (**Figure 1**). The survey area was immediately south, west and east of the building. The building was currently being used as an active retail food store. A brick wall was on the south side of the surveyed area. An overhead power line with a transformer was present in the eastern part of the surveyed area. The survey area was covered with asphalt pavement. The survey area was bounded by sidewalk for Hamilton Avenue on north side and sidewalk for Woodward Avenue on the east side. The survey area was immediately north of the Sunoco Gas Station.

The limits of the survey area were identified by the Associated Environmental Services, LLC. (AES) representative. The AES representative also provided a site map showing the area to be surveyed at the site. The area to be surveyed was covered with asphalt pavement. The surveyed area was approximately 90 ft × 100 ft wide.

EQUIPMENT AND METHOD:

ISI used a proton precession magnetometer unit manufactured by Scintrex, Ontario, Canada. The equipment was tested at the ISI office prior to mobilization to the site.

The survey was performed on December 7th, 2003. The survey was performed along predetermined grid pattern. The survey lines were marked at the site prior to performing the

survey. The grid pattern was established running north-south and east-west within the area specified by the AES representative. The grid lines were established at every 5 ft and the magnetic measurements were made at every 2.5 ft along the grid lines. Some of the grid lines were within the road and building areas. No measurements were made in areas within the road and the building.

Total magnetic field intensity and vertical magnetic field gradient were measured at each observation point. Data were recorded in the data logger. Diurnal variations in the magnetic field during the survey were measured along each grid line. The measured data were corrected for the diurnal variations.

RESULTS AND CONCLUSIONS:

The magnetic data collected during the field survey were processed to filter out the effects of diurnal variations. The processed data were used to prepare the contour diagrams. The total magnetic field and vertical magnetic gradient variations the within the surveyed area are presented in a contour form in **Figures 2** and **3** respectively.

Figures 2 and **3** show a significantly strong anomaly close to the southern boundary of the existing building and along the overhead power line. Very strong anomaly is present close to a pole and guardrails. The anomalies are labeled as A through C. Anomaly A was associated with overhead power lines. Anomalies B and C were close to the guardrail and sign pole respectively. However, the size, distribution and amplitude of the anomalies suggest that either some metallic objects were present inside the building or in the subsurface. Therefore, ISI suggests to explore the subsurface to confirm the presence or absence of metallic object within the area identified by anomalies B and C.

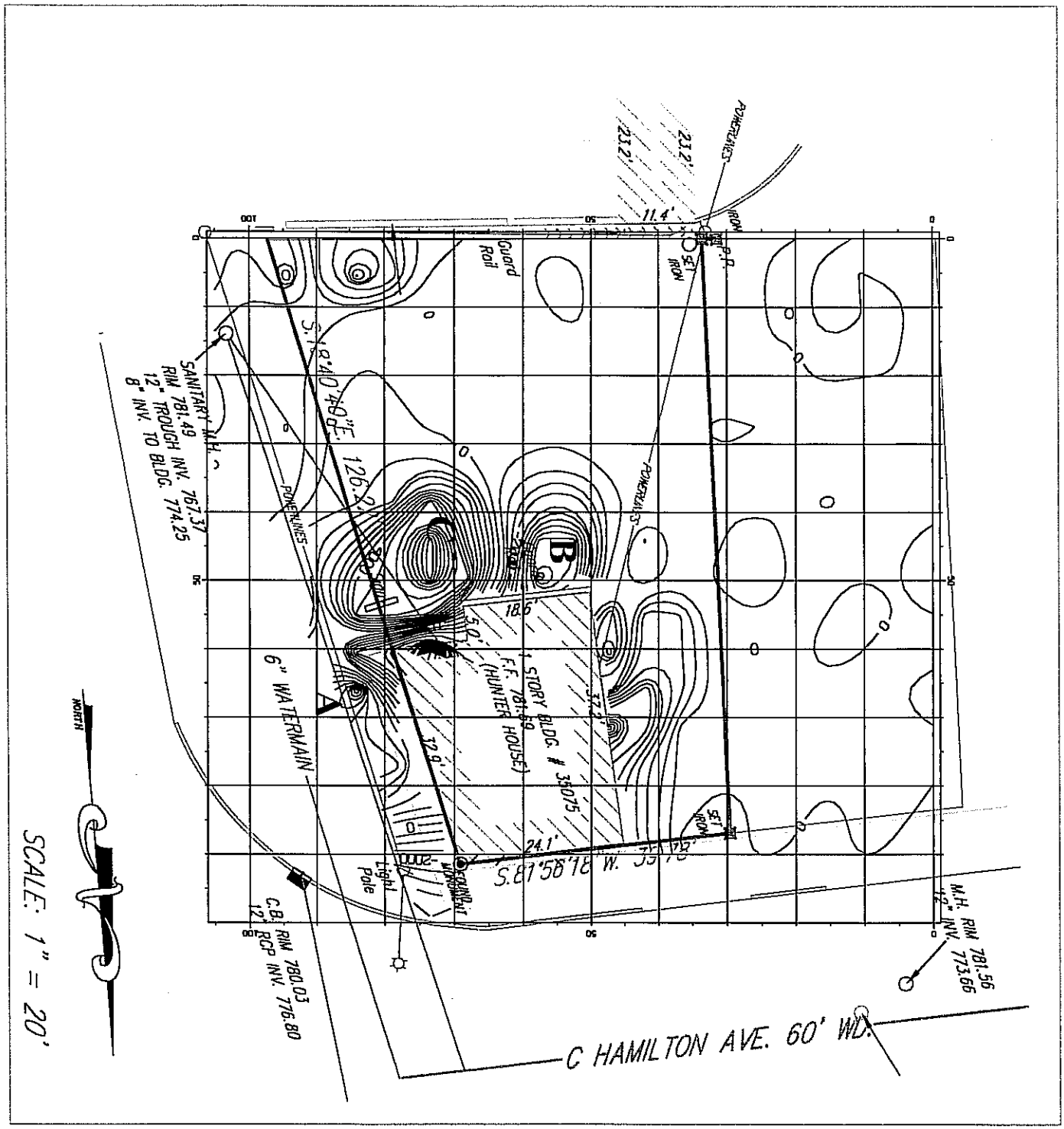
Based on the data collected during the magnetometer survey performed on December 7th, 2003, ISI **suggests** to investigate the source for the strong anomalies labeled as B and C. Anomaly A does not suggest presence of large steel objects in the subsurface.

ISI highly appreciates the opportunity to provide the geophysical surveying services to you. If you have any questions, please call me at **(313) 342-8871.**

Thank you.

Yours sincerely
IMAGING SUBSURFACE, INC.

Rakesh Sarman, Ph.D., C.P.G.
Technical Director

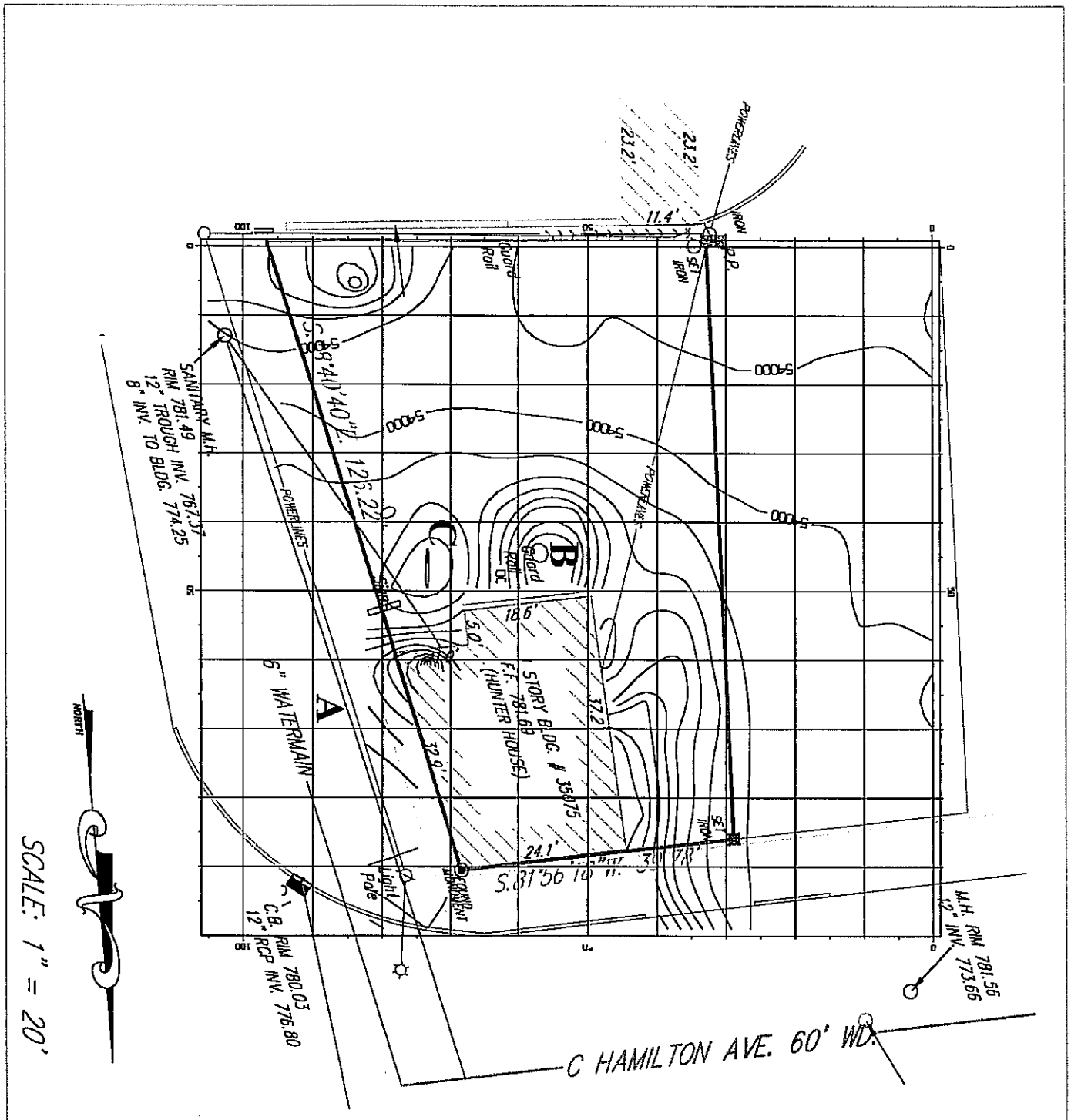


VERTICAL MAGNETIC GRADIENT ANOMALY MAP

TITLE	HUNTER HOUSE SITE MAPLE AND WOODWARD AVENUE BIRMINGHAM, MICHIGAN SITE DETAILS PROVIDED BY CLIENT		
PROJ. NO.	03-1342A	SCALE	=
DRAWN BY	RS		
APPROVED BY	RS		
DATE	12/11/03	DRAWING NO.	FIGURE 3

IMAGING SUBSURFACE, INC.
P.O. BOX 1019, NOVI, MI 48376-1019 WWW.ISIDIZ.COM

- GEOTECHNICAL INVESTIGATIONS
- GEOPHYSICAL SURVEYING
- CONSTRUCTION INSPECTION
- MATERTIAL TESTING
- ENVIRONMENTAL SAMPLING



TOTAL MAGNETIC FIELD ANOMALY MAP

TITLE	HUNTER HOUSE SITE MAPLE AND WOODWARD AVENUE BIRMINGHAM, MICHIGAN SITE DETAILS PROVIDED BY CLIENT		
PROJ NO.	03-1342A	SCALE	1" = 20'
DRAWN BY	RS	APPROVED BY	RS
DATE	12/11/03	DRAWING NO.	FIGURE 2

IMAGING SUBSURFACE, INC.
P.O. BOX 1019, NOVI, MI 48376-1019 WWW.ISIBIZ.COM
- GEOTECHNICAL INVESTIGATIONS
- GEOPHYSICAL SURVEYING
- CONSTRUCTION INSPECTION
- MATERIAL TESTING
- ENVIRONMENTAL SAMPLING

ATTACHMENT C

TEAM RESUMES

Seven West Square Lake Road
Bloomfield Hills, Michigan 48302

T (248) 758-2310
F (248) 758-2311
E associatedenv@comcast.net

ASSOCIATED ENVIRONMENTAL SERVICES LLC

Charles W. Dittmar II

QUALIFICATIONS

Mr. Dittmar has 20 years experience in the environmental field. He has worked on and led projects performing: site assessments and investigations; environmental due diligence; litigation support; brownfield redevelopment assistance; environmental audits; environmental data management; and, remediation option selection and pilot testing. He has managed projects ranging from Phase I environmental site assessments to multi-phased property redevelopment projects. His work experience has also included providing in-house training, SOP development, writing and presenting technical articles, and serving on business process improvement teams.

Education: Masters in Business Administration, EMU, April 2000
- Certificate in Internal Auditing
BS Biology, EMU, 1985.

Certification and Registrations:
Certified Internal Auditor's Exam - Passed Section I and II, November 1999
OSHA Hazardous Waste Site Health and Safety Training with Annual Updates
8-Hour OSHA Hazardous Waste Site Supervisor Training

PROFESSIONAL EXPERIENCE

2003-Present **Environmental Specialist, Associated Environmental Services, LLC, Bloomfield Hills, Michigan:** Mr. Dittmar is responsible for overall technical execution on projects, client management, and technical project management. Expertise includes providing consultation and professional services pertaining to real estate transactions, land development, environmental due diligence, data management, environmental plans and permits, environmental compliance, and chemical fate & transport modeling. In the area of business development, corporate level responsibilities include involvement in firm wide strategic planning, developing business and marketing plans, identifying potential clients, assisting clients in project definition and preparing proposals and cost estimates.

Technical capabilities and responsibilities include drafting work plans and reports, directing sub-contractors, coordinating project activities, review of project reports, and interfacing with Michigan Department of Environmental Quality (MDEQ) and other governmental regulatory agencies. Additional responsibilities include providing consultation in the areas of site assessments and remediation feasibility studies, remediation pilot testing, Brownfield redevelopment and Brownfield funding/government incentive application assistance.

2002-2003 **Manager of Environmental Services, TolTest, Inc., Plymouth, Michigan:** Mr. Dittmar served as the manager of a seven person department that provides environmental assessment, remediation, and due diligence services. Was responsible for staffing, work distribution, quality assurance, tracking regulatory changes, mentoring, training, and technical oversight of the department associates. Responsible for the department budget, profit/loss for the department, and generating sales/proposals for soliciting new work. Assisted project managers in the department with client relationship issues, including contract review, conflict resolution, and collections. Prepared monthly and quarterly status reports for senior management, and was part of the strategic planning committee for the office. Developed tracking mechanisms for projects and proposals to assist me in following their status.

2001-2002 **Program Manager, Quantum Compliance Systems, Ypsilanti, Michigan:** In this position Mr. Dittmar managed the implementation of the relational database software product sold by the company. Tasks involved in each of these implementations included performing a fit analysis to match the software functions to the customer's work processes, identifying "gaps" between the software function and the customer's work flow, and developing a plan to fill the "gaps." The results of

these reviews were either suggested work flow changes; or, customizations to the software, for which Mr. Dittmar was responsible for developing the functional specifications and test plans. He also coordinated the training of users in the software and developing the user documentation. As a program manager, Mr. Dittmar was responsible for the overall performance on projects, setting and tracking the project scope, schedule, and budget. He was appointed to a process improvement team to evaluate the company's core process, reviewing procedures and developing metrics to monitor process efficiency and improvement.

1994-2001 **Senior Consultant, The Traverse Group, Ann Arbor, Michigan:** Mr. Dittmar served as a Project Technical Leader, responsible for the overall technical performance of staff on projects. Was also responsible for developing the appropriate scope of work and budget given project constraints. In addition, Mr. Dittmar was responsible for keeping up to date on changes in the laws and administrative rules that govern the environmental business, especially in Michigan. In this position he worked on a variety of project types, including site investigations, remediation system selection and operation, litigation support and third-party review, and Brownfield redevelopments. Mr. Dittmar served as the in-house expert on financing options for Brownfield projects, helping communities and developers package the best funding sources to make the projects a financial success for all parties involved. Lastly, he served as the in-house expert for chemistry and laboratory issues, as well as environmental data management for projects.

SELECTED PRESENTATIONS

"Using Evidence of Natural Attenuation to Locate the Source of a Chlorinated VOC Plume", Site Assessment Techniques, December 1996.

"Lowering the Costs of Site Investigation Through On-Site and Alternative Laboratory Analyses", GTI Technical Seminar & Open House, April 1992.

"The Use of Field Methods in Site Delineation", Society of Military Engineers, November 1991.

SELECTED PROJECT SUMMARIES

Redevelopment, Former Iron Foundry, Traverse City, MI – This property was the site of an iron foundry on the banks of the Boardman River in Traverse City since the early 1900s. In the 1970s the site was abandoned. In 1996, a developer came forward with a plan to turn the site into high-end condominiums with retail space on the ground floor. Mr. Dittmar worked with the county to develop a county-wide brownfield authority and plan, setting the stage for redeveloping this property with a grant from the Site Reclamation Program, as well as the (then) new Brownfield Redevelopment Financing Act (Public Act 381 of 1996). Site data were evaluated, and environmental and development related activities eligible for funding through the grant or Act 381 were identified and their costs estimated. Development was also hindered by the past practice of depositing metal-laden sand and slag from the molding operation on the property and along the banks of the river. In 1999, construction and response activities were complete. The final eligible cost totaled over $2.5 Million.

Since funding for this project came from multiple sources, a system to track eligible expenses and under which program they were eligible became necessary. Mr. Dittmar developed a spreadsheet application for determining the tax increment revenues (TIR) available for capture by the BRA to fund eligible environmental and development activities. This spreadsheet allowed communities to determine how long it would take to pay for the eligible activities with tax increment financing and the amount of TIR available for use by the BRA in the future. It also took into account the grant funding, as well as the differing uses of the individual spaces in the development (homestead vs. non-homestead). The spreadsheet also showed the effects of tax abatements or tax credits on the TIR generated by the redevelopment.

Redevelopment, Former MGP Site & Canning Facility, Traverse City – These two developments occurred on neighboring parcels with the former manufactured gas plant (MGP) and the fruit canning facility overlapping the current parcel boundaries. Mr. Dittmar worked on both redevelopments, which greatly enhanced the service each customer received, as well as providing a

consistent set of data to the Michigan Department of Environmental Quality (MDEQ) for determining risk levels and responsible party liability. Contaminants included metals, cyanide, polynuclear aromatic hydrocarbons, and other petroleum hydrocarbons. Mr. Dittmar fully served the clients by creating their brownfield plans and Act 381 work plans, designing the site assessments, evaluating the data against the redevelopment plans, and representing the clients in negotiations between the MDEQ, the responsible party, the local municipality, and the clients. Mr. Dittmar was also responsible for setting up the TIR spreadsheet and tracking the eligible activity costs for the clients. In 2001, both sites were open for business, with a total reimbursement of $500,000.

Redevelopment, Former Manufacturing Site, Ypsilanti – A former manufacturing site was abandoned in the mid-1990s, and a printing company was looking to redevelop the site. Existing contamination included metals and volatile organic chemicals. Mr. Dittmar led the financing portion of the project, working with the developer and economic development personnel to create a package of tax abatements and brownfield tax increment financing agreeable to all sides. Mr. Dittmar created several iterations of the TIR spreadsheet, accounting for various combinations of tax abatements, to present to the brownfield authority and economic development personnel for discussion and negotiation. The brownfield plan was approved with approximately $270,000 in reimbursement to the developer, along with an Industrial Facilities Tax (IFT) abatement for up to 10 years on the new equipment installed at the facility.

Redevelopment, Former Auto Shop, Detroit – A growing auto body repair shop in Detroit wanted to expand their operation, and found a former service station/auto repair facility. As on of the first brownfield redevelopments in the city, Mr. Dittmar worked closely with the economic development personnel and their attorneys to negotiate the activities eligible for reimbursement and to show the length of time the brownfield tax increment financing would be in place. Being that the developer would require a Category S BEA, a higher level of investigative effort was necessary, as were engineering controls to separate existing contamination from any potential new release. The brownfield plan was approved with a developer reimbursement of approximately $100,000.

ATTACHMENT D

NOTICE REGARDING BEA DISCLOSURE

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
REMEDIATION AND REDEVELOPMENT DIVISION

FOR DEQ USE ONLY
BEA Disclosure #_____

DISCLOSURE OF A BASELINE ENVIRONMENTAL ASSESSMENT
(FORM EQP4446 (REV. 4/03))

(Under the authority of Part 201, 1994 Act 451, as amended, and the Rules promulgated thereunder)

DO NOT use this form for requesting a Baseline Environmental Assessment ("BEA") adequacy determination, OR if the property is not a facility, OR if the BEA was complete before the effective date of the BEA rules. *Please answer the following questions as completely as possible.*

Name and address of submitter (individual or legal entity):*
Birmingham Property, L.L.C.
28530 Orchard Lake Road
Suite 100
Farmington Hills, MI
48334

Status relative to the property:

	Former	Current	Prospective
Owner*	☐	☒	☐
Operator*	☐	☒	☐

Address/location of property where BEA was conducted:
35001 Woodward Avenue
Birmingham, MI
48009

County: Oakland

Provide the property tax identification number(s) or, if applicable, the ward and item number(s) for the property identified in the BEA. Required pursuant to Rule 907.
19-25-456-037-0000

Contact person: Jamal S.. Kalabat Telephone #: 248-851-4800

If the address of the person seeking liability protection above is different from the address that should be used to correspond with the contact person, please provide the contact person's address:

_____
_____
_____

Check the appropriate response to each of the following questions.

	YES	NO
1. **Is it known that the source of contamination at the property is primarily from any of the following?**		
• **A leaking underground storage tank (UST) regulated under Part 213, 1994 PA 451, as amended.**	☒	☐
• **A licensed landfill or solid waste management facility.**	☐	☒
• **A licensed hazardous waste treatment, storage, or disposal facility.**	☐	☒
• **Oil and gas development related activities.**	☐	☒

The source of the release that resulted in this property becoming a "facility" will determine which DEQ division will maintain a file regarding this BEA.

2. Based on the Part 201 Rules, this BEA is a:

Category N	☒
Category D	☐
Category S	☐

	YES	NO
3. Is the property at which the BEA was conducted a "facility"* as defined by Section 20101? If the answer to this question is NO, do not submit the BEA to the DEQ.	☒	☐

4. **Was the BEA conducted* prior to or within 45 days after the date of purchase*, occupancy, or foreclosure of the property, whichever is earliest, and completed* not more than 15 days after the date required by Section 20126(1)(c) or Rule 299.5903(8)?** If the answer to either portion of this question is no, you are ineligible for an exemption from liability based on the BEA. YES ☒ NO ☐

5. **Is the BEA being disclosed to the DEQ no later than 8 months after the earliest of the date of purchase, occupancy, or foreclosure?** All disclosures pursuant to Rule 919(3) must be submitted to the DEQ no later than 8 months after the earliest of the date of purchase, occupancy, or foreclosure. YES ☒ NO ☐

6. **Are any USTs or abandoned or discarded containers identified in the BEA?** If yes, this information must be provided on Form EQP4476. YES ☒ NO ☐

7. **Does this BEA rely on an isolation zone or an engineering control that requires an affidavit pursuant to Rule 299.5909(3) or 299.5909(4)?** If yes, a completed affidavit, Form EQP4479, must be attached or the BEA will not be considered complete. YES ☐ NO ☒

With my signature below, I certify that the enclosed BEA and all related materials are complete and accurate to the best of my knowledge and belief. I understand that intentionally submitting false information to the DEQ is a felony and may result in fines up to $25,000 for each violation.

Signature of Submitter: _____ 12/19/03
(Person legally authorized to bind the person seeking liability protection) Date

Name (Typed or Printed) Jamal S. Kalabat

Title Managing Member of LLC

ATTACHMENT E

GROUNDWATER & ENVIRONMENTAL SERVICES
DECEMBER 2003 ACTIVITY REPORT

Groundwater
& Environmental Services, Inc.

9436 Maltby Road • Brighton, Michigan 48116 • (810) 227-0002 • FAX (810) 227-0008

November 5, 2003

Mr. David Grzelak
Sunoco, Inc.
Toledo Terminal
P.O. Box 1014
Toledo, Ohio 43605

Re: **UST Removal Activities Summary Report**
Former Sunoco Service Station
DUNS # 0008-4178
35001 North Woodward
Birmingham, Michigan

Dear Mr. Grzelak:

Groundwater & Environmental Services, Inc. (GES) appreciates the opportunity to provide Sunoco, Inc. (Sunoco) with the professional environmental services conducted at the Sunoco retail gasoline station located at 35001 North Woodard, Birmingham, Michigan (site). The following report summarizes the scope of work, all on-site excavation, removal and disposal activities, soil verification sampling, and the laboratory analytical data generated from the submitted soil samples. Furthermore, appendices have been prepared to provide additional information to supplement specific discussions within the text.

SCOPE OF WORK

Following is a summary of GES' scope of work at the site:

- Documenting the excavation and off-site removal of one (1) gasoline, 6,000-gallon, fiberglass reinforced with plastic underground storage tank (UST) (tank 1) and two (2) gasoline, 8,000-gallon, fiberglass reinforced with plastic USTs (tanks 2 and 3,), three (3) dispensers, and all associated product piping and vent lines;
- Collecting soil verification samples per the Michigan Department of Environmental Quality (MDEQ) Guidance Document Verification of Soil Remediation, dated April 1994;
- Submitting these soil samples to a fixed laboratory for analysis pursuant to MDEQ Operational Memorandum No. 6, Revision 5 Analytical Method Detection Level Guidance for Environmental Contamination Response Activities, dated November 16, 1998;
- Evaluating the resultant laboratory analytical soil data by comparison to the MDEQ Tier 1 Residential Volatilization to Indoor Air Inhalation and Direct Contact Risked Based Screening Levels (RBSLs) per Operational Memorandum No. 4, Attachment 2, Revision 5 dated June 2000; and
- Preparing a detailed report summarizing the above-mentioned activities for submittal to the MDEQ.

DEQ MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY – WASTE AND HAZARDOUS MATERIALS DIVISION

UNDERGROUND STORAGE TANK SYSTEM SITE ASSESSMENT REPORT AND CLOSURE OR CHANGE-IN-SERVICE REGISTRATION FORM

This information is required under Part 211, Underground Storage Tank Regulations, of the Natural Resources and Environmental Protection Act, Act 451 of the Public Acts of 1994, being Sections 324.21101 to 324.21119 of the Michigan Compiled Laws Annotated. Any owner who knowingly fails to notify or submits false information shall be subject to a misdemeanor and/or civil penalties not to exceed $5000 per day for each tank for which notification is not given or for which false information is submitted.

INSTRUCTIONS: For permanent closure and change-in-service, complete all the information on this form and submit with the site assessment analytical results, chain of custody and site sketch which indicates the location and depths of tanks, piping, and samples. This form must be received within 45 days of the samples being taken. The owner is required to keep a copy of the site assessment report for a minimum of three years. See reverse side of this form for additional information.

FACILITY ID NUMBER
#00005935

I. OWNERSHIP OF TANKS

NAME OF OWNER (CORPORATION, INDIVIDUAL, ETC.)
Sunoco Inc. (R&M)

STREET ADDRESS
1801 Market Street

CITY: Philadelphia | STATE: PA | ZIP CODE: 19103

AREA CODE & TELEPHONE NUMBER
215.246.8513

II. LOCATION OF TANKS

FACILITY NAME OR COMPANY SITE IDENTIFIER
Sunoco #0008-1478

STREET ADDRESS (PO BOX NOT ACCEPTABLE)
35001 Woodward Ave.

CITY: Birmingham | STATE: MI | ZIP CODE: 48009

CONTACT PERSON FOR LOCATION
David M. Grezelak

AREA CODE & TELEPHONE NUMBER
262.853.6409

III. TANK INFORMATION

TANK NUMBER	3	4	5		
TANK SIZE	6000	8000	8000		
SUBSTANCE STORED	Gasoline	Gasoline	Gasoline		
DATE LAST USED					
DATE CLOSED	10/1/03	10/1/03	10/1/03		
REMOVED FROM GROUND	10/1/03	10/1/03	10/1/03		
CLOSED IN PLACE (INDICATE TYPE OF FILL)					
CHANGE-IN-SERVICE					

OWNER'S NAME: ~~Kathy McCaney~~ Dave Grezelak
OWNER'S SIGNATURE: David M Grezelak
DATE: 11/5/03

IV. SUBMITTER INFORMATION

SUBMITTED BY (COMPANY NAME)
Groundwater & Environmental Services, Inc.

NAME (INDIVIDUAL)
Robert Elliott

SIGNATURE: Robert Elliott
DATE: 11/5/03
AREA CODE & TELEPHONE NUMBER: 810.227.0002

DO NOT WRITE BELOW THIS LINE (FOR OFFICE USE ONLY)

SITE ASSESSMENT REVIEW REPORT

Your site assessment has been reviewed by the Storage Tank Unit staff and the following determination has been made:

- ☐ The contamination concentration is below the threshold detection levels, and there is no evidence of a confirmed release.
- ☐ The test methodology or level of detection is faulty. The data submitted is not considered valid. Please perform another site assessment and forward a copy of the results to this office within 45 days.
- ☐ The number of sampling points analyzed are considered inadequate to make a determination of the cleanliness of the site. Please perform another site assessment and forward a copy of the results to this office within 45 days.
- ☐ The contaminant concentrations are greater than the threshold detection levels and there is evidence of a confirmed release. A confirmed release report is being generated. Follow reporting requirements in accordance with 451 PA 1994, Part 213, as amended.
- ☐ The soils excavated and removed from the site were greater than allowable volumes. A confirmed release was not reported to this office within 24 hours per the Michigan Underground Storage Tank Rules (MUSTR) prior to excavation of contaminated soil. A confirmed release report is being generated. Follow reporting requirements in accordance with 451 PA 1994, Part 213, as amended.

SIGNATURE OF REVIEWER	DATE OF REVIEW

EQP3881 (12/02)

MAIL COPIES TO:

WASTE AND HAZARDOUS MATERIALS DIVISION, STORAGE TANK UNIT
DEPARTMENT OF ENVIRONMENTAL QUALITY
PO BOX 30157
LANSING, MI 48909-7657

SUMMARY OF ACTIVITIES

Sunoco retained Hawkins Equipment Company (Hawkins) of Pontiac, Michigan to complete the removal of the UST system. Sunoco also retained GES to complete the environmental portions of the UST removal. GES conducted field screening of all soil verification samples, documented the predominant geological conditions encountered during the excavation, and prepared the soil verification samples for laboratory submittal. Refer to Appendix A, Figure 1 Soil Sample Location Map for a detailed excavation plan including the former UST system layout.

On September 30, 2003, Hawkins retained Buck Oil of Belleville, Michigan to remove a total of 250-gallons of residual product located in the three USTs and product lines. Buck Oil also evacuated a total of 3000-gallons of groundwater present within the UST cavity. Buck Oil transported both the residual product and groundwater to their facility for recycling and treatment. Hawkins contracted Parks Excavation (Parks) of Milford, Michigan to excavate the USTs. Parks removed the overburden soil that lay on top of the tanks and placed it in the staging area.

On October 1, 2003, Parks removed the USTs and product piping using a track-mounted excavator. Each UST was placed on the established, concrete-paved staging area where GES personnel visually inspected its general condition looking for any holes or visible damage. Based on these inspections, all USTs appeared to be completely intact and free of any visible damage. After inspection, the tanks were prepared for crushing. Preparation included identifying tank serial numbers, opening an entry point at one end of the tank, and scrapping and removing with oil-dry residual sludge from within the tank body. The USTs were crushed in an onsite in the dumpster. A total of 176 cubic yards of overburden soil was excavated from the UST cavity. Both the USTs and soil were transported to the Onyx Arbor Hills Landfill located in Northville, Michigan for disposal. GES measured the final UST cavity excavation to be approximately 30-feet long (north and south sidewalls), 28-feet wide, (east and west sidewalls) and 11.5-feet deep. GES personnel then collected soil verification samples. The excavation was back filled with clean fill sand and compacted by Parks. Refer to Appendix B for photographs documenting the tank removal process. Refer to Appendix C for a copy of the Liquid Uniform Hazardous Waste Manifest and Soil Non-hazardous Special Waste Manifests.

GEOLOGY AND FIELD SCREENING

Upon completion of UST removal operations, GES visually evaluated soil conditions along the cavity floor and sidewalls. No free product was observed. Native soils observed along the excavation sidewalls and floor consisted of sand to four (4) below surface grade (bsg). The sand was underlain by clay to approximately 11.5-feet bsg, the bottom of the excavation.

Field screening of soils in the tank excavation indicated that soils approximately 6-feet bsg had the highest photo-ionization detector (PID) readings. Furthermore, soil samples were collected below the product piping runs and dispensers from approximately 6-feet bsg. Soils from these depths were then field screened for total petroleum hydrocarbon concentrations using a PID, properly calibrated with 100 parts per million (ppm) isobutylene gas. Refer to Appendix D for the PID log.

VERIFICATION SAMPLING

GES personnel collected and submitted a total of 17 soil samples from the open excavations in accordance with MDEQ Guidance Document Verification of Soil Remediation, dated April 1994 (VSR). Soil samples were collected from the four sidewalls (CW-1 through CW-8), tank bottoms (TB-1 through TB-6) and beneath each dispenser location (DB-1 through DB-3). Refer to Appendix A, Figure 1 for a detailed excavation plan with approximate excavation boundaries and approximate soil verification sample locations.

Each soil sample was placed within a laboratory provided glass jar, sealed with a Teflon® lid, and stored within an iced cooler pending final laboratory submittal. In addition, a 10-gram portion of each soil sample was field preserved in methanol in accordance with EPA SW 846 Method 5035. These samples were delivered to Biochem Laboratory in Grand Rapids, Michigan via lab courier on October 5, 2003.

Pursuant to MDEQ Operational Memorandum No. 6, Revision 5 Analytical Method Detection Level Guidance for Environmental Contamination Response Activities, dated November 16, 1998, each sample was analyzed for the MDEQ Unleaded Gasoline (ULG) Parameters by EPA Method 8260B. Refer to Appendix D Table I for a summary table of the analytical results. Refer to Appendix E for a copy of the laboratory analytical data.

ANALYTICAL RESULTS AND CONCLUSIONS

Review of the laboratory analytical results generated for the above-mentioned soil samples reveals that ULG concentrations exceeded the laboratory method detection limit (MDL) for all samples except CW-2 and DB-2.

The UST Removal analytical results are compared to the Tier 1 Residential Volatilization to Indoor Air Inhalation and Direct Contact RBSLs per Operational Memorandum No. 4, Attachment 2, Revision 5 dated June criteria because it is the established applicable criteria for the 1996 reported release (C-0924-96).

Based on this analysis and historical information, GES has arrived at the following conclusions:

- The adsorbed concentrations are above the applicable residential criteria.
- The 1996 reported release was discovered during a real estate assessment and the source of the reported release was never determined.
- The subsurface investigations completed between 1996 and 2002 have delineated the hydrocarbon impacted soil and groundwater below State standards.
- GES attributes the recently observed impacted soil as the true source of the 1996 reported release and no new release needs to be reported to the State.

Should you have any question or comments concerning this report, please contact me at (810) 227-0002.

Sincerely,

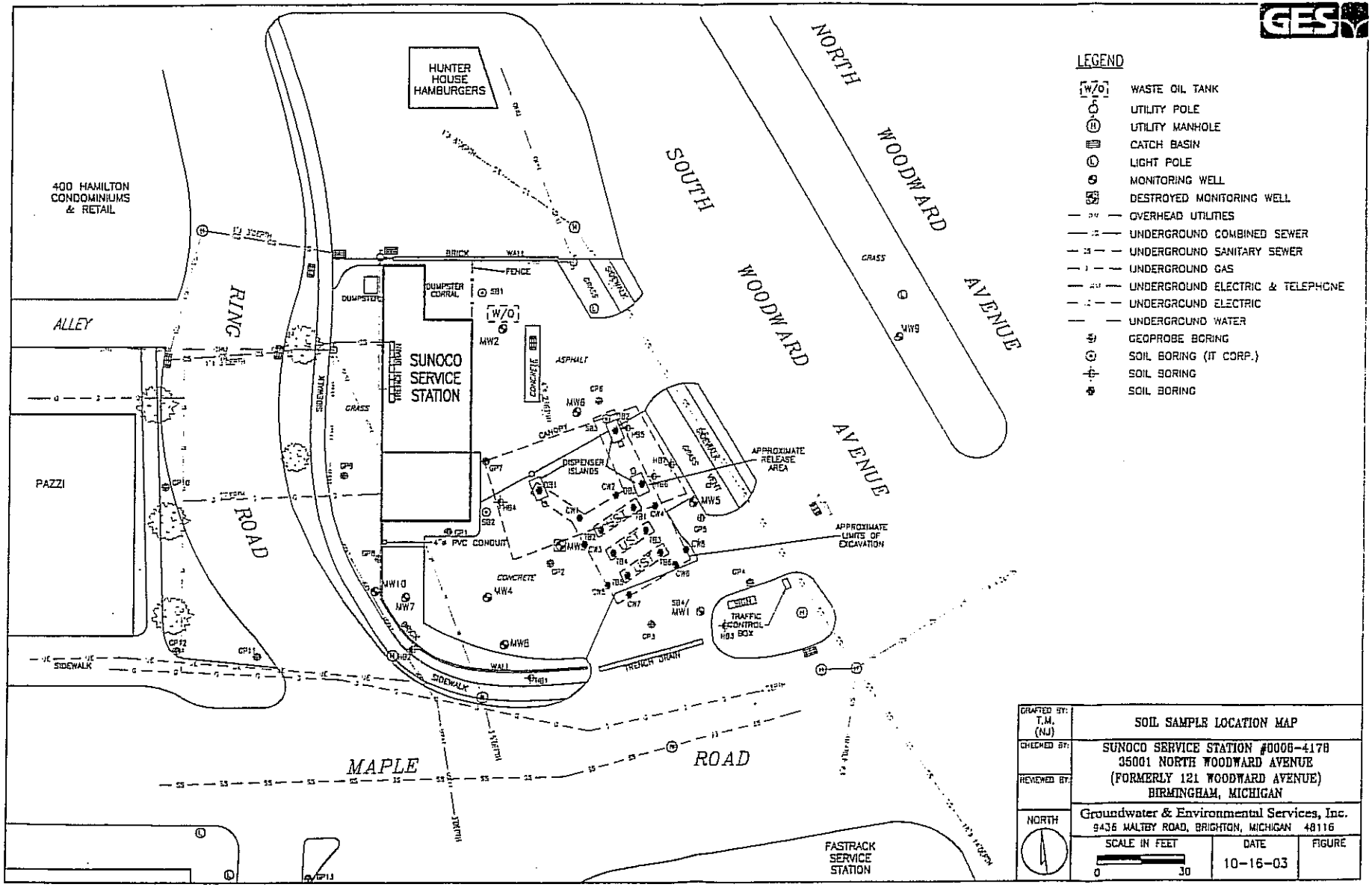
GROUNDWATER & ENVIRONMENTAL SERVICES, INC.

Robert Elliott
Project Manager

cc: Yvonne Monti – Sunoco, Inc.
Kathy McCaney – Sunoco, Inc.
Kirk Pompilius – GES, Inc.
MDEQ – Waste and Hazardous Management Division

APPENDIX A

FIGURE



LEGEND

- W/O — WASTE OIL TANK
- UTILITY POLE
- UTILITY MANHOLE
- CATCH BASIN
- LIGHT POLE
- MONITORING WELL
- DESTROYED MONITORING WELL
- OHW — OVERHEAD UTILITIES
- UGC — UNDERGROUND COMBINED SEWER
- UGS — UNDERGROUND SANITARY SEWER
- UG — UNDERGROUND GAS
- UGE — UNDERGROUND ELECTRIC & TELEPHONE
- UGE — UNDERGROUND ELECTRIC
- UGW — UNDERGROUND WATER
- GEOPROBE BORING
- SOIL BORING (IT CORP.)
- SOIL BORING
- SOIL BORING

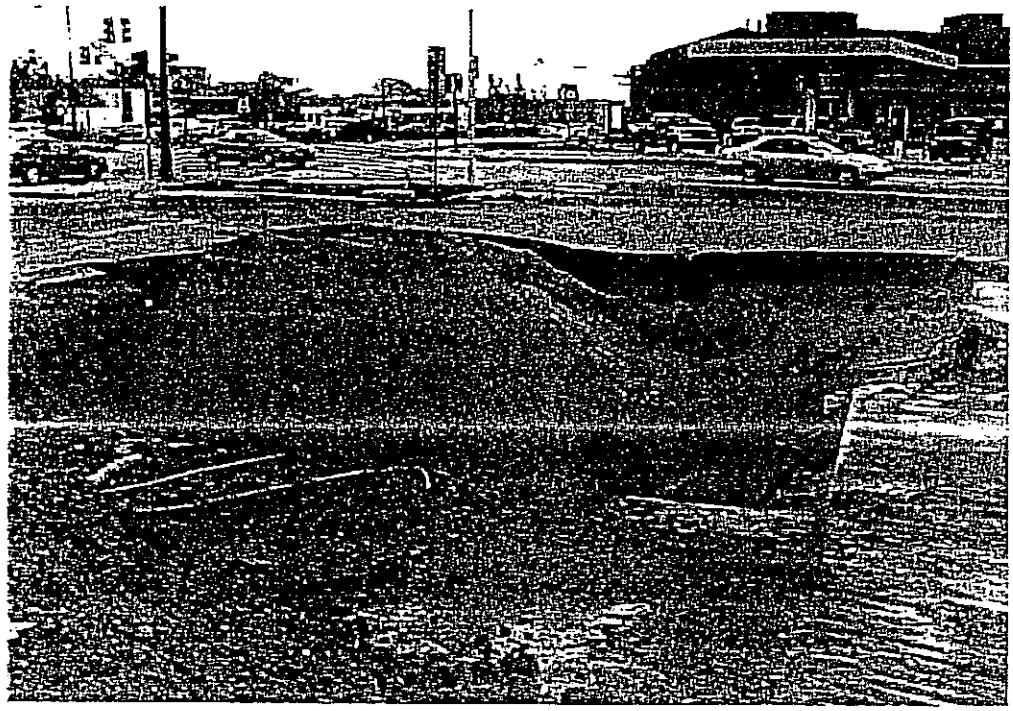
DRAFTED BY: T.M. (NJ)	SOIL SAMPLE LOCATION MAP
CHECKED BY:	SUNOCO SERVICE STATION #0006-4178 35001 NORTH WOODWARD AVENUE (FORMERLY 121 WOODWARD AVENUE) BIRMINGHAM, MICHIGAN
REVIEWED BY:	Groundwater & Environmental Services, Inc. 9436 MALTBY ROAD, BRIGHTON, MICHIGAN 48116
NORTH	SCALE IN FEET: 0 — 30 / DATE: 10-16-03 / FIGURE:

APPENDIX B

PHOTOGRAPHS

DATE:
October 1, 2003

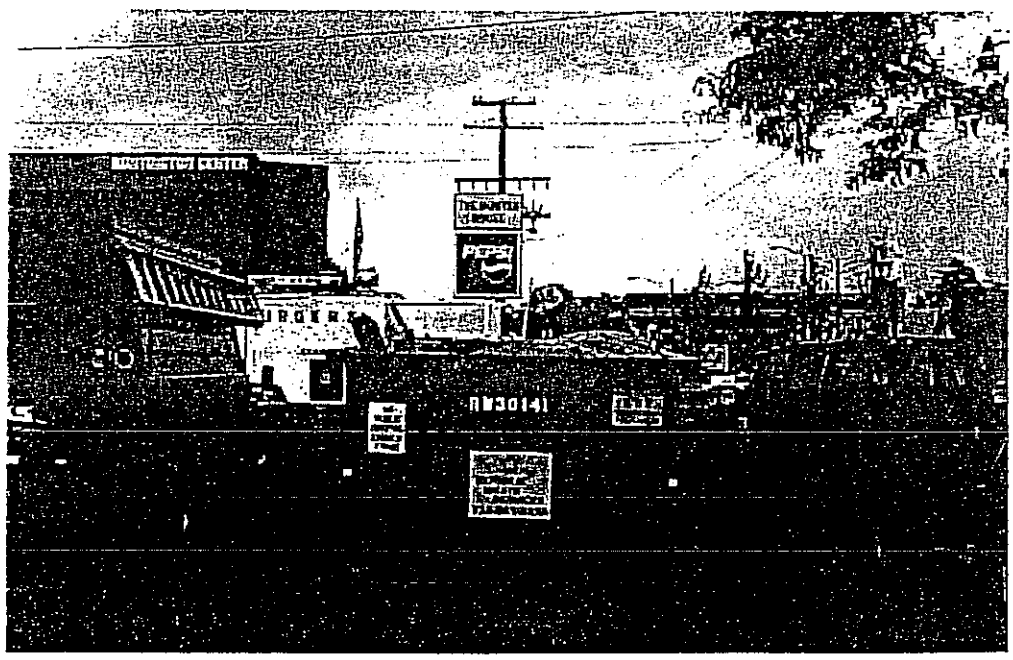
PHOTOGRAPHER:
Jarrad Brooks



Excavation being backfilled.

DATE:
October 1, 2003

PHOTOGRAPHER:
Jarrad Brooks



USTs disposed in the dumpster.

SITE PHOTOGRAPHS

SUNOCO SERVICE STATION # 000-4178
35001 NORTH WOODWARD AVE. @ MAPLE
(Formerly 121 Woodward Ave.)
BIRMINGHAM, MICHIGAN

PROJ: 17-00757

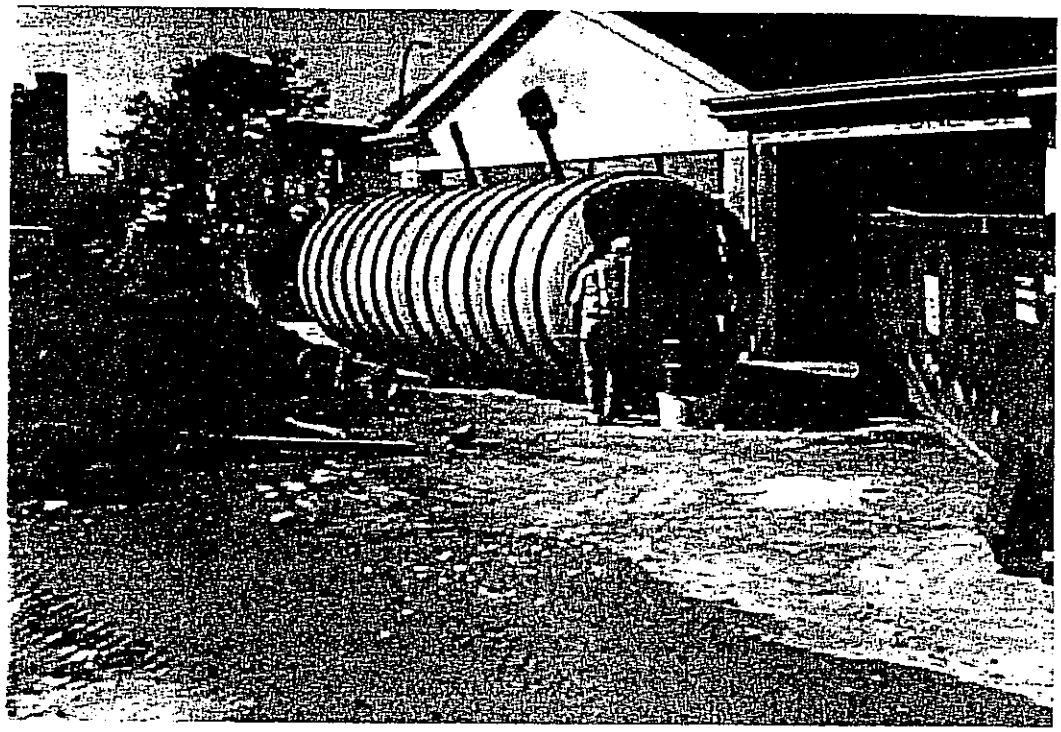
SCALE: NONE

DATE: 10/01/2003

FIGURES: 5 and 6

DATE:
October 1, 2003

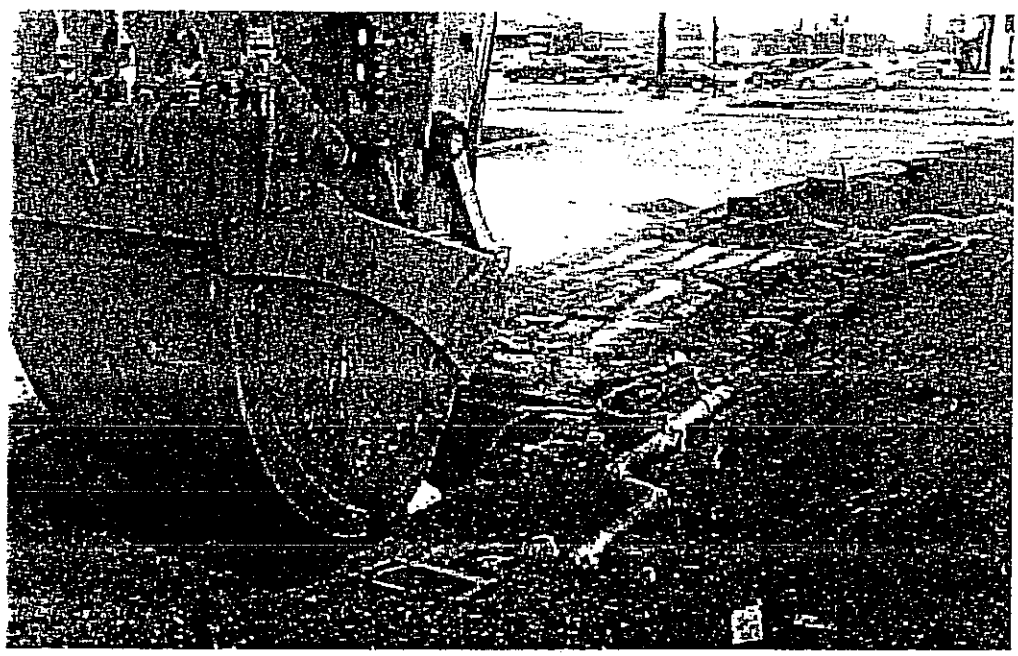
PHOTOGRAPHER:
Jarrad Brooks



The USTs being cleaned.

DATE:
October 1, 2003

PHOTOGRAPHER:
Jarrad Brooks



Dispenser island being excavated.

GES

SITE PHOTOGRAPHS

SUNOCO SERVICE STATION # 000-4178
35001 NORTH WOODWARD AVE. @ MAPLE
(Formerly 121 Woodward Ave.)
BIRMINGHAM, MICHIGAN

PROJ: 17-00757

SCALE: NONE

DATE: 10/01/2003

FIGURES: 3 and 4

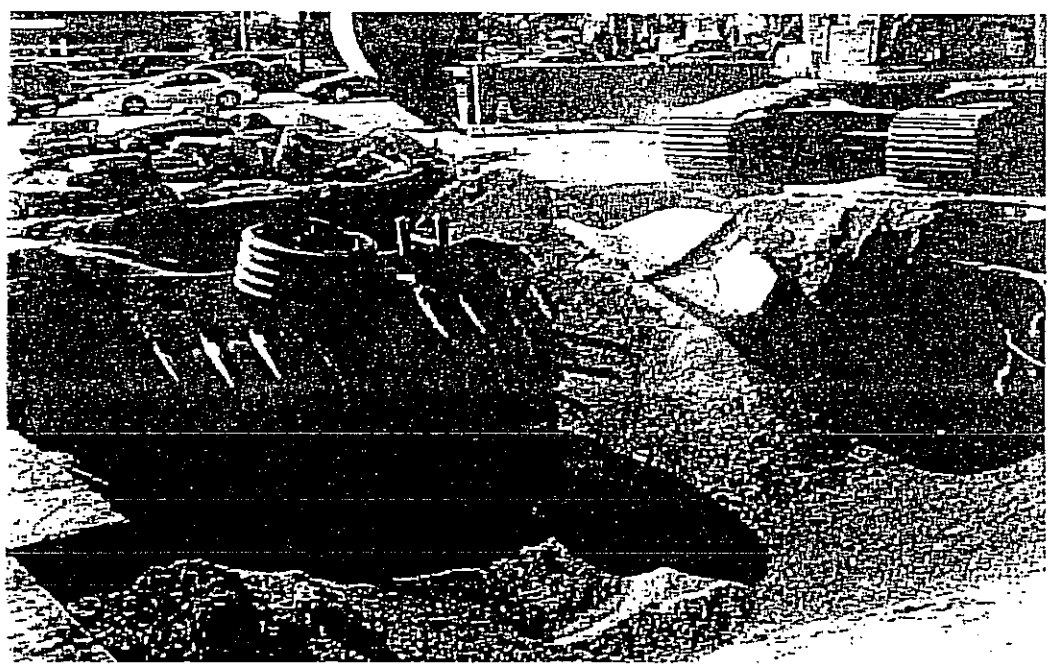
DATE:
October 1, 2003

PHOTOGRAPHER:
Jarrad Brooks

Dry ice being used to inert USTs.

DATE:
October 1, 2003

PHOTOGRAPHER:
Jarrad Brooks



The UST being excavated from the ground.

SITE PHOTOGRAPHS

SUNOCO SERVICE STATION # 000-4178
35001 NORTH WOODWARD AVE. @ MAPLE
(Formerly 121 Woodward Ave.)
BIRMINGHAM, MICHIGAN

PROJ: 17-00757

SCALE: NONE

DATE: 10/01/2003

FIGURES: 1 and 2

APPENDIX C

WASTE MANIFESTS

DEQ

WASTE AND HAZARDOUS MATERIALS DIVISION
MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

DO NOT WRITE IN THIS SPACE
ATT. ☐ DIS. ☐ REJ. ☐ PR. ☐

and Part 121 of Act 451, 1994, as amended.

Failure to file may subject you to criminal and/or civil penalties under Section 324.11151 or 324.12116 MCL.

Please print or type. Form Approved. OMB No. 2050-0039

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No.: M I D 0 8 7 7 5 0 2 0 4
Manifest Document No.: 79041
2. Page 1 of 1
Information in the shaded areas is not required by Federal law.

3. Generator's Name and Mailing Address
Sunoco Station
35001 Woodward
Birmingham, MI 48009
4. Generator's Phone ( )

A. State Manifest Document Number: MI 9179041
B. State Generator's ID:

5. Transporter 1 Company Name: Buck's Oil Co., Inc.
6. US EPA ID Number: M I R 0 0 0 0 2 3 6 8 9
C. State Transporter's ID:
D. Transporter's Phone: 734-728-3280

7. Transporter 2 Company Name:
8. US EPA ID Number:
E. State Transporter's ID:
F. Transporter's Phone:

9. Designated Facility Name and Site Address: Buck's Oil Co., Inc., 30110 Beverly,, Romulus, MI 48174
10. US EPA ID Number: M I R 0 0 0 0 2 3 6 8 9
G. State Facility's ID:
H. Facility's Phone:

11. US DOT Description (including Proper Shipping Name, Hazard Class, and ID NUMBER). HM	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	I. Waste No.
a. N.O.S. Used Oil & Water Non-combustible Liquid N/A 1270	0 0 1	TT	250	G	0 / 7 L N
b.					
c.					
d.					

J. Additional Descriptions for Materials Listed Above: Above material for recycle.

K. Handling Codes for Wastes Listed Above: a. R C; b.; c.; d.

15. Special Handling Instructions and Additional Information: In case of spill contain with sand and vacuum up.

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations. If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment; OR, if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford. To the best of my knowledge.

Printed/Typed Name: Signed in Detroit Dennis Hawkins — Signature — Date: Month Day Year 10 30 03

17. Transporter 1 Acknowledgement of Receipt of Materials
Printed/Typed Name — Signature — Date: Month Day Year 10 30 03

18. Transporter 2 Acknowledgement of Receipt of Materials
Printed/Typed Name — Signature — Date: Month Day Year

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in Item 19.
Printed/Typed Name — Signature — Date: Month Day Year

GENERATOR

TRANSPORTER

FACILITY

ALL SPILLS MUST BE REPORTED TO THE MICHIGAN POLLUTION EMERGENCY ALERTING SYSTEM, IN MICHIGAN AT 1-800-292-4706 OR OUT OF STATE AT 517-373-7660 AND THE NATIONAL RESPONSE CENTER AT 1-800-424-8802 24 HOURS PER DAY.

EPA Form 8700-22 (Rev. 9/88)

To be mailed by Generator to:
WASTE AND HAZARDOUS MATERIALS DIVISION
MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
PO BOX 30028
LANSING MI 48909-7528

EQP 5110
Rev. 10/02

DEQ

WASTE AND HAZARDOUS MATERIALS DIVISION
MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

DO NOT WRITE IN THIS SPACE
ATT. ☐ DIS. ☐ REJ. ☐ PR. ☐

and Part 121 of Act 451, 1994, as amended.

Failure to file may subject you to criminal and/or civil penalties under Section 324.11151 or 324.12116 MCL

Please print or type.

Form Approved. OMB No. 2050-0039

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No.: M I D 0 8 7 7 5 0 2 0 4
Manifest Document No.: 77994
2. Page 1 of 1
Information in the shaded areas is not required by Federal law.

3. Generator's Name and Mailing Address
sunoco Station
35001 Woodward
Birmingham, MI 48009
4. Generator's Phone ( )

A. State Manifest Document Number: MI 9177994
B. State Generator's ID:

5. Transporter 1 Company Name: Buck's Oil Co., Inc.
6. US EPA ID Number: M I R 0 0 0 0 2 3 6 8 9
C. State Transporter's ID:
D. Transporter's Phone: 734-728-3280

7. Transporter 2 Company Name:
8. US EPA ID Number:
E. State Transporter's ID:
F. Transporter's Phone:

9. Designated Facility Name and Site Address: American Waste, 44141 Yost, Belleville, MI 48111
10. US EPA ID Number: M I D 0 5 0 5 9 8 3 9 0
G. State Facility's ID:
H. Facility's Phone: 734-397-2300

	11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID NUMBER). HM	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	I. Waste No.
a.	Waste Water/Trace Commercial Fuel EPA & State Non-hazardous N.A N.A.	0 0 1	TT	3000	G	0 2 9 L N
b.						
c.						
d.						

J. Additional Descriptions for Materials Listed Above
Groundwater from U.S.T.
PCW Water

K. Handling Codes for Wastes Listed Above
A. R G
B.
C.
D.

15. Special Handling Instructions and Additional Information
In case of spill contain with sand and vacuum up.

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations. If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment; OR, if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.

Printed/Typed Name: [illegible] Signature: [illegible] To the best of my knowledge. Date: Month Day Year 10/30/03

17. Transporter 1 Acknowledgement of Receipt of Materials
Printed/Typed Name: [illegible] Signature: [illegible] Date: Month Day Year 10/30/03

18. Transporter 2 Acknowledgement of Receipt of Materials
Printed/Typed Name: Signature: Date: Month Day Year

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in Item 19.
Printed/Typed Name: Signature: Date: Month Day Year

GENERATOR — TRANSPORTER — FACILITY

ALL SPILLS MUST BE REPORTED TO THE MICHIGAN POLLUTION EMERGENCY ALERTING SYSTEM, IN MICHIGAN AT 1-800-292-4706 OR OUT OF STATE AT 517-373-7660 AND THE NATIONAL RESPONSE CENTER AT 1-800-424-8802 24 HOURS PER DAY.

EPA Form 8700-22 (Rev. 9/88)

To be mailed by Generator to: WASTE AND HAZARDOUS MATERIALS DIVISION, MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY, PO BOX [illegible], LANSING MI 48909-7532

EQP 5110 Rev. 10/02

Arbor Hills Main Gate
10690 W. Six Mile Road
Northville, MI 48167

Ticket: 01 327830

2 October 2003 5:00 am
2 October 2003 6:00 am

000354
PARKS INSTALLATION & EXC.
4893 MCCARTHY DRIVE
MILFORD, MI 48381-

Vehicle: MARLO77 MARLO

Inbound - Macomb Cty.

Contract: AH2360

Reference:

BOL# 245422

Gross Weight 155,400.00 LB
Stored Tare Weight 54,300.00 LB
Net Weight 101,100.00 LB 50.55 TN

Quantity	Unit	Description	Rate	Tax	Total
40.00	FY	SC Contaminated Soils			

Net Amount:
Tendered:

I hereby certify that this load does not contain any unauthorized waste.

Weighmaster: MIKE PRINT NAME: James A. O'Neill SIGNATURE:

ONYX

Arbor Hills Main Gate
10690 W. Six Mile Road
Northville, MI 48167

Ticket: 01 327662

1 October 2003 12:02 pm
1 October 2003 12:02 pm

000354
PARKS INSTALLATION & EXC.
4893 MCCARTHY DRIVE
MILFORD, MI 48381-

Vehicle: MARL011 MARLO

Inbound - Wayne Cty

Contract: AH2360

Reference: BOL# 245420

00 Gross Weight 104,480.00 LB
Stored Tare Weight 43,680.00 LB
Net Weight 60,800.00 LB 30.40 TN

Quantity	Unit	Description	Rate	Tax	Total
28.00	FY	SC Contaminated Soils			

Net Amount:
Tendered:

Weighmaster: JIM

I hereby certify that this load does not contain any unauthorized waste.

PRINT NAME: _____ SIGNATURE: Jeff

Copies: 1st Free - Additional copies $1.[illegible] per copy

ONYX

Arbor Hills Main Gate
10690 W. Six Mile Road
Northville, MI 48167

Ticket: 01 327766

1 October 2003 2:20 pm
1 October 2003 2:20 pm

000354
PARKS INSTALLATION & EXC.
4893 MCCARTHY DRIVE
MILFORD, MI 48381-

Vehicle: B00340 BOONES

Inbound - Wayne Cty

Contract: AH2360

Reference: BOL# 245421

00 Gross Weight 160,620.00 LB
Stored Tare Weight 54,600.00 LB
Net Weight 106,020.00 LB 53.01 TN

Quantity	Unit	Description	Rate	Tax	Total
40.00	FY	SC Contaminated Soils			

Net Amount:
Tendered:

I hereby certify that this load does not contain any unauthorized waste.

Weighmaster: MIKE PRINT NAME: Larry Curtis SIGNATURE: [signature]

Copies: 1st Free - Additional copies $1.00 per copy

ONYX

Arbor Hills Main Gate
10690 W. Six Mile Road
Northville, MI 48167

Ticket: 01 327567

1 October 2003 9:50 am
1 October 2003 9:50 am

000354
PARKS INSTALLATION & EXC.
4893 MCCARTHY DRIVE
MILFORD, MI 48381-

Vehicle: MARL011 MARLO

Inbound - Wayne Cty

Contract: AH2360

Reference: BOL# 245418

Gross Weight 102,440.00 LB
Stored Tare Weight 53,400.00 LB
Net Weight 49,040.00 LB 24.52 TN

Quantity	Unit	Description	Rate	Tax	Total
28.00	FY	SC Contaminated Soils			

Net Amount:
Tendered:

I hereby certify that this load does not contain any unauthorized waste.

Weighmaster: MIKE PRINT NAME: _____ SIGNATURE: Jeff

Copies: 1st Free - Additional copies $1.00 per copy

ONYX

Arbor Hills Main Gate
10690 W. Six Mile Road
Northville, MI 48167

Ticket: 01 327599

1 October 2003 10:45 am
1 October 2003 10:45 am

000354
PARKS INSTALLATION & EXC.
4893 MCCARTHY DRIVE
MILFORD, MI 48381-

Vehicle: MARL077 MARLO

Inbound - Macomb Cty.

Contract: AH2360

Reference: BOL# 245419

00 Gross Weight 149,840.00 LB
Stored Tare Weight 54,300.00 LB
Net Weight 95,540.00 LB 47.77 TN

Quantity	Unit	Description	Rate	Tax	Total
40.00	FY	SC Contaminated Soils			

Net Amount:
Tendered:

I hereby certify that this load does not contain any unauthorized waste.

Weighmaster: MIKE PRINT NAME: _____ SIGNATURE: _____

NON-HAZARDOUS SPECIAL WASTE MANIFEST

(1)

245418

Section I: GENERATOR (Generator completes all of Section I)

a. Generator Name: SUNOCO STATION
b. Generating Location:
c. Address: 35001 WOODWARD
BIRMINGHAM MI 48304
DUNS # 0608-4178
d. Address: SAME
e. Phone No.:
f. Phone No.:

If owner of the generating facility differs from the generator, provide:

g. Owner's Name:
h. Owner's Phone No.:

i. BFI WASTE CODE: MI - 687 - 040926 - AH2360 - 600

j. Description of Waste: C-Soil

k. Quantity: 28 Units: Y TYPE: TR

TYPE
DM - METAL DRUM
DP - PLASTIC DRUM
DF - FIBRE DRUM
B - BAG
TR - TRUCK
O - OTHER

UNITS
P - POUNDS
Y - YARDS
T - TONS
Y3 - CUBIC YARDS
C - OTHER

GENERATOR'S CERTIFICATION: I hereby certify that the above named material is not a hazardous waste as defined by 40 CFR Part 261 or any applicable state law, has been properly described, classified and packaged, and is in proper condition for transportation according to applicable regulations; AND, if the waste is a treatment residue of a previously restricted hazardous waste subject to the Land Disposal Restrictions, I certify and warrant that the waste has been treated in accordance with the requirements of 40 CFR Part 268 and is no longer a hazardous waste as defined by 40 CFR Part 261.

Geery Giles — Generator Authorized Agent Name
Signature
10/01/03 — Shipment Date

Section II: TRANSPORTER

TRANSPORTER I

a. Name: P.I.E.
b. Address: 4893 MC CARTHY DR
MILFORD, MI
c. Driver Name/Title: Jeff
PRINT/TYPE
d. Phone No.: 459-0240
e. Truck No.: 11
f. Vehicle License No./State: 8032-AD
Acknowledgement of Receipt of Materials.
g. Jeff — Driver Signature
10/01/03 — Shipment Date

TRANSPORTER II

h. Name:
i. Address:
j. Driver Name/Title:
PRINT/TYPE
k. Phone No.:
l. Truck No.:
m. Vehicle License No./State:
Acknowledgement of Receipt of Materials.
n. Driver Signature
Shipment Date

Section III: DESTINATION

a. Site Name:
b. Physical Address:
c. Phone No.:
d. Mailing Address:

ONYX
ARBOR HILLS LANDFILL
10690 SIX MILE RD.
NORTHVILLE, MI 48167
248-349-7230

e. TICKET No.: A327567

I hereby certify that the above named material has been accepted and to the best of my knowledge the foregoing is true and accurate.

Name of Authorized Agent
Signature
10-01-03 — Receipt Date

RETURN TO OPERATOR

NON-HAZARDOUS SPECIAL WASTE MANIFEST

(2)

245419

Section I — GENERATOR (Generator completes all of Section I)

a. Generator Name: Sunoco Station
b. Generating Location:
c. Address: 35001 Woodward, Birmingham, Mi. 48304
d. Address: SAME
e. Phone No.: DUNS # 0008-4178
f. Phone No.:

If owner of the generating facility differs from the generator, provide:

g. Owner's Name:
h. Owner's Phone No.:

i. BFI WASTE CODE MI - 687 - 040926 - AH2360 - 600

j. Description of Waste: C. Soil

k. Quantity: 40 Units: Y TYPE:

TYPE
DM - METAL DRUM
DP - PLASTIC DRUM
DF - FIBRE DRUM
B - BAG
TR - TRUCK
O - OTHER

UNITS
P - POUNDS
Y - YARDS
T - TONS
Y3 - CUBIC YARDS
O - OTHER

GENERATOR'S CERTIFICATION: I hereby certify that the above named material is not a hazardous waste as defined by 40 CFR Part 261 or any applicable state law, has been properly described, classified and packaged, and is in proper condition for transportation according to applicable regulations. AND, if the waste is a treatment residue of a previously restricted hazardous waste subject to the Land Disposal Restrictions, I certify and warrant that the waste has been treated in accordance with the requirements of 40 CFR Part 268 and is no longer a hazardous waste as defined by 40 CFR Part 261.

Gerry Giles — Generator Authorized Agent Name
Signature
10/1/03 — Shipment Date

Section II — TRANSPORTER

TRANSPORTER I

a. Name: P.I.E.
b. Address: 4893 McCarthy Dr. Milford, Mi.
c. Driver Name/Title: James Locklo (PRINT/TYPE)
d. Phone No.: Hwy
e. Truck No.:
f. Vehicle License No./State: 22 MD

Acknowledgement of Receipt of Materials.

g. Driver Signature — 10/1/03 Shipment Date

TRANSPORTER II

h. Name:
i. Address:
j. Driver Name/Title: (PRINT/TYPE)
k. Phone No.:
l. Truck No.:
m. Vehicle License No./State:

Acknowledgement of Receipt of Materials.

n. Driver Signature — Shipment Date

Section III — DESTINATION

a. Site Name:
b. Physical Address:
c. Phone No.:
d. Mailing Address: ONYX ARBOR HILLS LANDFILL, 10690 SIX MILE RD., NORTHVILLE, MI 48167, 248-349-7230
e. TICKET No.: A327599

I hereby certify that the above named material has been accepted and to the best of my knowledge the foregoing is true and accurate.

f. Name of Authorized Agent
Signature
10-01-03 — Receipt Date

RETURN TO OPERATOR

NON-HAZARDOUS SPECIAL WASTE MANIFEST

245420

Section I. GENERATOR (Generator completes all of Section I)

a. Generator Name: SUNOCO STATION
b. Generating Location:
c. Address: 35001 WOODWARD
BIRMINGHAM, MI 48304
d. Address: SAME
e. Phone No.: DIAL 1 800 8-4178
f. Phone No.:
If owner of the generating facility differs from the generator, provide:
g. Owner's Name:
h. Owner's Phone No.:
i. BFI WASTE CODE MI - 687 - 040926 - AH2360 - 600
j. Description of Waste: C. Soil
k. Quantity: 218
Units: Y
TYPE: CE

TYPE
DM - METAL DRUM
DP - PLASTIC DRUM
DF - FIBRE DRUM
B - BAG
TR - TRUCK
O - OTHER

UNITS
P - POUNDS
Y - YARDS
T - TONS
YB - CUBIC YARDS
O - OTHER

GENERATOR'S CERTIFICATION: I hereby certify that the above named material is not a hazardous waste as defined by 40 CFR Part 261 or any applicable state law, has been properly described, classified and packaged, and is in proper condition for transportation according to applicable regulations; AND, if the waste is a treatment residue of a previously restricted hazardous waste subject to the Land Disposal Restrictions, I certify and warrant that the waste has been treated in accordance with the requirements of 40 CFR Part 268 and is no longer a hazardous waste as defined by 40 CFR Part 261.

Gerry Giles — Generator Authorized Agent Name
Signature
10/1/03 — Shipment Date

Section II. TRANSPORTER

TRANSPORTER I

a. Name: P.I.E.
b. Address: 4893 MCCARTHY DR
MILFORD MI 48381
c. Driver Name/Title: JEFF
PRINT/TYPE
d. Phone No.: 459-0240
e. Truck No.: 11
f. Vehicle License No./State: 8032AD
Acknowledgement of Receipt of Materials.
g. Jeff — Driver Signature
10/1/03 — Shipment Date

TRANSPORTER II

h. Name:
i. Address:
j. Driver Name/Title:
PRINT/TYPE
k. Phone No.:
l. Truck No.
m. Vehicle License No./State:
Acknowledgement of Receipt of Materials.
n. Driver Signature
Shipment Date

Section III. DESTINATION

a. Site Name:
b. Physical Address:
c. Phone No.:
d. Mailing Address: ONYX ARBOR HILLS LANDFILL, INC.
[illegible] MILE ROAD
NORTHVILLE, MI 48167
248/349-7750
e. TICKET No.:

I hereby certify that the above named material has been accepted and to the best of my knowledge the foregoing is true and accurate.

f. Name of Authorized Agent
Signature
10/1/03 — Receipt Date
32962

RETURN TO OPERATOR

NON-HAZARDOUS SPECIAL WASTE MANIFEST

245421

Section I: GENERATOR (Generator completes all of Section I)

a. Generator Name: SUNOCO STATION
b. Generating Location:
c. Address: 35001 WOODWARD
BIRMINGHAM, MI 48304
d. Address: SAME
e. Phone No.: DUNS # 0008-4178
f. Phone No.:
If owner of the generating facility differs from the generator, provide:
g. Owner's Name:
h. Owner's Phone No.:
i. BFI WASTE CODE MI - 682 - 040926 - AH2360 - 600
j. Description of Waste: C. SOIL
k. Quantity: 40 Units: Y TYPE: TR

TYPE
DM - METAL DRUM
DP - PLASTIC DRUM
DF - FIBRE DRUM
B - BAG
TR - TRUCK
O - OTHER

UNITS
P - POUNDS
Y - YARDS
T - TONS
Y3 - CUBIC YARDS
O - OTHER

GENERATOR'S CERTIFICATION: I hereby certify that the above named material is not a hazardous waste as defined by 40 CFR Part 261 or any applicable state law, has been properly described, classified and packaged, and is in proper condition for transportation according to applicable regulations: AND, if the waste is a treatment residue of a previously restricted hazardous waste subject to the Land Disposal Restrictions, I certify and warrant that the waste has been treated in accordance with the requirements of 40 CFR Part 268 and is no longer a hazardous waste as defined by 40 CFR Part 261.

Geezy Giles — Generator Authorized Agent Name
Signature
10/10/03 — Shipment Date

Section II: TRANSPORTER

TRANSPORTER I

a. Name: P.I.F.
b. Address: 4893 MC CARTHY DR
MILFORD, MI
c. Driver Name/Title: Jerry Curtis (PRINT/TYPE)
d. Phone No.: 248 5F37080 e. Truck No.: 340
f. Vehicle License No./State: 2256 AA MI
Acknowledgement of Receipt of Materials.
g. Driver Signature — 10/10/03 Shipment Date

TRANSPORTER II

h. Name:
i. Address:
j. Driver Name/Title: (PRINT/TYPE)
k. Phone No.: l. Truck No.:
m. Vehicle License No./State:
Acknowledgement of Receipt of Materials.
n. Driver Signature — Shipment Date

Section III: DESTINATION

a. Site Name:
b. Physical Address:
c. Phone No.: 248-360-7200
d. Mailing Address: 10600 SIX MILE RD NORTHVILLE, MI 48167
ARBOR HILLS LANDFILL
ONYX
e. TICKET No.: 32746
I hereby certify that the above named material has been accepted and to the best of my knowledge the foregoing is true and accurate.
f. Name of Authorized Agent — Signature — 10/10/03 Receipt Date

RETURN TO OPERATOR

(5)

NON-HAZARDOUS SPECIAL WASTE MANIFEST

245422

Section I — GENERATOR (Generator completes all of Section I)

a. Generator Name: Sunoco Station
b. Generating Location:
c. Address: 35001 Woodward
Birmingham MI 48304
d. Address: Same
e. Phone No.: Dunsmore 4008-4128
f. Phone No.:

If owner of the generating facility differs from the generator, provide:

g. Owner's Name:
h. Owner's Phone No.:

i. BFI WASTE CODE MI - 687 - 040926 - AH2360 - 600

j. Description of Waste: C Soil

k. Quantity	Units	TYPE
46	Y	TR

TYPE: DM - METAL DRUM; DP - PLASTIC DRUM; DF - FIBRE DRUM; B - BAG; TR - TRUCK; O - OTHER

UNITS: P - POUNDS; Y - YARDS; T - TONS; Y3 - CUBIC YARDS; O - OTHER

GENERATOR'S CERTIFICATION: I hereby certify that the above named material is not a hazardous waste as defined by 40 CFR Part 261 or any applicable state law, has been properly described, classified and packaged, and is in proper condition for transportation according to applicable regulations. AND, if the waste is a treatment residue of a previously restricted hazardous waste subject to the Land Disposal Restrictions, I certify and warrant that the waste has been treated in accordance with the requirements of 40 CFR Part 268 and is no longer a hazardous waste as defined by 40 CFR Part 261.

Geoffrey Giles — Generator Authorized Agent Name
Signature
10/10/03 — Shipment Date

Section II — TRANSPORTER

TRANSPORTER I

a. Name: D & F
b. Address: 4893 McCaffrey Dr
Milford, MI
c. Driver Name/Title: James Collins
PRINT/TYPE
d. Phone No.:
e. Truck No.: 44
f. Vehicle License No./State: 228 MD

Acknowledgement of Receipt of Materials.

g. James Collins — Driver Signature
10/10/03 — Shipment Date

TRANSPORTER II

h. Name:
i. Address:
j. Driver Name/Title:
PRINT/TYPE
k. Phone No.:
l. Truck No.:
m. Vehicle License No./State:

Acknowledgement of Receipt of Materials.

n. Driver Signature
Shipment Date

Section III — DESTINATION

a. Site Name:
b. Physical Address:
c. Phone No.:
d. Mailing Address:
e. TICKET No.: A32783

I hereby certify that the above named material has been accepted and to the best of my knowledge the foregoing is true and accurate.

f. Name of Authorized Agent
Signature
10/28/03 — Receipt Date

RETURN TO OPERATOR

APPENDIX D

TABLES

UST REMOVAL PHOTOIONIZATION DETECTOR READINGS

Project Name	Sunoco Woodward @ Maple		Date	10/1/2003	Page 1 of 1
Project Location	35001 North Woodward Avenue @ Maple Road, Birmingham, MI		Project Number	1700757	
Sampling Method	Grab Sample Headspace Evaluation		Geologist/ Engineer	Jarrad Brooks	

Sample Number	PID Reading (ppm)	Sample Location	Depth (feet)	Date/Comments
CW #1	13.6	North wall, west side	6'	
CW #2	4.7	North wall, east side	6'	
CW #3	45.9	West wall, north side	6'	
CW #4	4.3	East wall, north side	6'	
CW #5	23.4	West wall, south side	6'	
CW #6	1.1	South wall, east side	6'	
CW #7	3.5	South wall, west side	6'	
CW #8	8.5	East wall, south side	6'	
DB #1	0	West dispenser bottom	6'	
DB #2	2.5	North east dispenser bottom	6'	
DB #3	0	South east dispenser bottom	6'	
TB #1	24.2	North east bottom	11.5'	
TB #2	6.2	North tank, west bottom	11.5'	
TB #3	9.2	Middle tank, east bottom	11.5'	
TB #4	5	Middle tank, west side	11.5'	
TB #5	12	South tank, west bottom	11.5'	
TB #6	34.2	South tank, east bottom	11.5'	

Table 1

Unleaded Gasoline Parameters for Soil

Sunoco, Inc.

DUNS # 0008-4178

35001 North Woodward Avenue @ Maple Road

Birmingham, Michigan

Parameters	MDEQ Tier 1 Residential Direct Contact RBSLs[1] (ug/kg)	MDEQ Tier 1 Residential Volatilization to Indoor Air Inhalation RBSLs[1] (ug/kg)	Sample Identification, Depth, Date Collected, Date Analyzed, Concentration ug/Kg										
			CW #1 6' 10/01/03 10/06/03	CW #2 6' 10/01/03 10/06/03	CW #3 6' 10/01/03 10/06/03	CW #4 6' 10/01/03 10/06/03	CW #5 6' 10/01/03 10/06/03	CW #6 6' 10/01/03 10/06/03	CW #7 6' 10/01/03 10/06/03	CW #8 6' 10/01/03 10/06/03	DB #1 6' 10/01/03 10/06/03	DB#2 6' 10/01/03 10/06/03	DB #3 6' 10/01/03 10/06/03
nzene	180,000	1,600	260	<50	1,800	220	1,000	<50	<50	190	66	<50	140
luene	250,000	250,000	<50	<50	51	4,600	69	<50	58	<50	300	<50	950
ylbenzene	140,000	140,000	<50	<50	1,600	2,000	3,600	220	780	1,500	130	<50	160
lenes	150,000	150,000	<150	<150	2,400	11,300	1,870	810	<150	620	610	<150	1,150
TBE	1,800,000	5,900,000	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250
,4-Trimethylbenzene	110,000	110,000	88	<50	2,200	310	150	4,300	130	3,900	450	<50	470
,5-Trimethylbenzene	94,000	94,000	<50	<50	690	<50	<50	1,500	<50	730	190	<50	190
phthalene	16,000,000	250,000	<250	<250	800	<250	690	420	1,900	4,300	<250	<250	<250
Methylnaphthalene	8,100,000	ID	<250	<250	840	<250	440	810	7,900	7,000	550	<250	490

MDEQ Tier 1 Residential Risk-Based Screening Levels (RBSLs) Per Operational Memorandum No. 4, Attachment 2, Dated June 2000

= Inadequate data to develop RBSLs

NA	- Not Analyzed
< 10	- Not detected above laboratory method detection limit
23	- Contaminant concentration above laboratory method detection limit
NONE	- Contaminant concentration above current MDEQ Tier 1 Residential RBSLs

Table I

Unleaded Gasoline Parameters for Soil
Sunoco, Inc.
DUNS # 0008-4178
35001 North Woodward Avenue @ Maple Road
Birmingham, Michigan

Parameters	MDEQ Tier I Residential Direct Contact RBSLs[1] (ug/kg)	MDEQ Tier I Residential Volatilization to Indoor Air Inhalation RBSLs[1] (ug/kg)	Sample Identification, Depth, Date Collected, Date Analyzed, Concentration ug/Kg					
			TB #1 11.5' 10/01/03 10/06/03	TB #2 11.5' 10/01/03 10/06/03	TB #3 11.5' 10/01/03 10/06/03	TB #4 11.5' 10/01/03 10/06/03	TB #5 11.5' 10/01/03 10/06/03	TB #6 11.5' 10/01/03 10/06/03
nzene	180,000	1,600	350	5,100	1,800	3,700	2,000	480
uene	250,000	250,000	77	<50	150	84	140	59
ylbenzene	140,000	140,000	7,900	110	12,000	180	7,700	3,100
lenes	150,000	150,000	1,180	220	1,079	<150	3,030	489
TBE	1,800,000	5,900,000	<250	<250	<250	<250	<250	<250
,4-Trimethylbenzene	110,000	110,000	2,200	420	5,900	<50	1,300	1,300
,5-Trimethylbenzene	94,000	94,000	410	120	2,100	<50	380	310
phthalene	16,000,000	250,000	12,000	370	11,000	<250	1,400	4,200
Methylnaphthalene	8,100,000	ID	12,000	740	6,700	<250	<250	6,200

MDEQ Tier I Residential Risk-Based Screening Levels (RBSLs) Per Operational Memorandum No. 4, Attachment 2, Dated June 2000

= Inadequate data to develop RBSLs

NA	- Not Analyzed
< 10	- Not detected above laboratory method detection limit
23	- Contaminant concentration above laboratory method detection limit
NONE	- Contaminant concentration above current MDEQ Tier I Residential RBSLs

APPENDIX E

LABORATORY REPORT

BIO-CHEM
ENVIRONMENTAL
ANALYTICAL
LABORATORIES

1049 - 28th Street SE
Grand Rapids, MI 49508
Ph: 616/248-4900
Toll Free: 800/362-LABS
Fax: 616/248-4904

October 07, 2003

Robert Elliott
Groundwater Environmental Services
9436 Maltby Rd
Brighton, MI 48116

TEL: (810) 227-0002
FAX (810) 227-0008

RE: Sunoco - Woodward @ Maple

Dear Robert Elliott: Order No.: 0310063

BIO-CHEM Laboratories, Inc. received 17 samples on 10/3/2003 for the analyses presented in the following report.

There were no problems with the analyses and all data for associated QC met EPA or laboratory specifications except where noted in the Case Narrative.

If you have any questions regarding these tests results, please feel free to call.

Please note that unless otherwise instructed, residual samples will be held for sixty (60) days from the original report date. At that time, all non-hazardous samples will be disposed of in accordance with federal, state and local regulations and ordinances, and hazardous samples shall be returned to you. Please contact the laboratory within thirty (30) days if other arrangements for sample retention need to be made.

Sincerely,

Sarah Honderd
Administrative Assistant

10-14-03

Working with you to insure a better tomorrow.

BIO-CHEM ENVIRONMENTAL ANALYTICAL LABORATORIES
1049 28th Street SE
Grand Rapids, MI 49508
PH: (616) 248-4900
Toll Free: 800-362-LABS
FAX: (616) 248-4904

Chain of Custody

1/2 03:10063

Project Number: 17-00757

Firm Name: GES
Turn around time: Standard
Date: 10-1-03
Date Due:
Firm Address: 7436 MALTBY Rd
Project Name: SUNCO Woodward & Maple
City, State, Zip: BRIGHTON MI 48116
State Samples Taken From: MI
Phone: 810 227 0002
Fax: 810 227 0003
Contact Person: Bob Elliott

Item No	Lab I.D.	Client Sample Number	Date Taken	Time Taken	Sample Description (sample type: water, soil, other)	Number of Containers	Analysis Desired (One per line): VOCs	MeOH	Remarks
1	01	TB#1 (11.5)	10/1/03		SOIL	2	X		
2	02	TB#2 (11.5)							
3	03	CW#1 (6.0)							
4	04	CW#2 (6.0)							
5	05	CW#3 (6.0)							
6	06	CW#4 (6.0)							
7	07	TB#3 (11.5)							
8	08	TB#4 (11.5)							
9	09	TB#5 (11.5)							
10	10	TB#6 (11.5)							

Released by	Received by	Date	Time
		10-3-03	11:15

Laboratory use only

- ☐ Blue Ice ____°
- ☒ Regular Ice <4°C
- ☐ No Coolant

BIO-CHEM ENVIRONMENTAL ANALYTICAL LABORATORIES
1049 28th Street SE
Grand Rapids, MI 49508
PH: (616) 248-4900
Toll Free: 800-362-LABS
FAX: (616) 248-4904

Chain of Custody

2 of 2
03100063

Project Number 17-00757

Firm Name GES
Turn around time Standard
Date 10-1-03
Date Due

Firm Address 7436 Maltby Rd
Project Name Sunoco Woodward & Maple
City, State, Zip BRIGHTON, MI 48116
State Samples Taken From MI
Phone 8102770022
Fax 8102270008
Contact Person Bob Elliott

Item No	Lab I.D.	Client Sample Number	Date Taken	Time Taken	Sample Description (sample type: water, soil, other)	Number of Containers	Analysis Desired (One per line) (L.L.C.)	Remarks
1	11	(L.C.) # CW#5	10/1/03		SOIL	2	X	MeOH
2	12	(L.C.) CW#6						
3	13	(L.C.) CW#7						
4	14	(L.C.) CW#8						
5	15	(L.C.) DB#1						
6	16	(L.C.) DB#2						
7	17	(L.C.) DB#3						
8								
9								
10								

Released by	Received by	Date	Time
		10-3-03	11.25

Laboratory use only

☐ Blue Ice ____°

☒ Regular Ice <4°C

☐ No Coolant

BIO-CHEM Laboratories, Inc.

Date: *07-Oct-03*

CLIENT: Groundwater Environmental Services
Project: Sunoco - Woodward @ Maple
Lab Order: 0310063

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Matrix	Collection Date	Date Received
0310063-01A	TB #1 (11.5')	Soil	10/1/2003	10/3/2003
0310063-02A	TB #2 (11.5')	Soil	10/1/2003	10/3/2003
0310063-03A	CW #1 (6.0')	Soil	10/1/2003	10/3/2003
0310063-04A	CW #2 (6.0')	Soil	10/1/2003	10/3/2003
0310063-05A	CW #3 (6.0')	Soil	10/1/2003	10/3/2003
0310063-06A	CW #4 (6.0')	Soil	10/1/2003	10/3/2003
0310063-07A	TB #3 (11.5')	Soil	10/1/2003	10/3/2003
0310063-08A	TB #4 (11.5')	Soil	10/1/2003	10/3/2003
0310063-09A	TB #5 (11.5')	Soil	10/1/2003	10/3/2003
0310063-10A	TB #6 (11.5')	Soil	10/1/2003	10/3/2003
0310063-11A	CW #5 (6.0')	Soil	10/1/2003	10/3/2003
0310063-12A	CW #6 (6.0')	Soil	10/1/2003	10/3/2003
0310063-13A	CW #7 (6.0')	Soil	10/1/2003	10/3/2003
0310063-14A	CW #8 (6.0')	Soil	10/1/2003	10/3/2003
0310063-15A	DB #1 (6.0')	Soil	10/1/2003	10/3/2003
0310063-16A	DB #2 (6.0')	Soil	10/1/2003	10/3/2003
0310063-17A	DB #3 (6.0')	Soil	10/1/2003	10/3/2003

BIO-CHEM Laboratories, Inc. Date: *07-Oct-03*

CLIENT: Groundwater Environmental Services
Project: Sunoco - Woodward @ Maple
Lab Order: 0310063

CASE NARRATIVE

Samples are routinely analyzed using methods outlined in the following references:

(SW) Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846, 3rd Ed.
(E) Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020.
(A) Standard Methods for the Examination of Water and Wastewater, APHA, 18th Ed.
(D) Annual Book of ASTM Standards.

Specific methods utilized for this project are provided in the analytical report and are identified by the reference document abbreviation ( ) followed by the method number.

All QA/QC and sample analyses met method, laboratory and/or regulatory data quality objectives unless otherwise specified below.

No data qualifications required.

BIO-CHEM Laboratories, Inc.

Date: *10/7/2003*

ANALYTICAL REPORT

CLIENT:	Groundwater Environmental Services	Project Number:	17-00757
Lab Order:	0310063	Client Sample ID:	TB #1 (11.5')
Project:	Sunoco - Woodward @ Maple	Collection Date:	10/1/2003
Lab Sample ID:	0310063-01A	Matrix:	SOIL

Analyses	Method Ref.	Result	Q	PQL	Units	DF	Analyst	Date
VOLATILES by GC/MS (5035)								
1. Benzene	SW8260B	350		50	µg/Kg-dry	1	DRF	10/6/2003
2. Toluene	SW8260B	77		50	µg/Kg-dry	1	DRF	10/6/2003
3. Ethylbenzene	SW8260B	7,900		50	µg/Kg-dry	1	DRF	10/6/2003
4. o-Xylene	SW8260B	80		50	µg/Kg-dry	1	DRF	10/6/2003
5. m,p-Xylene	SW8260B	1,100		100	µg/Kg-dry	1	DRF	10/6/2003
6. Methyl tert-butyl ether	SW8260B	< 250		250	µg/Kg-dry	1	DRF	10/6/2003
7. Naphthalene	SW8260B	12,000		250	µg/Kg-dry	1	DRF	10/6/2003
8. 2-Methylnaphthalene	SW8260B	12,000		250	µg/Kg-dry	1	DRF	10/6/2003
9. 1,2,4-Trimethylbenzene	SW8260B	2,200		50	µg/Kg-dry	1	DRF	10/6/2003
10. 1,3,5-Trimethylbenzene	SW8260B	410		50	µg/Kg-dry	1	DRF	10/6/2003

Definitions: PQL - Practical Quantitation Limit
DF - Dilution Factor

Qualifiers (Q): J - Detected below PQL but above MDL: Estimated
S - Spike Recovery Outside Acceptance Limits
B - Analyte detected in associated Method Blank
N - See case narrative for explanation

Note: The sample results reported are based on the sample aliquot(s) tested.

BIO-CHEM Laboratories, Inc.

Date: *10/7/2003*

ANALYTICAL REPORT

CLIENT:	Groundwater Environmental Services	Project Number:	17-00757
Lab Order:	0310063	Client Sample ID:	TB #2 (11.5')
Project:	Sunoco - Woodward @ Maple	Collection Date:	10/1/2003
Lab Sample ID:	0310063-02A	Matrix:	SOIL

Analyses	Method Ref.	Result	Q	PQL	Units	DF	Analyst	Date
VOLATILES by GC/MS (5035)								
1. Benzene	SW8260B	5,100		50	µg/Kg-dry	1	DRF	10/6/2003
2. Toluene	SW8260B	< 50		50	µg/Kg-dry	1	DRF	10/6/2003
3. Ethylbenzene	SW8260B	110		50	µg/Kg-dry	1	DRF	10/6/2003
4. o-Xylene	SW8260B	< 50		50	µg/Kg-dry	1	DRF	10/6/2003
5. m,p-Xylene	SW8260B	220		100	µg/Kg-dry	1	DRF	10/6/2003
6. Methyl tert-butyl ether	SW8260B	< 250		250	µg/Kg-dry	1	DRF	10/6/2003
7. Naphthalene	SW8260B	370		250	µg/Kg-dry	1	DRF	10/6/2003
8. 2-Methylnaphthalene	SW8260B	740		250	µg/Kg-dry	1	DRF	10/6/2003
9. 1,2,4-Trimethylbenzene	SW8260B	420		50	µg/Kg-dry	1	DRF	10/6/2003
10. 1,3,5-Trimethylbenzene	SW8260B	120		50	µg/Kg-dry	1	DRF	10/6/2003

Definitions: PQL - Practical Quantitation Limit
DF - Dilution Factor

Qualifiers (Q): J - Detected below PQL but above MDL: Estimated
S - Spike Recovery Outside Acceptance Limits
B - Analyte detected in associated Method Blank
N - See case narrative for explanation

Note: The sample results reported are based on the sample aliquot(s) tested.

BIO-CHEM Laboratories, Inc.

Date: *10/7/2003*

ANALYTICAL REPORT

CLIENT: Groundwater Environmental Services
Project Number: 17-00757
Lab Order: 0310063
Client Sample ID: CW #1 (6.0')
Project: Sunoco - Woodward @ Maple
Collection Date: 10/1/2003
Lab Sample ID: 0310063-03A
Matrix: SOIL

Analyses	Method Ref.	Result	Q	PQL	Units	DF	Analyst	Date
VOLATILES by GC/MS (5035)								
1. Benzene	SW8260B	260		50	µg/Kg-dry	1	DRF	10/6/2003
2. Toluene	SW8260B	< 50		50	µg/Kg-dry	1	DRF	10/6/2003
3. Ethylbenzene	SW8260B	< 50		50	µg/Kg-dry	1	DRF	10/6/2003
4. o-Xylene	SW8260B	< 50		50	µg/Kg-dry	1	DRF	10/6/2003
5. m,p-Xylene	SW8260B	< 100		100	µg/Kg-dry	1	DRF	10/6/2003
6. Methyl tert-butyl ether	SW8260B	< 250		250	µg/Kg-dry	1	DRF	10/6/2003
7. Naphthalene	SW8260B	< 250		250	µg/Kg-dry	1	DRF	10/6/2003
8. 2-Methylnaphthalene	SW8260B	< 250		250	µg/Kg-dry	1	DRF	10/6/2003
9. 1,2,4-Trimethylbenzene	SW8260B	88		50	µg/Kg-dry	1	DRF	10/6/2003
10 1,3,5-Trimethylbenzene	SW8260B	< 50		50	µg/Kg-dry	1	DRF	10/6/2003

Definitions: PQL - Practical Quantitation Limit
DF - Dilution Factor

Qualifiers (Q): J - Detected below PQL but above MDL: Estimated
S - Spike Recovery Outside Acceptance Limits
B - Analyte detected in associated Method Blank
N - See case narrative for explanation

Note: The sample results reported are based on the sample aliquot(s) tested.

BIO-CHEM Laboratories, Inc.

Date: *10/7/2003*

ANALYTICAL REPORT

CLIENT: Groundwater Environmental Services
Project Number: 17-00757
Lab Order: 0310063
Client Sample ID: CW #2 (6.0')
Project: Sunoco - Woodward @ Maple
Collection Date: 10/1/2003
Lab Sample ID: 0310063-04A
Matrix: SOIL

Analyses	Method Ref.	Result	Q	PQL	Units	DF	Analyst	Date
VOLATILES by GC/MS (5035)								
1. Benzene	SW8260B	< 50		50	µg/Kg-dry	1	DRF	10/6/2003
2. Toluene	SW8260B	< 50		50	µg/Kg-dry	1	DRF	10/6/2003
3. Ethylbenzene	SW8260B	< 50		50	µg/Kg-dry	1	DRF	10/6/2003
4. o-Xylene	SW8260B	< 50		50	µg/Kg-dry	1	DRF	10/6/2003
5. m,p-Xylene	SW8260B	< 100		100	µg/Kg-dry	1	DRF	10/6/2003
6. Methyl tert-butyl ether	SW8260B	< 250		250	µg/Kg-dry	1	DRF	10/6/2003
7. Naphthalene	SW8260B	< 250		250	µg/Kg-dry	1	DRF	10/6/2003
8. 2-Methylnaphthalene	SW8260B	< 250		250	µg/Kg-dry	1	DRF	10/6/2003
9. 1,2,4-Trimethylbenzene	SW8260B	< 50		50	µg/Kg-dry	1	DRF	10/6/2003
10. 1,3,5-Trimethylbenzene	SW8260B	< 50		50	µg/Kg-dry	1	DRF	10/6/2003

Definitions: PQL - Practical Quantitation Limit
DF - Dilution Factor

Qualifiers (Q): J - Detected below PQL but above MDL: Estimated
S - Spike Recovery Outside Acceptance Limits
B - Analyte detected in associated Method Blank
N - See case narrative for explanation

Note: The sample results reported are based on the sample aliquot(s) tested.

BIO-CHEM Laboratories, Inc.

Date: *10/7/2003*

ANALYTICAL REPORT

CLIENT:	Groundwater Environmental Services	Project Number:	17-00757
Lab Order:	0310063	Client Sample ID:	CW #3 (6.0')
Project:	Sunoco - Woodward @ Maple	Collection Date:	10/1/2003
Lab Sample ID:	0310063-05A	Matrix:	SOIL

Analyses	Method Ref.	Result	Q	PQL	Units	DF	Analyst	Date
VOLATILES by GC/MS (5035)								
1. Benzene	SW8260B	1,800		50	µg/Kg-dry	1	DRF	10/6/2003
2. Toluene	SW8260B	51		50	µg/Kg-dry	1	DRF	10/6/2003
3. Ethylbenzene	SW8260B	1,600		50	µg/Kg-dry	1	DRF	10/6/2003
4. o-Xylene	SW8260B	300		50	µg/Kg-dry	1	DRF	10/6/2003
5. m,p-Xylene	SW8260B	2,100		100	µg/Kg-dry	1	DRF	10/6/2003
6. Methyl tert-butyl ether	SW8260B	< 250		250	µg/Kg-dry	1	DRF	10/6/2003
7. Naphthalene	SW8260B	800		250	µg/Kg-dry	1	DRF	10/6/2003
8. 2-Methylnaphthalene	SW8260B	840		250	µg/Kg-dry	1	DRF	10/6/2003
9. 1,2,4-Trimethylbenzene	SW8260B	2,200		50	µg/Kg-dry	1	DRF	10/6/2003
10. 1,3,5-Trimethylbenzene	SW8260B	690		50	µg/Kg-dry	1	DRF	10/6/2003

Definitions: PQL - Practical Quantitation Limit
DF - Dilution Factor

Qualifiers (Q): J - Detected below PQL but above MDL: Estimated
S - Spike Recovery Outside Acceptance Limits
B - Analyte detected in associated Method Blank
N - See case narrative for explanation

Note: The sample results reported are based on the sample aliquot(s) tested.

BIO-CHEM Laboratories, Inc.

Date: *10/7/2003*

ANALYTICAL REPORT

CLIENT:	Groundwater Environmental Services	Project Number:	17-00757
Lab Order:	0310063	Client Sample ID:	CW #4 (6.0')
Project:	Sunoco - Woodward @ Maple	Collection Date:	10/1/2003
Lab Sample ID:	0310063-06A	Matrix:	SOIL

Analyses	Method Ref.	Result	Q	PQL	Units	DF	Analyst	Date
VOLATILES by GC/MS (5035)								
1. Benzene	SW8260B	220		50	µg/Kg-dry	1	DRF	10/6/2003
2. Toluene	SW8260B	4,600		50	µg/Kg-dry	1	DRF	10/6/2003
3. Ethylbenzene	SW8260B	2,000		50	µg/Kg-dry	1	DRF	10/6/2003
4. o-Xylene	SW8260B	4,300		50	µg/Kg-dry	1	DRF	10/6/2003
5. m,p-Xylene	SW8260B	7,000		100	µg/Kg-dry	1	DRF	10/6/2003
6. Methyl tert-butyl ether	SW8260B	< 250		250	µg/Kg-dry	1	DRF	10/6/2003
7. Naphthalene	SW8260B	< 250		250	µg/Kg-dry	1	DRF	10/6/2003
8. 2-Methylnaphthalene	SW8260B	< 250		250	µg/Kg-dry	1	DRF	10/6/2003
9. 1,2,4-Trimethylbenzene	SW8260B	310		50	µg/Kg-dry	1	DRF	10/6/2003
10. 1,3,5-Trimethylbenzene	SW8260B	< 50		50	µg/Kg-dry	1	DRF	10/6/2003

Definitions: PQL - Practical Quantitation Limit
DF - Dilution Factor

Qualifiers (Q): J - Detected below PQL but above MDL: Estimated
S - Spike Recovery Outside Acceptance Limits
B - Analyte detected in associated Method Blank
N - See case narrative for explanation

Note: The sample results reported are based on the sample aliquot(s) tested.

BIO-CHEM Laboratories, Inc.

Date: *10/7/2003*

ANALYTICAL REPORT

CLIENT:	Groundwater Environmental Services	Project Number:	17-00757
Lab Order:	0310063	Client Sample ID:	TB #3 (11.5')
Project:	Sunoco - Woodward @ Maple	Collection Date:	10/1/2003
Lab Sample ID:	0310063-07A	Matrix:	SOIL

Analyses	Method Ref.	Result	Q	PQL	Units	DF	Analyst	Date
VOLATILES by GC/MS (5035)								
1. Benzene	SW8260B	1,800		50	µg/Kg-dry	1	DRF	10/6/2003
2. Toluene	SW8260B	150		50	µg/Kg-dry	1	DRF	10/6/2003
3. Ethylbenzene	SW8260B	12,000		50	µg/Kg-dry	1	DRF	10/6/2003
4. o-Xylene	SW8260B	89		50	µg/Kg-dry	1	DRF	10/6/2003
5. m,p-Xylene	SW8260B	990		100	µg/Kg-dry	1	DRF	10/6/2003
6. Methyl tert-butyl ether	SW8260B	< 250		250	µg/Kg-dry	1	DRF	10/6/2003
7. Naphthalene	SW8260B	11,000		250	µg/Kg-dry	1	DRF	10/6/2003
8. 2-Methylnaphthalene	SW8260B	6,700		250	µg/Kg-dry	1	DRF	10/6/2003
9. 1,2,4-Trimethylbenzene	SW8260B	5,900		50	µg/Kg-dry	1	DRF	10/6/2003
10. 1,3,5-Trimethylbenzene	SW8260B	2,100		50	µg/Kg-dry	1	DRF	10/6/2003

Definitions: PQL - Practical Quantitation Limit
DF - Dilution Factor

Qualifiers (Q): J - Detected below PQL but above MDL: Estimated
S - Spike Recovery Outside Acceptance Limits
B - Analyte detected in associated Method Blank
N - See case narrative for explanation

Note: The sample results reported are based on the sample aliquot(s) tested.

CLIENT: Groundwater Environmental Services
Lab Order: 0310063
Project: Sunoco - Woodward @ Maple
Lab Sample ID: 0310063-08A

Project Number: 17-00757
Client Sample ID: TB #4 (11.5')
Collection Date: 10/1/2003
Matrix: SOIL

Analyses	Method Ref.	Result	Q	PQL	Units	DF	Analyst	Date
VOLATILES by GC/MS (5035)								
1. Benzene	SW8260B	3,700		50	µg/Kg-dry	1	DRF	10/6/2003
2. Toluene	SW8260B	84		50	µg/Kg-dry	1	DRF	10/6/2003
3. Ethylbenzene	SW8260B	180		50	µg/Kg-dry	1	DRF	10/6/2003
4. o-Xylene	SW8260B	< 50		50	µg/Kg-dry	1	DRF	10/6/2003
5. m,p-Xylene	SW8260B	< 100		100	µg/Kg-dry	1	DRF	10/6/2003
6. Methyl tert-butyl ether	SW8260B	< 250		250	µg/Kg-dry	1	DRF	10/6/2003
7. Naphthalene	SW8260B	< 250		250	µg/Kg-dry	1	DRF	10/6/2003
8. 2-Methylnaphthalene	SW8260B	< 250		250	µg/Kg-dry	1	DRF	10/6/2003
9. 1,2,4-Trimethylbenzene	SW8260B	< 50		50	µg/Kg-dry	1	DRF	10/6/2003
10. 1,3,5-Trimethylbenzene	SW8260B	< 50		50	µg/Kg-dry	1	DRF	10/6/2003

Definitions: PQL - Practical Quantitation Limit
DF - Dilution Factor

Qualifiers (Q): J - Detected below PQL but above MDL: Estimated
S - Spike Recovery Outside Acceptance Limits
B - Analyte detected in associated Method Blank
N - See case narrative for explanation

Note: The sample results reported are based on the sample aliquot(s) tested.

BIO-CHEM Laboratories, Inc.

Date: *10/7/2003*

ANALYTICAL REPORT

CLIENT: Groundwater Environmental Services
Project Number: 17-00757
Lab Order: 0310063
Client Sample ID: TB #5 (11.5')
Project: Sunoco - Woodward @ Maple
Collection Date: 10/1/2003
Lab Sample ID: 0310063-09A
Matrix: SOIL

Analyses	Method Ref.	Result	Q	PQL	Units	DF	Analyst	Date
VOLATILES by GC/MS (5035)								
1. Benzene	SW8260B	2,000		50	µg/Kg-dry	1	DRF	10/6/2003
2. Toluene	SW8260B	140		50	µg/Kg-dry	1	DRF	10/6/2003
3. Ethylbenzene	SW8260B	7,700		50	µg/Kg-dry	1	DRF	10/6/2003
4. o-Xylene	SW8260B	330		50	µg/Kg-dry	1	DRF	10/6/2003
5. m,p-Xylene	SW8260B	2,700		100	µg/Kg-dry	1	DRF	10/6/2003
6. Methyl tert-butyl ether	SW8260B	< 250		250	µg/Kg-dry	1	DRF	10/6/2003
7. Naphthalene	SW8260B	1,400		250	µg/Kg-dry	1	DRF	10/6/2003
8. 2-Methylnaphthalene	SW8260B	< 250		250	µg/Kg-dry	1	DRF	10/6/2003
9. 1,2,4-Trimethylbenzene	SW8260B	1,300		50	µg/Kg-dry	1	DRF	10/6/2003
10. 1,3,5-Trimethylbenzene	SW8260B	380		50	µg/Kg-dry	1	DRF	10/6/2003

Definitions: PQL - Practical Quantitation Limit
DF - Dilution Factor

Qualifiers (Q): J - Detected below PQL but above MDL: Estimated
S - Spike Recovery Outside Acceptance Limits
B - Analyte detected in associated Method Blank
N - See case narrative for explanation

Note: The sample results reported are based on the sample aliquot(s) tested.

BIO-CHEM Laboratories, Inc.

Date: *10/7/2003*

ANALYTICAL REPORT

CLIENT: Groundwater Environmental Services
Project Number: 17-00757
Lab Order: 0310063
Client Sample ID: TB #6 (11.5')
Project: Sunoco - Woodward @ Maple
Collection Date: 10/1/2003
Lab Sample ID: 0310063-10A
Matrix: SOIL

Analyses	Method Ref.	Result	Q	PQL	Units	DF	Analyst	Date
VOLATILES by GC/MS (5035)								
1. Benzene	SW8260B	480		50	µg/Kg-dry	1	DRF	10/6/2003
2. Toluene	SW8260B	59		50	µg/Kg-dry	1	DRF	10/6/2003
3. Ethylbenzene	SW8260B	3,100		50	µg/Kg-dry	1	DRF	10/6/2003
4. o-Xylene	SW8260B	79		50	µg/Kg-dry	1	DRF	10/6/2003
5. m,p-Xylene	SW8260B	410		100	µg/Kg-dry	1	DRF	10/6/2003
6. Methyl tert-butyl ether	SW8260B	< 250		250	µg/Kg-dry	1	DRF	10/6/2003
7. Naphthalene	SW8260B	4,200		250	µg/Kg-dry	1	DRF	10/6/2003
8. 2-Methylnaphthalene	SW8260B	6,200		250	µg/Kg-dry	1	DRF	10/6/2003
9. 1,2,4-Trimethylbenzene	SW8260B	1,300		50	µg/Kg-dry	1	DRF	10/6/2003
10. 1,3,5-Trimethylbenzene	SW8260B	310		50	µg/Kg-dry	1	DRF	10/6/2003

Definitions: PQL - Practical Quantitation Limit
DF - Dilution Factor

Qualifiers (Q): J - Detected below PQL but above MDL: Estimated
S - Spike Recovery Outside Acceptance Limits
B - Analyte detected in associated Method Blank
N - See case narrative for explanation

Note: The sample results reported are based on the sample aliquot(s) tested.

BIO-CHEM Laboratories, Inc.

Date: *10/7/2003*

ANALYTICAL REPORT

CLIENT: Groundwater Environmental Services
Project Number: 17-00757
Lab Order: 0310063
Client Sample ID: CW #5 (6.0')
Project: Sunoco - Woodward @ Maple
Collection Date: 10/1/2003
Lab Sample ID: 0310063-11A
Matrix: SOIL

Analyses	Method Ref.	Result	Q	PQL	Units	DF	Analyst	Date
VOLATILES by GC/MS (5035)								
1. Benzene	SW8260B	1,000		50	µg/Kg-dry	1	DRF	10/6/2003
2. Toluene	SW8260B	69		50	µg/Kg-dry	1	DRF	10/6/2003
3. Ethylbenzene	SW8260B	3,600		50	µg/Kg-dry	1	DRF	10/6/2003
4. o-Xylene	SW8260B	270		50	µg/Kg-dry	1	DRF	10/6/2003
5. m,p-Xylene	SW8260B	1,600		100	µg/Kg-dry	1	DRF	10/6/2003
6. Methyl tert-butyl ether	SW8260B	< 250		250	µg/Kg-dry	1	DRF	10/6/2003
7. Naphthalene	SW8260B	690		250	µg/Kg-dry	1	DRF	10/6/2003
8. 2-Methylnaphthalene	SW8260B	440		250	µg/Kg-dry	1	DRF	10/6/2003
9. 1,2,4-Trimethylbenzene	SW8260B	150		50	µg/Kg-dry	1	DRF	10/6/2003
10. 1,3,5-Trimethylbenzene	SW8260B	< 50		50	µg/Kg-dry	1	DRF	10/6/2003

Definitions: PQL - Practical Quantitation Limit
DF - Dilution Factor

Qualifiers (Q): J - Detected below PQL but above MDL: Estimated
S - Spike Recovery Outside Acceptance Limits
B - Analyte detected in associated Method Blank
N - See case narrative for explanation

Note: The sample results reported are based on the sample aliquot(s) tested.

BIO-CHEM Laboratories, Inc.

Date: *10/7/2003*

ANALYTICAL REPORT

CLIENT:	Groundwater Environmental Services	Project Number:	17-00757
Lab Order:	0310063	Client Sample ID:	CW #6 (6.0')
Project:	Sunoco - Woodward @ Maple	Collection Date:	10/1/2003
Lab Sample ID:	0310063-12A	Matrix:	SOIL

Analyses	Method Ref.	Result	Q	PQL	Units	DF	Analyst	Date
VOLATILES by GC/MS (5035)								
1. Benzene	SW8260B	< 50		50	µg/Kg-dry	1	DRF	10/6/2003
2. Toluene	SW8260B	< 50		50	µg/Kg-dry	1	DRF	10/6/2003
3. Ethylbenzene	SW8260B	220		50	µg/Kg-dry	1	DRF	10/6/2003
4. o-Xylene	SW8260B	240		50	µg/Kg-dry	1	DRF	10/6/2003
5. m,p-Xylene	SW8260B	570		100	µg/Kg-dry	1	DRF	10/6/2003
6. Methyl tert-butyl ether	SW8260B	< 250		250	µg/Kg-dry	1	DRF	10/6/2003
7. Naphthalene	SW8260B	420		250	µg/Kg-dry	1	DRF	10/6/2003
8. 2-Methylnaphthalene	SW8260B	810		250	µg/Kg-dry	1	DRF	10/6/2003
9. 1,2,4-Trimethylbenzene	SW8260B	4,300		50	µg/Kg-dry	1	DRF	10/6/2003
10. 1,3,5-Trimethylbenzene	SW8260B	1,500		50	µg/Kg-dry	1	DRF	10/6/2003

Definitions: PQL - Practical Quantitation Limit
DF - Dilution Factor

Qualifiers (Q): J - Detected below PQL but above MDL: Estimated
S - Spike Recovery Outside Acceptance Limits
B - Analyte detected in associated Method Blank
N - See case narrative for explanation

Note: The sample results reported are based on the sample aliquot(s) tested.

BIO-CHEM Laboratories, Inc.

Date: *10/7/2003*

ANALYTICAL REPORT

CLIENT: Groundwater Environmental Services
Project Number: 17-00757
Lab Order: 0310063
Client Sample ID: CW #7 (6.0')
Project: Sunoco - Woodward @ Maple
Collection Date: 10/1/2003
Lab Sample ID: 0310063-13A
Matrix: SOIL

Analyses	Method Ref.	Result	Q	PQL	Units	DF	Analyst	Date
VOLATILES by GC/MS (5035)								
1. Benzene	SW8260B	< 50		50	µg/Kg-dry	1	DRF	10/6/2003
2. Toluene	SW8260B	58		50	µg/Kg-dry	1	DRF	10/6/2003
3. Ethylbenzene	SW8260B	780		50	µg/Kg-dry	1	DRF	10/6/2003
4. o-Xylene	SW8260B	< 50		50	µg/Kg-dry	1	DRF	10/6/2003
5. m,p-Xylene	SW8260B	< 100		100	µg/Kg-dry	1	DRF	10/6/2003
6. Methyl tert-butyl ether	SW8260B	< 250		250	µg/Kg-dry	1	DRF	10/6/2003
7. Naphthalene	SW8260B	1,900		250	µg/Kg-dry	1	DRF	10/6/2003
8. 2-Methylnaphthalene	SW8260B	7,900		250	µg/Kg-dry	1	DRF	10/6/2003
9. 1,2,4-Trimethylbenzene	SW8260B	130		50	µg/Kg-dry	1	DRF	10/6/2003
10. 1,3,5-Trimethylbenzene	SW8260B	< 50		50	µg/Kg-dry	1	DRF	10/6/2003

Definitions: PQL - Practical Quantitation Limit
DF - Dilution Factor

Qualifiers (Q): J - Detected below PQL but above MDL: Estimated
S - Spike Recovery Outside Acceptance Limits
B - Analyte detected in associated Method Blank
N - See case narrative for explanation

Note: The sample results reported are based on the sample aliquot(s) tested.

BIO-CHEM Laboratories, Inc.

Date: *10/7/2003*

ANALYTICAL REPORT

CLIENT:	Groundwater Environmental Services	**Project Number:**	17-00757
Lab Order:	0310063	**Client Sample ID:**	CW #8 (6.0')
Project:	Sunoco - Woodward @ Maple	**Collection Date:**	10/1/2003
Lab Sample ID:	0310063-14A	**Matrix:**	SOIL

Analyses	Method Ref.	Result	Q	PQL	Units	DF	Analyst	Date
VOLATILES by GC/MS (5035)								
1. Benzene	SW8260B	190		50	µg/Kg-dry	1	DRF	10/6/2003
2. Toluene	SW8260B	< 50		50	µg/Kg-dry	1	DRF	10/6/2003
3. Ethylbenzene	SW8260B	1,500		50	µg/Kg-dry	1	DRF	10/6/2003
4. o-Xylene	SW8260B	< 50		50	µg/Kg-dry	1	DRF	10/6/2003
5. m,p-Xylene	SW8260B	620		100	µg/Kg-dry	1	DRF	10/6/2003
6. Methyl tert-butyl ether	SW8260B	< 250		250	µg/Kg-dry	1	DRF	10/6/2003
7. Naphthalene	SW8260B	4,300		250	µg/Kg-dry	1	DRF	10/6/2003
8. 2-Methylnaphthalene	SW8260B	7,000		250	µg/Kg-dry	1	DRF	10/6/2003
9. 1,2,4-Trimethylbenzene	SW8260B	3,900		50	µg/Kg-dry	1	DRF	10/6/2003
10. 1,3,5-Trimethylbenzene	SW8260B	730		50	µg/Kg-dry	1	DRF	10/6/2003

Definitions: PQL - Practical Quantitation Limit
DF - Dilution Factor

Qualifiers (Q): J - Detected below PQL but above MDL: Estimated
S - Spike Recovery Outside Acceptance Limits
B - Analyte detected in associated Method Blank
N - See case narrative for explanation

Note: The sample results reported are based on the sample aliquot(s) tested.

CLIENT: Groundwater Environmental Services
Lab Order: 0310063
Project: Sunoco - Woodward @ Maple
Lab Sample ID: 0310063-15A

Project Number: 17-00757
Client Sample ID: DB #1 (6.0')
Collection Date: 10/1/2003
Matrix: SOIL

Analyses	Method Ref.	Result	Q	PQL	Units	DF	Analyst	Date
VOLATILES by GC/MS (5035)								
1. Benzene	SW8260B	66		50	µg/Kg-dry	1	DRF	10/6/2003
2. Toluene	SW8260B	300		50	µg/Kg-dry	1	DRF	10/6/2003
3. Ethylbenzene	SW8260B	130		50	µg/Kg-dry	1	DRF	10/6/2003
4. o-Xylene	SW8260B	130		50	µg/Kg-dry	1	DRF	10/6/2003
5. m,p-Xylene	SW8260B	480		100	µg/Kg-dry	1	DRF	10/6/2003
6. Methyl tert-butyl ether	SW8260B	< 250		250	µg/Kg-dry	1	DRF	10/6/2003
7. Naphthalene	SW8260B	< 250		250	µg/Kg-dry	1	DRF	10/6/2003
8. 2-Methylnaphthalene	SW8260B	550		250	µg/Kg-dry	1	DRF	10/6/2003
9. 1,2,4-Trimethylbenzene	SW8260B	450		50	µg/Kg-dry	1	DRF	10/6/2003
10. 1,3,5-Trimethylbenzene	SW8260B	190		50	µg/Kg-dry	1	DRF	10/6/2003

Definitions: PQL - Practical Quantitation Limit
DF - Dilution Factor

Qualifiers (Q): J - Detected below PQL but above MDL: Estimated
S - Spike Recovery Outside Acceptance Limits
B - Analyte detected in associated Method Blank
N - See case narrative for explanation

Note: The sample results reported are based on the sample aliquot(s) tested.

CLIENT: Groundwater Environmental Services
Lab Order: 0310063
Project: Sunoco - Woodward @ Maple
Lab Sample ID: 0310063-16A

Project Number: 17-00757
Client Sample ID: DB #2 (6.0')
Collection Date: 10/1/2003
Matrix: SOIL

Analyses	Method Ref.	Result	Q	PQL	Units	DF	Analyst	Date
VOLATILES by GC/MS (5035)								
1. Benzene	SW8260B	< 50		50	µg/Kg-dry	1	DRF	10/6/2003
2. Toluene	SW8260B	< 50		50	µg/Kg-dry	1	DRF	10/6/2003
3. Ethylbenzene	SW8260B	< 50		50	µg/Kg-dry	1	DRF	10/6/2003
4. o-Xylene	SW8260B	< 50		50	µg/Kg-dry	1	DRF	10/6/2003
5. m,p-Xylene	SW8260B	< 100		100	µg/Kg-dry	1	DRF	10/6/2003
6. Methyl tert-butyl ether	SW8260B	< 250		250	µg/Kg-dry	1	DRF	10/6/2003
7. Naphthalene	SW8260B	< 250		250	µg/Kg-dry	1	DRF	10/6/2003
8. 2-Methylnaphthalene	SW8260B	< 250		250	µg/Kg-dry	1	DRF	10/6/2003
9. 1,2,4-Trimethylbenzene	SW8260B	< 50		50	µg/Kg-dry	1	DRF	10/6/2003
10. 1,3,5-Trimethylbenzene	SW8260B	< 50		50	µg/Kg-dry	1	DRF	10/6/2003

Definitions: PQL - Practical Quantitation Limit
DF - Dilution Factor

Qualifiers (Q): J - Detected below PQL but above MDL: Estimated
S - Spike Recovery Outside Acceptance Limits
B - Analyte detected in associated Method Blank
N - See case narrative for explanation

Note: The sample results reported are based on the sample aliquot(s) tested.

BIO-CHEM Laboratories, Inc.

Date: *10/7/2003*

ANALYTICAL REPORT

CLIENT: Groundwater Environmental Services
Lab Order: 0310063
Project: Sunoco - Woodward @ Maple
Lab Sample ID: 0310063-17A

Project Number: 17-00757
Client Sample ID: DB #3 (6.0')
Collection Date: 10/1/2003
Matrix: SOIL

Analyses	Method Ref.	Result	Q	PQL	Units	DF	Analyst	Date
VOLATILES by GC/MS (5035)								
1. Benzene	SW8260B	140		50	µg/Kg-dry	1	DRF	10/6/2003
2. Toluene	SW8260B	950		50	µg/Kg-dry	1	DRF	10/6/2003
3. Ethylbenzene	SW8260B	160		50	µg/Kg-dry	1	DRF	10/6/2003
4. o-Xylene	SW8260B	370		50	µg/Kg-dry	1	DRF	10/6/2003
5. m,p-Xylene	SW8260B	780		100	µg/Kg-dry	1	DRF	10/6/2003
6. Methyl tert-butyl ether	SW8260B	< 250		250	µg/Kg-dry	1	DRF	10/6/2003
7. Naphthalene	SW8260B	< 250		250	µg/Kg-dry	1	DRF	10/6/2003
8. 2-Methylnaphthalene	SW8260B	490		250	µg/Kg-dry	1	DRF	10/6/2003
9. 1,2,4-Trimethylbenzene	SW8260B	470		50	µg/Kg-dry	1	DRF	10/6/2003
10. 1,3,5-Trimethylbenzene	SW8260B	190		50	µg/Kg-dry	1	DRF	10/6/2003

Definitions: PQL - Practical Quantitation Limit
DF - Dilution Factor

Qualifiers (Q): J - Detected below PQL but above MDL: Estimated
S - Spike Recovery Outside Acceptance Limits
B - Analyte detected in associated Method Blank
N - See case narrative for explanation

Note: The sample results reported are based on the sample aliquot(s) tested.

BIO-CHEM Laboratories, Inc.

Lab Order: 0310063
Client: Groundwater Environmental Services
Project: Sunoco - Woodward @ Maple

ANALYTICAL DETAIL REPORT

Sample ID	Client Sample ID	Matrix	Test Name	Date Sampled	TCLP/SPLP Date	Prep Date	QC Batch	Analysis Date	Analytical Batch
0310063-01A	TB #1 (11.5')	Soil	VOLATILES by GC/MS (5035)	10/1/2003		10/6/2003	14976	10/6/2003	GCMS_Y_031006A
0310063-02A	TB #2 (11.5')	Soil	VOLATILES by GC/MS (5035)	10/1/2003		10/6/2003	14976	10/6/2003	GCMS_Y_031006A
0310063-03A	CW #1 (6.0')	Soil	VOLATILES by GC/MS (5035)	10/1/2003		10/6/2003	14976	10/6/2003	GCMS_Y_031006A
0310063-04A	CW #2 (6.0')	Soil	VOLATILES by GC/MS (5035)	10/1/2003		10/6/2003	14976	10/6/2003	GCMS_Y_031006A
0310063-05A	CW #3 (6.0')	Soil	VOLATILES by GC/MS (5035)	10/1/2003		10/6/2003	14976	10/6/2003	GCMS_Y_031006A
0310063-06A	CW #4 (6.0')	Soil	VOLATILES by GC/MS (5035)	10/1/2003		10/6/2003	14976	10/6/2003	GCMS_Y_031006A
0310063-07A	TB #3 (11.5')	Soil	VOLATILES by GC/MS (5035)	10/1/2003		10/6/2003	14976	10/6/2003	GCMS_Y_031006A
0310063-08A	TB #4 (11.5')	Soil	VOLATILES by GC/MS (5035)	10/1/2003		10/6/2003	14976	10/6/2003	GCMS_Y_031006A
0310063-09A	TB #5 (11.5')	Soil	VOLATILES by GC/MS (5035)	10/1/2003		10/6/2003	14976	10/6/2003	GCMS_Y_031006A
0310063-10A	TB #6 (11.5')	Soil	VOLATILES by GC/MS (5035)	10/1/2003		10/6/2003	14976	10/6/2003	GCMS_Y_031006A
0310063-11A	CW #5 (6.0')	Soil	VOLATILES by GC/MS (5035)	10/1/2003		10/6/2003	14976	10/6/2003	GCMS_Y_031006A
0310063-12A	CW #6 (6.0')	Soil	VOLATILES by GC/MS (5035)	10/1/2003		10/6/2003	14976	10/6/2003	GCMS_Y_031006A
0310063-13A	CW #7 (6.0')	Soil	VOLATILES by GC/MS (5035)	10/1/2003		10/6/2003	14976	10/6/2003	GCMS_Y_031006A
0310063-14A	CW #8 (6.0')	Soil	VOLATILES by GC/MS (5035)	10/1/2003		10/6/2003	14976	10/6/2003	GCMS_Y_031006A
0310063-15A	DB #1 (6.0')	Soil	VOLATILES by GC/MS (5035)	10/1/2003		10/6/2003	14976	10/6/2003	GCMS_Y_031006A
0310063-16A	DB #2 (6.0')	Soil	VOLATILES by GC/MS (5035)	10/1/2003		10/6/2003	14976	10/6/2003	GCMS_Y_031006A
0310063-17A	DB #3 (6.0')	Soil	VOLATILES by GC/MS (5035)	10/1/2003		10/6/2003	14976	10/6/2003	GCMS_Y_031006A
	DB #3 (6.0')	Soil	VOLATILES by GC/MS (5035)	10/1/2003		10/6/2003	14976	10/6/2003	GCMS_Y_031006A
	DB #3 (6.0')	Soil	VOLATILES by GC/MS (5035)	10/1/2003		10/6/2003	14976	10/6/2003	GCMS_Y_031006A

CITY OF BIRMINGHAM

2016 CONSUMERS ANNUAL REPORT ON WATER QUALITY

ATTENTION: THIS IS AN IMPORTANT REPORT ON WATER QUALITY AND SAFETY

The City of Birmingham, The Southeastern Oakland County Water Authority and the Great Lakes Water Authority (GLWA) are proud of the fine drinking water they supply and are honored to provide this report to you. The 2016 Consumers Annual Report on Water Quality shows the sources of our water, lists the results of our tests, and contains important information about water and health. We will notify you immediately if there is ever any reason for concern about our water. We are pleased to show you how we have surpassed water quality standards as mandated by the Environmental Protection Agency (EPA) and the Michigan Department of Environmental Quality (MDEQ).

About the System

The City of Birmingham purchases water from the Southeastern Oakland County Water Authority (SOCWA) at eleven locations. SOCWA provides GLWA water through its member distribution systems to a population of 210,000 within a 56 square mile area. Current members are: Berkley, Beverly Hills, Bingham Farms, Birmingham, Clawson, Huntington Woods, Lathrup Village, Pleasant Ridge, Royal Oak, Southfield and Southfield Township.

Your source water comes from the Detroit River, situated within the Lake St. Clair, and several watersheds within U.S. and Canada. The Michigan Department of Environmental Quality in partnership the Detroit Water and Sewerage Department and several other governmental agencies performed a source water assessment in 2004 to determine the susceptibility or relative potential of contamination. The susceptibility rating is on a seven-tiered scale from ”very low” to “very high” based primarily on geologic sensitivity, water chemistry, and contamination sources. The susceptibility of our Detroit River source water intakes were determined to be highly susceptible to potential contamination. However, all four Detroit water treatment plants that use source water from Detroit River have historically provided satisfactory treatment of this source water to meet drinking water standards.

GLWA initiated source-water protection activities that include chemical containment, spill response, and a mercury reduction program. GLWA participates in a National Pollutant Discharge Elimination System permit discharge program and has an emergency response management plan. GLWA voluntarily developed and receive approval in 2016 for a source water protection program (SWIPP) for the Detroit River intakes. The programs includes seven elements that include the following: roles and duties of government units and water supply agencies, delineation of a source water protection area, identification of potential of source water protection area, management approaches for protection, contingency plans, siting of new sources and public participation and education. If you would like to know more information about the Source Water Assessment or SWIPP, contact your water department (248) 288-5150.

Your source water comes from the lower Lake Huron watershed. The watershed includes numerous short, seasonal streams that drain to Lake Huron. The Michigan Department of Environmental Quality in partnership the Detroit Water and Sewerage Department and several other governmental agencies performed a source water assessment in 2004 to determine the susceptibility or relative potential of contamination. The susceptibility rating is on a seven-tiered scale ranging from “very low” to “very high” based primarily on geologic sensitivity, water chemistry, and contamination sources. The Lake Huron source water intake is categorized as having a moderately low susceptibility to potential contaminant sources. The Lake Huron water treatment plant has historically provided satisfactory treatment of this source water to meet drinking water standards.

GLWA voluntarily developed and received approval in 2016 for a source water protection program (SWIPP) for the Lake Huron Water Treatment Plant intake. The program includes seven elements that include the following: roles and duties of government units and water supply agencies, delineation of a source water protection area, identification of potential of source water protection area, management approaches for protection, contingency plans, siting of new sources and public participation and education. If you would like to know more information about the Source Water Assessment or the SWIPP please, contact your water department (248) 288-5150.

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the Environmental Protection Agency’s Safe Drinking Water Hotline at (800-426-4791).

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

Contaminants that may be present in source water include:

- Microbial contaminants, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations, and wildlife.
- Inorganic contaminants, such as salts and metals, which can be naturally-occurring or result from urban storm water runoff, industrial or domestic wastewater discharges, oil and gas production, mining, or farming.
- Pesticides and herbicides, which may come from a variety of sources such as agriculture, urban storm water runoff, and residential uses.
- Organic chemical contaminants, including synthetic and volatile organics, which are by-products of industrial processes and petroleum production, and can also come from gas stations, urban storm water runoff and septic systems.
- Radioactive contaminants, which can be naturally occurring or be the result of oil and gas production and mining activities.

In order to ensure that tap water is safe to drink, EPA prescribes regulations, which limit the amount of certain contaminants in water provided by public water systems. The Food and Drug Administration (FDA) regulations establish limits for contaminants in bottled water, which must provide the same protection for public health.

Key to the Detected Contaminants Table

Symbol	Abbreviation	Definition/Explanation
>	Greater than	
°C	Celsius	A scale of temperature in which water freezes at 0° and boils at 100° under standard conditions.
AL	Action Level	The concentration of a contaminant, which, if exceeded, triggers treatment or other requirements which a water system must follow.
HAA5	Haloacetic Acids	HAA5 is the total of bromoacetic, chloroacetic, dibromoacetic, dichloroacetic, and trichloroacetic acids. Compliance is based on the total.
LRAA	Locational Running Annual Average	The average of analytical results for samples at a particular monitoring location during the previous four quarters.
MCL	Maximum Contaminant Level	The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.
MCLG	Maximum Contaminant Level Goal	The level of contaminant in drinking water below which there is no known or expected risk to health.
MRDL	Maximum Residual Disinfectant Level	The highest level of disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.
MRDLG	Maximum Residual Disinfectant Level Goal	The level of a drinking water disinfectant below which there is no known or expected risk to health. MRLDG's do not reflect the benefits of the use of disinfectants to control microbial contaminants.
n/a	not applicable	
ND	Not Detected	
NTU	Nephelometric Turbidity Units	Measures the cloudiness of water.
pCi/L	Picocuries Per Liter	A measure of radioactivity
ppb	Parts Per Billion (one in one billion)	The ppb is equivalent to micrograms per liter. A microgram = 1/1000 milligram.
ppm	Parts Per Million (one in one million)	The ppm is equivalent to milligrams per liter. A milligram = 1/1000 gram.
RAA	Running Annual Average	The average of analytical results for all samples during the previous four quarters.
TT	Treatment Technique	A required process intended to reduce the level of a contaminant in drinking water.
TTHM	Total Trihalomethanes	Total Trihalomethanes is the sum of chloroform, bromodichloromethane, dibromoochloromethane and bromoform. Compliance is based on the total.
µmhos	Micromhos	Measure of electrical conductance of water

Springwells Water Treatment Plant
2016 Regulated Detected Contaminants Tables

The Great Lakes Water Authority monitored for Cryptosporidium in our source water (Detroit River) from our Southwest Water Treatment Plant during 2016. Cryptosporidium was detected twice in our source water samples. A follow-up water sample was collected from the treated water and Cryptosporidium was not found to be present. Cryptosporidium is a microbial pathogen found in surface water throughout the U.S. Although filtration removes Cryptosporidium, the most commonly-used filtration methods cannot guarantee 100 percent removal. Our monitoring indicates the presence of these organisms in our source water. Current test methods do not allow us to determine if the organisms are dead or if they are capable of causing disease. Ingestion of Cryptosporidium may cause cryptosporidiosis, an abdominal infection. Symptoms of infection include nausea, diarrhea, and abdominal cramps. Most healthy individuals can overcome the disease within a few weeks. However, immunocompromised people, infants and small children, and the elderly are at greater risk of developing life-threatening illness. We encourage immuno-compromised individuals to consult their doctor regarding appropriate precautions to take to avoid infection. Cryptosporidium must be ingested to cause disease, and it may be spread through means other than drinking water.

Inorganic Chemicals – Monitoring at the Plant Finished Water Tap

Regulated Contaminant	Test Date	Unit	Health Goal MCLG	Allowed Level MCL	Highest Level Detected	Range of Detection	Violation yes/no	Major Sources in Drinking Water
Fluoride	5-10-16	ppm	4	4	0.50	n/a	no	Erosion of natural deposits; Water additive, which promotes strong teeth; Discharge from fertilizer and aluminum factories.
Nitrate	5-10-16	ppm	10	10	0.34	n/a	no	Runoff from fertilizer use; Leaching from septic tanks, sewage; Erosion of natural deposits.

Disinfection By-Products – Monitoring in Distribution System, Stage 2 Disinfection By-Products

Regulated Contaminant	Test Date	Unit	Health Goal MCLG	Allowed Level MCL	Highest LRAA	Range of Detection	Violation yes/no	Major Sources in Drinking Water
Total Trihalomethanes (TTHM)	2016	ppb	n/a	80	22	11 – 37.8	no	By-product of drinking water chlorination
Haloacetic Acids (HAA5)	2016	ppb	n/a	60	9	6 - 11	no	By-product of drinking water disinfection

Disinfectant Residuals – Monitoring in Distribution System by Treatment Plant

Regulated Contaminant	Test Date	Unit	Health Goal MRDLG	Allowed Level MRDL	Highest RAA	Quarterly Range of Detection	Violation yes/no	Major Sources in Drinking Water
Total Chlorine Residual	Jan-Dec 2016	ppm	4	4	0.74	0.67-0.81	no	Water additive used to control microbes

2016 Turbidity – Monitored every 4 hours at Plant Finished Water

Highest Single Measurement Cannot exceed 1 NTU	Lowest Monthly % of Samples Meeting Turbidity Limit of 0.3 NTU (minimum 95%)	Violation yes/no	Major Sources in Drinking Water
0.33 NTU	99.7 %	no	Soil Runoff

Turbidity is a measure of the cloudiness of water. We monitor it because it is a good indicator of the effectiveness of our filtration system.

January – March 2016 Microbiological Contaminants – Monthly Monitoring in Distribution System

Regulated Contaminant	MCLG	MCL	Highest Number Detected	Violation yes/no	Major Sources in Drinking Water
Total Coliform Bacteria	0	Presence of Coliform bacteria > 5% of monthly samples	0	no	Naturally present in the environment
E. coli Bacteria	0	A routine sample and a repeat sample are total coliform positive, and one is also fecal or E.coli positive.	0	no	Human waste and animal fecal waste.

Springwells Water Treatment Plant
2016 Regulated Detected Contaminants Tables

2014 Lead and Copper Monitoring at Customers' Tap

Regulated Contaminant	Test Date	Unit	Health Goal MCLG	Action Level AL	90th Percentile Value*	Number of Samples over AL	Violation yes/no	Major Sources in Drinking Water
Lead	2014	ppb	0	15	0	0	No	Corrosion of household plumbing system; Erosion of natural deposits.
Copper	2014	ppb	1300	1300	82.5	0	no	Corrosion of household plumbing system; Erosion of natural deposits; Leaching from wood preservatives.

*The 90th percentile value means 90 percent of the homes tested have lead and copper levels below the given 90th percentile value. If the 90th percentile value is above the AL additional requirements must be met.

Regulated Contaminant	Treatment Technique	Typical Source of Contaminant
Total Organic Carbon (ppm)	The Total Organic Carbon (TOC) removal ratio is calculated as the ratio between the actual TOC removal and the TOC removal requirements. The TOC was measured each quarter and because the level was low, there is no TOC removal requirement	Erosion of natural deposits

Contaminant	MCLG	MCL	Level Detected	Source of Contamination
Sodium (ppm)	n/a	n/a	4.66	Erosion of natural deposits

Northeast Water Treatment Plant
2016 Regulated Detected Contaminants Tables

Regulated Contaminant	Treatment Technique	Typical Source of Contaminant
Total Organic Carbon (ppm)	The Total Organic Carbon (TOC) removal ratio is calculated as the ratio between the actual TOC removal and the TOC removal requirements. The TOC was measured each quarter and because the level was low, there is no TOC removal requirement	Erosion of natural deposits

Contaminant	MCLG	MCL	Level Detected	Source of Contamination
Sodium (ppm)	n/a	n/a	4.96	Erosion of natural deposits

Northeast Water Treatment Plant
2016 Regulated Detected Contaminants Tables

Inorganic Chemicals – Monitoring at the Plant Finished Water Tap

Regulated Contaminant	Test Date	Unit	Health Goal MCLG	Allowed Level MCL	Highest Level Detected	Range of Detection	Violation yes/no	Major Sources in Drinking Water
Fluoride	5-10-16	**ppm**	**4**	**4**	0.49	n/a	no	Erosion of natural deposits; Water additive, which promotes strong teeth; Discharge from fertilizer and aluminum factories.
Nitrate	5-10-16	**ppm**	**10**	**10**	0.48	n/a	no	Runoff from fertilizer use; Leaching from septic tanks, sewage; Erosion of natural deposits.

Disinfection By-Products – Monitoring in Distribution System, Stage 2 Disinfection By-Products

Regulated Contaminant	Test Date	Unit	Health Goal MCLG	Allowed Level MCL	Highest LRAA	Range of Detection	Violation yes/no	Major Sources in Drinking Water
Total Trihalomethanes (TTHM)	2016	**ppb**	n/a	**80**	22	11 – 37.8	no	By-product of drinking water chlorination
Haloacetic Acids (HAA5)	2016	**ppb**	n/a	**60**	9	6 - 11	no	By-product of drinking water disinfection

Disinfectant Residuals – Monitoring in Distribution System by Treatment Plant

Regulated Contaminant	Test Date	Unit	Health Goal MRDLG	Allowed Level MRDL	Highest RAA	Quarterly Range of Detection	Violation yes/no	Major Sources in Drinking Water
Total Chlorine Residual	Jan-Dec 2016	**ppm**	**4**	**4**	0.77	0.71-0.84	no	Water additive used to control microbes

2016 Turbidity – Monitored every 4 hours at Plant Finished Water

Highest Single Measurement Cannot exceed 1 NTU	Lowest Monthly % of Samples Meeting Turbidity Limit of 0.3 NTU (minimum 95%)	Violation yes/no	Major Sources in Drinking Water
0.17 NTU	100 %	no	Soil Runoff

Turbidity is a measure of the cloudiness of water. We monitor it because it is a good indicator of the effectiveness of our filtration system.

January – March 2016 Microbiological Contaminants – Monthly Monitoring in Distribution System

Regulated Contaminant	MCLG	MCL	Highest Number Detected	Violation yes/no	Major Sources in Drinking Water
Total Coliform Bacteria	0	Presence of Coliform bacteria > 5% of monthly samples	0	**no**	Naturally present in the environment
***E. coli* Bacteria**	0	A routine sample and a repeat sample are total coliform positive, and one is also fecal or E.coli positive.	0	**no**	Human waste and animal fecal waste.

2014 Lead and Copper Monitoring at Customers' Tap

Regulated Contaminant	Test Date	Unit	Health Goal MCLG	Action Level AL	90th Percentile Value*	Number of Samples over AL	Violation yes/no	Major Sources in Drinking Water
Lead	**2014**	**ppb**	**0**	**15**	**0**	**0**	No	Corrosion of household plumbing system; Erosion of natural deposits.
Copper	**2014**	**ppb**	**1300**	**1300**	**82.5**	**0**	no	Corrosion of household plumbing system; Erosion of natural deposits; Leaching from wood preservatives.

*The 90th percentile value means 90 percent of the homes tested have lead and copper levels below the given 90th percentile value. If the 90th percentile value is above the AL additional requirements must be met.

Lake Huron Water Treatment Plant
2016 Regulated Detected Contaminants Tables

Inorganic Chemicals – Monitoring at the Plant Finished Water Tap

Regulated Contaminant	Test Date	Unit	Health Goal MCLG	Allowed Level MCL	Highest Level Detected	Range of Detection	Violation yes/no	Major Sources in Drinking Water
Fluoride	5-10-16	ppm	**4**	**4**	0.50	n/a	no	Erosion of natural deposits; Water additive, which promotes strong teeth; Discharge from fertilizer and aluminum factories.
Nitrate	5-10-16	ppm	**10**	**10**	0.46	n/a	no	Runoff from fertilizer use; Leaching from septic tanks, sewage; Erosion of natural deposits.

Disinfection By-Products – Monitoring in Distribution System, Stage 2 Disinfection By-Products

Regulated Contaminant	Test Date	Unit	Health Goal MCLG	Allowed Level MCL	Highest LRAA	Range of Detection	Violation yes/no	Major Sources in Drinking Water
Total Trihalomethanes (TTHM)	2016	**ppb**	n/a	**80**	22	11 – 37.8	no	By-product of drinking water chlorination
Haloacetic Acids (HAA5)	2016	**ppb**	n/a	**60**	9	6 - 11	no	By-product of drinking water disinfection

Disinfectant Residuals – Monitoring in Distribution System by Treatment Plant

Regulated Contaminant	Test Date	Unit	Health Goal MRDLG	Allowed Level MRDL	Highest RAA	Quarterly Range of Detection	Violation yes/no	Major Sources in Drinking Water
Total Chlorine Residual	Jan-Dec 2016	**ppm**	**4**	**4**	0.79	0.61-0.85	no	Water additive used to control microbes

2016 Turbidity – Monitored every 4 hours at Plant Finished Water

Highest Single Measurement Cannot exceed 1 NTU	Lowest Monthly % of Samples Meeting Turbidity Limit of 0.3 NTU (minimum 95%)	Violation yes/no	Major Sources in Drinking Water
0.28 NTU	100 %	no	Soil Runoff

Turbidity is a measure of the cloudiness of water. We monitor it because it is a good indicator of the effectiveness of our filtration system.

2016 Microbiological Contaminants – Monthly Monitoring in Distribution System

Regulated Contaminant	MCLG	MCL	Highest Number Detected	Violation yes/no	Major Sources in Drinking Water
Total Coliform Bacteria	0	Presence of Coliform bacteria > 5% of monthly samples	0	**no**	Naturally present in the environment
***E. coli* Bacteria**	0	A routine sample and a repeat sample are total coliform positive, and one is also fecal or E.coli positive.	0	**no**	Human waste and animal fecal waste.

2014 Lead and Copper Monitoring at Customer Tap

Regulated Contaminant	Test Date	Unit	Health Goal MCLG	Action Level AL	90th Percentile Value*	Number of Samples over AL	Violation yes/no	Major Sources in Drinking Water
Lead	**2014**	**ppb**	**0**	**15**	**0**	**0**	No	Corrosion of household plumbing system; Erosion of natural deposits.
Copper	**2014**	**ppb**	**1300**	**1300**	**82.5**	**0**	no	Corrosion of household plumbing system; Erosion of natural deposits; Leaching from wood preservatives.

*The 90th percentile value means 90 percent of the homes tested have lead and copper levels below the given 90th percentile value. If the 90th percentile value is above the AL additional requirements must be met.

Lake Huron Water Treatment Plant
2016 Regulated Detected Contaminants Tables

Regulated Contaminant	Treatment Technique	Typical Source of Contaminant
Total Organic Carbon (ppm)	The Total Organic Carbon (TOC) removal ratio is calculated as the ratio between the actual TOC removal and the TOC removal requirements. The TOC was measured each quarter and because the level was low, there is no TOC removal requirement	Erosion of natural deposits

Radionuclides 2014

Regulated contaminant	Test date	Unit	Health Goal MCLG	Allowed Level	Level detected	Violation Yes/no	Major Sources in Drinking water
Combined Radium 226 and 228	5-13-14	pCi/L	0	**5**	0.86 + or – 0.55	no	Erosion of natural deposits

Contaminant	MCLG	MCL	Level Detected	Source of Contamination
Sodium (ppm)	n/a	n/a	4.00	Erosion of natural deposits

UCMR3 - 2014

The Unregulated Contaminant Monitoring Rule (UCMR 3) provides EPA and other interested parties with scientifically valid data on the occurrence of contaminants in drinking water. These data serve as a primary source of occurrence and exposure information that the agency uses to develop regulatory decisions.

The table lists the minimum reporting level, average and range of each contaminant detected.

Detection levels are in micro grams per Liter (1µg/L = 1ppb)

Contaminant	Minimum Reporting Level µg/L	AVG	Range
Chromium (total)	0.2	0.17	0.24 - 0.33
Strontium	0.3	99.21	97.3 - 103
Vanadium	0.2	0.056	0.22 - 0.23
Chromium-6	0.03	0.11	0.01 - 0.13

IMPORTANT HEALTH INFORMATION

Lead

If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. The City of Birmingham is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline or at www.epa.gov/safewater/lead.

People With Special Health Concerns

Some people may be more vulnerable to contaminants in drinking water than is the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA/CDC guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline at (800) 426-4791.

Questions:

- Local Distribution: City of Birmingham, Public Works Administration (248) 530-1700
- Southeastern Oakland County Water Supply System – Water Authority offices: (248) 288-5150. Visit our web site at www.socwa.org
- Detroit Water and Sewerage Department – Water Quality Division at (313) 926-8128 – www.dwsd.org
- Great Lakes Water Authority – www.glwater.org
- Michigan Department of Environmental Quality - (586) 753-3755 – www.michigan.gov/deq
- U.S. Environmental Protection Agency – Safe Drinking Water Hotline: (800) 426-4791.
- Water quality data for community water systems throughout the United States is available at www.epa.gov/drink/

Traffic Impact Assessment of Proposed

THE MAPLE

35001 & 35075 Woodward Avenue
Birmingham, Michigan 48009

Prepared For:
Kevin Biddison, AIA
Biddison Architecture + Design
320 Martin Street, Suite 10
Birmingham, MI 48009

Applicant Information:
Hesham Gayar
8469 Warwick Grove Court
Grand Blanc, MI 48439

Prepared: November 26, 2018
Revised: January 6, 2020

STONEFIELD

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TECHNICAL APPENDIX

Executive Summary

The Applicant is proposing to construct a five (5)-story mixed-use building on the subject site which is currently occupied by the Hunter House Hamburgers restaurant and a surface parking lot. The development would consist of 10,150 square feet of gross leasable retail space on the ground level, 21,675 square feet of gross leasable office space on the second floor, 42 apartment units on floors three (3) through five (5), and the existing Hunter House Hamburgers restaurant would be moved into a 1,330-square-foot space located at the northeastern corner of the proposed building. Parking on-site would be provided by a ground-level garage with three (3) parking spaces designated for employees of the Hunter House Hamburgers restaurant and ADA-accessible parking, and a 82 parking space, two (2)-level underground garage with 63 spaces designated for residents, 11 spaces designated for Hunter House Hamburger patrons, and eight (8) spaces designated for office employees. Construction and full occupancy are expected by 2021.

Access to the Hunter House Hamburgers ground-level parking garage would be provided via one (1) full-movement driveway along Hamilton Row, and access to the two (2)-level underground parking garage would be provided via one (1) full-movement driveway along Park Street.

The site is located within the parking assessment district, and as such, no parking is required for the non-residential portion of the development. However, parking for patrons of the Hunter House Hamburger restaurant and a portion of the office employees would be provided within the parking garage. Of the 82 parking spaces provided within the garage, 63 spaces would be designated for residents, 11 spaces would be designated for Hunter House Hamburger patrons, and eight (8) spaces would be designated for office employees.

The trips generated by the proposed development were assigned to the study network based on existing traffic patterns and proposed vehicle parking locations. Any additional trips into and out of the site that are generated by the off-site parking were also added to the study network.

This Traffic Impact Assessment was prepared by Stonefield Engineering & Design, LLC, utilized the City of Birmingham's Traffic Study Questionnaire (Form B), as well as accepted traffic engineering practices for Traffic Impact Assessments.

The key findings and conclusions developed in this study are as follows:

1. The proposed apartments are projected to generate 15 trips (4 in, 11 out) during the weekday morning peak hour and 18 trips (11 in, 7 out) during the weekday evening peak hour. The proposed office is projected to generate 47 trips (40 in, 7 out) during the weekday morning peak hour and 27 trips (4 in, 23 out) during the weekday evening peak hour. The retail uses are projected to generate 10 trips (6 in, 4 out) during the weekday morning peak hour and 100 trips (48 in, 52 out) during the weekday evening peak hour. The Hunter House Hamburgers restaurant is to continue operating on the site and is projected to generate three (3) trips (3 in, 0 out) during the weekday morning peak hour and 38 trips (19 in, 19 out) during the weekday evening peak hour.

2. Traffic for employees of the Hunter House Hamburgers restaurant and ADA parking would utilize the full-movement driveway along Hamilton Row. Traffic for the apartments, patrons of the Hunter House Hamburgers, and a portion of office employees would arrive to and depart from the driveway along Park Street. Traffic for the retail uses and remaining portion of office employees would utilize the parking garages located at 333 Park Street and 222 Peabody Street. Based on parking occupancy count data from March 2017, there is sufficient parking supply to accommodate the parking demand during the weekday morning and evening periods.

3. The site is located within the downtown parking assessment district, and as such, no parking is required for the non-residential portion development. The site would provide three (3) ground-level garage

parking spaces designated for Hunter House Hamburgers, and 82 parking spaces below grade, including 63 parking spaces for residents, 11 spaces dedicated to Hunter House Hamburgers, and eight (8) parking spaces for employees at the subject site.

4. The proposed development would further the City's Multi-Modal Transportation Plan by improving the urban character of the block, expanding the downtown footprint and removing surface parking lots that do not encourage pedestrian travel or interaction. The site's location would provide an additional destination in the vicinity of six (6) SMART bus routes. It is recommended that the office and retail uses provide transit information for its employees to encourage transit use.

5. The proposed development would further the City's Multi-Modal Transportation Plan by completing the sidewalk network along Woodward Avenue between Hamilton Row and Maple Road, whereas a combination of sidewalk and asphalt pavement for a parking lot exists today.

6. The proposed development would further the City's Multi-Modal Transportation Plan by providing outdoor bicycle racks at the entrances to the retail uses and Hunter House Hamburgers for visitor use and covered indoor bicycle storage would be provided within the parking garage for use by office employees and residents of the apartments. The proposed bicycle storage encourages bicycle use at the site and reduces the need for trips via automobile.

7. Gated access is not proposed at any of the parking areas.

8. Based on a Level of Service and Volume/Capacity analysis, the proposed development would not have a significant impact on the traffic operations of the roadway network during the weekday morning and weekday evening peak hours.

9. No traffic infrastructure improvements are warranted by the proposed development; however, the analysis does consider the proposed two-way operation of Park Street approved by the City of Birmingham.

Introduction

The Applicant is proposing to construct a five (5)-story mixed-use building on the subject site which is currently occupied by the Hunter House Hamburgers restaurant and a surface parking lot. The site is bounded by Woodward Avenue to the east, Park Street to the west, Hamilton Row to the north, and Maple Road to the south. The subject site location is shown on a map on **Figure 1** and is shown isometrically on **Figure 2**. The development would consist of 10,150 square feet of gross leasable retail space on the ground level, 21,675 square feet of gross leasable office space on the second floor, 42 apartment units on floors three (3) through five (5), and the existing Hunter House Hamburgers restaurant would be moved into a 1,330-square-foot space located at the northeastern corner of the proposed building. Parking on-site would be provided by a ground-level garage with three (3) parking spaces designated for Hunter House Hamburgers, and a 82 parking space, two (2)-level underground garage with 63 spaces designated for residents, 11 spaces designated for Hunter House Hamburgers, and eight (8) spaces for employees of the proposed development. Construction and full occupancy are expected by 2021.

Access to the Hunter House Hamburgers is currently provided via one (1) full-movement driveway along Hamilton Row and one (1) right-ingress/right-egress driveway along Woodward Avenue, and access to the adjacent surface parking lot is currently provided via two (2) right-ingress/right-egress driveways along Woodward Avenue. Under the proposed development program, access to the Hunter House Hamburgers ground-level parking area would be provided via one (1) full-movement driveway along Hamilton Row, and access to the two (2)-level underground parking garage would be provided via one (1) full-movement driveway along Park Street. The site is located within the downtown parking assessment district, and as such, 63 parking spaces are required for the 42 proposed residential apartment units, and no parking is required for the proposed non-residential portion of the development. A total of 85 parking spaces are proposed.

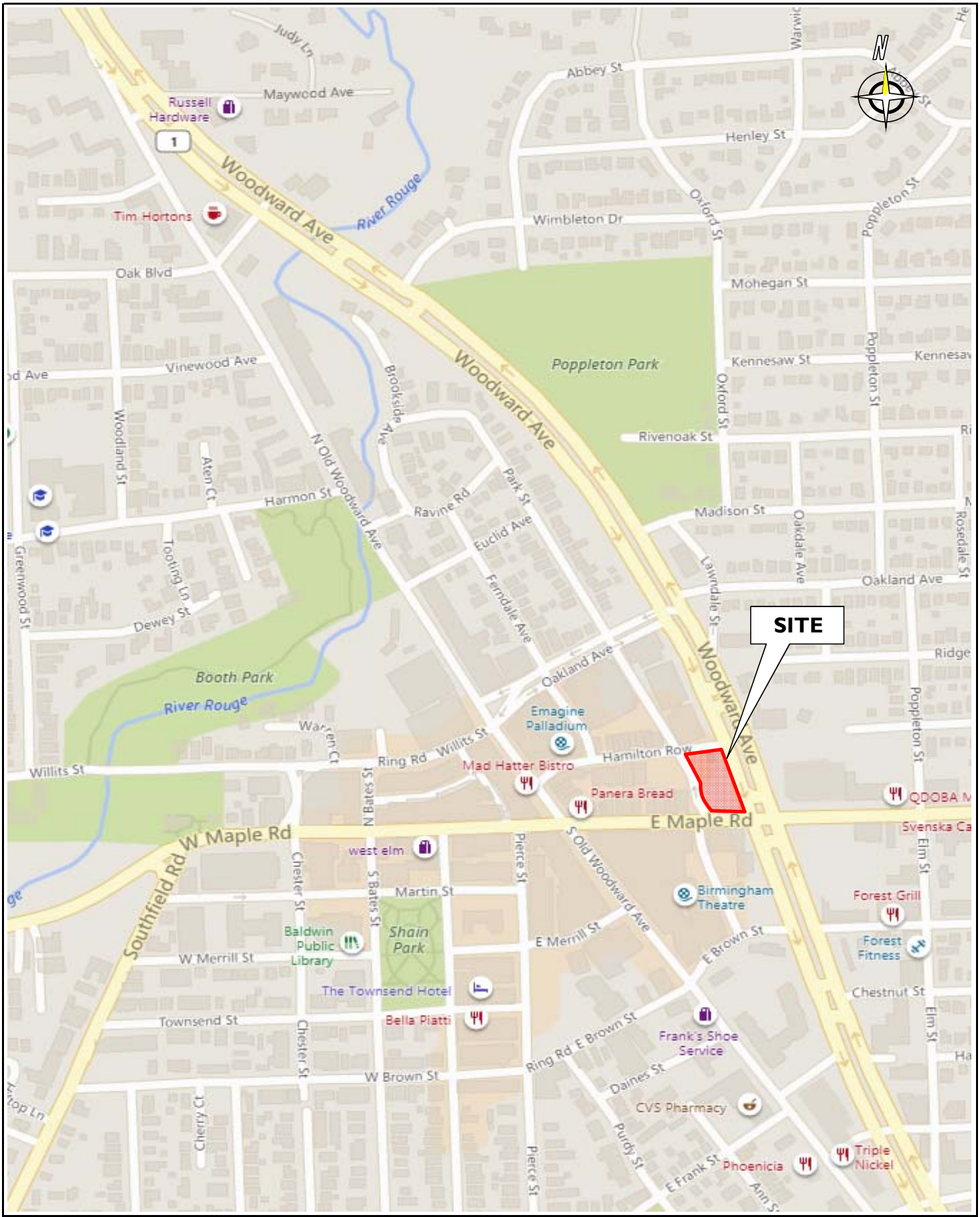
This Traffic Impact Assessment was prepared by Stonefield Engineering & Design, LLC, and utilized the City of Birmingham's Traffic Study Questionnaires (Form B), as well as accepted traffic engineering practices for Traffic Impact Assessments.

Existing Conditions

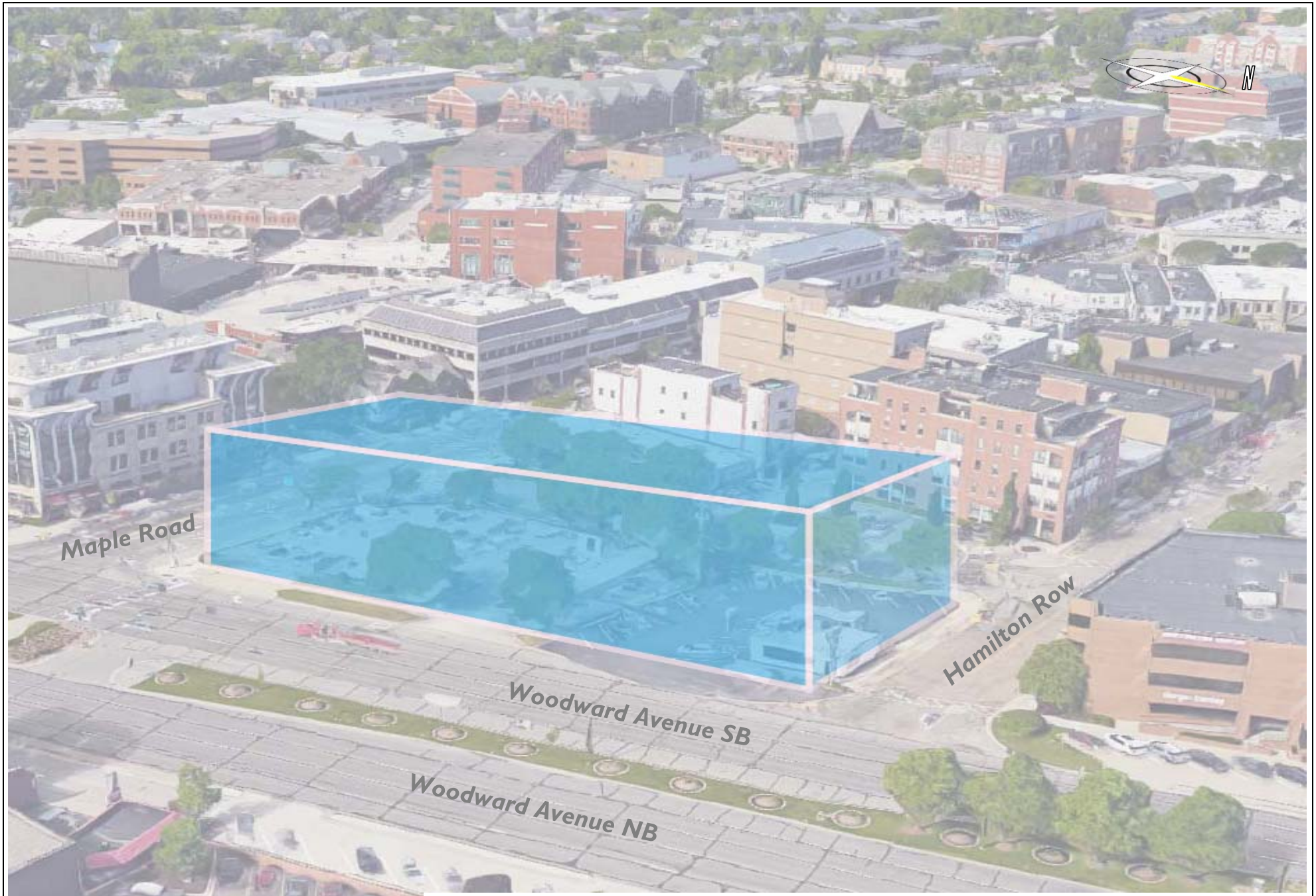
Roadway Characteristics

Woodward Avenue (M-1) is a state trunkline and is classified on the National Functional Classification Map as a Principal Arterial roadway. Woodward Avenue is located along the easterly side of the property with a general north-south orientation and generally provides four (4) lanes of travel in each direction. Woodward Avenue is separated by a raised grass median; crossovers are provided within the median to facilitate U-turns and left turns. Along the site frontage, additional lanes are provided approaching the intersection with East Maple Road to the south. Woodward Avenue has a posted speed limit of 45 mph. Along the site frontage, curb and sidewalk are provided, shoulders are not provided, and on-street parking is not permitted. Woodward Avenue provides north-south mobility throughout Birmingham and surrounding municipalities for a mix of commercial and residential uses along its length.

Hamilton Row is classified on the National Functional Classification Map as a local roadway. Hamilton Row has a general east-west orientation and generally provides one (1) lane of travel in each direction. Hamilton Row does not have a posted speed limit. Along the site frontage, curb and sidewalk are provided along both sides of the roadway, shoulders are not provided, and on-street parking is permitted along the northerly side of the roadway. Hamilton Row provides east-west mobility within in the City of Birmingham for a mix of commercial and residential uses along its length.



STONEFIELD	**The Maple: Mixed-Use Development** **35001-35075 Woodward Avenue** **Birmingham, Oakland County, Michigan** **Traffic Impact Assessment**	**FIGURE 1** **Site Location Map**



STONEFIELD	The Maple: Mixed-Use Development 35001-35075 Woodward Avenue Birmingham, Oakland County, Michigan Traffic Impact Assessment	**FIGURE 2** **Site Location Aerial View**

Maple Road is classified on the National Functional Classification Map as a Principal Arterial roadway. Maple Road has a general east-west orientation and generally provides one (1) lane of travel in each direction with additional lanes provided at key intersections to facilitate turning movements and provide additional capacity. Maple Road has a posted speed limit of 25 mph. Along the site frontage, curb and sidewalk are provided, shoulders are not provided, and on-street parking is not permitted. Maple Road provides east-west mobility in the City of Birmingham and surrounding municipalities for a mix of commercial and residential uses along its length.

Park Street is classified on the National Functional Classification Map as a Major Collector roadway. Park Street has a general north-south orientation and provides two (2) lanes of travel in the northbound direction. Park Street has a posted speed limit of 25 mph. Along the site frontage, curb and sidewalk are provided, shoulders are not provided, and on-street parking is not permitted. It is Stonefield's understanding that the City of Birmingham recently approved a proposal to convert Park Street between Hamilton Row and Maple Road from a one-way roadway to a two-way roadway. In the future condition, Park Street would provide one (1) lane in both directions. Note that presently, Park Street is a two-way roadway north of Hamilton Row.

Woodward Avenue and East Maple Road intersect to form a four (4)-leg signalized intersection. The eastbound and westbound approaches of East Maple Avenue provide one (1) exclusive through lane and one (1) shared though/right-turn lane. The northbound approach of Woodward Avenue provides three (3) exclusive through lanes and one (1) shared though/right-turn lane and the southbound approach of Woodward Avenue provides four (4) exclusive through lanes and one (1) exclusive right-turn lane. Crosswalks and pedestrian signal heads are provided across all legs of the intersection.

Woodward Avenue and Hamilton Row intersect to form a stop-controlled T-intersection with the eastbound approach of Hamilton Row operation under stop control. Hamilton Row provides one (1) exclusive right-turn lane. The southbound approach of Woodward Avenue provides three (3) exclusive through lanes and one (1) shared through/right-turn lane. Crosswalks are provided across the Hamilton Avenue leg of the intersection.

Maple Road, Park Street, and Peabody Street intersect to form a (4)-leg signalized intersection. The eastbound approach of Maple Road provides one (1) shared through/right-turn lane and the westbound approach of Maple Road provides one (1) exclusive left-turn lane, one (1) shared through/right-turn lane, and one (1) channelized right turn lane. The northbound approach of Peabody Street provides one (1) exclusive right-turn lane. Crosswalks and pedestrian signal heads are provided across the eastbound and northbound legs of the intersection.

In the future condition, the southbound approach of Park Street would provide one (1) exclusive right-turn lane, and the westbound approach of Maple Road would provide one (1) exclusive left-turn lane, one (1) exclusive through lane, and one (1) exclusive right-turn lane. A plan sheet details the future lane configuration is provided within the Technical Appendix.

Hamilton Row and Park Street intersect to form a four (4)-leg unsignalized intersection with the eastbound and westbound approaches of Hamilton Row and the southbound approach of Park Street operating under stop control. The eastbound approach of Hamilton Row provides one shared left-turn/through lane and the westbound approach of Hamilton Row provides one (1) shared through/right-turn lane. The northbound approach of Park Street provides one (1) exclusive left-turn lane, one (1) exclusive through lane, and one (1) shared through/right-turn lane. The southbound approach of Park Street provides one (1) shared left-turn/right-turn lane. Crosswalks are provided across all approaches of the intersection.

In the future condition, each approach at the intersection would provide one (1) full-movement lane, and only the eastbound and westbound approaches of Hamilton Row would operate under stop control.

Current Traffic Volumes

Stonefield utilized traffic volume data provided by the City of Birmingham, traffic volume data collected by our office, and volume balancing techniques to determine peak-hour traffic volumes at the study intersections. **Table 1** provides a summary of the traffic data utilized for this study and the year it was collected.

TABLE 1 – BIRMINGHAM TRAFFIC VOLUME DATA

Intersection	Source	Year
Intersection of Woodward Avenue and East Maple Road	City of Birmingham turning movement count data	2016
Intersection of Park Street/Peabody Street and East Maple Road	City of Birmingham turning movement count data	2016
Intersection of Woodward Avenue and North-to-South Crossover	Stonefield Engineering turning movement count data	2018
Intersection of Woodward Avenue and Hamilton Row	Traffic volume balancing	--
Intersection of Park Street and Hamilton Row	City of Birmingham automatic traffic recorder data	2016

Data collected in 2016 and 2018 was grown to the year 2019 to be consistent with the issuance of this report. In accordance with industry guidelines, the 2016 and 2018 traffic volumes were increased by 2.7% annually for three (3) years and one (1) year, respectively. The background growth rate was determined based on two-way AADT volumes collected on Old Woodward Avenue between Maple Road and Oak Avenue in 2007 and 2013. The volumes were 8,830 vehicles in 2007 and 10,355 in 2013, which equates to an annual traffic volume increase of 2.7%

Based on the City of Birmingham data available proximate to the site, it was determined that the data collected at the study intersections would provide the most conservative estimate of the existing traffic volume along the Park Street site frontage. The 2016 volume data at the intersection of Woodward Avenue and Maple Road and the intersection of Park Street/Peabody Street and East Maple Road was utilized to calculate an annual growth rate of approximately 2.7%.

Traffic volumes at the intersection of Woodward Avenue and Hamilton Row were calculated by balancing traffic volumes at the adjacent intersection of Woodward Avenue and the North-to-South Crossover and the intersection of Park Street and Hamilton Row. For the balanced movements at the intersection, the higher volume was utilized to provide a conservative analysis. The calculated 2019 Current Traffic Volumes are shown on **Figure 3**.

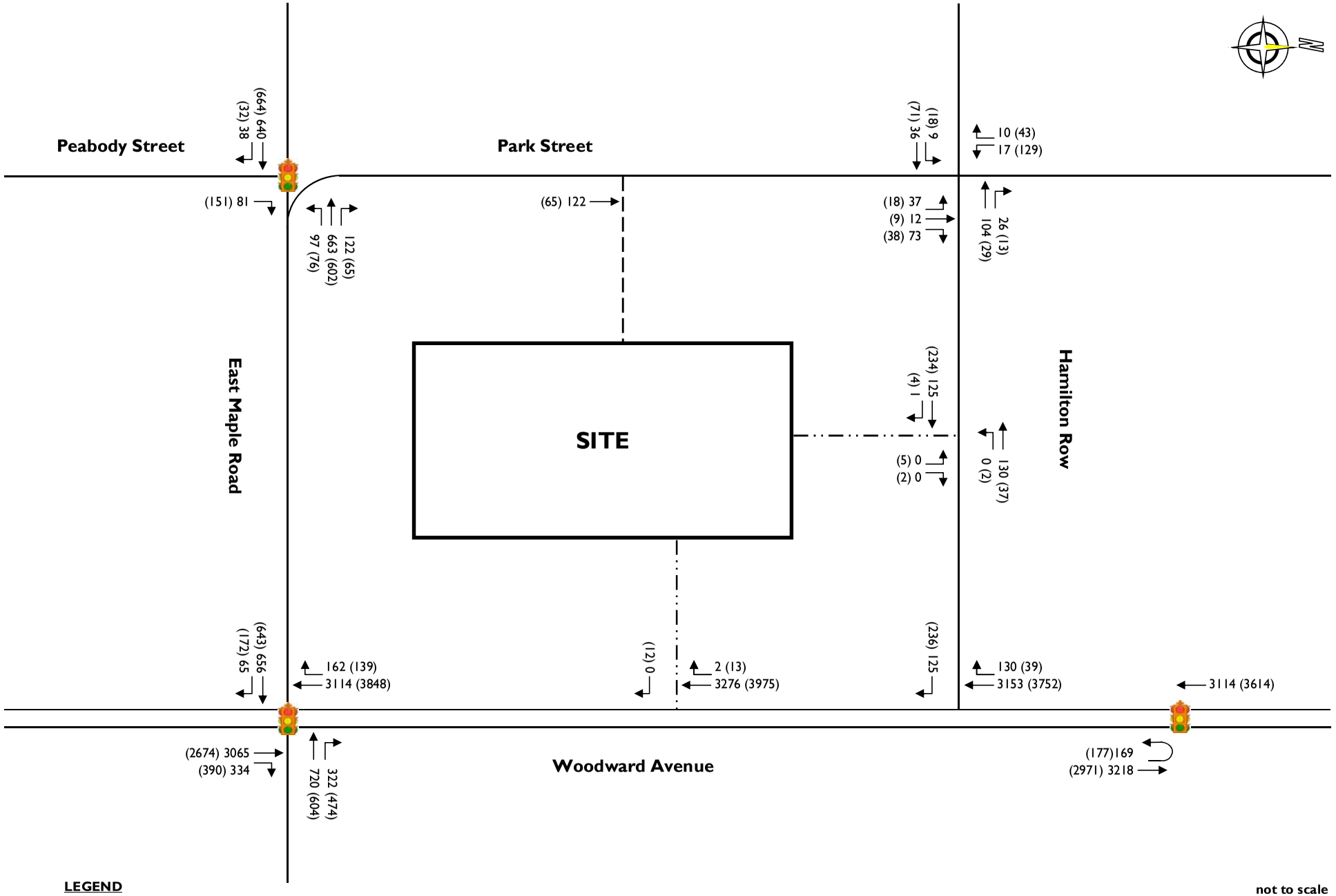
Future Conditions

Background Traffic Volumes

The 2019 Current Traffic Volumes were grown to a future horizon year of 2021, which is a conservative estimate for the proposed development is expected to be fully constructed. In accordance with industry guidelines, the 2019 Current Traffic Volumes were increased by 2.7% annually for two (2) years to determine the 2021 Base Traffic Volumes. These volumes are shown on **Figure 4**.

Other Planned Development Projects

To evaluate the future traffic conditions, it is important to consider the potential site-generated traffic of other projects that could influence the traffic volume at the study intersections. Other planned development projects include those that are either in the entitlement process or have recently been approved for building permits in proximity to the proposed development. Based on coordination with Julie M. Kroll, PE, PTOE from Fleis & Vandenbrink, the City's Traffic consultant engineer, traffic associated with the Peabody Redevelopment



LEGEND

- Existing Roadway
- Proposed Driveway
- Existing Private Driveway
- AM (PM) Peak Hour Volumes
- Signalized Intersection

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FIGURE 3
2019 Current Traffic Volumes

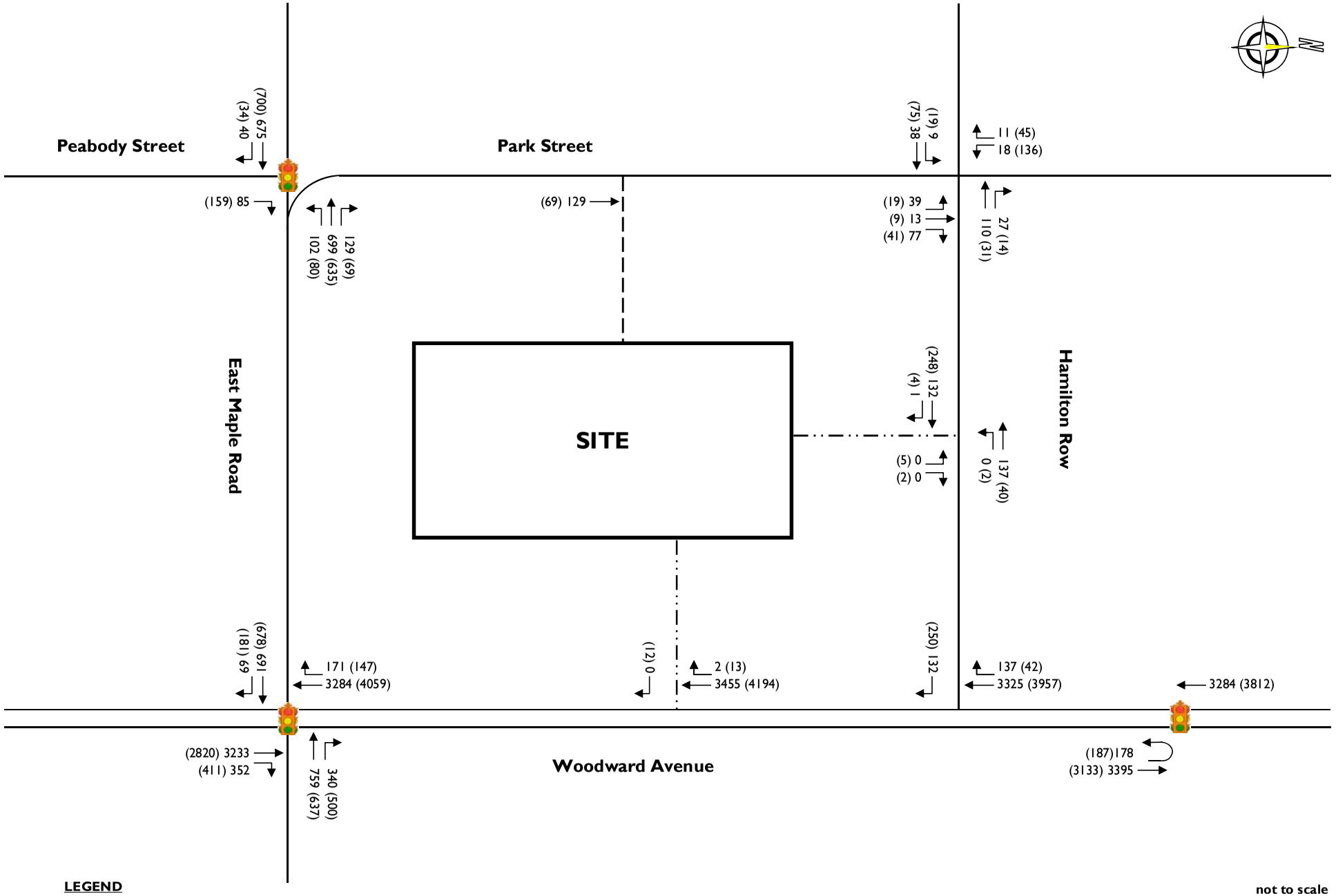

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FIGURE 4
2021 Base Traffic Volumes

located at 34965 Woodward Avenue and 215 Peabody Street would be expected to add traffic volume to the study network. **Figure 5** illustrates the site-generated traffic associated with the Peabody Redevelopment assigned to the study area network.

Future Background Volumes

The site-generated trips associated with the Peabody Redevelopment were added to the 2021 Base Traffic Volumes to calculate the 2021 Future Background Traffic Volumes, which are shown on **Figure 6**.

Hunter House Hamburgers Traffic Redistribution

The Hunter House Hamburgers restaurant is presently operating and generating traffic. These traffic volumes are anticipated to generally remain as-is along the surrounding roadway network. The existing driveway along Woodward Avenue would be closed, and vehicular access to the site for Hunter House Hamburgers would be provided via one (1) full-movement driveway along Hamilton Row and one (1) full-movement driveway along Park Street. As such, traffic from employees during the weekday morning peak hour were rerouted to utilize the driveway along Hamilton Row with all other ingress and egress traffic rerouted to the on-site parking garage along Park Street where 11 spaces dedicated to Hunter House Hamburgers would be provided. It was assumed that employees would not arrive or depart the Hamilton Row driveway during the weekday evening roadway peak hour. **Figure 7** illustrates the rerouting of Hunter House Hamburgers restaurant traffic as a result of the proposed driveway configuration and parking management plan.

Trip Generation

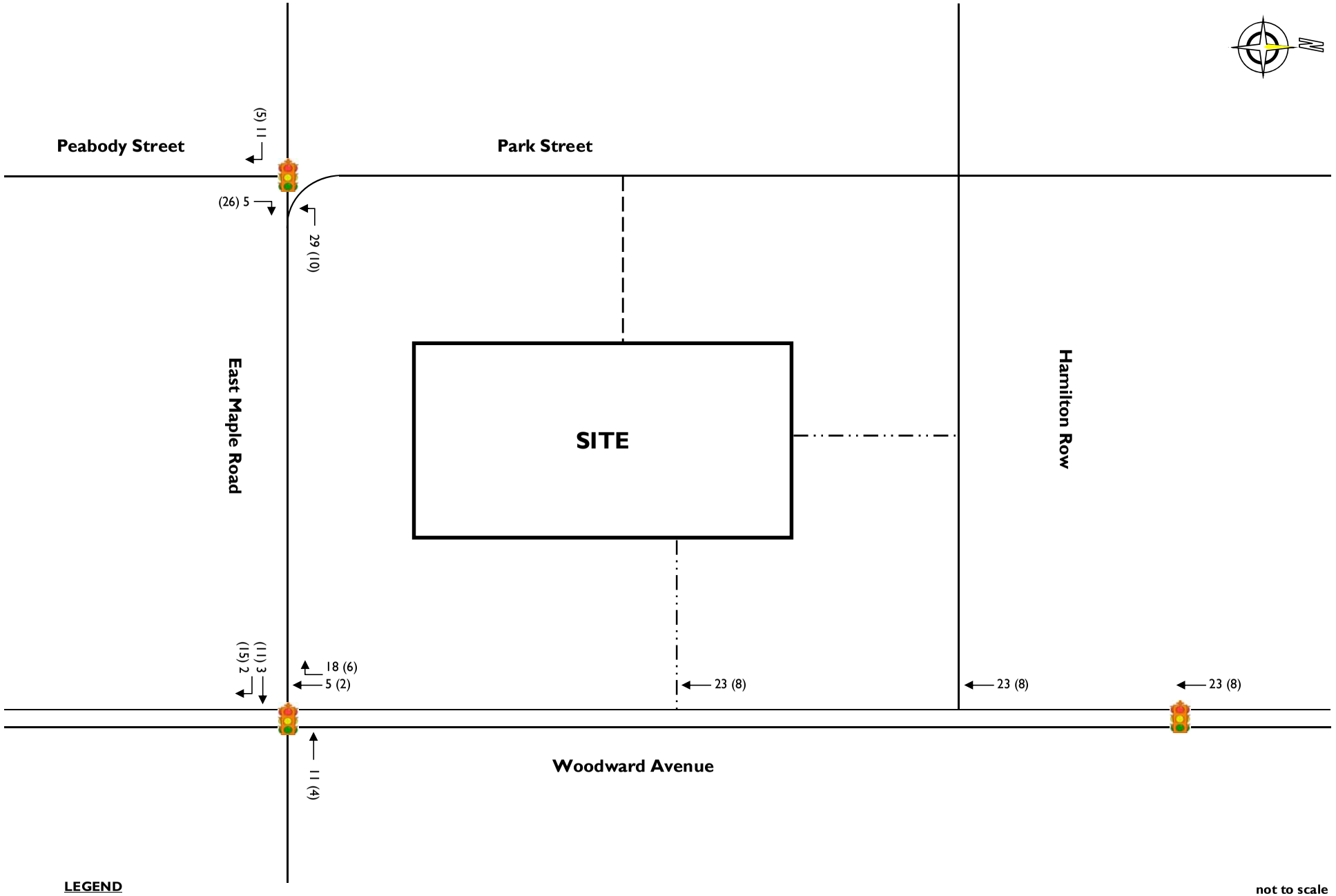
Trip generation projections for the proposed development were prepared utilizing the Institute of Transportation Engineers' (ITE) Trip Generation Manual, 10th Edition. ITE trip generation rates for the following land uses were cited for the proposed development:

1. Land Use 221 "Multifamily Housing (Mid-Rise)" was utilized for the proposed 42 apartment units,
2. Land Use 710 "General Office Building" was utilized for the proposed 21,675 square feet of office space,
3. Land Use 820 "Shopping Center" was utilized for the proposed 10,150 square feet of retail space, and
4. Land Use 933 "Fast-Food Restaurant without Drive-Through Window" was utilized for the 1,330-square-foot Hunter House restaurant.

For the residential apartments, parking would be provided for residents within the underground garage levels at a rate of 1.5 spaces per unit, consistent with the City's requirement. All trips for residential users would utilize the site driveway along Park Street.

As the existing Hunter House restaurant will remain in its current location, provide a smaller building with a reduced parking supply, traffic generated by the restaurant would be expected to not increase in the Future Condition. As such, there would not be new traffic impacts associated with the Hunter House Restaurant as part of this development. The Birmingham Hunter House Hamburgers location opens at 9:00 a.m. on weekdays, just outside the peak period. A reduced trip generation to account for the arrival of opening shift employees is included within the calculations.

Land Use 10 "General Office Building" "is a location where affairs of businesses, commercial or industrial organizations, or professional persons or firms are conducted" and includes "a mixture of tenants including professional services, insurance companies, investment brokers, and tenant services, such as a bank or savings and loan institution, a restaurant, or cafeteria and service retail facilities." As such, this land use encompasses a variety of potential uses for the space and its trip generation projections would be appropriate to utilize given the tenants of the space are unknown at the time of this issuance.



LEGEND

- Existing Roadway
- Proposed Driveway
- Existing Private Driveway
- AM (PM) Peak Hour Volumes
- Signalized Intersection

not to scale

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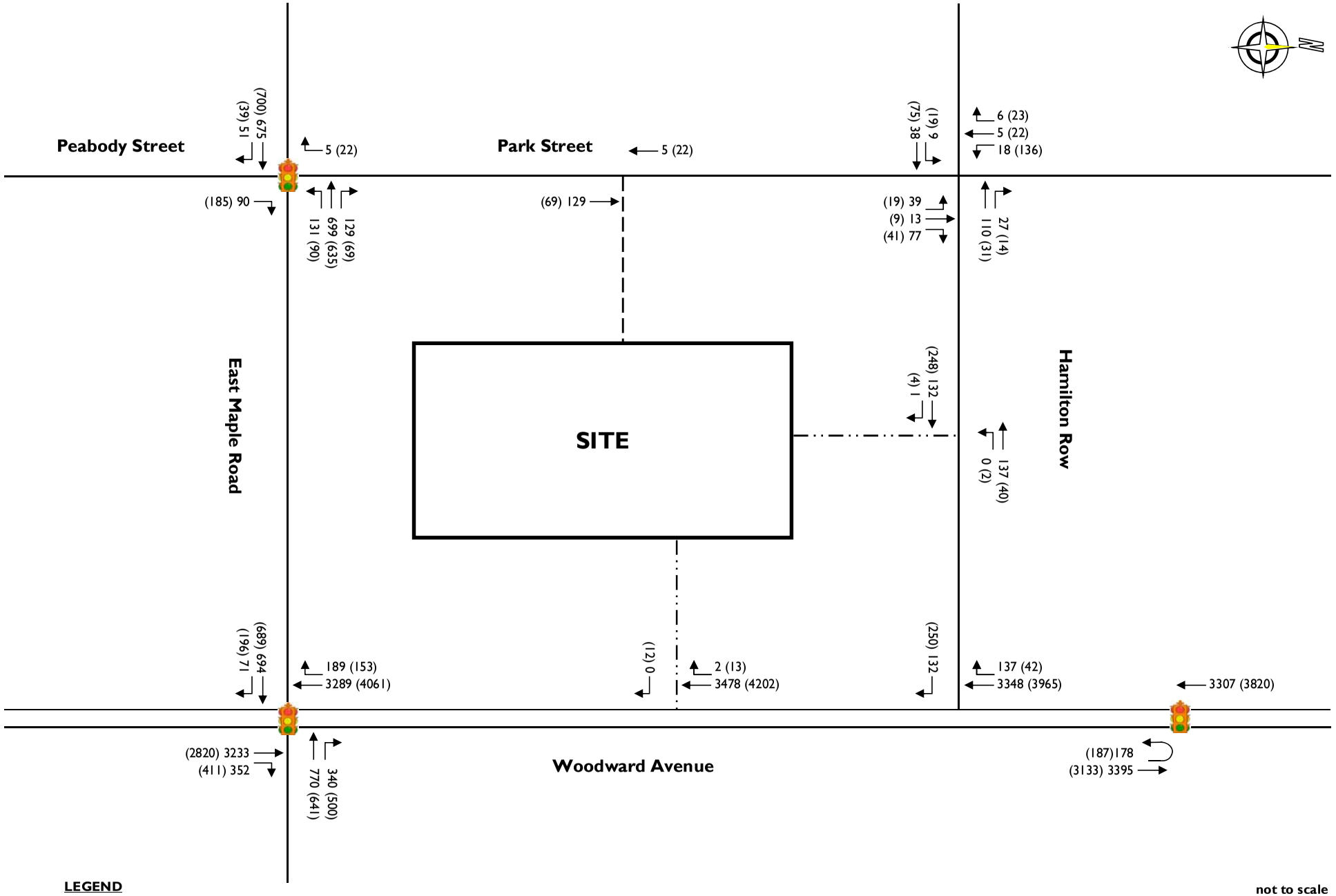
Traffic Impact Assessment

FIGURE 5
Other Planned Projects
Traffic Volumes



LEGEND

- Existing Roadway
- Proposed Driveway
- Existing Private Driveway
- AM (PM) Peak Hour Volumes
- Signalized Intersection

not to scale

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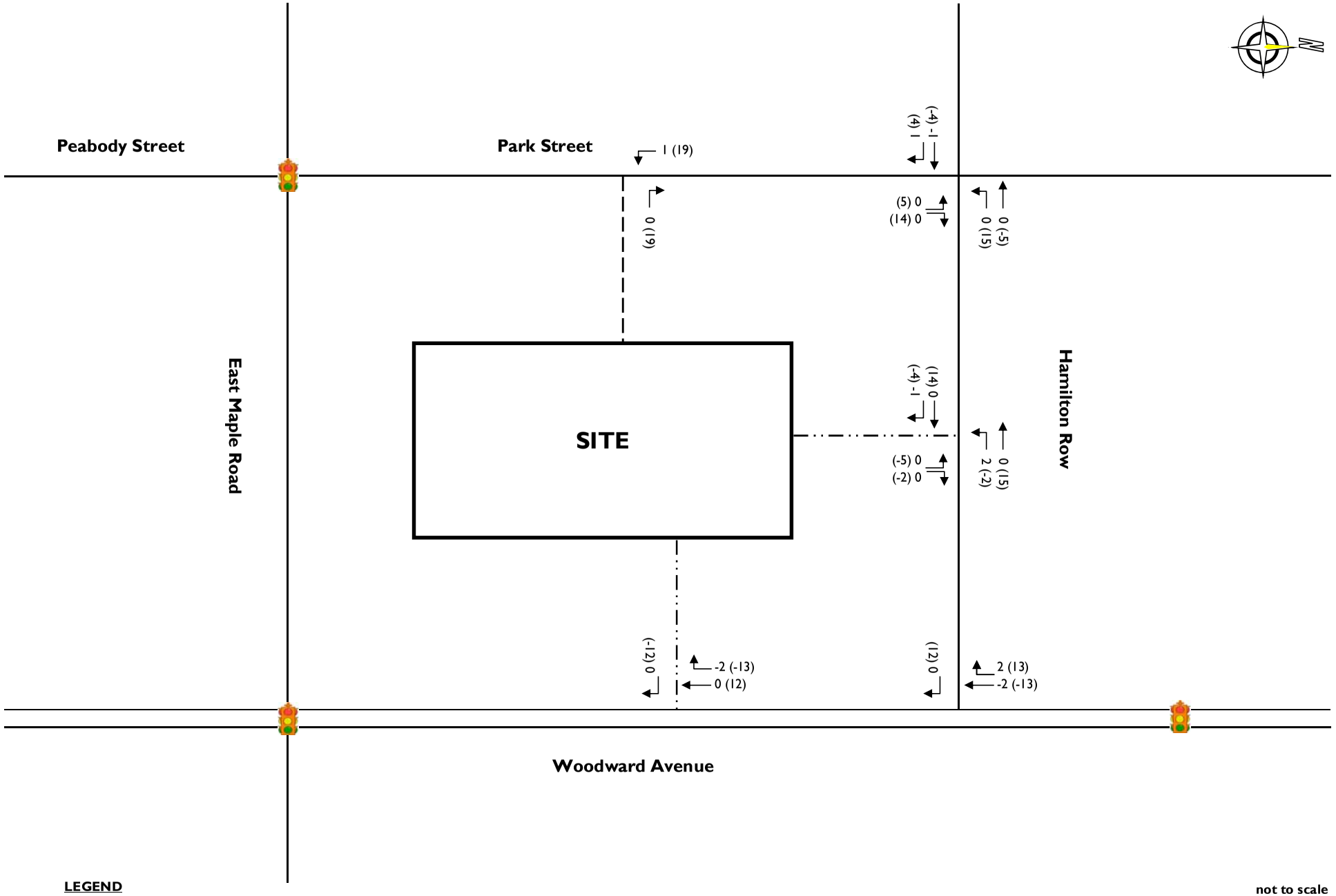
FIGURE 6
2021 Future Background Traffic Volumes



LEGEND

- Existing Roadway
- Proposed Driveway
- Existing Private Driveway
- AM (PM) Peak Hour Volumes
- Signalized Intersection

not to scale

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FIGURE 7
Hunter House Future Trip Re-Routing

Land Use 820 "Shopping Center" "is an integrated group of commercial establishments that is planned, developed, owned, and managed as a unit" and includes "office buildings, movie theaters, restaurants, post offices, banks, health clubs, and recreational facilities (for example, ice skating rinks or indoor miniature golf courses)." As such, this land use encompasses a variety of potential uses for the space and its trip generation projections would be appropriate to utilize given the tenants of the space are unknown at the time of this issuance.

Table 2 provides the weekday morning peak hour, weekday evening peak hour, and weekday daily trip generation volumes associated with the proposed development. As per correspondence with the City's reviewing traffic engineering consultant, the weekend peak trip generation for each of the proposed uses is not simultaneous. Therefore, the weekday morning and weekday evening peak-hour analyses would be sufficient for the evaluation of the traffic impacts of the proposed development.

TABLE 2 – TRIP GENERATION PROJECTIONS

Land Use	ITE Code	Amount	Daily	Weekday Morning Peak Hour			Weekday Evening Peak Hour		
				Enter	Exit	Total	Enter	Exit	Total
Hunter House Hamburgers (To remain)	933	1,330 SF	460	3	0	3	19	19	38
Apartments	221	42 Units	207	4	11	15	11	7	18
Office	710	21,675 SF	241	40	7	47	4	23	27
Shopping Center	820	10,150 SF	1,269	6	4	10	48	52	100
Total Trip Increase			**1,717**	**50**	**22**	**72**	**63**	**82**	**145**

As indicated in Table 2, the proposed development would be expected to generate 72 additional trips during the weekday morning peak hour and 145 additional trips during the weekday evening peak hour.

Trip Distribution & Assignment

The projected trips generated by the proposed development were distributed along the adjacent roadway network. The trip distribution was determined utilizing existing travel patterns along the surrounding roadway network, the location of population centers and major arterials, the access management plan of the site, and the location of specific land uses on-site. As the trip generation for each of the land uses consists entirely of new trips, the overall distribution was assumed to be the same for each use/time period.

A review of historical traffic counts available from the Southeast Michigan Council of Governments (SEMCOG) was performed to understand the existing travel patterns. Specifically, SEMCOG counts from October 2006 along Woodward Avenue and East Maple Road were utilized. Based on the traffic count data, the following observations influenced the trip distribution of the development:

1. AM & PM peak-hour volumes along Woodward Avenue were generally equally distributed between the northbound and southbound directions
2. AM & PM peak-hour volumes along Maple Road were greater for the eastbound direction than the westbound direction, indicating an origin of trips to the west.
3. The total traffic volume along Woodward Avenue was approximately 70% higher than the total traffic volume along Maple Road.

The above-referenced data indicates that Woodward Avenue would likely serve a majority of the traffic generated by the site given its size and traffic volumes. Additionally, the Maple Road data indicates a draw from the west, given the higher rate of eastbound traffic. While a portion of that draw is likely from Woodward Avenue, locally the density within the City of Birmingham is located predominately to the west of the site.

Based on these factors, the following entering and exiting trip distribution was utilized:

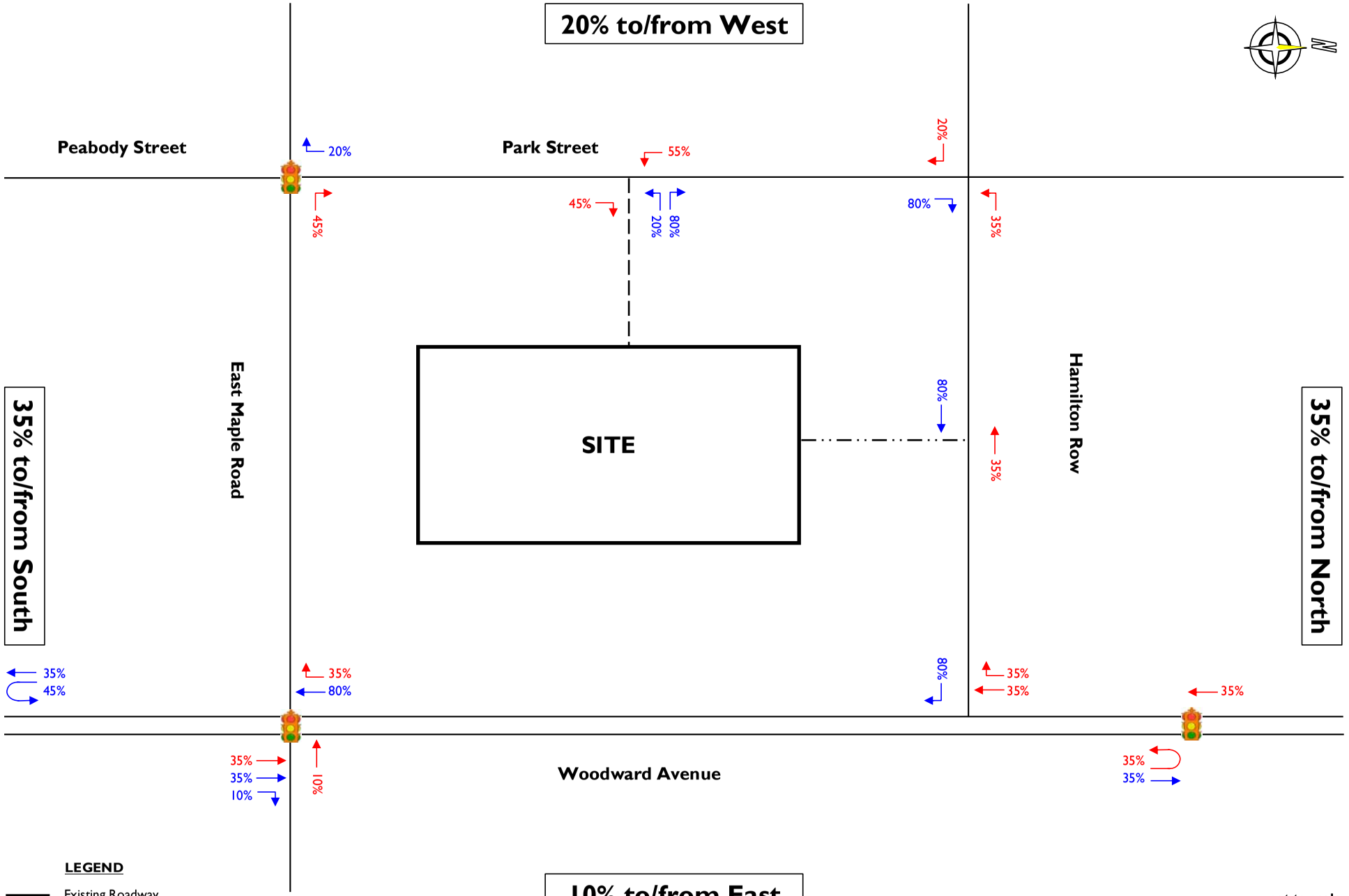
1. 35% to/from the north,
2. 35% to/from the south,
3. 10% to/from the east, and
4. 20% to/from the west.

The driveway along Hamilton Row serves three (3) parking spaces dedicated to Hunter House Hamburgers. The driveway along Park Street would serve residents, Hunter House Hamburgers, and a portion of office employees. Ten percent (10%) of peak-hour office trips were routed to/from the Park Street driveway. The 10% rate was selected based on the available parking for the office use (eight (8) spaces) and the projected parking demand (72 vehicles) based on the City Ordinance requirement.[1]

Parking for the remaining portion of office employees and the retail uses would utilize the parking garages located at 333 Park Street and 222 Peabody Street and as such, traffic for these uses was routed to and from the parking garage. **Figures 8** and **9** illustrates the primary residential trip distribution and primary residential traffic volumes respectively. **Figures 10** and **11** illustrates the primary office trip distribution and primary office traffic volumes respectively. **Figures 12** and **13** illustrates the primary retail trip distribution and primary retail traffic volumes respectively.

Figure 14 provides the total new traffic volume associated with the proposed development during the weekday morning and weekday evening peak hours. The site-generated trips associated with the proposed development and the volumes associated with the Hunter House Hamburgers trip rerouting were added to the 2021 Future Background Traffic Volumes to calculate the 2021 Future Total Traffic Volumes and are provided on **Figure 15**.

[1] Parking requirement for office uses not located in the parking assessment district is one (1) space per 300 square feet of floor area. For the 21,675 square feet of office space, this equates to 72 parking spaces. A supply of eight (8) parking spaces equates to 11.1% of the 72-space requirement, thus a 10% Park Street driveway office use rate was utilized.

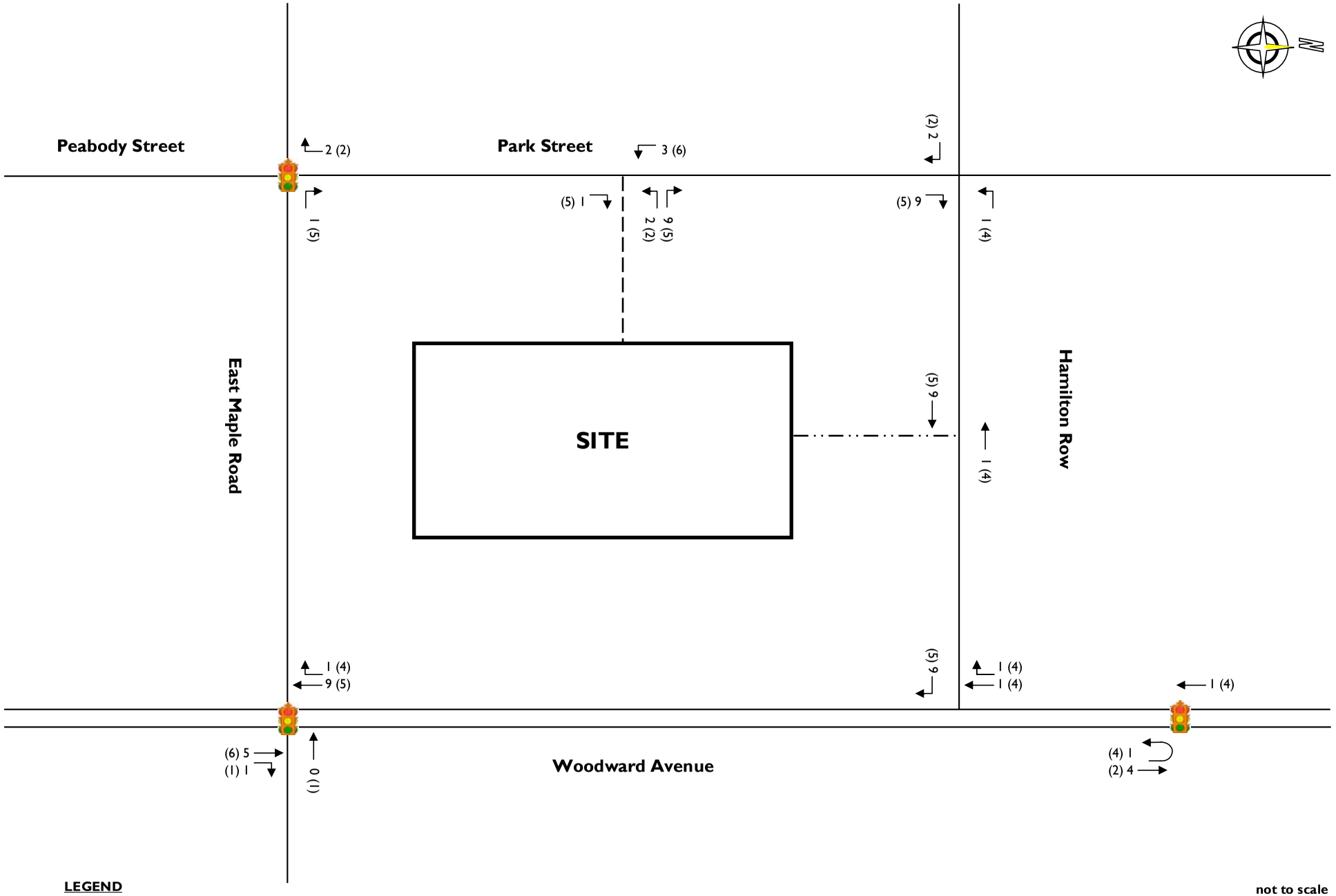


LEGEND

- Existing Roadway
- Proposed Driveway
- Existing Private Driveway
- Entering Trips
- Exiting Trips
- Signalized Intersection

not to scale

STONEFIELD	The Maple: Mixed-Use Development 35001-35075 Woodward Avenue Birmingham, Oakland County, Michigan Traffic Impact Assessment	FIGURE 8 Primary Residential Trip Distribution



LEGEND

- Existing Roadway
- Proposed Driveway
- Existing Private Driveway
- AM (PM) Peak Hour Volumes
- Signalized Intersection

not to scale

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35001-35075 Woodward Avenue
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FIGURE 9
Primary Residential Traffic Volumes

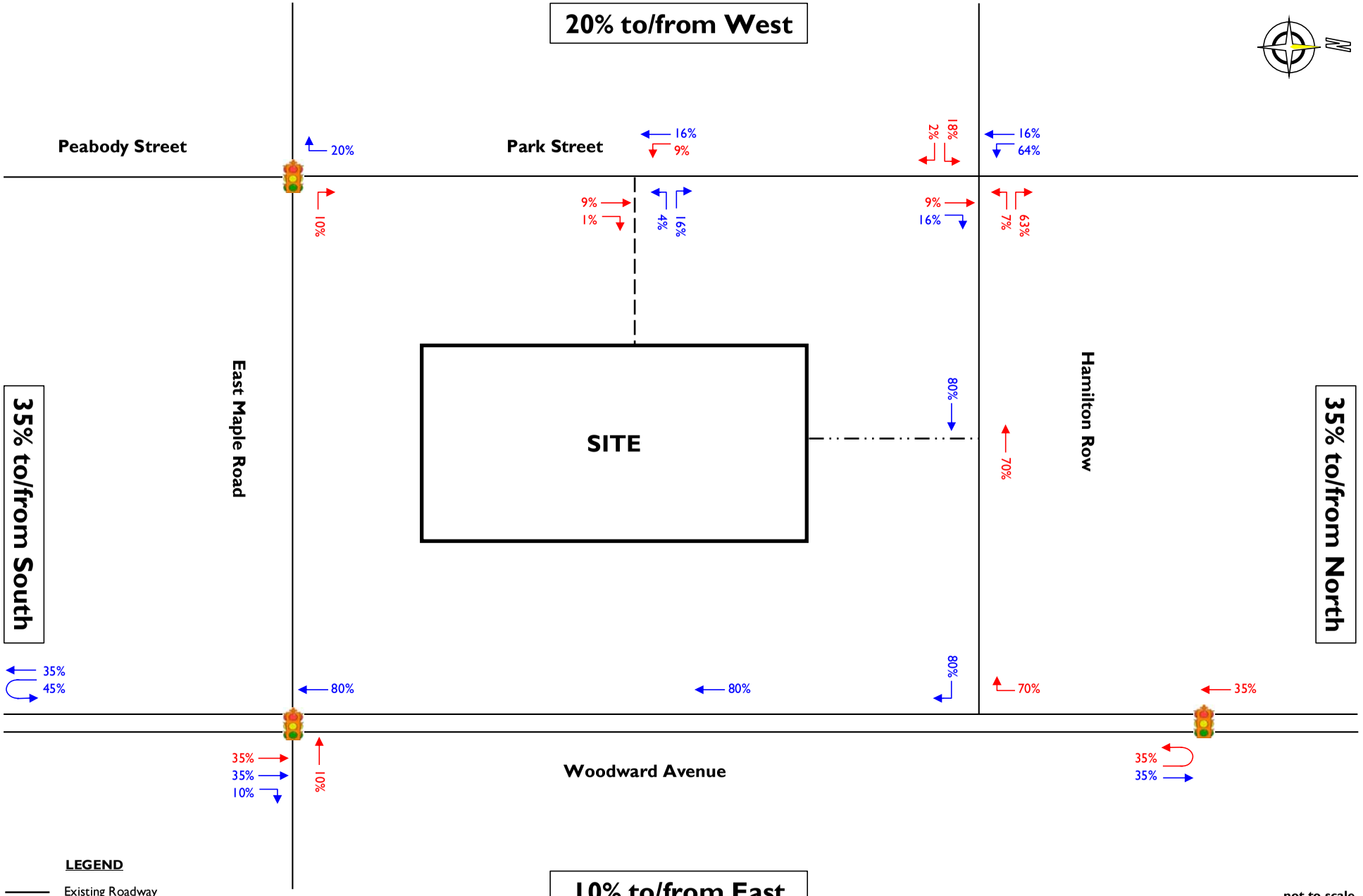

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FIGURE 10
Primary Office Trip Distribution

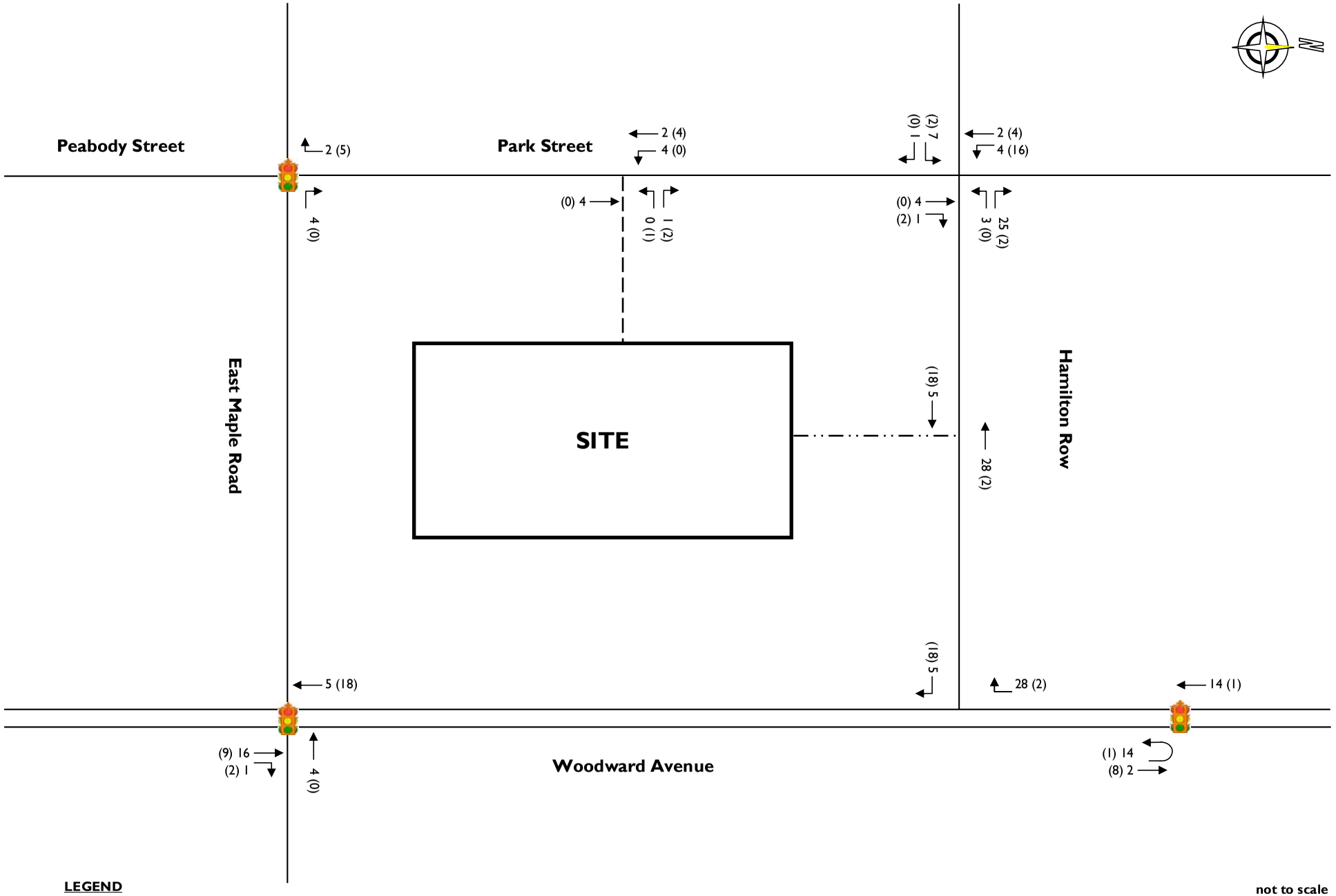

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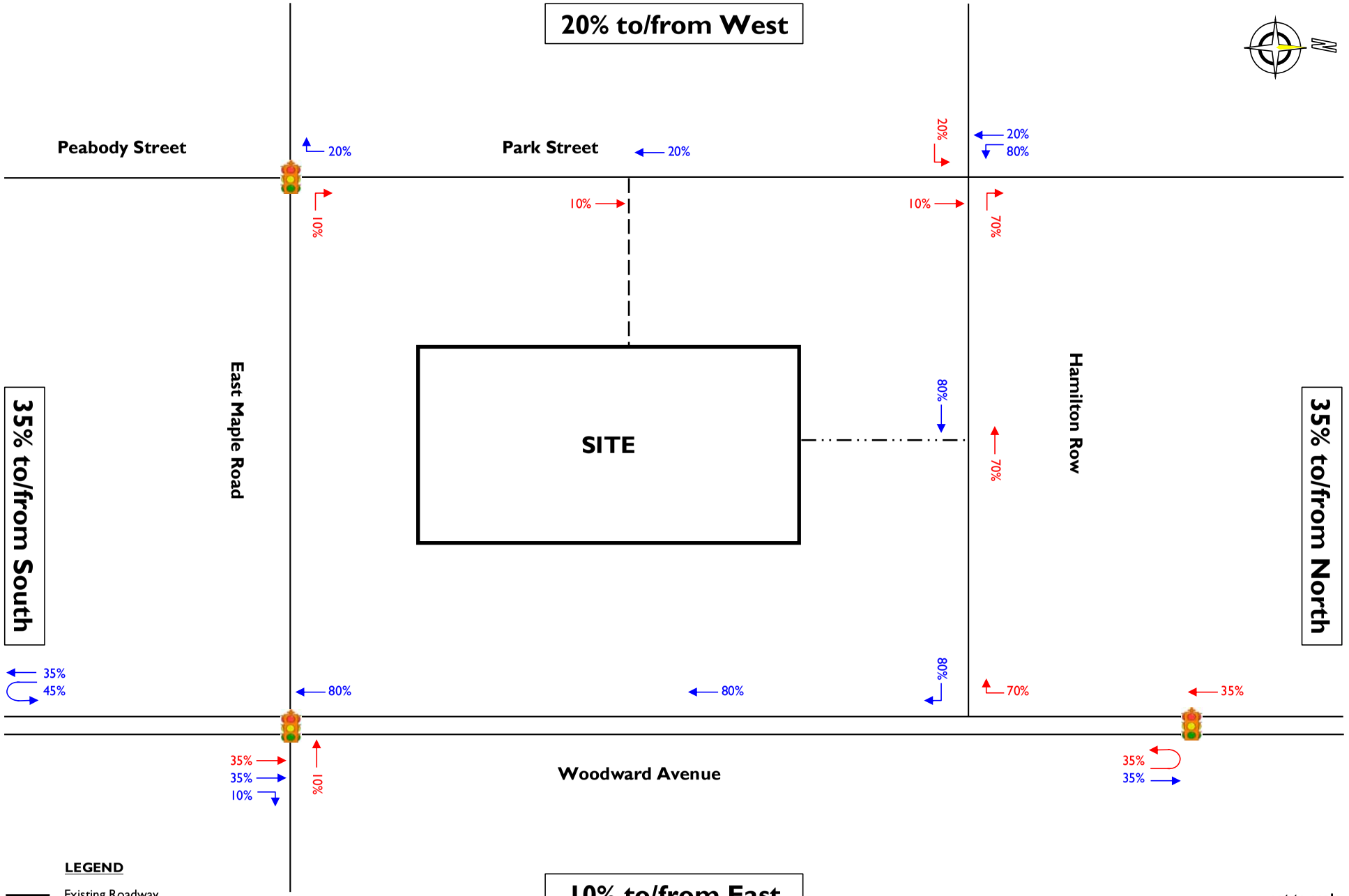
FIGURE 11
Primary Office Traffic Volumes



LEGEND

- Existing Roadway
- Proposed Driveway
- Existing Private Driveway
- Entering Trips
- Exiting Trips
- Signalized Intersection

not to scale

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35001-35075 Woodward Avenue
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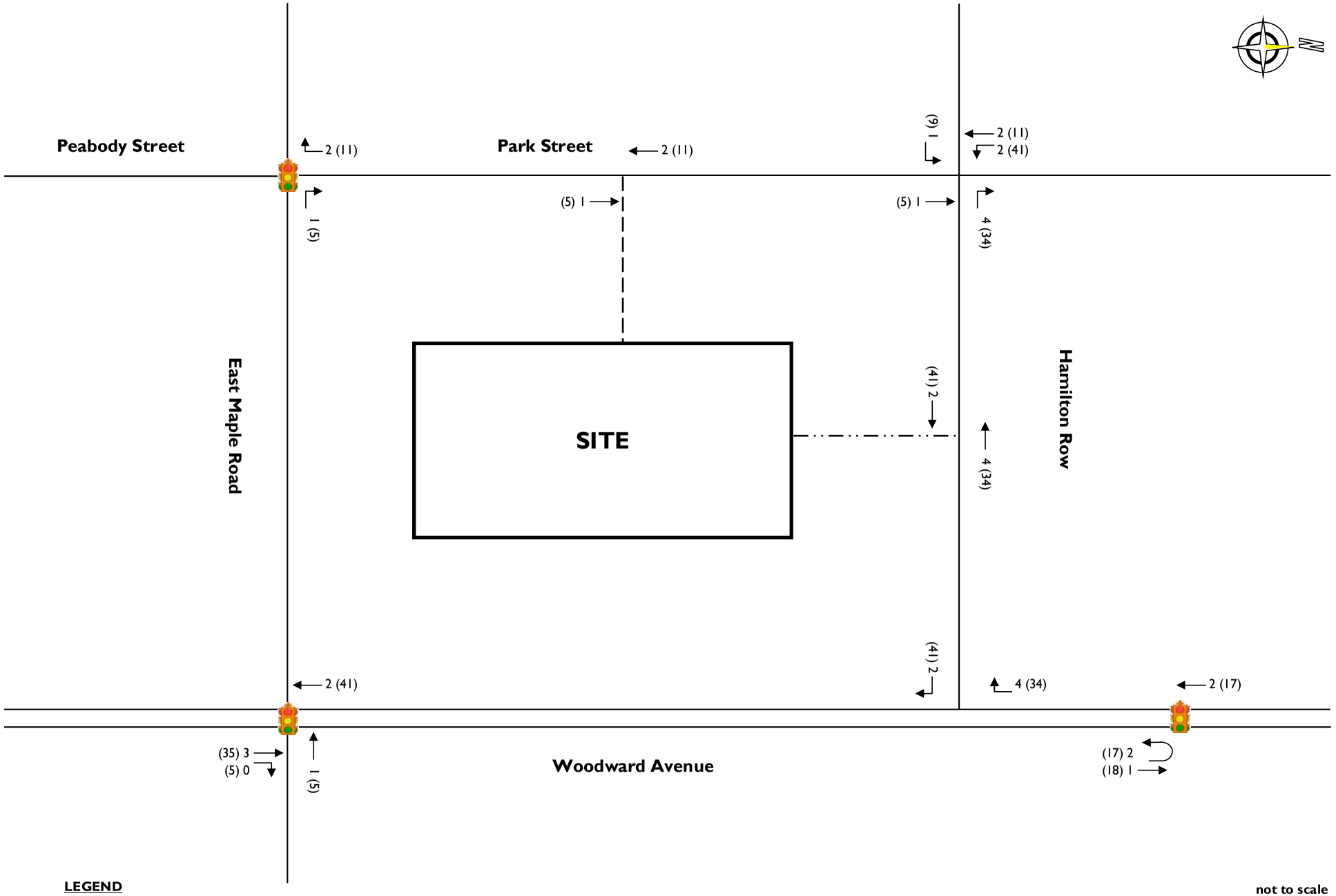
FIGURE 12
Primary Retail Trip Distribution



LEGEND

- Existing Roadway
- Proposed Driveway
- Existing Private Driveway
- AM (PM) Peak Hour Volumes
- Signalized Intersection

not to scale

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35001-35075 Woodward Avenue
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FIGURE 13
Primary Retail Traffic Volumes

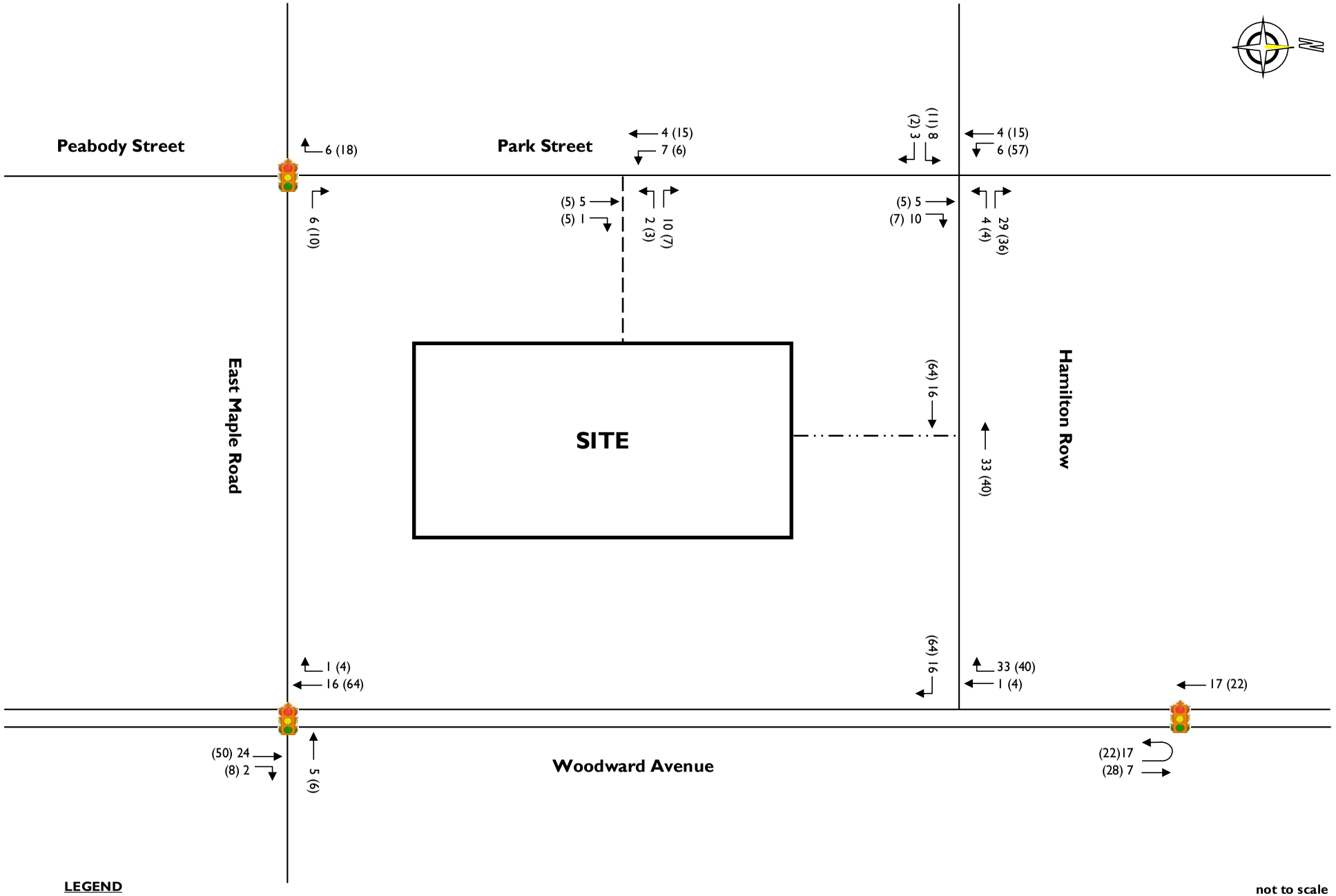

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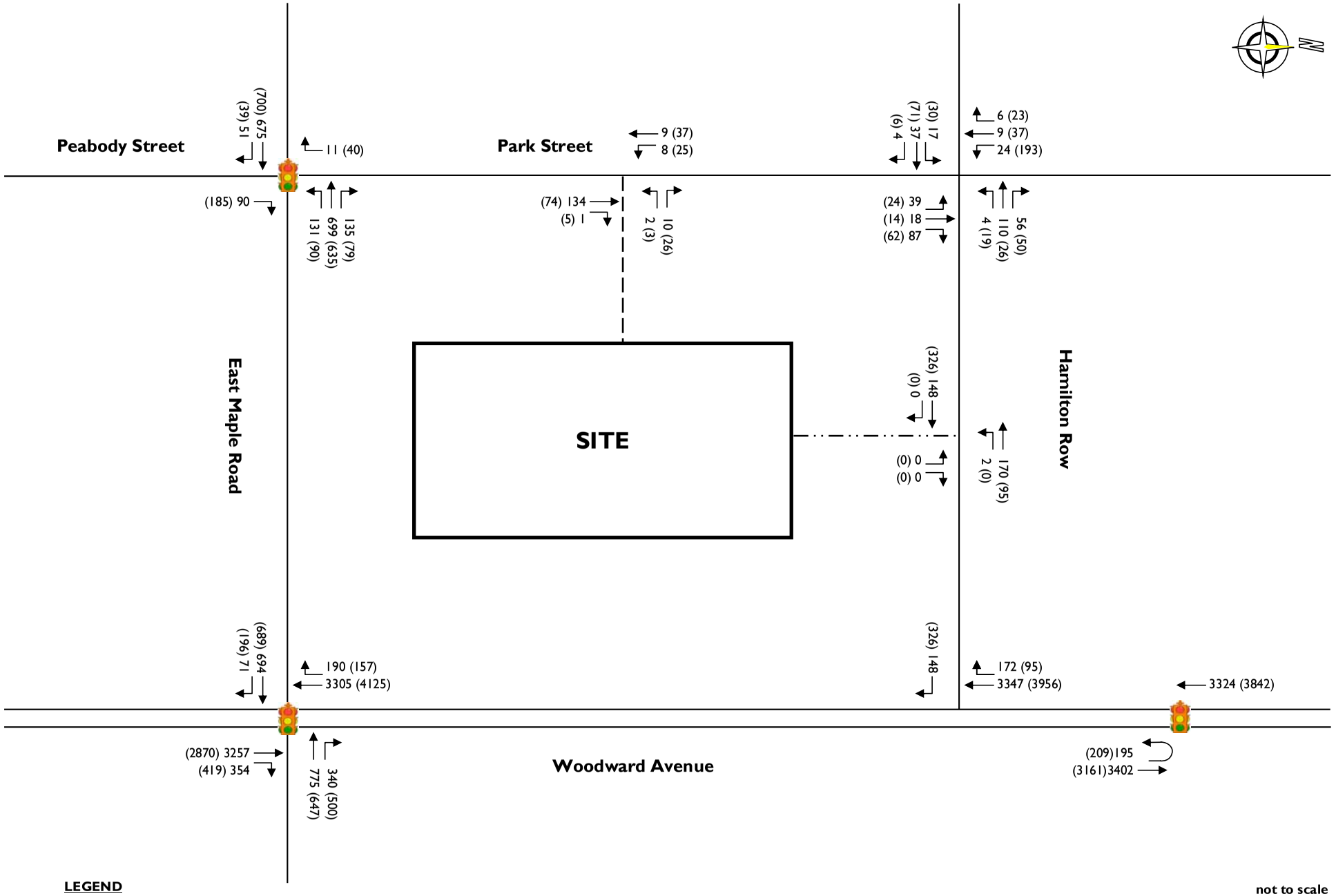
FIGURE 14
Total New Traffic Volumes



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The Maple: Mixed-Use Development
35001-35075 Woodward Avenue
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Traffic Impact Assessment

FIGURE 15
2021 Future Total Traffic Volumes

Traffic Impacts

Level of Service Impacts

A Level of Service and Volume/Capacity analysis was conducted for the 2019 Current Condition, 2021 Future Background Condition, and 2021 Future Total Condition during the weekday morning and weekday evening peak hours at the study intersections and proposed site driveways. The 2019 Current Condition analysis utilized the existing roadway geometry to reflect the existing traffic conditions. For the 2021 Future Conditions, the future layouts of the intersection of Park Street/Peabody Street and Maple Road and the intersection of Park Street and Hamilton Row were utilized to forecast traffic operations under the two-way Park Street orientation.

Under existing conditions, the signalized intersection of northbound Woodward Avenue and Maple Road is calculated to operate at overall Level of Service D with the westbound approach operating under capacity constraints during both peak hours studied. The signalized intersection of southbound Woodward Avenue and Maple Road is calculated to operate at overall Level of Service B during the weekday morning peak hour and overall Level of Service D with southbound through approach calculated to operate at Level of Service E during the weekday evening peak hour. The signalized intersection of Peabody Street/Park Street with Maple Road is calculated to operate at overall Level of Service B during both peak hours studied. The signalized intersection of southbound Woodward Avenue with the north-to-south crossover is calculated to operate at overall Level of Service B during the weekday morning peak hour and overall Level of Service C during the weekday evening peak hour. The turning movements at the unsignalized intersection of Woodward Avenue with Hamilton Row and the site driveways are calculated to operate at Level of Service C or better during both peak hours studied.

The existing layout of the intersection of Park Street with Hamilton Row is not supported by HCM 2000, HCM 2010, nor HCM 6th Edition, and therefore it was analyzed using the SimTraffic 10 Software. The simulation results indicated that this intersection operates at overall Level of Service A during the weekday morning peak hour and at overall Level of Service C during the weekday evening peak hour.

Under the 2021 Future Background Condition, the signalized intersection of northbound Woodward Avenue and Maple Road is calculated to operate generally consistently with the 2019 Current Condition during the weekday evening peak hour and at overall Level of Service E during the weekday morning peak hour with the westbound approach continuing to operate under capacity constraints during both peak hours studied. The signalized intersection of southbound Woodward Avenue and Maple Road is calculated to operate at overall Level of Service C during the weekday morning peak hour and overall Level of Service E with southbound through approach calculated to operate under capacity constraints and the eastbound approach calculated to operate at Level of Service E during the weekday evening peak hour. The signalized intersection of southbound Woodward Avenue with the north-to-south crossover is calculated to operate generally consistently with the 2019 Current Condition during the weekday morning peak hour and at overall Level of Service D during the weekday evening peak hour. It is likely that minor adjustments to the signal timing could be implemented by MDOT should capacity conditions exist in the future. The remaining study intersections and site driveways are calculated to operate generally consistently with the 2019 Current Condition analysis. Consistent with the anticipated roadway changes, the intersection of Park Street and Hamilton Row was analyzed as a two-way-stop-controlled intersection with the Hamilton Row approaches operating under stop control.

As a result of adding the site-generated traffic volume of the proposed mixed-use development during the 2021 Future Total Condition, the study intersections and site driveways are calculated to operate generally consistently with the 2021 Future Background Condition during the weekday morning peak hour with the turning movements at the site driveways calculated to operate at acceptable Level of Service A. During the weekday evening peak hour, the signalized intersection of northbound Woodward Avenue and Maple Road is calculated to operate at overall Level of Service E, the signalized intersection of southbound Woodward Avenue and Maple Road is calculated to operate under capacity constraints, and the eastbound right-turn movement at the unsignalized intersection of southbound Woodward Avenue with Hamilton Row is calculated to operate at Level of Service E. The remaining study intersections and site driveways are calculated to operate generally consistently

with the 2021 Future Background Condition analysis with the turning movements at the site driveways calculated to operate at acceptable Level of A. Therefore, the proposed development would not significantly impact the traffic operations of the adjacent roadway network. The Level of Service results for the study network are summarized on **Table 3**.

Queuing Impacts

A vehicle queuing analysis was performed using SimTraffic 10 software for the 2019 Current Condition, 2021 Future Background Condition, and 2021 Future Total Condition during the weekday morning and weekday evening peak hours at the study intersections and proposed site driveways. The 2019 Current Condition analysis utilized the existing roadway geometry to reflect the existing queueing conditions. For each of the 2021 Future Conditions, the future layouts of the intersection of Park Street/Peabody Street and Maple Road and the intersection of Park Street and Hamilton Row were utilized to forecast queue lengths under the two-way Park Street orientation. During the 2021 Future Total Condition, the queue lengths on the surrounding roadway network were calculated to be generally consistent with the queue lengths during the 2021 Future Background Condition. As such, the proposed development would not significantly impact vehicle queues on the adjacent streets and at the proposed site driveways. The queuing results are summarized on **Table 4**.

STONEFIELD

TABLE 3 - Comparative Level of Service (Delay) Table
X (n) = Level of Service (seconds of delay)

		2019 Current Condition		2021 Future Background Condition		2021 Future Total Condition	
Intersection	**Lane Group**	**AM Peak LOS (Delay)**	**PM Peak LOS (Delay)**	**AM Peak LOS (Delay)**	**PM Peak LOS (Delay)**	**AM Peak LOS (Delay)**	**PM Peak LOS (Delay)**
NB Woodward Avenue & Maple Road *	EB Through	A (1.3)	A (0.9)	A (1.1)	A (0.2)	A (1.1)	A (0.2)
	WB Through/Right	F (148.5)	F (161.2)	F (183.3)	F (169.3)	F (185.4)	F (171.4)
	NB Through/Right	C (32.2)	C (20.5)	D (47.2)	C (25.5)	D (49.9)	C (27.5)
	Overall	**D (53.9)**	**D (49.8)**	**E (71.5)**	**D (54.8)**	**E (73.7)**	**E (56.3)**
SB Woodward Avenue & Maple Road *	EB Through/Right	C (31.1)	D (40.2)	D (35.6)	E (57.9)	D (35.6)	E (57.9)
	WB Through	A (0.2)	A (0.2)	A (0.3)	A (0.2)	A (0.3)	A (0.2)
	SB Through	C (21.6)	E (60.6)	C (23.3)	F (95.8)	C (23.4)	F (103.9)
	SB Right	A (8.8)	A (7.4)	A (8.1)	A (7.2)	A (8.0)	A (7.0)
	Overall	**B (19.4)**	**D (49.4)**	**C (21.1)**	**E (76.9)**	**C (21.2)**	**F (82.8)**
Peabody Street/Park Street & Maple Road *	EB Through	B (16.5)	C (22.6)				
	EB Right	A (5.9)	A (7.2)				
	EB Through/Right			B (16.4)	B (17.0)	B (16.4)	B (17.0)
	WB Left	D (37.9)	C (32.2)	D (40.4)	D (37.4)	D (40.4)	D (37.4)
	WB Through/Right	A (8.3)	A (4.0)	B (17.1)	B (11.8)	B (17.1)	B (11.9)
	WB Right	A (0.1)	A (0.1)	A (0.2)	A (0.1)	A (0.3)	A (0.2)
	NB Right	C (27.3)	C (25.2)	C (30.5)	C (31.6)	C (30.5)	C (31.6)
	SB Right			D (36.5)	D (36.7)	D (36.6)	D (36.9)
	Overall	**B (13.7)**	**B (15.2)**	**B (18.2)**	**B (17.5)**	**B (18.2)**	**B (17.7)**
Park Street & Hamilton Row **	EB Left	A (4.1)	B (11.7)				
	EB Through	A (6.0)	C (20.3)				
	EB Left/Through/Right			B (11.4)	C (15.7)	B (12.1)	C (22.4)
	WB Through	A (3.6)	A (3.5)				
	WB Right	A (2.1)	A (2.5)				
	WB Left/Through/Right			B (11.5)	B (12.3)	B (11.9)	B (14.7)
	NB Left	A (0.1)	A (0.0)				
	NB Through	A (1.0)	A (0.2)				
	NB Right	A (0.4)	A (7.8)				
	NB Left/Through/Right			A (7.3)	A (7.3)	A (7.3)	A (7.4)
	SB Left	A (5.6)	D (34.9)				
	SB Right	A (2.9)	D (29.8)				
	SB Left/Through/Right			A (7.4)	A (7.6)	A (7.5)	A (7.8)
	Overall	**A (2.8)**	**C (22.3)**				
SB Woodward Avenue & Hamilton Row	EB Right	B (11.8)	C (21.9)	B (12.7)	C (23.6)	B (13.1)	E (35.7)
SB Woodward Avenue & Site Driveway	EB Right	A (0.0)	B (12.7)	A (0.0)	B (12.8)		
Park Street & Site Driveway	WB Left/Right					A (9.1)	A (8.9)
	SB Left/Through					A (7.5)	A (7.4)
Site Driveway & Hamilton Row	WB Left	A (0.0)	A (7.8)	A (0.0)	A (7.8)	A (7.6)	A (0.0)
	NB Left/Right	A (0.0)	B (10.2)	A (0.0)	B (10.3)	A (0.0)	A (0.0)
SB Woodward Avenue & NB to SB Crossover *	WB Left	B (15.4)	B (15.2)	B (15.6)	B (14.8)	B (15.9)	B (15.0)
	SB Through	B (15.3)	C (31.6)	B (16.8)	D (48.3)	B (17.0)	D (50.4)
	Overall	**B (15.4)**	**C (30.8)**	**B (16.8)**	**D (46.7)**	**B (16.9)**	**D (48.6)**

* Intersections of Woodward Avenue & Maple Road, Peabody Street/Park Street & Maple Road, and Woodward Avenue & NB to SB Crossover were analyzed using HCM 2000 due to limitations in HCM 6th Edition methodology pertaining to clustering and non-NEMA phasing

** The intersection of Park Street & Hamilton Row was analyzed using SimTraffic 10 for the 2019 Current Condition and HCM 6th TWSC for the 2021 Future Background & Total Conditions.

STONEFIELD

TABLE 4 - Comparative Queue Length Table
95th Percentile Queues in Feet

		Weekday Morning Peak Hour			Weekday Evening Peak Hour		
Intersection	**Lane Group**	**2021 Future Background**	**2021 Future Total**	**Δ Vehicles (25ft/veh)**	**2021 Future Background**	**2021 Future Total**	**Δ Vehicles (25ft/veh)**
NB Woodward Avenue & Maple Road	EB Through	15	15	0	11	19	0
	EB Through	15	11	0	0	0	0
	WB Through	560	565	0	571	556	-1
	WB Through/Right	563	560	0	571	555	-1
	NB Through	706	699	0	590	602	0
	NB Through	647	666	1	492	532	2
	NB Through	556	605	2	361	383	1
	NB Through/Right	519	584	3	274	324	2
SB Woodward Avenue & Maple Road	EB Through	147	157	0	135	149	1
	EB Through/Right	178	182	0	170	176	0
	WB Through	45	40	0	21	15	0
	WB Through	19	19	0	14	13	0
	SB Through	361	318	-2	375	347	-1
	SB Through	358	318	-2	366	340	-1
	SB Through	321	300	-1	380	348	-1
	SB Through	250	309	2	397	345	-2
	SB Right	109	110	0	225	359	5
Peabody Street/Park Street & Maple Road	EB Through/Right	625	567	-2	618	610	0
	WB Left	123	131	0	96	95	0
	WB Through	118	118	0	108	94	-1
	WB Right	64	49	-1	47	42	0
	NB Right	244	219	-1	243	238	0
	SB Right	16	21	0	41	64	1
Park Street & Hamilton Row	EB Left/Through/Right	33	33	0	79	54	-1
	WB Left/Through/Right	49	51	0	30	47	1
	NB Left/Through/Right	12	12	0	37	19	-1
	SB Left/Through/Right	13	17	0	108	52	-2
SB Woodward Avenue & Hamilton Row	EB Right	82	61	-1	107	102	0
	SB Through	74	67	0	233	264	1
	SB Through	47	6	-2	235	264	1
	SB Through	25	23	0	246	268	1
	SB Through/Right	14	58	2	245	257	0
Park Street & Site Driveway	WB Left/Right		35	--		43	--
	NB Through/Right		7	--		4	--
	SB Left/Through		10	--		10	--
Site Driveway & Hamilton Row	EB Through/Right	17	0	-1	46	29	-1
	WB Left/Through	13	22	0	5	0	0
	NB Left/Right	0	0	0	26	0	-1
SB Woodward Avenue & NB to SB Crossover	WB Left	71	69	0	75	69	0
	SB Through	272	273	0	260	264	0
	SB Through	276	283	0	259	262	0
	SB Through	291	297	0	262	261	0
	SB Through	299	310	0	291	264	-1

Parking Supply & Parking Demand

The proposed development is located within the City of Birmingham's downtown parking assessment district. Per the City's Zoning Ordinance, "For all nonresidential uses located within the parking assessment district, parking on the site shall not be required." For residential uses, a parking supply rate of 1.5 spaces per unit is required. For the proposed 42 apartment units, this equates to 63 required parking spaces.

Parking would be provided on-site via ground-level parking spaces within the building's footprint and via a two (2)-level underground parking garage. Access to the parking areas would not be gated. The ground-level parking spaces would be located adjacent to the Hunter House Hamburgers restaurant on the northeast portion of the property and provide three (3) ground-level parking spaces, inclusive of one (1) ADA-accessible parking space. The three (3) parking spaces would be designated for the Hunter House Hamburgers restaurant. The upper level and lower level of the underground parking garage would each provide 41 parking spaces, for a total of 82 underground parking spaces and 85 total parking spaces on-site.

Although the site exceeds the minimum parking supply required, an analysis of the total proposed supply of 85 spaces was conducted with respect to the anticipated peak parking demand.

Per the City's Ordinance, if the site were not located within the downtown parking assessment district, the development would require:

1. Hunter House Hamburgers – 1 space per 75 SF – for 1,330 SF this equates to 18 spaces.
2. Residential Apartments – 1.5 spaces per unit – for 42 units this equates to 63 spaces.
3. Office – 1 space per 300 SF – for 21,675 SF this equates to 72 spaces,
4. Retail Store – 1 space per 300 SF – for 10,150 SF this equates to 34 spaces.

For the 42 residential units, 21,675 square feet of office space, 10,150 square feet of retail space, and 1,330-square-foot Hunter House Hamburgers, this equates to 187 spaces. Of the 82 parking spaces provided within the on-site parking garage, 63 spaces would be designated for residents, 11 spaces would be designated for Hunter House Hamburger patrons, and eight (8) spaces would be designated for employees of the site. The remaining office employees, and the retail employees and patrons would park off-site.

A shared parking model was prepared utilizing the parking demand rates calculated above and the Urban Land Institute's (ULI) Shared Parking, 2nd Edition to provide an understanding of the time-of-day peaks of the proposed development. The shared parking model indicates that the weekday midday period represents the time period of most intense use on the site. **Table 5** provides the ULI Shared Parking Model for the proposed development, excluding Hunter House Hamburgers, which provides a separated dedicated parking supply on-site.

The parking demand generated by the site in excess of the on-site supply was compared to available parking within the Park Street Parking Structure and Peabody Parking Structure. Based on data collected in March 2017, there is sufficient parking within the Park Street Parking Structure and the Peabody Parking Structure during the peak weekday morning and weekday evening periods of the development. During the weekday midday peak hour, which represents the peak period for each of the parking structures, the parking supply would be at capacity. **Table 6** provides the parking demand of the proposed development and supply provided within the nearby parking structures.

It is important to note that the parking demand rates utilized within the report are applicable to uses outside the downtown parking assessment area, where developments generally consist of homogeneous, single-use developments and transportation to and from developments is made nearly exclusively by personal vehicle. In a traditional downtown environment, such as the location of the proposed development, trips made by walking, bicycle, transit, or other means are common. Visitors and employees in downtown areas typically park once and walk, making trips to several destinations via walking without parking additional vehicles or contributing to

additional vehicular traffic. It is anticipated existing visitors and employees in Downtown Birmingham would make trips to the proposed development via walking and not contribute to an increased parking demand.

Parking is not required for non-residential uses in the downtown parking assessment district, and the parking supply provided on-site is in excess of the minimum requirement of 63 parking spaces.

TABLE 5 - Proposed Mixed-Use Development Demand (Weekday)
ULI Shared Parking Model

	Office **Peak Demand: 72 spaces**		**Retail** **Peak Demand: 34 spaces**		**Residential Apartments** **Peak Demand: 63 spaces**		**Total Site Parking Demand**
Time of Day	Time-of-day Factor	Parking Demand	Time-of-day Factor	Parking Demand	Time-of-day Factor	Parking Demand	
6:00 AM	3%	2	1%	0	100%	63	65
7:00 AM	30%	22	5%	2	100%	63	87
8:00 AM	75%	54	15%	5	100%	63	122
9:00 AM	95%	68	35%	12	100%	63	143
10:00 AM	100%	72	65%	22	100%	63	157
11:00 AM	100%	72	85%	29	100%	63	164
12:00 PM	90%	65	95%	32	100%	63	160
1:00 PM	90%	65	100%	34	100%	63	162
2:00 PM	100%	72	95%	32	100%	63	167
3:00 PM	100%	72	90%	31	100%	63	166
4:00 PM	90%	65	90%	31	100%	63	159
5:00 PM	50%	36	95%	32	100%	63	131
6:00 PM	25%	18	95%	32	100%	63	113
7:00 PM	10%	7	95%	32	100%	63	102
8:00 PM	7%	5	80%	27	100%	63	95
9:00 PM	3%	2	50%	17	100%	63	82
10:00 PM	1%	1	30%	10	100%	63	74
11:00 PM	0%	0	10%	3	100%	63	66
12:00 AM	0%	0	0%	0	100%	63	63

TABLE 6 - Parking Occupancy (Weekday)
Public Parking Sturcture Parking Supply & Demand

Time of Day	Available Spaces in March 2017			Proposed The Maple Development			Future Parking Supply	
	Park Street Structure	Peabody Street Structure	Total	Parking Demand	On-Site Supply	Off-Site Demand	Park Street Structure	Both Structures
12:00 AM	746	392	1138	63	71	0	746	1138
1:00 AM	750	393	1143					
2:00 AM	751	394	1145					
3:00 AM	751	394	1145					
4:00 AM	763	378	1141					
5:00 AM	801	425	1226					
6:00 AM	796	398	1194	65	71	0	796	1194
7:00 AM	775	380	1155	87	71	16	759	1139
8:00 AM	644	326	970	122	71	51	593	919
9:00 AM	310	149	459	143	71	72	238	387
10:00 AM	72	35	107	157	71	86	-14	21
11:00 AM	40	11	51	164	71	93	-53	-42
12:00 PM	22	8	30	160	71	89	-67	-59
1:00 PM	8	8	16	162	71	91	-83	-75
2:00 PM	16	8	24	167	71	96	-80	-72
3:00 PM	30	15	45	166	71	95	-65	-50
4:00 PM	54	32	86	159	71	88	-34	-2
5:00 PM	146	120	266	131	71	60	86	206
6:00 PM	477	215	692	113	71	42	435	650
7:00 PM	560	237	797	102	71	31	529	766
8:00 PM	602	283	885	95	71	24	578	861
9:00 PM	653	329	982	82	71	11	642	971
10:00 PM	721	362	1083	74	71	3	718	1080
11:00 PM	736	388	1124	66	71	0	736	1124

Multi-Modal Analysis

A review was conducted of the City of Birmingham's Multi-Modal Transportation Plan to identify impacts of the proposed development with respect to non-automobile transportation alternatives. Based on this review, there are several attributes of the proposed development that contribute to positive multi-modal impacts.

Based on the design of the site, the proposed development improves the urban form of the current block as compared to the existing uses. Presently, the majority of the development on-site consists of surface parking, which does not encourage pedestrian travel along the property in a downtown environment. The proposed development would be comprised of a five (5)-story building set back directly along the property lines of the site, which is consistent with the downtown character of the buildings on adjacent blocks located on the opposite sides of Maple Road, Park Street, and Hamilton Road. The construction of the proposed building would help expand the downtown footprint along Woodward Avenue and provide urban continuity between the westerly side of Woodward Avenue and the Kroger Supermarket located at the northeast quadrant of the intersection of Woodward Avenue and Maple Road.

The entrances to the office and residential portions of the site would be located midblock along Park Street. The primary retail use on site would have entrances located on the corner of Maple Road and Park Street, midblock along Park Street, and along Woodward Avenue in close proximity to Maple Road. The entrance to the retail pad on the northeast portion of the property would be located along Woodward Avenue near Hamilton Row. The entrance to Hunter House Hamburgers would remain facing Woodward Avenue near Hamilton Row in the northeast corner of the site. The entrances along Park Street would face toward the center of downtown and is more desirable for pedestrian interaction. The Hunter Hamburger House restaurant entrance location is adjacent to the crosswalk crossing Hamilton Row, and along Woodward Avenue, the sidewalk network would be completed between Hamilton Row and Maple Road, whereas presently the network consists of a mix of sidewalk and asphalt for an existing parking lot.

Per Figure 3.6A within the Multi-Modal Transportation Plan, Maple Road is designated for shared lane markings for bicycle traffic along the site frontage. Bicycle racks would be provided outside at the entrances to the retail uses and Hunter House Hamburgers for visitor use and covered indoor bicycle storage would be provided within the parking garage for use by office employees and residents of the apartments. The proposed bicycle storage encourages non-automobile use via bicycle travel. As Park Street is to be converted to two-way traffic on a permanent basis, an opportunity exists to improve multi-modal facilities along Park Street as part of the two-way conversion process.

SMART offers fixed-route bus service in close proximity to the site frontage via Route 450, Route 460, Routes 461/462 (Fast Woodward), Route 445 and Route 780. Stops are provided for Routes 461/462 along Woodward Avenue at its intersection with Maple Road, stops are provided for Route 445 and Route 780 along Maple Road at its intersection with Old Woodward Avenue, and stops are provided for Route 450 and Route 460 along Old Woodward Avenue. These stops are all located within an approximately two (2)-block walk from the site. Information regarding the nearby bus routes is provided within the Technical Appendix. It is recommended that the proposed office and retail uses provide information for employees regarding available transit options in the area, including wayfinding assistance, schedules, routes, and other general information.

Based on the attributes of development stated above, the proposed development is consistent with the City's Multi-modal Transportation Plan and represents a significant improvement over the existing site.

Key Findings and Conclusions

The key findings and conclusions developed in this study are as follows:

1. The proposed apartments are projected to generate 15 trips (4 in, 11 out) during the weekday morning peak hour and 18 trips (11 in, 7 out) during the weekday evening peak hour. The proposed office is projected to generate 47 trips (40 in, 7 out) during the weekday morning peak hour and 27 trips (4 in, 23 out) during the weekday evening peak hour. The retail uses are projected to generate 10 trips (6 in, 4 out) during the weekday morning peak hour and 100 trips (48 in, 52 out) during the weekday evening peak hour. The Hunter House Hamburgers restaurant is to continue operating on the site and is projected to generate three (3) trips (3 in, 0 out) during the weekday morning peak hour and 38 trips (19 in, 19 out) during the weekday evening peak hour.

2. Traffic for employees of the Hunter House Hamburgers restaurant and ADA parking would utilize the full-movement driveway along Hamilton Row. Traffic for the apartments, patrons of the Hunter House Hamburgers, and a portion of office employees would arrive to and depart from the driveway along Park Street. Traffic for the retail uses and remaining portion of office employees would utilize the parking garages located at 333 Park Street and 222 Peabody Street. Based on parking occupancy count data from March 2017, there is sufficient parking supply to accommodate the parking demand during the weekday morning and evening periods.

3. The site is located within the downtown parking assessment district, and as such, no parking is required for the non-residential portion development. The site would provide three (3) ground-level garage parking spaces designated for Hunter House Hamburgers, and 82 parking spaces below grade, including 63 parking spaces for residents, 11 spaces dedicated to Hunter House Hamburgers, and eight (8) parking spaces for employees at the subject site.

4. The proposed development would further the City's Multi-Modal Transportation Plan by improving the urban character of the block, expanding the downtown footprint and removing surface parking lots that do not encourage pedestrian travel or interaction. The site's location would provide an additional destination in the vicinity of six (6) SMART bus routes. It is recommended that the office and retail uses provide transit information for its employees to encourage transit use.

5. The proposed development would further the City's Multi-Modal Transportation Plan by completing the sidewalk network along Woodward Avenue between Hamilton Row and Maple Road, whereas a combination of sidewalk and asphalt pavement for a parking lot exists today.

6. The proposed development would further the City's Multi-Modal Transportation Plan by providing outdoor bicycle racks at the entrances to the retail uses and Hunter House Hamburgers for visitor use and covered indoor bicycle storage would be provided within the parking garage for use by office employees and residents of the apartments. The proposed bicycle storage encourages bicycle use at the site and reduces the need for trips via automobile.

7. Gated access is not proposed at any of the parking areas.

8. Based on a Level of Service and Volume/Capacity analysis, the proposed development would not have a significant impact on the traffic operations of the roadway network during the weekday morning and weekday evening peak hours.

9. No traffic infrastructure improvements are warranted by the proposed development; however, the analysis does consider the proposed two-way operation of Park Street approved by the City of Birmingham.

TECHNICAL APPENDIX

PROFESSIONAL RESUME

CHARLES D. OLIVO, PE
PRINCIPAL/FOUNDER

Education

BS Civil Engineering
University of Notre Dame, 2002

Licensure

Professional Engineer
Michigan
Indiana
Ohio
New Jersey
New York
Pennsylvania
Connecticut
Maine
Massachusetts
Rhode Island
Maryland
North Carolina
New Hampshire

Professional Traffic Operations Engineer

Associations

Institute of Transportation Engineers (ITE)

American Society of Civil Engineers (ASCE)

Urban Land Institute (ULI)

Mr. Charles Olivo is accomplished in numerous aspects of Civil, Infrastructure, Highway, and Traffic and Transportation Engineering having completed projects for private development/redevelopment entities, public jurisdictional agencies, and local municipalities. Serving clients throughout the Northeast and Midwest, he has professional experience designing and managing the unique and diverse elements of land development and infrastructure design. Mr. Olivo is involved with engineering design from project inception and conceptual development through the entitlement and construction process. His experience in the Civil Engineering field has involved the shaping of development parcels inclusive of both on-site and off-site impacts and access management features.

Preparation of detailed traffic and civil engineering findings during the Due Diligence/Site Assessment process for over 300 development sites to serve as the cornerstone of project viability and create a critical reference point during feasibility assessment. Through thorough research of local development codes and an understanding of development opportunities and constraints, Mr. Olivo has successfully prepared numerous Site and Traffic Analyses for development/redevelopment projects and programs.

Preparation of engineered Site Plan and Traffic Roadway Plan documents to serve as essential components in the land use permitting and entitlement process. Mr. Olivo has been integrally involved in the preparation of over 300 construction document sets, studies, analyses, and assessments associated with land development projects. He has established a reputation of high-quality design, innovative thinking, and understanding of client objectives throughout his experience.

Mr. Olivo has been a key advocate in urban infill development and the advancement of smart growth techniques. He has been the transportation engineer of record for numerous development and redevelopment plans.

Mr. Olivo has been qualified as a traffic and site Engineering Expert and provided testimony before approximately 100 Land Use Boards throughout the country. In addition, he has presented to client groups, public governing bodies, and civic associations to explain the impacts of private development/redevelopment projects and the proposed improvement/mitigation measures associated with these projects.

Mr. Olivo's project experience includes traffic analysis, traffic signal and intersection improvement design, zoning review, site investigation and due diligence, concept preparation, stormwater management and stormwater conveyance system design, grading utility design, soil erosion and sediments, control design, and project coordination.

CITY OF BIRMINGHAM TRAFFIC IMPACT ASSESSMENT FORM (FORM B)

FORM B - FULL TRAFFIC STUDY QUESTIONNAIRE

Applicant: _____ Case#:_____

Date: 01/06/2020 Address:_____

1. Proposed Project

Brief description of the proposed project: Proposed construction of a five (5)-story mixed-use building. The existing Hunter House Hamburgers restaurant would remain on-site within the proposed building. Access is proposed via one (1) full-movement driveway along Park Street and one (1) full-movement driveway along Hamilton Row. An underground parking garage would provide 82 parking spaces for residents and a surface lot would provide three (3) spaces for employees of Hunter House Hamburgers restaurant.

Use of building(s): Residential, retail, office

Gross square footage: 95,356 SF (excluding parking)

Net square footage:_____

Number of parking spaces: 85

Site plan attached: Included with CIS

2. Existing Traffic

Provide Map 1 depicting recent a.m. and p.m. peak hour turning movement counts at all critical intersections within the project's impact area. Critical intersections should be defined in consultation with the City's Traffic Consultant. In general, small projects will have critical intersection within 0.5 to 1 mile from the site. Large projects may have an impact area expending two or more miles form the site.

Provide Map 2 depicting all roadways within the impact area of the project, the number of lanes on each road, and the most recent a.m. peak hour, p.m. peak hour and ADT counts on each road that are available from the City or Road Commission.

Using methodologies in the Highway Capacity Manual, Special Report 209, by the Transportation Research Board, provide tables below depicting the existing stopped time delay per vehicle and Level of Service for each critical intersection during a.m. and p.m. peak hours:

Included within Traffic Impact Assessment

Intersection:

A.M. Peak Hour:_____ P.M. Peak Hour:_____

Ex. Stopped Time Delay/Vehicle:_____ Ex. Stopped Time Delay/Vehicle:_____

Level of Service:_____ Level of Service:_____

Intersection:

A.M. Peak Hour:_____ P.M. Peak Hour:_____

Ex. Stopped Time Delay/Vehicle:_____ Ex. Stopped Time Delay/Vehicle:_____

Level of Service:_____ Level of Service:_____

Intersection:

A.M. Peak Hour:_____ P.M. Peak Hour:_____
Ex. Stopped Time Delay/Vehicle:_____ Ex. Stopped Time Delay/Vehicle:_____
Level of Service:_____ Level of Service:_____

3. Background Growth and Other Development Traffic

Determine the historical growth rate of traffic on roadways in the impact area by examining traffic counts over the last 3 to 5 years. Once an annual growth rate has been identified, apply the growth rate to existing traffic for the number of years until project completion. Show the background growth assignment on Map 4.

In some cases it may be necessary to assign trips for other large projects in the impact area to the road network in conjunction with or in lieu of using a background growth rate. This would be done to more accurately reflect future conditions. Consult with the City's Traffic Consultant.

Using the Highway Capacity Manual, provide tables as below depicting the Stopped Time Delay and Level of Service for each critical intersection for the existing plus background/other development scenario. For multi-phase projects, provide a separate table for each phase.

Included within Traffic Impact Assessment

Intersection 1

A.M. Peak Hour:_____ P.M. Peak Hour:_____
Ex. Stopped Time Delay/Vehicle: _____ Ex. Stopped Time Delay/Vehicle: _____
Level of Service: _____ Level of Service: _____

A.M. Peak Hour:_____ P.M. Peak Hour:_____
Dev. Scenario Stopped Time Delay/Vehicle: _____ Dev. Stopped Time Delay/Vehicle: _____
Dev. Scenario Level of Service: _____ Dev. Scenario Level of Service:_____

Intersection 2

A.M. Peak Hour:_____ P.M. Peak Hour:_____
Ex. Stopped Time Delay/Vehicle: _____ Ex. Stopped Time Delay/Vehicle: _____
Level of Service: _____ Level of Service: _____

A.M. Peak Hour:_____ P.M. Peak Hour:_____
Dev. Scenario Stopped Time Delay/Vehicle: _____ Dev. Stopped Time Delay/Vehicle: _____
Dev. Scenario Level of Service: _____ Dev. Scenario Level of Service:_____

4. Project Traffic

Determine the number of trips generated by the proposed project, identify the directional distribution of the trips and assign the trips to the road network. Show the directional distribution on Map 5.

On Map 6, show the assignment of a.m. and p.m. peak hour trips from the project and show the number of a.m. and p.m. peak hour trips for the total of existing background/other development and project traffic.

Provide Map 7 (see below) for each critical intersection showing separately: number of turning movements made by existing traffic; existing plus background/other development; and existing plus background/other development plus project.

Using the Highway Capacity Manual, provide a table showing the stopped time delay and level of service for each critical intersection for the total traffic scenario (existing plus background/other plus project). Use the same form as example in section 3 above. For multi-phase projects, provide a separate table for each phase.

5. Driveway Movements (a.m. and p.m. peak hours)

Driveway: Park Street
Left In: AM - 8, PM - 25
Right In: AM - 1, PM - 5
Left Out: AM - 2, PM - 3
Right Out: AM - 10, PM - 26

Driveway: Hamilton Row
Left In: AM - 2, PM - 0
Right In: AM - 0, PM - 0
Left Out: AM - 0, PM - 0
Right Out: AM - 0, PM - 0

Driveway: _____
Left In: _____
Right In: _____
Left Out: _____
Right Out: _____

Driveway: _____
Left In: _____
Right In: _____
Left Out: _____
Right Out: _____

6. Recommended Improvements

Attach a separate sheet outlining recommended improvements to intersections and roadways necessary to accommodate future volumes. Provide appropriate capacity analyses to demonstrate the impact of the improvement(s).

7. Transportation Standards

Using the City Design and Construction standards or where appropriate, County Road Commission and Michigan Department of Transportation standards, identify and evaluate the following:

Passing lanes: N/A

Tapers: N/A

Turn Lanes: N/A

Vehicle stacking analysis (if drive-up facilities are proposed): N/A

8. Sight Distance

Provide evaluations of sight distances at project driveways to demonstrate that they meet applicable City, County or State criteria.

*All maps and tables referenced above should be provided in the applicant's traffic study.
**Some projects with a low a.m. peak hour trip generation my not require Level of Service analysis for the a.m. peak hour. Consult with the City' Traffic Consultant.

Map 7

CRITICAL INTERSECTION
PHASE _____ (if applicable) Not Applicable

C C C

B B B
A A A

_____	____
C B A	A B C
C B A	A B C
C B A	A B C
_____	____

A A A

B B B
C C C

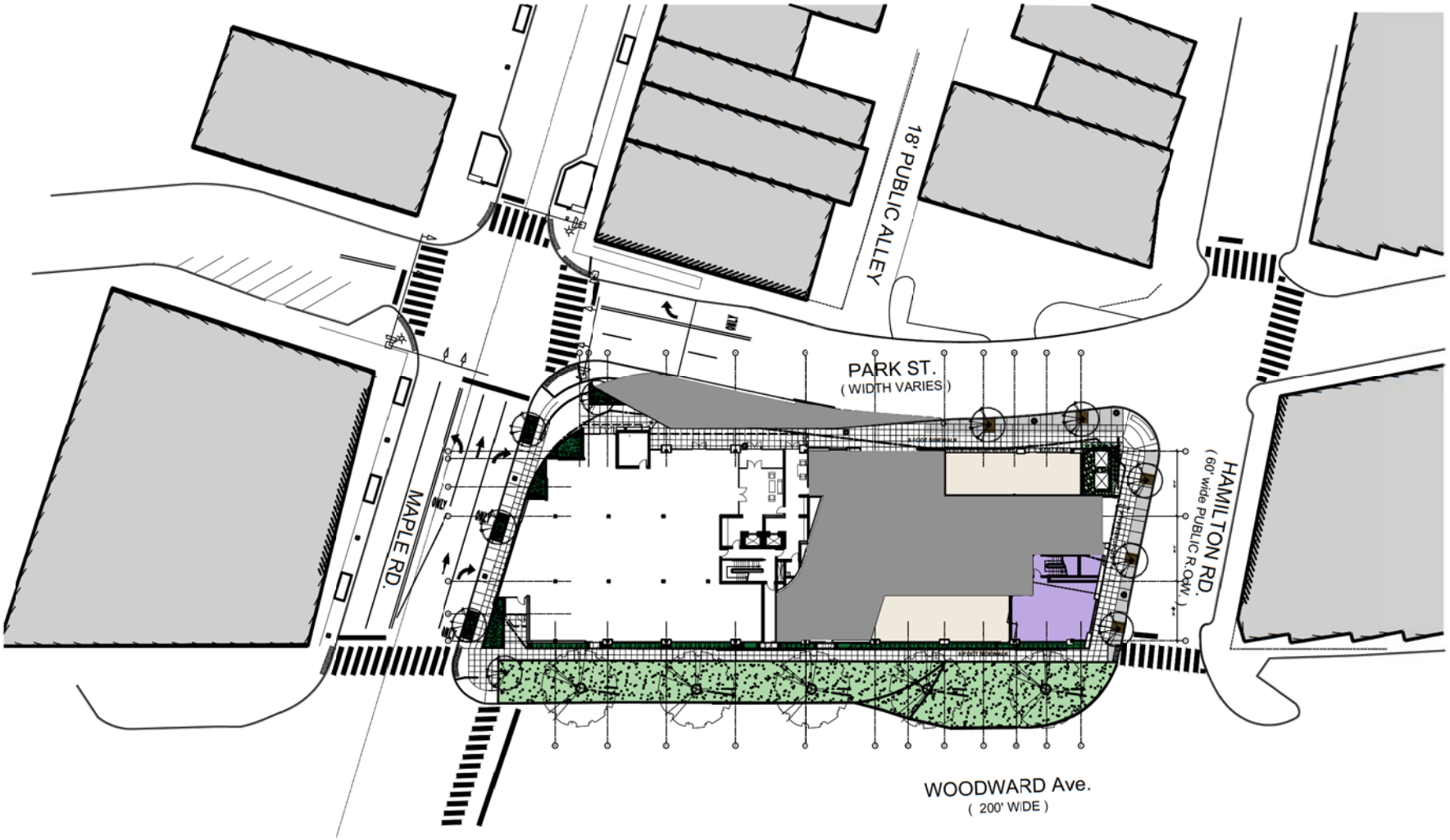
A = Existing traffic

B = Existing plus background/other traffic

C = Existing plus background/other plus project traffic

Note: In addition to the above information, the Petitioner must acknowledge and address all of the pertinent goals, objectives, requirements and standards enumerated in the Birmingham Master Traffic Study.

SITE PLAN



ARCHITECTURAL SITE PLAN
SCALE: 1"=20'-0"

biddison | architecture + design
320 Martin St., Suite 10
Birmingham, MI 48009
t.248.554.9500

Consultants

Project title

PROPOSED BUILDING FOR:
The Maple

35001 and 35075 Woodward Ave.
Birmingham, Michigan

Issued dr/ch

SITE PLAN REVISION 02.20.19
SITE PLAN REVISION 05.13.19

Sheet title

ARCHITECTURAL SITE PLAN

STATE OF MICHIGAN
KEVIN L. BIDDISON
ARCHITECT

Project no.

1971.16

Sheet no.

SP.101

A10

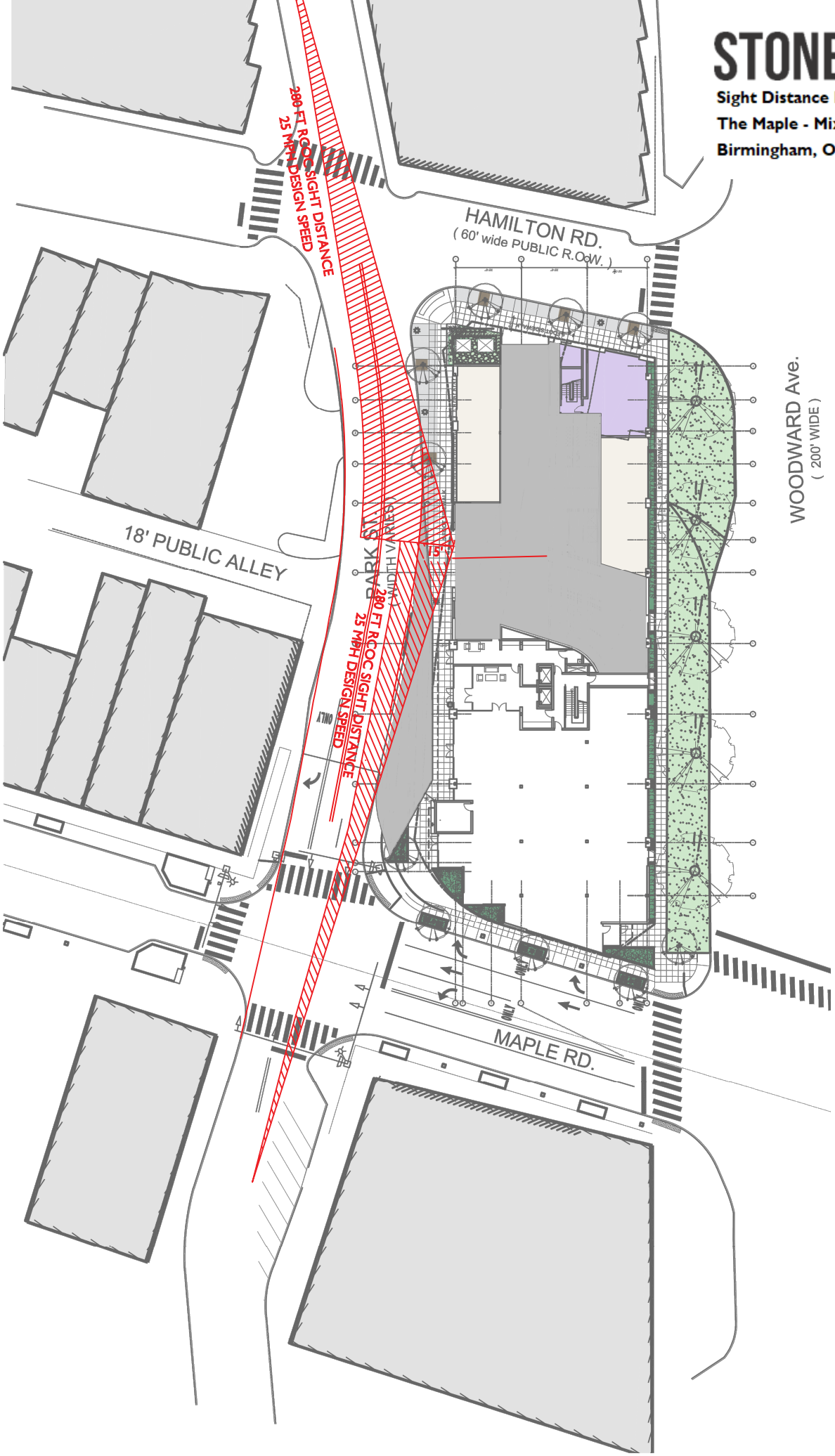
SIGHT DISTANCE EVALUATION

STONEFIELD

Sight Distance Evaluation Exhibit - Park Street

The Maple - Mixed-Use Development

Birmingham, Oakland County, Michigan

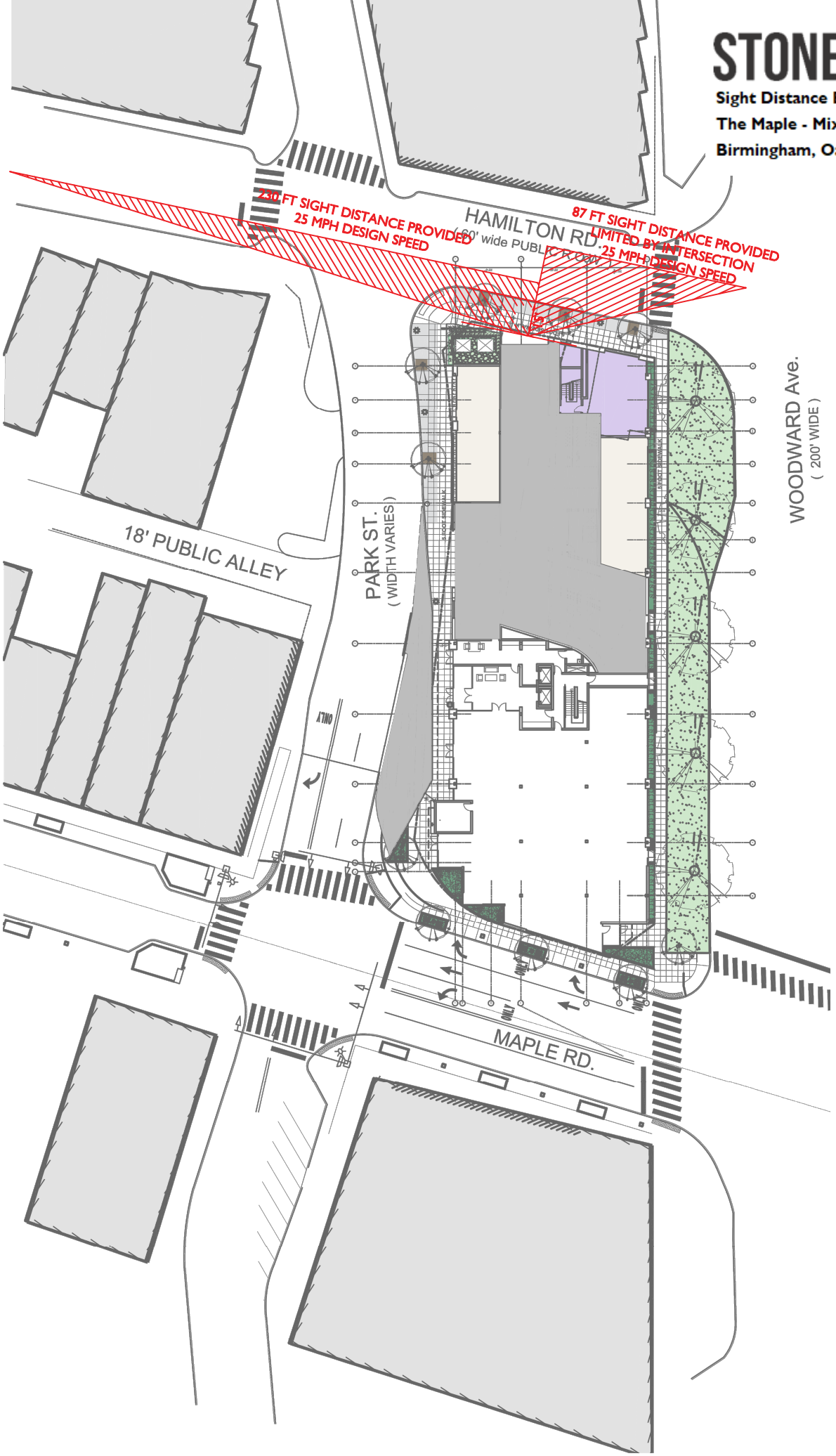


STONEFIELD

Sight Distance Evaluation Exhibit - Hamilton Row

The Maple - Mixed-Use Development

Birmingham, Oakland County, Michigan



PEABODY STREET/PARK STREET & MAPLE ROAD
FUTURE INTERSECTION LANE GEOMETRY

PARK STREET

OPTION L
(5) - 10 FOOT WIDE LANES

RAY PROJECT NO. 23365

FLEIS&VANDENBRINK
DESIGN. BUILD. OPERATE.

TURNING MOVEMENT COUNT DATA

Traffic Data Collection, LLC

www:tdccounts.com

Phone: 586.786-5407

Traffic Study Performed For:

STONEFIELD

Project: Birmingham Traffic Impact Study
Study:4 Hr. Video Turning Movement Count
Weather: Sunny/Cldy. Dry Deg's 80's
Count By Miovision Video VCU 61A SW

File Name : TMC_1 SB M1 & NB-SB XO_8-8-18
Site Code : TMC_1
Start Date : 8/8/2018
Page No : 1

4 Hour traffic study was conducted during typical weekday (Tuesday-Thursday) from 7:00 AM - 9:00 AM morning & 4:00 PM - 6:00 PM afternoon peak hours, while school was not in session.

Groups Printed- Pass Cars - Single Units - Heavy Trucks

	SB M-1 (Woodward Ave.) Southbound				NB>SB Crossover								
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
07:00 AM	451	8	0	459	0	15	0	15	0	0	0	0	474
07:15 AM	502	10	0	512	0	21	0	21	0	0	0	0	533
07:30 AM	610	14	0	624	0	25	0	25	0	0	0	0	649
07:45 AM	637	13	0	650	0	42	0	42	0	0	0	0	692
Total	2200	45	0	2245	0	103	0	103	0	0	0	0	2348
08:00 AM	588	26	0	614	0	30	0	30	0	0	0	0	644
08:15 AM	593	25	0	618	0	45	0	45	0	0	0	0	663
08:30 AM	616	34	0	650	0	47	0	47	0	0	0	0	697
08:45 AM	618	32	0	650	0	43	0	43	0	0	0	0	693
Total	2415	117	0	2532	0	165	0	165	0	0	0	0	2697
*** BREAK ***													
04:00 PM	549	43	0	592	0	47	0	47	0	0	0	0	639
04:15 PM	582	54	0	636	0	38	0	38	0	0	0	0	674
04:30 PM	591	60	0	651	0	45	0	45	0	0	0	0	696
04:45 PM	676	50	0	726	0	38	0	38	0	0	0	0	764
Total	2398	207	0	2605	0	168	0	168	0	0	0	0	2773
05:00 PM	676	56	0	732	0	43	0	43	0	0	0	0	775
05:15 PM	727	68	0	795	0	48	0	48	0	0	0	0	843
05:30 PM	656	55	0	711	0	43	0	43	0	0	0	0	754
05:45 PM	618	56	0	674	0	41	0	41	0	0	0	0	715
Total	2677	235	0	2912	0	175	0	175	0	0	0	0	3087
Grand Total	9690	604	0	10294	0	611	0	611	0	0	0	0	10905
Apprch %	94.1	5.9	0		0	100	0		0	0	0		
Total %	88.9	5.5	0	94.4	0	5.6	0	5.6	0	0	0	0	
Pass Cars	9495	596	0	10091	0	589	0	589	0	0	0	0	10680
% Pass Cars	98	98.7	0	98	0	96.4	0	96.4	0	0	0	0	97.9
Single Units	151	8	0	159	0	17	0	17	0	0	0	0	176
% Single Units	1.6	1.3	0	1.5	0	2.8	0	2.8	0	0	0	0	1.6
Heavy Trucks	44	0	0	44	0	5	0	5	0	0	0	0	49
% Heavy Trucks	0.5	0	0	0.4	0	0.8	0	0.8	0	0	0	0	0.4

TDC Traffic Comments: Signalized "T" intersection, no ped. signals. Video VCU camera was located within SW intersection quadrant. Note: SB left turn movements have been recorded for SB>NB M-1 Crossover, north of Hamilton ROW.

Traffic Data Collection, LLC

www:tdccounts.com

Phone: 586.786-5407

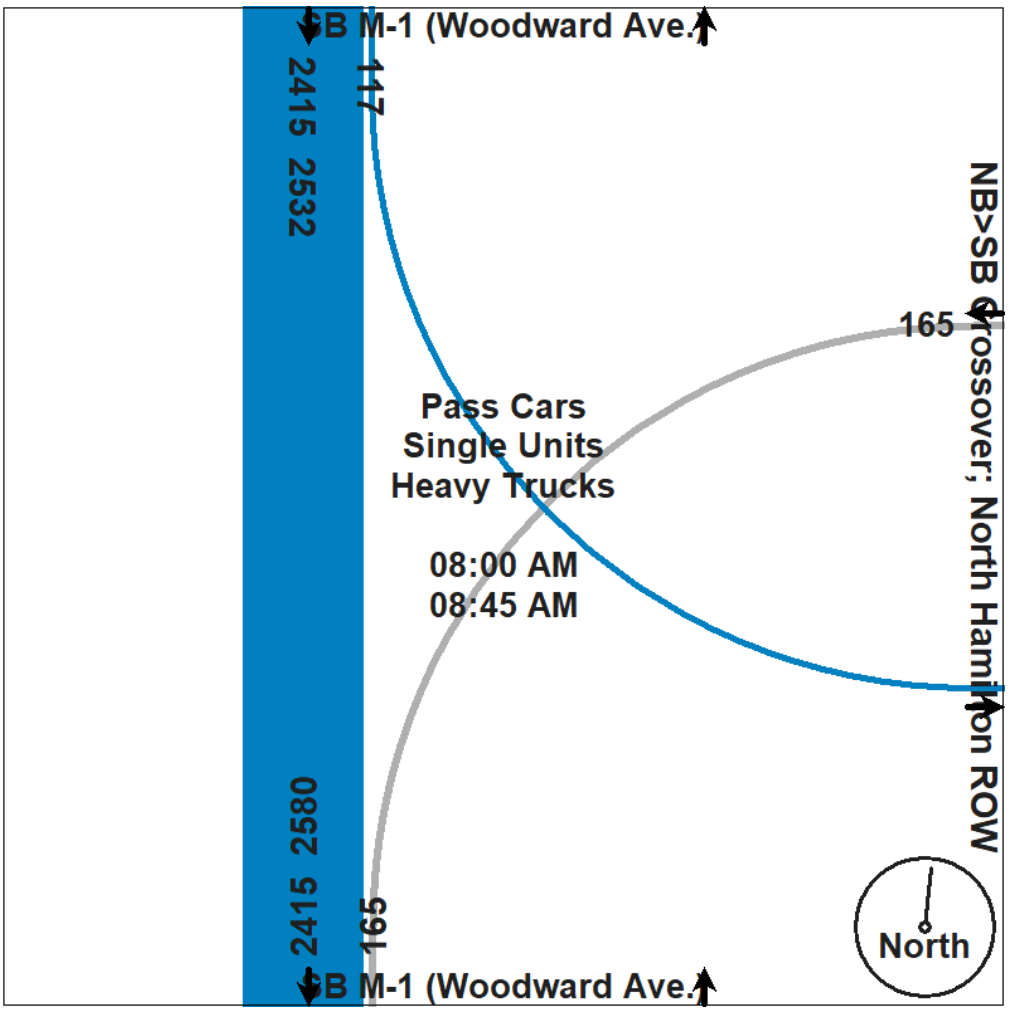
Traffic Study Performed For:

STONEFIELD

Project: Birmingham Traffic Impact Study
Study:4 Hr. Video Turning Movement Count
Weather: Sunny/Cldy. Dry Deg's 80's
Count By Miovision Video VCU 61A SW

File Name : TMC_1 SB M1 & NB-SB XO_8-8-18
Site Code : TMC_1
Start Date : 8/8/2018
Page No : 3

	SB M-1 (Woodward Ave.) Southbound			NB>SB Crossover						
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 08:00 AM										
08:00 AM	588	26	614	0	30	30	0	0	0	644
08:15 AM	593	25	618	0	45	45	0	0	0	663
08:30 AM	616	**34**	**650**	0	**47**	**47**	0	0	0	**697**
08:45 AM	**618**	32	650	0	43	43	0	0	0	693
Total Volume	2415	117	2532	0	165	165	0	0	0	2697
% App. Total	95.4	4.6		0	100		0	0		
PHF	.977	.860	.974	.000	.878	.878	.000	.000	.000	.967
Pass Cars	2351	115	2466	0	157	157	0	0	0	2623
% Pass Cars	97.3	98.3	97.4	0	95.2	95.2	0	0	0	97.3
Single Units	44	2	46	0	6	6	0	0	0	52
% Single Units	1.8	1.7	1.8	0	3.6	3.6	0	0	0	1.9
Heavy Trucks	20	0	20	0	2	2	0	0	0	22
% Heavy Trucks	0.8	0	0.8	0	1.2	1.2	0	0	0	0.8



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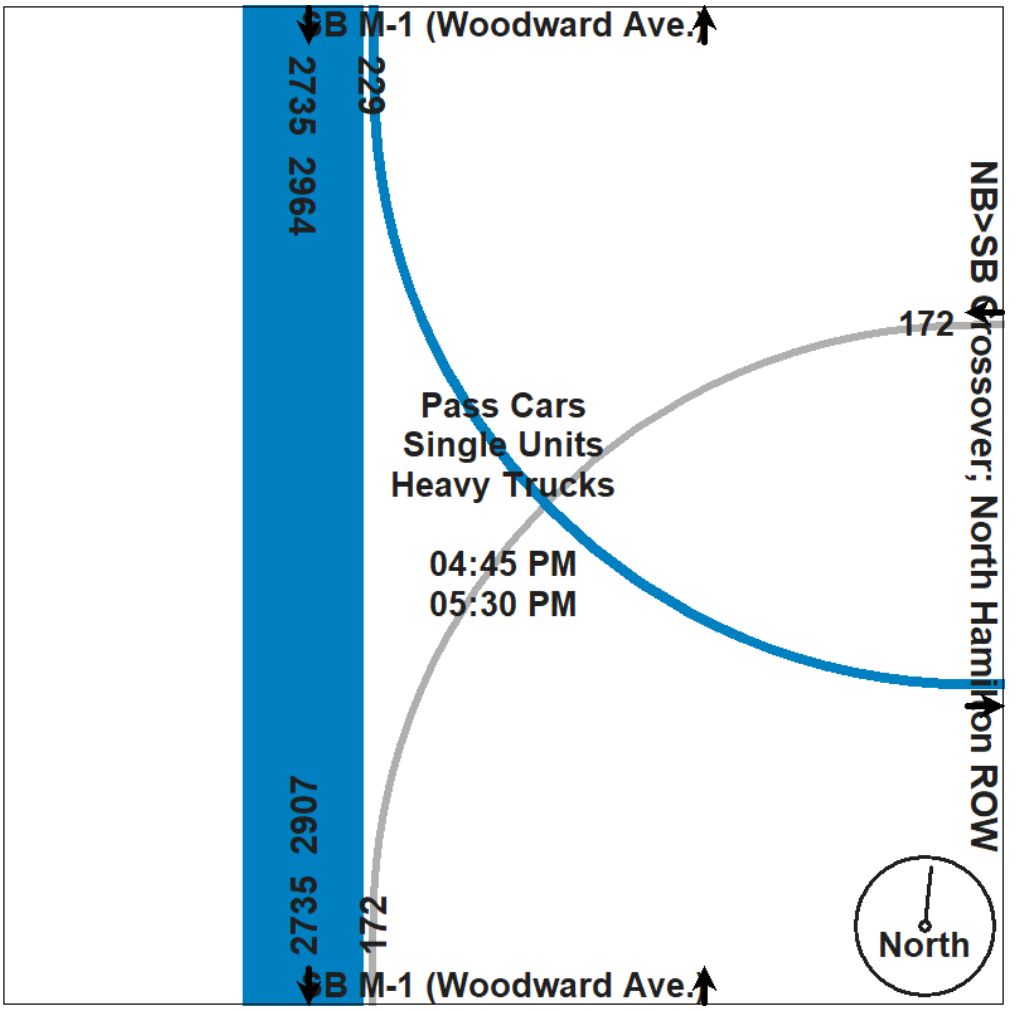
STONEFIELD

Project: Birmingham Traffic Impact Study
Study:4 Hr. Video Turning Movement Count
Weather: Sunny/Cldy. Dry Deg's 80's
Count By Miovision Video VCU 61A SW

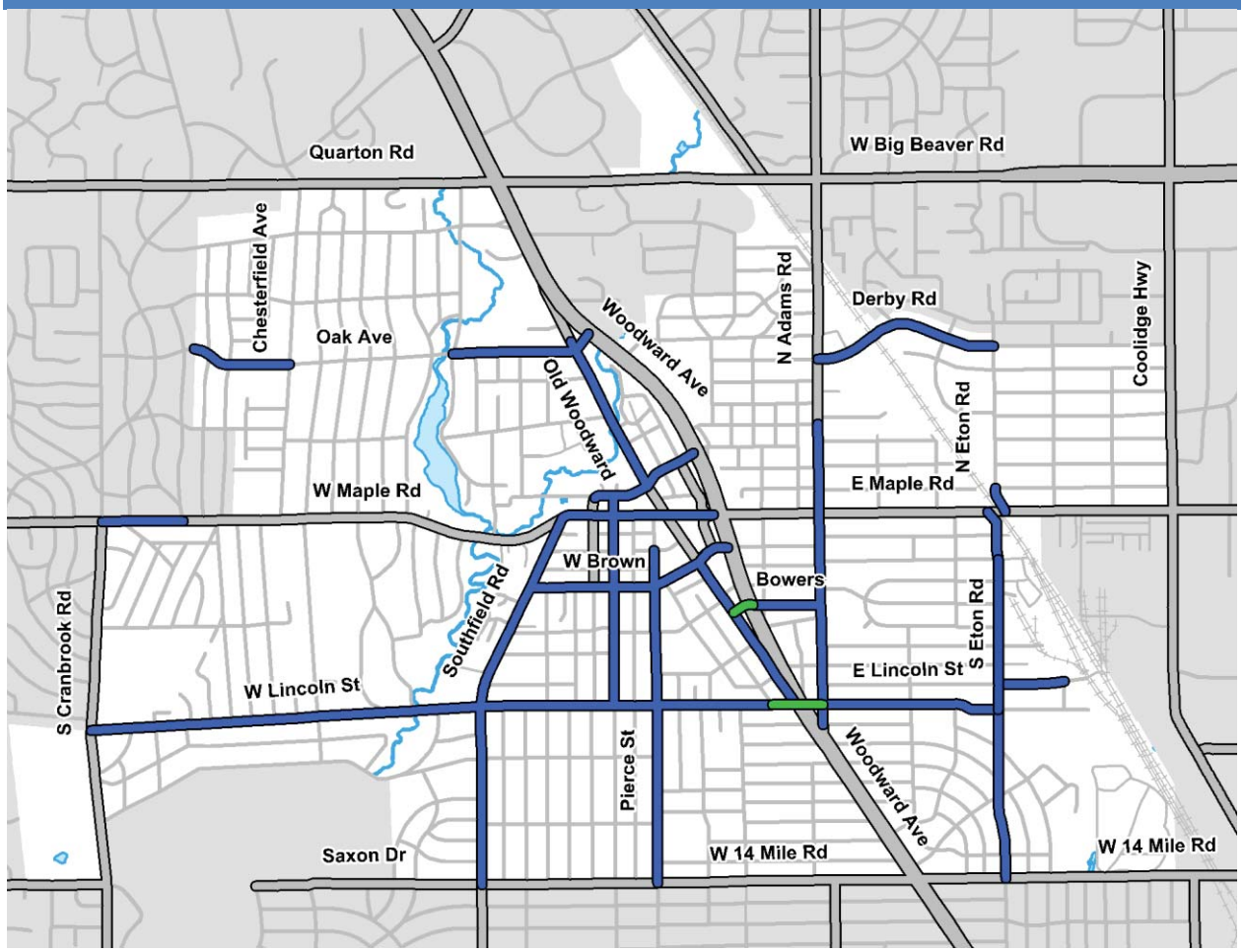
File Name : TMC_1 SB M1 & NB-SB XO_8-8-18
Site Code : TMC_1
Start Date : 8/8/2018
Page No : 4

	SB M-1 (Woodward Ave.) Southbound			NB>SB Crossover						
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:45 PM										
04:45 PM	676	50	726	0	38	38	0	0	0	764
05:00 PM	676	56	732	0	43	43	0	0	0	775
05:15 PM	**727**	**68**	**795**	0	**48**	**48**	0	0	0	**843**
05:30 PM	656	55	711	0	43	43	0	0	0	754
Total Volume	2735	229	2964	0	172	172	0	0	0	3136
% App. Total	92.3	7.7		0	100		0	0		
PHF	.941	.842	.932	.000	.896	.896	.000	.000	.000	.930
Pass Cars	2705	227	2932	0	170	170	0	0	0	3102
% Pass Cars	98.9	99.1	98.9	0	98.8	98.8	0	0	0	98.9
Single Units	27	2	29	0	2	2	0	0	0	31
% Single Units	1.0	0.9	1.0	0	1.2	1.2	0	0	0	1.0
Heavy Trucks	3	0	3	0	0	0	0	0	0	3
% Heavy Trucks	0.1	0	0.1	0	0	0	0	0	0	0.1



EXCERPTS FROM CITY'S MULTI-MODAL TRANSPORTATION PLAN

FIGURE 3.6A PROPOSED SHARED LANE MARKINGS

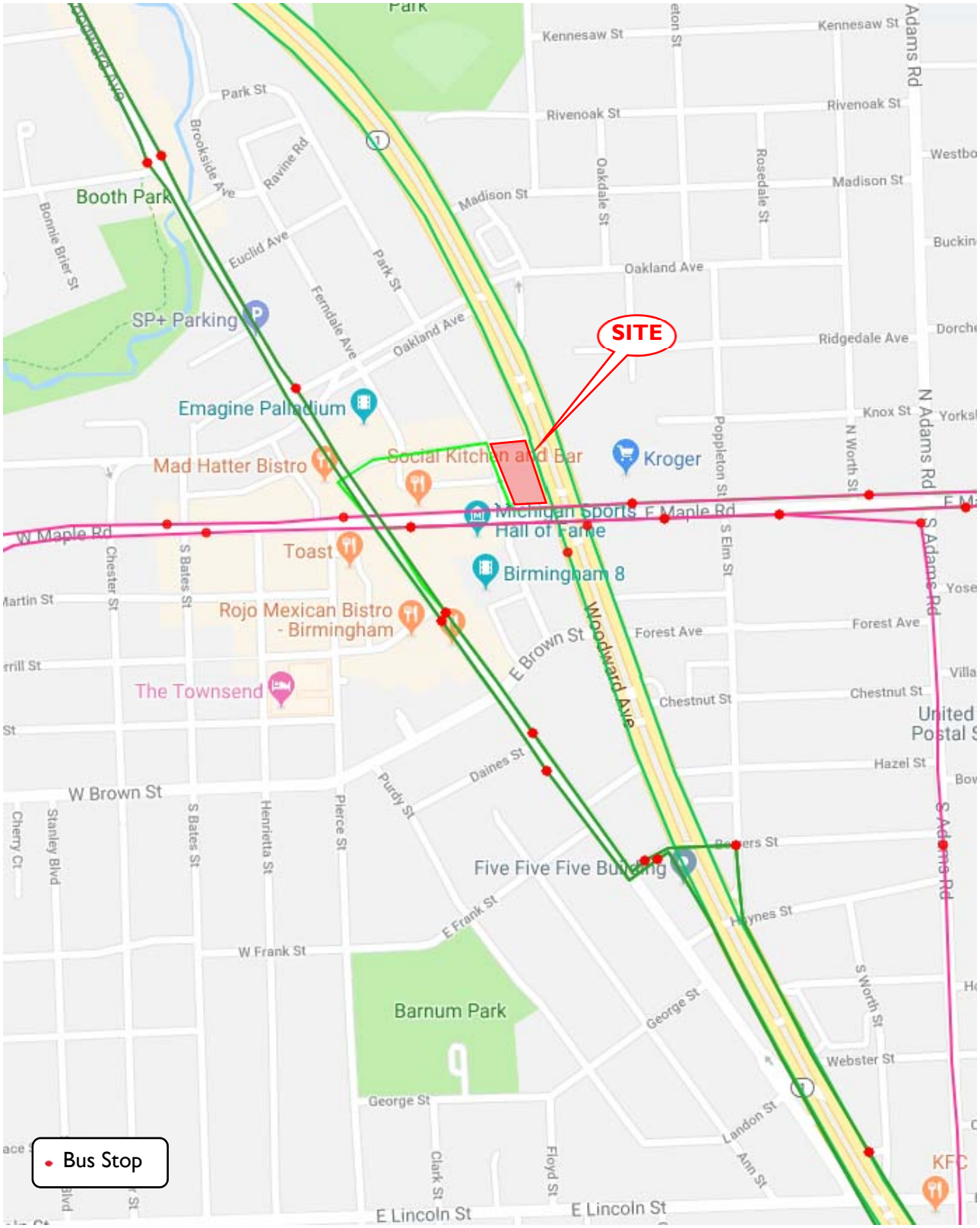


Shared Lane Markings

- Proposed Shared Lane Markings
- Proposed Colored Shared Lane Markings

APPROXIMATELY 10.7 MILES OF NEW SHARED LANES MARKINGS ARE PROPOSED AND 0.2 MILES OF COLORED SHARED LANE MARKINGS ARE PROPOSED

SMART BUS STOPS & ROUTES IN SITE VICINITY



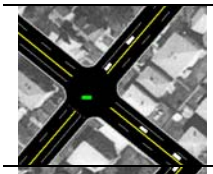
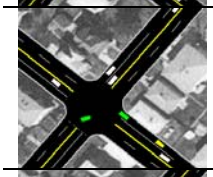
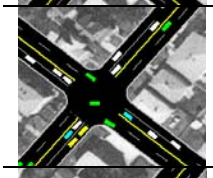
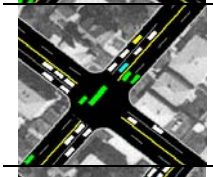
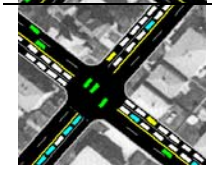
SMART Bus Routes Proximate to Site Location
(Route #: 445, 450, 460, 461, 462 & 780)

SYNCHRO 10 LEVEL OF SERVICE/CAPACITY ANALYSIS

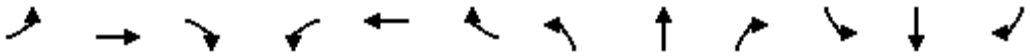
LEVEL OF SERVICE /AVERAGE CONTROL DELAY CRITERIA

The ability of a roadway to effectively accommodate traffic demand is determined through an assessment of the volume-to-capacity ratio, delay and Level of Service of the lane group and/or intersection. The volume-to-capacity ratio is the ratio of traffic flow rate to capacity for a given transportation facility. As defined within the Highway Capacity Manual, 6th Edition (HCM), intersection delay is the total additional travel time experienced by drivers, passengers, or pedestrians as a result of control measures and interaction with other users of the facility, divided by the volume departing from the corresponding cross section of the facility. Level of service is a qualitative measure describing operational conditions within a traffic stream, based on service measures such as speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience.

For an unsignalized intersection, LOS A indicates operations with delay less than 10 seconds per vehicle, while LOS F describes operations with delay in excess of 50 seconds per vehicle. For a signalized intersection, LOS A indicates operations with delay less than 10 seconds per vehicle and LOS F denotes operations with delay in excess of 80 seconds per vehicle.

	Level Of Service (LOS)	Signalized Delay Range (average control delay in sec/veh)	Unsignalized Delay Range (average control delay in sec/veh)
	A	<=10	<=10
	B	>10 and <=20	>10 and <=15
	C	>20 and <=35	>15 and <=25
	D	>35 and <=55	>25 and <=35
	E	>55 and <=80	>35 and <=50
	F	>80	>50

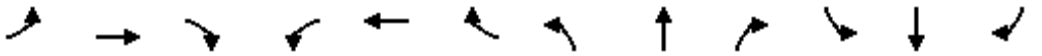
Source: Highway Capacity Manual, 6th Edition



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	656	0	0	720	322	0	3065	334	0	0	0
Future Volume (vph)	0	656	0	0	720	322	0	3065	334	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.0			10.0			6.0				
Lane Util. Factor		0.95			0.95			0.86				
Frpb, ped/bikes		1.00			0.99			1.00				
Flpb, ped/bikes		1.00			1.00			1.00				
Frt		1.00			0.95			0.99				
Flt Protected		1.00			1.00			1.00				
Satd. Flow (prot)		3725			3522			6630				
Flt Permitted		1.00			1.00			1.00				
Satd. Flow (perm)		3725			3522			6630				
Peak-hour factor, PHF	0.93	0.93	0.93	0.86	0.86	0.86	0.95	0.95	0.95	0.92	0.92	0.92
Adj. Flow (vph)	0	705	0	0	837	374	0	3226	352	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	21	0	0	0	0
Lane Group Flow (vph)	0	705	0	0	1211	0	0	3558	0	0	0	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type		NA			NA			NA				
Protected Phases		8			4			2				
Permitted Phases												
Actuated Green, G (s)		29.0			25.0			49.0				
Effective Green, g (s)		29.0			25.0			49.0				
Actuated g/C Ratio		0.32			0.28			0.54				
Clearance Time (s)		6.0			10.0			6.0				
Lane Grp Cap (vph)		1200			978			3609				
v/s Ratio Prot		0.19			c0.34			c0.54				
v/s Ratio Perm												
v/c Ratio		0.59			1.24			0.99				
Uniform Delay, d1		25.5			32.5			20.2				
Progression Factor		0.00			1.00			1.00				
Incremental Delay, d2		1.3			116.0			12.0				
Delay (s)		1.3			148.5			32.2				
Level of Service		A			F			C				
Approach Delay (s)		1.3			148.5			32.2			0.0	
Approach LOS		A			F			C			A	

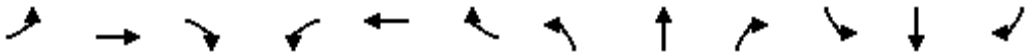
Intersection Summary			
HCM 2000 Control Delay	53.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.07		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	89.9%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	656	65	0	720	0	0	0	0	0	3114	162
Future Volume (vph)	0	656	65	0	720	0	0	0	0	0	3114	162
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		10.0			6.0						6.0	6.0
Lane Util. Factor		0.95			0.95						0.86	1.00
Frpb, ped/bikes		1.00			1.00						1.00	0.98
Flpb, ped/bikes		1.00			1.00						1.00	1.00
Frt		0.99			1.00						1.00	0.85
Flt Protected		1.00			1.00						1.00	1.00
Satd. Flow (prot)		3630			3762						6812	1657
Flt Permitted		1.00			1.00						1.00	1.00
Satd. Flow (perm)		3630			3762						6812	1657
Peak-hour factor, PHF	0.93	0.93	0.93	0.95	0.95	0.95	0.92	0.92	0.92	0.95	0.95	0.95
Adj. Flow (vph)	0	705	70	0	758	0	0	0	0	0	3278	171
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	39
Lane Group Flow (vph)	0	775	0	0	758	0	0	0	0	0	3278	132
Confl. Peds. (#/hr)	22		11	11		22	3		1	1		3
Heavy Vehicles (%)	3%	3%	3%	1%	1%	1%	2%	2%	2%	1%	1%	1%
Turn Type		NA			NA						NA	Perm
Protected Phases		4			8						2	
Permitted Phases												2
Actuated Green, G (s)		25.0			29.0						49.0	49.0
Effective Green, g (s)		25.0			29.0						49.0	49.0
Actuated g/C Ratio		0.28			0.32						0.54	0.54
Clearance Time (s)		10.0			6.0						6.0	6.0
Lane Grp Cap (vph)		1008			1212						3708	902
v/s Ratio Prot		c0.21			0.20						c0.48	
v/s Ratio Perm												0.08
v/c Ratio		0.77			0.63						0.88	0.15
Uniform Delay, d1		29.8			25.9						18.0	10.1
Progression Factor		0.90			0.00						1.07	0.85
Incremental Delay, d2		4.2			0.2						2.3	0.2
Delay (s)		31.1			0.2						21.6	8.8
Level of Service		C			A						C	A
Approach Delay (s)		31.1			0.2			0.0			21.0	
Approach LOS		C			A			A			C	

Intersection Summary			
HCM 2000 Control Delay	19.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	89.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			



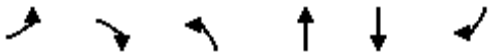
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	640	38	97	663	122	0	0	81	0	0	0
Future Volume (vph)	0	640	38	97	663	122	0	0	81	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	11	11	11	11	11	11	11	11	11	11	11	11
Total Lost time (s)		6.0	5.0	6.0	6.0	4.0			6.0			
Lane Util. Factor		1.00	1.00	1.00	0.95	0.95			1.00			
Frpb, ped/bikes		1.00	0.94	1.00	1.00	0.98			1.00			
Flpb, ped/bikes		1.00	1.00	1.00	1.00	1.00			1.00			
Frt		1.00	0.85	1.00	1.00	0.85			0.86			
Flt Protected		1.00	1.00	0.95	1.00	1.00			1.00			
Satd. Flow (prot)		1450	1369	1605	1600	1343			1490			
Flt Permitted		1.00	1.00	0.95	1.00	1.00			1.00			
Satd. Flow (perm)		1450	1369	1605	1600	1343			1490			
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.78	0.78	0.78	0.92	0.92	0.92
Adj. Flow (vph)	0	674	40	102	698	128	0	0	104	0	0	0
RTOR Reduction (vph)	0	0	13	0	1	0	0	0	80	0	0	0
Lane Group Flow (vph)	0	674	27	102	710	115	0	0	24	0	0	0
Confl. Peds. (#/hr)	12		13	13		12						
Heavy Vehicles (%)	2%	2%	2%	3%	3%	3%	1%	1%	1%	2%	2%	2%
Parking (#/hr)		10										
Turn Type		NA	Perm	Prot	NA	Free			Over			
Protected Phases		6		5	2 10				5			
Permitted Phases			6			Free						
Actuated Green, G (s)		57.0	57.0	21.0	61.0	90.0			21.0			
Effective Green, g (s)		57.0	58.0	21.0	59.0	90.0			21.0			
Actuated g/C Ratio		0.63	0.64	0.23	0.66	1.00			0.23			
Clearance Time (s)		6.0	6.0	6.0					6.0			
Vehicle Extension (s)		0.2	0.2	0.2					0.2			
Lane Grp Cap (vph)		918	882	374	1048	1343			347			
v/s Ratio Prot		c0.46		c0.06	c0.44				0.02			
v/s Ratio Perm			0.02			0.09						
v/c Ratio		0.73	0.03	0.27	0.68	0.09			0.07			
Uniform Delay, d1		11.3	5.8	28.2	9.6	0.0			26.9			
Progression Factor		1.00	1.00	1.29	0.55	1.00			1.00			
Incremental Delay, d2		5.2	0.1	1.5	3.0	0.1			0.4			
Delay (s)		16.5	5.9	37.9	8.3	0.1			27.3			
Level of Service		B	A	D	A	A			C			
Approach Delay (s)		15.9			10.6			27.3			0.0	
Approach LOS		B			B			C			A	

Intersection Summary			
HCM 2000 Control Delay	13.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	51.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

4: Park Street & Hamilton Row Performance by movement

Movement	EBL	EBT	WBT	WBR	NBL	NBT	NBR	SBL	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0
Total Delay (hr)	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Total Del/Veh (s)	4.1	6.0	3.6	2.1	0.1	1.0	0.4	5.6	2.9	2.8
Total Stops	9	34	102	28	0	0	0	14	12	199
Travel Time (hr)	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.6
Avg Speed (mph)	15	14	6	6	21	20	16	14	15	13



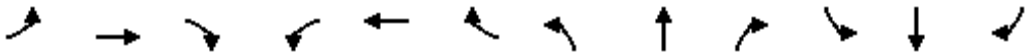
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	125	0	0	3153	130
Future Volume (Veh/h)	0	125	0	0	3153	130
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.84	0.84	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	149	0	0	3319	137
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				327	192	
pX, platoon unblocked	0.62	0.62	0.62			
vC, conflicting volume	3388	898	3456			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1808	0	1918			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	78	100			
cM capacity (veh/h)	45	678	195			

Direction, Lane #	EB 1	SB 1	SB 2	SB 3	SB 4
Volume Total	149	948	948	948	611
Volume Left	0	0	0	0	0
Volume Right	149	0	0	0	137
cSH	678	1700	1700	1700	1700
Volume to Capacity	0.22	0.56	0.56	0.56	0.36
Queue Length 95th (ft)	21	0	0	0	0
Control Delay (s)	11.8	0.0	0.0	0.0	0.0
Lane LOS	B				
Approach Delay (s)	11.8	0.0			
Approach LOS	B				

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	59.5%	ICU Level of Service	B
Analysis Period (min)	15		

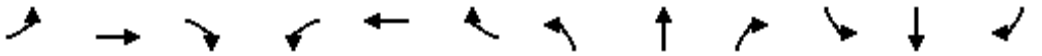
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	169	0	0	0	0	3114
Future Volume (vph)	169	0	0	0	0	3114
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	16	12	12	12	12	12
Total Lost time (s)	5.0					5.7
Lane Util. Factor	1.00					0.86
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	2132					6812
Flt Permitted	0.95					1.00
Satd. Flow (perm)	2132					6812
Peak-hour factor, PHF	0.88	0.88	1.00	1.00	0.95	0.95
Adj. Flow (vph)	192	0	0	0	0	3278
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	192	0	0	0	0	3278
Heavy Vehicles (%)	1%	0%	0%	0%	0%	1%
Turn Type	Prot					NA
Protected Phases	8					6
Permitted Phases						
Actuated Green, G (s)	25.0					54.3
Effective Green, g (s)	25.0					54.3
Actuated g/C Ratio	0.28					0.60
Clearance Time (s)	5.0					5.7
Lane Grp Cap (vph)	592					4109
v/s Ratio Prot	c0.09					c0.48
v/s Ratio Perm						
v/c Ratio	0.32					0.80
Uniform Delay, d1	25.8					13.7
Progression Factor	0.57					1.00
Incremental Delay, d2	0.6					1.7
Delay (s)	15.4					15.3
Level of Service	B					B
Approach Delay (s)	15.4		0.0			15.3
Approach LOS	B		A			B

Intersection Summary			
HCM 2000 Control Delay	15.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.7
Intersection Capacity Utilization	95.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			



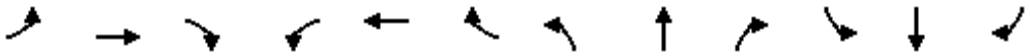
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	643	0	0	604	474	0	2674	390	0	0	0
Future Volume (vph)	0	643	0	0	604	474	0	2674	390	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.0			10.0			6.0				
Lane Util. Factor		0.95			0.95			0.86				
Frpb, ped/bikes		1.00			0.97			1.00				
Flpb, ped/bikes		1.00			1.00			1.00				
Frt		1.00			0.93			0.98				
Flt Protected		1.00			1.00			1.00				
Satd. Flow (prot)		3689			3399			6596				
Flt Permitted		1.00			1.00			1.00				
Satd. Flow (perm)		3689			3399			6596				
Peak-hour factor, PHF	0.95	0.95	0.95	0.94	0.94	0.94	0.95	0.95	0.95	0.92	0.92	0.92
Adj. Flow (vph)	0	677	0	0	643	504	0	2815	411	0	0	0
RTOR Reduction (vph)	0	0	0	0	1	0	0	26	0	0	0	0
Lane Group Flow (vph)	0	677	0	0	1146	0	0	3200	0	0	0	0
Confl. Peds. (#/hr)						39			10			
Heavy Vehicles (%)	3%	3%	3%	1%	1%	1%	2%	2%	2%	2%	2%	2%
Turn Type		NA			NA			NA				
Protected Phases		8			4			2				
Permitted Phases												
Actuated Green, G (s)		28.0			24.0			50.0				
Effective Green, g (s)		28.0			24.0			50.0				
Actuated g/C Ratio		0.31			0.27			0.56				
Clearance Time (s)		6.0			10.0			6.0				
Lane Grp Cap (vph)		1147			906			3664				
v/s Ratio Prot		0.18			c0.34			c0.49				
v/s Ratio Perm												
v/c Ratio		0.59			1.27			0.87				
Uniform Delay, d1		26.2			33.0			17.3				
Progression Factor		0.00			1.00			1.00				
Incremental Delay, d2		0.9			128.2			3.2				
Delay (s)		0.9			161.2			20.5				
Level of Service		A			F			C				
Approach Delay (s)		0.9			161.2			20.5			0.0	
Approach LOS		A			F			C			A	

Intersection Summary			
HCM 2000 Control Delay	49.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	88.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	643	172	0	604	0	0	0	0	0	3848	139
Future Volume (vph)	0	643	172	0	604	0	0	0	0	0	3848	139
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		10.0			6.0						6.0	6.0
Lane Util. Factor		0.95			0.95						0.86	1.00
Frpb, ped/bikes		0.99			1.00						1.00	0.97
Flpb, ped/bikes		1.00			1.00						1.00	1.00
Frt		0.97			1.00						1.00	0.85
Flt Protected		1.00			1.00						1.00	1.00
Satd. Flow (prot)		3542			3762						6812	1632
Flt Permitted		1.00			1.00						1.00	1.00
Satd. Flow (perm)		3542			3762						6812	1632
Peak-hour factor, PHF	0.95	0.95	0.95	0.94	0.94	0.94	0.92	0.92	0.92	0.94	0.94	0.94
Adj. Flow (vph)	0	677	181	0	643	0	0	0	0	0	4094	148
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	38
Lane Group Flow (vph)	0	858	0	0	643	0	0	0	0	0	4094	110
Confl. Peds. (#/hr)			18									16
Heavy Vehicles (%)	3%	3%	3%	1%	1%	1%	2%	2%	2%	1%	1%	1%
Turn Type		NA			NA						NA	Perm
Protected Phases		4			8						2	
Permitted Phases												2
Actuated Green, G (s)		24.0			28.0						50.0	50.0
Effective Green, g (s)		24.0			28.0						50.0	50.0
Actuated g/C Ratio		0.27			0.31						0.56	0.56
Clearance Time (s)		10.0			6.0						6.0	6.0
Lane Grp Cap (vph)		944			1170						3784	906
v/s Ratio Prot		c0.24			0.17						c0.60	
v/s Ratio Perm												0.07
v/c Ratio		0.91			0.55						1.08	0.12
Uniform Delay, d1		31.9			25.8						20.0	9.5
Progression Factor		0.92			0.00						1.06	0.77
Incremental Delay, d2		10.9			0.2						39.4	0.1
Delay (s)		40.2			0.2						60.6	7.4
Level of Service		D			A						E	A
Approach Delay (s)		40.2			0.2			0.0			58.7	
Approach LOS		D			A			A			E	

Intersection Summary			
HCM 2000 Control Delay	49.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	88.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			



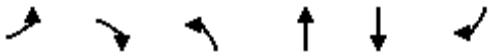
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	664	32	76	602	65	0	0	151	0	0	0
Future Volume (vph)	0	664	32	76	602	65	0	0	151	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	11	11	11	11	11	11	12	12	12	12	12	12
Total Lost time (s)		6.0	5.0	6.0	6.0	4.0			6.0			
Lane Util. Factor		1.00	1.00	1.00	0.95	0.95			1.00			
Frpb, ped/bikes		1.00	0.91	1.00	1.00	0.98			1.00			
Flpb, ped/bikes		1.00	1.00	1.00	1.00	1.00			1.00			
Frt		1.00	0.85	1.00	1.00	0.85			0.86			
Flt Protected		1.00	1.00	0.95	1.00	1.00			1.00			
Satd. Flow (prot)		1450	1325	1637	1634	1365			1483			
Flt Permitted		1.00	1.00	0.95	1.00	1.00			1.00			
Satd. Flow (perm)		1450	1325	1637	1634	1365			1483			
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.83	0.83	0.83	0.92	0.92	0.92
Adj. Flow (vph)	0	699	34	80	634	68	0	0	182	0	0	0
RTOR Reduction (vph)	0	0	13	0	0	0	0	0	132	0	0	0
Lane Group Flow (vph)	0	699	21	80	641	61	0	0	50	0	0	0
Confl. Peds. (#/hr)	23		24	24		23	45					45
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	5%	5%	5%	2%	2%	2%
Parking (#/hr)		10										
Turn Type		NA	Perm	Prot	NA	Free			Over			
Protected Phases		6		5	2 10				5			
Permitted Phases			6			Free						
Actuated Green, G (s)		53.4	53.4	24.6	71.2	90.0			24.6			
Effective Green, g (s)		53.4	54.4	24.6	69.2	90.0			24.6			
Actuated g/C Ratio		0.59	0.60	0.27	0.77	1.00			0.27			
Clearance Time (s)		6.0	6.0	6.0					6.0			
Vehicle Extension (s)		0.2	0.2	0.2					0.2			
Lane Grp Cap (vph)		860	800	447	1256	1365			405			
v/s Ratio Prot		c0.48		c0.05	c0.39				0.03			
v/s Ratio Perm			0.02			0.04						
v/c Ratio		0.81	0.03	0.18	0.51	0.04			0.12			
Uniform Delay, d1		14.4	7.2	25.0	4.0	0.0			24.6			
Progression Factor		1.00	1.00	1.26	0.68	1.00			1.00			
Incremental Delay, d2		8.3	0.1	0.8	1.3	0.1			0.6			
Delay (s)		22.6	7.2	32.2	4.0	0.1			25.2			
Level of Service		C	A	C	A	A			C			
Approach Delay (s)		21.9			6.6			25.2			0.0	
Approach LOS		C			A			C			A	

Intersection Summary			
HCM 2000 Control Delay	15.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	56.8%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

4: Park Street & Hamilton Row Performance by movement

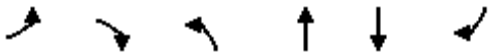
Movement	EBL	EBT	WBT	WBR	NBL	NBT	NBR	SBL	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.2	0.3	0.2
Total Delay (hr)	0.0	0.4	0.0	0.0	0.0	0.0	0.1	1.3	0.4	2.2
Total Del/Veh (s)	11.7	20.3	3.5	2.5	0.0	0.2	7.8	34.9	29.8	22.3
Total Stops	13	65	28	13	0	0	10	137	44	310
Travel Time (hr)	0.1	0.5	0.0	0.0	0.0	0.0	0.1	1.7	0.5	3.0
Avg Speed (mph)	10	7	7	6	21	23	7	5	5	6



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	236	0	0	3752	39
Future Volume (Veh/h)	0	236	0	0	3752	39
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.87	0.87	1.00	1.00	0.93	0.93
Hourly flow rate (vph)	0	271	0	0	4034	42
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				327	192	
pX, platoon unblocked	0.44	0.44	0.44			
vC, conflicting volume	4055	1030	4076			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1562	0	1610			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	43	100			
cM capacity (veh/h)	46	478	180			

Direction, Lane #	EB 1	SB 1	SB 2	SB 3	SB 4
Volume Total	271	1153	1153	1153	618
Volume Left	0	0	0	0	0
Volume Right	271	0	0	0	42
cSH	478	1700	1700	1700	1700
Volume to Capacity	0.57	0.68	0.68	0.68	0.36
Queue Length 95th (ft)	87	0	0	0	0
Control Delay (s)	21.9	0.0	0.0	0.0	0.0
Lane LOS	C				
Approach Delay (s)	21.9	0.0			
Approach LOS	C				

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	72.8%	ICU Level of Service	C
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	12	0	0	3975	13
Future Volume (Veh/h)	0	12	0	0	3975	13
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	1.00	1.00	0.93	0.93
Hourly flow rate (vph)	0	13	0	0	4274	14
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				225	294	
pX, platoon unblocked	0.44	0.44	0.44			
vC, conflicting volume	4281	1076	4288			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2100	0	2115			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	97	100			
cM capacity (veh/h)	20	481	116			

Direction, Lane #	EB 1	SB 1	SB 2	SB 3	SB 4
Volume Total	13	1221	1221	1221	625
Volume Left	0	0	0	0	0
Volume Right	13	0	0	0	14
cSH	481	1700	1700	1700	1700
Volume to Capacity	0.03	0.72	0.72	0.72	0.37
Queue Length 95th (ft)	2	0	0	0	0
Control Delay (s)	12.7	0.0	0.0	0.0	0.0
Lane LOS	B				
Approach Delay (s)	12.7	0.0			
Approach LOS	B				

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	64.9%	ICU Level of Service	C
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	0.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	234	4	2	37	5	2
Future Vol, veh/h	234	4	2	37	5	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	87	87	84	84	85	85
Heavy Vehicles, %	1	0	0	1	0	0
Mvmt Flow	269	5	2	44	6	2

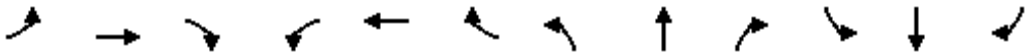
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	274	0	320	272
Stage 1	-	-	-	-	272	-
Stage 2	-	-	-	-	48	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1301	-	678	772
Stage 1	-	-	-	-	778	-
Stage 2	-	-	-	-	980	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1301	-	677	772
Mov Cap-2 Maneuver	-	-	-	-	677	-
Stage 1	-	-	-	-	778	-
Stage 2	-	-	-	-	978	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.4	10.2
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	702	-	-	1301	-
HCM Lane V/C Ratio	0.012	-	-	0.002	-
HCM Control Delay (s)	10.2	-	-	7.8	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	177	0	0	0	0	3614
Future Volume (vph)	177	0	0	0	0	3614
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	16	12	12	12	12	12
Total Lost time (s)	5.0					5.7
Lane Util. Factor	1.00					0.86
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	2153					6880
Flt Permitted	0.95					1.00
Satd. Flow (perm)	2153					6880
Peak-hour factor, PHF	0.90	0.90	1.00	1.00	0.93	0.93
Adj. Flow (vph)	197	0	0	0	0	3886
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	197	0	0	0	0	3886
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Turn Type	Prot					NA
Protected Phases	8					6
Permitted Phases						
Actuated Green, G (s)	28.0					51.3
Effective Green, g (s)	28.0					51.3
Actuated g/C Ratio	0.31					0.57
Clearance Time (s)	5.0					5.7
Lane Grp Cap (vph)	669					3921
v/s Ratio Prot	c0.09					c0.56
v/s Ratio Perm						
v/c Ratio	0.29					0.99
Uniform Delay, d1	23.5					19.1
Progression Factor	0.62					1.00
Incremental Delay, d2	0.6					12.4
Delay (s)	15.2					31.6
Level of Service	B					C
Approach Delay (s)	15.2		0.0			31.6
Approach LOS	B		A			C

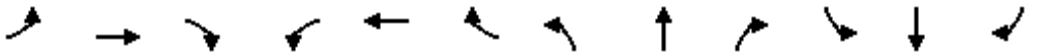
Intersection Summary			
HCM 2000 Control Delay	30.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.7
Intersection Capacity Utilization	98.7%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	694	0	0	770	340	0	3233	352	0	0	0
Future Volume (vph)	0	694	0	0	770	340	0	3233	352	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.0			10.0			6.0				
Lane Util. Factor		0.95			0.95			0.86				
Frpb, ped/bikes		1.00			0.99			1.00				
Flpb, ped/bikes		1.00			1.00			1.00				
Frt		1.00			0.95			0.99				
Flt Protected		1.00			1.00			1.00				
Satd. Flow (prot)		3725			3524			6630				
Flt Permitted		1.00			1.00			1.00				
Satd. Flow (perm)		3725			3524			6630				
Peak-hour factor, PHF	0.93	0.93	0.93	0.86	0.86	0.86	0.95	0.95	0.95	0.92	0.92	0.92
Adj. Flow (vph)	0	746	0	0	895	395	0	3403	371	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	21	0	0	0	0
Lane Group Flow (vph)	0	746	0	0	1290	0	0	3754	0	0	0	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type		NA			NA			NA				
Protected Phases		8			4			2				
Permitted Phases												
Actuated Green, G (s)		29.0			25.0			49.0				
Effective Green, g (s)		29.0			25.0			49.0				
Actuated g/C Ratio		0.32			0.28			0.54				
Clearance Time (s)		6.0			10.0			6.0				
Lane Grp Cap (vph)		1200			978			3609				
v/s Ratio Prot		0.20			c0.37			c0.57				
v/s Ratio Perm												
v/c Ratio		0.62			1.32			1.04				
Uniform Delay, d1		25.9			32.5			20.5				
Progression Factor		0.00			1.00			1.00				
Incremental Delay, d2		1.1			150.8			26.7				
Delay (s)		1.1			183.3			47.2				
Level of Service		A			F			D				
Approach Delay (s)		1.1			183.3			47.2			0.0	
Approach LOS		A			F			D			A	

Intersection Summary			
HCM 2000 Control Delay	71.5	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.13		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	94.4%	ICU Level of Service	F
Analysis Period (min)	15		

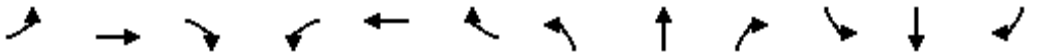
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	694	71	0	770	0	0	0	0	0	3289	189
Future Volume (vph)	0	694	71	0	770	0	0	0	0	0	3289	189
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	10	10	10	12	12	12	12	12	12	12	12	12
Total Lost time (s)		10.0			6.0						6.0	6.0
Lane Util. Factor		0.95			0.95						0.86	1.00
Frpb, ped/bikes		1.00			1.00						1.00	0.98
Flpb, ped/bikes		1.00			1.00						1.00	1.00
Frt		0.99			1.00						1.00	0.85
Flt Protected		1.00			1.00						1.00	1.00
Satd. Flow (prot)		3386			3762						6812	1657
Flt Permitted		1.00			1.00						1.00	1.00
Satd. Flow (perm)		3386			3762						6812	1657
Peak-hour factor, PHF	0.93	0.93	0.93	0.95	0.95	0.95	0.92	0.92	0.92	0.95	0.95	0.95
Adj. Flow (vph)	0	746	76	0	811	0	0	0	0	0	3462	199
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	39
Lane Group Flow (vph)	0	822	0	0	811	0	0	0	0	0	3462	160
Confl. Peds. (#/hr)	22		11	11		22	3		1	1		3
Heavy Vehicles (%)	3%	3%	3%	1%	1%	1%	2%	2%	2%	1%	1%	1%
Turn Type		NA			NA						NA	Perm
Protected Phases		4			8						2	
Permitted Phases												2
Actuated Green, G (s)		25.0			29.0						49.0	49.0
Effective Green, g (s)		25.0			29.0						49.0	49.0
Actuated g/C Ratio		0.28			0.32						0.54	0.54
Clearance Time (s)		10.0			6.0						6.0	6.0
Lane Grp Cap (vph)		940			1212						3708	902
v/s Ratio Prot		c0.24			0.22						c0.51	
v/s Ratio Perm												0.10
v/c Ratio		0.87			0.67						0.93	0.18
Uniform Delay, d1		31.0			26.4						19.0	10.3
Progression Factor		0.89			0.00						1.03	0.76
Incremental Delay, d2		8.1			0.3						3.6	0.3
Delay (s)		35.6			0.3						23.3	8.1
Level of Service		D			A						C	A
Approach Delay (s)		35.6			0.3			0.0			22.4	
Approach LOS		D			A			A			C	

Intersection Summary			
HCM 2000 Control Delay	21.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	94.4%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	675	51	131	699	129	0	0	90	0	0	5
Future Volume (vph)	0	675	51	131	699	129	0	0	90	0	0	5
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	11	11	11	10	10	10	12	12	12	12	12	12
Total Lost time (s)		6.0		6.0	6.0	6.0			6.0			6.0
Lane Util. Factor		1.00		1.00	1.00	1.00			1.00			1.00
Frpb, ped/bikes		1.00		1.00	1.00	0.97			1.00			1.00
Flpb, ped/bikes		1.00		1.00	1.00	1.00			1.00			1.00
Frt		0.99		1.00	1.00	0.85			0.86			0.86
Flt Protected		1.00		0.95	1.00	1.00			1.00			1.00
Satd. Flow (prot)		1431		1550	1631	1343			1542			1526
Flt Permitted		1.00		0.95	1.00	1.00			1.00			1.00
Satd. Flow (perm)		1431		1550	1631	1343			1542			1526
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.78	0.78	0.78	0.92	0.92	0.92
Adj. Flow (vph)	0	711	54	138	736	136	0	0	115	0	0	5
RTOR Reduction (vph)	0	3	0	0	0	66	0	0	93	0	0	5
Lane Group Flow (vph)	0	762	0	138	736	70	0	0	22	0	0	1
Confl. Peds. (#/hr)	12		13	13		12						
Heavy Vehicles (%)	2%	2%	2%	3%	3%	3%	1%	1%	1%	2%	2%	2%
Parking (#/hr)		10										
Turn Type		NA		Prot	NA	Perm			Over			Prot
Protected Phases		6 14		5	2				5			14
Permitted Phases						2						
Actuated Green, G (s)		61.0		17.0	46.0	46.0			17.0			9.0
Effective Green, g (s)		61.0		17.0	46.0	46.0			17.0			9.0
Actuated g/C Ratio		0.68		0.19	0.51	0.51			0.19			0.10
Clearance Time (s)				6.0	6.0	6.0			6.0			6.0
Vehicle Extension (s)				0.2	0.2	0.2			0.2			0.2
Lane Grp Cap (vph)		969		292	833	686			291			152
v/s Ratio Prot		c0.53		c0.09	c0.45				0.01			0.00
v/s Ratio Perm						0.05						
v/c Ratio		0.79		0.47	0.88	0.10			0.07			0.00
Uniform Delay, d1		10.0		32.5	19.6	11.3			30.0			36.5
Progression Factor		1.00		1.11	0.31	0.00			1.00			1.00
Incremental Delay, d2		6.4		4.4	11.1	0.2			0.5			0.0
Delay (s)		16.4		40.4	17.1	0.2			30.5			36.5
Level of Service		B		D	B	A			C			D
Approach Delay (s)		16.4			18.0			30.5			36.5	
Approach LOS		B			B			C			D	

Intersection Summary			
HCM 2000 Control Delay	18.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	58.5%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

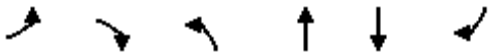
Intersection	
Int Delay, s/veh	7.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	9	38	0	0	110	27	39	13	77	18	5	6
Future Vol, veh/h	9	38	0	0	110	27	39	13	77	18	5	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	84	84	84	82	82	82	88	88	88	91	91	91
Heavy Vehicles, %	0	0	0	0	0	0	0	0	1	1	0	0
Mvmt Flow	11	45	0	0	134	33	44	15	88	20	5	7

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	280	240	9	218	199	59	12	0	0	103	0	0
Stage 1	49	49	-	147	147	-	-	-	-	-	-	-
Stage 2	231	191	-	71	52	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.11	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.209	-	-
Pot Cap-1 Maneuver	676	665	1079	743	700	1012	1620	-	-	1495	-	-
Stage 1	969	858	-	860	779	-	-	-	-	-	-	-
Stage 2	776	746	-	944	856	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	537	637	1079	681	671	1012	1620	-	-	1495	-	-
Mov Cap-2 Maneuver	537	637	-	681	671	-	-	-	-	-	-	-
Stage 1	941	847	-	835	756	-	-	-	-	-	-	-
Stage 2	600	724	-	882	845	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11.4	11.5	2.2	4.6
HCM LOS	B	B		

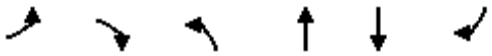
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1620	-	-	615	719	1495	-	-
HCM Lane V/C Ratio	0.027	-	-	0.091	0.232	0.013	-	-
HCM Control Delay (s)	7.3	0	-	11.4	11.5	7.4	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.3	0.9	0	-	-



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	132	0	0	3348	137
Future Volume (Veh/h)	0	132	0	0	3348	137
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.84	0.84	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	157	0	0	3524	144
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				329	192	
pX, platoon unblocked	0.57	0.57	0.57			
vC, conflicting volume	3596	953	3668			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1806	0	1931			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	75	100			
cM capacity (veh/h)	41	623	177			

Direction, Lane #	EB 1	SB 1	SB 2	SB 3	SB 4
Volume Total	157	1007	1007	1007	647
Volume Left	0	0	0	0	0
Volume Right	157	0	0	0	144
cSH	623	1700	1700	1700	1700
Volume to Capacity	0.25	0.59	0.59	0.59	0.38
Queue Length 95th (ft)	25	0	0	0	0
Control Delay (s)	12.7	0.0	0.0	0.0	0.0
Lane LOS	B				
Approach Delay (s)	12.7	0.0			
Approach LOS	B				

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	62.7%	ICU Level of Service	B
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	0	3478	2
Future Volume (Veh/h)	0	0	0	0	3478	2
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	0	0	0	3661	2
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				250	271	
pX, platoon unblocked	0.58	0.58	0.58			
vC, conflicting volume	3662	916	3663			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1940	0	1942			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	34	628	176			

Direction, Lane #	EB 1	SB 1	SB 2	SB 3	SB 4
Volume Total	0	1046	1046	1046	525
Volume Left	0	0	0	0	0
Volume Right	0	0	0	0	2
cSH	1700	1700	1700	1700	1700
Volume to Capacity	0.00	0.62	0.62	0.62	0.31
Queue Length 95th (ft)	0	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0
Lane LOS	A				
Approach Delay (s)	0.0	0.0			
Approach LOS	A				

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	51.2%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	132	1	0	137	0	0
Future Vol, veh/h	132	1	0	137	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	84	84	82	82	85	85
Heavy Vehicles, %	1	0	0	1	0	0
Mvmt Flow	157	1	0	167	0	0

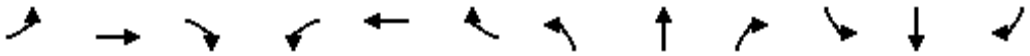
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	158	0	325	158
Stage 1	-	-	-	-	158	-
Stage 2	-	-	-	-	167	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1434	-	673	893
Stage 1	-	-	-	-	875	-
Stage 2	-	-	-	-	867	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1434	-	673	893
Mov Cap-2 Maneuver	-	-	-	-	673	-
Stage 1	-	-	-	-	875	-
Stage 2	-	-	-	-	867	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	1434	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	0	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	-	-	-	0	-

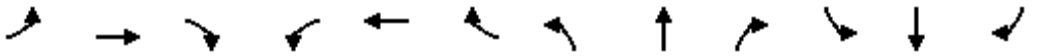
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	178	0	0	0	0	3307
Future Volume (vph)	178	0	0	0	0	3307
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	16	12	12	12	12	12
Total Lost time (s)	5.0					5.7
Lane Util. Factor	1.00					0.86
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	2132					6812
Flt Permitted	0.95					1.00
Satd. Flow (perm)	2132					6812
Peak-hour factor, PHF	0.88	0.88	1.00	1.00	0.95	0.95
Adj. Flow (vph)	202	0	0	0	0	3481
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	202	0	0	0	0	3481
Heavy Vehicles (%)	1%	0%	0%	0%	0%	1%
Turn Type	Prot					NA
Protected Phases	8					6
Permitted Phases						
Actuated Green, G (s)	25.0					54.3
Effective Green, g (s)	25.0					54.3
Actuated g/C Ratio	0.28					0.60
Clearance Time (s)	5.0					5.7
Lane Grp Cap (vph)	592					4109
v/s Ratio Prot	c0.09					c0.51
v/s Ratio Perm						
v/c Ratio	0.34					0.85
Uniform Delay, d1	25.9					14.5
Progression Factor	0.58					1.00
Incremental Delay, d2	0.5					2.3
Delay (s)	15.6					16.8
Level of Service	B					B
Approach Delay (s)	15.6		0.0			16.8
Approach LOS	B		A			B

Intersection Summary			
HCM 2000 Control Delay	16.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.7
Intersection Capacity Utilization	100.3%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	689	0	0	641	500	0	2820	411	0	0	0
Future Volume (vph)	0	689	0	0	641	500	0	2820	411	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.0			10.0			6.0				
Lane Util. Factor		0.95			0.95			0.86				
Frpb, ped/bikes		1.00			0.97			1.00				
Flpb, ped/bikes		1.00			1.00			1.00				
Frt		1.00			0.93			0.98				
Flt Protected		1.00			1.00			1.00				
Satd. Flow (prot)		3689			3400			6596				
Flt Permitted		1.00			1.00			1.00				
Satd. Flow (perm)		3689			3400			6596				
Peak-hour factor, PHF	0.95	0.95	0.95	0.94	0.94	0.94	0.95	0.95	0.95	0.92	0.92	0.92
Adj. Flow (vph)	0	725	0	0	682	532	0	2968	433	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	24	0	0	0	0
Lane Group Flow (vph)	0	725	0	0	1214	0	0	3377	0	0	0	0
Confl. Peds. (#/hr)						39			10			
Heavy Vehicles (%)	3%	3%	3%	1%	1%	1%	2%	2%	2%	2%	2%	2%
Turn Type		NA			NA			NA				
Protected Phases		8			4			2				
Permitted Phases												
Actuated Green, G (s)		29.0			25.0			49.0				
Effective Green, g (s)		29.0			25.0			49.0				
Actuated g/C Ratio		0.32			0.28			0.54				
Clearance Time (s)		6.0			10.0			6.0				
Lane Grp Cap (vph)		1188			944			3591				
v/s Ratio Prot		0.20			c0.36			c0.51				
v/s Ratio Perm												
v/c Ratio		0.61			1.29			0.94				
Uniform Delay, d1		25.7			32.5			19.1				
Progression Factor		0.00			1.00			1.00				
Incremental Delay, d2		0.2			136.8			6.4				
Delay (s)		0.2			169.3			25.5				
Level of Service		A			F			C				
Approach Delay (s)		0.2			169.3			25.5			0.0	
Approach LOS		A			F			C			A	

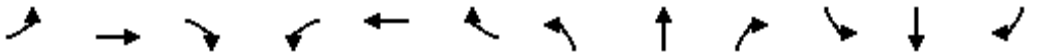
Intersection Summary			
HCM 2000 Control Delay	54.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.06		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	93.7%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	689	196	0	641	0	0	0	0	0	4061	153
Future Volume (vph)	0	689	196	0	641	0	0	0	0	0	4061	153
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	10	10	10	12	12	12	12	12	12	12	12	12
Total Lost time (s)		10.0			6.0						6.0	6.0
Lane Util. Factor		0.95			0.95						0.86	1.00
Frpb, ped/bikes		0.99			1.00						1.00	0.97
Flpb, ped/bikes		1.00			1.00						1.00	1.00
Frt		0.97			1.00						1.00	0.85
Flt Protected		1.00			1.00						1.00	1.00
Satd. Flow (prot)		3299			3762						6812	1632
Flt Permitted		1.00			1.00						1.00	1.00
Satd. Flow (perm)		3299			3762						6812	1632
Peak-hour factor, PHF	0.95	0.95	0.95	0.94	0.94	0.94	0.92	0.92	0.92	0.94	0.94	0.94
Adj. Flow (vph)	0	725	206	0	682	0	0	0	0	0	4320	163
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	39
Lane Group Flow (vph)	0	931	0	0	682	0	0	0	0	0	4320	124
Confl. Peds. (#/hr)			18									16
Heavy Vehicles (%)	3%	3%	3%	1%	1%	1%	2%	2%	2%	1%	1%	1%
Turn Type		NA			NA						NA	Perm
Protected Phases		4			8						2	
Permitted Phases												2
Actuated Green, G (s)		25.0			29.0						49.0	49.0
Effective Green, g (s)		25.0			29.0						49.0	49.0
Actuated g/C Ratio		0.28			0.32						0.54	0.54
Clearance Time (s)		10.0			6.0						6.0	6.0
Lane Grp Cap (vph)		916			1212						3708	888
v/s Ratio Prot		c0.28			0.18						c0.63	
v/s Ratio Perm												0.08
v/c Ratio		1.02			0.56						1.17	0.14
Uniform Delay, d1		32.5			25.3						20.5	10.1
Progression Factor		0.90			0.00						0.99	0.70
Incremental Delay, d2		28.6			0.2						75.4	0.1
Delay (s)		57.9			0.2						95.8	7.2
Level of Service		E			A						F	A
Approach Delay (s)		57.9			0.2			0.0			92.6	
Approach LOS		E			A			A			F	

Intersection Summary			
HCM 2000 Control Delay	76.9	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.11		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	93.7%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	700	39	90	635	69	0	0	185	0	0	22
Future Volume (vph)	0	700	39	90	635	69	0	0	185	0	0	22
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	11	11	11	10	10	10	12	12	12	12	12	12
Total Lost time (s)		6.0		6.0	6.0	6.0			6.0			6.0
Lane Util. Factor		1.00		1.00	1.00	1.00			1.00			1.00
Frpb, ped/bikes		1.00		1.00	1.00	0.96			1.00			1.00
Flpb, ped/bikes		1.00		1.00	1.00	1.00			1.00			1.00
Frt		0.99		1.00	1.00	0.85			0.86			0.86
Flt Protected		1.00		0.95	1.00	1.00			1.00			1.00
Satd. Flow (prot)		1433		1580	1663	1354			1483			1526
Flt Permitted		1.00		0.95	1.00	1.00			1.00			1.00
Satd. Flow (perm)		1433		1580	1663	1354			1483			1526
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.83	0.83	0.83	0.92	0.92	0.92
Adj. Flow (vph)	0	737	41	95	668	73	0	0	223	0	0	24
RTOR Reduction (vph)	0	2	0	0	0	36	0	0	181	0	0	22
Lane Group Flow (vph)	0	776	0	95	668	37	0	0	42	0	0	2
Confl. Peds. (#/hr)	23		24	24		23	45					45
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	5%	5%	5%	2%	2%	2%
Parking (#/hr)		10										
Turn Type		NA		Prot	NA	Perm			Over			Prot
Protected Phases		6 14		5	2				5			14
Permitted Phases						2						
Actuated Green, G (s)		61.0		17.0	46.0	46.0			17.0			9.0
Effective Green, g (s)		61.0		17.0	46.0	46.0			17.0			9.0
Actuated g/C Ratio		0.68		0.19	0.51	0.51			0.19			0.10
Clearance Time (s)				6.0	6.0	6.0			6.0			6.0
Vehicle Extension (s)				0.2	0.2	0.2			0.2			0.2
Lane Grp Cap (vph)		971		298	849	692			280			152
v/s Ratio Prot		c0.54		c0.06	0.40				0.03			0.00
v/s Ratio Perm						0.03						
v/c Ratio		0.80		0.32	0.79	0.05			0.15			0.02
Uniform Delay, d1		10.2		31.5	18.0	11.1			30.5			36.5
Progression Factor		1.00		1.11	0.30	0.00			1.00			1.00
Incremental Delay, d2		6.8		2.5	6.5	0.1			1.1			0.2
Delay (s)		17.0		37.4	11.8	0.1			31.6			36.7
Level of Service		B		D	B	A			C			D
Approach Delay (s)		17.0			13.7			31.6			36.7	
Approach LOS		B			B			C			D	

Intersection Summary			
HCM 2000 Control Delay	17.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	63.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

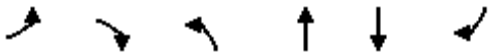
Intersection	
Int Delay, s/veh	8.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	19	75	0	0	31	14	19	9	41	136	22	23
Future Vol, veh/h	19	75	0	0	31	14	19	9	41	136	22	23
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	87	87	87	84	84	84	90	90	90	86	86	86
Heavy Vehicles, %	0	0	0	0	0	0	0	0	1	1	0	0
Mvmt Flow	22	86	0	0	37	17	21	10	46	158	26	27

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	458	454	40	474	444	33	53	0	0	56	0	0
Stage 1	356	356	-	75	75	-	-	-	-	-	-	-
Stage 2	102	98	-	399	369	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.11	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.209	-	-
Pot Cap-1 Maneuver	516	505	1037	504	511	1046	1566	-	-	1555	-	-
Stage 1	666	633	-	939	836	-	-	-	-	-	-	-
Stage 2	909	818	-	631	624	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	433	445	1037	392	451	1046	1566	-	-	1555	-	-
Mov Cap-2 Maneuver	433	445	-	392	451	-	-	-	-	-	-	-
Stage 1	657	567	-	926	824	-	-	-	-	-	-	-
Stage 2	842	807	-	479	558	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	15.7	12.3	2	5.7
HCM LOS	C	B		

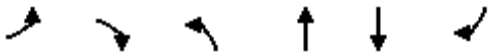
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1566	-	-	443	548	1555	-	-
HCM Lane V/C Ratio	0.013	-	-	0.244	0.098	0.102	-	-
HCM Control Delay (s)	7.3	0	-	15.7	12.3	7.6	0	-
HCM Lane LOS	A	A	-	C	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.9	0.3	0.3	-	-



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	250	0	0	3965	42
Future Volume (Veh/h)	0	250	0	0	3965	42
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.87	0.87	1.00	1.00	0.93	0.93
Hourly flow rate (vph)	0	287	0	0	4263	45
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				327	192	
pX, platoon unblocked	0.43	0.43	0.43			
vC, conflicting volume	4286	1088	4308			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2052	0	2104			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	39	100			
cM capacity (veh/h)	21	474	115			

Direction, Lane #	EB 1	SB 1	SB 2	SB 3	SB 4
Volume Total	287	1218	1218	1218	654
Volume Left	0	0	0	0	0
Volume Right	287	0	0	0	45
cSH	474	1700	1700	1700	1700
Volume to Capacity	0.61	0.72	0.72	0.72	0.38
Queue Length 95th (ft)	99	0	0	0	0
Control Delay (s)	23.6	0.0	0.0	0.0	0.0
Lane LOS	C				
Approach Delay (s)	23.6	0.0			
Approach LOS	C				

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	76.6%	ICU Level of Service	D
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	12	0	0	4202	13
Future Volume (Veh/h)	0	12	0	0	4202	13
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.93	0.93
Hourly flow rate (vph)	0	13	0	0	4518	14
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				244	275	
pX, platoon unblocked	0.44	0.44	0.44			
vC, conflicting volume	4525	1136	4532			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2614	0	2630			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	97	100			
cM capacity (veh/h)	9	475	72			

Direction, Lane #	EB 1	SB 1	SB 2	SB 3	SB 4
Volume Total	13	1291	1291	1291	659
Volume Left	0	0	0	0	0
Volume Right	13	0	0	0	14
cSH	475	1700	1700	1700	1700
Volume to Capacity	0.03	0.76	0.76	0.76	0.39
Queue Length 95th (ft)	2	0	0	0	0
Control Delay (s)	12.8	0.0	0.0	0.0	0.0
Lane LOS	B				
Approach Delay (s)	12.8	0.0			
Approach LOS	B				

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	68.1%	ICU Level of Service	C
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	0.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	248	4	2	40	5	2
Future Vol, veh/h	248	4	2	40	5	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	87	87	84	84	85	85
Heavy Vehicles, %	1	0	0	1	0	0
Mvmt Flow	285	5	2	48	6	2

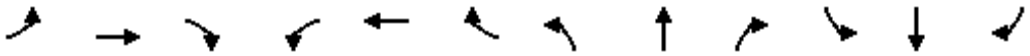
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	290	0	340	288
Stage 1	-	-	-	-	288	-
Stage 2	-	-	-	-	52	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1283	-	660	756
Stage 1	-	-	-	-	766	-
Stage 2	-	-	-	-	976	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1283	-	659	756
Mov Cap-2 Maneuver	-	-	-	-	659	-
Stage 1	-	-	-	-	766	-
Stage 2	-	-	-	-	974	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.4	10.3
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	684	-	-	1283	-
HCM Lane V/C Ratio	0.012	-	-	0.002	-
HCM Control Delay (s)	10.3	-	-	7.8	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	187	0	0	0	0	3820
Future Volume (vph)	187	0	0	0	0	3820
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	16	12	12	12	12	12
Total Lost time (s)	5.0					5.7
Lane Util. Factor	1.00					0.86
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	2153					6880
Flt Permitted	0.95					1.00
Satd. Flow (perm)	2153					6880
Peak-hour factor, PHF	0.90	0.90	1.00	1.00	0.93	0.93
Adj. Flow (vph)	208	0	0	0	0	4108
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	208	0	0	0	0	4108
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Turn Type	Prot					NA
Protected Phases	8					6
Permitted Phases						
Actuated Green, G (s)	28.0					51.3
Effective Green, g (s)	28.0					51.3
Actuated g/C Ratio	0.31					0.57
Clearance Time (s)	5.0					5.7
Lane Grp Cap (vph)	669					3921
v/s Ratio Prot	c0.10					c0.60
v/s Ratio Perm						
v/c Ratio	0.31					1.05
Uniform Delay, d1	23.6					19.4
Progression Factor	0.60					1.00
Incremental Delay, d2	0.5					28.9
Delay (s)	14.8					48.3
Level of Service	B					D
Approach Delay (s)	14.8		0.0			48.3
Approach LOS	B		A			D

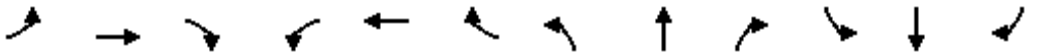
Intersection Summary			
HCM 2000 Control Delay	46.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.7
Intersection Capacity Utilization	103.8%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	694	0	0	775	340	0	3257	354	0	0	0
Future Volume (vph)	0	694	0	0	775	340	0	3257	354	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.0			10.0			6.0				
Lane Util. Factor		0.95			0.95			0.86				
Frpb, ped/bikes		1.00			0.99			1.00				
Flpb, ped/bikes		1.00			1.00			1.00				
Frt		1.00			0.95			0.99				
Flt Protected		1.00			1.00			1.00				
Satd. Flow (prot)		3725			3525			6630				
Flt Permitted		1.00			1.00			1.00				
Satd. Flow (perm)		3725			3525			6630				
Peak-hour factor, PHF	0.93	0.93	0.93	0.86	0.86	0.86	0.95	0.95	0.95	0.92	0.92	0.92
Adj. Flow (vph)	0	746	0	0	901	395	0	3428	373	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	21	0	0	0	0
Lane Group Flow (vph)	0	746	0	0	1296	0	0	3781	0	0	0	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type		NA			NA			NA				
Protected Phases		8			4			2				
Permitted Phases												
Actuated Green, G (s)		29.0			25.0			49.0				
Effective Green, g (s)		29.0			25.0			49.0				
Actuated g/C Ratio		0.32			0.28			0.54				
Clearance Time (s)		6.0			10.0			6.0				
Lane Grp Cap (vph)		1200			979			3609				
v/s Ratio Prot		0.20			c0.37			c0.57				
v/s Ratio Perm												
v/c Ratio		0.62			1.32			1.05				
Uniform Delay, d1		25.9			32.5			20.5				
Progression Factor		0.00			1.00			1.00				
Incremental Delay, d2		1.1			152.9			29.4				
Delay (s)		1.1			185.4			49.9				
Level of Service		A			F			D				
Approach Delay (s)		1.1			185.4			49.9			0.0	
Approach LOS		A			F			D			A	

Intersection Summary			
HCM 2000 Control Delay	73.7	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.14		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	94.9%	ICU Level of Service	F
Analysis Period (min)	15		

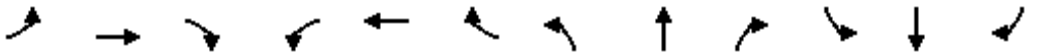
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	694	71	0	775	0	0	0	0	0	3305	190
Future Volume (vph)	0	694	71	0	775	0	0	0	0	0	3305	190
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	10	10	10	12	12	12	12	12	12	12	12	12
Total Lost time (s)		10.0			6.0						6.0	6.0
Lane Util. Factor		0.95			0.95						0.86	1.00
Frpb, ped/bikes		1.00			1.00						1.00	0.98
Flpb, ped/bikes		1.00			1.00						1.00	1.00
Frt		0.99			1.00						1.00	0.85
Flt Protected		1.00			1.00						1.00	1.00
Satd. Flow (prot)		3386			3762						6812	1657
Flt Permitted		1.00			1.00						1.00	1.00
Satd. Flow (perm)		3386			3762						6812	1657
Peak-hour factor, PHF	0.93	0.93	0.93	0.95	0.95	0.95	0.92	0.92	0.92	0.95	0.95	0.95
Adj. Flow (vph)	0	746	76	0	816	0	0	0	0	0	3479	200
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	39
Lane Group Flow (vph)	0	822	0	0	816	0	0	0	0	0	3479	161
Confl. Peds. (#/hr)	22		11	11		22	3		1	1		3
Heavy Vehicles (%)	3%	3%	3%	1%	1%	1%	2%	2%	2%	1%	1%	1%
Turn Type		NA			NA						NA	Perm
Protected Phases		4			8						2	
Permitted Phases												2
Actuated Green, G (s)		25.0			29.0						49.0	49.0
Effective Green, g (s)		25.0			29.0						49.0	49.0
Actuated g/C Ratio		0.28			0.32						0.54	0.54
Clearance Time (s)		10.0			6.0						6.0	6.0
Lane Grp Cap (vph)		940			1212						3708	902
v/s Ratio Prot		c0.24			0.22						c0.51	
v/s Ratio Perm												0.10
v/c Ratio		0.87			0.67						0.94	0.18
Uniform Delay, d1		31.0			26.4						19.1	10.3
Progression Factor		0.89			0.00						1.02	0.74
Incremental Delay, d2		8.1			0.3						3.9	0.3
Delay (s)		35.6			0.3						23.4	8.0
Level of Service		D			A						C	A
Approach Delay (s)		35.6			0.3			0.0			22.6	
Approach LOS		D			A			A			C	

Intersection Summary			
HCM 2000 Control Delay	21.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	94.9%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	675	51	131	699	135	0	0	90	0	0	11
Future Volume (vph)	0	675	51	131	699	135	0	0	90	0	0	11
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	11	11	11	10	10	10	12	12	12	12	12	12
Total Lost time (s)		6.0		6.0	6.0	6.0			6.0			6.0
Lane Util. Factor		1.00		1.00	1.00	1.00			1.00			1.00
Frpb, ped/bikes		1.00		1.00	1.00	0.97			1.00			1.00
Flpb, ped/bikes		1.00		1.00	1.00	1.00			1.00			1.00
Frt		0.99		1.00	1.00	0.85			0.86			0.86
Flt Protected		1.00		0.95	1.00	1.00			1.00			1.00
Satd. Flow (prot)		1431		1550	1631	1343			1542			1526
Flt Permitted		1.00		0.95	1.00	1.00			1.00			1.00
Satd. Flow (perm)		1431		1550	1631	1343			1542			1526
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.78	0.78	0.78	0.92	0.92	0.92
Adj. Flow (vph)	0	711	54	138	736	142	0	0	115	0	0	12
RTOR Reduction (vph)	0	3	0	0	0	69	0	0	93	0	0	11
Lane Group Flow (vph)	0	762	0	138	736	73	0	0	22	0	0	1
Confl. Peds. (#/hr)	12		13	13		12						
Heavy Vehicles (%)	2%	2%	2%	3%	3%	3%	1%	1%	1%	2%	2%	2%
Parking (#/hr)		10										
Turn Type		NA		Prot	NA	Perm			Over			Prot
Protected Phases		6 14		5	2				5			14
Permitted Phases						2						
Actuated Green, G (s)		61.0		17.0	46.0	46.0			17.0			9.0
Effective Green, g (s)		61.0		17.0	46.0	46.0			17.0			9.0
Actuated g/C Ratio		0.68		0.19	0.51	0.51			0.19			0.10
Clearance Time (s)				6.0	6.0	6.0			6.0			6.0
Vehicle Extension (s)				0.2	0.2	0.2			0.2			0.2
Lane Grp Cap (vph)		969		292	833	686			291			152
v/s Ratio Prot		c0.53		c0.09	c0.45				0.01			0.00
v/s Ratio Perm						0.05						
v/c Ratio		0.79		0.47	0.88	0.11			0.07			0.01
Uniform Delay, d1		10.0		32.5	19.6	11.4			30.0			36.5
Progression Factor		1.00		1.11	0.31	0.00			1.00			1.00
Incremental Delay, d2		6.4		4.4	11.1	0.3			0.5			0.1
Delay (s)		16.4		40.4	17.1	0.3			30.5			36.6
Level of Service		B		D	B	A			C			D
Approach Delay (s)		16.4			17.9			30.5			36.6	
Approach LOS		B			B			C			D	

Intersection Summary			
HCM 2000 Control Delay	18.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	58.5%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

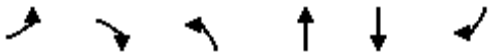
Intersection	
Int Delay, s/veh	7.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	17	37	4	4	110	56	39	18	87	24	9	6
Future Vol, veh/h	17	37	4	4	110	56	39	18	87	24	9	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	84	84	84	82	82	82	88	88	88	91	91	91
Heavy Vehicles, %	0	0	0	0	0	0	0	0	1	1	0	0
Mvmt Flow	20	44	5	5	134	68	44	20	99	26	10	7

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	325	273	14	248	227	70	17	0	0	119	0	0
Stage 1	66	66	-	158	158	-	-	-	-	-	-	-
Stage 2	259	207	-	90	69	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.11	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.209	-	-
Pot Cap-1 Maneuver	632	637	1072	710	676	998	1613	-	-	1475	-	-
Stage 1	950	844	-	849	771	-	-	-	-	-	-	-
Stage 2	750	734	-	922	841	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	477	607	1072	644	644	998	1613	-	-	1475	-	-
Mov Cap-2 Maneuver	477	607	-	644	644	-	-	-	-	-	-	-
Stage 1	922	829	-	824	748	-	-	-	-	-	-	-
Stage 2	556	712	-	853	826	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.1	11.9	2	4.6
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1613	-	-	578	729	1475	-	-
HCM Lane V/C Ratio	0.027	-	-	0.119	0.284	0.018	-	-
HCM Control Delay (s)	7.3	0	-	12.1	11.9	7.5	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.4	1.2	0.1	-	-



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	148	0	0	3347	172
Future Volume (Veh/h)	0	148	0	0	3347	172
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.84	0.84	1.00	1.00	0.95	0.95
Hourly flow rate (vph)	0	176	0	0	3523	181
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				327	192	
pX, platoon unblocked	0.57	0.57	0.57			
vC, conflicting volume	3614	971	3704			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1802	0	1961			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	72	100			
cM capacity (veh/h)	41	618	171			

Direction, Lane #	EB 1	SB 1	SB 2	SB 3	SB 4
Volume Total	176	1007	1007	1007	684
Volume Left	0	0	0	0	0
Volume Right	176	0	0	0	181
cSH	618	1700	1700	1700	1700
Volume to Capacity	0.28	0.59	0.59	0.59	0.40
Queue Length 95th (ft)	29	0	0	0	0
Control Delay (s)	13.1	0.0	0.0	0.0	0.0
Lane LOS	B				
Approach Delay (s)	13.1	0.0			
Approach LOS	B				

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	64.2%	ICU Level of Service	C
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	2	10	134	1	8	9
Future Vol, veh/h	2	10	134	1	8	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	0	0	1	0	0	0
Mvmt Flow	2	11	152	1	9	10

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	181	153	0	0	153	0
Stage 1	153	-	-	-	-	-
Stage 2	28	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	813	898	-	-	1440	-
Stage 1	880	-	-	-	-	-
Stage 2	1000	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	808	898	-	-	1440	-
Mov Cap-2 Maneuver	808	-	-	-	-	-
Stage 1	880	-	-	-	-	-
Stage 2	994	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.1	0	3.5
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	882	1440	-
HCM Lane V/C Ratio	-	-	0.015	0.006	-
HCM Control Delay (s)	-	-	9.1	7.5	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0	0	-

Intersection	
Int Delay, s/veh	0.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	148	0	2	170	0	0
Future Vol, veh/h	148	0	2	170	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	84	84	82	82	85	85
Heavy Vehicles, %	1	0	0	1	0	0
Mvmt Flow	176	0	2	207	0	0

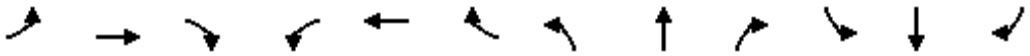
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	176	0	387	176
Stage 1	-	-	-	-	176	-
Stage 2	-	-	-	-	211	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1412	-	620	872
Stage 1	-	-	-	-	859	-
Stage 2	-	-	-	-	829	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1412	-	619	872
Mov Cap-2 Maneuver	-	-	-	-	619	-
Stage 1	-	-	-	-	859	-
Stage 2	-	-	-	-	827	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	1412	-
HCM Lane V/C Ratio	-	-	-	0.002	-
HCM Control Delay (s)	0	-	-	7.6	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	-	-	-	0	-

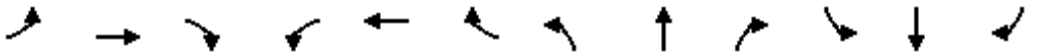
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	195	0	0	0	0	3324
Future Volume (vph)	195	0	0	0	0	3324
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	16	12	12	12	12	12
Total Lost time (s)	5.0					5.7
Lane Util. Factor	1.00					0.86
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	2132					6812
Flt Permitted	0.95					1.00
Satd. Flow (perm)	2132					6812
Peak-hour factor, PHF	0.88	0.88	1.00	1.00	0.95	0.95
Adj. Flow (vph)	222	0	0	0	0	3499
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	222	0	0	0	0	3499
Heavy Vehicles (%)	1%	0%	0%	0%	0%	1%
Turn Type	Prot					NA
Protected Phases	8					6
Permitted Phases						
Actuated Green, G (s)	25.0					54.3
Effective Green, g (s)	25.0					54.3
Actuated g/C Ratio	0.28					0.60
Clearance Time (s)	5.0					5.7
Lane Grp Cap (vph)	592					4109
v/s Ratio Prot	c0.10					c0.51
v/s Ratio Perm						
v/c Ratio	0.38					0.85
Uniform Delay, d1	26.2					14.6
Progression Factor	0.58					1.00
Incremental Delay, d2	0.6					2.4
Delay (s)	15.9					17.0
Level of Service	B					B
Approach Delay (s)	15.9		0.0			17.0
Approach LOS	B		A			B

Intersection Summary			
HCM 2000 Control Delay	16.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.7
Intersection Capacity Utilization	100.7%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	689	0	0	647	500	0	2870	419	0	0	0
Future Volume (vph)	0	689	0	0	647	500	0	2870	419	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.0			10.0			6.0				
Lane Util. Factor		0.95			0.95			0.86				
Frpb, ped/bikes		1.00			0.97			1.00				
Flpb, ped/bikes		1.00			1.00			1.00				
Frt		1.00			0.93			0.98				
Flt Protected		1.00			1.00			1.00				
Satd. Flow (prot)		3689			3402			6596				
Flt Permitted		1.00			1.00			1.00				
Satd. Flow (perm)		3689			3402			6596				
Peak-hour factor, PHF	0.95	0.95	0.95	0.94	0.94	0.94	0.95	0.95	0.95	0.92	0.92	0.92
Adj. Flow (vph)	0	725	0	0	688	532	0	3021	441	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	24	0	0	0	0
Lane Group Flow (vph)	0	725	0	0	1220	0	0	3438	0	0	0	0
Confl. Peds. (#/hr)						39			10			
Heavy Vehicles (%)	3%	3%	3%	1%	1%	1%	2%	2%	2%	2%	2%	2%
Turn Type		NA			NA			NA				
Protected Phases		8			4			2				
Permitted Phases												
Actuated Green, G (s)		29.0			25.0			49.0				
Effective Green, g (s)		29.0			25.0			49.0				
Actuated g/C Ratio		0.32			0.28			0.54				
Clearance Time (s)		6.0			10.0			6.0				
Lane Grp Cap (vph)		1188			945			3591				
v/s Ratio Prot		0.20			c0.36			c0.52				
v/s Ratio Perm												
v/c Ratio		0.61			1.29			0.96				
Uniform Delay, d1		25.7			32.5			19.5				
Progression Factor		0.00			1.00			1.00				
Incremental Delay, d2		0.2			138.9			8.0				
Delay (s)		0.2			171.4			27.5				
Level of Service		A			F			C				
Approach Delay (s)		0.2			171.4			27.5			0.0	
Approach LOS		A			F			C			A	

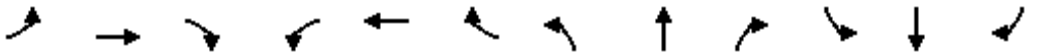
Intersection Summary			
HCM 2000 Control Delay	56.3	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.07		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	94.5%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	689	196	0	647	0	0	0	0	0	4125	157
Future Volume (vph)	0	689	196	0	647	0	0	0	0	0	4125	157
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	10	10	10	12	12	12	12	12	12	12	12	12
Total Lost time (s)		10.0			6.0						6.0	6.0
Lane Util. Factor		0.95			0.95						0.86	1.00
Frpb, ped/bikes		0.99			1.00						1.00	0.97
Flpb, ped/bikes		1.00			1.00						1.00	1.00
Frt		0.97			1.00						1.00	0.85
Flt Protected		1.00			1.00						1.00	1.00
Satd. Flow (prot)		3299			3762						6812	1632
Flt Permitted		1.00			1.00						1.00	1.00
Satd. Flow (perm)		3299			3762						6812	1632
Peak-hour factor, PHF	0.95	0.95	0.95	0.94	0.94	0.94	0.92	0.92	0.92	0.94	0.94	0.94
Adj. Flow (vph)	0	725	206	0	688	0	0	0	0	0	4388	167
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	39
Lane Group Flow (vph)	0	931	0	0	688	0	0	0	0	0	4388	128
Confl. Peds. (#/hr)			18									16
Heavy Vehicles (%)	3%	3%	3%	1%	1%	1%	2%	2%	2%	1%	1%	1%
Turn Type		NA			NA						NA	Perm
Protected Phases		4			8						2	
Permitted Phases												2
Actuated Green, G (s)		25.0			29.0						49.0	49.0
Effective Green, g (s)		25.0			29.0						49.0	49.0
Actuated g/C Ratio		0.28			0.32						0.54	0.54
Clearance Time (s)		10.0			6.0						6.0	6.0
Lane Grp Cap (vph)		916			1212						3708	888
v/s Ratio Prot		c0.28			0.18						c0.64	
v/s Ratio Perm												0.08
v/c Ratio		1.02			0.57						1.18	0.14
Uniform Delay, d1		32.5			25.3						20.5	10.1
Progression Factor		0.90			0.00						0.99	0.68
Incremental Delay, d2		28.6			0.2						83.6	0.1
Delay (s)		57.9			0.2						103.9	7.0
Level of Service		E			A						F	A
Approach Delay (s)		57.9			0.2			0.0			100.3	
Approach LOS		E			A			A			F	

Intersection Summary			
HCM 2000 Control Delay	82.8	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.13		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	94.5%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	700	39	90	635	79	0	0	185	0	0	40
Future Volume (vph)	0	700	39	90	635	79	0	0	185	0	0	40
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	11	11	11	10	10	10	12	12	12	12	12	12
Total Lost time (s)		6.0		6.0	6.0	6.0			6.0			6.0
Lane Util. Factor		1.00		1.00	1.00	1.00			1.00			1.00
Frpb, ped/bikes		1.00		1.00	1.00	0.96			1.00			1.00
Flpb, ped/bikes		1.00		1.00	1.00	1.00			1.00			1.00
Frt		0.99		1.00	1.00	0.85			0.86			0.86
Flt Protected		1.00		0.95	1.00	1.00			1.00			1.00
Satd. Flow (prot)		1433		1580	1663	1354			1483			1526
Flt Permitted		1.00		0.95	1.00	1.00			1.00			1.00
Satd. Flow (perm)		1433		1580	1663	1354			1483			1526
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.83	0.83	0.83	0.92	0.92	0.92
Adj. Flow (vph)	0	737	41	95	668	83	0	0	223	0	0	43
RTOR Reduction (vph)	0	2	0	0	0	41	0	0	181	0	0	39
Lane Group Flow (vph)	0	776	0	95	668	42	0	0	42	0	0	4
Confl. Peds. (#/hr)	23		24	24		23	45					45
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	5%	5%	5%	2%	2%	2%
Parking (#/hr)		10										
Turn Type		NA		Prot	NA	Perm			Over			Prot
Protected Phases		6 14		5	2				5			14
Permitted Phases						2						
Actuated Green, G (s)		61.0		17.0	46.0	46.0			17.0			9.0
Effective Green, g (s)		61.0		17.0	46.0	46.0			17.0			9.0
Actuated g/C Ratio		0.68		0.19	0.51	0.51			0.19			0.10
Clearance Time (s)				6.0	6.0	6.0			6.0			6.0
Vehicle Extension (s)				0.2	0.2	0.2			0.2			0.2
Lane Grp Cap (vph)		971		298	849	692			280			152
v/s Ratio Prot		c0.54		c0.06	0.40				0.03			0.00
v/s Ratio Perm						0.03						
v/c Ratio		0.80		0.32	0.79	0.06			0.15			0.03
Uniform Delay, d1		10.2		31.5	18.0	11.1			30.5			36.6
Progression Factor		1.00		1.11	0.30	0.00			1.00			1.00
Incremental Delay, d2		6.8		2.5	6.5	0.2			1.1			0.3
Delay (s)		17.0		37.4	11.9	0.2			31.6			36.9
Level of Service		B		D	B	A			C			D
Approach Delay (s)		17.0			13.6			31.6			36.9	
Approach LOS		B			B			C			D	

Intersection Summary			
HCM 2000 Control Delay	17.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	63.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

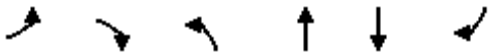
Intersection	
Int Delay, s/veh	9.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	30	71	6	19	26	50	24	14	62	193	37	23
Future Vol, veh/h	30	71	6	19	26	50	24	14	62	193	37	23
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	87	87	87	84	84	84	90	90	90	86	86	86
Heavy Vehicles, %	0	0	0	0	0	0	0	0	1	1	0	0
Mvmt Flow	34	82	7	23	31	60	27	16	69	224	43	27

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	655	644	57	654	623	51	70	0	0	85	0	0
Stage 1	505	505	-	105	105	-	-	-	-	-	-	-
Stage 2	150	139	-	549	518	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.11	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.209	-	-
Pot Cap-1 Maneuver	382	394	1015	383	405	1023	1544	-	-	1518	-	-
Stage 1	553	544	-	906	812	-	-	-	-	-	-	-
Stage 2	857	785	-	524	536	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	291	327	1015	269	337	1023	1544	-	-	1518	-	-
Mov Cap-2 Maneuver	291	327	-	269	337	-	-	-	-	-	-	-
Stage 1	543	460	-	890	797	-	-	-	-	-	-	-
Stage 2	762	771	-	362	453	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	22.4	14.7	1.8	5.9
HCM LOS	C	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1544	-	-	328	483	1518	-	-
HCM Lane V/C Ratio	0.017	-	-	0.375	0.234	0.148	-	-
HCM Control Delay (s)	7.4	0	-	22.4	14.7	7.8	0	-
HCM Lane LOS	A	A	-	C	B	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	1.7	0.9	0.5	-	-



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	326	0	0	3956	95
Future Volume (Veh/h)	0	326	0	0	3956	95
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.87	0.87	1.00	1.00	0.93	0.93
Hourly flow rate (vph)	0	375	0	0	4254	102
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				327	192	
pX, platoon unblocked	0.43	0.43	0.43			
vC, conflicting volume	4305	1114	4356			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2097	0	2215			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	21	100			
cM capacity (veh/h)	20	474	104			

Direction, Lane #	EB 1	SB 1	SB 2	SB 3	SB 4
Volume Total	375	1215	1215	1215	710
Volume Left	0	0	0	0	0
Volume Right	375	0	0	0	102
cSH	474	1700	1700	1700	1700
Volume to Capacity	0.79	0.71	0.71	0.71	0.42
Queue Length 95th (ft)	180	0	0	0	0
Control Delay (s)	35.7	0.0	0.0	0.0	0.0
Lane LOS	E				
Approach Delay (s)	35.7	0.0			
Approach LOS	E				

Intersection Summary			
Average Delay	2.8		
Intersection Capacity Utilization	81.8%	ICU Level of Service	D
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	2.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	3	26	74	5	25	37
Future Vol, veh/h	3	26	74	5	25	37
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	1	0	0	0
Mvmt Flow	3	29	82	6	28	41

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	182	85	0	0	88	0
Stage 1	85	-	-	-	-	-
Stage 2	97	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	812	980	-	-	1520	-
Stage 1	943	-	-	-	-	-
Stage 2	932	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	797	980	-	-	1520	-
Mov Cap-2 Maneuver	797	-	-	-	-	-
Stage 1	943	-	-	-	-	-
Stage 2	914	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.9	0	3
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	957	1520	-
HCM Lane V/C Ratio	-	-	0.034	0.018	-
HCM Control Delay (s)	-	-	8.9	7.4	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0.1	-

Intersection	
Int Delay, s/veh	0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	326	0	0	95	0	0
Future Vol, veh/h	326	0	0	95	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	87	87	84	84	85	85
Heavy Vehicles, %	1	0	0	1	0	0
Mvmt Flow	375	0	0	113	0	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	375	0	488	375
Stage 1	-	-	-	-	375	-
Stage 2	-	-	-	-	113	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1195	-	543	676
Stage 1	-	-	-	-	699	-
Stage 2	-	-	-	-	917	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1195	-	543	676
Mov Cap-2 Maneuver	-	-	-	-	543	-
Stage 1	-	-	-	-	699	-
Stage 2	-	-	-	-	917	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	1195	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	0	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	-	-	-	0	-

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	209	0	0	0	0	3842
Future Volume (vph)	209	0	0	0	0	3842
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	16	12	12	12	12	12
Total Lost time (s)	5.0					5.7
Lane Util. Factor	1.00					0.86
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	2153					6880
Flt Permitted	0.95					1.00
Satd. Flow (perm)	2153					6880
Peak-hour factor, PHF	0.90	0.90	1.00	1.00	0.93	0.93
Adj. Flow (vph)	232	0	0	0	0	4131
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	232	0	0	0	0	4131
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Turn Type	Prot					NA
Protected Phases	8					6
Permitted Phases						
Actuated Green, G (s)	28.0					51.3
Effective Green, g (s)	28.0					51.3
Actuated g/C Ratio	0.31					0.57
Clearance Time (s)	5.0					5.7
Lane Grp Cap (vph)	669					3921
v/s Ratio Prot	c0.11					c0.60
v/s Ratio Perm						
v/c Ratio	0.35					1.05
Uniform Delay, d1	23.9					19.4
Progression Factor	0.60					1.00
Incremental Delay, d2	0.6					31.1
Delay (s)	15.0					50.4
Level of Service	B					D
Approach Delay (s)	15.0		0.0			50.4
Approach LOS	B		A			D

Intersection Summary			
HCM 2000 Control Delay	48.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.7
Intersection Capacity Utilization	104.5%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

SIMTRAFFIC PERFORMANCE REPORTS

1: NB Woodward Avenue & Maple Road Performance by movement

Movement	EBT	WBT	WBR	NBT	NBR	All
Denied Delay (hr)	0.0	131.1	56.0	0.2	0.0	187.3
Denied Del/Veh (s)	0.0	648.4	637.9	0.2	0.4	133.1
Total Delay (hr)	0.2	27.8	9.7	27.4	1.6	66.8
Total Del/Veh (s)	1.3	193.4	157.5	32.1	17.3	50.1
Total Stops	1	536	246	2299	192	3274
Travel Time (hr)	0.8	160.9	66.7	35.8	3.0	267.3
Avg Speed (mph)	17	2	2	10	13	6

2: SB Woodward Avenue & Maple Road Performance by movement

Movement	EBT	EBR	WBT	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.1	0.0	0.0	0.1
Denied Del/Veh (s)	0.2	0.2	0.4	0.0	0.0	0.1
Total Delay (hr)	5.3	0.5	0.5	14.6	0.4	21.3
Total Del/Veh (s)	29.4	26.1	3.7	17.0	7.9	17.1
Total Stops	361	41	17	1456	70	1945
Travel Time (hr)	6.3	0.6	1.0	17.5	0.7	26.2
Avg Speed (mph)	4	4	11	7	9	7

3: Peabody Street/Park Street & Maple Road Performance by movement

Movement	EBT	EBR	WBL	WBT	WBR	NBR	All
Denied Delay (hr)	1.6	0.1	0.0	0.0	0.0	3.8	5.5
Denied Del/Veh (s)	9.3	9.6	0.2	0.3	0.0	162.9	13.9
Total Delay (hr)	4.7	0.2	1.7	0.7	0.0	5.6	13.0
Total Del/Veh (s)	26.9	18.8	82.6	4.7	1.4	262.9	32.7
Total Stops	390	38	70	68	3	44	613
Travel Time (hr)	8.7	0.4	1.8	1.5	0.2	9.5	22.3
Avg Speed (mph)	8	10	1	12	14	0	5

4: Park Street & Hamilton Row Performance by movement

Movement	EBL	EBT	WBT	WBR	NBL	NBT	NBR	SBL	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0
Total Delay (hr)	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Total Del/Veh (s)	4.1	6.0	3.6	2.1	0.1	1.0	0.4	5.6	2.9	2.8
Total Stops	9	34	102	28	0	0	0	14	12	199
Travel Time (hr)	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.6
Avg Speed (mph)	15	14	6	6	21	20	16	14	15	13

5: SB Woodward Avenue & Hamilton Row Performance by movement

Movement	EBR	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	0.0
Total Delay (hr)	0.6	6.5	0.1	7.3
Total Del/Veh (s)	22.0	7.4	3.0	7.7
Total Stops	98	425	10	533
Travel Time (hr)	0.8	9.1	0.4	10.2
Avg Speed (mph)	3	12	13	11

6: SB Woodward Avenue & Site Driveway Performance by movement

Movement	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0
Total Delay (hr)	4.7	0.0	4.7
Total Del/Veh (s)	5.2	9.0	5.2
Total Stops	396	0	396
Travel Time (hr)	6.2	0.0	6.2
Avg Speed (mph)	10	6	10

8: Site Driveway & Hamilton Row Performance by movement

Movement	EBT	EBR	WBT	All
Denied Delay (hr)	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	0.0
Total Delay (hr)	0.0	0.0	0.0	0.1
Total Del/Veh (s)	1.3	0.6	0.8	1.0
Total Stops	4	0	1	5
Travel Time (hr)	0.1	0.0	0.2	0.3
Avg Speed (mph)	9	11	11	10

9: SB Woodward Avenue & NB to SB Cross-over Performance by movement

Movement	WBL	WBT	SBT	All
Denied Delay (hr)	0.0	0.0	5.0	5.1
Denied Del/Veh (s)	0.4	0.0	5.8	5.5
Total Delay (hr)	0.5	0.0	16.2	16.7
Total Del/Veh (s)	10.6	0.1	18.5	18.1
Total Stops	35	0	1353	1388
Travel Time (hr)	0.6	0.0	24.5	25.1
Avg Speed (mph)	2	13	7	7

Total Zone Performance

Denied Delay (hr)	198.0
Denied Del/Veh (s)	84.3
Total Delay (hr)	130.0
Total Del/Veh (s)	2052.9
Total Stops	8353
Travel Time (hr)	358.2
Avg Speed (mph)	7

1: NB Woodward Avenue & Maple Road Performance by movement

Movement	EBT	WBT	WBR	NBT	NBR	All
Denied Delay (hr)	0.0	92.3	74.7	0.2	0.0	167.2
Denied Del/Veh (s)	0.0	533.4	548.5	0.2	0.4	126.2
Total Delay (hr)	0.2	22.8	14.8	17.7	1.3	56.9
Total Del/Veh (s)	1.4	171.4	143.7	23.3	12.5	45.3
Total Stops	2	477	336	1574	184	2573
Travel Time (hr)	0.7	116.9	91.2	25.2	2.9	236.9
Avg Speed (mph)	17	2	2	13	15	7

2: SB Woodward Avenue & Maple Road Performance by movement

Movement	EBT	EBR	WBT	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.3	0.0	0.3
Denied Del/Veh (s)	0.1	0.2	0.0	0.3	0.1	0.2
Total Delay (hr)	5.6	1.4	0.3	18.9	0.3	26.5
Total Del/Veh (s)	35.7	32.9	2.7	17.7	8.1	18.5
Total Stops	345	96	11	1642	54	2148
Travel Time (hr)	6.5	1.7	0.7	22.8	0.6	32.3
Avg Speed (mph)	3	3	13	7	9	6

3: Peabody Street/Park Street & Maple Road Performance by movement

Movement	EBT	EBR	WBL	WBT	WBR	NBR	All
Denied Delay (hr)	3.5	0.2	0.0	0.0	0.0	54.5	58.1
Denied Del/Veh (s)	18.9	17.1	0.0	0.0	0.0	1257.2	145.2
Total Delay (hr)	9.8	0.4	1.4	0.5	0.0	9.0	21.1
Total Del/Veh (s)	52.5	46.0	85.2	3.5	1.0	577.3	56.2
Total Stops	600	51	58	47	2	1	759
Travel Time (hr)	15.7	0.7	1.5	1.3	0.1	63.6	82.9
Avg Speed (mph)	5	5	1	14	15	0	3

4: Park Street & Hamilton Row Performance by movement

Movement	EBL	EBT	WBT	WBR	NBL	NBT	NBR	SBL	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.2	1.1	4.4
Denied Del/Veh (s)	0.2	0.2	0.0	0.0	0.0	0.0	0.0	82.6	89.9	43.5
Total Delay (hr)	0.1	1.0	0.0	0.0	0.0	0.0	0.2	5.9	1.7	9.0
Total Del/Veh (s)	32.7	51.9	3.8	2.1	0.0	2.9	24.8	156.8	138.3	90.8
Total Stops	16	70	26	10	0	1	16	84	26	249
Travel Time (hr)	0.2	1.2	0.0	0.0	0.0	0.0	0.2	9.5	2.9	14.1
Avg Speed (mph)	5	3	6	7	21	14	3	1	1	2

5: SB Woodward Avenue & Hamilton Row Performance by movement

Movement	EBT	EBR	SBT	SBR	All
Denied Delay (hr)	0.0	0.2	0.0	0.0	0.2
Denied Del/Veh (s)	0.0	3.9	0.0	0.2	0.2
Total Delay (hr)	0.0	3.0	10.3	0.1	13.4
Total Del/Veh (s)	21.5	48.2	10.0	6.8	12.1
Total Stops	0	161	1250	10	1421
Travel Time (hr)	0.0	3.6	13.3	0.1	17.0
Avg Speed (mph)	1	1	10	9	8

6: SB Woodward Avenue & Site Driveway Performance by movement

Movement	EBR	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	0.0	0.0	0.0
Total Delay (hr)	0.0	6.8	0.0	6.8
Total Del/Veh (s)	4.9	6.2	4.3	6.2
Total Stops	11	697	3	711
Travel Time (hr)	0.0	8.7	0.0	8.7
Avg Speed (mph)	3	9	8	8

8: Site Driveway & Hamilton Row Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	0.0	0.0	0.0	0.1	0.1	0.1
Total Delay (hr)	0.7	0.0	0.0	0.0	0.0	0.0	0.7
Total Del/Veh (s)	11.2	1.1	1.2	0.8	2.9	4.0	9.5
Total Stops	46	0	1	0	4	2	53
Travel Time (hr)	0.9	0.0	0.0	0.1	0.0	0.0	1.0
Avg Speed (mph)	3	10	10	11	6	5	4

9: SB Woodward Avenue & NB to SB Cross-over Performance by movement

Movement	WBL	WBT	SBT	All
Denied Delay (hr)	0.0	0.0	37.6	37.6
Denied Del/Veh (s)	0.5	0.0	37.2	35.4
Total Delay (hr)	0.5	0.0	27.1	27.6
Total Del/Veh (s)	9.5	0.4	26.9	26.1
Total Stops	34	0	1748	1782
Travel Time (hr)	0.6	0.0	68.4	69.0
Avg Speed (mph)	2	12	5	5

Total Zone Performance

Denied Delay (hr)	267.8
Denied Del/Veh (s)	106.4
Total Delay (hr)	161.9
Total Del/Veh (s)	2259.4
Total Stops	9696
Travel Time (hr)	462.0
Avg Speed (mph)	6

1: NB Woodward Avenue & Maple Road Performance by movement

Movement	EBT	WBT	WBR	NBT	NBR	All
Denied Delay (hr)	0.0	124.0	54.9	0.4	0.1	179.4
Denied Del/Veh (s)	0.0	578.8	585.2	0.5	0.7	121.2
Total Delay (hr)	0.3	27.3	10.4	34.9	2.5	75.3
Total Del/Veh (s)	1.4	169.2	147.8	38.8	26.2	53.1
Stop/Veh	0.00	0.98	1.03	0.85	0.69	0.75
Travel Time (hr)	0.9	153.5	66.5	43.8	4.0	268.7
Avg Speed (mph)	17	2	2	9	10	6

2: SB Woodward Avenue & Maple Road Performance by movement

Movement	EBT	EBR	WBT	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.1	0.0	0.0	0.1
Denied Del/Veh (s)	0.2	0.2	0.3	0.0	0.0	0.1
Total Delay (hr)	6.8	0.6	0.5	10.8	0.2	18.8
Total Del/Veh (s)	34.9	29.4	3.2	11.8	3.4	14.0
Stop/Veh	0.62	0.59	0.03	0.44	0.31	0.42
Travel Time (hr)	7.8	0.7	1.0	13.9	0.6	24.0
Avg Speed (mph)	3	3	12	10	13	8

3: Peabody Street/Park Street & Maple Road Performance by movement

Movement	EBT	EBR	WBL	WBT	WBR	NBR	SBT	SBR	All
Denied Delay (hr)	5.2	0.3	0.0	0.0	0.0	1.0	0.0	0.0	6.5
Denied Del/Veh (s)	27.5	24.6	0.0	0.1	0.0	39.8		0.0	14.8
Total Delay (hr)	9.7	0.6	1.0	0.8	0.0	4.0	0.0	0.0	16.2
Total Del/Veh (s)	50.7	45.7	35.0	5.2	1.2	172.0		39.9	36.6
Stop/Veh	0.89	0.82	0.92	0.15	0.17	0.67		1.00	0.57
Travel Time (hr)	17.4	1.2	1.2	1.8	0.3	5.2	0.0	0.1	27.1
Avg Speed (mph)	5	5	3	12	15	1	22	2	5

4: Park Street & Hamilton Row Performance by movement

Movement	EBL	EBT	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.0
Total Delay (hr)	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
Total Del/Veh (s)	4.7	5.9	4.2	2.3	1.5	0.3	0.2	1.9	0.1	0.1	2.9
Stop/Veh	1.00	0.98	0.99	1.00	0.06	0.00	0.02	0.12	0.00	0.00	0.60
Travel Time (hr)	0.0	0.2	0.2	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.7
Avg Speed (mph)	15	14	7	7	16	23	17	19	24	20	13

5: SB Woodward Avenue & Hamilton Row Performance by movement

Movement	EBR	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	0.0
Total Delay (hr)	0.5	4.7	0.1	5.2
Total Del/Veh (s)	14.9	5.0	2.0	5.2
Stop/Veh	0.97	0.01	0.00	0.05
Travel Time (hr)	0.7	7.4	0.4	8.4
Avg Speed (mph)	3	16	14	15

6: SB Woodward Avenue & Site Driveway Performance by movement

Movement	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0
Total Delay (hr)	3.2	0.0	3.2
Total Del/Veh (s)	3.3	0.2	3.3
Stop/Veh	0.08	0.00	0.08
Travel Time (hr)	4.8	0.0	4.8
Avg Speed (mph)	13	15	13

8: Site Driveway & Hamilton Row Performance by movement

Movement	EBT	EBR	WBT	All
Denied Delay (hr)	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	0.0
Total Delay (hr)	0.0	0.0	0.0	0.0
Total Del/Veh (s)	0.8	0.4	0.5	0.6
Stop/Veh	0.02	0.00	0.00	0.01
Travel Time (hr)	0.1	0.0	0.2	0.4
Avg Speed (mph)	11	11	11	11

9: SB Woodward Avenue & NB to SB Cross-over Performance by movement

Movement	WBL	WBT	SBT	All
Denied Delay (hr)	0.0	0.0	0.6	0.7
Denied Del/Veh (s)	0.4	0.0	0.7	0.7
Total Delay (hr)	0.4	0.0	14.5	14.9
Total Del/Veh (s)	9.4	0.3	15.5	15.2
Stop/Veh	0.20	0.00	0.39	0.38
Travel Time (hr)	0.5	0.0	18.6	19.1
Avg Speed (mph)	2	13	9	8

Total Zone Performance

Denied Delay (hr)	186.7
Denied Del/Veh (s)	75.1
Total Delay (hr)	133.9
Total Del/Veh (s)	2161.6
Stop/Veh	38.90
Travel Time (hr)	353.1
Avg Speed (mph)	7

1: NB Woodward Avenue & Maple Road Performance by movement

Movement	EBT	WBT	WBR	NBT	NBR	All
Denied Delay (hr)	0.0	63.6	50.0	0.2	0.0	113.8
Denied Del/Veh (s)	0.0	360.6	362.2	0.2	0.4	82.8
Total Delay (hr)	0.2	21.6	15.6	21.4	1.6	60.5
Total Del/Veh (s)	1.3	147.5	136.2	27.2	13.9	45.5
Total Stops	2	504	334	1858	211	2909
Travel Time (hr)	0.7	87.3	67.5	29.1	3.3	188.0
Avg Speed (mph)	18	2	2	12	15	7

2: SB Woodward Avenue & Maple Road Performance by movement

Movement	EBT	EBR	WBT	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.2	0.0	0.3
Denied Del/Veh (s)	0.3	0.2	0.0	0.2	0.1	0.2
Total Delay (hr)	6.1	1.5	0.3	17.0	0.2	25.1
Total Del/Veh (s)	36.4	33.3	2.1	15.8	4.4	17.1
Total Stops	373	99	10	1652	50	2184
Travel Time (hr)	7.0	1.8	0.7	21.0	0.5	31.0
Avg Speed (mph)	3	3	15	8	12	7

3: Peabody Street/Park Street & Maple Road Performance by movement

Movement	EBT	EBR	WBL	WBT	WBR	NBR	SBR	All
Denied Delay (hr)	17.3	0.9	0.0	0.0	0.0	53.2	0.0	71.5
Denied Del/Veh (s)	88.8	88.0	0.0	0.0	0.0	1053.3	0.0	161.3
Total Delay (hr)	12.8	0.6	0.7	0.7	0.0	9.0	0.3	24.0
Total Del/Veh (s)	67.1	63.7	36.3	4.9	0.9	370.4	46.3	58.4
Total Stops	640	32	66	82	7	3	20	850
Travel Time (hr)	32.7	1.6	0.8	1.6	0.1	62.4	0.3	99.6
Avg Speed (mph)	4	4	3	12	16	0	2	3

4: Park Street & Hamilton Row Performance by movement

Movement	EBL	EBT	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.2	0.1
Total Delay (hr)	0.1	0.5	0.0	0.0	0.0	0.0	0.1	0.4	0.1	0.1	1.3
Total Del/Veh (s)	13.3	26.0	4.9	2.0	3.3	3.9	8.8	12.4	9.3	7.5	12.8
Total Stops	18	76	30	12	2	1	8	57	6	8	218
Travel Time (hr)	0.1	0.7	0.1	0.0	0.0	0.0	0.1	0.8	0.1	0.1	2.1
Avg Speed (mph)	9	6	6	8	13	13	7	9	12	12	8

5: SB Woodward Avenue & Hamilton Row Performance by movement

Movement	EBT	EBR	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.3	0.0	0.0	0.0
Total Delay (hr)	0.0	2.3	8.5	0.0	10.9
Total Del/Veh (s)	14.5	35.9	8.2	4.5	9.7
Total Stops	2	194	1132	10	1338
Travel Time (hr)	0.0	2.6	11.6	0.1	14.3
Avg Speed (mph)	2	2	11	11	10

6: SB Woodward Avenue & Site Driveway Performance by movement

Movement	EBR	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	0.0	0.0	0.0
Total Delay (hr)	0.0	5.5	0.0	5.5
Total Del/Veh (s)	3.6	5.0	1.8	4.9
Total Stops	11	697	2	710
Travel Time (hr)	0.0	7.3	0.0	7.3
Avg Speed (mph)	4	10	10	10

8: Site Driveway & Hamilton Row Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.1	0.1	0.0
Total Delay (hr)	0.4	0.0	0.0	0.0	0.0	0.0	0.4
Total Del/Veh (s)	5.7	0.8	7.7	0.5	8.1	4.4	4.9
Total Stops	32	0	0	0	5	3	40
Travel Time (hr)	0.6	0.0	0.0	0.1	0.0	0.0	0.7
Avg Speed (mph)	6	11	4	11	3	4	6

9: SB Woodward Avenue & NB to SB Cross-over Performance by movement

Movement	WBL	WBT	SBT	All
Denied Delay (hr)	0.0	0.0	104.7	104.7
Denied Del/Veh (s)	0.1	0.0	99.6	94.9
Total Delay (hr)	0.5	0.0	30.1	30.6
Total Del/Veh (s)	9.4	0.3	29.8	28.8
Total Stops	35	0	1635	1670
Travel Time (hr)	0.6	0.0	138.6	139.2
Avg Speed (mph)	2	12	5	5

Total Zone Performance

Denied Delay (hr)	290.3
Denied Del/Veh (s)	110.9
Total Delay (hr)	158.2
Total Del/Veh (s)	2363.7
Total Stops	9919
Travel Time (hr)	482.2
Avg Speed (mph)	6

1: NB Woodward Avenue & Maple Road Performance by movement

Movement	EBT	WBT	WBR	NBT	NBR	All
Denied Delay (hr)	0.0	107.4	46.9	0.6	0.1	155.0
Denied Del/Veh (s)	0.0	484.6	496.2	0.7	0.9	102.6
Total Delay (hr)	0.2	27.0	10.5	39.5	2.7	80.0
Total Del/Veh (s)	1.3	161.5	142.8	42.7	29.2	55.4
Total Stops	2	644	268	2974	243	4131
Travel Time (hr)	0.8	136.8	58.6	48.9	4.2	249.3
Avg Speed (mph)	18	2	2	8	10	6

2: SB Woodward Avenue & Maple Road Performance by movement

Movement	EBT	EBR	WBT	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	0.2	0.1	0.0	0.0	0.0
Total Delay (hr)	6.0	0.6	0.4	13.6	0.3	20.9
Total Del/Veh (s)	32.1	25.9	2.6	14.8	4.8	15.5
Total Stops	405	44	14	1778	67	2308
Travel Time (hr)	7.0	0.8	0.9	18.3	0.8	27.8
Avg Speed (mph)	3	4	13	11	14	9

3: Peabody Street/Park Street & Maple Road Performance by movement

Movement	EBT	EBR	WBL	WBT	WBR	NBR	SBR	All
Denied Delay (hr)	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.9
Denied Del/Veh (s)	4.7	3.3	0.0	0.1	0.0	0.6	0.0	2.1
Total Delay (hr)	6.2	0.4	1.1	0.8	0.0	3.2	0.1	11.8
Total Del/Veh (s)	33.7	28.1	34.5	5.2	1.0	129.6	27.9	26.6
Total Stops	508	36	102	88	14	69	8	825
Travel Time (hr)	9.6	0.7	1.3	1.8	0.3	3.4	0.1	17.1
Avg Speed (mph)	7	8	3	12	15	1	3	6

4: Park Street & Hamilton Row Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.1	0.1
Total Delay (hr)	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	5.1	5.5	2.1	3.4	4.5	2.3	1.5	0.7	0.2	2.1	0.3	0.1
Total Stops	20	38	3	4	108	56	2	0	0	4	0	0
Travel Time (hr)	0.1	0.1	0.0	0.0	0.2	0.1	0.1	0.0	0.1	0.1	0.0	0.0
Avg Speed (mph)	14	15	16	7	7	7	15	20	16	19	24	20

4: Park Street & Hamilton Row Performance by movement

Movement	All
Denied Delay (hr)	0.0
Denied Del/Veh (s)	0.0
Total Delay (hr)	0.3
Total Del/Veh (s)	2.7
Total Stops	235
Travel Time (hr)	0.9
Avg Speed (mph)	13

5: SB Woodward Avenue & Hamilton Row Performance by movement

Movement	EBR	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	0.0
Total Delay (hr)	0.2	4.6	0.1	4.9
Total Del/Veh (s)	4.5	4.9	2.1	4.8
Total Stops	144	31	1	176
Travel Time (hr)	0.4	7.4	0.4	8.1
Avg Speed (mph)	7	16	14	15

7: Park Street & Site Driveway Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	0.1	0.0		0.0	0.0	0.0
Total Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	2.7	2.1	0.2		1.9	0.2	0.5
Total Stops	1	14	0	0	1	0	16
Travel Time (hr)	0.0	0.0	0.2	0.0	0.0	0.0	0.3
Avg Speed (mph)	8	7	14	11	15	19	14

8: Site Driveway & Hamilton Row Performance by movement

Movement	EBT	WBL	WBT	All
Denied Delay (hr)	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	0.0
Total Delay (hr)	0.0	0.0	0.0	0.0
Total Del/Veh (s)	0.5	0.6	0.5	0.5
Total Stops	0	0	0	0
Travel Time (hr)	0.1	0.0	0.3	0.4
Avg Speed (mph)	12	11	11	11

9: SB Woodward Avenue & NB to SB Cross-over Performance by movement

Movement	WBL	WBT	SBT	All
Denied Delay (hr)	0.1	0.0	0.6	0.6
Denied Del/Veh (s)	0.9	0.0	0.6	0.7
Total Delay (hr)	0.5	0.0	14.9	15.4
Total Del/Veh (s)	8.9	0.3	15.9	15.5
Total Stops	36	0	1342	1378
Travel Time (hr)	0.6	0.0	19.0	19.6
Avg Speed (mph)	2	13	8	8

Total Zone Performance

Denied Delay (hr)	156.6
Denied Del/Veh (s)	61.8
Total Delay (hr)	133.4
Total Del/Veh (s)	1975.6
Total Stops	9069
Travel Time (hr)	323.5
Avg Speed (mph)	7

1: NB Woodward Avenue & Maple Road Performance by movement

Movement	EBT	WBT	WBR	NBT	NBR	All
Denied Delay (hr)	0.0	115.4	81.0	0.2	0.0	196.6
Denied Del/Veh (s)	0.0	607.1	572.1	0.2	0.4	139.5
Total Delay (hr)	0.2	23.0	15.5	23.3	1.9	64.0
Total Del/Veh (s)	1.4	185.2	166.6	28.9	16.2	49.0
Total Stops	3	440	306	2005	235	2989
Travel Time (hr)	0.7	140.1	98.0	31.2	3.7	273.8
Avg Speed (mph)	17	2	2	11	14	6

2: SB Woodward Avenue & Maple Road Performance by movement

Movement	EBT	EBR	WBT	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.2	0.0	0.2
Denied Del/Veh (s)	0.1	0.1	0.0	0.2	0.1	0.2
Total Delay (hr)	6.0	1.6	0.2	27.0	0.3	35.1
Total Del/Veh (s)	36.7	33.9	2.0	24.7	6.4	24.0
Total Stops	375	103	6	2543	65	3092
Travel Time (hr)	6.9	1.9	0.6	32.8	0.7	42.9
Avg Speed (mph)	3	3	15	7	13	6

3: Peabody Street/Park Street & Maple Road Performance by movement

Movement	EBT	EBR	WBL	WBT	WBR	NBR	SBT	SBR	All
Denied Delay (hr)	27.2	1.7	0.0	0.0	0.0	58.1	0.0	0.0	87.0
Denied Del/Veh (s)	138.6	148.3	0.0	0.0	0.0	1067.0	0.0	0.0	200.5
Total Delay (hr)	13.5	0.7	0.6	0.6	0.0	9.0	0.0	0.4	24.9
Total Del/Veh (s)	71.0	63.5	35.6	4.8	1.0	354.1	0.3	36.1	62.6
Total Stops	653	36	59	70	10	1	0	34	863
Travel Time (hr)	43.2	2.6	0.8	1.4	0.1	67.3	0.0	0.5	115.9
Avg Speed (mph)	4	4	3	12	15	0	21	2	3

4: Park Street & Hamilton Row Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.2
Total Delay (hr)	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Total Del/Veh (s)	7.2	8.8	3.5	6.4	6.4	2.7	1.7	0.4	0.3	2.6	1.0	0.8
Total Stops	25	74	7	20	25	46	3	0	1	27	1	1
Travel Time (hr)	0.1	0.4	0.0	0.0	0.1	0.1	0.0	0.0	0.1	0.6	0.1	0.1
Avg Speed (mph)	12	12	14	5	5	7	14	19	15	18	22	19

4: Park Street & Hamilton Row Performance by movement

Movement	All
Denied Delay (hr)	0.0
Denied Del/Veh (s)	0.1
Total Delay (hr)	0.5
Total Del/Veh (s)	3.5
Total Stops	230
Travel Time (hr)	1.6
Avg Speed (mph)	15

5: SB Woodward Avenue & Hamilton Row Performance by movement

Movement	EBT	EBR	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	0.0	0.6	10.6	0.2	11.4
Total Del/Veh (s)	1.2	6.6	10.3	7.8	9.9
Total Stops	0	302	1310	29	1641
Travel Time (hr)	0.0	1.0	13.6	0.4	15.0
Avg Speed (mph)	12	6	9	9	9

7: Park Street & Site Driveway Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.2	0.1	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	3.0	2.1	0.2	0.2	1.6	0.5	0.9
Total Stops	2	29	0	0	1	0	32
Travel Time (hr)	0.0	0.0	0.1	0.0	0.1	0.1	0.3
Avg Speed (mph)	7	7	14	12	15	19	14

8: Site Driveway & Hamilton Row Performance by movement

Movement	EBT	WBT	All
Denied Delay (hr)	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0
Total Delay (hr)	0.1	0.0	0.1
Total Del/Veh (s)	0.8	0.8	0.8
Total Stops	9	2	11
Travel Time (hr)	0.3	0.2	0.5
Avg Speed (mph)	12	11	12

9: SB Woodward Avenue & NB to SB Cross-over Performance by movement

Movement	WBL	WBT	SBT	All
Denied Delay (hr)	0.0	0.0	166.9	166.9
Denied Del/Veh (s)	0.8	0.0	152.8	145.3
Total Delay (hr)	0.5	0.0	30.1	30.6
Total Del/Veh (s)	9.6	0.3	29.6	28.6
Total Stops	37	0	1818	1855
Travel Time (hr)	0.7	0.0	200.7	201.4
Avg Speed (mph)	2	13	5	5

Total Zone Performance

Denied Delay (hr)	450.8
Denied Del/Veh (s)	165.1
Total Delay (hr)	166.7
Total Del/Veh (s)	2247.4
Total Stops	10713
Travel Time (hr)	651.4
Avg Speed (mph)	6

SIMTRAFFIC QUEUING & BLOCKING REPORTS

Intersection: 1: NB Woodward Avenue & Maple Road

Movement	EB	EB	WB	WB	NB	NB	NB	NB
Directions Served	T	T	T	TR	T	T	T	TR
Maximum Queue (ft)	24	15	569	572	640	602	485	410
Average Queue (ft)	4	1	543	543	496	433	299	214
95th Queue (ft)	17	8	559	559	656	574	431	345
Link Distance (ft)	14	14	523	523	616	616	616	616
Upstream Blk Time (%)	4	1	94	88	3	0		
Queuing Penalty (veh)	13	2	0	0	0	0		
Storage Bay Dist (ft)								
Storage Blk Time (%)								
Queuing Penalty (veh)								

Intersection: 2: SB Woodward Avenue & Maple Road

Movement	EB	EB	WB	WB	SB	SB	SB	SB	SB
Directions Served	T	TR	T	T	T	T	T	T	R
Maximum Queue (ft)	139	169	74	33	242	249	243	237	125
Average Queue (ft)	107	148	21	3	225	223	209	179	48
95th Queue (ft)	133	178	48	19	241	247	253	243	97
Link Distance (ft)	96	96	14	14	147	147	147	147	147
Upstream Blk Time (%)	27	39	25	5	24	23	20	14	0
Queuing Penalty (veh)	98	142	89	17	154	149	129	94	1
Storage Bay Dist (ft)									
Storage Blk Time (%)									
Queuing Penalty (veh)									

Intersection: 3: Peabody Street/Park Street & Maple Road

Movement	EB	EB	WB	WB	WB	NB
Directions Served	T	R	L	TR	R	R
Maximum Queue (ft)	504	48	91	152	114	221
Average Queue (ft)	265	18	59	77	10	155
95th Queue (ft)	517	48	90	174	61	266
Link Distance (ft)	478			96	96	203
Upstream Blk Time (%)	11		2	12	1	37
Queuing Penalty (veh)	0		0	54	3	0
Storage Bay Dist (ft)		25	75			
Storage Blk Time (%)	37	0	10	12		
Queuing Penalty (veh)	14	3	74	11		

Intersection: 4: Park Street & Hamilton Row

Movement	EB	WB	NB	SB
Directions Served	LT	TR	TR	LTR
Maximum Queue (ft)	30	55	8	32
Average Queue (ft)	15	27	0	18
95th Queue (ft)	29	47	8	40
Link Distance (ft)	285	2	82	294
Upstream Blk Time (%)		8		
Queuing Penalty (veh)		11		
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 5: SB Woodward Avenue & Hamilton Row

Movement	EB	SB	SB	SB	SB
Directions Served	R	T	T	T	TR
Maximum Queue (ft)	91	211	211	187	180
Average Queue (ft)	46	80	73	60	43
95th Queue (ft)	89	232	220	190	159
Link Distance (ft)	58	135	135	135	135
Upstream Blk Time (%)	10	11	9	6	4
Queuing Penalty (veh)	13	87	71	47	29
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 6: SB Woodward Avenue & Site Driveway

Movement	SB	SB	SB	SB
Directions Served	T	T	T	TR
Maximum Queue (ft)	139	129	120	120
Average Queue (ft)	83	75	59	35
95th Queue (ft)	154	154	147	116
Link Distance (ft)	35	35	35	35
Upstream Blk Time (%)	19	17	14	8
Queuing Penalty (veh)	152	139	114	67
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 8: Site Driveway & Hamilton Row

Movement	EB	WB
Directions Served	TR	LT
Maximum Queue (ft)	36	14
Average Queue (ft)	4	1
95th Queue (ft)	22	9
Link Distance (ft)	2	58
Upstream Blk Time (%)	2	0
Queuing Penalty (veh)	2	0
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 9: SB Woodward Avenue & NB to SB Cross-over

Movement	WB	SB	SB	SB	SB
Directions Served	L	T	T	T	T
Maximum Queue (ft)	63	278	286	272	276
Average Queue (ft)	47	259	254	204	182
95th Queue (ft)	70	272	291	303	306
Link Distance (ft)	4	244	244	244	244
Upstream Blk Time (%)	45	30	18	9	10
Queuing Penalty (veh)	77	0	0	0	0
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Zone Summary

Zone wide Queuing Penalty: 1855

Intersection: 1: NB Woodward Avenue & Maple Road

Movement	EB	WB	WB	NB	NB	NB	NB
Directions Served	T	T	TR	T	T	T	TR
Maximum Queue (ft)	29	568	563	581	498	374	296
Average Queue (ft)	3	540	540	366	324	208	157
95th Queue (ft)	16	553	550	498	451	308	257
Link Distance (ft)	14	523	523	616	616	616	616
Upstream Blk Time (%)	4	94	91	0			
Queuing Penalty (veh)	11	0	0	0			
Storage Bay Dist (ft)							
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 2: SB Woodward Avenue & Maple Road

Movement	EB	EB	WB	WB	SB	SB	SB	SB	SB
Directions Served	T	TR	T	T	T	T	T	T	R
Maximum Queue (ft)	142	190	29	20	226	226	225	225	126
Average Queue (ft)	108	158	9	2	226	225	225	220	38
95th Queue (ft)	128	177	29	12	232	230	234	248	93
Link Distance (ft)	96	96	14	14	147	147	147	147	147
Upstream Blk Time (%)	38	55	14	3	22	23	26	27	0
Queuing Penalty (veh)	156	226	43	9	181	189	212	215	3
Storage Bay Dist (ft)									
Storage Blk Time (%)									
Queuing Penalty (veh)									

Intersection: 3: Peabody Street/Park Street & Maple Road

Movement	EB	EB	WB	WB	WB	NB
Directions Served	T	R	L	TR	R	R
Maximum Queue (ft)	517	52	95	146	58	248
Average Queue (ft)	412	20	50	57	4	220
95th Queue (ft)	615	51	89	142	37	235
Link Distance (ft)	478			96	96	203
Upstream Blk Time (%)	33		1	7	1	100
Queuing Penalty (veh)	0		0	26	2	0
Storage Bay Dist (ft)		25	75			
Storage Blk Time (%)	51	0	6	8		
Queuing Penalty (veh)	16	3	41	6		

Intersection: 4: Park Street & Hamilton Row

Movement	EB	WB	NB	SB
Directions Served	LT	TR	TR	LTR
Maximum Queue (ft)	119	33	61	299
Average Queue (ft)	49	15	16	210
95th Queue (ft)	104	32	48	385
Link Distance (ft)	285	2	82	294
Upstream Blk Time (%)		2	0	38
Queuing Penalty (veh)		1	0	0
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 5: SB Woodward Avenue & Hamilton Row

Movement	EB	SB	SB	SB	SB
Directions Served	R	T	T	T	TR
Maximum Queue (ft)	113	202	201	201	201
Average Queue (ft)	86	148	161	165	157
95th Queue (ft)	103	276	270	267	272
Link Distance (ft)	58	135	135	135	135
Upstream Blk Time (%)	78	14	17	18	17
Queuing Penalty (veh)	189	138	160	169	160
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 6: SB Woodward Avenue & Site Driveway

Movement	EB	SB	SB	SB	SB
Directions Served	R	T	T	T	TR
Maximum Queue (ft)	32	118	117	116	116
Average Queue (ft)	9	108	113	112	105
95th Queue (ft)	32	151	142	141	155
Link Distance (ft)	34	35	35	35	35
Upstream Blk Time (%)	2	20	22	24	21
Queuing Penalty (veh)	0	202	220	239	217
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 8: Site Driveway & Hamilton Row

Movement	EB	WB	NB
Directions Served	TR	LT	LR
Maximum Queue (ft)	53	15	28
Average Queue (ft)	37	1	5
95th Queue (ft)	59	8	22
Link Distance (ft)	2	58	39
Upstream Blk Time (%)	60		0
Queuing Penalty (veh)	146		0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 9: SB Woodward Avenue & NB to SB Cross-over

Movement	WB	SB	SB	SB	SB
Directions Served	L	T	T	T	T
Maximum Queue (ft)	65	259	259	259	259
Average Queue (ft)	47	259	258	258	252
95th Queue (ft)	73	264	267	269	300
Link Distance (ft)	4	244	244	244	244
Upstream Blk Time (%)	46	43	41	36	40
Queuing Penalty (veh)	81	0	0	0	0
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Zone Summary

Zone wide Queuing Penalty: 3262

Intersection: 1: NB Woodward Avenue & Maple Road

Movement	EB	EB	WB	WB	NB	NB	NB	NB
Directions Served	T	T	T	TR	T	T	T	TR
Maximum Queue (ft)	24	23	577	578	650	639	565	554
Average Queue (ft)	3	3	543	544	548	485	368	288
95th Queue (ft)	15	15	560	563	706	647	556	519
Link Distance (ft)	15	15	523	523	616	616	616	616
Upstream Blk Time (%)	3	3	96	89	10	2	1	2
Queuing Penalty (veh)	9	10	0	0	0	0	0	0
Storage Bay Dist (ft)								
Storage Blk Time (%)								
Queuing Penalty (veh)								

Intersection: 2: SB Woodward Avenue & Maple Road

Movement	EB	EB	WB	WB	SB	SB	SB	SB	SB
Directions Served	T	TR	T	T	T	T	T	T	R
Maximum Queue (ft)	164	173	68	24	245	230	236	234	94
Average Queue (ft)	127	153	18	5	218	216	201	165	40
95th Queue (ft)	147	178	45	19	236	242	247	219	78
Link Distance (ft)	110	110	15	15	159	159	159	159	159
Upstream Blk Time (%)	38	45	21	7	13	12	9	3	
Queuing Penalty (veh)	147	172	77	26	94	87	61	24	
Storage Bay Dist (ft)									
Storage Blk Time (%)									
Queuing Penalty (veh)									

Intersection: 3: Peabody Street/Park Street & Maple Road

Movement	EB	WB	WB	WB	NB	SB
Directions Served	TR	L	T	R	R	R
Maximum Queue (ft)	528	124	127	112	216	35
Average Queue (ft)	422	72	66	19	118	2
95th Queue (ft)	625	123	118	64	244	16
Link Distance (ft)	500	110	110	110	206	93
Upstream Blk Time (%)	31	4	1	0	25	
Queuing Penalty (veh)	0	13	5	1	0	
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 4: Park Street & Hamilton Row

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	39	61	26	22
Average Queue (ft)	17	27	2	2
95th Queue (ft)	33	49	12	13
Link Distance (ft)	285	15	94	294
Upstream Blk Time (%)		11		
Queuing Penalty (veh)		15		
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 5: SB Woodward Avenue & Hamilton Row

Movement	EB	SB	SB	SB	SB
Directions Served	R	T	T	T	TR
Maximum Queue (ft)	88	149	98	56	24
Average Queue (ft)	45	13	8	2	1
95th Queue (ft)	82	74	47	25	14
Link Distance (ft)	59	135	135	135	135
Upstream Blk Time (%)	7	0	0		
Queuing Penalty (veh)	9	1	0		
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 6: SB Woodward Avenue & Site Driveway

Movement	SB	SB	SB	SB
Directions Served	T	T	T	TR
Maximum Queue (ft)	118	119	100	82
Average Queue (ft)	59	48	21	4
95th Queue (ft)	125	116	74	31
Link Distance (ft)	28	28	28	28
Upstream Blk Time (%)	7	5	2	0
Queuing Penalty (veh)	60	48	17	3
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 8: Site Driveway & Hamilton Row

Movement	EB
Directions Served	TR
Maximum Queue (ft)	31
Average Queue (ft)	2
95th Queue (ft)	14
Link Distance (ft)	15
Upstream Blk Time (%)	1
Queuing Penalty (veh)	1
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 9: SB Woodward Avenue & NB to SB Cross-over

Movement	WB	SB	SB	SB	SB
Directions Served	L	T	T	T	T
Maximum Queue (ft)	64	280	276	268	271
Average Queue (ft)	47	260	253	196	181
95th Queue (ft)	73	271	287	296	303
Link Distance (ft)	4	244	244	244	244
Upstream Blk Time (%)	43	25	14	4	5
Queuing Penalty (veh)	76	0	0	0	0
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Zone Summary

Zone wide Queuing Penalty: 956

Intersection: 1: NB Woodward Avenue & Maple Road

Movement	EB	WB	WB	NB	NB	NB	NB
Directions Served	T	T	TR	T	T	T	TR
Maximum Queue (ft)	15	573	567	593	508	400	313
Average Queue (ft)	1	539	538	425	362	245	176
95th Queue (ft)	11	571	571	590	492	361	274
Link Distance (ft)	15	523	523	616	616	616	616
Upstream Blk Time (%)	2	93	88	1			
Queuing Penalty (veh)	7	0	0	0			
Storage Bay Dist (ft)							
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 2: SB Woodward Avenue & Maple Road

Movement	EB	EB	WB	WB	SB	SB	SB	SB	SB
Directions Served	T	TR	T	T	T	T	T	T	R
Maximum Queue (ft)	145	184	26	24	218	222	227	232	127
Average Queue (ft)	116	157	5	3	217	222	226	226	32
95th Queue (ft)	135	170	21	14	224	225	240	253	81
Link Distance (ft)	106	106	15	15	162	162	162	162	162
Upstream Blk Time (%)	37	52	7	4	17	18	21	20	
Queuing Penalty (veh)	165	231	22	14	146	155	174	167	
Storage Bay Dist (ft)									
Storage Blk Time (%)									
Queuing Penalty (veh)									

Intersection: 3: Peabody Street/Park Street & Maple Road

Movement	EB	WB	WB	WB	NB	SB
Directions Served	TR	L	T	R	R	R
Maximum Queue (ft)	558	105	119	102	255	60
Average Queue (ft)	490	51	59	10	223	16
95th Queue (ft)	618	96	108	47	243	41
Link Distance (ft)	500	106	106	106	206	93
Upstream Blk Time (%)	54	1	1	0	97	
Queuing Penalty (veh)	0	2	3	0	0	
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 4: Park Street & Hamilton Row

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	111	31	54	120
Average Queue (ft)	38	14	9	43
95th Queue (ft)	79	30	37	108
Link Distance (ft)	285	15	94	294
Upstream Blk Time (%)		4		
Queuing Penalty (veh)		2		
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 5: SB Woodward Avenue & Hamilton Row

Movement	EB	SB	SB	SB	SB
Directions Served	R	T	T	T	TR
Maximum Queue (ft)	116	202	201	201	200
Average Queue (ft)	87	109	131	145	126
95th Queue (ft)	107	233	235	246	245
Link Distance (ft)	59	135	135	135	135
Upstream Blk Time (%)	56	6	7	9	7
Queuing Penalty (veh)	143	56	74	90	71
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 6: SB Woodward Avenue & Site Driveway

Movement	EB	SB	SB	SB	SB
Directions Served	R	T	T	T	TR
Maximum Queue (ft)	36	119	114	110	105
Average Queue (ft)	9	108	108	104	86
95th Queue (ft)	31	151	141	140	144
Link Distance (ft)	29	23	23	23	23
Upstream Blk Time (%)	1	14	15	17	13
Queuing Penalty (veh)	0	150	161	178	138
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 8: Site Driveway & Hamilton Row

Movement	EB	WB	NB
Directions Served	TR	LT	LR
Maximum Queue (ft)	45	7	28
Average Queue (ft)	25	0	7
95th Queue (ft)	46	5	26
Link Distance (ft)	15	59	39
Upstream Blk Time (%)	29		0
Queuing Penalty (veh)	75		0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 9: SB Woodward Avenue & NB to SB Cross-over

Movement	WB	SB	SB	SB	SB
Directions Served	L	T	T	T	T
Maximum Queue (ft)	71	259	259	259	259
Average Queue (ft)	49	259	259	259	256
95th Queue (ft)	75	260	259	262	291
Link Distance (ft)	4	244	244	244	244
Upstream Blk Time (%)	45	48	48	47	51
Queuing Penalty (veh)	85	0	0	0	0
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Zone Summary

Zone wide Queuing Penalty: 2310

Intersection: 1: NB Woodward Avenue & Maple Road

Movement	EB	EB	WB	WB	NB	NB	NB	NB
Directions Served	T	T	T	TR	T	T	T	TR
Maximum Queue (ft)	23	27	586	580	643	655	597	586
Average Queue (ft)	3	2	546	542	590	525	404	337
95th Queue (ft)	15	11	565	560	699	666	605	584
Link Distance (ft)	15	15	523	523	616	616	616	616
Upstream Blk Time (%)	3	2	95	88	15	5	2	3
Queuing Penalty (veh)	9	6	0	0	0	0	0	0
Storage Bay Dist (ft)								
Storage Blk Time (%)								
Queuing Penalty (veh)								

Intersection: 2: SB Woodward Avenue & Maple Road

Movement	EB	EB	WB	WB	SB	SB	SB	SB	SB
Directions Served	T	TR	T	T	T	T	T	T	R
Maximum Queue (ft)	162	162	74	24	326	325	313	307	173
Average Queue (ft)	124	153	13	4	250	248	228	212	45
95th Queue (ft)	157	182	40	19	318	318	300	309	110
Link Distance (ft)	113	113	15	15	245	245	245	245	245
Upstream Blk Time (%)	27	39	14	7	5	4	2	2	0
Queuing Penalty (veh)	105	153	56	25	33	28	14	15	0
Storage Bay Dist (ft)									
Storage Blk Time (%)									
Queuing Penalty (veh)									

Intersection: 3: Peabody Street/Park Street & Maple Road

Movement	EB	WB	WB	WB	NB	SB
Directions Served	TR	L	T	R	R	R
Maximum Queue (ft)	529	135	133	90	221	23
Average Queue (ft)	316	76	66	13	105	6
95th Queue (ft)	567	131	118	49	219	21
Link Distance (ft)	500	113	113	113	206	93
Upstream Blk Time (%)	11	5	2	0	6	
Queuing Penalty (veh)	0	17	6	0	0	
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 4: Park Street & Hamilton Row

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	43	64	27	27
Average Queue (ft)	19	29	2	3
95th Queue (ft)	33	51	12	17
Link Distance (ft)	285	15	94	294
Upstream Blk Time (%)		13		
Queuing Penalty (veh)		24		
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 5: SB Woodward Avenue & Hamilton Row

Movement	EB	SB	SB	SB	SB
Directions Served	R	T	T	T	TR
Maximum Queue (ft)	71	114	81	49	100
Average Queue (ft)	39	8	0	2	8
95th Queue (ft)	61	67	6	23	58
Link Distance (ft)	60	135	135	135	135
Upstream Blk Time (%)	1	0			0
Queuing Penalty (veh)	2	1			2
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 7: Park Street & Site Driveway

Movement	WB	NB	SB
Directions Served	LR	TR	LT
Maximum Queue (ft)	29	15	16
Average Queue (ft)	12	1	1
95th Queue (ft)	35	7	10
Link Distance (ft)	52	93	94
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 8: Site Driveway & Hamilton Row

Movement	WB
Directions Served	LT
Maximum Queue (ft)	40
Average Queue (ft)	2
95th Queue (ft)	22
Link Distance (ft)	60
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 9: SB Woodward Avenue & NB to SB Cross-over

Movement	WB	SB	SB	SB	SB
Directions Served	L	T	T	T	T
Maximum Queue (ft)	60	290	274	266	267
Average Queue (ft)	49	261	254	202	202
95th Queue (ft)	69	273	283	297	310
Link Distance (ft)	4	244	244	244	244
Upstream Blk Time (%)	44	26	15	5	6
Queuing Penalty (veh)	86	0	0	0	0
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Zone Summary

Zone wide Queuing Penalty: 622

Intersection: 1: NB Woodward Avenue & Maple Road

Movement	EB	WB	WB	NB	NB	NB	NB
Directions Served	T	T	TR	T	T	T	TR
Maximum Queue (ft)	29	568	568	628	548	418	381
Average Queue (ft)	3	539	538	451	397	257	204
95th Queue (ft)	19	556	555	602	532	383	324
Link Distance (ft)	15	523	523	616	616	616	616
Upstream Blk Time (%)	4	95	91	0	0		
Queuing Penalty (veh)	15	0	0	0	0		
Storage Bay Dist (ft)							
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 2: SB Woodward Avenue & Maple Road

Movement	EB	EB	WB	WB	SB	SB	SB	SB	SB
Directions Served	T	TR	T	T	T	T	T	T	R
Maximum Queue (ft)	156	186	20	25	326	325	324	323	310
Average Queue (ft)	127	164	3	2	324	323	320	317	153
95th Queue (ft)	149	176	15	13	347	340	348	345	359
Link Distance (ft)	113	113	15	15	245	245	245	245	245
Upstream Blk Time (%)	32	51	5	3	22	22	22	29	6
Queuing Penalty (veh)	144	228	17	10	189	195	192	249	49
Storage Bay Dist (ft)									
Storage Blk Time (%)									
Queuing Penalty (veh)									

Intersection: 3: Peabody Street/Park Street & Maple Road

Movement	EB	WB	WB	WB	NB	SB
Directions Served	TR	L	T	R	R	R
Maximum Queue (ft)	557	98	110	80	252	78
Average Queue (ft)	506	45	52	10	224	27
95th Queue (ft)	610	95	94	42	238	64
Link Distance (ft)	500	113	113	113	206	93
Upstream Blk Time (%)	62	1	1	0	99	0
Queuing Penalty (veh)	0	3	1	0	0	0
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 4: Park Street & Hamilton Row

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	70	58	32	70
Average Queue (ft)	30	25	4	19
95th Queue (ft)	54	47	19	52
Link Distance (ft)	285	15	94	294
Upstream Blk Time (%)		10		
Queuing Penalty (veh)		9		
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 5: SB Woodward Avenue & Hamilton Row

Movement	EB	SB	SB	SB	SB
Directions Served	R	T	T	T	TR
Maximum Queue (ft)	98	202	201	201	201
Average Queue (ft)	67	183	181	168	168
95th Queue (ft)	102	264	264	268	257
Link Distance (ft)	60	135	135	135	135
Upstream Blk Time (%)	11	19	19	17	17
Queuing Penalty (veh)	36	195	197	173	170
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 7: Park Street & Site Driveway

Movement	WB	NB	SB
Directions Served	LR	TR	LT
Maximum Queue (ft)	43	6	25
Average Queue (ft)	19	0	1
95th Queue (ft)	43	4	10
Link Distance (ft)	52	93	94
Upstream Blk Time (%)	0		
Queuing Penalty (veh)	0		
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 8: Site Driveway & Hamilton Row

Movement	EB
Directions Served	TR
Maximum Queue (ft)	38
Average Queue (ft)	7
95th Queue (ft)	29
Link Distance (ft)	15
Upstream Blk Time (%)	2
Queuing Penalty (veh)	5
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 9: SB Woodward Avenue & NB to SB Cross-over

Movement	WB	SB	SB	SB	SB
Directions Served	L	T	T	T	T
Maximum Queue (ft)	63	259	259	259	259
Average Queue (ft)	50	258	259	259	259
95th Queue (ft)	69	264	262	261	264
Link Distance (ft)	4	244	244	244	244
Upstream Blk Time (%)	51	46	44	42	57
Queuing Penalty (veh)	107	0	0	0	0
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Zone Summary

Zone wide Queuing Penalty: 2185

PROPOSED BUILDING FOR:

The Maple

PROJECT LOCATION:

35001 AND 35075 WOODWARD AVE.
BIRMINGHAM, MI 48009

ZONED: B-4 BUSINESS-RESIDENTIAL
OVERLAY ZONING DISTRICT: D-4

APPLICANT INFORMATION

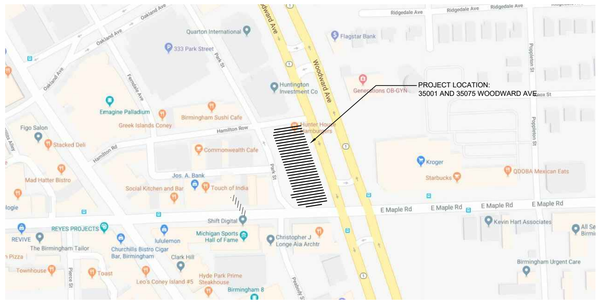
HESHAM GAYAR
8469 WARWICK GROVE COURT,
GRAND BLANC, MI 48439

T. 810.338.3923
E. HESHAM.GAYER@GMAIL.COM

FIRE SUPPRESSION NOTE:
THE BUILDING WILL BE PROVIDED WITH A FULLY AUTOMATIC FIRE PROTECTION SPRINKLER SYSTEM INSTALLED (FIRE SUPPRESSION SYSTEM) - WORK WILL BE DESIGNED TO MEET M.B.C. REQUIREMENTS AND CITY OF BIRMINGHAM INSPECTION & PERMIT APPROVAL. FACTORY MUTUAL STANDARDS AND SPECIFICATIONS SHALL ALSO BE USED WHERE NOT OTHERWISE IN CONFLICT WITH LOCAL STANDARDS. SPRINKLER CONTRACTOR SHALL BE FULLY LICENSED AND BE RESPONSIBLE FOR PREPARATION OF ENGINEERED DRAWINGS, SUBMISSION OF DRAWINGS TO ALL LOCAL AND STATE AGENCIES FOR APPROVAL AND FOR COORDINATION OF REQUIREMENTS WITH OWNERS AND TENANTS INSURANCE CARRIER.

NOTE:
FIRE PROTECTION SYSTEM FOR THE BUILDING EQUAL TO: GROUND FLOOR - ORDINARY HAZARD AND FLOORS 2-5 LITE HAZARD (OFFICE AND RESIDENTIAL)N.F.P.A. NO. 13 CRITERIA AND SECTION 903.3.1.1 WITH ONE (1) 4" D.I. BUILDING SERVICE PROVIDED. TYPE 2A FIRE EXTINGUISHERS SHALL BE PROVIDED AND SPACED A MAX. OF 75' APART PER SECTION 906.1 OF THE 2012 INTERNATIONAL FIRE CODE AND / OR BY THE DIRECTION OF THE FIRE MARSHAL.

SHEET INDEX:



NORTH

LOCATION MAP
SCALE: NOT TO SCALE

biddison
architecture + design

320 Martin Street Suite 10
Birmingham, Michigan 48009
t:248.554.9500
Contact Person: Kevin Biddison
e.mail: kb@biddison-ad.com

Consultants

Project data

GOVERNING CODES:	2015 MICHIGAN BUILDING CODE 2015 MICHIGAN PLUMBING CODE 2015 MICHIGAN MECHANICAL CODE 2015 MICHIGAN REHABILITATION CODE 2015 INTERNATIONAL FUEL GAS CODE MICHIGAN ELECTRICAL CODE, 2014 N.E.C. W/ PART 8 STATE AMENDMENTS ICC/ANSI A117.1-2015 AND MICHIGAN BARRIER FREE DESIGN LAW OF PUBLIC ACT 1 OF 1966 AS AMENDED. MICHIGAN UNIFORM ENERGY CODE RULES PART 10 WITH ANSI/ASHRAE/IESNA STANDARD 90.1-2015 2015 INTERNATIONAL FIRE CODE NFPA 13 - 2010 NFPA 72 - 2010
BUILDING AREA:	101,970 SQFT
PARKING AREA:	48,732 SQFT
TOTAL BUILDING & PARKING AREA:	150,702 SQFT
BUILDING USE:	A-2: RESTAURANT H: HOTEL B: BUSINESS OFFICE R-2: RESIDENTIAL APARTMENT

TYPE OF CONSTRUCTION:

2015 MBC: TYPE IIA (PROTECTED)
NFPA 220: TYPE II-000

Issued for

SITE PLAN REVIEW	03.29.18
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SITE PLAN REVISION	01.02.19
SITE PLAN REVISION	02.20.19
SITE PLAN REVIEW	05.13.19

STATE OF MICHIGAN
KEVIN L. BIDDISON
ARCHITECT
LICENSED ARCHITECT

Project no.

THE MAPLE 1971.16

Sheet no.

T.101

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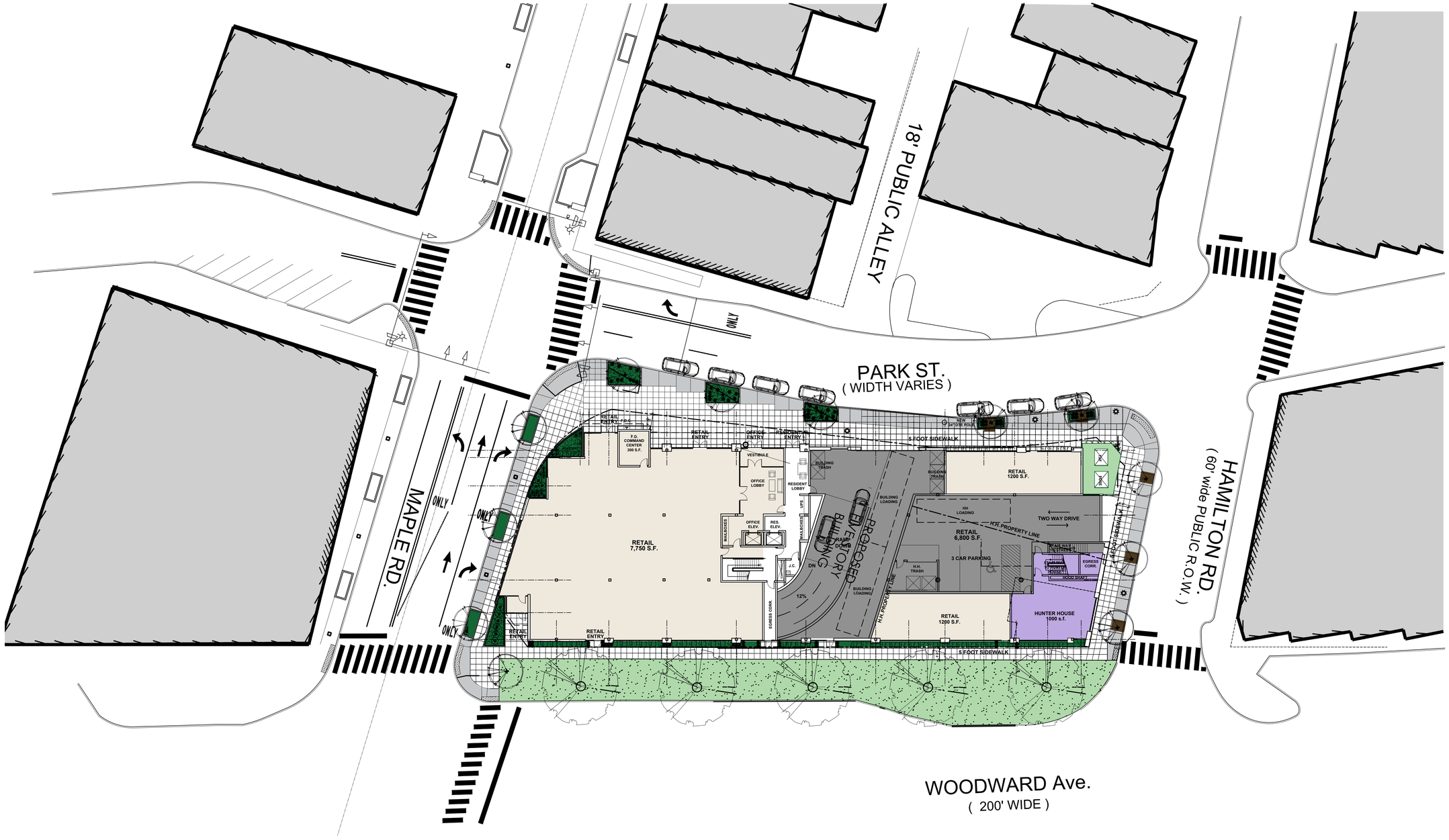
Birmingham, MI 48009
t:248.554.9500

Consultants



NORTH

ARCHITECTURAL SITE PLAN

SCALE: 1"=20'-0"

Project title

PROPOSED BUILDING FOR:

The Maple

35001 and 35075 Woodward Ave.
Birmingham, Michigan

Issued dr/ch

SITE PLAN REVISION	02.20.19
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Sheet title

ARCHITECTURAL SITE PLAN

STATE OF MICHIGAN
KEVIN L. BIDDISON
ARCHITECT
LICENSED ARCHITECT

Project no.

1971.16

Sheet no.

SP.101

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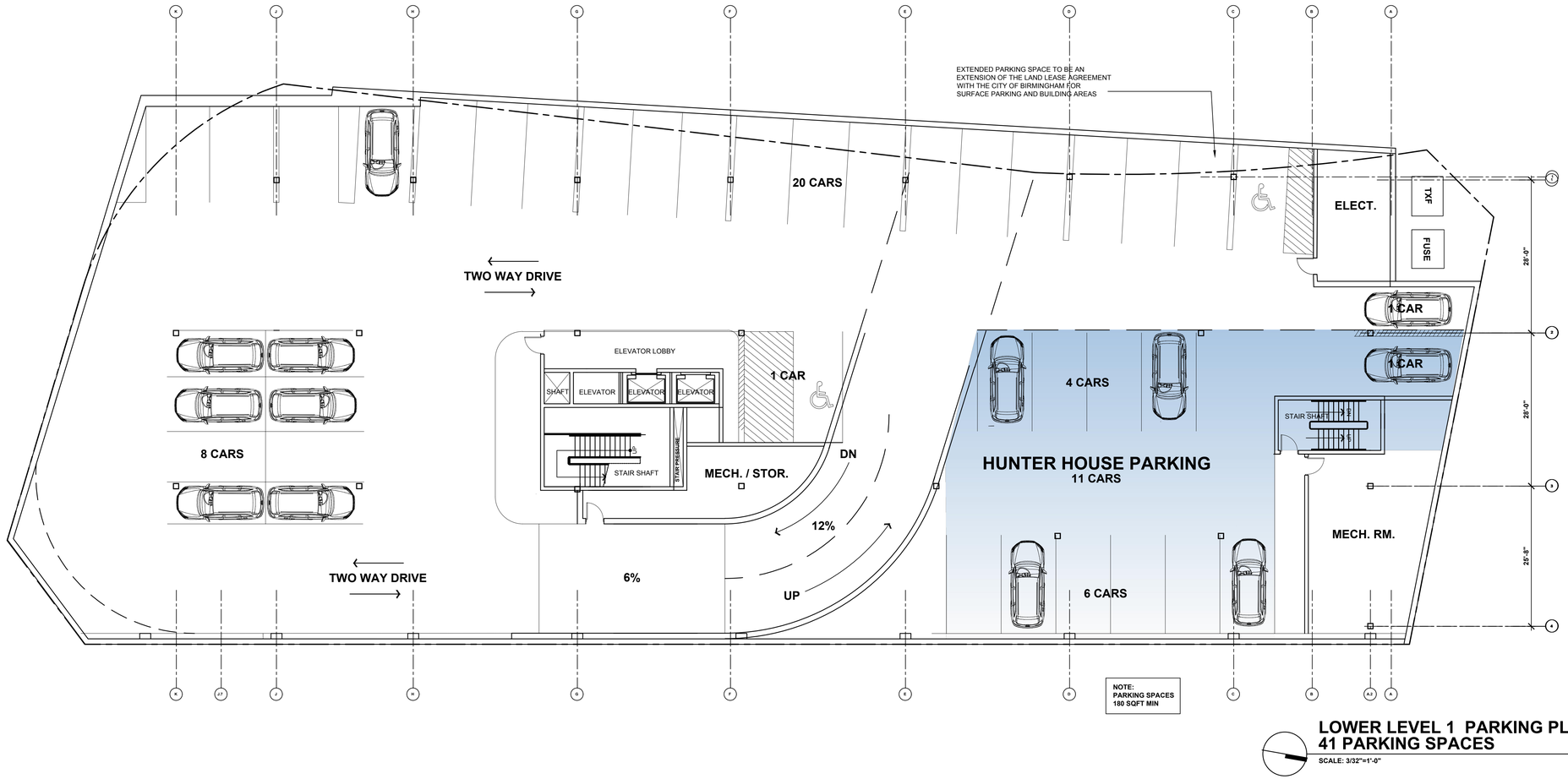
Consultants



LOWER LEVEL 1 PARKING PLAN
41 PARKING SPACES

SCALE: 3/32"=1'-0"

NORTH

Project title

PROPOSED BUILDING FOR:

The Maple

35001 and 35075 Woodward Ave.
Birmingham, Michigan

Issued dr/ch

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LOWER LEVEL1
PARKING PLAN

STATE OF MICHIGAN
KEVIN L. BIDDISON
ARCHITECT
LICENSED ARCHITECT

Project no.

1971.16

Sheet no.

LL.100

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architecture + design

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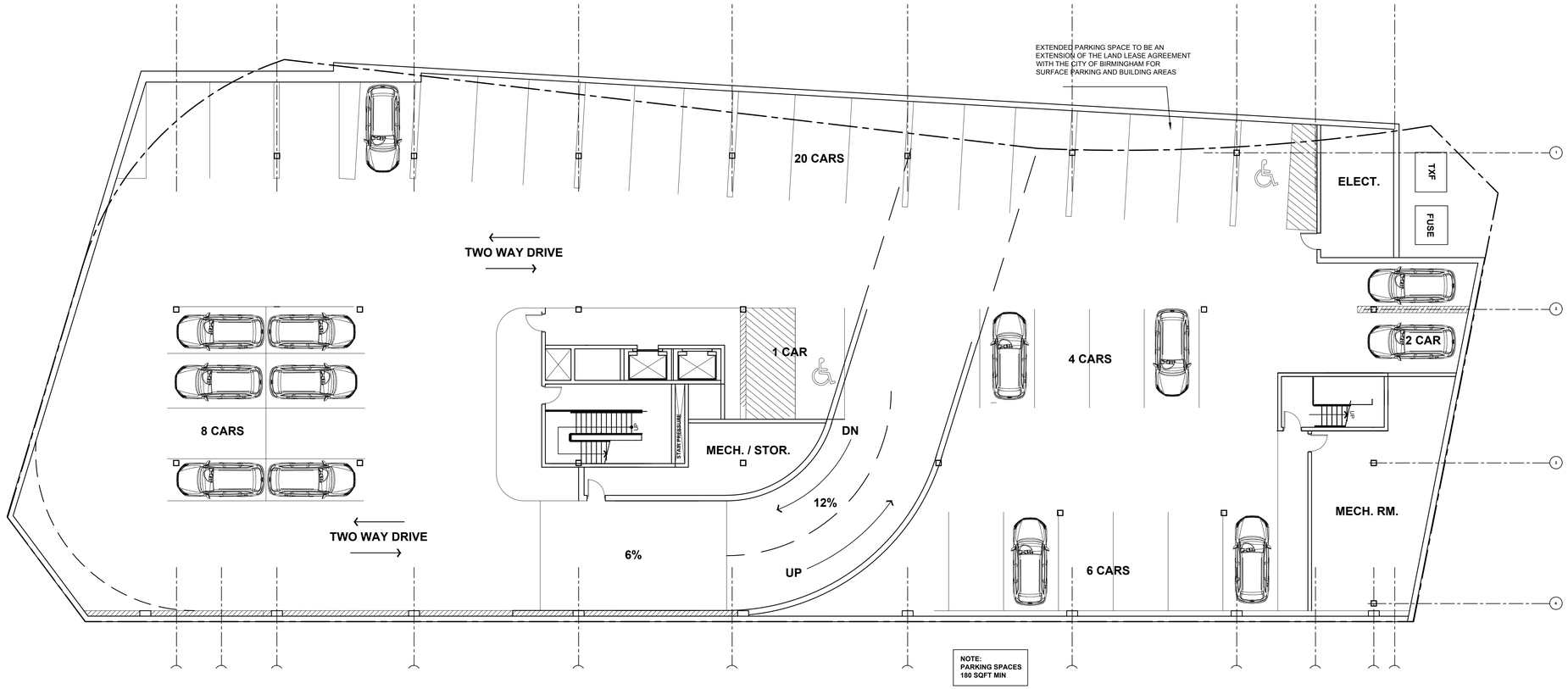
Consultants



LOWER LEVEL 2 PARKING PLAN
41 PARKING SPACES

SCALE: 3/32"=1'-0"

Project title

PROPOSED BUILDING FOR:

The Maple

35001 and 35075 Woodward Ave.
Birmingham, Michigan

Issued dr/ch

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LOWER LEVEL 2
PARKING PLAN

STATE OF MICHIGAN
KEVIN L. BIDDISON
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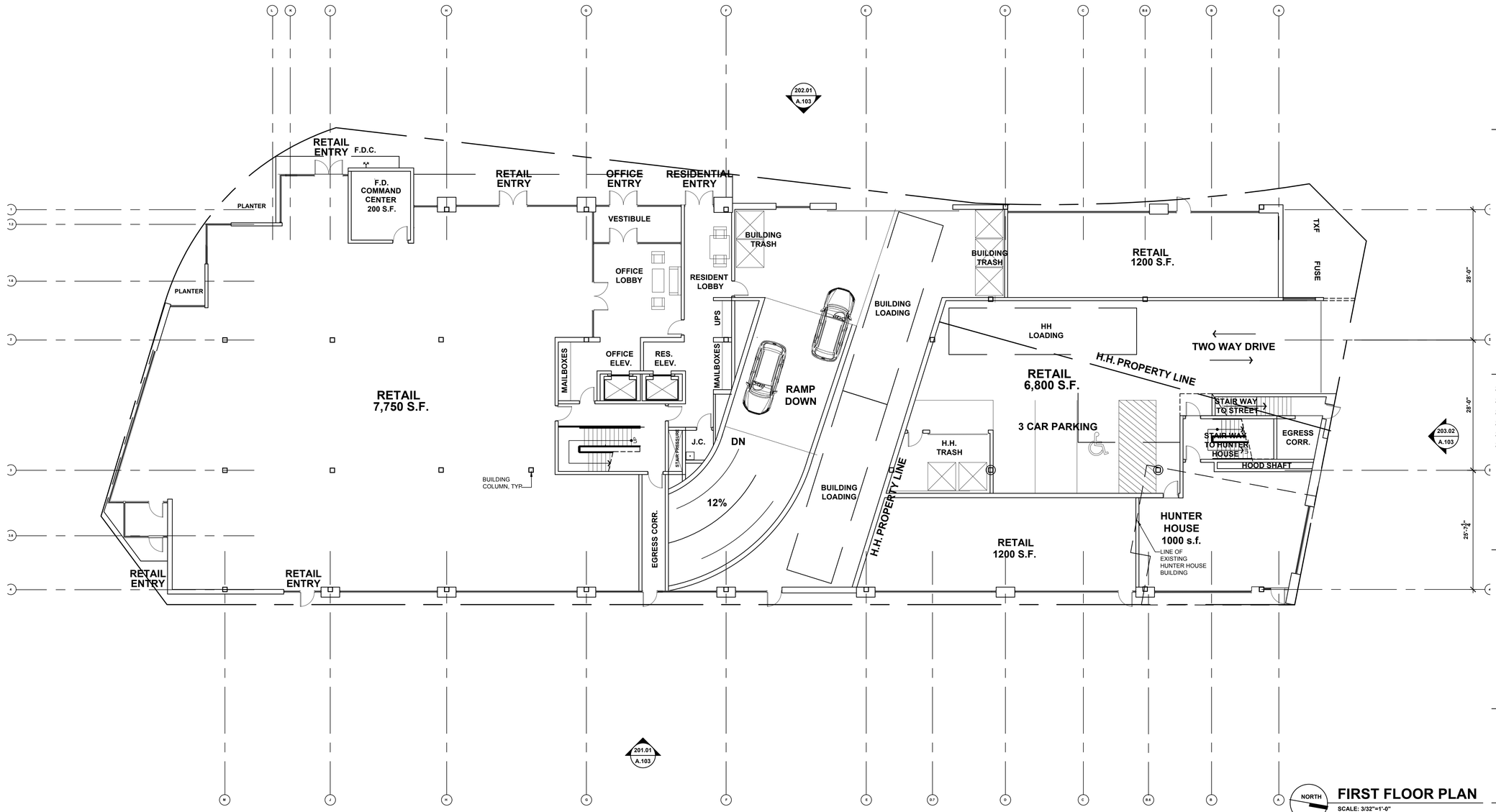

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PROPOSED BUILDING FOR:

The Maple

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Birmingham, Michigan

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FIRST FLOOR PLAN

STATE OF MICHIGAN
KEVIN L. BIDDISON
ARCHITECT
LICENSED ARCHITECT

Project no.

1971.16

NORTH

FIRST FLOOR PLAN

SCALE: 3/32"=1'-0"

Sheet no.

A.101

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t:248.554.9500

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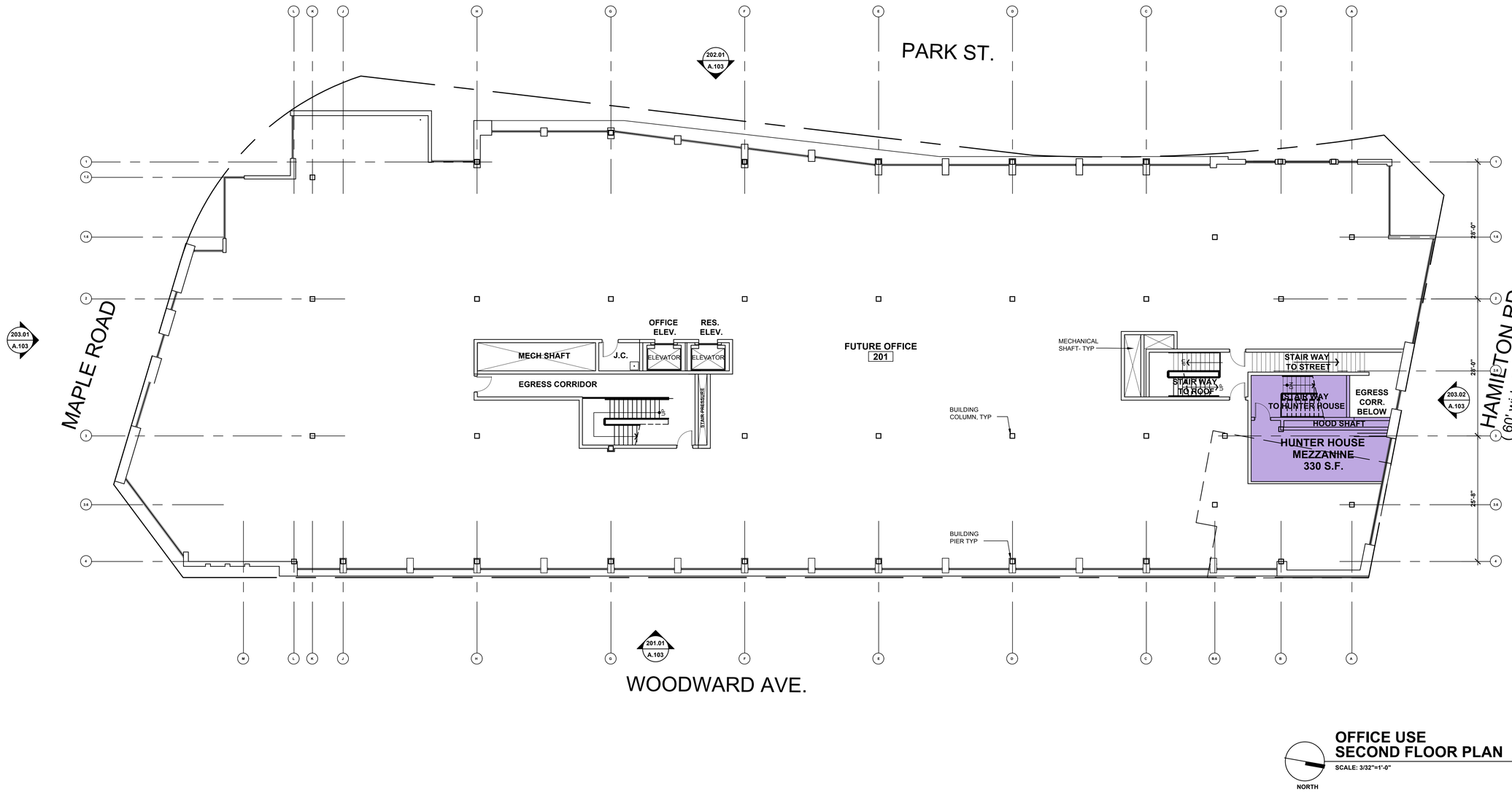

Project title

PROPOSED BUILDING FOR:

The Maple

35001 and 35075 Woodward Ave.
Birmingham, Michigan

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SECOND
FLOOR PLAN

STATE OF MICHIGAN
KEVIN L BIDDISON
ARCHITECT
No. 1301
REGISTERED ARCHITECT

Project no.

1971.16

OFFICE USE
SECOND FLOOR PLAN

SCALE: 3/32"=1'-0"

NORTH

Sheet no.

A.102

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Consultants

RESIDENTIAL USE
THIRD FLOOR PLAN

SCALE: 3/32"=1'-0"

NORTH

Project title

PROPOSED BUILDING FOR:

The Maple

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THIRD
FLOOR PLAN

STATE OF MICHIGAN
KEVIN L. BIDDISON
ARCHITECT
LICENSED ARCHITECT

Project no.

1971.16

Sheet no.

A.103

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Consultants

RESIDENTIAL USE
FOURTH FLOOR PLAN

SCALE: 3/32"=1'-0"

NORTH

Project title

PROPOSED BUILDING FOR:

The Maple

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Birmingham, Michigan

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FOURTH
FLOOR PLAN

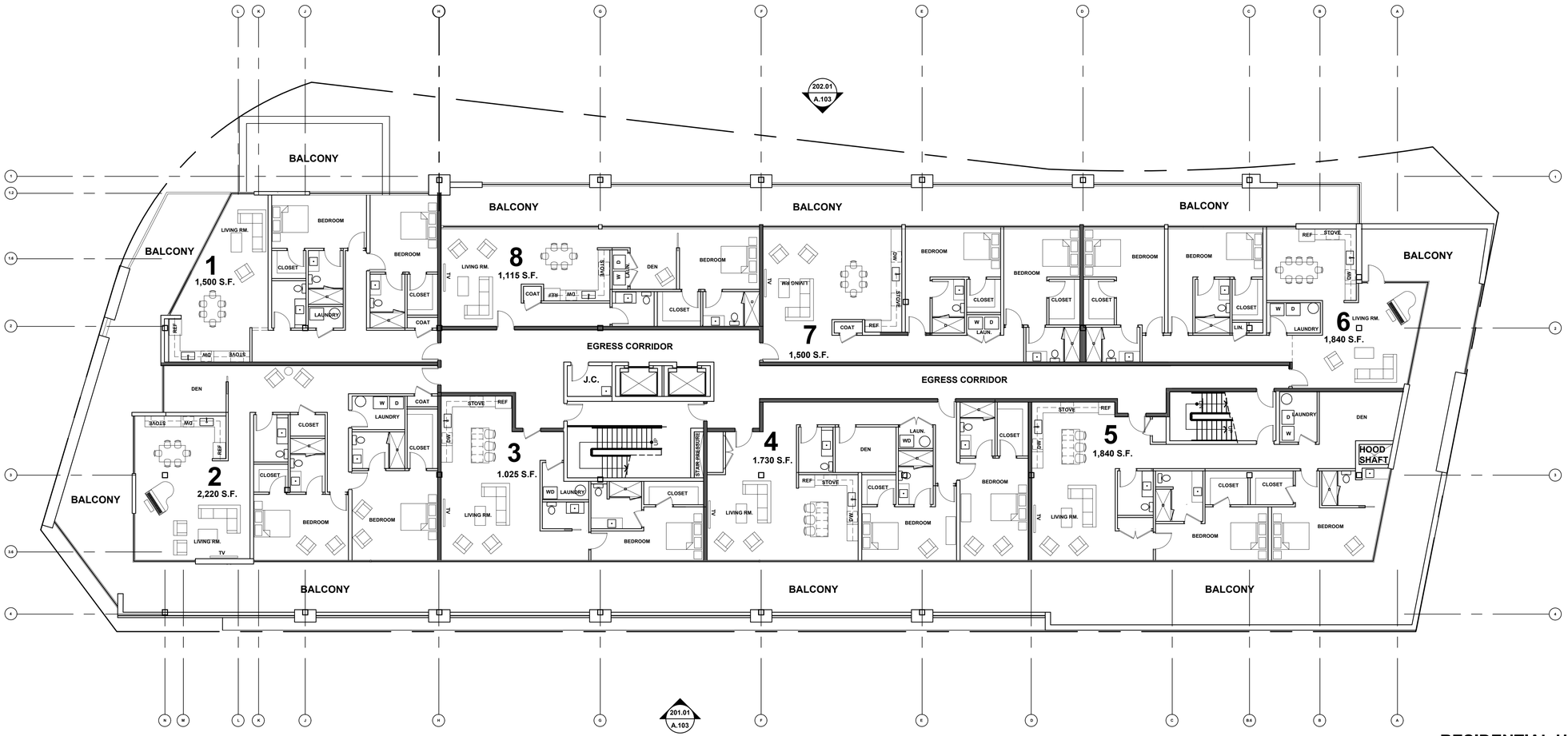
STATE OF MICHIGAN
KEVIN L
BIDDISON
ARCHITECT
No.
REGISTERED ARCHITECT

Project no.

1971.16

Sheet no.

A.104



RESIDENTIAL USE
FIFTH FLOOR PLAN

SCALE: 3/32"=1'-0"

NORTH

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Project title

PROPOSED BUILDING FOR:

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FIFTH
FLOOR PLAN

STATE OF MICHIGAN
KEVIN L. BIDDISON
ARCHITECT
REGISTERED ARCHITECT

Project no.

1971.16

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A.105

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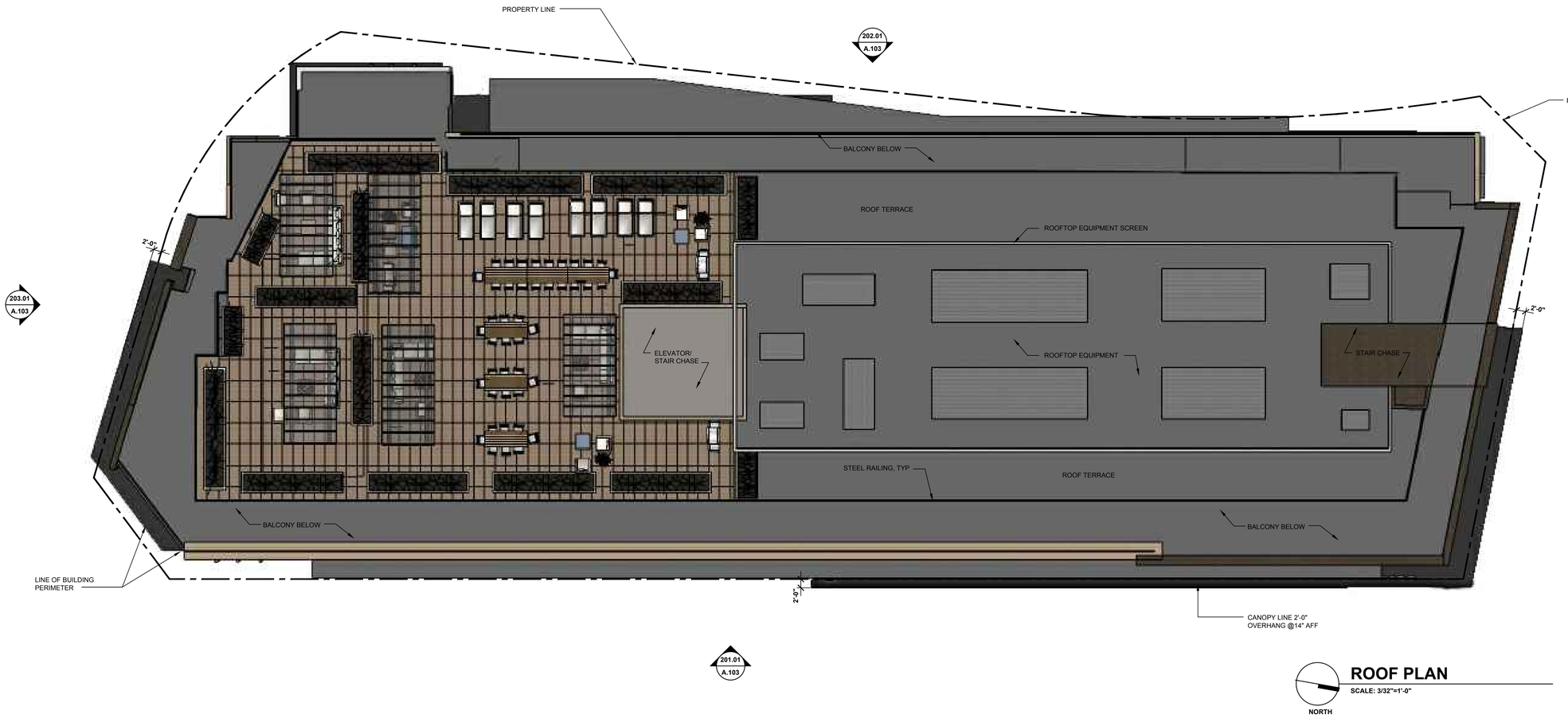

ROOF PLAN

SCALE: 3/32"=1'-0"

NORTH

Project title

PROPOSED BUILDING FOR:

The Maple

35001 and 35075 Woodward Ave.
Birmingham, Michigan

Issued dr/ch

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ROOF PLAN

STATE OF MICHIGAN
KEVIN L. BIDDISON
ARCHITECT
LICENSED ARCHITECT

Project no.

1971.16

Sheet no.

A.106

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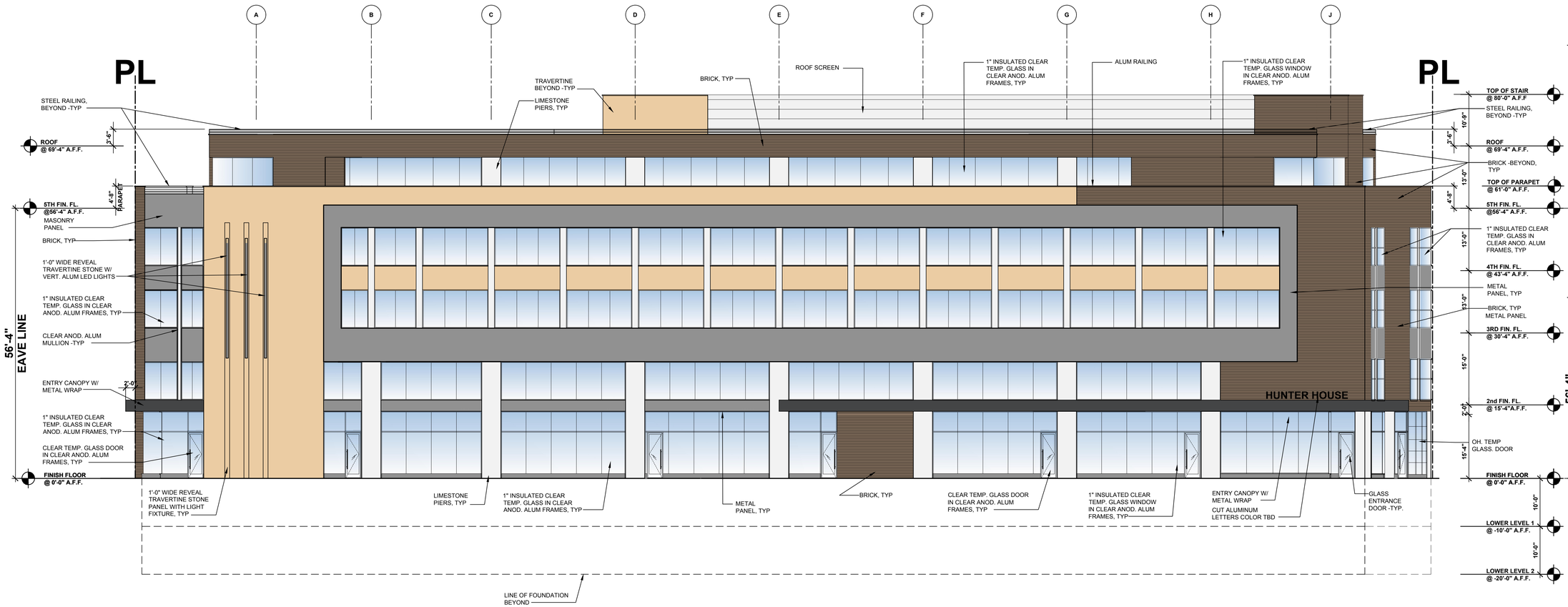
Consultants



ELEVATION	MATERIAL AREA (SQ. FT.)	
	SOLID	GLASS
EAST (1'-0" TO 8'-0")	565	1,325
% OF TOTAL	29.9%	70.1%
REQUIRED %	30% MAX	70% MIN

ELEVATION	MATERIAL AREA (SQ. FT.)	
	SOLID	GLASS
EAST (2ND FLOOR TO ROOF)	10,672	5,588
% OF TOTAL	65.6%	34.4%
REQUIRED %	65% MIN	35% MAX

201.01
A.103

EAST ELEVATION

SCALE: 3/32"=1'-0"

Project title

PROPOSED BUILDING FOR:

The Maple

35001 and 35075 Woodward Ave.
Birmingham, Michigan

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ELEVATIONS

STATE OF MICHIGAN
KEVIN L. BIDDISON
ARCHITECT
LICENSED ARCHITECT

Project no.

1971.16

Sheet no.

A.201

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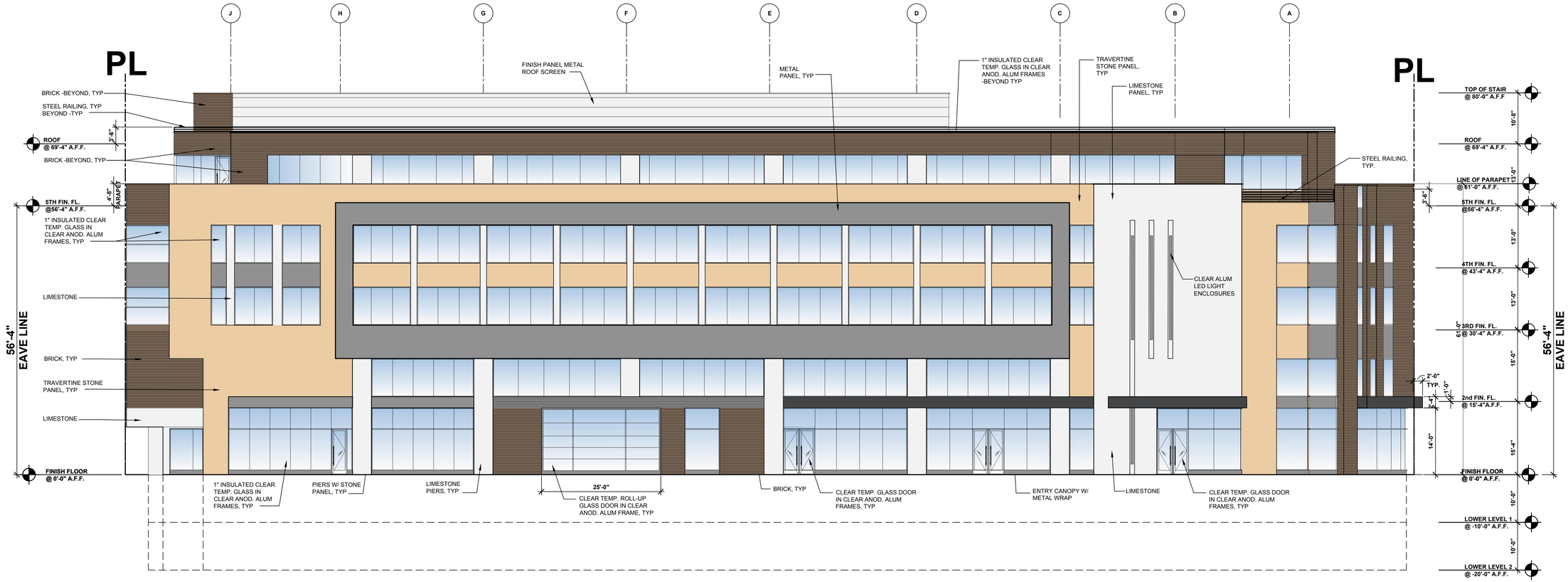

ELEVATION	MATERIAL AREA (SQ. FT.)	
	SOLID	GLASS
EAST (1'-0" TO 8'-0")	525	1,318
% OF TOTAL	29.6%	70.4%
REQUIRED %	30% MAX	70% MIN

ELEVATION	MATERIAL AREA (SQ. FT.)	
	SOLID	GLASS
EAST (2ND FLOOR TO ROOF)	10,629	5,418
% OF TOTAL	66.3%	33.7%
REQUIRED %	65% MIN	35% MAX

202.01
A.102

WEST ELEVATION

SCALE: 3/32"=1'-0"

Project title

PROPOSED BUILDING FOR:

The Maple

35001 and 35075 Woodward Ave.
Birmingham, Michigan

Issued dr/ch

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Sheet title

ELEVATIONS

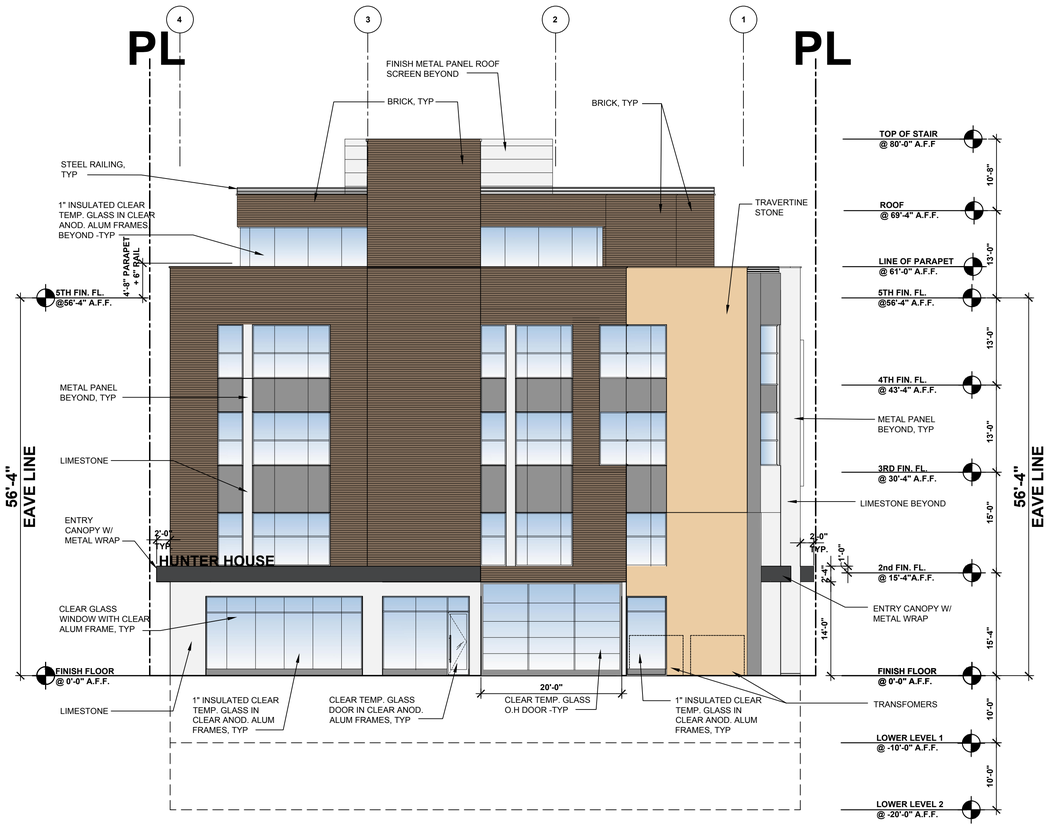
STATE OF MICHIGAN
KEVIN L. BIDDISON
ARCHITECT
LICENSED ARCHITECT

Project no.

1971.16

Sheet no.

A.202

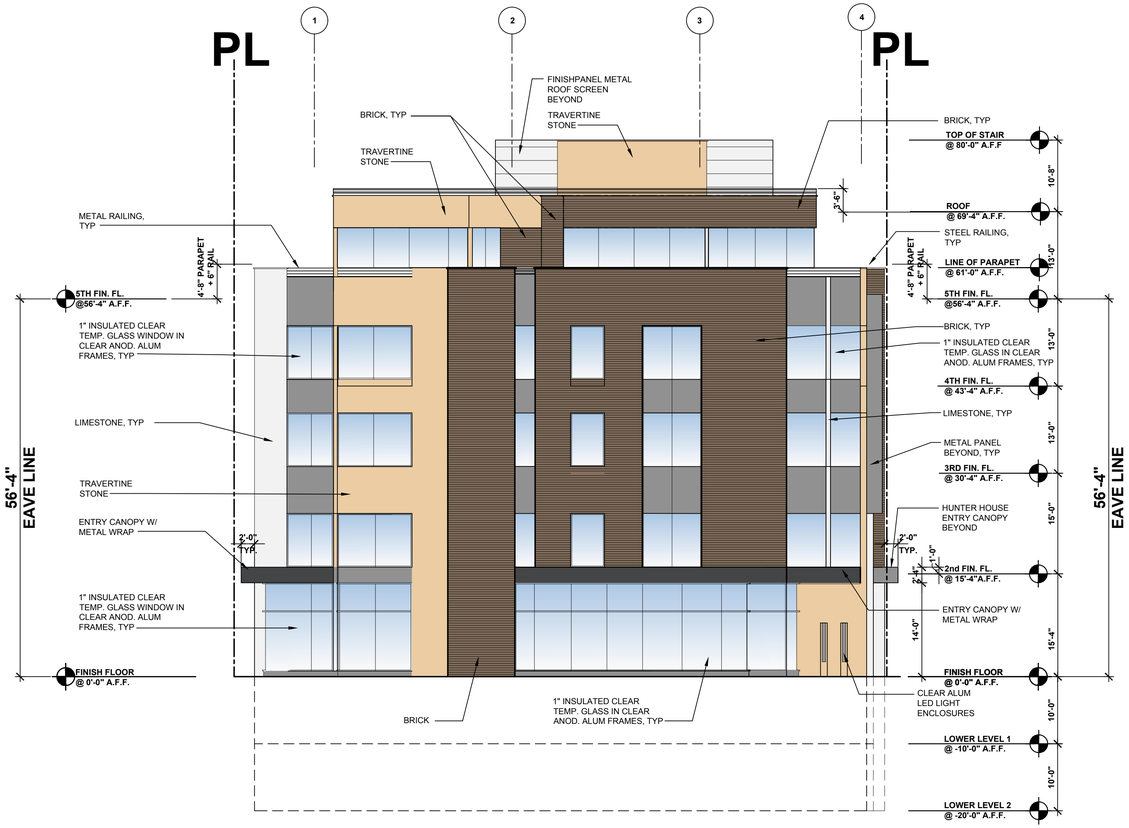


ELEVATION	MATERIAL AREA (SQ. FT.)	
	SOLID	GLASS
EAST (1'-0" TO 8'-0")	187	471
% OF TOTAL	28.4%	71.6%
REQUIRED %	30% MAX	70% MIN

ELEVATION	MATERIAL AREA (SQ. FT.)	
	SOLID	GLASS
EAST (2ND FLOOR TO ROOF)	3,600	1,600
% OF TOTAL	69.4%	30.6%
REQUIRED %	65% MIN	35% MAX

203.02 / A.103 NORTH ELEVATION

SCALE: 3/32"=1'-0"



ELEVATION	MATERIAL AREA (SQ. FT.)	
	SOLID	GLASS
EAST (1'-0" TO 8'-0")	190	468
% OF TOTAL	28.9%	71.1%
REQUIRED %	30% MAX	70% MIN

ELEVATION	MATERIAL AREA (SQ. FT.)	
	SOLID	GLASS
EAST (2ND FLOOR TO ROOF)	3,394	2,059
% OF TOTAL	64%	36%
REQUIRED %	65% MIN	35% MAX

203.01 / A.103 SOUTH ELEVATION

SCALE: 3/32"=1'-0"

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Project title

PROPOSED BUILDING FOR:

The Maple

35001 and 35075 Woodward Ave.
Birmingham, Michigan

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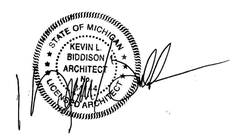
Sheet title

ELEVATIONS



Project no.

1971.16

Sheet no.

A.203

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Consultants

SOUTHEAST PERSPECTIVE IMAGE

NORTHEAST PERSPECTIVE IMAGE

EAST PERSPECTIVE IMAGE

SOUTHWEST PERSPECTIVE IMAGE

Project title

PROPOSED BUILDING FOR:

The Maple

35001 and 35075 Woodward Ave.
Birmingham, Michigan

Issued dr/ch

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Sheet title

PERSPECTIVE IMAGES

STATE OF MICHIGAN
KEVIN L BIDDISON
ARCHITECT
LICENSED ARCHITECT

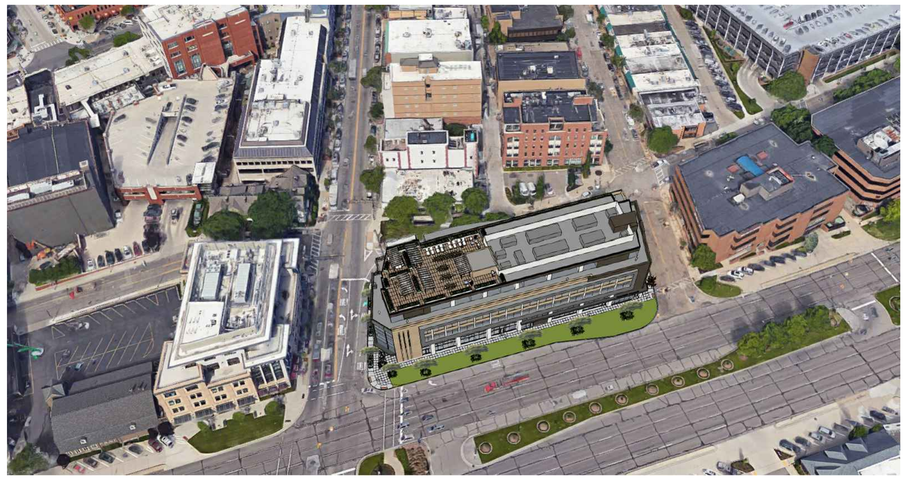
Project no.

1971.16

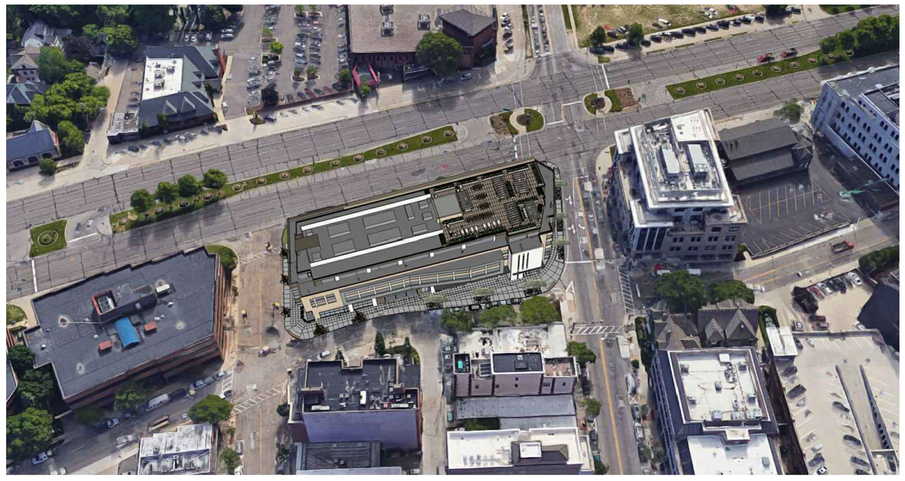
Sheet no.

A.301

SOUTH AERIAL IMAGE



EAST AERIAL IMAGE



WEST AERIAL IMAGE

NORTH AERIAL IMAGE

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Consultants

Project title

PROPOSED BUILDING FOR:

The Maple

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Birmingham, Michigan

Issued dr/ch

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Sheet title

PERSPECTIVE IMAGES

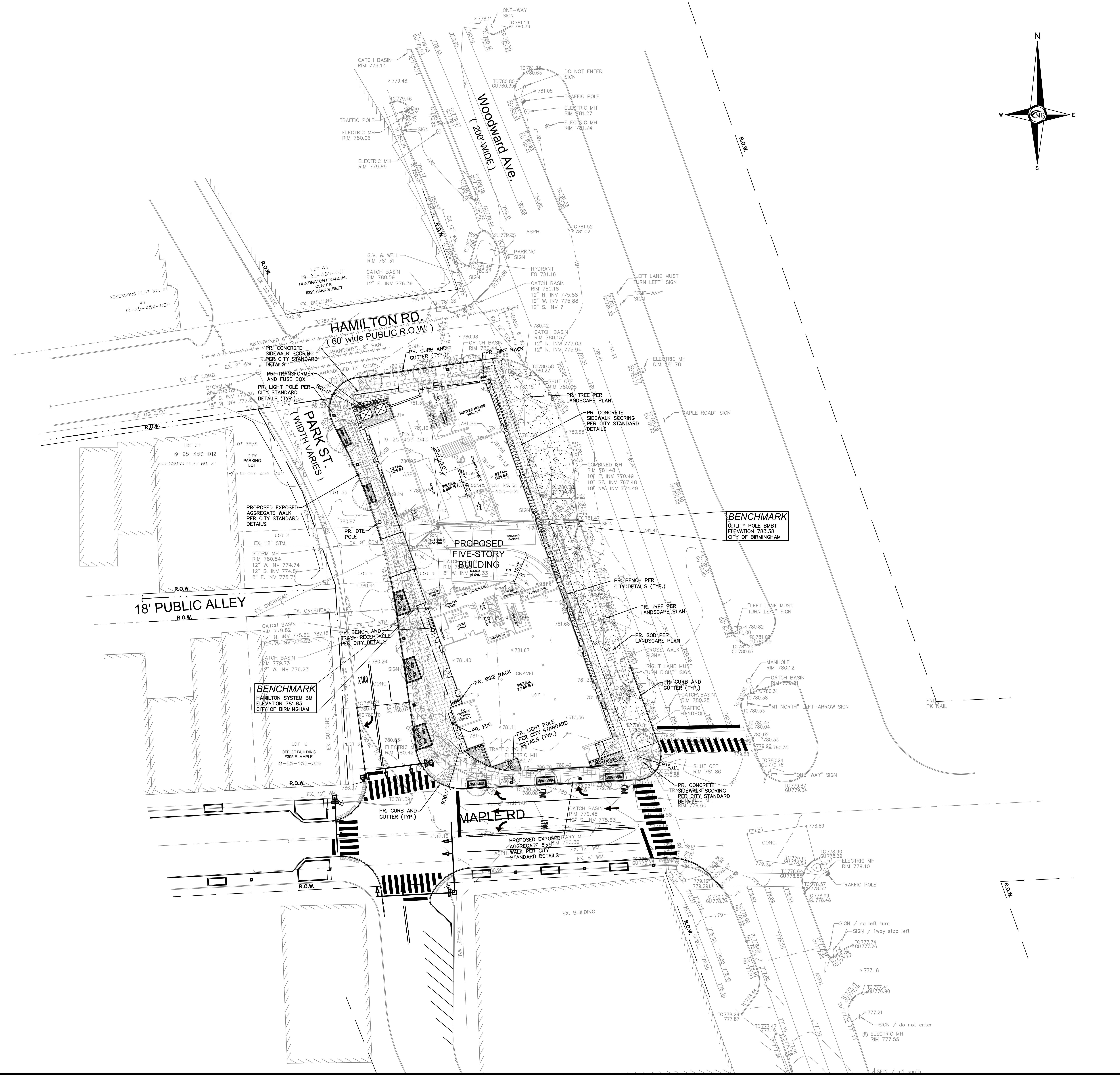
STATE OF MICHIGAN KEVIN L. BIDDISON ARCHITECT LICENSED ARCHITECT

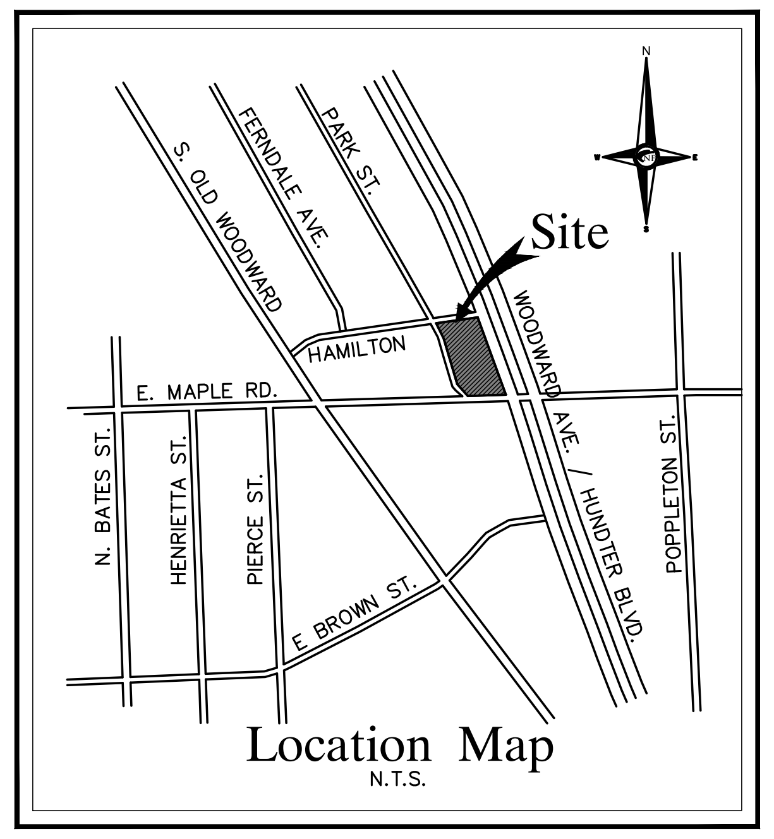
Project no.

1971.16

Sheet no.

A.302





Location Map
N.T.S.

NF ENGINEERS

CIVIL ENGINEERS
LAND SURVEYORS
LAND PLANNERS

NOWAK & FRAUS ENGINEERS
46777 WOODWARD AVE.
PONTIAC, MI 48342-5032
TEL. (248) 332-7931
FAX. (248) 332-8257

SEAL

PATRICK J. WILLIAMS
ENGINEER NO. 44351

PROJECT
35001 & 35075 Woodward

CLIENT
Biddison Architecture
320 Martin, Suite 10
Birmingham, MI 48009

Contact: Kevin Biddison
Ph: (248) 554-9500

PROJECT LOCATION
Part of Section 25
T. 2 North, R. 10 East
City of Birmingham,
Oakland County, Michigan

SHEET
Preliminary Site Plan

811
Know what's below
Call before you dig.

REVISIONS
11-26-2018 Revised Per Client
12-31-2018 Revised Per Client
04-11-2019 Revised Per Client
05-10-2019 Revised Per City
11-19-2019 Revised Per Client

DRAWN BY:
A. Eizember

DESIGNED BY:
P. Williams

APPROVED BY:
P. Williams

DATE:
March 28, 2018

SCALE: 1" = 30'
30 15 0 15 30 45

NFE JOB NO.
J398-01

SHEET NO.
SP-2

PAVING LEGEND

▨	PROPOSED CONCRETE PAVEMENT
▒	PROPOSED ASPHALT PAVEMENT

LEGEND

MANHOLE	EXISTING SANITARY SEWER
	SAN. CLEAN OUT
HYDRANT, GATE VALVE	EXISTING WATERMAIN
MANHOLE, CATCH BASIN	EXISTING STORM SEWER
	EX. R. Y. CATCH BASIN
	EXISTING BURIED CABLES
UTILITY POLE, GUY POLE, GUY WIRE	OVERHEAD LINES
	LIGHT POLE
	SIGN
	EXISTING GAS MAIN
C.O., MANHOLE	PR. SANITARY SEWER
HYDRANT, GATE VALVE	PR. WATER MAIN
INLET, C.B., MANHOLE	PR. STORM SEWER
	PR. R. Y. CATCH BASIN
	PROPOSED LIGHT POLE
TC 600.00	PR. TOP OF CURB ELEVATION
GU 600.00	PR. GUTTER ELEVATION
TW 600.00	PR. TOP OF WALK ELEVATION
TP 600.00	PR. TOP OF PVMT. ELEVATION
FG 600.00	FINISH GRADE ELEVATION

ADDENDUM TO AGREEMENT TO PURCHASE REAL ESTATE

THIS ADDENDUM TO AGREEMENT, dated the _____ day of September, 2005, by and between Birmingham Properties, L.L.C. (hereinafter Purchaser), and Hunter House Hamburgers, Inc. (hereinafter Seller), and concerning the sale of certain air and subjacent development rights in land situated in the City of Birmingham, described as 35075 Woodward Avenue, Birmingham, MI 48009.

amends and modifies as described hereinafter the terms and conditions precedent to the contract previously entered into and entitled AGREEMENT TO PURCHASE REAL ESTATE.

WHEREAS, the parties hereto desire to set forth the amended terms and conditions as they relate to the agreement previously entered into; and,

WHEREAS, the parties hereto desire to amend and modify the terms and provisions of the previous agreement only as set forth herein; and,

WHEREAS, certain conditions precedent to the effectuation of the previous agreement must be addressed;

NOW THEREFORE, in consideration of the foregoing,

IT IS AGREED AS FOLLOWS:

1. Paragraph 4 previously provided that a deposit would be deposited with the Fidelity Title Company. This addendum modifies that provision in that no deposit shall be placed with Fidelity Title Company for the reason that the parties have negotiated that the sum of Six Hundred Ten Thousand ($610,000.00) Dollars will be paid by the Purchaser to the Seller at the closing to take place within thirty (30) days.

2. In addition to the foregoing payment by the Seller to the Purchaser, Purchaser will arrange for a loan to be made to the Seller by a bank or financial institution of the Purchaser's choosing in the amount of $200,000.00. Such loan shall be closed concurrently with the closing date set forth in paragraph 1 herein. Collateral for said loan will be placed with the creditor by the Purchaser in satisfaction of any criteria demanded by the creditor (including the business assets of the Seller's restaurant, but excluding any leased or secured assets, and the personal guaranty of Mark Pappazian). All payments to be made pursuant to said loan shall be made by the Seller. If the Seller defaults, and the collateral placed by the Purchaser is in jeopardy, Purchaser may make said payments, sue the Seller or otherwise proceed under any available legal or equitable process to collect such loan. Seller's default however shall in no way affect the underlying agreement previously entered into. This paragraph is a condition precedent to the effect of this addendum.

3. Paragraphs 4 and 8 previously provided that the Purchaser would have a due diligence and an extended due diligence period. This addendum modifies and amends such provisions by eliminating any due diligence or extended due diligence period for the reason that the closing will have already taken place and funds will have been paid by the Purchaser and there is no requirement for any due diligence periods.

4. Paragraphs 4 and 14A also previously included provisions relating to Seller's right to approve plans or right to waive approval of such plans. This addendum modifies and amends such provisions by the parties' agreement that "Hunter House retains the right in its sole discretion to approve the plans related to the re-construction of interior of the Hunter House, subsequent to closing, which right shall in no way be compromised." With respect to such plans, the parties also agree that Victor Saroki, the architect for the project which is the subject of this agreement to purchase real estate and this addendum, shall submit plans for the lay out (or the building envelope for the new Hunter House) to the Hunter House concurrently with the signing of this addendum for Seller's approval. Seller shall have 10 days to approve such plans. If Seller approves such plans within such 10 days, then they will be deemed final and accepted by the parties. If Seller desires modifications to such plans, then Seller shall notify Victor Saroki, with reasonable detail, of such desired modifications and Victor Saroki shall determine if such changes are acceptable or not within 10 days. If such changes are acceptable, then Victor Saroki shall make such modifications and such plans shall be deemed final. If no agreement is reached with respect to the plans during such 20 day period, then the parties shall seek a determination by an independent architect chosen by the parties to resolve the disputed items within 30 days of the end of such 20 day period and whose determination with respect to the disputed items shall be deemed final and the plans shall then be deemed final.

5. Paragraph 7 previously provided that Purchaser has examined the title to the subject property and has determined that it is acceptable in its current condition (subject to the removal of mortgages and liens such as the one described in this paragraph). This addendum modifies and amends that provision because there now appears a second mortgage held by Dennis DeClerk. Seller must FIRST negotiate and obtain a discharge of the second mortgage or a subordination of the second mortgage. Unless this mortgage can be discharged or subordinated, Hunter House cannot convey title to the subject property, and the closing herein cannot be conducted. This paragraph is a condition precedent to the effect of this addendum. Seller shall endeavor to have such mortgages discharged by the closing date or Purchaser may waive such requirement and proceed to closing.

6. Paragraph 14A will contain the following language: "Hunter House retains the right in its sole discretion to approve the plans related to the re-construction of Hunter House, subsequent to closing, which right shall in no way be compromised."

7. Paragraph 14B in the previous agreement used the word "closing." This addendum will amend the last sentence in the previous agreement with the following: "Beginning on the date construction begins and continuing until the restaurant opens for

business, BPLLC agrees to reimburse HH, within five (5) days of payment for the monthly rental fee for the Municipal Parking Lot."

8. Paragraph 14D in the previous agreement used the word "closing." This addendum will amend that paragraph to replace the word "closing" with "start of construction."

9. Paragraph 16 as it relates to "Lender's Approval" should be eliminated in its entirety. This paragraph dealt with the first mortgage on the subject property. Since that mortgage will be paid off in full, there is no necessity to include that provision at all. The provision in Paragraph 16 as it relates to "Adequate Security" shall be amended to provide that Purchaser's letter of credit shall be issued by a bank or other financial institution concurrently with its notice to Seller that construction will commence within sixty (60) days.

10. The parties hereby agree that Seller shall retain possession of the premises after the closing and delivery of a warranty deed until such time as it has been notified by the Purchaser that construction is to commence within sixty (60) days. The parties agree that Seller shall continue to operate its business and be entitled to the same rights of possession that it enjoyed prior to the closing of this transaction. No lease shall be necessary and Seller shall have no financial obligation to the Purchaser subsequent to the closing since the parties agree to Seller's retention of the premises (except to name Purchaser on insurance policies as additional insured for liability and real property damage).

IN WITNESS WHEREOF, the parties have executed and delivered this agreement as of the day and year first above written.

Dated: 9-29-05

BIRMINGHAM PROPERTIES, LLC (BPLLC)

By: _____
JAMAL S. KALABAT
Its Managing Member

Dated: 9-27-05

HUNTER HOUSE HAMBURGERS, INC. (HH)

By: _____
MARK S. RAPAZIAN
Its President

AGREEMENT TO PURCHASE REAL ESTATE

Birmingham Properties, LLC. ("BPLLC") and **Hunter House Hamburgers, Inc**, ("HH") enter into this agreement ("Agreement") concerning the sale of certain air and subjacent development rights in land situated in the City of Birmingham, Oakland County, Michigan ("Property"), described as follows:

a. See legal description attached as **exhibit A** attached hereto and incorporated herein by reference; and
b. Tax parcel id no(s): **19-25-456-014** ; and
c. Commonly known by the address of:
35075 Woodward Avenue, Birmingham, MI 48009

The term "Effective Date" means the date upon which HH accepts this Agreement, as evidenced by HH's signature. At the closing of the conveyance, the Property shall be immediately conveyed to BPLLC as provided in this Agreement ("HH Property"). The HH Property is more specifically described on **Exhibit A.**

1. **Condition of Property:** The Property shall be conveyed "as is, where is" without any representation or warranty as to its condition or its suitability for the use intended by BPLLC. The Property does not include any personal property, fixtures or improvements located on the Property. BPLLC assumes the risk with respect to the soil conditions, the location of underground utility and sewer lines, hazardous materials, governmental regulations and approvals, and any other factor which could adversely impact BPLLC's intended use or its performance under this Agreement.

2. **Cash Sale:** The sale shall be consummated by HH's delivery of a warranty deed conveying marketable title to the Property in the form attached as **Exhibit B,** subject to all building and use restrictions and interests of record. Payment of purchase money is to be made in cash or certified check.

3. **Purchase Price:** The Purchase Price for the Property is **Six Hundred Ten Thousand and no/100 Dollars ($610,000.00) ("Purchase Price").**

4. **Deposit:** Within seven (7) days of the Effective Date, BPLLC shall deposit the sum of $35,000.00 ("Deposit") with the Fidelity Title Co., 32100 Telegraph Rd Ste 215, Bingham Farms, MI 48025-2454 ("Title Company") as escrow agent, in escrow pursuant to an escrow agreement of even date herewith ("Escrow Agreement"). A portion of the Deposit, specifically $10,000.00, shall be immediately non-refundable and shall be disbursed to HH by the Title Company. The remainder of the Deposit, specifically $25,000.00, shall be held by the Title Company and disbursed in accord with this Agreement. In the event of Closing, the Deposit shall be applied as a credit against the Purchase Price.

In the event the Deposit is not paid to the Title Company within fourteen (14) days of the Effective Date, this Agreement shall become automatically null and void, and BPLLC shall

reimburse HH the actual attorney fees it incurred in negotiating and drafting this Agreement. In the event of a termination of this Agreement by BPLLC during the Due Diligence Period, $25,000.00 of the Deposit shall be refunded to BPLLC. In the event of a termination of this Agreement by BPLLC after the Due Diligence Period, the entire Deposit shall be paid to HH as a termination fee. In the event of a breach of this Agreement by BPLLC prior to or at Closing, the entire Deposit shall be paid to HH as liquidated damages. In the event of a termination of this Agreement by HH prior to or at Closing, $25,000.00 of the Deposit shall be paid to BPLLC, unless (a) BPLLC has elected to invoke its right to an Extended Due Diligence Period, in which case the entire Deposit shall be paid to HH, or (b) HH has agreed to Approved Plans or waived the approval of such plans as a condition to closing, in which case the entire Deposit shall be paid to HH, or (c) there has been breach of this Agreement by BPLLC prior to or at Closing, in which case the entire Deposit shall be paid to HH. In the event of a material breach of this Agreement by HH prior to or at Closing, the entire Deposit shall be refunded to BPLLC as liquidated damages. In the event of a breach by both parties on or before Closing, the distribution of the Deposit shall be referred to binding arbitration to determine a fair allocation between the parties in light of their respective breaches. The decision of the arbitrator shall be enforced by judgment of the Circuit Court. Notwithstanding anything to the contrary, once HH has agreed to Approved Plans or waived the approval of such plans as a condition to Closing, the entire Deposit shall become nonrefundable and shall be immediately disbursed to HH by the Title Company. In no event shall HH be liable for any damages to BPLLC beyond the return of the Deposit. In the event a dispute should arise concerning distribution of the Deposit, the prevailing party shall be entitled to recover its reasonable costs and attorney fees.

6. **Closing:** Unless this Agreement is terminated pursuant to a condition precedent, the closing ("Closing") shall occur at the latest of: (a) six (6) months from the last day of the Due Diligence Period or the Extended Due Diligence Period, or (b) on or before the expiration of forty-five (45) days following BPLLC obtaining, and the issuance of all governmental approvals necessary, in BPLLC's sole discretion, to permit BPLLC to use the Property as it deems reasonably appropriate. Notwithstanding the foregoing, the Closing must occur within two (2) years of the Effective Date. If the Closing does not occur within the two (2) year period, then this Agreement shall be deemed to have been terminated by BPLLC at the end of such period and the Deposit shall be paid to HH as a termination fee. BPLLC shall give HH at least thirty (30) days prior written notice of the Closing date. The Closing shall take place at the office of the Title Company. BPLLC shall be responsible for preparing the documents for the Closing. The documents shall be delivered to HH for review at least four (4) days prior to Closing. At Closing, the parties shall execute closing statements prepared by the Title Company and all income or other tax reporting documents as required by the Title Company.

7. **Evidence of Title:** BPLLC has examined the title and has determined that it is acceptable in its current condition. Nonetheless, BPLLC may obtain a commitment for a policy of title insurance for the Property without "standard exceptions" issued by the Title Company in an amount not less than the Purchase Price and bearing a date later than the date of the Effective Date ("BPLLC Title Commitment"). The cost of the BPLLC Title Commitment and corresponding title policy shall be borne by BPLLC. HH may obtain a commitment for a policy of title insurance for the HH Property without "standard exceptions" issued by the Title Company in an amount not less than $610,000.00 and bearing a date later than the date of the Effective Date ("HH Title

Commitment"). The cost of the HH Title Commitment and corresponding title policy shall be borne by HH.

8. **Due Diligence Period/Extended Due Diligence Period:** For a period of sixty (60) days from the Effective Date ("Due Diligence Period"), BPLLC shall have the right, at its sole cost and expense and provided that its actions do not interfere with HH's business, to enter upon the Property for all purposes relative to BPLLC's environmental, preliminary site planning, engineering, zoning, and for any other physical, environmental, legal, or other inspection of the Property, or for any other purpose related to the Property deemed necessary at BPLLC's sole discretion, including but not limited to, any and all matters related to any future use of the Property by BPLLC. Such activities shall include, but not be limited to all environmental testing, topographical surveys, soil borings and testings of such other ecological environmental engineering and other testing as BPLLC deems appropriate. BPLLC may, at it's option and at it's sole discretion, extend the Due Diligence Period for sixty (60) additional days ("Extended Due Diligence Period"), by giving written notice to HH before the expiration of the Due Diligence Period. The maximum length of the combined Due Diligence Period and Extended Due Diligence Period shall be one hundred twenty (120) days from the Effective Date. In the event BPLLC damages or disturbs the Property as a result of its inspection or other activities, BPLLC shall restore, at BPLLC's sole cost and expense, the Property to substantially the same condition as existed on the Effective Date.

9. **Survey:** BPLLC has obtained, at BPLLC's sole cost and expense, an ALTA form metes and bounds survey of the Property ("Survey"). At the closing of the conveyance, the Survey shall be certified to BPLLC, HH, Title Company and to such other entity as BPLLC may direct, to a date no earlier than the date of this Agreement, prepared by a Michigan registered civil engineer or a licensed surveyor, reasonably acceptable to BPLLC, HH and Title Company, and otherwise in a form to permit the issuance of a title policy without standard exceptions or as otherwise required hereunder regarding the matters of survey. A copy of the Survey shall be provided to HH free of charge.

10. **Environmental Reports & Environmental Indemnification:** BPLLC shall obtain, at BPLLC's sole cost and expense, any and all environmental review and assessment reports it deems appropriate with respect to the Property ("Environmental Reports"). BPLLC shall promptly provide a copy of the Environmental Reports to HH free of charge. BPLLC shall not share or disclose the contents of the Environmental Reports or any information regarding Hazardous Materials on the Property with any third party without the prior written consent of HH, other than as required by law or to BPLLC's lenders, lawyers, environmental consultants, governmental officials and contractors. At the closing of the conveyance, BPLLC and its principals, jointly and individually, agree to indemnify and defend HH against all environmental remediation and clean-up costs relating to the Property that may be disclosed , including all related costs and reasonable attorney fees incurred by HH in the Environmental Report. HH shall fully cooperate connection with any such environmental remediation efforts required by BPLLC.or clean-up ("Environmental Indemnification"). The limitation on damages in Section 4 shall not apply to a breach of this covenant caused by BPLLC, which shall survive termination. The obligations under this Section commence upon execution of this Agreement and are not conditioned on Closing. This Section is to be construed to protect HH, and shall be deemed to

include to all matters set forth in Section 23H, regardless of termination, unless such termination is caused by BPLLC. In the event, however, that HH terminates this Agreement prior to Closing, the Environmental Indemnification shall become void. HH acknowledges that BPLLC intends to pursue Brownfield redevelopment funding, but both HH and BPLLC agree that the Environmental Indemnification is not conditioned on such funding.

13. **Delivery of Documents Relating to the Property:** Within seven (7) days after request from either party, BPLLC and HH shall deliver to one another any and all documents and information with respect to the Property which they may have in their possession or which they may obtain from their agents, employees, consultants or other parties who have knowledge of the Property, including without limitation, all plans and other matters of title.

14. **Redevelopment of Property:** The parties acknowledge and agree that BPLLC intends to re-develop the HH Property for HH's use as a restaurant and parking lot (the "Restaurant"), subject to required community approvals and permits. BPLLC shall also develop the remainder of the Property and the adjacent property which BPLLC owns and on which a "Sunoco" gas station was previously operated (the "Adjacent Parcel") into a hotel (the "Hotel Condo") which is to be part of a larger development ("Development"). The Development shall include the common areas located on the Property and the Adjacent Property, and a parking garage located under the Property, but shall not include the HH Property, and shall include the municipal surface parking lot next to the HH Property further identified on **Exhibit C** ("Municipal Parking Lot"), which shall continue to be used by HH as in the past, unless otherwise agreed by HH in its sole discretion.

The parties agree that the HH Property will be redeveloped into the and as **Condominium Unit "The HH PROPERTY"** Restaurant, with a mezzanine, in accordance with plans to "Vanilla Box" condition described below. The "Vanilla Box" improvements shall be transferred a deed of The new **Condominium Unit "the HH PROPERTY"** to HH free of charge upon completion of such construction.

A. Hotel Development. BPLLC agrees to construct the Development, at its sole cost and expense, substantially as provided in the preliminary site plans attached hereto as **Exhibit D** (the "Site Plan") and prepared by Victor Saroki & Associates (the "Architects") which shall be subject to review and prompt and reasonable approval by HH.

B. Parking. BPLLC understands and agrees that adequate parking is critical to the success of the Restaurant, and that a minimum of fourteen (14) parking spaces, as approved by local government, are needed for the Restaurant's use on the HH Property and in the neighboring parking lot owned by the City of Birmingham (the "Municipal Parking Lot" identified on Exhibit D). HH will continue to lease the Municipal Parking Lot for its use. Beginning at Closing and continuing until the Restaurant opens for business, BPLLC agrees to reimburse HH, within five (5) days of payment, for the monthly rental fee for the Municipal Parking Lot until the completion of the Restaurant as provided below.

C. Dumpster. BPLLC shall provide a dumpster for the Restaurant's use in the area of the Development identified on **Exhibit D**. HH shall reimburse the Development its proportionate

share of the trash removal costs based on volume of use. Unless otherwise agreed in writing, Sunrise Management Company shall provide the dumpster service for the Development.

D. Restaurant construction. BPLLC shall proceed, at its sole cost and expense, to demolish the existing structures and construct the Restaurant on the Property in accord with the Approved Plans. Such demolition and construction shall be performed in a workmanlike manner using commercially reasonable efforts to complete construction in a timely manner. BPLLC's obligation to construct the Restaurant shall be to the extent of delivering, at its sole cost and expense, a "Vanilla Box" as provided below, and. HH shall complete all other improvements beyond the "Vanilla Box" necessary for it to open for business (including fixtures and equipment and other finishes and all applicable permits). The "Vanilla Box" shall consist of: (a) exterior walls and structural elements, (b) interior walls dry-walled and ready to paint, (c) cement flooring, (d) all windows, doors and window and door fixtures, (e) separately metered HVAC, heating, cooling, shaft and air return systems complete and operational ("Air Systems"), (f) all rough plumbing complete and operational, (g) all electrical necessary for HH's equipments pulled to the walls, (h) acoustical ceiling or an allowance of two (2) dollars per square foot for exposed painted ceiling at HH's option, (i) bathrooms to code, and (j) driveways, curb cuts and parking lot paved and stripped (as provided in the Approved Plans). The Air Systems shall include ductwork between the Restaurant and the roof of the Hotel, and HVAC units that will provide make up air for the Restaurant, but will not include hood, fans, or pipe. BPLLC shall, however, install the pipe at it's sole cost and expense, provided HH pays for the pipe materials. The "Vanilla Box" shall be constructed by BPLLC in accord with the Americans with Disabilities Act and all similar laws, ordinances and regulations concerning accessibility by handicapped persons (the "Disability Acts"). BPLLC represents and warrants that the "Vanilla Box" shall be in full compliance with the Disability Laws upon delivery to HH. BPLLC agrees to substantially complete the construction of the Restaurant in "Vanilla Box" condition within seven (7) months after the delivery of Possession. Closing. The construction of the core "Vanilla Box" shall be deemed substantially complete upon (a) the issuance of a temporary certificate of occupancy as a shell permit by the City of Birmingham, and (b) the Vanilla Box is in such condition that the allowing HH could commence interior work in order to open the Restaurant for business. The issuance of a temporary certificate of occupancy shall not, however, relieve BPLLC from the obligation of completing the remainder of the construction in a timely manner. In the event that such Restaurant is not substantially completed in "Vanilla Box" condition within such seven (7) month period, then for each month thereafter in which such completion is delayed, BPLLC agrees to pay HH the amount of Thirty Seven Thousand Five Hundred and 00/100 Dollars ($37,500.00) per month (the "Delay Fee"), paid on the first of the month in advance and then pro-rated on a daily basis during the month in which the core "Vanilla Box" is delivered. If the Hotel and the "Vanilla Box" are not substantially completed within thirty (30) months after Start of Construction, HH shall have the option, but not the obligation, to declare this Agreement in default and to draw down and retain the entire Letter of Credit as liquidated damages. HH may commence its work on the Restaurant while BPLLC is performing its work, provided it does not interfere or cause delay with BPLLC's construction on the Property. Upon the issuance of a temporary certificate of occupancy by the City of Birmingham for the Vanilla Box, HH shall take possession of the Restaurant and shall become responsible for all costs and expenses relating to utilities, insurance and maintenance of the Restaurant from and after that date. HH

agrees to complete the interior work within sixty (60) days in order to obtain the temporary certificate of occupancy.

In the event of a default in this Agreement by BPLLC after Closing, HH shall be entitled to collect the Delay Fee. If (a) the Development and the "Vanilla Box" are not substantially completed within twenty four (24) months after Start of Construction, or (b) there is any default in the payment of the Delay Fee, then HH shall have the option, but not the obligation, to declare this Agreement in default and to draw down and retain the entire Letter of Credit ($1,900,000.00) as liquidated damages. The parties acknowledge that this is a negotiated liquidated damage provision and that it is not a penalty. In the event HH elects to draw against the Letter of Credit, HH shall deliver a warranty deed to BPLLC conveying its interest in the HH Property within seven (7) days following HH's receipt of the funds. If HH elects to exercise its remedy to draw against the Letter of Credit, the amount of Delay Fee (up to but not exceeding the initial 7 monthly payments of such Delay Fee) actually paid by BPLLC to HH through such date(s) of draw shall be credited against and reduce such liquidated damages. In the event that for any reason HH is unable to draw amounts the Letter of Credit, then BPLLC and its principals shall be jointly and severally liable for the payment of the liquidated damages ($1,900,000.00 as reduced by up to 7 monthly payments of the Delay Fee) and all reasonable attorney fees HH incurs in enforcing its rights under this Agreement.

15. **Condition Precedent to BPLLC's Obligation to Close/Termination:** BPLLC shall have the right to terminate this Agreement before or at Closing if certain conditions are not satisfied. BPLLC shall exercise its right to terminate this Agreement by written notice to HH. Conditions precedent to BPLLC's obligation to close the transaction contemplated herein include the following: (a) full and complete performance by HH of all terms, covenants and conditions of this Agreement, (b) BPLLC's satisfaction with the results of the inspections and other work done during the Due Diligence Period or any Extended Due Diligence Periods, (c) the occurrence of all other conditions precedent set forth in this Agreement and satisfactory evidence, in writing, to BPLLC from HH that all HH's warranties, representations and covenants are true, accurate and confirmed on and after the Effective Date hereof through Closing, (d) the rezoning of the Property to permit its use as a Hotel, (e) BPLLC obtaining all permits and approvals for the redevelopment of the Property and the Adjacent Property (defined below), as the Hotel and Restaurant as provided below, from applicable government agencies (f) BPLLC obtaining financing for at least eighty percent of the Purchase Price and (g) failure of the parties to agree upon a common condominium structure.

16. **Condition Precedent to HH's Obligation to Close/Termination:** HH shall have the right to terminate this Agreement if certain conditions are not satisfied. HH shall exercise its right to terminate this Agreement by written notice to BPLLC. Conditions precedent to HH's obligation to close the transaction contemplated herein include all the following: (a) full and complete performance by BPLLC of all terms, covenants and conditions of this Agreement prior to Closing, (b) the preparation and delivery by BPLLC to HH of a complete set of Approved Plans that will be submitted to the City of Birmingham for approval, at least thirty (30) days before submittal for approval by the City of Birmingham, (c) the issuance of all governmental permits and approvals required to complete construction in accord with the Approved Plans, (d) evidence satisfactory to HH in its reasonable discretion that BPLLC has commitments for

financing sufficient to complete the Development and Restaurant in accord with the Approved Plans, (e) negotiation and execution of a Covenant Agreement to be recorded at Closing with the register of deeds against the Adjacent Parcel, Property and HH Property, (f) delivery of evidence to HH that construction of the Restaurant will commence within one (1) month following the demolition of the existing structure at the Property, (g) Lender's Approval, (h) delivery of Adequate Security ensuring BPLLC's full and timely performance of this Agreement (i) agreement upon a common condominium ownership structure for the Restaurant and Development, and (j) an agreement between BPLLC and Stress-Concrete-Papazian for concrete work in connection with the Development and the Restaurant, provided that company is reasonably qualified and competitive in price. The foregoing conditions shall be construed as conditions precedent to Closing and not simply as covenants. Substantial compliance shall not be sufficient to comply with these conditions.

"Approved Plans" shall mean a complete set of final architectural and engineering plans and specifications approved by HH, reflecting both the Development and the "Vanilla Box" portion of the Restaurant. In exercising its approval, HH shall exercise reasonable discretion in approving the plans and specifications for the Development, but shall be entitled to exercise its sole discretion with respect to the plans and specifications for the "Vanilla Box" provided it exercises such discretion in good faith.

"Covenant Agreement" shall mean the covenant agreement further identified in Section 23.

"Lender's Approval" shall mean the approval (of the transfers contemplated by this Agreement) of any lender who has loaned funds to HH and who holds a mortgage or other lien against the Property at Closing. HH agrees to apply $305,000.00 of the Purchase Price at Closing toward the pay down of any such loan secured by the Property in order to obtain Lender's Approval. In no event shall HH be required to pay any funds beyond that amount to obtain Lender's Approval.

"Adequate Security" shall mean a letter of credit in the amount of $1,900.000.00. The letter of credit shall be (a) irrevocable, (b) unconditional, (c) issued by a bank or other financial institution which is approved by HH, (d) able to be drawn upon and confirmed by a bank or other financial institution located in Oakland County, Michigan, (e) assignable by HH without charge or limitation upon transfer or collateral assignment, (f) remain in effect until HH obtains a temporary certificate of occupancy to open the Restaurant. The letter of credit shall permit HH, in the event of default by BPLLC under this Agreement, to draw down either partial draws or the entire amount upon presentation of a sight draft executed by an authorized agent of HH. HH may, in its sole desertion, agree to an alternative method of providing Adequate Security.
HH agrees to complete the interior work within sixty (60) days in order to obtain the temporary certificate of occupancy.

17. **HH's Cooperation:** HH shall cooperate with BPLLC with regard to all of BPLLC's testing requirements and applications during and after the Due Diligence Period and any Extended Due Diligence Period, and shall, if requested to do so, execute or cause to be executed any letters of authorization, applications, petitions or requests as may be reasonably necessary to be executed by HH and to provide any information privy to, known to or in possession of HH which may be necessary or useful in completing the applications or requests. Such applications

and petitions shall include without limitation, site plan applications, zoning/rezoning petitions, petitions for zoning variance, special land use, agreements for environmental studies and to authorize same or any other similar authority, permission or execution of any document necessary to obtain such local, state, and/or federal governmental approval or regulatory approval of use or any future use of the Property by BPLLC in its reasonable discretion. HH hereby gives BPLLC authority to obtain zoning variances, special land uses and similar approvals for the Property and if necessary to rezone the Property in whole or in part to a zoning district determined by BPLLC, in BPLLC's reasonable discretion. Notwithstanding anything to the contrary, (a) HH shall not be required to approve or consent to any action that would preclude or adversely interfere with HH's use of the Property as a restaurant, (b) BPLLC shall not undertake any action that would preclude or adversely interfere with HH's use of the Property as a restaurant ,and (c) HH shall not be required to consent to the disclosure of information regarding Hazardous Waste, unless BPLLC agrees to fully indemnify HH for any liability to clean-up the Property and such indemnification survives termination of this Agreement.

18. Real Estate Taxes; Transfer and Documentary Stamps: All taxes and assessment which have become a lien upon the land at the date of Closing shall be paid by HH. Water bills shall be prorated and adjusted as of the date of Closing. All current real estate taxes shall be prorated (based on a 30 day month and 360 day year) on the "due date" basis between HH and BPLLC as of the Closing. HH and BPLLC agree that the tax proration shall be interpreted and applied as if the amendments of law set forth in P.A. 80 and 279 of 1994 did not exist, and that all taxes are deemed to be paid in advance. HH shall pay all state and county transfer taxes and/or revenue/documentary stamps due on this transaction with respect to the transfer of the Property to BPLLC. BPLLC shall pay all state and county transfer taxes and/or revenue/documentary stamps due on this transaction with respect to the transfer of the **Condominium Unit "The HH POPERTY"** to HH. BPLLC shall pay all recording fees. Additionally, all assessments (special or otherwise) imposed against, or which become a lien on, the Property by any governmental agency or public utility for improvements on or before the date of Closing shall be paid in full by HH at Closing, unless the assessment arises out of or is related to the development of the Hotel, in which case they shall be paid by BPLLC.

19. Possession at Closing: HH shall give BPLLC sole and exclusive possession of the Property and the HH Property beginning thirty (30) days following Start Construction until the earlier of (a) delivery of the core "Vanilla Box" substantially completed, or (b) thirty months (30) from the Effective Date.

20. Notices: Any such notice, request or other communication shall be considered given or delivered, as the case may be, on the date of personal service or the date of receipt by overnight courier delivery, or upon receipt of notice given in the United States mail as provided below:

To HH: **Hunter House Hamburgers, Inc.**
Mark S. Papazian
1966 Dell Rose Circle
Bloomfield Hills, Michigan 48302
T. 248-335-4420—F. 248-335-4421
E-Mail mpapazian@comcast.net

To BPLLC: **Birmingham Properties, LLC.**
Jamal S. Kalabat, ***Managing Member***
28530 Orchard Lake Road
Suite 100
Farmington Hills, MI 48334
Tel. 248-851-4875 (Ext. 227) Fax. 248-851-4875
E-Mail jamal@kalabat.com

Rejection or other refusal to accept or inability to deliver because of changed address of which no notice was given shall be deemed to be receipt of the notice, request or other communication. By giving at least five (5) days prior written notice thereof, any party may from time to time at any time change its mailing address hereunder.

22. **Warranties and Representations:** HH and BPLLC make the following representations and warranties to one another. All warranties and representations made herein shall be true, accurate and confirmed as of the Effective Date and the date of Closing and shall survive the termination of this Agreement and/or the Closing of the transaction contemplated herein.

A. Authority. HH and BPLLC (a) have the authority and power to enter into this Agreement and to consummate the transactions contemplated herein; and (b) upon execution hereof will be legally obligated in accordance with the terms and provisions of this Agreement.

B. Condemnation. Neither HH nor BPLLC have received any notice of, nor is either aware of, any pending, threatened or contemplated action by any governmental authority or agency having the power of eminent domain, which might result in any part of the Property being taken by condemnation or conveyed in lieu thereof.

C. Litigation. There is no action, suit or proceeding pending or, to HH or BPLLC's knowledge, threatened by or against or affecting the Property, HH and BPLLC shall, promptly upon receiving any such notice or learning of any such contemplated or threatened action, give written notice thereof to the other.

D. Foreign Ownership. Neither BPLLC, nor HH, is a "foreign person" as that term is defined in the U. S. Internal Revenue Code of 1986, as amended, and the regulations promulgated pursuant thereto, and neither BPLLC, nor HH, has no obligation under Section 1445 of the U.S. Internal Revenue Code of 1986, as amended, to withhold and pay over to the U.S. Internal Revenue Service any part of the "amount realized" by BPLLC or HH in the transaction contemplated hereby (as such term is defined in the regulations issued under said Section 1445).

E. Prior Options. No prior purchase agreements, leases, options or rights of first refusal have been granted by HH to any third parties to purchase or lease any interest in the Property, or any part thereof, which are effective as of the Effective Date.

23. **Covenant Agreement:** At Closing the parties shall execute a covenant agreement in recordable form containing the following covenants which shall run with the land and which shall bind BPLLC, its successors and assigns.

A. Use: The Hotel shall be used as a Hilton or equal hotel facility operated in accord with "Hilton" or equal franchised hotel standards, and for no other use without the prior consent of HH. BPLLC may use a portion of the Development for offices, restaurant, bar operating a Class C license, apartment rentals, or as residential condominiums, provided the square footage of any such use shall not exceed the larger of (a) 20% of the entire square footage of the Development 's building or (b) one entire floor that building.

B. Repairs: BPLLC shall maintain the Development in good repair and in a clean and safe condition, and in accord with Applicable Laws. BPLLC shall maintain the structural elements and supporting elements of the Restaurant in good repair in a clean and safe condition, and in accord with Applicable Laws.

C. HH shall keep the Restaurant neat, clean and free from dirt, snow and ice, rubbish, insects and pests at all times, and shall store all trash and garbage within the dumpsters maintained by the Development. HH shall not perform any acts or carry on any practices that may injure the Property and shall not obstruct or permit the obstruction of any street, drives, sidewalk or parking lot(s).

D. Liens: BPLLC shall keep the HH Property free of construction or other liens. BPLLC shall hold HH harmless against any liens which may be placed against the HH Property, except those directly attributable to the acts of HH. If a lien is filed against the HH Property as the result of any action undertaken by BPLLC, BPLLC shall discharge (or bond against or insure over) the lien. If BPLLC fails to discharge the lien, HH may procure discharge at BPLLC's expense, which shall be paid by BPLLC immediately upon demand from HH

E. Indemnification: BPLLC shall indemnify and defend HH against claims for bodily injury or property damage occurring in or on the Development. HH shall indemnify and defend BPLLC against the claims for bodily injury or property damage occurring in or on the Restaurant.

F. Fire or Other Casualty: In the event of a fire or other casualty to the Development, BPLLC shall promptly repair and restore the Development and BPLLC's personal property, trade-fixtures and improvements to their prior condition. In the event of a fire or other casualty to the Restaurant, HH shall promptly repair and restore the Restaurant and HH's personal property, trade-fixtures and improvements to their prior condition.

G. Insurance: BPLLC shall maintain in effect a commercial general liability insurance policy providing coverage for the Development, with policy limits of not less than $1,000,000.00 per person and $1,000,000.00 per occurrence, exclusive of defense costs and without any provision for a deductible or self insured retention. During the construction of the Restaurant, the foregoing coverage shall be extended to the HH Property. BPLLC shall maintain in effect a

special cause of loss property insurance policy covering the Development and BPLLC's personal property, trade-fixtures and improvements to their full replacement cost, without deduction for depreciation. Any insurance policy BPLLC is required to maintain shall (a) be written by carriers authorized to write business in the state of Michigan and having an A.M. Best & Co. rating of not less than A-VIII, (b) name HH as an additional named insured, (c) be endorsed to provide that it will not be canceled or materially changed for any reason except on 30 days prior written notice to HH, and (d) provide coverage to HH whether or not the event giving rise to the claim is alleged to have been caused in whole or in part by the acts, omissions or negligence of HH. If any policy which BPLLC is required to maintain is written on a "claims made" insurance form, each policy must have a "retroactive date" which is not later than the Effective Date. Furthermore, should insurance coverage be written on a "claims made" basis, BPLLC's obligation to provide insurance will be extended for an additional period equal to the statute of limitations for such claims, plus one year. BPLLC shall deliver certificates of insurance or, at HH's request, the original insurance policies to HH, together with receipts evidencing payment of the premiums. BPLLC shall deliver certificates of renewal for such policies to HH not less than 30 days prior to their expiration dates. HH shall maintain in effect a commercial general liability insurance policy providing coverage for the Restaurant, with policy limits of not less than $1,000,000.00 per person and $1,000,000.00 per occurrence, exclusive of defense costs and without any provision for a deductible or self insured retention. HH shall maintain in effect a special cause of loss property insurance policy covering the Restaurant and HH's personal property, trade-fixtures and improvements to their full replacement cost, without deduction for depreciation. Any insurance policy HH is required to maintain shall (a) be written by carriers authorized to write business in the state of Michigan and having an A.M. Best & Co. rating of not less than A-VIII, (b) name BPLLC as an additional named insured, (c) be endorsed to provide that it will not be canceled or materially changed for any reason except on 30 days prior written notice to BPLLC, and (d) provide coverage to BPLLC whether or not the event giving rise to the claim is alleged to have been caused in whole or in part by the acts, omissions or negligence of BPLLC. If any policy which HH is required to maintain is written on a "claims made" insurance form, each policy must have a "retroactive date" which is not later than the Effective Date. Furthermore, should insurance coverage be written on a "claims made" basis, HH's obligation to provide insurance will be extended for an additional period equal to the statute of limitations for such claims, plus one year. HH shall deliver certificates of insurance or, at BPLLC's request, original policies, together with receipts evidencing payment of the premiums. HH shall deliver certificates of renewal for such policies to BPLLC not less than 30 days prior to their expiration dates.

H. Hazardous Materials: BPLLC agrees that it will not use, permit, hold, release or dispose of any Hazardous Material on, under or at the Property or the Development and that it will not use or permit the use of the Property or any portion of the Development as a treatment, storage or disposal (whether permanent or temporary) site for any Hazardous Material, other than De Minimis Amounts. The term "De Minimis Amounts" shall mean, with respect to any given level of Hazardous Materials, that such level or quantity of Hazardous Materials in any given form or combination of forms (a) does not constitute a violation of any applicable law, and (b) is customarily employed in, or associated with, similar hotels and restaurants. BPLLC agrees that it will clean-up, at its sole cost and expense, any Hazardous Materials located on the Property. BPLLC further agrees that it will not cause or allow any asbestos to be incorporated into any

improvements or alterations which it makes or causes to be made to the Property. BPLLC hereby holds HH harmless from and indemnifies HH against any and all losses, liabilities, damages, injuries, costs, expenses, fines, penalties, and claims of any and every kind whatsoever (including, without limitation, costs and attorney fees) which at any time or from time to time may be paid, incurred or suffered by, or asserted against HH for, with respect to, or as a direct or indirect result of (a) a breach by BPLLC of the foregoing covenants, or (b) to the extent caused or allowed by BPLLC or any agent, contractor, employee, invitee or licensee of BPLLC, (c) the presence on or under, or the escape, seepage, leakage, spillage, discharge, emission or release from, onto or into the Property, the Hotel, the atmosphere, or any watercourse, body of water or groundwater, of any Hazardous Material. The provisions of and undertakings and indemnification set out in this paragraph shall survive Closing, and shall continue to be the liability, obligation and indemnification of BPLLC, binding upon BPLLC, forever, subject to the applicable statute of limitations. The provisions of the preceding sentence shall govern and control over any inconsistent provision of this Covenant Agreement.

If during BPLLC's initial construction work at the Property BPLLC shall discover any Hazardous Material in the Property, then BPLLC shall promptly notify HH and BPLLC will diligently remove and dispose of such Hazardous Materials in compliance with all applicable laws and regulations.

"Hazardous Material" means and includes any hazardous substance or any pollutant or contaminant defined as such in (or for purposes of) the Comprehensive Environmental Response, Compensation, and Liability Act, any so-called "Superfund" or "Superlien" law, the Toxic Substances Control Act, or any other Federal, state or local statute, law, ordinance, code, rule, regulation, order or decree regulating, relating to or imposing liability or standards of conduct concerning, any hazardous, toxic or dangerous waste, substance or material, as now or at any time hereafter in effect, or any other hazardous, toxic or dangerous, waste, substance or material.

24. **Authority:** HH and BPLLC each represents, covenants and warrants that all necessary actions and authorizations have been obtained, and that it has been specifically authorized to enter into this Agreement and that no additional action will be necessary to make this Agreement legally binding upon them in all respects. HH and BPLLC covenant to provide written evidence of compliance with this Section prior to or at Closing.

25. **Advice of Counsel:** Each party acknowledges that it has sought the advice of an attorney with regard to the review and analysis of this Agreement. Each party, by executing this Agreement, acknowledges that he/she does so voluntarily and with advice of counsel.

26. **Recordation of Notice:** Notwithstanding the foregoing, BPLLC may record a notice of the existence of this Agreement with the applicable register of deeds, and HH hereby consents to same. In the event that this transaction does not close, BPLLC shall execute and record any and all documentation required to remove its interest from the Property.

27. **Governing Law:** This Agreement and the performance shall be construed and interpreted in accordance with the laws of the State of Michigan. BPLLC agrees to perform this Agreement in good faith and in a commercially reasonable manner.

28. **Entire Agreement:** This Agreement constitutes the entire Agreement between the parties in connection with the subject matter addressed in this Agreement. This Agreement may not be modified orally, and no modification and/or amendment shall be effective unless in writing and signed by all the parties making specific reference to the changes to be made to this Agreement.

29. **Binding Agreement:** This Agreement shall be binding upon and inure to the benefit of the parties, their respective heirs, personal representatives, successors and assigns.

30. **Waiver:** Waiver by any party of any breach, or failure to enforce any of the terms and conditions of this Agreement, at any time, shall not in any way affect, limit or waive such party's right thereafter to enforce and compel strict compliance with every term and condition.

31. **Severability:** If and to the extent that any provision, or portion, of this Agreement is determined by any legislature or court to be in whole or in part invalid or unenforceable, such provision or term shall be unenforceable only to the extent of such invalidity without invalidating the remaining provisions; all other provisions of this Agreement shall remain in full force and effect, and the rights and obligations of the parties shall be construed and enforced accordingly. In addition, it is the intent of the parties that any provision of the Agreement which is determined to be invalid or unenforceable due to the duration, scope, breadth, or otherwise, shall be interpreted in a reduced form which is not invalid or unenforceable with the intent that the provisions of this Agreement shall be construed and enforced in such a manner as to give them the broadest enforceable scope and effect.

32. **Survives Closing:** The terms of this Agreement survive closing and shall not be merged in any subsequent transfer of instrument of conveyance.

33. **Cooperation:** The parties shall execute and deliver such other documents as may be reasonably required in order to accomplish the objective of this Agreement.

34. **Like Kind Exchange:** HH may exchange the fee title in the Development Rights for other property of like kind and qualifying use within the meaning of Section 1031 of the Internal Revenue Code of 1986, as amended, and the Regulations promulgated thereunder. In order to facilitate the transaction, HH may retain the services of a Qualified Intermediary within the meaning of Treas. Reg. 1.1031(k)-1(g)(4). This Qualified Intermediary will provide services to HH in connection with HH's Section 1031 transaction. HH expressly reserves the right to assign its rights under this Agreement to a Qualified Intermediary on or before the date of Closing and in that situation; BPLLC shall pay or cause to be paid to such Qualified Intermediary the net proceeds of the sale. However, this assignment in no way relieves HH of any obligations or duties under this Agreement including the obligation to convey the Development Rights by warranty deed. HH shall bear any and all additional cost, expense and liability as a result of its 1031 exchange.

35. **Condominium By-Laws:** The parties agree to negotiate in good faith to establish a mutually agreeable set of By-Laws for a condominium association to be established for the HH

Property and the Development. It is understood, however, that the condominium association shall have no power or authority over the operation or condition of the Restaurant or its ownership, nor shall the condominium association have the power or authority to impose fees or charges against the Restaurant or its owner, with the exception of the following common area expenses incurred after the date on which the Restaurant opens for business: (a) lawn mowing, (b) snow removal, (c) outdoor landscaping, and (d) trash removal. The Restaurant will be charged and shall pay for the ___% percent of these costs.

36. Brokers: The parties represent to one another that no real estate brokers are involved in this transaction. Each party indemnifies the other against the claims of any brokers and salespeople who allege that they represented a party or are entitled to a commission or fee as a result of the transaction.

37. Counterparts: This Agreement may be executed in counterparts, and each such counterpart shall constitute an original and all such counterparts shall constitute one and the same instrument.

IN WITNESS WHEREOF, the parties have executed and delivered this agreement as of the day and year first above written.

Birmingham Properties, LLC. ("BPLLC")
By: JAMAL S. KATTOUF
Its Managing Member

9-26-05
Date

Hunter House Hamburgers, Inc. ("HH")
By: MARK S. YAPALIAN
Its PRES

9/26/05
Date

City Map

Help Employee Login

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February 1, 2019

Jana Ecker
Planning Director
City of Birmingham, Mi

Re: 35001 35075 Woodward Response to Questions and requirements for Planning Approval:

Dear Ms. Ecker,

The following is an item by item response to the original review letter and additional comments from the Planning Commission during the previous Meeting during which the CIS was approved for this project.

1. All streetscape requirements to be developed for this project will incorporate the proposed changes to the Future Maple Phase II Downtown development creating a two way street and curb cut changes to the Maple and Park Street intersection. Refer to the attached Site Plans which show the current model for that new proposed intersection.
2. All Utilities will be buried on site including the proposed new 12" public watermain to be constructed by the property owner as required from Hamilton Ave. to Maple in the right of way adjacent to the building. The Owners intent would be to tap into this new water main for the building service.
3. The final impervious surface changes and final Storm Water Detention if necessary will be reviewed and provided to meet all City Engineering Department requirements by Nowak and Fraus prior to final site Plan Approval.

Setback and Height Requirements:

1. A revised floor plan of the fifth floor has been provided to better show the number and size of the residential units which will all have kitchens and smaller units will be connected together as shown. If a variance from the BZA is required we will follow that path.
2. A variance from the BZA is required for the parking with in the 20 ft. frontage line on the north end of the building to facilitate the Hunter House Group we will apply to obtain that variance.
3. We are currently showing three loading spaces for the building. We would be submitting to the BZA to allow the one space which is only 12' x 30' x 14' high in lieu of the required 12' x 40' x 14' high to be allowed since many of the delivery trucks are 24' or less in length and would be more than sufficient to service the building.
4. All rooftop equipment will be screened within a proposed 30' x 120' rooftop screen. A roof plan has been added to show the screened area for that equipment. The final length of that screened in area will increase if necessary during the final building design to enclose all equipment.

Screening and landscape:

1. All dumpster areas and containers will be screened from view. The containers in Refuse area 1 the main Hotel loading area are set back behind a solid wall and would be rolled forward into the loading area to be emptied. The dumpster containers Refuse area 2 for the Hunter House area of the building will have a roll up door enclosing the opening allowing access to those containers.
2. The two DTE equipment boxes for the Transformer and the Fuse are each 6' deep x 7' wide x 6' high and will be fully screened by the proposed 6' high landscape materials.

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Birmingham, MI 48009
p 248•554•9500

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3. All planting materials and hardscape features will be provided as required. At this time the additional tree requested in the frontage is not shown since the normal spacing proposed by the City street scape requirements would not provide enough room. Our Landscape Architect will provide the additional tree if he can come to a final spacing layout which is acceptable to the City. If that cannot be achieved we will apply for a waiver from the staff Arborist.
4. A final Photometric plan will be provided prior to the final Site Plan Approval, once we know if any general adjustments need to be made to the site and building façade.

Engineering Comments:

1. Once we have obtained preliminary Site Plan Approval the discussions to secure the long term lease from the city for the surface property and underground parking lot encroachments will continue with City Attorney at his request.
2. The attached Site Plan and Landscape Plan show the proposed option for the Maple Road and Park Street intersection and curb changes as required. Final Engineering drawings for Final Site Plan Approval will show any updated details of these areas if they exist at that time. It is our understanding that this work will be completed sometime in 2020. If this work is postponed by the City until after our development is started the Applicant will take on this new intersection work adjacent to there property as required.
3. The Engineering Department may consider the elimination of on street parking as an extension of the queuing lane, at the very least these spaces could be rented by the building during event times.
4. Refer to the attached Site Plans and Landscape Plan which show the revised drop off lane which is provided behind the existing street curb as discuss with the City Engineering Department and pulled away from the building to allow the required 5 foot sidewalk to be extend across the drive entrance to the underground parking and loading areas along Park Street. This 5 foot sidewalk is also shown to cross the other two drive openings at Hamilton and Woodward for the proposed Hunter House parking lot area.
5. Final Jointing patterns as part of the final street scape plan will be reviewed with the Engineering department prior to final Site Plan Approval. All ingress/egress easements for these cross traffic and public walk areas will be provided as required.

Permits and Reviews:

1. All necessary Permits from the City of Birmingham and MDOT will be acquired prior to any work on the project.
2. All comments from the Fire including increase in the size of the Fire Command Center, Police and Building departments will be provided as necessary for the final building review and construction.

Design Review:

1. Final building material samples will be provide prior to the Final Site Plan Approval as required.
2. Refer to the roof plan for the rooftop equipment screening. Final equipment cut sheets can be provided prior to the Final Site Plan Approval.
3. Final Cut sheets on the 6' x 7' x 6' high DTE ground mounted equipment can be provided Prior to Final ite Plan approval.
4. All questions and comments regarding the building Façade will be addressed at the Site Plan Meeting. Any changes or variances necessary will be made or applied for prior to Final Site Plan Approval. Due to the nature of this site which is surrounded on all four sides by streets unlike any other such Major building development in the City, the need to have a back of house area which might requires some variance from the normal Façade or curb cut opening requirements can be discussed. The need for the additional surface parking for the Hunter House portion of the site is necessary to that business operation so a variance would be sought from BZA to allow that into the 20' front yard setback.

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Special Events Parking:

1. A Floor Plan showing the proposed maximum occupancy based on (8) person tables in the proposed banquet area has been provided. If the smaller area to the side of the large banquet room was opened to the larger room a total of (11) eight person tables could be provided for a total of (88) seated guests and a few speakers at a front oriented table as shown.
2. To handle this additional influx of building visitors additional Valet parking attendants would be provided based on the timing assumed by the traffic study, and additionally since the building has control over the parking below grade via Valet service for all guests, the lowest level of underground parking could be used for short term overflow parking with in the drive lanes as shown on the attached proposed parking plan allowing the Valet group to stack in the driving lanes for minimum of 70 to 80 short term event spaces controlled by the Valet service only.
3. The upper level of the underground parking would remain open for the buildings Residential units on the fifth floor.

Please contact our office if you have any additional questions or need any additional information at this time.

Regards,

Kevin Biddison AIA
Biddison Architecture

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p 248•554•9500

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City of Birmingham
A Walkable Community

Jana Ecker <jecker@bhamgov.org>

Re: Ecker - Liaison for Planning Board

1 message

MELIH OZTALAY <melih@smartfindsmarketing.com> Tue, Jan 8, 2019 at 6:30 PM
To: Jana Ecker <Jecker@bhamgov.org>

Hi Jana,

Places like Hunter House have become extinct and therefore more valuable to the community. I would go so far as to say there are only four businesses like Hunter House in the entire Detroit Metro area serving old style sliders. The fact one is in the City of Birmingham, makes the city valuable as an attraction.

Hunter House is a focal point for the Dream Cruise benefiting the City of Birmingham. Hunter House is one of the few restaurants along Woodward Avenue with a parking lot.

The building across the street on Maple Road, after it was rebuilt into the current ugly monstrosity that it has become, is a visual eye sore and the restaurant is dysfunctional for the community because it is difficult to park, and get in and out of that corner. Building another such building across from it would only cause more problems to an already busy intersection where no one seems to understand how to use the lanes correctly.

Hunter House in comparison is off set from the main intersection, a right turn lane helps to get in and out of Hunter House, and Hunter House has a parking lot.

If a compromise is necessary, the lot next to Hunter House has been vacant for quite some time and seems sufficient to build a tax generating building or even a South bound gas station. A South bound Woodward Avenue gas station has been missing in the city for quite some time.

Thank you for considering these comments in your decision making process.

Melih (“may-lee”) Oztalay, CEO
SmartFinds Marketing
Direct: +1 (248) 568-2241
https://smartfindsmarketing.com
https://www.linkedin.com/in/melihoztalay

On Jan 7, 2019, at 8:46 AM, Jana Ecker <Jecker@bhamgov.org> wrote:

Good morning,

You may send me an email or letter prior to Wednesday evening and I will share it with the Planning Board, or you could attend and speak at the meeting.

Jana Ecker

On Sun, Jan 6, 2019 at 5:38 PM MELIH OZTALAY <melih@smartfindsmarketing.com> wrote:

> Hi Jan,
>
> I just found out about the agenda on Wed, Jan 9th. This agenda includes Hunter House.
>
> Who do we need to contact…if we are not able to attend in person….to share our views to NOT (absolutely NOT), tear down Hunter House.
>
> Thank you.

Melih (“may-lee”) Oztalay, CEO
SmartFinds Marketing
Direct: +1 (248) 568-2241
https://smartfindsmarketing.com
https://www.linkedin.com/in/melihoztalay

--

Jana L. Ecker

Planning Director
City of Birmingham
248-530-1841

City of Birmingham
A Walkable Community

MEMORANDUM

Planning Department

DATE: **January 22, 2020**

TO: **Planning Board**

FROM: **Brooks Cowan, City Planner**

SUBJECT: **34350 Woodward & 907-911 Haynes Street Fred Lavery Special Land Use Permit amendment (SLUP) for lot combination and site plan amendment**

Executive Summary

The subject properties are located at 34350 Woodward and 907-911 Haynes Street. Both parcels are zoned B-2, General Business. 34350 Woodward is zoned MU-7 in the Triangle Overlay District while 907-911 Haynes Street is zoned MU-5. Auto sales agencies require a Special Land Use Permit to operate in the B2 District, which can be obtained as long as long as they meet their obligations required by the City. The applicant, Fred Lavery Company, received a Special Land Use Permit in 2010 to operate a Porsche car dealership within the B2 Zone and MU-7 Triangle District Overlay at 34350 Woodward.

In 2016, the applicant received a temporary SLUP amendment to use the Haynes property as an office for the Porsche sales and management team for one year while renovations were made to the Porsche dealership at 34350 Woodward. Conditions of approval were that the applicant could not have cars for sale parked on 907-911 Haynes Street and that the applicant provide proof of adequate parking lot landscaping. It appears as though the applicant has continued to store cars at the 907-911 Haynes location.

The applicant is proposing to demolish the two story building on Haynes Street and construct a surface parking lot to accommodate a larger fleet of cars for sale. The Birmingham Zoning Ordinance requires that the applicant obtain a Special Land Use Permit Amendment and approval from the City Commission to expand the auto sales agency use. Accordingly, the applicant will be required to obtain a recommendation from the Planning Board on the Final Site Plan and Special Land Use Permit amendment, and then obtain approval from the City Commission for the Final Site Plan and Special Land Use Permit amendment. **A lot combination will also be required to be approved by the City Commission.**

1.0 Land Use and Zoning

1.1 Existing Land Use – 34350 Woodward is a single story building used as a Porsche Dealership. 907-911 Haynes contains a two-story building where the first floor is unoccupied and the second floor is used as a spa.

1.2 Existing Zoning – Both properties are zoned B-2, Business-Residential. 34350 Woodward is zoned MU-7 in the Triangle Overlay District while 907-911 Haynes is zoned MU-5. The existing use and surrounding uses appear to conform to the permitted uses of each Zoning District.

1.3 Summary of Land Use and Zoning - The following chart summarizes existing land use and zoning adjacent to and/or in the vicinity of the subject site.

	North	**South**	**East**	**West**
Existing Land Use	Office	Retail/ Commercial (Walgreens)	Commercial (Goodwin & Scieszka Law)	Woodward Ave & Elm St Intersection
Existing Zoning District	B-2, General Business	B-2, General Business	B-2, General Business	B-2, General Business
Triangle Overlay Zoning District	MU-3	MU-7/MU-5	MU-5	MU-3

1.4 Proposed Use – The proposed use that would remain at 34350 Woodward is permitted within the MU-7 zoning district with a Special Land Use Permit. At this time, the applicant is requesting approval of a SLUP Amendment for 34350 Woodward to expand the use of the auto sales agency by expanding the parking lot to be used for storage and display of vehicles for sale to include the site at 907-911 Haynes Street.

2.0 Screening and Landscaping

2.1 Screening –All parking facilities must be screened in accordance with Article 4, section 4.53 of the Zoning Ordinance. A minimum 32" masonry screen wall is required. The applicant is proposing a new concrete wall to align with and match the existing concrete screen wall with a maximum height of 36" along Haynes Street. The existing brick screen wall in the northeast corner of the property is proposed to remain.

The length of the new proposed screenwall is not provided, although it appears to be longer than 50 feet. Article 4, Section 4.54(B)(5) requires a break in the screenwall every 50-100 feet. **The applicant must submit plans indicating a break in the screenwall to reduce the length of the gray concrete screening.**

The site plan also indicates a new DC battery charging box in the front of the property along Haynes Street that will be screened by Juniper Evergreens ranging from four to six feet in height.

2.2 Landscaping– There are no proposed landscape changes to the site at 34350 Woodward. This portion of the site plan has a landscaped display court with Pleached Linden trees along Elm Street. Changes to landscaping for 907-911 Haynes are proposed which includes a new landscaping bed along Haynes with new trees.

The size of the parking area exceeds 7,500 sq. ft. (approximately 29,000 sq ft after demolition), therefore the applicant must provide landscaping that equals 5% of the parking lot size. (29,000 * 0.05= 1,450 square feet of required landscaping). The applicant has proposed 2,575 square feet of landscape coverage, thus satisfying the coverage requirement.

Article 04 section 4.20 LA-01 states that the interior planting areas shall be located in a manner that breaks the expanse of paving throughout the parking lot interior. Each interior planting area shall be at least 150 square feet in size, and not less than 8 feet in any single dimension. **The proposed landscaping is only located on the edges of the property, and does not break up the expanse of the parking lot interior. The applicant must place landscaping plantings no smaller than 150 square feet, and not less than 8 feet in any single dimension throughout the parking lot in a manner that breaks the expanse of paving throughout the parking lot interior, or obtain a variance from the Board of Zoning Appeals.**

Article 04 section 4.20 LA-01 also states there shall be at least one canopy tree for each 150 square feet or fraction thereof of interior planting area required. The applicant is required to provide 10 canopy trees (1,450 /150 = 10) within the parking lot area, or obtain a variance from the Board of Zoning Appeals. The applicant has proposed 13 trees which satisfies the requirement. Seven of these trees are existing along the sides of the property which include two Katsura trees and five Pear trees. Five new trees are proposed along the front of the property which include two Pear trees and three Katsura trees while a Weeping Cherry tree will be transplanted on site.

3.0 Parking, Loading, Access, and Circulation

3.1 Parking – The Porsche showroom area is 5,730 square feet while the service area has three service bays. The applicant is required to provide one parking space for each 300 sq. ft. of floor area of sales room plus one space for each auto service stall, not to be used for new or used car storage. Accordingly, the applicant is required to provide a total of 22 spaces on site. The applicant has proposed a total of 66 parking spaces, with 23 parking spaces on the current 34350 Woodward site and a proposed 43 parking spaces on 907-911 Haynes. **The Zoning Ordinance requires that the 22 parking spaces required be available for employees**

and customers of the business for 34350 Woodward, and cannot be used as car storage for dealership inventory.

The applicant has also provided 3 bike racks which satisfies the Zoning Ordinance requirements of 1 for every 3000 square feet of building area.

3.2 Loading – The applicant has indicated there is an existing loading area on the east side of the Porsche dealership which is enclosed by an 8' fence that screens the area from the right-of-way, therefore satisfying the Zoning Ordinance requirement of one loading space for a commercial use between 5,001-20,000 square feet.

3.3 Vehicular Access & Circulation - Vehicular access to the Porsche dealership on 34350 Woodward has two curb cuts for ingress and egress, one on Elm Street and one on Haynes Street. The applicant has indicated one curb cut for ingress and egress at the proposed parking lot expansion on 907-911 Haynes. The site plan also indicates a two-way access drive connecting the current dealership to the proposed parking lot.

An existing curb cut on 907-911 Haynes Street will be replaced with new sidewalk and street curb installed.

3.4 Pedestrian Access & Circulation –Pedestrian access is via sidewalks along Haynes and Elm. A pedestrian sidewalk connects the dealership entrance to the City sidewalk on Elm Street. The site plan does not indicate a pedestrian walkway from either curb cut along Haynes Street. **The applicant must submit plans indicating a pedestrian path through the parking lot at 907-911 Haynes Street where the screen wall opening is placed.**

3.5 Streetscape – This site is located within the Triangle District, which states that the sidewalk environment should accommodate ample space for pedestrians, street furniture and prominent storefronts. The Plan also states that there should be ample space for sidewalk cafés, street trees, pedestrian scale lights, benches and other elements in order to create a comfortable pedestrian experience

The applicant is not proposing any changes to the existing streetscape surrounding the current Porsche dealership. The site plan indicates four new tree well locations in front of 907-911 Haynes with Ginko Biloba trees planted and tree grates per Triangle District Standards. The proposed Haynes Street frontage will be 353 feet which will require 9 total street trees, therefore the applicant has satisfied this requirement.

The site plan also indicates two new benches and a trash receptacle in front of 907-911 Haynes Street that appear to be the same type and make as the existing benches and trash receptacles in front of the dealership at 34350 Woodward. Three new bike racks along the sidewalk are also proposed.

Five new Lumenton Street Light Models PT90 pedestrian scale street lights are proposed in front of 907-911 Haynes Street to match existing street lights and conform to the Triangle District Standards.

4.0 Lighting

The applicant is not proposing any lighting changes to the current dealership at 34350 Woodward Haynes. The site plan for 907-911 Haynes indicates four new light poles to illuminate the proposed parking lot. The Proposed lights are Tru-Tribute pulse start metal halide 100-400 watt full-cutoff luminaires. Light pole plans indicate a height of 16 feet which satisfies the ordinance.

The photometric plan for the proposed parking lot indicates a foot-candle ratio of 13.63 within the circulation area which satisfies the requirements of 20 or less in Article 4, Section 4.21(F)(3).

5.0 Departmental Reports

6.1 Engineering Division – Engineering Division has not yet provided comments, but will do so prior to the meeting on January 22, 2020.

6.2 Department of Public Services – No concerns were reported.

6.3 Fire Department – Fire Department has not yet provided comments, but will do so prior to the meeting on January 22, 2020.

6.4 Police Department - No concerns were reported from the Police Dept.

6.5 Building Division – The additional parking spaces will require another accessible parking space be provided in addition to the two existing. One of the three will need to be van accessible.

6.0 Design Review

The applicant has proposed to remove the two-story building at 907-911 Haynes Street to make way for a 43 space surface parking lot. The parking lot will be surrounded by a concrete screenwall and additional landscaping. The parking lot will be accommodated with new AC & DC charging stations for vehicles.

No changes to the existing Porsche Dealership building at 34350 Woodward are proposed at this time. The site plan does indicate a new access drive connecting 34350 Woodward to 907-911 Haynes. See Figure 1 for an aerial of this area.

7.0 Signage Review

No changes or additions to the signage have been proposed. The applicant currently has signs advertising "Fred Lavery", "PORSCHE", a Porsche logo wall sign, and a Porsche logo ground sign.

8.0 Birmingham Triangle District

The opening paragraph for the Triangle District Plan states, *"The Triangle District is a stage for bold and distinctive architecture that creates a unique identity for the neighborhood and City. Building masses are the primary features, replacing the bleak parking lots that currently dominate the landscape" (pg. 1).*

In regards to the Development Plan Summary*, "Infill development and redevelopment is recommended to create a distinct character for the Triangle District while complementing the Downtown and surrounding neighborhoods," (pg. 4).*

The Triangle District Plan advocates for an increase in building density to replace the large surface parking areas that currently exist. Demolishing a two-story building to make way for a larger surface parking lot appears to be counterproductive to what the Triangle District Plan recommends.

In regards to the recommended Worth Street Plaza and Worth Street realignment, the subject site faces the suggested urban plaza which is recommended to be *"… an island of activity bounded by tree-lined sidewalks and brick lined local streets, and enclosed by five to seven story buildings, (pg. 10).* **Constructing a 43-space surface parking lot to serve an expanding car dealership does not appear to meet the intent of the Triangle District Plan's vision for the spaces surrounding Worth Plaza.**

In regards to rerouting Worth Street, the *Circulation* section of the Triangle District Plan states:

> *Currently Worth Street ends at Haynes Street. This prevents circulation between the Triangle District's northern and southern halves. Worth should be realigned parallel to Woodward Avenue and extended to Bowers. This will improve north/south interior connectivity with the Triangle District and better link the north and south halves of the District, which will help support redevelopment of the area. This road reconfiguration will also allow the creation of Worth Plaza in the heart of the Triangle District. The alignment of Worth Street will be through the rear of the Borders (Now Walgreens) parking lot and buildings currently located between Bowers and Haynes.* ***Therefore Worth Street realignment will need to be done in conjunction with the development of a parking structure and redevelopment of the properties on the north side of Haynes. The specific alignment shown on this plan is conceptual and could be varied, provided the ultimate alignment created Worth Plaza (pg. 19).***

Phase I of the Triangle District Plan states that Worth Plaza is the centerpiece of the plan and also mentions the necessity of acquiring additional roadway right-of-way stating:

> *There are two key improvements that will be necessary precursors to the successful implementation of Phase I. They are the realignment of Worth Street to create the Worth Plaza open space and a substantial public or public-private parking deck. The reconfiguration Worth Street requires public acquisition of additional roadway right-of-way and includes the extension of Worth Street to Bowers (pg. 26).*
> See Figure 2 for Triangle District Urban Design Plan.

On February 3rd, 2012, a similar situation regarding Worth Street realignment on the rear property line of Walgreens was brought to City Commission. A condition of approval for the Walgreens SLUP was that Walgreens grant a portion of property to the City for future rerouting of Worth Street. An agreement was reached between the City and the property owner, hence the triangular pieice of propery on the east side of Walgreens which is now owned by the City of Birmingham. See Figures 1 & 3.

The Triangle District Plan recommends acquiring additional land for the Worth Street realignment during redevelopment of the properties on the north side of Haynes which would include this subject's application. 907-911 Haynes plays a crucial role in the realignment of Worth Street and connecting Worth Street to Bowers Street as the subject site is located in the Triangle District Urban Design Plan's Worth Street right-of-way extension.

Although the construction of a surface parking does not appear to meet the intent of the Triangle District Plan, permitting this parking lot construction with the condition that the applicant reach an agreement with the City regarding the Worth Street realignment and extension could serve as an important step towards implementing the goals of the Triangle District Plan.

Figure 1: Parcel Map and Aerial Image of Subject Properties:

Figure 2: Triangle District Urban Design Plan

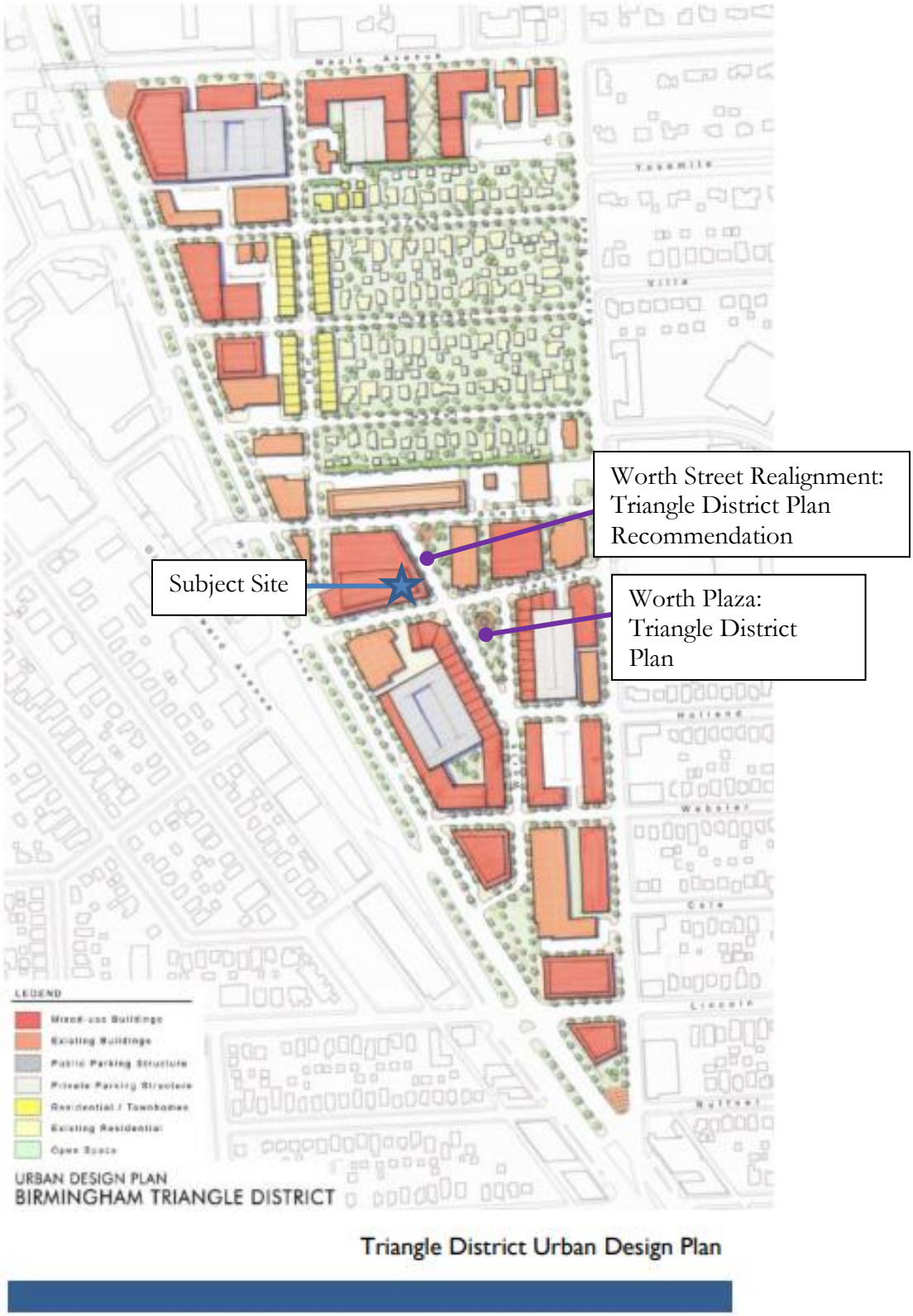


Figure 3: Current Parcel Outlines Overlaid on Triangle Design Plan

9.0 Approval Criteria for Final Site Plan

In accordance with Article 7, section 7.27 of the Zoning Ordinance, the proposed plans for development must meet the following conditions:

(1) The location, size and height of the building, walls and fences shall be such that there is adequate landscaped open space so as to provide light, air and access to the persons occupying the structure.

(2) The location, size and height of the building, walls and fences shall be such that there will be no interference with adequate light, air and access to adjacent lands and buildings.

(3) The location, size and height of the building, walls and fences shall be such that they will not hinder the reasonable development of adjoining property not diminish the value thereof.

(4) The site plan, and its relation to streets, driveways and sidewalks, shall be such as to not interfere with or be hazardous to vehicular and pedestrian traffic.

(5) The proposed development will be compatible with other uses and buildings in the neighborhood and will not be contrary to the spirit and purpose of this chapter.

(6) The location, shape and size of required landscaped open space is such as to provide adequate open space for the benefit of the inhabitants of the building and the surrounding neighborhood.

10.0 Approval Criteria for Special Land Use Permits

Article 07, section 7.34 of the Zoning Ordinance specifies the procedures and approval criteria for Special Land Use Permits. Use approval, site plan approval, and design review are the responsibilities of the City Commission. This section reads, in part:

> Prior to its consideration of a special land use application (SLUP) for an initial permit or an amendment to a permit, the **City Commission shall refer the site plan and the design to the Planning Board for its review and recommendation. After receiving the recommendation, the City Commission shall review the site plan and design of the buildings and uses proposed** for the site described in the application of amendment.
>
> The City Commission's approval of any special land use application or amendment pursuant to this section shall constitute approval of the site plan and design.

11.0 Suggested Action

Based on a review of the site plan submitted, as well as the goals and intent of the Triangle District Plan, the Planning Division recommends that the Planning Board RECOMMEND APPROVAL of the applicant's request for Final Site Plan and a SLUP amendment to allow the demolition of the building at 907-911 Haynes Street and for the property to be converted into a surface parking lot for car sales, with the condition that the applicant reach an agreement with the City of Birmingham to comply with the goals of the Triangle District Plan, including but not limited to the accommodation of the Worth Street realignment.

12.0 Sample Motion Language

Based on a review of the site plan submitted, as well as the goals and intent of the Triangle District Plan, the Planning Board RECOMMENDS APPROVAL of the applicant's request for Final Site Plan approval to allow the demolition of the 907-911 Haynes Street building and for the property to be converted into a surface parking lot for car sales with the following conditions;

1. The applicant reach an agreement with the City of Birmingham to comply with the goals of the Triangle District Plan, including but not limited to the accommodation of the Worth Street realignment;
2. The applicant obtain lot combination approval from City Commission; and
3. The applicant break up the expanse of the parking lot with various landscaping islands.
4. The applicant provide a break in the new screenwall;
5. The applicant provide a pedestrian pathway through the lot currently at 907-911 Haynes where the new screenwall opening is placed; and
6. The applicant ensures that 22 of the parking spaces are used for employee and customer parking only and not used for the storage of new or used vehicles for sale, lease or repair.

AND

Based on a review of the site plan submitted, as well as the goals and intent of the Triangle District Plan, the Planning Board RECOMMENDS APPROVAL of the applicant's request for a Special Land Use Permit amendment to allow the demolition of the 907-911 Haynes Street building and for the property to be converted into a surface parking lot for car sales with the following conditions;

1. The applicant reach an agreement with the City of Birmingham to comply with the goals of the Triangle District Plan, including but not limited to the accommodation of the Worth Street realignment;
2. The applicant obtain lot combination approval from City Commission; and
3. The applicant break up the expanse of the parking lot with various landscaping islands.
4. The applicant provide a break in the new screenwall;

5. The applicant provide a pedestrian pathway through the lot currently at 907-911 Haynes where the new screenwall opening is placed; and
6. The applicant ensures that 22 of the parking spaces are used for employee and customer parking only and not used for the storage of new or used vehicles for sale, lease or repair.

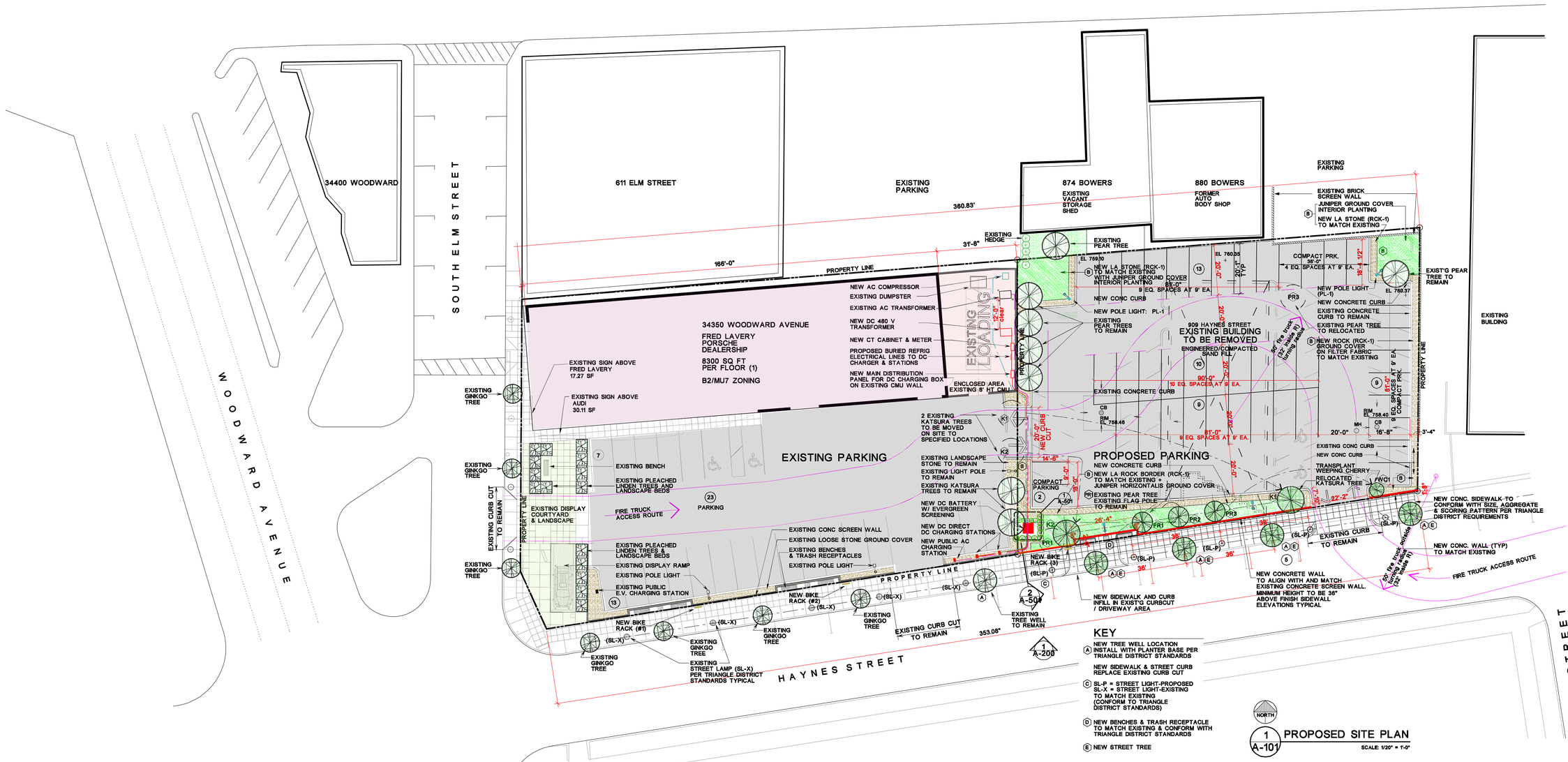
OR

Based on a review of the site plan submitted, the Planning Board RECOMMENDS DENIAL of the applicant's request for Final Site Plan and a SLUP Amendment to allow the demolition of the 907-911 Haynes Street building and for the property to be converted into a surface parking lot for car sales for the following reasons:

1. _____
2. _____
3. _____
4. _____
5. _____

OR

Motion to POSTPONE the Final Site Plan and SLUP Amendment to the City Commission for Lavery Porsche at 34350 Woodward & 907-911 Haynes, with the following conditions:



seal:

Luckenbach Ziegelman Gardner Architects PLLC

555 South Old Woodward Suite 27L
Birmingham, Michigan 48009
248.644.0600

project:

Fred Lavery PORSCHE

Special Land Use Permit Review

835 Haynes Street
Birmingham, Michigan

sheet title:

PROPOSED SITE PLAN FOR SPECIAL LAND USE PLANNING AMENDMENT

date issued:

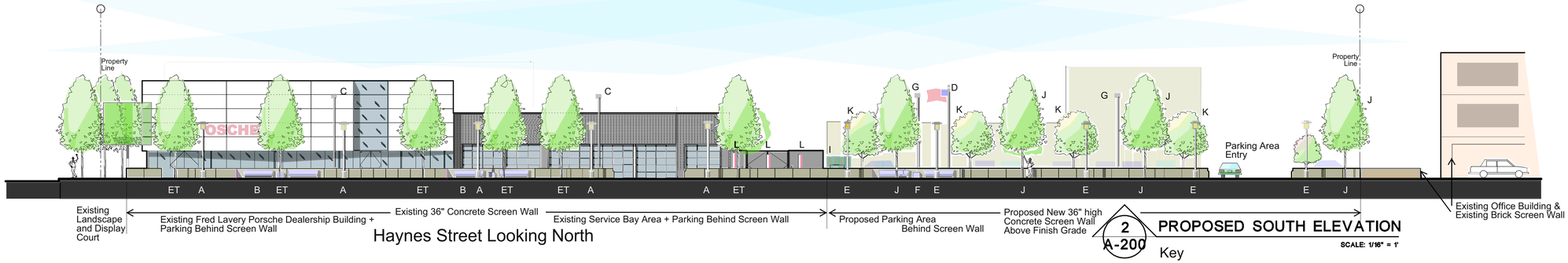
09.23.2019	OWNER REVIEW
09.29.2019	OWNER REVIEW
10.14.2019	OWNER REVIEW
10.16.2019	OWNER REVIEW

project number:

LZG 2019.0025

sheet number:

A-101



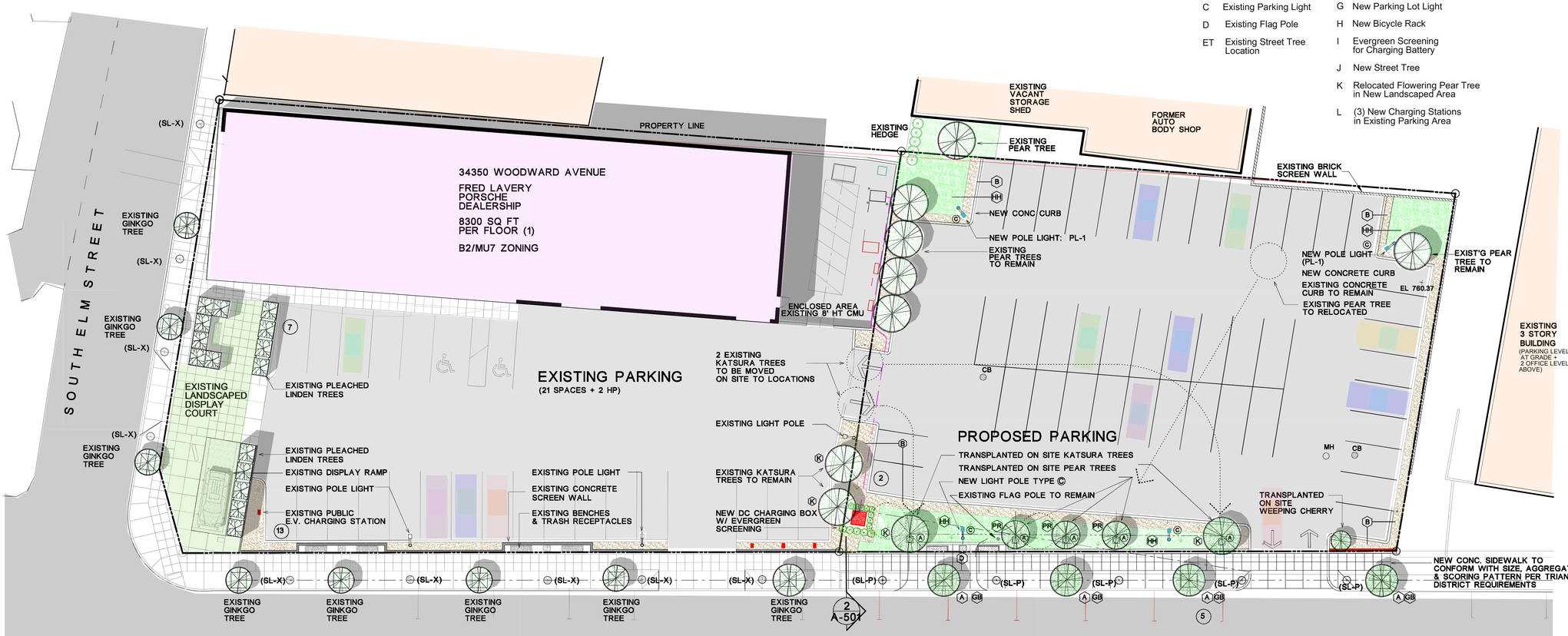
Haynes Street Looking North

2 A-200 **PROPOSED SOUTH ELEVATION**

SCALE: 1/16" = 1'

Key

A	Existing Street Light	E	New Street Light
B	Existing Bench Seating	F	New Bench/Seating
C	Existing Parking Light	G	New Parking Lot Light
D	Existing Flag Pole	H	New Bicycle Rack
ET	Existing Street Tree Location	I	Evergreen Screening for Charging Battery
		J	New Street Tree
		K	Relocated Flowering Pear Tree in New Landscaped Area
		L	(3) New Charging Stations in Existing Parking Area



NORTH

1 A/LA-200 **PROPOSED LANDSCAPE PLAN**

SCALE: 1/16" = 1'

LANDSCAPE KEY

- (A) NEW TREE WELL LOCATION INSTALL WITH PLANTER BASE PER TRIANGLE DISTRICT STANDARDS
- (GB) Gingko biloba "Autumn Gold"
- (B) EXISTING STONE (1" DIA) VOLCANIC STONE (Washed Decorative Stone: Midnight Granite)
- (D) NEW BENCHES & TRASH RECEPTACLE
- (HH) BLUE RUG JUNIPER (Juniperus horizontalis)
- (K) KATURA TREE (Existing - Transplanted on Site) (Cerdidiphyllum japonicum)
- (PR) FLOWERING PEAR TREE (Existing - Transplanted on Site - Pyrus sp)

LIGHTING KEY

- (A) Auralight 12V LED Micro well Uplight
- (B) SL-P SL-X Lumenton Street Light Model PT90 - 42W TO MATCH EXISTING (CONFORM TO TRIANGLE DISTRICT STANDARDS)
- (C) (PL-1) PARKING LIGHT POLE Cooper Lighting - Lumark Model MPTR (match existing)

seal:

Luckenbach Ziegelman Gardner Architects PLLC

555 South Old Woodward Suite 27L
Birmingham, Michigan 48009
248.644.0600

project:

Fred Lavery PORSCHE

Special Land Use Permit Review

835 Haynes Street
Birmingham, Michigan

sheet title:

PROPOSED AMMENDMENT TO SLUP LANDSCAPING PLAN + STREET ELEVATION

date issued:

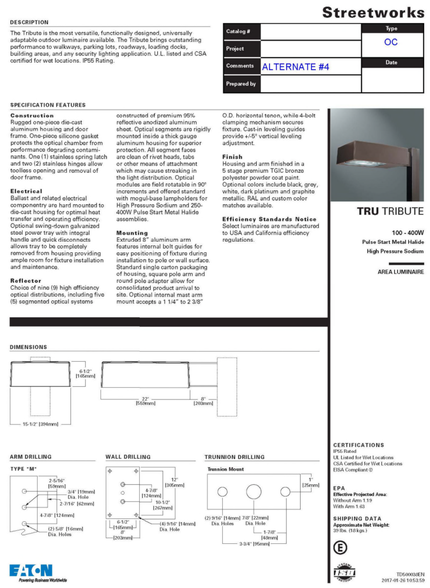
10.16.2019 OWNER REVIEW

project number:

LZG 2019.0025

sheet number:

A-200



Streetworks

DESCRIPTION

The Tribute is the most versatile, functionally designed, universally adaptable outdoor luminaire available. The Tribute brings outstanding performance to walkways, parking lots, roadways, loading docks, building areas, and any security lighting application. U.L. listed and CSA certified for wet locations. IP55 Rating.

		Type
Catalog #		OC
Project		
Comments	ALTERNATE #4	Date
Prepared by		

SPECIFICATION FEATURES

Construction
Rugged one-piece die-cast aluminum housing and door frame. One-piece silicone gasket protects the optical chamber from performance degrading contaminants. One (1) stainless spring latch and two (2) stainless hinges allow toolless opening and removal of door frame.

Electrical
Ballast and related electrical componentry are hunt mounted to die-cast housing for optimal heat transfer and operating efficiency. Optional swing-down galvanized steel power bay with integral hook and spacer assembly allows tray to be completely removed from housing providing ample room for fixture installation and maintenance.

Reflector
Choice of nine (9) high efficiency optical distributions, including five (5) segmented optical systems constructed of premium 95% reflective anodized aluminum sheet. Optical segments are rigidly mounted inside a thick gauge aluminum housing for superior protection. All segment faces are clean of rivet heads, tabs or other means of attachment which may cause streaking in the light distribution. Optical modules are field rotatable in 90° increments and offered standard with mogul-base lampholders for High Pressure Sodium and 250-400W Pulse Start Metal Halide assemblies.

Mounting
Extruded 6" aluminum arm features internal bolt guides for easy positioning of fixture during installation to pole or wall surface. Standard single carton packaging of housing, square pole arm and round pole adapter allow for consolidated product arrival to site. Optional internal mast arm mount accepts a 1 1/4" to 2 3/8" O.D. horizontal tenon, while 4-bolt clamping mechanism secures fixture. Cast-in leveling guides provide +/-5° vertical leveling adjustment.

Finish
Housing and arm finished in a 5 stage premium TGIC bronze polyester powder coat paint. Optional colors include black, grey, white, dark platinum and graphite metallic. RAL and custom color matches available.

Efficiency Standards Notice
Select luminaires are manufactured to USA and California efficiency regulations.

TRU TRIBUTE

100 - 400W
Pulse Start Metal Halide
High Pressure Sodium

AREA LUMINAIRE

DIMENSIONS

ARM DRILLING

TYPE "M"

WALL DRILLING

TRUNNION DRILLING

CERTIFICATIONS
IP65 Rated
UL Listed for Wet Locations
CSA Certified for Wet Locations
ESA Compliant ①

EPA
Effective Projected Area:
Without Arm: 1.19
With Arm: 1.43

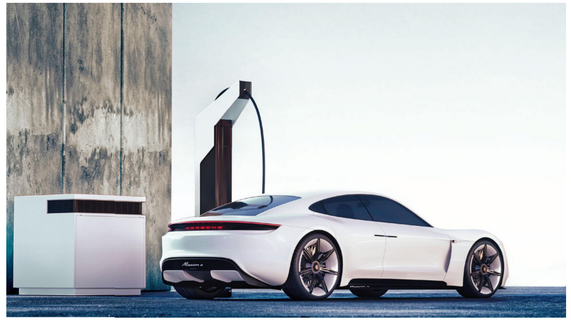
SHIPPING DATA
Approximate Net Weight:
28 lbs. (13 kgs.)

TD560003EN
2017-01-26 10:53:59

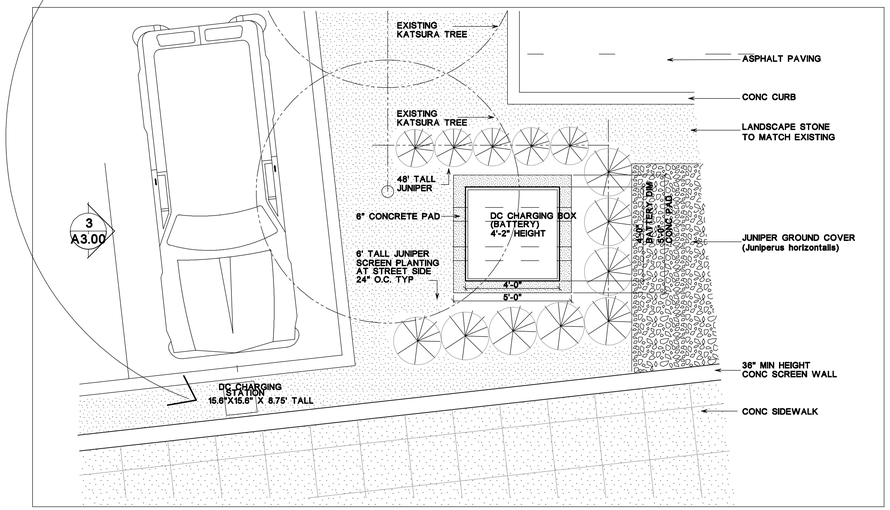
PARKING LIGHTING FIXTURE

3 A3.00 SCREEN WALL+PLANTING SECTION / ELEVATION AT CHARGING STATION SCALE: 1/2" = 1'

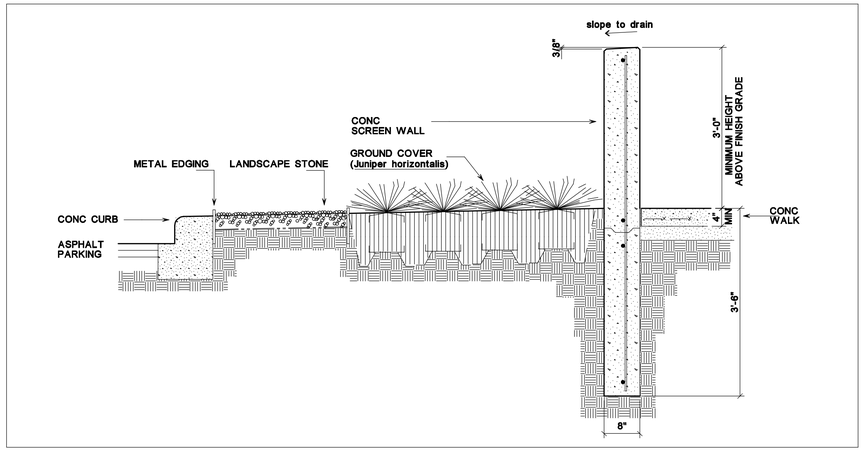
ABM DC CHARGING STATION



ABM DC CHARGING STATION + DC BATTERY



1 A3 DC CHARGING BATTERY AREA PLAN DETAIL SCALE: 1/2" = 1'



2 A3.00 SCREEN WALL+PLANTING SECTION DETAIL SCALE: 1/2" = 1'

seal:

Luckenbach Ziegelman Gardner Architects PLLC

555 South Old Woodward Suite 27L
Birmingham, Michigan 48009
248.644.0600

project:

Fred Lavery PORSCHE
Special Land Use Permit Review
835 Haynes Street
Birmingham, Michigan

sheet title:

PROPOSED SLUP AMENDMENT DETAILS

date issued:

10.17.2019 REVIEW

project number:

LZG 2019.0025

sheet number:

A-3.00

Streetworks

DESCRIPTION

The Tribute is the most versatile, functionally designed, universally adaptable outdoor luminaire available. The Tribute brings outstanding performance to walkways, parking lots, roadways, loading docks, building areas, and any security lighting application. U.L. listed and CSA certified for wet locations. IP55 Rating.

Catalog #		Type
Project		
Comments		Date
Prepared by		

SPECIFICATION FEATURES

Construction
Rugged one-piece die-cast aluminum housing and door frame. One-piece silicone gasket protects the optical chamber from performance degrading contaminants. One (1) stainless spring latch and two (2) stainless hinges allow toolless opening and removal of door frame.

Electrical
Ballast and related electrical componentry are hard mounted to die-cast housing for optimal heat transfer and operating efficiency. Optional swing-down galvanized steel power tray with integral handle and quick disconnects allows tray to be completely removed from housing providing ample room for fixture installation and maintenance.

Reflector
Choice of nine (9) high efficiency optical distributions, including five (5) segmented optical systems constructed of premium 95% reflective anodized aluminum sheet. Optical segments are rigidly mounted inside a thick gauge aluminum housing for superior protection. All segment faces are clean of rivet heads, tabs or other means of attachment which may cause streaking in the light distribution. Optical modules are field rotatable in 90° increments and offered standard with mogul-base lampholders for High Pressure Sodium and 250-400W Pulse Start Metal Halide assemblies.

Mounting
Extruded 8" aluminum arm features internal bolt guides for easy positioning of fixture during installation to pole or wall surface. Standard single carton packaging of housing, square pole arm and round pole adapter allow for consolidated product arrival to site. Optional internal mast arm mount accepts a 1 1/4" to 2 3/8" O.D. horizontal tenon, while 4-bolt clamping mechanism secures fixture. Cast-in leveling guides provide +/-5° vertical leveling adjustment.

Finish
Housing and arm finished in a 5 stage premium TGIC bronze polyester powder coat paint. Optional colors include black, grey, white, dark platinum and graphite metallic. RAL and custom color matches available.

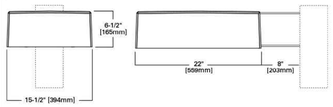
Efficiency Standards Notice
Select luminaires are manufactured to USA and California efficiency regulations.

TRU TRIBUTE

100 - 400W
Pulse Start Metal Halide
High Pressure Sodium

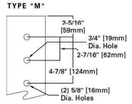
AREA LUMINAIRE

DIMENSIONS

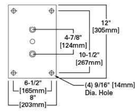


ARM DRILLING

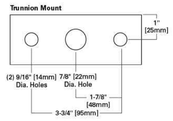
TYPE "M"



WALL DRILLING



TRUNNION DRILLING



CERTIFICATIONS
IP55 Rated
UL Listed for Wet Locations
CSA Certified for Wet Locations
EISA Compliant ®

EPA
Effective Projected Area:
Without Arm 1.19
With Arm 1.63

SHIPPING DATA
Approximate Net Weight:
39 lbs. (18 kgs.)

EATON
Powering Business Worldwide

TD500038EN
2017-01-26 10:53:59

1 A-700 PARKING LOT LIGHTING FIXTURES

landscapeforms

35 COLLECTION

Product Data Sheet

The 35 Collection is a family of site furniture elements with a youthful spirit and a mission to promote social life in outdoor spaces. Created in collaboration with frog, the design powerhouse renowned for the first Apple computer, 35 integrates forms from architecture and nature in outdoor furniture for the 21st century. The collection includes nine elements: Chill, an iconic chaise lounge; Mingle, a table with attached seats and its companion Shade, a colorful winged shade structure; the Sit four-legged bench and Stay cantilevered bench; Pitch, a litter receptacle with a lyrical shape; and three new high performance products: Signal, an innovative LED pedestrian and streetscape light; Guide, an illuminated bollard; and Loop, a bike rack with a twist. 35 Collection elements work together to create integrated design solutions, while each makes a strong design statement all its own. Aluminum and steel parts are powdercoat finished in sophisticated colors from Landscape Forms' Designer Palette.

Sit™ Bench

	STYLE	DEPTH	WIDTH	HEIGHT	PRODUCT WEIGHT
	backed bench	25"	74"	32"	210 lb
	backed bench 2 dividers	25"	74"	32"	220 lb
	backless bench	20"	69"	28"	192 lb
	backless bench 1 divider	20"	69"	28"	196 lb

- Sit benches are available in backed or backless styles; offered either surface mount or freestanding.
- All Sit benches have arms.
- The seat is perforated steel supported by steel tubing.
- The back is perforated aluminum supported by aluminum extrusions.
- On the backed bench, perforated aluminum side panels are welded to the end castings.
- Both benches have aluminum end castings.
- Freestanding glides are wear resistant non-marring plastic.
- Surface mounting plates are made of aluminum.
- Bench ships fully assembled.

Divider Options
- Optional divider is a contoured cast aluminum component that fits across the seat from back to front, and must be installed at the factory.
- A single divider leaves 32" of seating space on either side.
- Two dividers leave three 21" seating spaces.

Mounting Options
- Sit benches may be freestanding or surface mounted.
- All freestanding benches ship with wear resistant, non-marring glides.
- Surface mount style has factory installed plate with tab; tabs must be specified when ordered.
- Call for mounting recommendations.

Finishes
- All metal is finished with Landscape Forms' proprietary Panguard II polyester powdercoat, a hard yet flexible finish that resists rusting, chipping, peeling and fading.
- Call for standard color chart.

Recycled Content
- Sit has a recycled material content of 63% or greater of which 38 % is post consumer and 25% is post industrial.
- Sit is 100% recyclable.

To Specify
- Specify product name, model description and powdercoat color.
- Specify surface mount or freestanding.
- Select number of optional seat dividers.

BACKLESS FREESTANDING	BACKED SURFACE MOUNT	DETAIL OF PERF
		

U.S. Patent Nos. D 507,426; D 512,229

Landscape Forms, Inc. | 800.521.2546 | F 269.381.3455 | 7800 E. Michigan Ave., Kalamazoo, MI 49048

2 A-700 SIDEWALK BENCHES

landscapeforms

35 COLLECTION

Product Data Sheet




Pitch™

- Pitch is offered in side or top opening styles. Bowl/funnel ash option available with side opening litter.
- These durable units feature a lift-off polyethylene top that allows easy access to the liner.
- Black polyethylene liner is made of 100% recycled material.
- All units can be installed freestanding or surface mounted.
- Heavy, stable cast iron base, coordinates with the perforated aluminum sides.
- Shipped fully assembled, with freestanding glides.

Finishes
- All metal is finished with Landscape Forms' proprietary Panguard II polyester powdercoat, a hard yet flexible finish that resists rusting, chipping, peeling and fading.
- Call for standard color chart.
- Pitch lid is formed of rotationally-molded polyethylene, easy to lift and clean, and attached with a cable to the body.

Recycled Content
- Pitch has a recycled material content of 52% and is 100% recyclable.

Note: Unit is emptied by lifting trash bag from top.

To Specify
- Specify product name, model description and powdercoat color.
- Select rotationally molded polyethylene color for lid.
- Lid is not available in millstone.

Note: Unit is emptied by lifting trash bag from top.

	STYLE	DEPTH	WIDTH	HEIGHT	PRODUCT WEIGHT
	top-opening liner receptacle 32 gallon capacity	25"	25"	33"	175 lb
	side-opening liner receptacle 28 gallon capacity	25"	25"	35"	170 lb
	side-opening liner receptacle bowl/funnel option	25"	25"	35"	171 lb
18" square footprint					

U.S. Patent No. D 536,148

Landscape Forms, Inc. | 800.521.2546 | F 269.381.3455 | 7800 E. Michigan Ave., Kalamazoo, MI 49048

2 A-700 SIDEWALK TRASH RECEPTACLES

seal:

Luckenbach
Ziegelman
Gardner
Architects
PLLC

555 South Old Woodward Suite 27L
Birmingham, Michigan 48009
248.644.0600

project:
LAVERY
PORSCHE

sheet title:
SPEC SHEETS

date issued:

REVIEW 10.16.2019

project number:

sheet number:
A-4.00

VIEW FROM HAYNES ST.

VIEW FROM BOWERS ST.

VIEW FROM HAYNES ST.

LOOKING WEST ON HAYNES ST.

LOOKING EAST FROM PORSCHE BUILDING TO BARDHA BUILDING

Luckenbach Ziegelman Architects PLLC

39800 Woodward Suite 100
Bloomfield Hills, Michigan 48304
248.644.0600

Project
LAVERY PORSCHE

BIRMINGHAM, MI.

Sheet Title

Date Issued
REVIEW 10.17.2019

Project Number
1007

Sheet Number
A 5.00

HAYNES STREET

LOOKING NORTH ON HAYNES STREET

Seal

Luckenbach Ziegelman Architects PLLC

36800 Woodward Suite 100
Bloomfield Hills, Michigan 48304
248.644.0600

Project

LAVERY PORSCHE

BIRMINGHAM, MI.

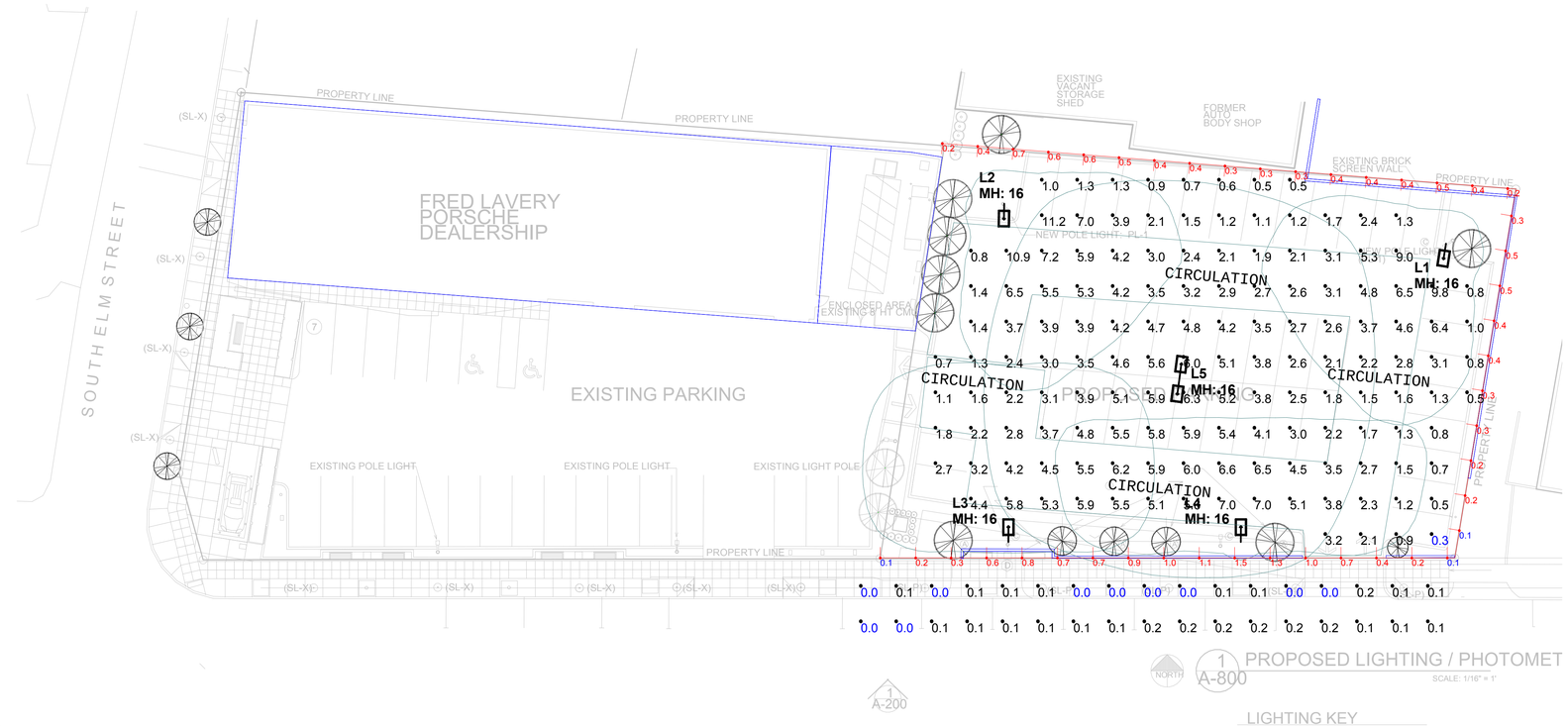
Sheet Title

Date Issued

Project Number

Sheet Number

A 600



Scale: 1 inch= 20 Ft.

Luminaire Schedule						
Symbol	Qty	Label	LLF	Description	Lum. Watts	Lum. Lumens
	1	L1	0.900	GLEON-AF-02-LED-E1-SLR	113	10949
	1	L2	0.900	GLEON-AF-02-LED-E1-SLL	113	10949
	1	L3	0.900	GLEON-AF-02-LED-E1-SL4-HSS	113	10111
	1	L4	0.900	GLEON-AF-02-LED-E1-SL3-HSS	113	10644
	1	L5	0.900	GLEON-AF-02-LED-E1-5WQ	113	13123

Calculation Summary					
Label	Units	Avg	Max	Min	Max/Min
Beyond Front Setback	Fc	0.09	0.2	0.0	N.A.
Parking Lot Overall	Fc	3.53	11.2	0.3	37.33
Property Line	Fc	0.50	1.5	0.1	15.00
Circulation	Fc	3.84	10.9	0.8	13.63

PARKING LOT AND CIRCULATION CALCULATION POINTS TAKEN AT GRADE (HORIZONTAL).

PROPERTY LINE CALCULATION POINTS TAKEN AT 6'-0" ABOVE GRADE AIMED VERTICALLY.

10-23-19
11-07-19

REVISION
REVISION NO. 1
REVISION NO. 2

CLARUS
LIGHTING & CONTROLS
30775 Barrington St.
Madison Heights, MI 48071
P: 248.677.0850
F: 248.677.0512
E: info@clarus-lighting.com

PROJECT TITLE
FRED LAVERY PORSCHE
BIRMINGHAM, MI

SHEET TITLE
PHOTOMETRIC CALCULATION
PARKING LOT ADDITION
GALLEON SERIES

DATE
11-07-19
PROJECT No.
CLC19-67304
SHEET No.
L201

POLE SPECIFICATIONS			
NO.	COMPONENT	ASTM DESIGNATION	MIN. YIELD (P.S.I)
1.	POLE SHAFT	A-500 GR. B	46,000
2.	BASE PLATE	A36	36,000
3.	ANCHOR BOLTS	F1554 GR. 55	55,000
4.	GALVANIZED HARDWARE	A153	-

FINISH SPECIFICATIONS
POLES SHALL HAVE A POLYESTER POWDER COAT FINISH IN A STANDARD COLOR.

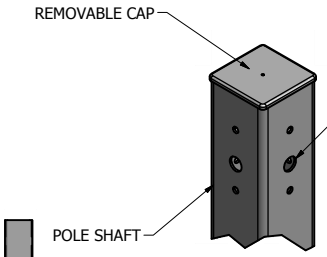
POLE DIMENSIONS				
POLE HGT (FT.)	TOP SQ. SIZE (IN.)	BOT. SQ. SIZE (IN.)	GAGE	MTG. HGT. (FT.)
14'	4.00	4.00	11 GAGE	14'

POLE DIMENSIONS			
BOLT CIRCLE (IN.)	BASE PLATE DIM. (IN.)	BOLT HOLE (IN.)	PLATE THK. (IN.)
8.00-9.00	8.00 SQ	1.00	.75

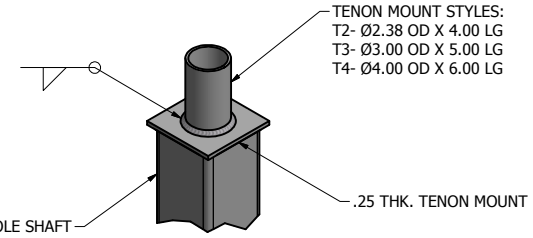
ANCHOR BOLT DIMENSIONS	
ANCHOR BOLT DIA. (IN.)	ANCHOR BOLT LENGTH (IN.)
.75	20.00

ALLOWABLE WIND LOADING (SQ. FT.)				
WIND*	80 MPH	90 MPH	100 MPH	120 MPH
EPA	16.6	13.5	10.9	7.7

*WITH 1.3 GUST FACTOR

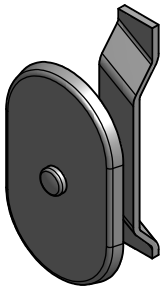


DRILL MOUNT OPTIONS

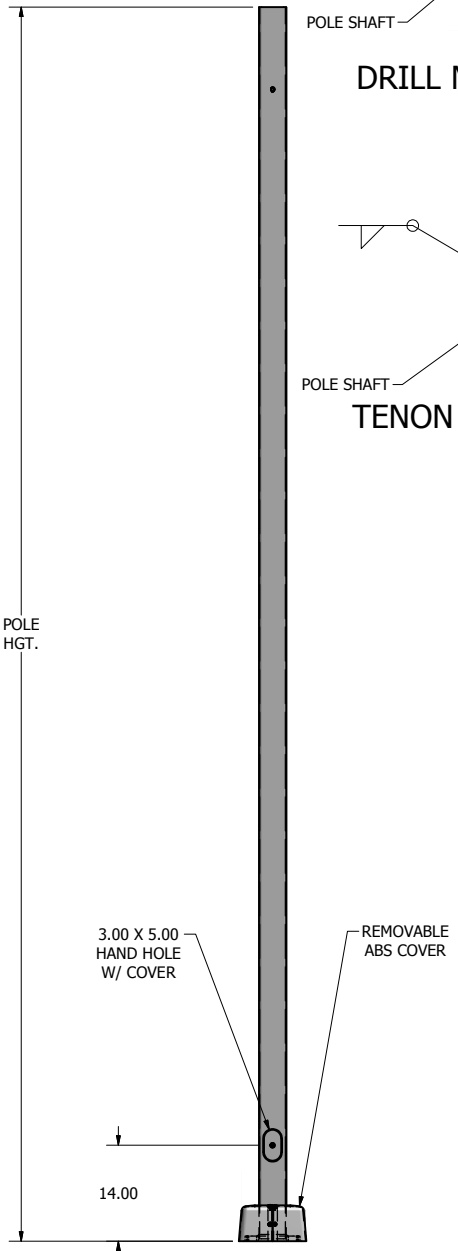


TENON MOUNT OPTIONS

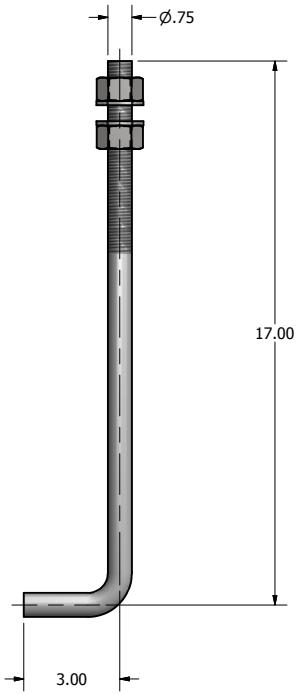
13'-6" TALL



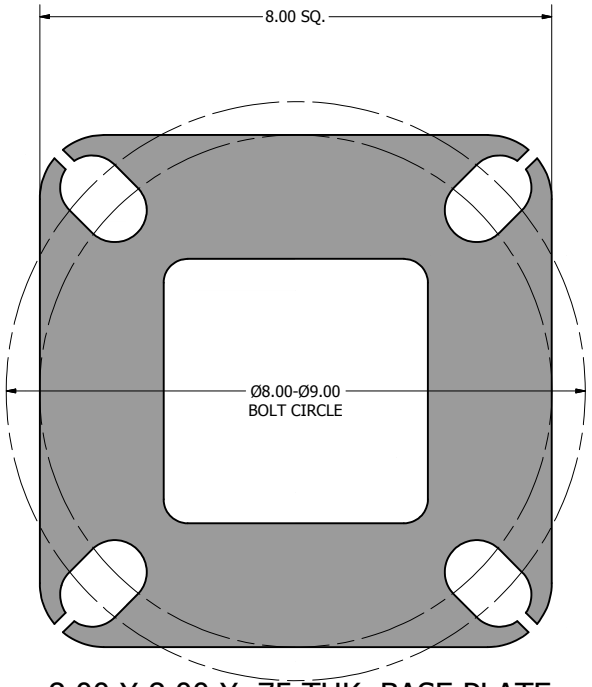
3.00 X 5.00 HAND HOLE COVER



POLE DETAIL



Ø.75 X 20.00 ANCHOR BOLT



8.00 X 8.00 X .75 THK. BASE PLATE

SOME GEOGRAPHICAL AREAS HAVE SPECIAL WIND CONDITIONS THAT CAN CREATE WIND INDUCED VIBRATIONS CAUSING A FATIGUE PROBLEM. NO METHOD HAS YET BEEN FOUND FOR PREDICTING DESTRUCTIVE LIGHTING POLE VIBRATION. THESE CONDITIONS ARE UNIQUE AND CANNOT BE GUARANTEED AGAINST, AND ARE THE RESPONSIBILITY OF A LOCAL SITE ENGINEER.

TITLE:

CATALOG:

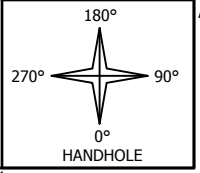
DWG NO: CPS-1-4011-14

SIZE: C

SHEET 1 OF 1

GENERAL STRUCTURES INC
A DWI COMPANY
23171 Groesbeck Hwy.
Warren, MI 48089
P: (586) 774-6105 | F: (586) 774-5706
www.generalstructuresinc.com

DRAWN: M. HARVALA	2/20/2015		
CHECKED		DATE:	
REVISION:			
APPROVED:			
QUOTE:			
S.O.#			SCALE: NONE
REF:			



McGraw-Edison

DESCRIPTION

The Galleon™ LED luminaire delivers exceptional performance in a highly scalable, low-profile design. Patented, high-efficiency AccuLED Optics™ system provides uniform and energy conscious illumination to walkways, parking lots, roadways, building areas and security lighting applications. IP66 rated and UL/cUL Listed for wet locations.

OVERALL
MOUNTING HEIGHT
16'-0" A.F.G.

Catalog #		Type
Project	FRED LAVERY PORSCHE	L1
Comments		Date
Prepared by		

SPECIFICATION FEATURES

Construction
Extruded aluminum driver enclosure thermally isolated from Light Squares for optimal thermal performance. Heavy-wall, die-cast aluminum end caps enclose housing and die-cast aluminum heat sinks. A unique, patent pending interlocking housing and heat sink provides scalability with superior structural rigidity. 3G vibration tested and rated. Optional tool-less hardware available for ease of entry into electrical chamber. Housing is IP66 rated.

Optics
Patented, high-efficiency injection-molded AccuLED Optics technology. Optics are precisely designed to shape the distribution maximizing efficiency and application spacing. AccuLED Optics create consistent distributions with the scalability to meet customized application requirements. Offered standard in 4000K (+/- 275K) CCT 70 CRI. Optional 3000K, 5000K and 6000K CCT.

Electrical
LED drivers are mounted to removable tray assembly for ease of maintenance. 120-277V 50/60Hz, 347V 60Hz or 480V 60Hz operation. 480V is compatible for use with 480V Wye systems only. Standard with 0-10V dimming. Shipped standard with Eaton proprietary circuit module designed to withstand 10kV of transient line surge. The Galleon LED luminaire is suitable for operation in -40°C to 40°C ambient environments. For applications with ambient temperatures exceeding 40°C, specify the HA (High Ambient) option. Light Squares are IP66 rated. Greater than 90% lumen maintenance expected at 60,000 hours. Available in standard 1A drive current and optional 600mA, 800mA and 1200mA drive currents (nominal).

Mounting
STANDARD ARM MOUNT: Extruded aluminum arm includes internal bolt guides allowing for easy positioning of fixture during mounting. When mounting two or more luminaires at 90° and 120° apart, the EA extended arm may be required. Refer to the arm mounting requirement table. Round pole adapter included. For wall mounting, specify wall mount bracket option. QUICK MOUNT ARM: Adapter is bolted directly to the pole. Quick mount arm slide into place on the adapter and is secured via two screws, facilitating quick and easy installation. The versatile, patent pending, quick mount arm accommodates multiple drill patterns ranging from 1-1/2" to 4-7/8". Removal of the door on the quick mount arm enables wiring of the fixture without having to access the driver compartment. A knock-out enables round pole mounting.

Finish
Housing finished in super durable TGIC polyester powder coat paint, 2.5 mil nominal thickness for superior protection against fade and wear. Heat sink is powder coated black. Standard housing colors include black, bronze, grey, white, dark platinum and graphite metallic. RAL and custom color matches available.

Warranty
Five-year warranty.

GLEON
GALLEON LED

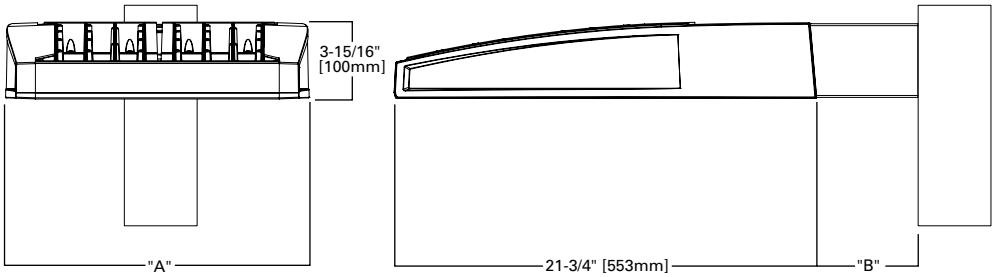
1-10 Light Squares
Solid State LED

AREA/SITE LUMINAIRE

LumenSafe Technology
CLICK HERE

WaveLinx

DIMENSIONS



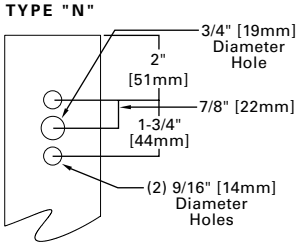
DIMENSION DATA

Number of Light Squares	"A" Width	"B" Standard Arm Length	"B" Optional Arm Length [1]	Weight with Arm (lbs.)	EPA with Arm [2] (Sq. Ft.)
1-4	15-1/2" (394mm)	7" (178mm)	10" (254mm)	33 (15.0 kgs.)	0.96
5-6	21-5/8" (549mm)	7" (178mm)	10" (254mm)	44 (20.0 kgs.)	1.00
7-8	27-5/8" (702mm)	7" (178mm)	13" (330mm)	54 (24.5 kgs.)	1.07
9-10	33-3/4" (857mm)	7" (178mm)	16" (406mm)	63 (28.6 kgs.)	1.12

NOTES: 1. Optional arm length to be used when mounting two fixtures at 90° on a single pole. **2.** EPA calculated with optional arm length.

DRILLING PATTERN

TYPE "N"



CERTIFICATION DATA
3G Vibration Rated
DesignLights Consortium® Qualified*
IP66 Rated
ISO 9001
LM79 / LM80 Compliant
UL/cUL Wet Location Listed

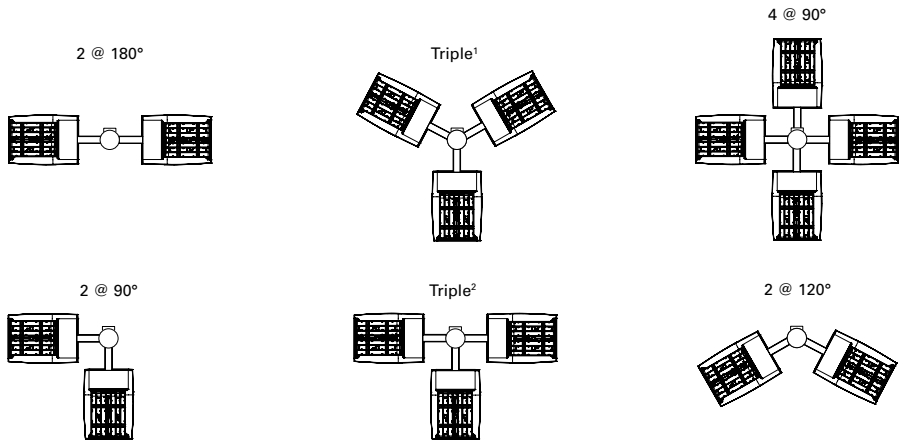
ENERGY DATA
Electronic LED Driver
>0.9 Power Factor
<20% Total Harmonic Distortion
120V-277V 50/60Hz
347V, 480V 60Hz
-40°C Min. Temperature
40°C Max. Temperature
50°C Max. Temperature (HA Option)

*www.designlights.org

Powering Business Worldwide

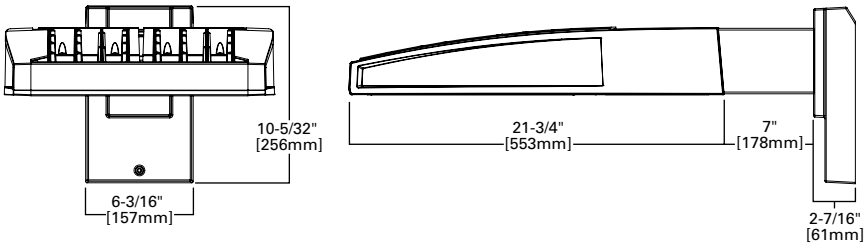
ARM MOUNTING REQUIREMENTS

Configuration	90° Apart	120° Apart
GLEON-AF-01	7" Arm (Standard)	7" Arm (Standard)
GLEON-AF-02	7" Arm (Standard)	7" Arm (Standard)
GLEON-AF-03	7" Arm (Standard)	7" Arm (Standard)
GLEON-AF-04	7" Arm (Standard)	7" Arm (Standard)
GLEON-AF-05	10" Extended Arm (Required)	7" Arm (Standard)
GLEON-AF-06	10" Extended Arm (Required)	7" Arm (Standard)
GLEON-AF-07	13" Extended Arm (Required)	13" Extended Arm (Required)
GLEON-AF-08	13" Extended Arm (Required)	13" Extended Arm (Required)
GLEON-AF-09	16" Extended Arm (Required)	16" Extended Arm (Required)
GLEON-AF-10	16" Extended Arm (Required)	16" Extended Arm (Required)

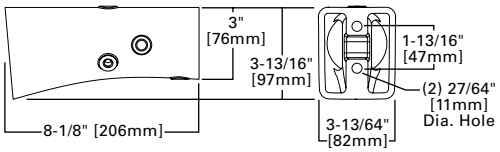


NOTES: 1 Round poles are 3 @ 120°. Square poles are 3 @ 90°. **2** Round poles are 3 @ 90°.

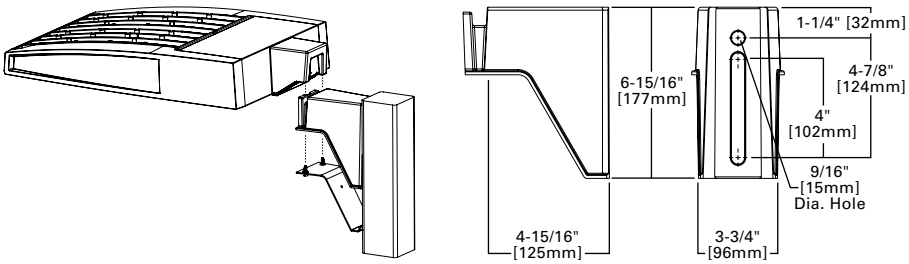
STANDARD WALL MOUNT



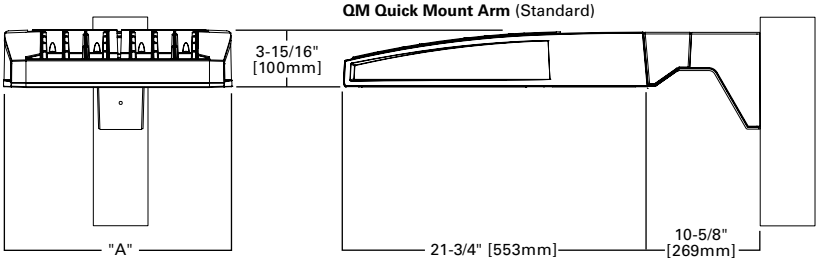
MAST ARM MOUNT



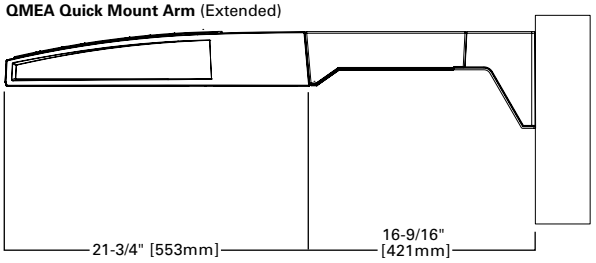
QUICK MOUNT ARM (INCLUDES FIXTURE ADAPTER)



QM Quick Mount Arm (Standard)



QMEA Quick Mount Arm (Extended)

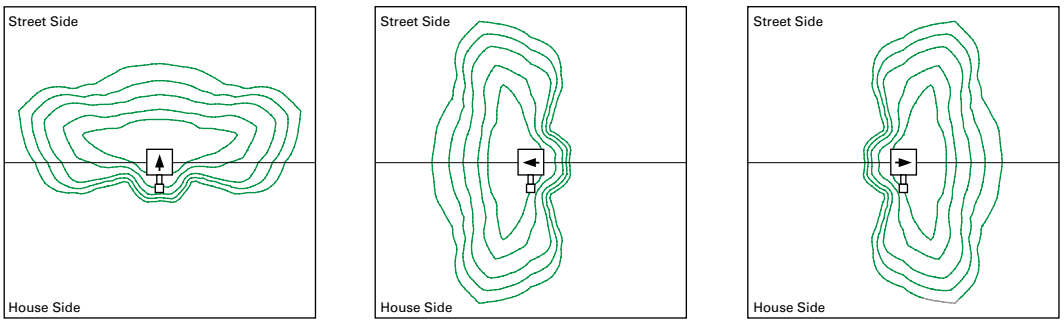


QUICK MOUNT ARM DATA

Number of Light Squares [1, 2]	"A" Width	Weight with QM Arm (lbs.)	Weight with QMEA Arm (lbs.)	EPA (Sq. Ft.)
1-4	15-1/2" (394mm)	35 (15.91 kgs.)	38 (17.27 kgs.)	1.11
5-6 [3]	21-5/8" (549mm)	46 (20.91 kgs.)	49 (22.27 kgs.)	
7-8	27-5/8" (702mm)	56 (25.45 kgs.)	N/A	

NOTES: 1 QM option available with 1-8 light square configurations. **2** QMEA option available with 1-6 light square configurations. **3** QMEA arm to be used when mounting two fixtures at 90° on a single pole.

OPTIC ORIENTATION

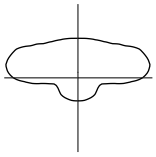


Standard | **Optics Rotated Left @ 90°** [L90] | **Optics Rotated Right @ 90°** [R90]

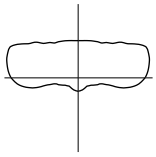
OPTICAL DISTRIBUTIONS

Asymmetric Area Distributions

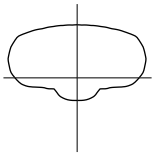
T2 (Type II)



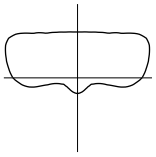
SL2 (Type II with Spill Control)



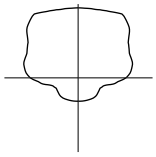
T3 (Type III)



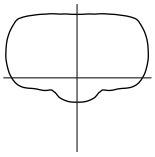
SL3 (Type III with Spill Control)



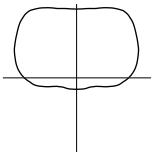
T4FT (Type IV Forward Throw)



T4W (Type IV Wide)

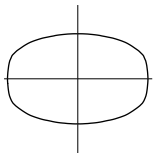


SL4 (Type IV with Spill Control)

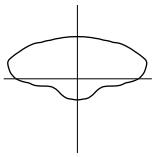


Asymmetric Roadway Distributions

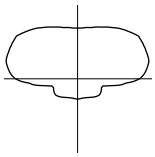
RW (Rectangular Wide Type I)



T2R (Type II Roadway)

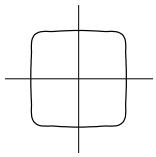


T3R (Type III Roadway)

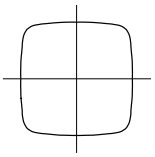


Symmertric Distributions

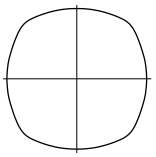
5NQ (Type V Square Narrow)



5MQ (Type V Square Medium)

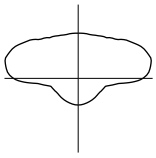


5WQ (Type V Square Wide)

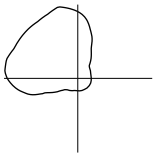


Specialized Distributions

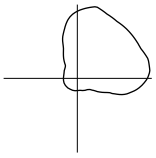
AFL (Automotive Frontline)



SLL (90° Spill Light Eliminator Left)

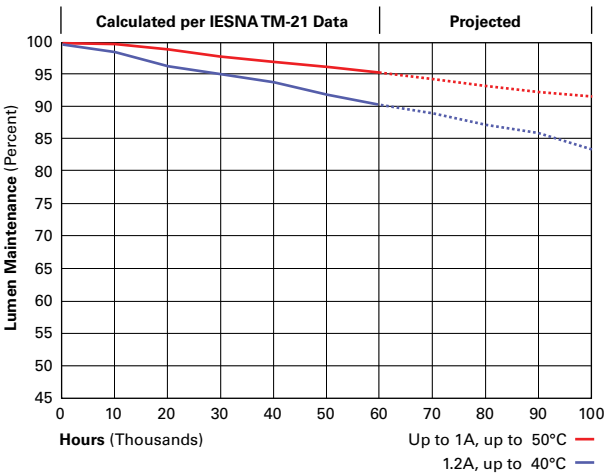


SLR (90° Spill Light Eliminator Right)



LUMEN MAINTENANCE

Drive Current	Ambient Temperature	TM-21 Lumen Maintenance (60,000 Hours)	Projected L70 (Hours)
Up to 1A	Up to 50°C	> 95%	416,000
1.2A	Up to 40°C	> 90%	205,000



LUMEN MULTIPLIER

Ambient Temperature	Lumen Multiplier
0°C	1.02
10°C	1.01
25°C	1.00
40°C	0.99
50°C	0.97

NOMINAL POWER LUMENS (1A)

Number of Light Squares		1	2	3	4	5	6	7	8	9	10
Nominal Power (Watts)		59	113	166	225	279	333	391	445	501	558
Input Current @ 120V (A)		0.51	1.02	1.53	2.03	2.55	3.06	3.56	4.08	4.60	5.07
Input Current @ 208V (A)		0.29	0.56	0.82	1.11	1.37	1.64	1.93	2.19	2.46	2.75
Input Current @ 240V (A)		0.26	0.48	0.71	0.96	1.19	0.41	1.67	1.89	2.12	2.39
Input Current @ 277V (A)		0.23	0.42	0.61	0.83	1.03	1.23	1.45	1.65	1.84	2.09
Input Current @ 347V (A)		0.17	0.32	0.50	0.64	0.82	1.00	1.14	1.32	1.50	1.68
Input Current @ 480V (A)		0.14	0.24	0.37	0.48	0.61	0.75	0.91	0.99	1.12	1.28
Optics											
T2	4000K/5000K Lumens	6,256	12,225	18,242	24,104	29,865	35,739	42,265	47,888	53,420	59,144
	3000K Lumens	5,915	11,559	17,248	22,789	28,236	33,790	39,960	45,277	50,506	55,919
	BUG Rating	B1-U0-G2	B2-U0-G2	B3-U0-G3	B3-U0-G4	B3-U0-G4	B3-U0-G4	B4-U0-G5	B4-U0-G5	B4-U0-G5	B4-U0-G5
T2R	4000K/5000K Lumens	6,642	12,979	19,366	25,589	31,705	37,941	44,870	50,840	56,711	62,789
	3000K Lumens	6,280	12,271	18,311	24,193	29,976	35,872	42,423	48,068	53,619	59,365
	BUG Rating	B1-U0-G1	B2-U0-G2	B2-U0-G2	B3-U0-G3	B3-U0-G4	B3-U0-G4	B3-U0-G4	B3-U0-G5	B4-U0-G5	B4-U0-G5
T3	4000K/5000K Lumens	6,377	12,461	18,593	24,568	30,439	36,426	43,077	48,810	54,447	60,282
	3000K Lumens	6,029	11,781	17,580	23,229	28,781	34,441	40,731	46,150	51,480	56,997
	BUG Rating	B1-U0-G2	B2-U0-G2	B3-U0-G3	B3-U0-G4	B3-U0-G4	B3-U0-G5	B4-U0-G5	B4-U0-G5	B4-U0-G5	B4-U0-G5
T3R	4000K/5000K Lumens	6,518	12,739	19,006	25,113	31,116	37,235	44,036	49,895	55,658	61,622
	3000K Lumens	6,029	11,781	17,579	23,229	28,779	34,440	40,729	46,148	51,478	56,995
	BUG Rating	B1-U0-G2	B2-U0-G2	B2-U0-G3	B3-U0-G4	B3-U0-G4	B3-U0-G5	B3-U0-G5	B3-U0-G5	B4-U0-G5	B4-U0-G5
T4FT	4000K/5000K Lumens	6,414	12,533	18,702	24,710	30,616	36,637	43,328	49,093	54,763	60,631
	3000K Lumens	6,064	11,849	17,681	23,363	28,946	34,638	40,966	46,417	51,776	57,325
	BUG Rating	B1-U0-G2	B2-U0-G3	B2-U0-G4	B3-U0-G4	B3-U0-G5	B3-U0-G5	B3-U0-G5	B3-U0-G5	B4-U0-G5	B4-U0-G5
T4W	4000K/5000K Lumens	6,331	12,372	18,459	24,391	30,221	36,163	42,769	48,459	54,056	59,849
	3000K Lumens	5,986	11,697	17,452	23,061	28,572	34,192	40,436	45,817	51,108	56,585
	BUG Rating	B1-U0-G2	B2-U0-G3	B3-U0-G4	B3-U0-G4	B3-U0-G5	B3-U0-G5	B4-U0-G5	B4-U0-G5	B4-U0-G5	B4-U0-G5
SL2	4000K/5000K Lumens	6,245	12,205	18,212	24,062	29,813	35,677	42,192	47,807	53,326	59,042
	3000K Lumens	5,904	11,539	17,218	22,750	28,187	33,732	39,891	45,199	50,418	55,822
	BUG Rating	B1-U0-G2	B2-U0-G3	B3-U0-G3	B3-U0-G4	B3-U0-G4	B3-U0-G5	B4-U0-G5	B4-U0-G5	B4-U0-G5	B4-U0-G5
SL3	4000K/5000K Lumens	6,376	12,460	18,591	24,564	30,436	36,421	43,072	48,803	54,439	60,273
	3000K Lumens	6,028	11,780	17,578	23,224	28,776	34,435	40,723	46,141	51,471	56,986
	BUG Rating	B1-U0-G2	B2-U0-G3	B2-U0-G3	B3-U0-G4	B3-U0-G4	B3-U0-G5	B3-U0-G5	B3-U0-G5	B4-U0-G5	B4-U0-G5
SL4	4000K/5000K Lumens	6,058	11,838	17,664	23,340	28,918	34,605	40,924	46,370	51,727	57,269
	3000K Lumens	5,727	11,193	16,701	22,067	27,341	32,718	38,692	43,841	48,906	54,146
	BUG Rating	B1-U0-G2	B1-U0-G3	B2-U0-G4	B2-U0-G4	B2-U0-G5	B3-U0-G5	B3-U0-G5	B3-U0-G5	B3-U0-G5	B3-U0-G5
5NQ	4000K/5000K Lumens	6,577	12,851	19,176	25,336	31,392	37,566	44,426	50,337	56,151	62,170
	3000K Lumens	6,218	12,151	18,131	23,955	29,680	35,517	42,003	47,592	53,089	58,779
	BUG Rating	B2-U0-G1	B3-U0-G2	B4-U0-G2	B4-U0-G2	B5-U0-G2	B5-U0-G3	B5-U0-G3	B5-U0-G3	B5-U0-G4	B5-U0-G4
5MQ	4000K/5000K Lumens	6,697	13,088	19,528	25,803	31,970	38,258	45,243	51,264	57,185	63,313
	3000K Lumens	6,332	12,374	18,463	24,395	30,227	36,171	42,776	48,468	54,066	59,861
	BUG Rating	B3-U0-G1	B4-U0-G2	B4-U0-G2	B5-U0-G3	B5-U0-G4	B5-U0-G4	B5-U0-G4	B5-U0-G5	B5-U0-G5	B5-U0-G5
5WQ	4000K/5000K Lumens	6,715	13,122	19,580	25,871	32,055	38,360	45,365	51,401	57,337	63,482
	3000K Lumens	6,348	12,406	18,513	24,461	30,307	36,268	42,891	48,599	54,210	60,021
	BUG Rating	B3-U0-G2	B4-U0-G2	B5-U0-G3	B5-U0-G3	B5-U0-G4	B5-U0-G4	B5-U0-G5	B5-U0-G5	B5-U0-G5	B5-U0-G5
SLL/SLR	4000K/5000K Lumens	5,604	10,949	16,337	21,586	26,745	32,004	37,850	42,886	47,838	52,965
	3000K Lumens	5,298	10,351	15,446	20,409	25,287	30,258	35,786	40,547	45,229	50,077
	BUG Rating	B1-U0-G2	B1-U0-G3	B2-U0-G3	B2-U0-G4	B3-U0-G4	B3-U0-G5	B3-U0-G5	B3-U0-G5	B3-U0-G5	B3-U0-G5
RW	4000K/5000K Lumens	6,517	12,735	19,002	25,107	31,109	37,227	44,025	49,883	55,644	61,607
	3000K Lumens	6,162	12,040	17,965	23,738	29,413	35,197	41,623	47,163	52,609	58,247
	BUG Rating	B3-U0-G1	B3-U0-G2	B4-U0-G2	B4-U0-G2	B5-U0-G3	B5-U0-G3	B5-U0-G3	B5-U0-G4	B5-U0-G4	B5-U0-G4
AFL	4000K/5000K Lumens	6,541	12,781	19,072	25,199	31,221	37,362	44,185	50,065	55,846	61,831
	3000K Lumens	6,184	12,084	18,032	23,825	29,519	35,325	41,775	47,334	52,801	58,459
	BUG Rating	B1-U0-G1	B2-U0-G2	B2-U0-G2	B3-U0-G2	B3-U0-G3	B3-U0-G3	B3-U0-G3	B3-U0-G3	B4-U0-G4	B4-U0-G4

* Nominal data for 70 CRI.

CONTROL OPTIONS

0-10V (DIM)
This fixture is offered standard with 0-10V dimming driver(s). The DIM option provides 0-10V dimming wire leads for use with a lighting control panel or other control method.

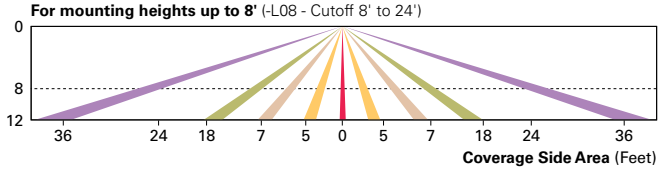
Photocontrol (P, R and PER7)
Optional button-type photocontrol (P) and photocontrol receptacles (R and PER7) provide a flexible solution to enable "dusk-to-dawn" lighting by sensing light levels. Advanced control systems compatible with NEMA 7-pin standards can be utilized with the PER7 receptacle.

After Hours Dim (AHD)
This feature allows photocontrol-enabled luminaires to achieve additional energy savings by dimming during scheduled portions of the night. The dimming profile will automatically take effect after a "dusk-to-dawn" period has been calculated from the photocontrol input. Specify the desired dimming profile for a simple, factory-shipped dimming solution requiring no external control wiring. Reference the After Hours Dim supplemental guide for additional information.

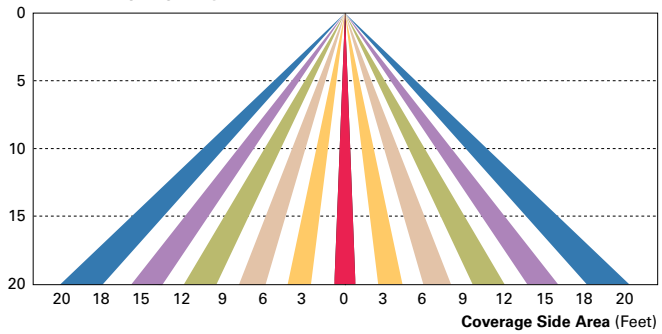
Dimming Occupancy Sensor (MS/DIM-LXX, MS/X-LXX and MS-LXX)
These sensors are factory installed in the luminaire housing. When the MS/DIM-LXX sensor option is selected, the occupancy sensor is connected to a dimming driver and the entire luminaire dims when there is no activity detected. When activity is detected, the luminaire returns to full light output. The MS/DIM sensor is factory preset to dim down to approximately 50 percent power with a time delay of five minutes. The MS-LXX sensor is factory preset to turn the luminaire off after five minutes of no activity. The MS/X-LXX is also preset for five minutes and only controls the specified number of light engines to maintain steady output from the remaining light engines.

These occupancy sensors includes an integral photocell that can be activated with the FSIR-100 accessory for "dusk-to-dawn" control or daylight harvesting - the factory preset is OFF. The FSIR-100 is a wireless tool utilized for changing the dimming level, time delay, sensitivity and other parameters. A variety of sensor lens are available to optimize the coverage. pattern for mounting heights from 8'-40'.

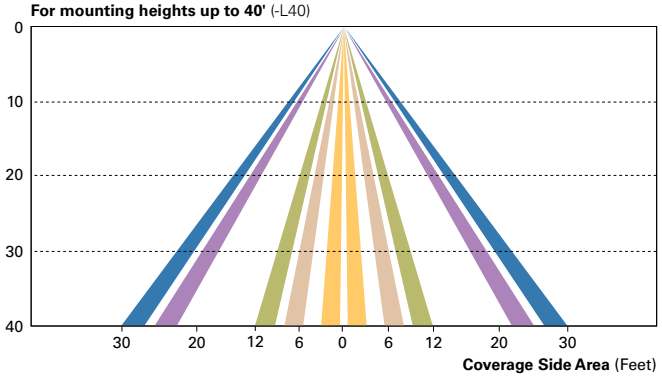
For mounting heights up to 8' (-L08 - Cutoff 8' to 24')



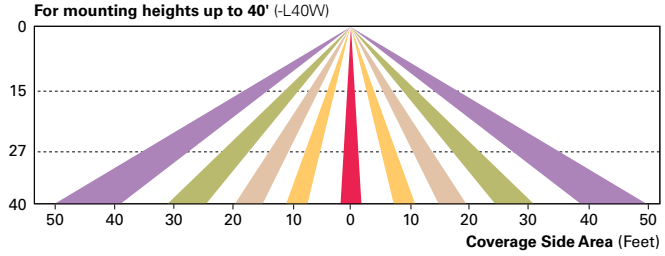
For mounting heights up to 20' (-L20)



For mounting heights up to 40' (-L40)

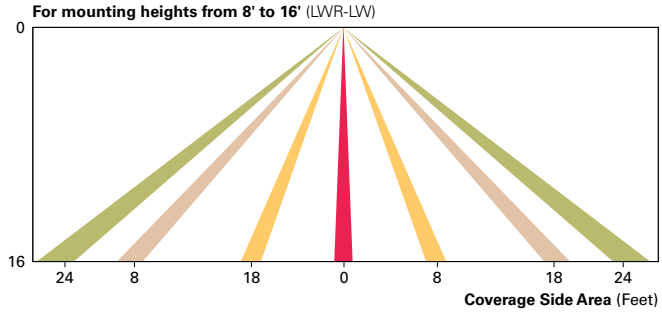


For mounting heights up to 40' (-L40W)

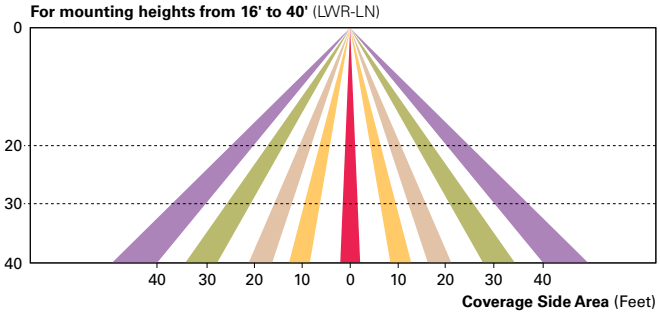


LumaWatt Pro Wireless Control and Monitoring System (LWR-LW and LWR-LN)
The Eaton's LumaWatt Pro powered by Enlighted is a connected lighting solution that combines a broad selection of energy-efficient LED luminaires with a powerful integrated wireless sensor system. The sensor controls the lighting system in compliance with the latest energy codes and collects valuable data about building performance and use. Software applications turn the granular data into information through energy dashboards and specialized apps that make it simple and help optimize the use of building resources, beyond lighting.

For mounting heights from 8' to 16' (LWR-LW)



For mounting heights from 16' to 40' (LWR-LN)



WaveLinx Wireless Outdoor Lighting Control Module (WOLC-7P-10A)
The 7-pin wireless outdoor lighting control module enables WaveLinx to control outdoor area, site and flood lighting. WaveLinx controls outdoor lighting using schedules to provide ON, OFF and dimming controls based on astronomic or time schedules based on a 7 day week.

LumenSafe Integrated Network Security Camera (LD)
Eaton brings ease of camera deployment to a whole new level. No additional wiring is needed beyond providing line power to the luminaire. A variety of networking options allows security integrators to design the optimal solution for active surveillance. As the ideal solution to meet the needs for active surveillance, the LumenSafe integrated network camera is a streamlined, outdoor-ready fixed dome that provides HDTV 1080p video. This IP camera is optimally designed for deployment in the video management system or security software platform of choice.

ORDERING INFORMATION

Sample Number: GLEON-AF-04-LED-E1-T3-GM-QM

Product Family [1, 2]	Light Engine	Number of Light Squares [3]	Lamp Type	Voltage	Distribution	Color	Mounting
GLEON=Galleon	**AF**=1A Drive Current	**01**=1 **02**=2 **03**=3 **04**=4 **05**=5 [4] **06**=6 **07**=7 [5] **08**=8 [5] **09**=9 [6] **10**=10 [6]	**LED**=Solid State Light Emitting Diodes	**E1**=120-277V **347**=347V [7] **480**=480V [7,8]	**T2**=Type II **T2R**=Type II Roadway **T3**=Type III **T3R**=Type III Roadway **T4FT**=Type IV ForwardThrow **T4W**=Type IV Wide **5NQ**=Type V Narrow **5MQ**=Type V Square Medium **5WQ**=Type V Square Wide **SL2**=Type II w/Spill Control **SL3**=Type III w/Spill Control **SL4**=Type IV w/Spill Control **SLL**=90° Spill Light Eliminator Left **SLR**=90° Spill Light Eliminator Right **RW**=Rectangular Wide Type I **AFL**=Automotive Frontline	**AP**=Grey **BZ**=Bronze **BK**=Black **DP**=Dark Platinum **GM**=Graphite Metallic **WH**=White FINISH AS SELECTED BY ARCHITECT	**[Blank]**=Arm for Round or Square Pole **EA**=Extended Arm [9] **MA**=Mast Arm Adapter [10] **WM**=Wall Mount **QM**=Quick Mount Arm (Standard Length) [11] **QMEA**=Quick Mount Arm (Extended Length) [12]

Options (Add as Suffix)

7027=70 CRI 2700K [13]
7030=70 CRI 3000K [13]
8030=80 CRI 3000K [13]
7050=70 CRI 5000K [13]
7060=70 CRI 6000K [13]
600=Drive Current Set to Nominal 600mA [15]
800=Drive Current Set to Nominal 800mA [15]
1200=Drive Current Set to Nominal 1200mA [15, 16]
F=Single Fuse (120, 277 or 347V. Specify Voltage)
FF=Double Fuse (208, 240 or 480V. Specify Voltage)
2L=Two Circuits [17, 18]
DIM=External 0-10V Dimming Leads [19, 20]
AHD145=After Hours Dim, 5 Hours [22]
AHD245=After Hours Dim, 6 Hours [22]
AHD255=After Hours Dim, 7 Hours [22]
AHD355=After Hours Dim, 8 Hours [22]
HA=50°C High Ambient [23]
L90=Optics Rotated 90° Left
R90=Optics Rotated 90° Right
MT=Installed Mesh Top
TH=Tool-less Door Hardware
HSS=Installed House Side Shield [28]
CE=CE Marking [29]
LCF=Light Square Trim Painted to Match Housing [27]
P=Button Type Photocontrol (120, 208, 240 or 277V. Must Specify Voltage) [21]
PER7=NEMA 7-PIN Photocontrol Receptacle [21]
R=NEMA Photocontrol Receptacle [21]
MS-L20=Motion Sensor for ON/OFF Operation, 9' - 20' Mounting Height [24]
MS-L40W=Motion Sensor for ON/OFF Operation, 21' - 40' Mounting Height [24]
MS/DIM-L08= Motion Sensor for Dimming Operation, Maximum 8' Mounting Height [24]
MS/DIM-L20= Motion Sensor for Dimming Operation, 9' - 20' Mounting Height [24]
MS/DIM-L40W=Motion Sensor for Dimming Operation, 21' - 40' Mounting Height [24]
MS/X-L08=Bi-Level Motion Sensor, Maximum 8' Mounting Height [24, 25]
MS/X-L20=Bi-Level Motion Sensor, 9' - 20' Mounting Height [24, 25]
MS/X-L40W=Bi-Level Motion Sensor, 21' - 40' Mounting Height [24, 25]
MS-L08=Motion Sensor for ON/OFF Operation, Maximum 8' Mounting Height [24]
LWR-LW=LumaWatt Pro Wireless Sensor, Wide Lens for 8' - 16' Mounting Height [26]
LWR-LN=LumaWatt Pro Wireless Sensor, Narrow Lens for 16' - 40' Mounting Height [26]
ZW =WaveLinx-enabled 4-PIN Twistlock Receptacle [19, 33]
ZW-SWPD4WH=Wavelinx Wireless Sensor, 7' – 15' Mounting Height, White [19, 33]
ZW-SWPD4BZ=Wavelinx Wireless Sensor, 7' – 15' Mounting Height, Bronze [19, 33]
ZW-SWPD5WH=Wavelinx Wireless Sensor, 15' – 40' Mounting Height, White [19, 33]
ZW-SWPD5BZ=Wavelinx Wireless Sensor, 15' – 40' Mounting Height, Bronze [19, 33]

Accessories (Order Separately)

OA/RA1016=NEMA Photocontrol Multi-Tap - 105-285V
OA/RA1027=NEMA Photocontrol - 480V
OA/RA1201=NEMA Photocontrol - 347V
OA/RA1013=Photocontrol Shorting Cap
OA/RA1014=120V Photocontrol
MA1252=10kV Surge Module Replacement
MA1036-XX=Single Tenon Adapter for 2-3/8" O.D. Tenon
MA1037-XX=2@180° Tenon Adapter for 2-3/8" O.D. Tenon
MA1197-XX=3@120° Tenon Adapter for 2-3/8" O.D. Tenon
MA1188-XX=4@90° Tenon Adapter for 2-3/8" O.D. Tenon
MA1189-XX=2@90° Tenon Adapter for 2-3/8" O.D. Tenon
MA1190-XX=3@90° Tenon Adapter for 2-3/8" O.D. Tenon
MA1191-XX=2@120° Tenon Adapter for 2-3/8" O.D. Tenon
MA1038-XX=Single Tenon Adapter for 3-1/2" O.D. Tenon
MA1039-XX=2@180° Tenon Adapter for 3-1/2" O.D. Tenon
MA1192-XX=3@120° Tenon Adapter for 3-1/2" O.D. Tenon
MA1193-XX=4@90° Tenon Adapter for 3-1/2" O.D. Tenon
MA1194-XX=2@90° Tenon Adapter for 3-1/2" O.D. Tenon
MA1195-XX=3@90° Tenon Adapter for 3-1/2" O.D. Tenon
FSIR-100=Wireless Configuration Tool for Occupancy Sensor [24]
GLEON-MT1=Field Installed Mesh Top for 1-4 Light Squares
GLEON-MT2=Field Installed Mesh Top for 5-6 Light Squares
GLEON-MT3=Field Installed Mesh Top for 7-8 Light Squares
GLEON-MT4=Field Installed Mesh Top for 9-10 Light Squares
GLEON-QM=Quick Mount Arm Kit [11]
GLEON-QMEA=Quick Mount Extended Arm Kit [12]
LS/HSS=Field Installed House Side Shield [28, 30]
WOLC-7P-10A=WaveLinx Outdoor Control Module [19, 31]
SWPD4-WH=Wavelinx Wireless Sensor, 7' – 15' Mounting Height, White [19, 33, 34]
SWPD4-BZ=Wavelinx Wireless Sensor, 7' – 15' Mounting Height, Bronze [19, 33, 34]
SWPD5-WH=Wavelinx Wireless Sensor, 15' – 40' Mounting Height, White [19, 33, 34]
SWPD5-BZ=Wavelinx Wireless Sensor, 15' – 40' Mounting Height, Bronze [19, 33, 34]

NOTES:
1 Customer is responsible for engineering analysis to confirm pole and fixture compatibility for all applications. Refer to our white paper WP513001EN for additional support information. **2** DesignLights Consortium® Qualified. Refer to www.designlights.org Qualified Products List under Family Models for details. **3** Standard 4000K CCT and minimum 70 CRI. **4** Not compatible with MS/4-LXX or MS/1-LXX sensors. **5** Not compatible with extended quick mount arm (QMEA). **6** Not compatible with standard quick mount arm (QM) or extended quick mount arm (QMEA). **7** Requires the use of an internal step down transformer when combined with sensor options. Not available with sensor at 1200mA. Not available in combination with the HA high ambient and sensor options at 1A. **8** Only for use with 480V Wye systems. Per NEC, not for use with ungrounded systems, impedance grounded systems or corner grounded systems (commonly known as Three Phase Three Wire Delta, Three Phase High Leg Delta and Three Phase Corner Grounded Delta systems). **9** May be required when two or more luminaires are oriented on a 90° or 120° drilling pattern. Refer to arm mounting requirement table. **10** Factory installed. **11** Maximum 8 light squares. **12** Maximum 6 light squares. **13** Extended lead times apply. Use dedicated IES files for 2700K, 3000K, 5000K and 6000K when performing layouts. **14** Reserved **15** 1 Amp standard. Use dedicated IES files for 600mA, 800mA and 1200mA when performing layouts. **16** Not available with HA option. **17** 2L is not available with MS, MS/X or MS/DIM at 347V or 480V. 2L in AF-02 through AF-04 requires a larger housing, normally used for AF-05 or AF-06. Extended arm option may be required when mounting two or more fixtures per pole at 90° or 120°. Refer to arm mounting requirement table. **18** Not available with LumaWatt Pro wireless sensors. **19** Cannot be used with other control options. **20** Low voltage control lead brought out 18" outside fixture. **21** Not available if any "MS" sensor is selected. Motion sensor has an integral photocell. **22** Requires the use of P photocontrol or the PER7 or R photocontrol receptacle with photocontrol accessory. See After Hours Dim supplemental guide for additional information. **23** 50°C lumen maintenance data applies to 600mA, 800mA and 1A drive currents. **24** The FSIR-100 configuration tool is required to adjust parameters including high and low modes, sensitivity, time delay, cutoff and more. Consult your lighting representative at Eaton for more information. **25** Replace X with number of Light Squares operating in low output mode. **26** LumaWatt Pro wireless sensors are factory installed only requiring network components LWP-EM-1, LWP-GW-1 and LWP-PoE8 in appropriate quantities. See www.eaton.com/lighting for LumaWatt Pro application information. **27** Not available with house side shield (HSS). **28** Only for use with SL2, SL3, SL4 and AFL distributions. The Light Square trim plate is painted black when the HSS option is selected. **29** CE is not available with the LWR, MS, MS/X, MS/DIM, P, R or PER7 options. Available in 120-277V only. **30** One required for each Light Square. **31** Requires PER7. **32** Reserved. **33** WAC Gateway required to enable field-configurability: Order WAC-PoE and WPOE-120 (10V to PoE injector) power supply if needed. **34** Requires ZW. **35** Reserved.

LumenSafe Integrated Network Security Camera Technology Options (Add as Suffix)

Product Family	Camera Type	Data Backhaul	
L=LumenSafe Technology* LumenSafe Technology CLICK HERE	**D**=Dome Camera, Standard **H**=Dome Camera, Hi-Res **Z**=Dome Camera, Remote PTZ	**C**=Cellular, Customer Installed SIM Card **A**=Cellular, Factory Installed AT&T SIM Card **V**=Cellular, Factory Installed Verizon SIM Card **S**=Cellular, Factory Installed Sprint SIM Card	**W**=Wi-Fi Networking w/ Omni-Directional Antenna **E**=Ethernet Networking

*Consult LumenSafe system pages for additional details and compatibility.

McGraw-Edison

DESCRIPTION

The Galleon™ LED luminaire delivers exceptional performance in a highly scalable, low-profile design. Patented, high-efficiency AccuLED Optics™ system provides uniform and energy conscious illumination to walkways, parking lots, roadways, building areas and security lighting applications. IP66 rated and UL/cUL Listed for wet locations.

OVERALL
MOUNTING HEIGHT
16'-0" A.F.G.

Catalog #		Type
Project	FRED LAVERY PORSCHE	L1
Comments		Date
Prepared by		

SPECIFICATION FEATURES

Construction
Extruded aluminum driver enclosure thermally isolated from Light Squares for optimal thermal performance. Heavy-wall, die-cast aluminum end caps enclose housing and die-cast aluminum heat sinks. A unique, patent pending interlocking housing and heat sink provides scalability with superior structural rigidity. 3G vibration tested and rated. Optional tool-less hardware available for ease of entry into electrical chamber. Housing is IP66 rated.

Optics
Patented, high-efficiency injection-molded AccuLED Optics technology. Optics are precisely designed to shape the distribution maximizing efficiency and application spacing. AccuLED Optics create consistent distributions with the scalability to meet customized application requirements. Offered standard in 4000K (+/- 275K) CCT 70 CRI. Optional 3000K, 5000K and 6000K CCT.

Electrical
LED drivers are mounted to removable tray assembly for ease of maintenance. 120-277V 50/60Hz, 347V 60Hz or 480V 60Hz operation. 480V is compatible for use with 480V Wye systems only. Standard with 0-10V dimming. Shipped standard with Eaton proprietary circuit module designed to withstand 10kV of transient line surge. The Galleon LED luminaire is suitable for operation in -40°C to 40°C ambient environments. For applications with ambient temperatures exceeding 40°C, specify the HA (High Ambient) option. Light Squares are IP66 rated. Greater than 90% lumen maintenance expected at 60,000 hours. Available in standard 1A drive current and optional 600mA, 800mA and 1200mA drive currents (nominal).

Mounting
STANDARD ARM MOUNT: Extruded aluminum arm includes internal bolt guides allowing for easy positioning of fixture during mounting. When mounting two or more luminaires at 90° and 120° apart, the EA extended arm may be required. Refer to the arm mounting requirement table. Round pole adapter included. For wall mounting, specify wall mount bracket option. QUICK MOUNT ARM: Adapter is bolted directly to the pole. Quick mount arm slide into place on the adapter and is secured via two screws, facilitating quick and easy installation. The versatile, patent pending, quick mount arm accommodates multiple drill patterns ranging from 1-1/2" to 4-7/8". Removal of the door on the quick mount arm enables wiring of the fixture without having to access the driver compartment. A knock-out enables round pole mounting.

Finish
Housing finished in super durable TGIC polyester powder coat paint, 2.5 mil nominal thickness for superior protection against fade and wear. Heat sink is powder coated black. Standard housing colors include black, bronze, grey, white, dark platinum and graphite metallic. RAL and custom color matches available.

Warranty
Five-year warranty.

GLEON
GALLEON LED

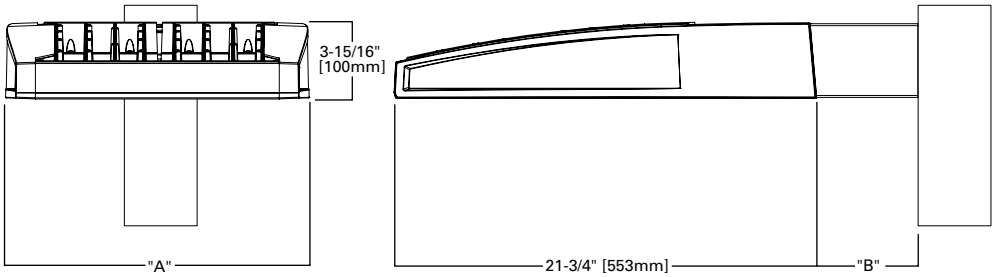
1-10 Light Squares
Solid State LED

AREA/SITE LUMINAIRE

LumenSafe Technology
CLICK HERE

WaveLinx

DIMENSIONS



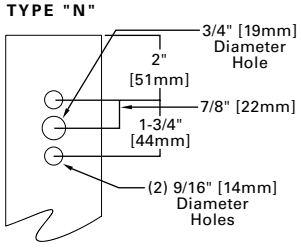
DIMENSION DATA

Number of Light Squares	"A" Width	"B" Standard Arm Length	"B" Optional Arm Length [1]	Weight with Arm (lbs.)	EPA with Arm [2] (Sq. Ft.)
1-4	15-1/2" (394mm)	7" (178mm)	10" (254mm)	33 (15.0 kgs.)	0.96
5-6	21-5/8" (549mm)	7" (178mm)	10" (254mm)	44 (20.0 kgs.)	1.00
7-8	27-5/8" (702mm)	7" (178mm)	13" (330mm)	54 (24.5 kgs.)	1.07
9-10	33-3/4" (857mm)	7" (178mm)	16" (406mm)	63 (28.6 kgs.)	1.12

NOTES: 1. Optional arm length to be used when mounting two fixtures at 90° on a single pole. **2.** EPA calculated with optional arm length.

DRILLING PATTERN

TYPE "N"



CERTIFICATION DATA
3G Vibration Rated
DesignLights Consortium® Qualified*
IP66 Rated
ISO 9001
LM79 / LM80 Compliant
UL/cUL Wet Location Listed

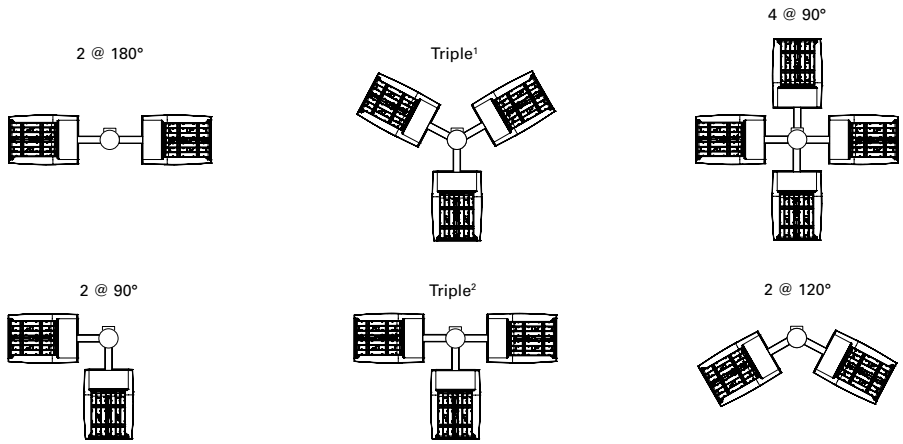
ENERGY DATA
Electronic LED Driver
>0.9 Power Factor
<20% Total Harmonic Distortion
120V-277V 50/60Hz
347V, 480V 60Hz
-40°C Min. Temperature
40°C Max. Temperature
50°C Max. Temperature (HA Option)

*www.designlights.org

Powering Business Worldwide

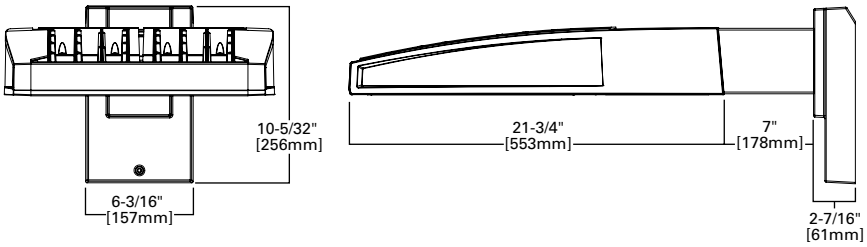
ARM MOUNTING REQUIREMENTS

Configuration	90° Apart	120° Apart
GLEON-AF-01	7" Arm (Standard)	7" Arm (Standard)
GLEON-AF-02	7" Arm (Standard)	7" Arm (Standard)
GLEON-AF-03	7" Arm (Standard)	7" Arm (Standard)
GLEON-AF-04	7" Arm (Standard)	7" Arm (Standard)
GLEON-AF-05	10" Extended Arm (Required)	7" Arm (Standard)
GLEON-AF-06	10" Extended Arm (Required)	7" Arm (Standard)
GLEON-AF-07	13" Extended Arm (Required)	13" Extended Arm (Required)
GLEON-AF-08	13" Extended Arm (Required)	13" Extended Arm (Required)
GLEON-AF-09	16" Extended Arm (Required)	16" Extended Arm (Required)
GLEON-AF-10	16" Extended Arm (Required)	16" Extended Arm (Required)

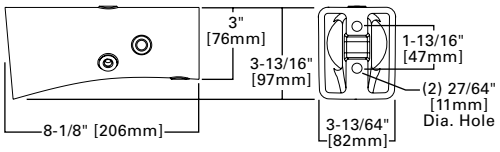


NOTES: 1 Round poles are 3 @ 120°. Square poles are 3 @ 90°. **2** Round poles are 3 @ 90°.

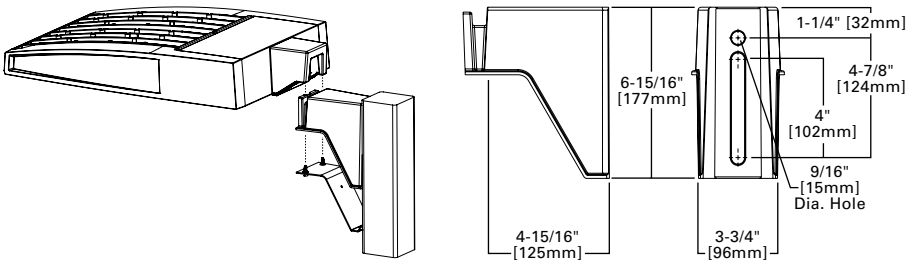
STANDARD WALL MOUNT



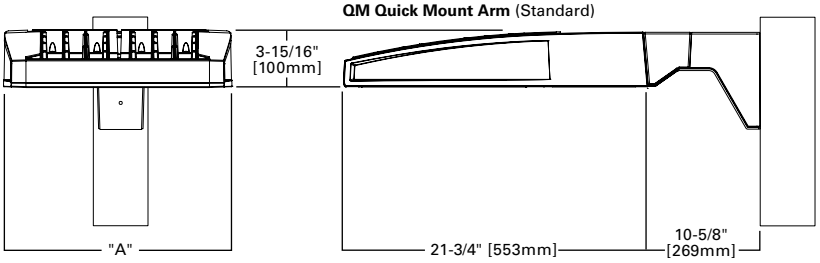
MAST ARM MOUNT



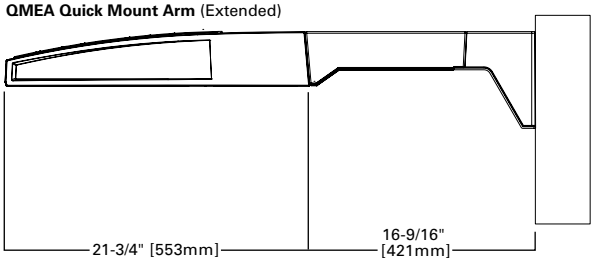
QUICK MOUNT ARM (INCLUDES FIXTURE ADAPTER)



QM Quick Mount Arm (Standard)



QMEA Quick Mount Arm (Extended)

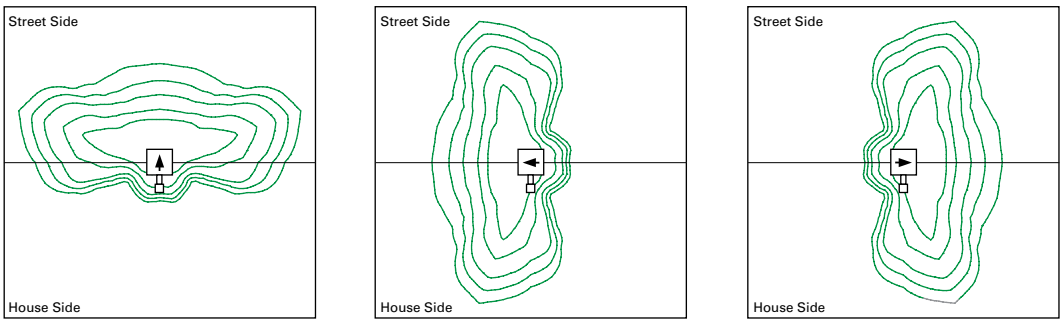


QUICK MOUNT ARM DATA

Number of Light Squares [1, 2]	"A" Width	Weight with QM Arm (lbs.)	Weight with QMEA Arm (lbs.)	EPA (Sq. Ft.)
1-4	15-1/2" (394mm)	35 (15.91 kgs.)	38 (17.27 kgs.)	1.11
5-6 [3]	21-5/8" (549mm)	46 (20.91 kgs.)	49 (22.27 kgs.)	
7-8	27-5/8" (702mm)	56 (25.45 kgs.)	N/A	

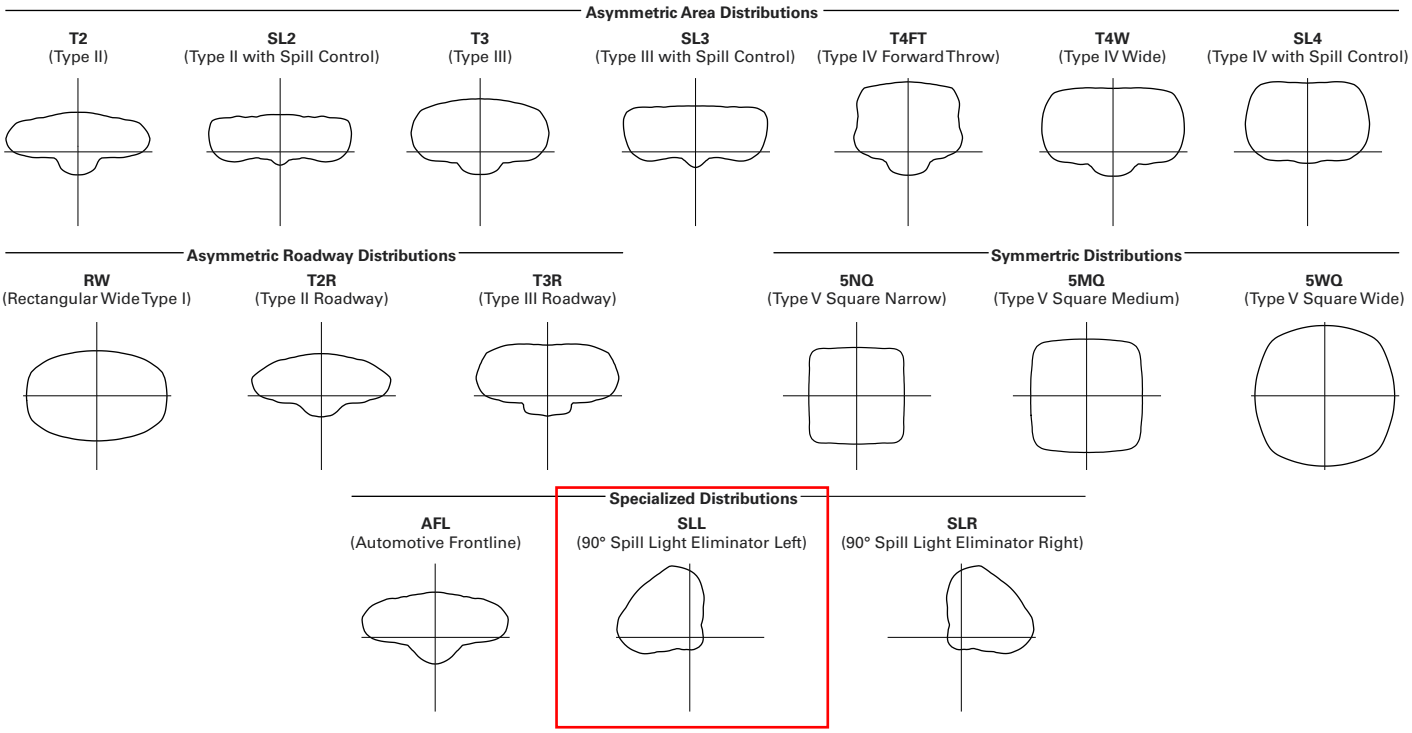
NOTES: 1 QM option available with 1-8 light square configurations. **2** QMEA option available with 1-6 light square configurations. **3** QMEA arm to be used when mounting two fixtures at 90° on a single pole.

OPTIC ORIENTATION



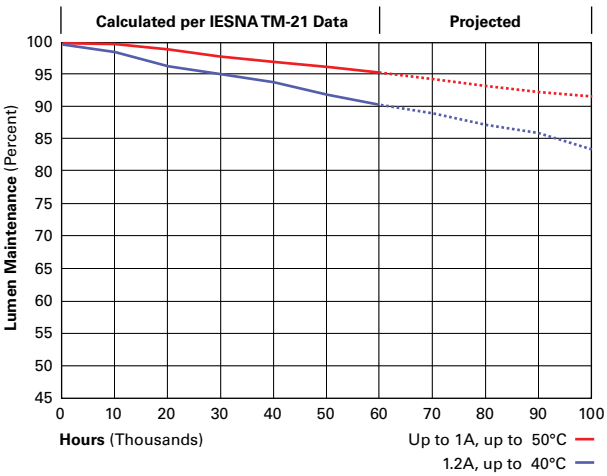
Standard | **Optics Rotated Left @ 90°** [L90] | **Optics Rotated Right @ 90°** [R90]

OPTICAL DISTRIBUTIONS



LUMEN MAINTENANCE

Drive Current	Ambient Temperature	TM-21 Lumen Maintenance (60,000 Hours)	Projected L70 (Hours)
Up to 1A	Up to 50°C	> 95%	416,000
1.2A	Up to 40°C	> 90%	205,000



LUMEN MULTIPLIER

Ambient Temperature	Lumen Multiplier
0°C	1.02
10°C	1.01
25°C	1.00
40°C	0.99
50°C	0.97

NOMINAL POWER LUMENS (1A)

Number of Light Squares		1	2	3	4	5	6	7	8	9	10
Nominal Power (Watts)		59	113	166	225	279	333	391	445	501	558
Input Current @ 120V (A)		0.51	1.02	1.53	2.03	2.55	3.06	3.56	4.08	4.60	5.07
Input Current @ 208V (A)		0.29	0.56	0.82	1.11	1.37	1.64	1.93	2.19	2.46	2.75
Input Current @ 240V (A)		0.26	0.48	0.71	0.96	1.19	0.41	1.67	1.89	2.12	2.39
Input Current @ 277V (A)		0.23	0.42	0.61	0.83	1.03	1.23	1.45	1.65	1.84	2.09
Input Current @ 347V (A)		0.17	0.32	0.50	0.64	0.82	1.00	1.14	1.32	1.50	1.68
Input Current @ 480V (A)		0.14	0.24	0.37	0.48	0.61	0.75	0.91	0.99	1.12	1.28
Optics											
T2	4000K/5000K Lumens	6,256	12,225	18,242	24,104	29,865	35,739	42,265	47,888	53,420	59,144
	3000K Lumens	5,915	11,559	17,248	22,789	28,236	33,790	39,960	45,277	50,506	55,919
	BUG Rating	B1-U0-G2	B2-U0-G2	B3-U0-G3	B3-U0-G4	B3-U0-G4	B3-U0-G4	B4-U0-G5	B4-U0-G5	B4-U0-G5	B4-U0-G5
T2R	4000K/5000K Lumens	6,642	12,979	19,366	25,589	31,705	37,941	44,870	50,840	56,711	62,789
	3000K Lumens	6,280	12,271	18,311	24,193	29,976	35,872	42,423	48,068	53,619	59,365
	BUG Rating	B1-U0-G1	B2-U0-G2	B2-U0-G2	B3-U0-G3	B3-U0-G4	B3-U0-G4	B3-U0-G4	B3-U0-G5	B4-U0-G5	B4-U0-G5
T3	4000K/5000K Lumens	6,377	12,461	18,593	24,568	30,439	36,426	43,077	48,810	54,447	60,282
	3000K Lumens	6,029	11,781	17,580	23,229	28,781	34,441	40,731	46,150	51,480	56,997
	BUG Rating	B1-U0-G2	B2-U0-G2	B3-U0-G3	B3-U0-G4	B3-U0-G4	B3-U0-G5	B4-U0-G5	B4-U0-G5	B4-U0-G5	B4-U0-G5
T3R	4000K/5000K Lumens	6,518	12,739	19,006	25,113	31,116	37,235	44,036	49,895	55,658	61,622
	3000K Lumens	6,029	11,781	17,579	23,229	28,779	34,440	40,729	46,148	51,478	56,995
	BUG Rating	B1-U0-G2	B2-U0-G2	B2-U0-G3	B3-U0-G4	B3-U0-G4	B3-U0-G5	B3-U0-G5	B3-U0-G5	B4-U0-G5	B4-U0-G5
T4FT	4000K/5000K Lumens	6,414	12,533	18,702	24,710	30,616	36,637	43,328	49,093	54,763	60,631
	3000K Lumens	6,064	11,849	17,681	23,363	28,946	34,638	40,966	46,417	51,776	57,325
	BUG Rating	B1-U0-G2	B2-U0-G3	B2-U0-G4	B3-U0-G4	B3-U0-G5	B3-U0-G5	B3-U0-G5	B3-U0-G5	B4-U0-G5	B4-U0-G5
T4W	4000K/5000K Lumens	6,331	12,372	18,459	24,391	30,221	36,163	42,769	48,459	54,056	59,849
	3000K Lumens	5,986	11,697	17,452	23,061	28,572	34,192	40,436	45,817	51,108	56,585
	BUG Rating	B1-U0-G2	B2-U0-G3	B3-U0-G4	B3-U0-G4	B3-U0-G5	B3-U0-G5	B4-U0-G5	B4-U0-G5	B4-U0-G5	B4-U0-G5
SL2	4000K/5000K Lumens	6,245	12,205	18,212	24,062	29,813	35,677	42,192	47,807	53,326	59,042
	3000K Lumens	5,904	11,539	17,218	22,750	28,187	33,732	39,891	45,199	50,418	55,822
	BUG Rating	B1-U0-G2	B2-U0-G3	B3-U0-G3	B3-U0-G4	B3-U0-G4	B3-U0-G5	B4-U0-G5	B4-U0-G5	B4-U0-G5	B4-U0-G5
SL3	4000K/5000K Lumens	6,376	12,460	18,591	24,564	30,436	36,421	43,072	48,803	54,439	60,273
	3000K Lumens	6,028	11,780	17,578	23,224	28,776	34,435	40,723	46,141	51,471	56,986
	BUG Rating	B1-U0-G2	B2-U0-G3	B2-U0-G3	B3-U0-G4	B3-U0-G4	B3-U0-G5	B3-U0-G5	B3-U0-G5	B4-U0-G5	B4-U0-G5
SL4	4000K/5000K Lumens	6,058	11,838	17,664	23,340	28,918	34,605	40,924	46,370	51,727	57,269
	3000K Lumens	5,727	11,193	16,701	22,067	27,341	32,718	38,692	43,841	48,906	54,146
	BUG Rating	B1-U0-G2	B1-U0-G3	B2-U0-G4	B2-U0-G4	B2-U0-G5	B3-U0-G5	B3-U0-G5	B3-U0-G5	B3-U0-G5	B3-U0-G5
5NQ	4000K/5000K Lumens	6,577	12,851	19,176	25,336	31,392	37,566	44,426	50,337	56,151	62,170
	3000K Lumens	6,218	12,151	18,131	23,955	29,680	35,517	42,003	47,592	53,089	58,779
	BUG Rating	B2-U0-G1	B3-U0-G2	B4-U0-G2	B4-U0-G2	B5-U0-G2	B5-U0-G3	B5-U0-G3	B5-U0-G3	B5-U0-G4	B5-U0-G4
5MQ	4000K/5000K Lumens	6,697	13,088	19,528	25,803	31,970	38,258	45,243	51,264	57,185	63,313
	3000K Lumens	6,332	12,374	18,463	24,395	30,227	36,171	42,776	48,468	54,066	59,861
	BUG Rating	B3-U0-G1	B4-U0-G2	B4-U0-G2	B5-U0-G3	B5-U0-G4	B5-U0-G4	B5-U0-G4	B5-U0-G5	B5-U0-G5	B5-U0-G5
5WQ	4000K/5000K Lumens	6,715	13,122	19,580	25,871	32,055	38,360	45,365	51,401	57,337	63,482
	3000K Lumens	6,348	12,406	18,513	24,461	30,307	36,268	42,891	48,599	54,210	60,021
	BUG Rating	B3-U0-G2	B4-U0-G2	B5-U0-G3	B5-U0-G3	B5-U0-G4	B5-U0-G4	B5-U0-G5	B5-U0-G5	B5-U0-G5	B5-U0-G5
SLL/SLR	4000K/5000K Lumens	5,604	10,949	16,337	21,586	26,745	32,004	37,850	42,886	47,838	52,965
	3000K Lumens	5,298	10,351	15,446	20,409	25,287	30,258	35,786	40,547	45,229	50,077
	BUG Rating	B1-U0-G2	B1-U0-G3	B2-U0-G3	B2-U0-G4	B3-U0-G4	B3-U0-G5	B3-U0-G5	B3-U0-G5	B3-U0-G5	B3-U0-G5
RW	4000K/5000K Lumens	6,517	12,735	19,002	25,107	31,109	37,227	44,025	49,883	55,644	61,607
	3000K Lumens	6,162	12,040	17,965	23,738	29,413	35,197	41,623	47,163	52,609	58,247
	BUG Rating	B3-U0-G1	B3-U0-G2	B4-U0-G2	B4-U0-G2	B5-U0-G3	B5-U0-G3	B5-U0-G3	B5-U0-G4	B5-U0-G4	B5-U0-G4
AFL	4000K/5000K Lumens	6,541	12,781	19,072	25,199	31,221	37,362	44,185	50,065	55,846	61,831
	3000K Lumens	6,184	12,084	18,032	23,825	29,519	35,325	41,775	47,334	52,801	58,459
	BUG Rating	B1-U0-G1	B2-U0-G2	B2-U0-G2	B3-U0-G2	B3-U0-G3	B3-U0-G3	B3-U0-G3	B3-U0-G3	B4-U0-G4	B4-U0-G4

* Nominal data for 70 CRI.

CONTROL OPTIONS

0-10V (DIM)
This fixture is offered standard with 0-10V dimming driver(s). The DIM option provides 0-10V dimming wire leads for use with a lighting control panel or other control method.

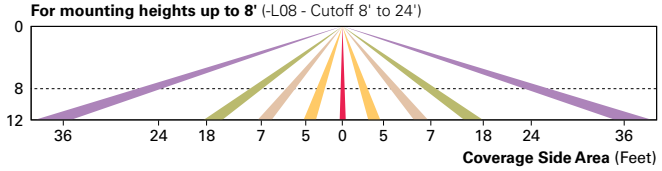
Photocontrol (P, R and PER7)
Optional button-type photocontrol (P) and photocontrol receptacles (R and PER7) provide a flexible solution to enable "dusk-to-dawn" lighting by sensing light levels. Advanced control systems compatible with NEMA 7-pin standards can be utilized with the PER7 receptacle.

After Hours Dim (AHD)
This feature allows photocontrol-enabled luminaires to achieve additional energy savings by dimming during scheduled portions of the night. The dimming profile will automatically take effect after a "dusk-to-dawn" period has been calculated from the photocontrol input. Specify the desired dimming profile for a simple, factory-shipped dimming solution requiring no external control wiring. Reference the After Hours Dim supplemental guide for additional information.

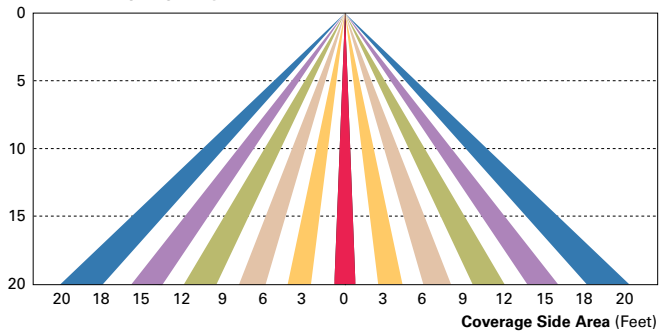
Dimming Occupancy Sensor (MS/DIM-LXX, MS/X-LXX and MS-LXX)
These sensors are factory installed in the luminaire housing. When the MS/DIM-LXX sensor option is selected, the occupancy sensor is connected to a dimming driver and the entire luminaire dims when there is no activity detected. When activity is detected, the luminaire returns to full light output. The MS/DIM sensor is factory preset to dim down to approximately 50 percent power with a time delay of five minutes. The MS-LXX sensor is factory preset to turn the luminaire off after five minutes of no activity. The MS/X-LXX is also preset for five minutes and only controls the specified number of light engines to maintain steady output from the remaining light engines.

These occupancy sensors includes an integral photocell that can be activated with the FSIR-100 accessory for "dusk-to-dawn" control or daylight harvesting - the factory preset is OFF. The FSIR-100 is a wireless tool utilized for changing the dimming level, time delay, sensitivity and other parameters. A variety of sensor lens are available to optimize the coverage. pattern for mounting heights from 8'-40'.

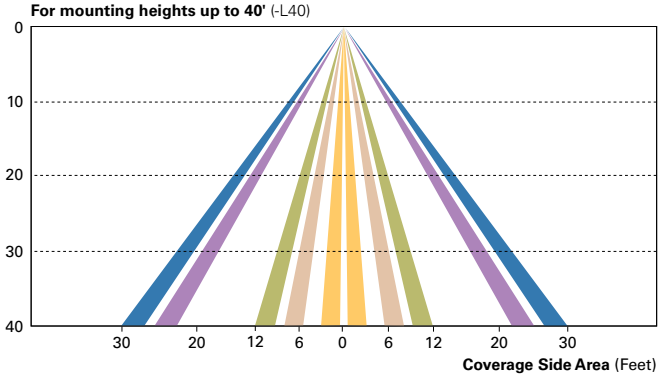
For mounting heights up to 8' (-L08 - Cutoff 8' to 24')



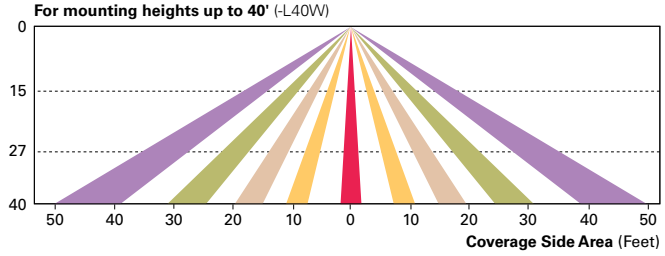
For mounting heights up to 20' (-L20)



For mounting heights up to 40' (-L40)

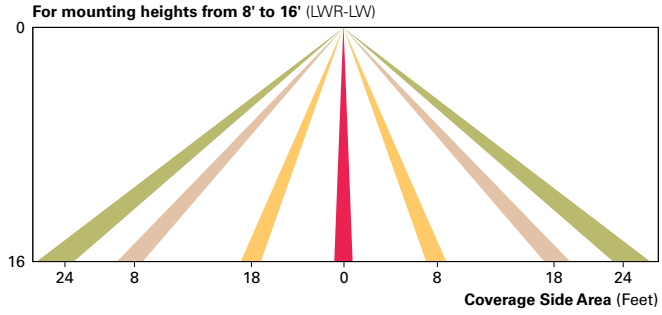


For mounting heights up to 40' (-L40W)

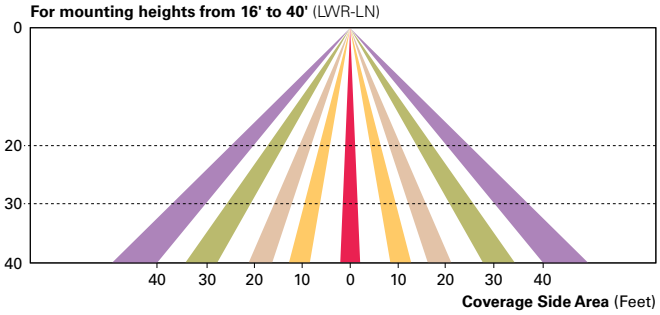


LumaWatt Pro Wireless Control and Monitoring System (LWR-LW and LWR-LN)
The Eaton's LumaWatt Pro powered by Enlighted is a connected lighting solution that combines a broad selection of energy-efficient LED luminaires with a powerful integrated wireless sensor system. The sensor controls the lighting system in compliance with the latest energy codes and collects valuable data about building performance and use. Software applications turn the granular data into information through energy dashboards and specialized apps that make it simple and help optimize the use of building resources, beyond lighting.

For mounting heights from 8' to 16' (LWR-LW)



For mounting heights from 16' to 40' (LWR-LN)



WaveLinx Wireless Outdoor Lighting Control Module (WOLC-7P-10A)
The 7-pin wireless outdoor lighting control module enables WaveLinx to control outdoor area, site and flood lighting. WaveLinx controls outdoor lighting using schedules to provide ON, OFF and dimming controls based on astronomic or time schedules based on a 7 day week.

LumenSafe Integrated Network Security Camera (LD)
Eaton brings ease of camera deployment to a whole new level. No additional wiring is needed beyond providing line power to the luminaire. A variety of networking options allows security integrators to design the optimal solution for active surveillance. As the ideal solution to meet the needs for active surveillance, the LumenSafe integrated network camera is a streamlined, outdoor-ready fixed dome that provides HDTV 1080p video. This IP camera is optimally designed for deployment in the video management system or security software platform of choice.

ORDERING INFORMATION

Sample Number: GLEON-AF-04-LED-E1-T3-GM-QM

Product Family [1, 2]	Light Engine	Number of Light Squares [3]	Lamp Type	Voltage	Distribution	Color	Mounting
GLEON=Galleon	**AF**=1A Drive Current	**01**=1 **02**=2 **03**=3 **04**=4 **05**=5 [4] **06**=6 **07**=7 [5] **08**=8 [5] **09**=9 [6] **10**=10 [6]	**LED**=Solid State Light Emitting Diodes	**E1**=120-277V **347**=347V [7] **480**=480V [7,8]	**T2**=Type II **T2R**=Type II Roadway **T3**=Type III **T3R**=Type III Roadway **T4FT**=Type IV ForwardThrow **T4W**=Type IV Wide **5NQ**=Type V Narrow **5MQ**=Type V Square Medium **5WQ**=Type V Square Wide **SL2**=Type II w/Spill Control **SL3**=Type III w/Spill Control **SL4**=Type IV w/Spill Control **SLL**=90° Spill Light Eliminator Left **SLR**=90° Spill Light Eliminator Right **RW**=Rectangular Wide Type I **AFL**=Automotive Frontline	**AP**=Grey **BZ**=Bronze **BK**=Black **DP**=Dark Platinum **GM**=Graphite Metallic **WH**=White FINISH AS SELECTED BY ARCHITECT	**[Blank]**=Arm for Round or Square Pole **EA**=Extended Arm [9] **MA**=Mast Arm Adapter [10] **WM**=Wall Mount **QM**=Quick Mount Arm (Standard Length) [11] **QMEA**=Quick Mount Arm (Extended Length) [12]

Options (Add as Suffix)

7027=70 CRI 2700K [13]
7030=70 CRI 3000K [13]
8030=80 CRI 3000K [13]
7050=70 CRI 5000K [13]
7060=70 CRI 6000K [13]
600=Drive Current Set to Nominal 600mA [15]
800=Drive Current Set to Nominal 800mA [15]
1200=Drive Current Set to Nominal 1200mA [15,16]
F=Single Fuse (120, 277 or 347V. Specify Voltage)
FF=Double Fuse (208, 240 or 480V. Specify Voltage)
2L=Two Circuits [17,18]
DIM=External 0-10V Dimming Leads [19,20]
AHD145=After Hours Dim, 5 Hours [22]
AHD245=After Hours Dim, 6 Hours [22]
AHD255=After Hours Dim, 7 Hours [22]
AHD355=After Hours Dim, 8 Hours [22]
HA=50°C High Ambient [23]
L90=Optics Rotated 90° Left
R90=Optics Rotated 90° Right
MT=Installed Mesh Top
TH=Tool-less Door Hardware
HSS=Installed House Side Shield [28]
CE=CE Marking [29]
LCF=Light Square Trim Painted to Match Housing [27]
P=Button Type Photocontrol (120, 208, 240 or 277V. Must Specify Voltage) [21]
PER7=NEMA 7-PIN Photocontrol Receptacle [21]
R=NEMA Photocontrol Receptacle [21]
MS-L20=Motion Sensor for ON/OFF Operation, 9' - 20' Mounting Height [24]
MS-L40W=Motion Sensor for ON/OFF Operation, 21' - 40' Mounting Height [24]
MS/DIM-L08= Motion Sensor for Dimming Operation, Maximum 8' Mounting Height [24]
MS/DIM-L20= Motion Sensor for Dimming Operation, 9' - 20' Mounting Height [24]
MS/DIM-L40W=Motion Sensor for Dimming Operation, 21' - 40' Mounting Height [24]
MS/X-L08=Bi-Level Motion Sensor, Maximum 8' Mounting Height [24,25]
MS/X-L20=Bi-Level Motion Sensor, 9' - 20' Mounting Height [24,25]
MS/X-L40W=Bi-Level Motion Sensor, 21' - 40' Mounting Height [24,25]
MS-L08=Motion Sensor for ON/OFF Operation, Maximum 8' Mounting Height [24]
LWR-LW=LumaWatt Pro Wireless Sensor, Wide Lens for 8' - 16' Mounting Height [26]
LWR-LN=LumaWatt Pro Wireless Sensor, Narrow Lens for 16' - 40' Mounting Height [26]
ZW =WaveLinx-enabled 4-PIN Twistlock Receptacle [19,33]
ZW-SWPD4WH=Wavelinx Wireless Sensor, 7' – 15' Mounting Height, White [19,33]
ZW-SWPD4BZ=Wavelinx Wireless Sensor, 7' – 15' Mounting Height, Bronze [19,33]
ZW-SWPD5WH=Wavelinx Wireless Sensor, 15' – 40' Mounting Height, White [19,33]
ZW-SWPD5BZ=Wavelinx Wireless Sensor, 15' – 40' Mounting Height, Bronze [19,33]

Accessories (Order Separately)

OA/RA1016=NEMA Photocontrol Multi-Tap - 105-285V
OA/RA1027=NEMA Photocontrol - 480V
OA/RA1201=NEMA Photocontrol - 347V
OA/RA1013=Photocontrol Shorting Cap
OA/RA1014=120V Photocontrol
MA1252=10kV Surge Module Replacement
MA1036-XX=Single Tenon Adapter for 2-3/8" O.D. Tenon
MA1037-XX=2@180° Tenon Adapter for 2-3/8" O.D. Tenon
MA1197-XX=3@120° Tenon Adapter for 2-3/8" O.D. Tenon
MA1188-XX=4@90° Tenon Adapter for 2-3/8" O.D. Tenon
MA1189-XX=2@90° Tenon Adapter for 2-3/8" O.D. Tenon
MA1190-XX=3@90° Tenon Adapter for 2-3/8" O.D. Tenon
MA1191-XX=2@120° Tenon Adapter for 2-3/8" O.D. Tenon
MA1038-XX=Single Tenon Adapter for 3-1/2" O.D. Tenon
MA1039-XX=2@180° Tenon Adapter for 3-1/2" O.D. Tenon
MA1192-XX=3@120° Tenon Adapter for 3-1/2" O.D. Tenon
MA1193-XX=4@90° Tenon Adapter for 3-1/2" O.D. Tenon
MA1194-XX=2@90° Tenon Adapter for 3-1/2" O.D. Tenon
MA1195-XX=3@90° Tenon Adapter for 3-1/2" O.D. Tenon
FSIR-100=Wireless Configuration Tool for Occupancy Sensor [24]
GLEON-MT1=Field Installed Mesh Top for 1-4 Light Squares
GLEON-MT2=Field Installed Mesh Top for 5-6 Light Squares
GLEON-MT3=Field Installed Mesh Top for 7-8 Light Squares
GLEON-MT4=Field Installed Mesh Top for 9-10 Light Squares
GLEON-QM=Quick Mount Arm Kit [11]
GLEON-QMEA=Quick Mount Extended Arm Kit [12]
LS/HSS=Field Installed House Side Shield [28,30]
WOLC-7P-10A=WaveLinx Outdoor Control Module [19,31]
SWPD4-WH=Wavelinx Wireless Sensor, 7' – 15' Mounting Height, White [19,33,34]
SWPD4-BZ=Wavelinx Wireless Sensor, 7' – 15' Mounting Height, Bronze [19,33,34]
SWPD5-WH=Wavelinx Wireless Sensor, 15' – 40' Mounting Height, White [19,33,34]
SWPD5-BZ=Wavelinx Wireless Sensor, 15' – 40' Mounting Height, Bronze [19,33,34]

NOTES:
1 Customer is responsible for engineering analysis to confirm pole and fixture compatibility for all applications. Refer to our white paper WP513001EN for additional support information. **2** DesignLights Consortium® Qualified. Refer to www.designlights.org Qualified Products List under Family Models for details. **3** Standard 4000K CCT and minimum 70 CRI. **4** Not compatible with MS/4-LXX or MS/1-LXX sensors. **5** Not compatible with extended quick mount arm (QMEA). **6** Not compatible with standard quick mount arm (QM) or extended quick mount arm (QMEA). **7** Requires the use of an internal step down transformer when combined with sensor options. Not available with sensor at 1200mA. Not available in combination with the HA high ambient and sensor options at 1A. **8** Only for use with 480V Wye systems. Per NEC, not for use with ungrounded systems, impedance grounded systems or corner grounded systems (commonly known as Three Phase Three Wire Delta, Three Phase High Leg Delta and Three Phase Corner Grounded Delta systems). **9** May be required when two or more luminaires are oriented on a 90° or 120° drilling pattern. Refer to arm mounting requirement table. **10** Factory installed. **11** Maximum 8 light squares. **12** Maximum 6 light squares. **13** Extended lead times apply. Use dedicated IES files for 2700K, 3000K, 5000K and 6000K when performing layouts. **14** Reserved **15** 1 Amp standard. Use dedicated IES files for 600mA, 800mA and 1200mA when performing layouts. **16** Not available with HA option. **17** 2L is not available with MS, MS/X or MS/DIM at 347V or 480V. 2L in AF-02 through AF-04 requires a larger housing, normally used for AF-05 or AF-06. Extended arm option may be required when mounting two or more fixtures per pole at 90° or 120°. Refer to arm mounting requirement table. **18** Not available with LumaWatt Pro wireless sensors. **19** Cannot be used with other control options. **20** Low voltage control lead brought out 18" outside fixture. **21** Not available if any "MS" sensor is selected. Motion sensor has an integral photocell. **22** Requires the use of P photocontrol or the PER7 or R photocontrol receptacle with photocontrol accessory. See After Hours Dim supplemental guide for additional information. **23** 50°C lumen maintenance data applies to 600mA, 800mA and 1A drive currents. **24** The FSIR-100 configuration tool is required to adjust parameters including high and low modes, sensitivity, time delay, cutoff and more. Consult your lighting representative at Eaton for more information. **25** Replace X with number of Light Squares operating in low output mode. **26** LumaWatt Pro wireless sensors are factory installed only requiring network components LWP-EM-1, LWP-GW-1 and LWP-PoE8 in appropriate quantities. See www.eaton.com/lighting for LumaWatt Pro application information. **27** Not available with house side shield (HSS). **28** Only for use with SL2, SL3, SL4 and AFL distributions. The Light Square trim plate is painted black when the HSS option is selected. **29** CE is not available with the LWR, MS, MS/X, MS/DIM, P, R or PER7 options. Available in 120-277V only. **30** One required for each Light Square. **31** Requires PER7. **32** Reserved. **33** WAC Gateway required to enable field-configurability: Order WAC-PoE and WPOE-120 (10V to PoE injector) power supply if needed. **34** Requires ZW. **35** Reserved.

LumenSafe Integrated Network Security Camera Technology Options (Add as Suffix)

Product Family	Camera Type	Data Backhaul	
L=LumenSafe Technology* LumenSafe Technology CLICK HERE	**D**=Dome Camera, Standard **H**=Dome Camera, Hi-Res **Z**=Dome Camera, Remote PTZ	**C**=Cellular, Customer Installed SIM Card **A**=Cellular, Factory Installed AT&T SIM Card **V**=Cellular, Factory Installed Verizon SIM Card **S**=Cellular, Factory Installed Sprint SIM Card	**W**=Wi-Fi Networking w/ Omni-Directional Antenna **E**=Ethernet Networking

*Consult LumenSafe system pages for additional details and compatibility.

McGraw-Edison

DESCRIPTION

The Galleon™ LED luminaire delivers exceptional performance in a highly scalable, low-profile design. Patented, high-efficiency AccuLED Optics™ system provides uniform and energy conscious illumination to walkways, parking lots, roadways, building areas and security lighting applications. IP66 rated and UL/cUL Listed for wet locations.

OVERALL
MOUNTING HEIGHT
16'-0" A.F.G.

Catalog #		Type
Project	FRED LAVERY PORSCHE	L1
Comments		Date
Prepared by		

SPECIFICATION FEATURES

Construction
Extruded aluminum driver enclosure thermally isolated from Light Squares for optimal thermal performance. Heavy-wall, die-cast aluminum end caps enclose housing and die-cast aluminum heat sinks. A unique, patent pending interlocking housing and heat sink provides scalability with superior structural rigidity. 3G vibration tested and rated. Optional tool-less hardware available for ease of entry into electrical chamber. Housing is IP66 rated.

Optics
Patented, high-efficiency injection-molded AccuLED Optics technology. Optics are precisely designed to shape the distribution maximizing efficiency and application spacing. AccuLED Optics create consistent distributions with the scalability to meet customized application requirements. Offered standard in 4000K (+/- 275K) CCT 70 CRI. Optional 3000K, 5000K and 6000K CCT.

Electrical
LED drivers are mounted to removable tray assembly for ease of maintenance. 120-277V 50/60Hz, 347V 60Hz or 480V 60Hz operation. 480V is compatible for use with 480V Wye systems only. Standard with 0-10V dimming. Shipped standard with Eaton proprietary circuit module designed to withstand 10kV of transient line surge. The Galleon LED luminaire is suitable for operation in -40°C to 40°C ambient environments. For applications with ambient temperatures exceeding 40°C, specify the HA (High Ambient) option. Light Squares are IP66 rated. Greater than 90% lumen maintenance expected at 60,000 hours. Available in standard 1A drive current and optional 600mA, 800mA and 1200mA drive currents (nominal).

Mounting
STANDARD ARM MOUNT: Extruded aluminum arm includes internal bolt guides allowing for easy positioning of fixture during mounting. When mounting two or more luminaires at 90° and 120° apart, the EA extended arm may be required. Refer to the arm mounting requirement table. Round pole adapter included. For wall mounting, specify wall mount bracket option. QUICK MOUNT ARM: Adapter is bolted directly to the pole. Quick mount arm slide into place on the adapter and is secured via two screws, facilitating quick and easy installation. The versatile, patent pending, quick mount arm accommodates multiple drill patterns ranging from 1-1/2" to 4-7/8". Removal of the door on the quick mount arm enables wiring of the fixture without having to access the driver compartment. A knock-out enables round pole mounting.

Finish
Housing finished in super durable TGIC polyester powder coat paint, 2.5 mil nominal thickness for superior protection against fade and wear. Heat sink is powder coated black. Standard housing colors include black, bronze, grey, white, dark platinum and graphite metallic. RAL and custom color matches available.

Warranty
Five-year warranty.

GLEON
GALLEON LED

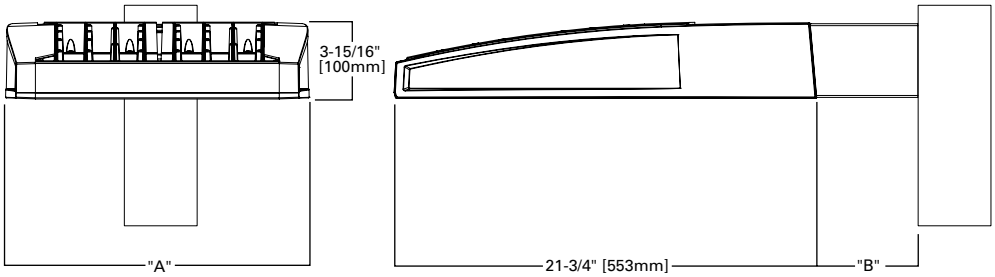
1-10 Light Squares
Solid State LED

AREA/SITE LUMINAIRE

LumenSafe Technology
CLICK HERE

WaveLinx

DIMENSIONS



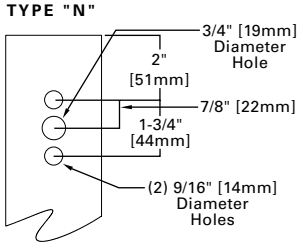
DIMENSION DATA

Number of Light Squares	"A" Width	"B" Standard Arm Length	"B" Optional Arm Length [1]	Weight with Arm (lbs.)	EPA with Arm [2] (Sq. Ft.)
1-4	15-1/2" (394mm)	7" (178mm)	10" (254mm)	33 (15.0 kgs.)	0.96
5-6	21-5/8" (549mm)	7" (178mm)	10" (254mm)	44 (20.0 kgs.)	1.00
7-8	27-5/8" (702mm)	7" (178mm)	13" (330mm)	54 (24.5 kgs.)	1.07
9-10	33-3/4" (857mm)	7" (178mm)	16" (406mm)	63 (28.6 kgs.)	1.12

NOTES: 1. Optional arm length to be used when mounting two fixtures at 90° on a single pole. **2.** EPA calculated with optional arm length.

DRILLING PATTERN

TYPE "N"



CERTIFICATION DATA
3G Vibration Rated
DesignLights Consortium® Qualified*
IP66 Rated
ISO 9001
LM79 / LM80 Compliant
UL/cUL Wet Location Listed

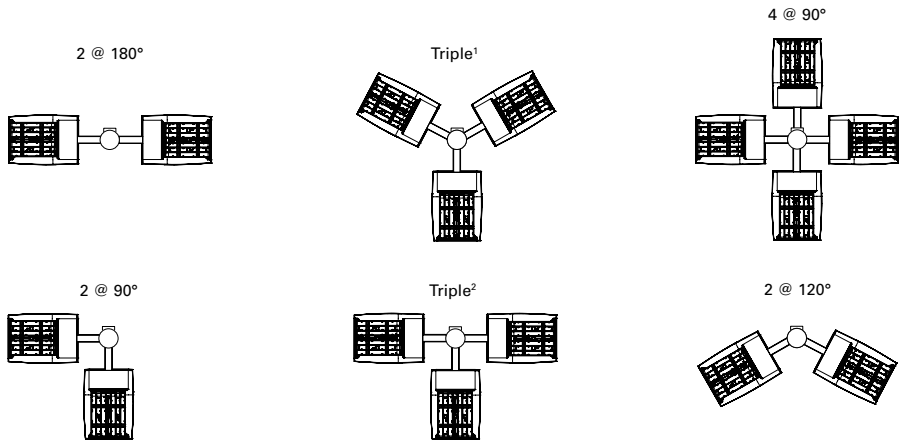
ENERGY DATA
Electronic LED Driver
>0.9 Power Factor
<20% Total Harmonic Distortion
120V-277V 50/60Hz
347V, 480V 60Hz
-40°C Min. Temperature
40°C Max. Temperature
50°C Max. Temperature (HA Option)

*www.designlights.org

Powering Business Worldwide

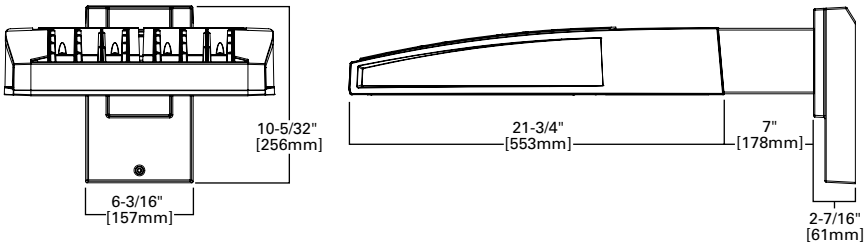
ARM MOUNTING REQUIREMENTS

Configuration	90° Apart	120° Apart
GLEON-AF-01	7" Arm (Standard)	7" Arm (Standard)
GLEON-AF-02	7" Arm (Standard)	7" Arm (Standard)
GLEON-AF-03	7" Arm (Standard)	7" Arm (Standard)
GLEON-AF-04	7" Arm (Standard)	7" Arm (Standard)
GLEON-AF-05	10" Extended Arm (Required)	7" Arm (Standard)
GLEON-AF-06	10" Extended Arm (Required)	7" Arm (Standard)
GLEON-AF-07	13" Extended Arm (Required)	13" Extended Arm (Required)
GLEON-AF-08	13" Extended Arm (Required)	13" Extended Arm (Required)
GLEON-AF-09	16" Extended Arm (Required)	16" Extended Arm (Required)
GLEON-AF-10	16" Extended Arm (Required)	16" Extended Arm (Required)

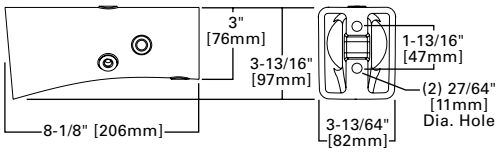


NOTES: 1 Round poles are 3 @ 120°. Square poles are 3 @ 90°. **2** Round poles are 3 @ 90°.

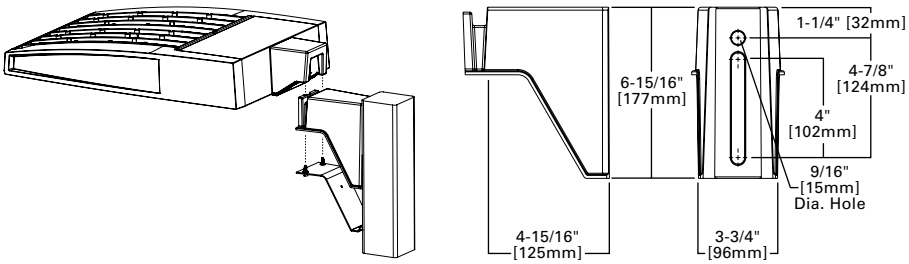
STANDARD WALL MOUNT



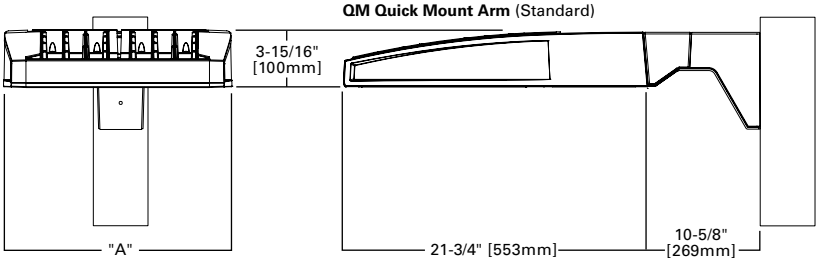
MAST ARM MOUNT



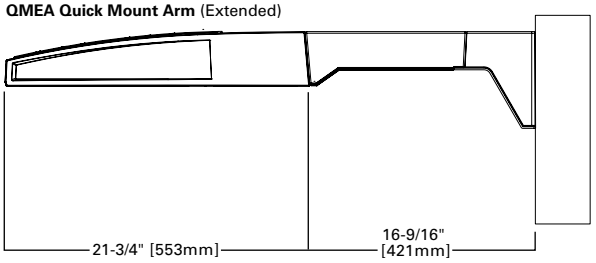
QUICK MOUNT ARM (INCLUDES FIXTURE ADAPTER)



QM Quick Mount Arm (Standard)



QMEA Quick Mount Arm (Extended)

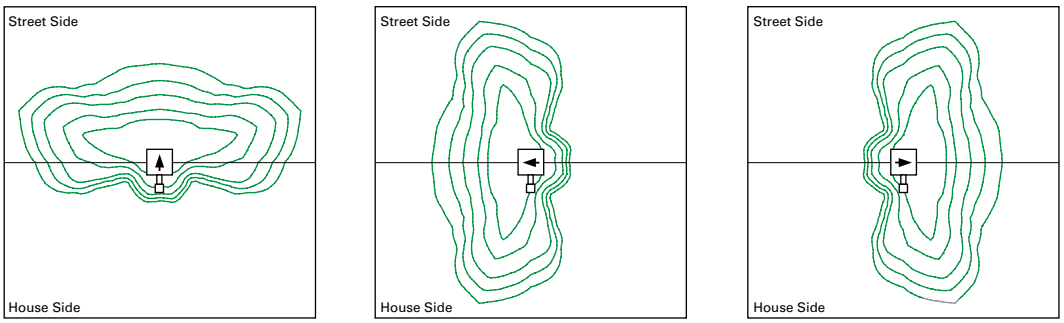


QUICK MOUNT ARM DATA

Number of Light Squares [1, 2]	"A" Width	Weight with QM Arm (lbs.)	Weight with QMEA Arm (lbs.)	EPA (Sq. Ft.)
1-4	15-1/2" (394mm)	35 (15.91 kgs.)	38 (17.27 kgs.)	1.11
5-6 [3]	21-5/8" (549mm)	46 (20.91 kgs.)	49 (22.27 kgs.)	
7-8	27-5/8" (702mm)	56 (25.45 kgs.)	N/A	

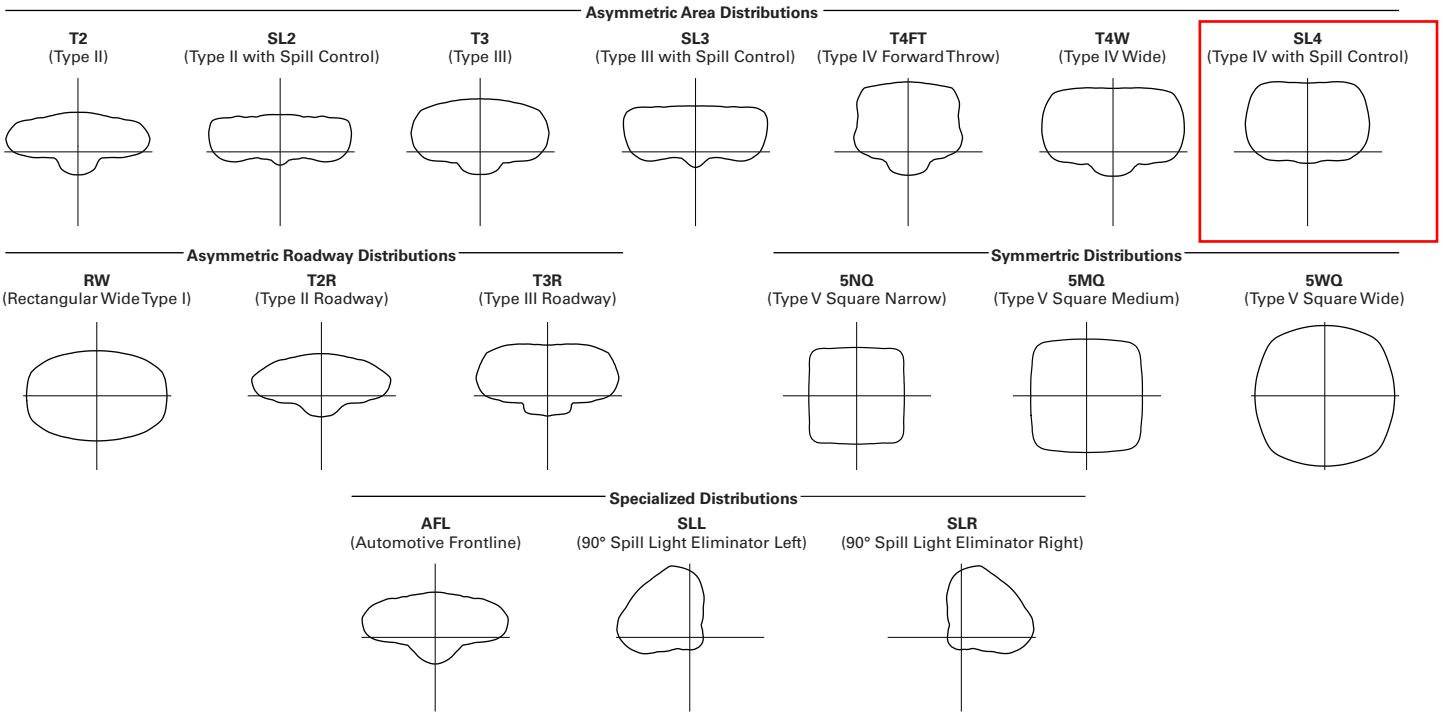
NOTES: 1 QM option available with 1-8 light square configurations. **2** QMEA option available with 1-6 light square configurations. **3** QMEA arm to be used when mounting two fixtures at 90° on a single pole.

OPTIC ORIENTATION



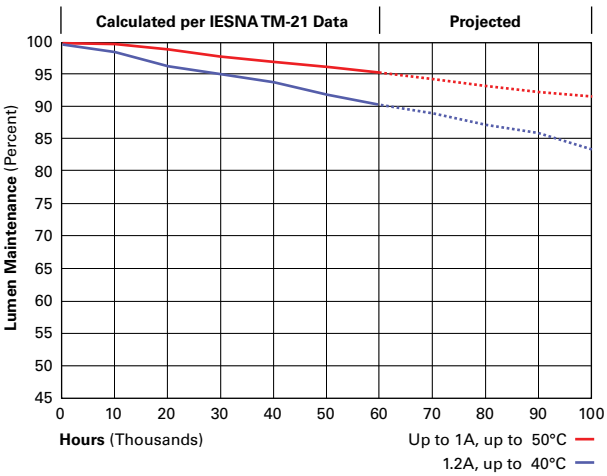
Standard | **Optics Rotated Left @ 90°** [L90] | **Optics Rotated Right @ 90°** [R90]

OPTICAL DISTRIBUTIONS



LUMEN MAINTENANCE

Drive Current	Ambient Temperature	TM-21 Lumen Maintenance (60,000 Hours)	Projected L70 (Hours)
Up to 1A	Up to 50°C	> 95%	416,000
1.2A	Up to 40°C	> 90%	205,000



LUMEN MULTIPLIER

Ambient Temperature	Lumen Multiplier
0°C	1.02
10°C	1.01
25°C	1.00
40°C	0.99
50°C	0.97

NOMINAL POWER LUMENS (1A)

Number of Light Squares		1	2	3	4	5	6	7	8	9	10
Nominal Power (Watts)		59	113	166	225	279	333	391	445	501	558
Input Current @ 120V (A)		0.51	1.02	1.53	2.03	2.55	3.06	3.56	4.08	4.60	5.07
Input Current @ 208V (A)		0.29	0.56	0.82	1.11	1.37	1.64	1.93	2.19	2.46	2.75
Input Current @ 240V (A)		0.26	0.48	0.71	0.96	1.19	0.41	1.67	1.89	2.12	2.39
Input Current @ 277V (A)		0.23	0.42	0.61	0.83	1.03	1.23	1.45	1.65	1.84	2.09
Input Current @ 347V (A)		0.17	0.32	0.50	0.64	0.82	1.00	1.14	1.32	1.50	1.68
Input Current @ 480V (A)		0.14	0.24	0.37	0.48	0.61	0.75	0.91	0.99	1.12	1.28
Optics											
T2	4000K/5000K Lumens	6,256	12,225	18,242	24,104	29,865	35,739	42,265	47,888	53,420	59,144
	3000K Lumens	5,915	11,559	17,248	22,789	28,236	33,790	39,960	45,277	50,506	55,919
	BUG Rating	B1-U0-G2	B2-U0-G2	B3-U0-G3	B3-U0-G4	B3-U0-G4	B3-U0-G4	B4-U0-G5	B4-U0-G5	B4-U0-G5	B4-U0-G5
T2R	4000K/5000K Lumens	6,642	12,979	19,366	25,589	31,705	37,941	44,870	50,840	56,711	62,789
	3000K Lumens	6,280	12,271	18,311	24,193	29,976	35,872	42,423	48,068	53,619	59,365
	BUG Rating	B1-U0-G1	B2-U0-G2	B2-U0-G2	B3-U0-G3	B3-U0-G4	B3-U0-G4	B3-U0-G4	B3-U0-G5	B4-U0-G5	B4-U0-G5
T3	4000K/5000K Lumens	6,377	12,461	18,593	24,568	30,439	36,426	43,077	48,810	54,447	60,282
	3000K Lumens	6,029	11,781	17,580	23,229	28,781	34,441	40,731	46,150	51,480	56,997
	BUG Rating	B1-U0-G2	B2-U0-G2	B3-U0-G3	B3-U0-G4	B3-U0-G4	B3-U0-G5	B4-U0-G5	B4-U0-G5	B4-U0-G5	B4-U0-G5
T3R	4000K/5000K Lumens	6,518	12,739	19,006	25,113	31,116	37,235	44,036	49,895	55,658	61,622
	3000K Lumens	6,029	11,781	17,579	23,229	28,779	34,440	40,729	46,148	51,478	56,995
	BUG Rating	B1-U0-G2	B2-U0-G2	B2-U0-G3	B3-U0-G4	B3-U0-G4	B3-U0-G5	B3-U0-G5	B3-U0-G5	B4-U0-G5	B4-U0-G5
T4FT	4000K/5000K Lumens	6,414	12,533	18,702	24,710	30,616	36,637	43,328	49,093	54,763	60,631
	3000K Lumens	6,064	11,849	17,681	23,363	28,946	34,638	40,966	46,417	51,776	57,325
	BUG Rating	B1-U0-G2	B2-U0-G3	B2-U0-G4	B3-U0-G4	B3-U0-G5	B3-U0-G5	B3-U0-G5	B3-U0-G5	B4-U0-G5	B4-U0-G5
T4W	4000K/5000K Lumens	6,331	12,372	18,459	24,391	30,221	36,163	42,769	48,459	54,056	59,849
	3000K Lumens	5,986	11,697	17,452	23,061	28,572	34,192	40,436	45,817	51,108	56,585
	BUG Rating	B1-U0-G2	B2-U0-G3	B3-U0-G4	B3-U0-G4	B3-U0-G5	B3-U0-G5	B4-U0-G5	B4-U0-G5	B4-U0-G5	B4-U0-G5
SL2	4000K/5000K Lumens	6,245	12,205	18,212	24,062	29,813	35,677	42,192	47,807	53,326	59,042
	3000K Lumens	5,904	11,539	17,218	22,750	28,187	33,732	39,891	45,199	50,418	55,822
	BUG Rating	B1-U0-G2	B2-U0-G3	B3-U0-G3	B3-U0-G4	B3-U0-G4	B3-U0-G5	B4-U0-G5	B4-U0-G5	B4-U0-G5	B4-U0-G5
SL3	4000K/5000K Lumens	6,376	12,460	18,591	24,564	30,436	36,421	43,072	48,803	54,439	60,273
	3000K Lumens	6,028	11,780	17,578	23,224	28,776	34,435	40,723	46,141	51,471	56,986
	BUG Rating	B1-U0-G2	B2-U0-G3	B2-U0-G3	B3-U0-G4	B3-U0-G4	B3-U0-G5	B3-U0-G5	B3-U0-G5	B4-U0-G5	B4-U0-G5
SL4	4000K/5000K Lumens	6,058	11,838	17,664	23,340	28,918	34,605	40,924	46,370	51,727	57,269
	3000K Lumens	5,727	11,193	16,701	22,067	27,341	32,718	38,692	43,841	48,906	54,146
	BUG Rating	B1-U0-G2	B1-U0-G3	B2-U0-G4	B2-U0-G4	B2-U0-G5	B3-U0-G5	B3-U0-G5	B3-U0-G5	B3-U0-G5	B3-U0-G5
5NQ	4000K/5000K Lumens	6,577	12,851	19,176	25,336	31,392	37,566	44,426	50,337	56,151	62,170
	3000K Lumens	6,218	12,151	18,131	23,955	29,680	35,517	42,003	47,592	53,089	58,779
	BUG Rating	B2-U0-G1	B3-U0-G2	B4-U0-G2	B4-U0-G2	B5-U0-G2	B5-U0-G3	B5-U0-G3	B5-U0-G3	B5-U0-G4	B5-U0-G4
5MQ	4000K/5000K Lumens	6,697	13,088	19,528	25,803	31,970	38,258	45,243	51,264	57,185	63,313
	3000K Lumens	6,332	12,374	18,463	24,395	30,227	36,171	42,776	48,468	54,066	59,861
	BUG Rating	B3-U0-G1	B4-U0-G2	B4-U0-G2	B5-U0-G3	B5-U0-G4	B5-U0-G4	B5-U0-G4	B5-U0-G5	B5-U0-G5	B5-U0-G5
5WQ	4000K/5000K Lumens	6,715	13,122	19,580	25,871	32,055	38,360	45,365	51,401	57,337	63,482
	3000K Lumens	6,348	12,406	18,513	24,461	30,307	36,268	42,891	48,599	54,210	60,021
	BUG Rating	B3-U0-G2	B4-U0-G2	B5-U0-G3	B5-U0-G3	B5-U0-G4	B5-U0-G4	B5-U0-G5	B5-U0-G5	B5-U0-G5	B5-U0-G5
SLL/SLR	4000K/5000K Lumens	5,604	10,949	16,337	21,586	26,745	32,004	37,850	42,886	47,838	52,965
	3000K Lumens	5,298	10,351	15,446	20,409	25,287	30,258	35,786	40,547	45,229	50,077
	BUG Rating	B1-U0-G2	B1-U0-G3	B2-U0-G3	B2-U0-G4	B3-U0-G4	B3-U0-G5	B3-U0-G5	B3-U0-G5	B3-U0-G5	B3-U0-G5
RW	4000K/5000K Lumens	6,517	12,735	19,002	25,107	31,109	37,227	44,025	49,883	55,644	61,607
	3000K Lumens	6,162	12,040	17,965	23,738	29,413	35,197	41,623	47,163	52,609	58,247
	BUG Rating	B3-U0-G1	B3-U0-G2	B4-U0-G2	B4-U0-G2	B5-U0-G3	B5-U0-G3	B5-U0-G3	B5-U0-G4	B5-U0-G4	B5-U0-G4
AFL	4000K/5000K Lumens	6,541	12,781	19,072	25,199	31,221	37,362	44,185	50,065	55,846	61,831
	3000K Lumens	6,184	12,084	18,032	23,825	29,519	35,325	41,775	47,334	52,801	58,459
	BUG Rating	B1-U0-G1	B2-U0-G2	B2-U0-G2	B3-U0-G2	B3-U0-G3	B3-U0-G3	B3-U0-G3	B3-U0-G3	B4-U0-G4	B4-U0-G4

* Nominal data for 70 CRI.

CONTROL OPTIONS

0-10V (DIM)
This fixture is offered standard with 0-10V dimming driver(s). The DIM option provides 0-10V dimming wire leads for use with a lighting control panel or other control method.

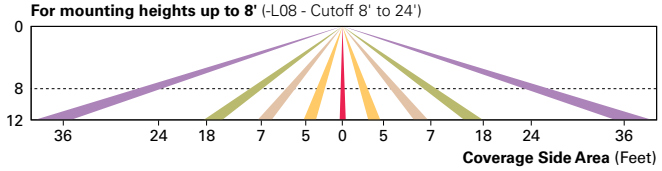
Photocontrol (P, R and PER7)
Optional button-type photocontrol (P) and photocontrol receptacles (R and PER7) provide a flexible solution to enable "dusk-to-dawn" lighting by sensing light levels. Advanced control systems compatible with NEMA 7-pin standards can be utilized with the PER7 receptacle.

After Hours Dim (AHD)
This feature allows photocontrol-enabled luminaires to achieve additional energy savings by dimming during scheduled portions of the night. The dimming profile will automatically take effect after a "dusk-to-dawn" period has been calculated from the photocontrol input. Specify the desired dimming profile for a simple, factory-shipped dimming solution requiring no external control wiring. Reference the After Hours Dim supplemental guide for additional information.

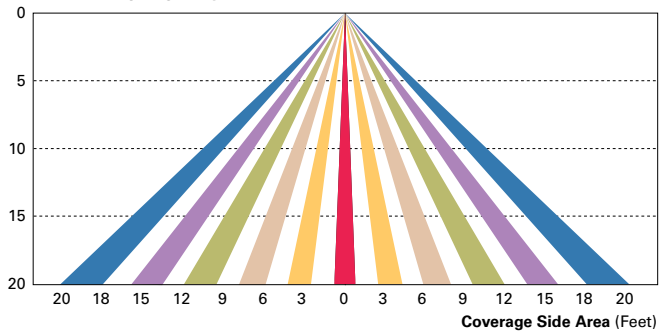
Dimming Occupancy Sensor (MS/DIM-LXX, MS/X-LXX and MS-LXX)
These sensors are factory installed in the luminaire housing. When the MS/DIM-LXX sensor option is selected, the occupancy sensor is connected to a dimming driver and the entire luminaire dims when there is no activity detected. When activity is detected, the luminaire returns to full light output. The MS/DIM sensor is factory preset to dim down to approximately 50 percent power with a time delay of five minutes. The MS-LXX sensor is factory preset to turn the luminaire off after five minutes of no activity. The MS/X-LXX is also preset for five minutes and only controls the specified number of light engines to maintain steady output from the remaining light engines.

These occupancy sensors includes an integral photocell that can be activated with the FSIR-100 accessory for "dusk-to-dawn" control or daylight harvesting - the factory preset is OFF. The FSIR-100 is a wireless tool utilized for changing the dimming level, time delay, sensitivity and other parameters. A variety of sensor lens are available to optimize the coverage. pattern for mounting heights from 8'-40'.

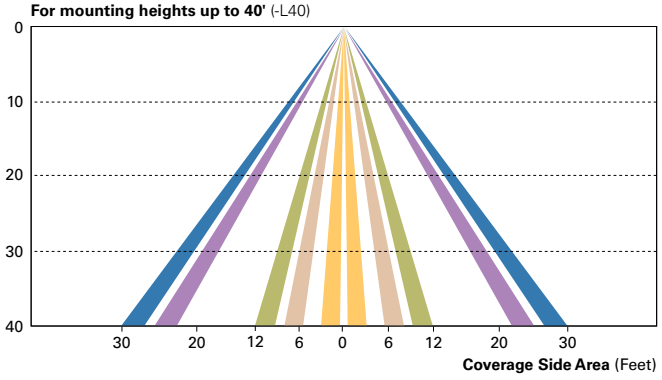
For mounting heights up to 8' (-L08 - Cutoff 8' to 24')



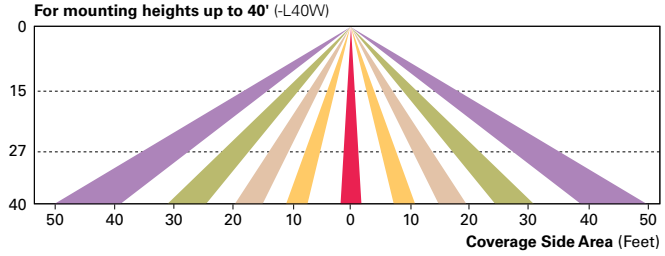
For mounting heights up to 20' (-L20)



For mounting heights up to 40' (-L40)

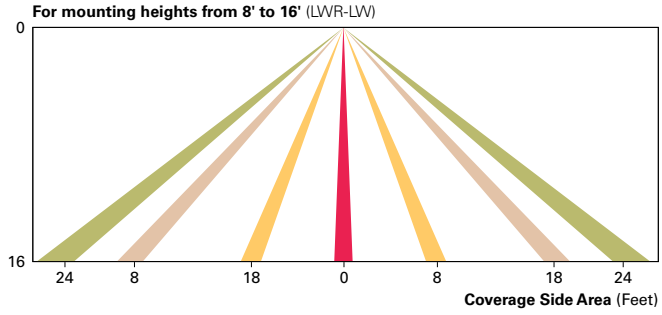


For mounting heights up to 40' (-L40W)

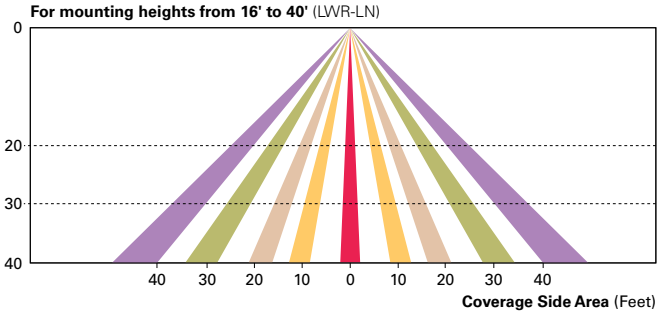


LumaWatt Pro Wireless Control and Monitoring System (LWR-LW and LWR-LN)
The Eaton's LumaWatt Pro powered by Enlighted is a connected lighting solution that combines a broad selection of energy-efficient LED luminaires with a powerful integrated wireless sensor system. The sensor controls the lighting system in compliance with the latest energy codes and collects valuable data about building performance and use. Software applications turn the granular data into information through energy dashboards and specialized apps that make it simple and help optimize the use of building resources, beyond lighting.

For mounting heights from 8' to 16' (LWR-LW)



For mounting heights from 16' to 40' (LWR-LN)



WaveLinx Wireless Outdoor Lighting Control Module (WOLC-7P-10A)
The 7-pin wireless outdoor lighting control module enables WaveLinx to control outdoor area, site and flood lighting. WaveLinx controls outdoor lighting using schedules to provide ON, OFF and dimming controls based on astronomic or time schedules based on a 7 day week.

LumenSafe Integrated Network Security Camera (LD)
Eaton brings ease of camera deployment to a whole new level. No additional wiring is needed beyond providing line power to the luminaire. A variety of networking options allows security integrators to design the optimal solution for active surveillance. As the ideal solution to meet the needs for active surveillance, the LumenSafe integrated network camera is a streamlined, outdoor-ready fixed dome that provides HDTV 1080p video. This IP camera is optimally designed for deployment in the video management system or security software platform of choice.

ORDERING INFORMATION

Sample Number: GLEON-AF-04-LED-E1-T3-GM-QM

Product Family [1, 2]	Light Engine	Number of Light Squares [3]	Lamp Type	Voltage	Distribution	Color	Mounting
GLEON=Galleon	**AF**=1A Drive Current	**01**=1 **02**=2 **03**=3 **04**=4 **05**=5 [4] **06**=6 **07**=7 [5] **08**=8 [5] **09**=9 [6] **10**=10 [6]	**LED**=Solid State Light Emitting Diodes	**E1**=120-277V **347**=347V [7] **480**=480V [7,8]	**T2**=Type II **T2R**=Type II Roadway **T3**=Type III **T3R**=Type III Roadway **T4FT**=Type IV ForwardThrow **T4W**=Type IV Wide **5NQ**=Type V Narrow **5MQ**=Type V Square Medium **5WQ**=Type V Square Wide **SL2**=Type II w/Spill Control **SL3**=Type III w/Spill Control **SL4**=Type IV w/Spill Control **SLL**=90° Spill Light Eliminator Left **SLR**=90° Spill Light Eliminator Right **RW**=Rectangular Wide Type I **AFL**=Automotive Frontline	**AP**=Grey **BZ**=Bronze **BK**=Black **DP**=Dark Platinum **GM**=Graphite Metallic **WH**=White	**[Blank]**=Arm for Round or Square Pole **EA**=Extended Arm [9] **MA**=Mast Arm Adapter [10] **WM**=Wall Mount **QM**=Quick Mount Arm (Standard Length) [11] **QMEA**=Quick Mount Arm (Extended Length) [12]

PROVIDE HSS - HOUSESIDE SHIELD

FINISH AS SELECTED BY ARCHITECT

Options (Add as Suffix)

7027=70 CRI 2700K [13]
7030=70 CRI 3000K [13]
8030=80 CRI 3000K [13]
7050=70 CRI 5000K [13]
7060=70 CRI 6000K [13]
600=Drive Current Set to Nominal 600mA [15]
800=Drive Current Set to Nominal 800mA [15]
1200=Drive Current Set to Nominal 1200mA [15, 16]
F=Single Fuse (120, 277 or 347V. Specify Voltage)
FF=Double Fuse (208, 240 or 480V. Specify Voltage)
2L=Two Circuits [17, 18]
DIM=External 0-10V Dimming Leads [19, 20]
AHD145=After Hours Dim, 5 Hours [22]
AHD245=After Hours Dim, 6 Hours [22]
AHD255=After Hours Dim, 7 Hours [22]
AHD355=After Hours Dim, 8 Hours [22]
HA=50°C High Ambient [23]
L90=Optics Rotated 90° Left
R90=Optics Rotated 90° Right
MT=Installed Mesh Top
TH=Tool-less Door Hardware
HSS=Installed House Side Shield [28]
CE=CE Marking [29]
LCF=Light Square Trim Painted to Match Housing [27]
P=Button Type Photocontrol (120, 208, 240 or 277V. Must Specify Voltage) [21]
PER7=NEMA 7-PIN Photocontrol Receptacle [21]
R=NEMA Photocontrol Receptacle [21]
MS-L20=Motion Sensor for ON/OFF Operation, 9' - 20' Mounting Height [24]
MS-L40W=Motion Sensor for ON/OFF Operation, 21' - 40' Mounting Height [24]
MS/DIM-L08= Motion Sensor for Dimming Operation, Maximum 8' Mounting Height [24]
MS/DIM-L20= Motion Sensor for Dimming Operation, 9' - 20' Mounting Height [24]
MS/DIM-L40W=Motion Sensor for Dimming Operation, 21' - 40' Mounting Height [24]
MS/X-L08=Bi-Level Motion Sensor, Maximum 8' Mounting Height [24, 25]
MS/X-L20=Bi-Level Motion Sensor, 9' - 20' Mounting Height [24, 25]
MS/X-L40W=Bi-Level Motion Sensor, 21' - 40' Mounting Height [24, 25]
MS-L08=Motion Sensor for ON/OFF Operation, Maximum 8' Mounting Height [24]
LWR-LW=LumaWatt Pro Wireless Sensor, Wide Lens for 8' - 16' Mounting Height [26]
LWR-LN=LumaWatt Pro Wireless Sensor, Narrow Lens for 16' - 40' Mounting Height [26]
ZW =WaveLinx-enabled 4-PIN Twistlock Receptacle [19, 33]
ZW-SWPD4WH=Wavelinx Wireless Sensor, 7' – 15' Mounting Height, White [19, 33]
ZW-SWPD4BZ=Wavelinx Wireless Sensor, 7' – 15' Mounting Height, Bronze [19, 33]
ZW-SWPD5WH=Wavelinx Wireless Sensor, 15' – 40' Mounting Height, White [19, 33]
ZW-SWPD5BZ=Wavelinx Wireless Sensor, 15' – 40' Mounting Height, Bronze [19, 33]

Accessories (Order Separately)

OA/RA1016=NEMA Photocontrol Multi-Tap - 105-285V
OA/RA1027=NEMA Photocontrol - 480V
OA/RA1201=NEMA Photocontrol - 347V
OA/RA1013=Photocontrol Shorting Cap
OA/RA1014=120V Photocontrol
MA1252=10kV Surge Module Replacement
MA1036-XX=Single Tenon Adapter for 2-3/8" O.D. Tenon
MA1037-XX=2@180° Tenon Adapter for 2-3/8" O.D. Tenon
MA1197-XX=3@120° Tenon Adapter for 2-3/8" O.D. Tenon
MA1188-XX=4@90° Tenon Adapter for 2-3/8" O.D. Tenon
MA1189-XX=2@90° Tenon Adapter for 2-3/8" O.D. Tenon
MA1190-XX=3@90° Tenon Adapter for 2-3/8" O.D. Tenon
MA1191-XX=2@120° Tenon Adapter for 2-3/8" O.D. Tenon
MA1038-XX=Single Tenon Adapter for 3-1/2" O.D. Tenon
MA1039-XX=2@180° Tenon Adapter for 3-1/2" O.D. Tenon
MA1192-XX=3@120° Tenon Adapter for 3-1/2" O.D. Tenon
MA1193-XX=4@90° Tenon Adapter for 3-1/2" O.D. Tenon
MA1194-XX=2@90° Tenon Adapter for 3-1/2" O.D. Tenon
MA1195-XX=3@90° Tenon Adapter for 3-1/2" O.D. Tenon
FSIR-100=Wireless Configuration Tool for Occupancy Sensor [24]
GLEON-MT1=Field Installed Mesh Top for 1-4 Light Squares
GLEON-MT2=Field Installed Mesh Top for 5-6 Light Squares
GLEON-MT3=Field Installed Mesh Top for 7-8 Light Squares
GLEON-MT4=Field Installed Mesh Top for 9-10 Light Squares
GLEON-QM=Quick Mount Arm Kit [11]
GLEON-QMEA=Quick Mount Extended Arm Kit [12]
LS/HSS=Field Installed House Side Shield [28, 30]
WOLC-7P-10A=WaveLinx Outdoor Control Module [19, 31]
SWPD4-WH=Wavelinx Wireless Sensor, 7' – 15' Mounting Height, White [19, 33, 34]
SWPD4-BZ=Wavelinx Wireless Sensor, 7' – 15' Mounting Height, Bronze [19, 33, 34]
SWPD5-WH=Wavelinx Wireless Sensor, 15' – 40' Mounting Height, White [19, 33, 34]
SWPD5-BZ=Wavelinx Wireless Sensor, 15' – 40' Mounting Height, Bronze [19, 33, 34]

NOTES:
1 Customer is responsible for engineering analysis to confirm pole and fixture compatibility for all applications. Refer to our white paper WP513001EN for additional support information. **2** DesignLights Consortium® Qualified. Refer to www.designlights.org Qualified Products List under Family Models for details. **3** Standard 4000K CCT and minimum 70 CRI. **4** Not compatible with MS/4-LXX or MS/1-LXX sensors. **5** Not compatible with extended quick mount arm (QMEA). **6** Not compatible with standard quick mount arm (QM) or extended quick mount arm (QMEA). **7** Requires the use of an internal step down transformer when combined with sensor options. Not available with sensor at 1200mA. Not available in combination with the HA high ambient and sensor options at 1A. **8** Only for use with 480V Wye systems. Per NEC, not for use with ungrounded systems, impedance grounded systems or corner grounded systems (commonly known as Three Phase Three Wire Delta, Three Phase High Leg Delta and Three Phase Corner Grounded Delta systems). **9** May be required when two or more luminaires are oriented on a 90° or 120° drilling pattern. Refer to arm mounting requirement table. **10** Factory installed. **11** Maximum 8 light squares. **12** Maximum 6 light squares. **13** Extended lead times apply. Use dedicated IES files for 2700K, 3000K, 5000K and 6000K when performing layouts. **14** Reserved **15** 1 Amp standard. Use dedicated IES files for 600mA, 800mA and 1200mA when performing layouts. **16** Not available with HA option. **17** 2L is not available with MS, MS/X or MS/DIM at 347V or 480V. 2L in AF-02 through AF-04 requires a larger housing, normally used for AF-05 or AF-06. Extended arm option may be required when mounting two or more fixtures per pole at 90° or 120°. Refer to arm mounting requirement table. **18** Not available with LumaWatt Pro wireless sensors. **19** Cannot be used with other control options. **20** Low voltage control lead brought out 18" outside fixture. **21** Not available if any "MS" sensor is selected. Motion sensor has an integral photocell. **22** Requires the use of P photocontrol or the PER7 or R photocontrol receptacle with photocontrol accessory. See After Hours Dim supplemental guide for additional information. **23** 50°C lumen maintenance data applies to 600mA, 800mA and 1A drive currents. **24** The FSIR-100 configuration tool is required to adjust parameters including high and low modes, sensitivity, time delay, cutoff and more. Consult your lighting representative at Eaton for more information. **25** Replace X with number of Light Squares operating in low output mode. **26** LumaWatt Pro wireless sensors are factory installed only requiring network components LWP-EM-1, LWP-GW-1 and LWP-PoE8 in appropriate quantities. See www.eaton.com/lighting for LumaWatt Pro application information. **27** Not available with house side shield (HSS). **28** Only for use with SL2, SL3, SL4 and AFL distributions. The Light Square trim plate is painted black when the HSS option is selected. **29** CE is not available with the LWR, MS, MS/X, MS/DIM, P, R or PER7 options. Available in 120-277V only. **30** One required for each Light Square. **31** Requires PER7. **32** Reserved. **33** WAC Gateway required to enable field-configurability: Order WAC-PoE and WPOE-120 (10V to PoE injector) power supply if needed. **34** Requires ZW. **35** Reserved.

LumenSafe Integrated Network Security Camera Technology Options (Add as Suffix)

Product Family	Camera Type	Data Backhaul	
L=LumenSafe Technology* LumenSafe Technology CLICK HERE	**D**=Dome Camera, Standard **H**=Dome Camera, Hi-Res **Z**=Dome Camera, Remote PTZ	**C**=Cellular, Customer Installed SIM Card **A**=Cellular, Factory Installed AT&T SIM Card **V**=Cellular, Factory Installed Verizon SIM Card **S**=Cellular, Factory Installed Sprint SIM Card	**W**=Wi-Fi Networking w/ Omni-Directional Antenna **E**=Ethernet Networking

*Consult LumenSafe system pages for additional details and compatibility.

McGraw-Edison

DESCRIPTION

The Galleon™ LED luminaire delivers exceptional performance in a highly scalable, low-profile design. Patented, high-efficiency AccuLED Optics™ system provides uniform and energy conscious illumination to walkways, parking lots, roadways, building areas and security lighting applications. IP66 rated and UL/cUL Listed for wet locations.

OVERALL
MOUNTING HEIGHT
16'-0" A.F.G.

Catalog #		Type
Project	FRED LAVERY PORSCHE	L1
Comments		Date
Prepared by		

SPECIFICATION FEATURES

Construction
Extruded aluminum driver enclosure thermally isolated from Light Squares for optimal thermal performance. Heavy-wall, die-cast aluminum end caps enclose housing and die-cast aluminum heat sinks. A unique, patent pending interlocking housing and heat sink provides scalability with superior structural rigidity. 3G vibration tested and rated. Optional tool-less hardware available for ease of entry into electrical chamber. Housing is IP66 rated.

Optics
Patented, high-efficiency injection-molded AccuLED Optics technology. Optics are precisely designed to shape the distribution maximizing efficiency and application spacing. AccuLED Optics create consistent distributions with the scalability to meet customized application requirements. Offered standard in 4000K (+/- 275K) CCT 70 CRI. Optional 3000K, 5000K and 6000K CCT.

Electrical
LED drivers are mounted to removable tray assembly for ease of maintenance. 120-277V 50/60Hz, 347V 60Hz or 480V 60Hz operation. 480V is compatible for use with 480V Wye systems only. Standard with 0-10V dimming. Shipped standard with Eaton proprietary circuit module designed to withstand 10kV of transient line surge. The Galleon LED luminaire is suitable for operation in -40°C to 40°C ambient environments. For applications with ambient temperatures exceeding 40°C, specify the HA (High Ambient) option. Light Squares are IP66 rated. Greater than 90% lumen maintenance expected at 60,000 hours. Available in standard 1A drive current and optional 600mA, 800mA and 1200mA drive currents (nominal).

Mounting
STANDARD ARM MOUNT: Extruded aluminum arm includes internal bolt guides allowing for easy positioning of fixture during mounting. When mounting two or more luminaires at 90° and 120° apart, the EA extended arm may be required. Refer to the arm mounting requirement table. Round pole adapter included. For wall mounting, specify wall mount bracket option. QUICK MOUNT ARM: Adapter is bolted directly to the pole. Quick mount arm slide into place on the adapter and is secured via two screws, facilitating quick and easy installation. The versatile, patent pending, quick mount arm accommodates multiple drill patterns ranging from 1-1/2" to 4-7/8". Removal of the door on the quick mount arm enables wiring of the fixture without having to access the driver compartment. A knock-out enables round pole mounting.

Finish
Housing finished in super durable TGIC polyester powder coat paint, 2.5 mil nominal thickness for superior protection against fade and wear. Heat sink is powder coated black. Standard housing colors include black, bronze, grey, white, dark platinum and graphite metallic. RAL and custom color matches available.

Warranty
Five-year warranty.

GLEON
GALLEON LED

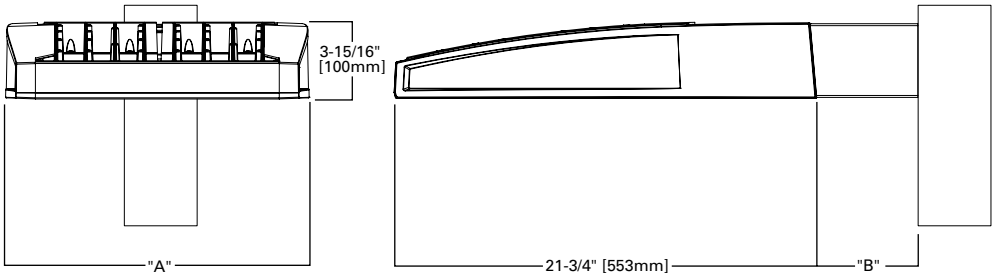
1-10 Light Squares
Solid State LED

AREA/SITE LUMINAIRE

LumenSafe Technology
CLICK HERE

WaveLinx

DIMENSIONS



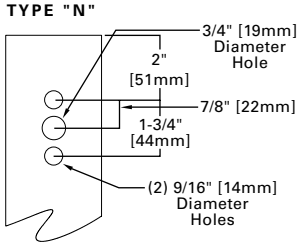
DIMENSION DATA

Number of Light Squares	"A" Width	"B" Standard Arm Length	"B" Optional Arm Length [1]	Weight with Arm (lbs.)	EPA with Arm [2] (Sq. Ft.)
1-4	15-1/2" (394mm)	7" (178mm)	10" (254mm)	33 (15.0 kgs.)	0.96
5-6	21-5/8" (549mm)	7" (178mm)	10" (254mm)	44 (20.0 kgs.)	1.00
7-8	27-5/8" (702mm)	7" (178mm)	13" (330mm)	54 (24.5 kgs.)	1.07
9-10	33-3/4" (857mm)	7" (178mm)	16" (406mm)	63 (28.6 kgs.)	1.12

NOTES: 1. Optional arm length to be used when mounting two fixtures at 90° on a single pole. **2.** EPA calculated with optional arm length.

DRILLING PATTERN

TYPE "N"



CERTIFICATION DATA
3G Vibration Rated
DesignLights Consortium® Qualified*
IP66 Rated
ISO 9001
LM79 / LM80 Compliant
UL/cUL Wet Location Listed

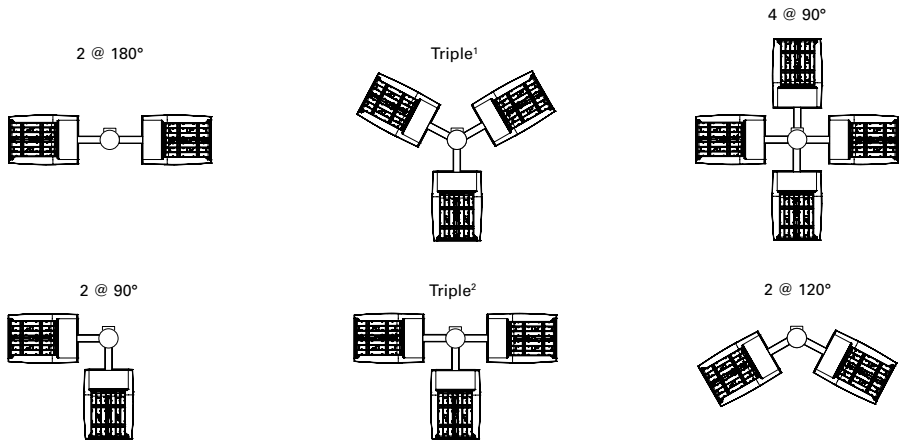
ENERGY DATA
Electronic LED Driver
>0.9 Power Factor
<20% Total Harmonic Distortion
120V-277V 50/60Hz
347V, 480V 60Hz
-40°C Min. Temperature
40°C Max. Temperature
50°C Max. Temperature (HA Option)

*www.designlights.org

Powering Business Worldwide

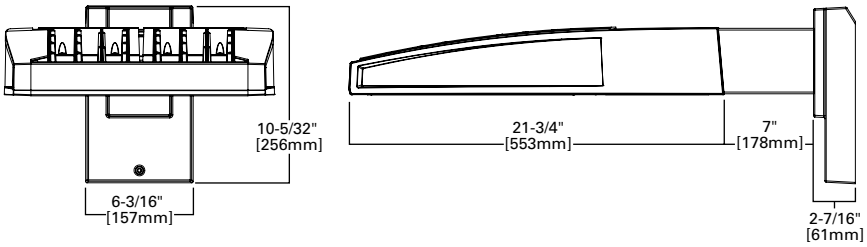
ARM MOUNTING REQUIREMENTS

Configuration	90° Apart	120° Apart
GLEON-AF-01	7" Arm (Standard)	7" Arm (Standard)
GLEON-AF-02	7" Arm (Standard)	7" Arm (Standard)
GLEON-AF-03	7" Arm (Standard)	7" Arm (Standard)
GLEON-AF-04	7" Arm (Standard)	7" Arm (Standard)
GLEON-AF-05	10" Extended Arm (Required)	7" Arm (Standard)
GLEON-AF-06	10" Extended Arm (Required)	7" Arm (Standard)
GLEON-AF-07	13" Extended Arm (Required)	13" Extended Arm (Required)
GLEON-AF-08	13" Extended Arm (Required)	13" Extended Arm (Required)
GLEON-AF-09	16" Extended Arm (Required)	16" Extended Arm (Required)
GLEON-AF-10	16" Extended Arm (Required)	16" Extended Arm (Required)

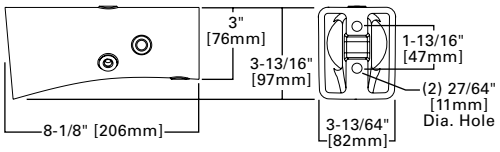


NOTES: 1 Round poles are 3 @ 120°. Square poles are 3 @ 90°. **2** Round poles are 3 @ 90°.

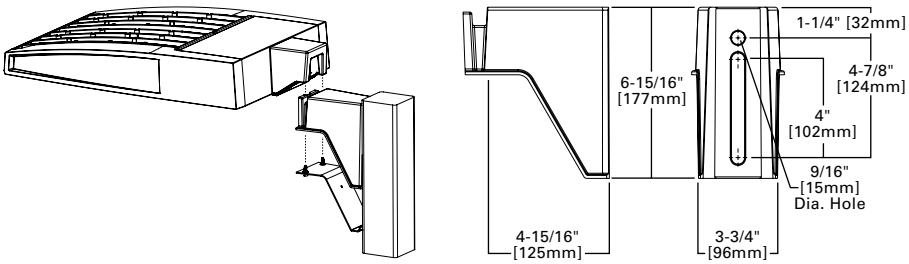
STANDARD WALL MOUNT



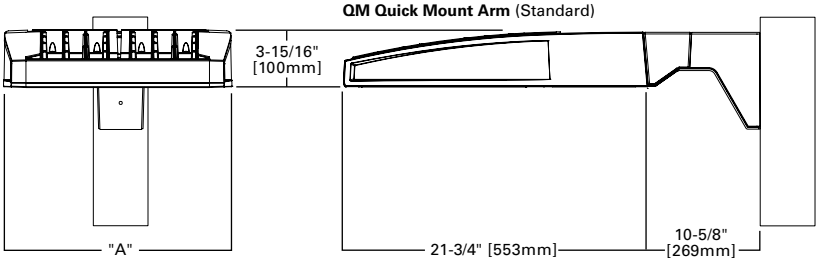
MAST ARM MOUNT



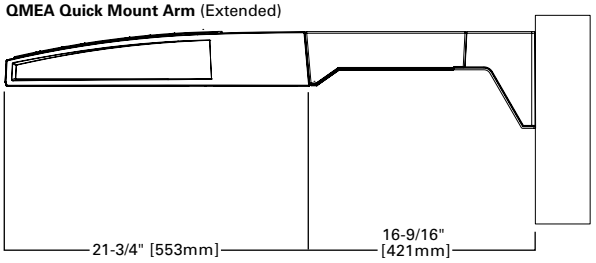
QUICK MOUNT ARM (INCLUDES FIXTURE ADAPTER)



QM Quick Mount Arm (Standard)



QMEA Quick Mount Arm (Extended)

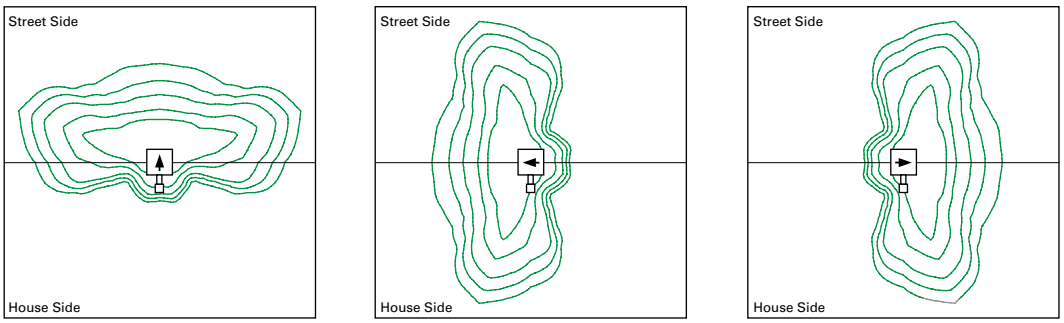


QUICK MOUNT ARM DATA

Number of Light Squares [1, 2]	"A" Width	Weight with QM Arm (lbs.)	Weight with QMEA Arm (lbs.)	EPA (Sq. Ft.)
1-4	15-1/2" (394mm)	35 (15.91 kgs.)	38 (17.27 kgs.)	1.11
5-6 [3]	21-5/8" (549mm)	46 (20.91 kgs.)	49 (22.27 kgs.)	
7-8	27-5/8" (702mm)	56 (25.45 kgs.)	N/A	

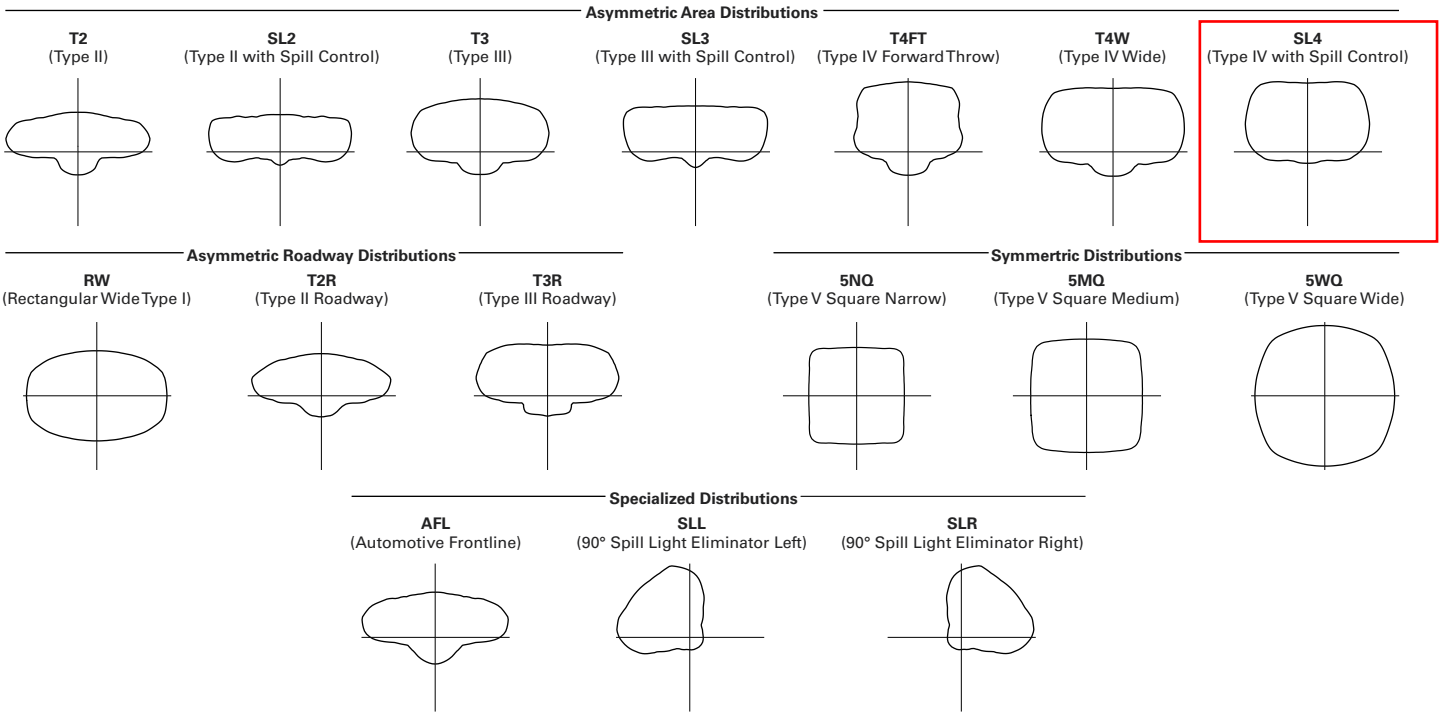
NOTES: 1 QM option available with 1-8 light square configurations. **2** QMEA option available with 1-6 light square configurations. **3** QMEA arm to be used when mounting two fixtures at 90° on a single pole.

OPTIC ORIENTATION



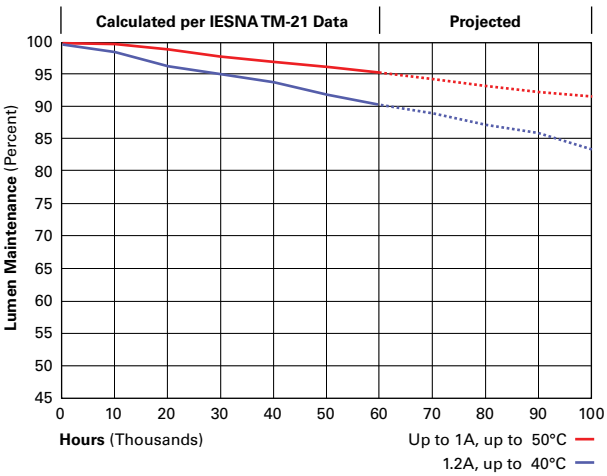
Standard | **Optics Rotated Left @ 90°** [L90] | **Optics Rotated Right @ 90°** [R90]

OPTICAL DISTRIBUTIONS



LUMEN MAINTENANCE

Drive Current	Ambient Temperature	TM-21 Lumen Maintenance (60,000 Hours)	Projected L70 (Hours)
Up to 1A	Up to 50°C	> 95%	416,000
1.2A	Up to 40°C	> 90%	205,000



LUMEN MULTIPLIER

Ambient Temperature	Lumen Multiplier
0°C	1.02
10°C	1.01
25°C	1.00
40°C	0.99
50°C	0.97

NOMINAL POWER LUMENS (1A)

Number of Light Squares		1	2	3	4	5	6	7	8	9	10
Nominal Power (Watts)		59	113	166	225	279	333	391	445	501	558
Input Current @ 120V (A)		0.51	1.02	1.53	2.03	2.55	3.06	3.56	4.08	4.60	5.07
Input Current @ 208V (A)		0.29	0.56	0.82	1.11	1.37	1.64	1.93	2.19	2.46	2.75
Input Current @ 240V (A)		0.26	0.48	0.71	0.96	1.19	0.41	1.67	1.89	2.12	2.39
Input Current @ 277V (A)		0.23	0.42	0.61	0.83	1.03	1.23	1.45	1.65	1.84	2.09
Input Current @ 347V (A)		0.17	0.32	0.50	0.64	0.82	1.00	1.14	1.32	1.50	1.68
Input Current @ 480V (A)		0.14	0.24	0.37	0.48	0.61	0.75	0.91	0.99	1.12	1.28
Optics											
T2	4000K/5000K Lumens	6,256	12,225	18,242	24,104	29,865	35,739	42,265	47,888	53,420	59,144
	3000K Lumens	5,915	11,559	17,248	22,789	28,236	33,790	39,960	45,277	50,506	55,919
	BUG Rating	B1-U0-G2	B2-U0-G2	B3-U0-G3	B3-U0-G4	B3-U0-G4	B3-U0-G4	B4-U0-G5	B4-U0-G5	B4-U0-G5	B4-U0-G5
T2R	4000K/5000K Lumens	6,642	12,979	19,366	25,589	31,705	37,941	44,870	50,840	56,711	62,789
	3000K Lumens	6,280	12,271	18,311	24,193	29,976	35,872	42,423	48,068	53,619	59,365
	BUG Rating	B1-U0-G1	B2-U0-G2	B2-U0-G2	B3-U0-G3	B3-U0-G4	B3-U0-G4	B3-U0-G4	B3-U0-G5	B4-U0-G5	B4-U0-G5
T3	4000K/5000K Lumens	6,377	12,461	18,593	24,568	30,439	36,426	43,077	48,810	54,447	60,282
	3000K Lumens	6,029	11,781	17,580	23,229	28,781	34,441	40,731	46,150	51,480	56,997
	BUG Rating	B1-U0-G2	B2-U0-G2	B3-U0-G3	B3-U0-G4	B3-U0-G4	B3-U0-G5	B4-U0-G5	B4-U0-G5	B4-U0-G5	B4-U0-G5
T3R	4000K/5000K Lumens	6,518	12,739	19,006	25,113	31,116	37,235	44,036	49,895	55,658	61,622
	3000K Lumens	6,029	11,781	17,579	23,229	28,779	34,440	40,729	46,148	51,478	56,995
	BUG Rating	B1-U0-G2	B2-U0-G2	B2-U0-G3	B3-U0-G4	B3-U0-G4	B3-U0-G5	B3-U0-G5	B3-U0-G5	B4-U0-G5	B4-U0-G5
T4FT	4000K/5000K Lumens	6,414	12,533	18,702	24,710	30,616	36,637	43,328	49,093	54,763	60,631
	3000K Lumens	6,064	11,849	17,681	23,363	28,946	34,638	40,966	46,417	51,776	57,325
	BUG Rating	B1-U0-G2	B2-U0-G3	B2-U0-G4	B3-U0-G4	B3-U0-G5	B3-U0-G5	B3-U0-G5	B3-U0-G5	B4-U0-G5	B4-U0-G5
T4W	4000K/5000K Lumens	6,331	12,372	18,459	24,391	30,221	36,163	42,769	48,459	54,056	59,849
	3000K Lumens	5,986	11,697	17,452	23,061	28,572	34,192	40,436	45,817	51,108	56,585
	BUG Rating	B1-U0-G2	B2-U0-G3	B3-U0-G4	B3-U0-G4	B3-U0-G5	B3-U0-G5	B4-U0-G5	B4-U0-G5	B4-U0-G5	B4-U0-G5
SL2	4000K/5000K Lumens	6,245	12,205	18,212	24,062	29,813	35,677	42,192	47,807	53,326	59,042
	3000K Lumens	5,904	11,539	17,218	22,750	28,187	33,732	39,891	45,199	50,418	55,822
	BUG Rating	B1-U0-G2	B2-U0-G3	B3-U0-G3	B3-U0-G4	B3-U0-G4	B3-U0-G5	B4-U0-G5	B4-U0-G5	B4-U0-G5	B4-U0-G5
SL3	4000K/5000K Lumens	6,376	12,460	18,591	24,564	30,436	36,421	43,072	48,803	54,439	60,273
	3000K Lumens	6,028	11,780	17,578	23,224	28,776	34,435	40,723	46,141	51,471	56,986
	BUG Rating	B1-U0-G2	B2-U0-G3	B2-U0-G3	B3-U0-G4	B3-U0-G4	B3-U0-G5	B3-U0-G5	B3-U0-G5	B4-U0-G5	B4-U0-G5
SL4	4000K/5000K Lumens	6,058	11,838	17,664	23,340	28,918	34,605	40,924	46,370	51,727	57,269
	3000K Lumens	5,727	11,193	16,701	22,067	27,341	32,718	38,692	43,841	48,906	54,146
	BUG Rating	B1-U0-G2	B1-U0-G3	B2-U0-G4	B2-U0-G4	B2-U0-G5	B3-U0-G5	B3-U0-G5	B3-U0-G5	B3-U0-G5	B3-U0-G5
5NQ	4000K/5000K Lumens	6,577	12,851	19,176	25,336	31,392	37,566	44,426	50,337	56,151	62,170
	3000K Lumens	6,218	12,151	18,131	23,955	29,680	35,517	42,003	47,592	53,089	58,779
	BUG Rating	B2-U0-G1	B3-U0-G2	B4-U0-G2	B4-U0-G2	B5-U0-G2	B5-U0-G3	B5-U0-G3	B5-U0-G3	B5-U0-G4	B5-U0-G4
5MQ	4000K/5000K Lumens	6,697	13,088	19,528	25,803	31,970	38,258	45,243	51,264	57,185	63,313
	3000K Lumens	6,332	12,374	18,463	24,395	30,227	36,171	42,776	48,468	54,066	59,861
	BUG Rating	B3-U0-G1	B4-U0-G2	B4-U0-G2	B5-U0-G3	B5-U0-G4	B5-U0-G4	B5-U0-G4	B5-U0-G5	B5-U0-G5	B5-U0-G5
5WQ	4000K/5000K Lumens	6,715	13,122	19,580	25,871	32,055	38,360	45,365	51,401	57,337	63,482
	3000K Lumens	6,348	12,406	18,513	24,461	30,307	36,268	42,891	48,599	54,210	60,021
	BUG Rating	B3-U0-G2	B4-U0-G2	B5-U0-G3	B5-U0-G3	B5-U0-G4	B5-U0-G4	B5-U0-G5	B5-U0-G5	B5-U0-G5	B5-U0-G5
SLL/SLR	4000K/5000K Lumens	5,604	10,949	16,337	21,586	26,745	32,004	37,850	42,886	47,838	52,965
	3000K Lumens	5,298	10,351	15,446	20,409	25,287	30,258	35,786	40,547	45,229	50,077
	BUG Rating	B1-U0-G2	B1-U0-G3	B2-U0-G3	B2-U0-G4	B3-U0-G4	B3-U0-G5	B3-U0-G5	B3-U0-G5	B3-U0-G5	B3-U0-G5
RW	4000K/5000K Lumens	6,517	12,735	19,002	25,107	31,109	37,227	44,025	49,883	55,644	61,607
	3000K Lumens	6,162	12,040	17,965	23,738	29,413	35,197	41,623	47,163	52,609	58,247
	BUG Rating	B3-U0-G1	B3-U0-G2	B4-U0-G2	B4-U0-G2	B5-U0-G3	B5-U0-G3	B5-U0-G3	B5-U0-G4	B5-U0-G4	B5-U0-G4
AFL	4000K/5000K Lumens	6,541	12,781	19,072	25,199	31,221	37,362	44,185	50,065	55,846	61,831
	3000K Lumens	6,184	12,084	18,032	23,825	29,519	35,325	41,775	47,334	52,801	58,459
	BUG Rating	B1-U0-G1	B2-U0-G2	B2-U0-G2	B3-U0-G2	B3-U0-G3	B3-U0-G3	B3-U0-G3	B3-U0-G3	B4-U0-G4	B4-U0-G4

* Nominal data for 70 CRI.

CONTROL OPTIONS

0-10V (DIM)
This fixture is offered standard with 0-10V dimming driver(s). The DIM option provides 0-10V dimming wire leads for use with a lighting control panel or other control method.

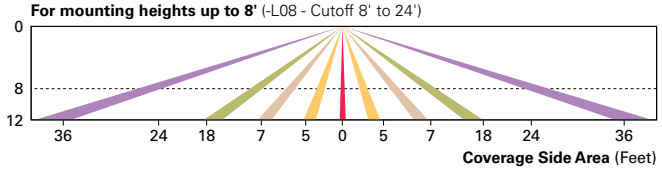
Photocontrol (P, R and PER7)
Optional button-type photocontrol (P) and photocontrol receptacles (R and PER7) provide a flexible solution to enable "dusk-to-dawn" lighting by sensing light levels. Advanced control systems compatible with NEMA 7-pin standards can be utilized with the PER7 receptacle.

After Hours Dim (AHD)
This feature allows photocontrol-enabled luminaires to achieve additional energy savings by dimming during scheduled portions of the night. The dimming profile will automatically take effect after a "dusk-to-dawn" period has been calculated from the photocontrol input. Specify the desired dimming profile for a simple, factory-shipped dimming solution requiring no external control wiring. Reference the After Hours Dim supplemental guide for additional information.

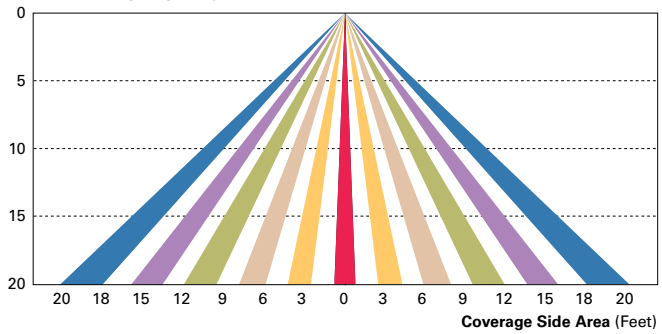
Dimming Occupancy Sensor (MS/DIM-LXX, MS/X-LXX and MS-LXX)
These sensors are factory installed in the luminaire housing. When the MS/DIM-LXX sensor option is selected, the occupancy sensor is connected to a dimming driver and the entire luminaire dims when there is no activity detected. When activity is detected, the luminaire returns to full light output. The MS/DIM sensor is factory preset to dim down to approximately 50 percent power with a time delay of five minutes. The MS-LXX sensor is factory preset to turn the luminaire off after five minutes of no activity. The MS/X-LXX is also preset for five minutes and only controls the specified number of light engines to maintain steady output from the remaining light engines.

These occupancy sensors includes an integral photocell that can be activated with the FSIR-100 accessory for "dusk-to-dawn" control or daylight harvesting - the factory preset is OFF. The FSIR-100 is a wireless tool utilized for changing the dimming level, time delay, sensitivity and other parameters. A variety of sensor lens are available to optimize the coverage. pattern for mounting heights from 8'-40'.

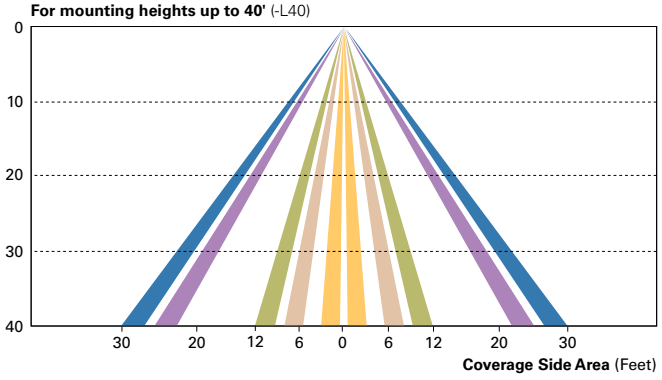
For mounting heights up to 8' (-L08 - Cutoff 8' to 24')



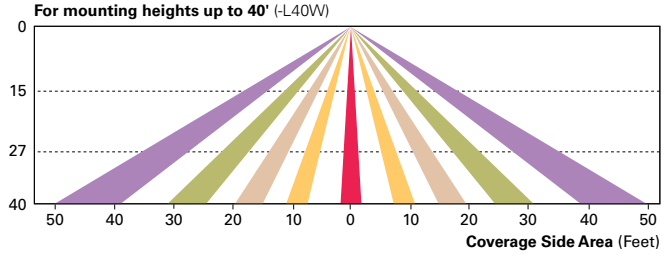
For mounting heights up to 20' (-L20)



For mounting heights up to 40' (-L40)

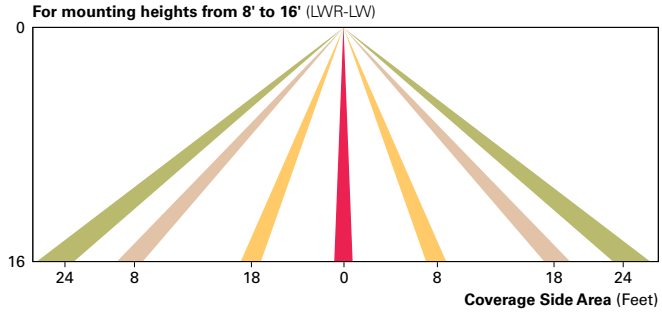


For mounting heights up to 40' (-L40W)

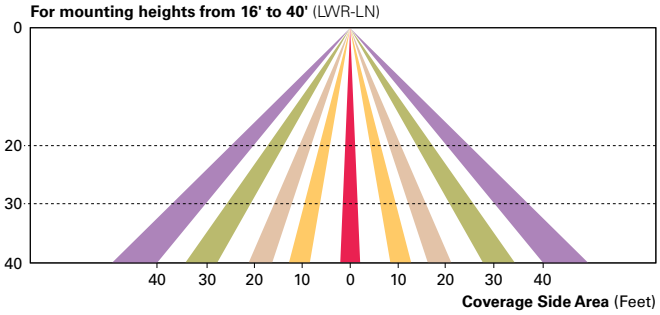


LumaWatt Pro Wireless Control and Monitoring System (LWR-LW and LWR-LN)
The Eaton's LumaWatt Pro powered by Enlighted is a connected lighting solution that combines a broad selection of energy-efficient LED luminaires with a powerful integrated wireless sensor system. The sensor controls the lighting system in compliance with the latest energy codes and collects valuable data about building performance and use. Software applications turn the granular data into information through energy dashboards and specialized apps that make it simple and help optimize the use of building resources, beyond lighting.

For mounting heights from 8' to 16' (LWR-LW)



For mounting heights from 16' to 40' (LWR-LN)



WaveLinx Wireless Outdoor Lighting Control Module (WOLC-7P-10A)
The 7-pin wireless outdoor lighting control module enables WaveLinx to control outdoor area, site and flood lighting. WaveLinx controls outdoor lighting using schedules to provide ON, OFF and dimming controls based on astronomic or time schedules based on a 7 day week.

LumenSafe Integrated Network Security Camera (LD)
Eaton brings ease of camera deployment to a whole new level. No additional wiring is needed beyond providing line power to the luminaire. A variety of networking options allows security integrators to design the optimal solution for active surveillance. As the ideal solution to meet the needs for active surveillance, the LumenSafe integrated network camera is a streamlined, outdoor-ready fixed dome that provides HDTV 1080p video. This IP camera is optimally designed for deployment in the video management system or security software platform of choice.

ORDERING INFORMATION

Sample Number: GLEON-AF-04-LED-E1-T3-GM-QM

Product Family [1, 2]	Light Engine	Number of Light Squares [3]	Lamp Type	Voltage	Distribution	Color	Mounting
GLEON=Galleon	**AF**=1A Drive Current	**01**=1 **02**=2 **03**=3 **04**=4 **05**=5 [4] **06**=6 **07**=7 [5] **08**=8 [5] **09**=9 [6] **10**=10 [6]	**LED**=Solid State Light Emitting Diodes	**E1**=120-277V **347**=347V [7] **480**=480V [7,8]	**T2**=Type II **T2R**=Type II Roadway **T3**=Type III **T3R**=Type III Roadway **T4FT**=Type IV ForwardThrow **T4W**=Type IV Wide **5NQ**=Type V Narrow **5MQ**=Type V Square Medium **5WQ**=Type V Square Wide **SL2**=Type II w/Spill Control **SL3**=Type III w/Spill Control **SL4**=Type IV w/Spill Control **SLL**=90° Spill Light Eliminator Left **SLR**=90° Spill Light Eliminator Right **RW**=Rectangular Wide Type I **AFL**=Automotive Frontline	**AP**=Grey **BZ**=Bronze **BK**=Black **DP**=Dark Platinum **GM**=Graphite Metallic **WH**=White	**[Blank]**=Arm for Round or Square Pole **EA**=Extended Arm [9] **MA**=Mast Arm Adapter [10] **WM**=Wall Mount **QM**=Quick Mount Arm (Standard Length) [11] **QMEA**=Quick Mount Arm (Extended Length) [12]

PROVIDE HSS - HOUSESIDE SHIELD

FINISH AS SELECTED BY ARCHITECT

Options (Add as Suffix)

7027=70 CRI 2700K [13]
7030=70 CRI 3000K [13]
8030=80 CRI 3000K [13]
7050=70 CRI 5000K [13]
7060=70 CRI 6000K [13]
600=Drive Current Set to Nominal 600mA [15]
800=Drive Current Set to Nominal 800mA [15]
1200=Drive Current Set to Nominal 1200mA [15, 16]
F=Single Fuse (120, 277 or 347V. Specify Voltage)
FF=Double Fuse (208, 240 or 480V. Specify Voltage)
2L=Two Circuits [17, 18]
DIM=External 0-10V Dimming Leads [19, 20]
AHD145=After Hours Dim, 5 Hours [22]
AHD245=After Hours Dim, 6 Hours [22]
AHD255=After Hours Dim, 7 Hours [22]
AHD355=After Hours Dim, 8 Hours [22]
HA=50°C High Ambient [23]
L90=Optics Rotated 90° Left
R90=Optics Rotated 90° Right
MT=Installed Mesh Top
TH=Tool-less Door Hardware
HSS=Installed House Side Shield [28]
CE=CE Marking [29]
LCF=Light Square Trim Painted to Match Housing [27]
P=Button Type Photocontrol (120, 208, 240 or 277V. Must Specify Voltage) [21]
PER7=NEMA 7-PIN Photocontrol Receptacle [21]
R=NEMA Photocontrol Receptacle [21]
MS-L20=Motion Sensor for ON/OFF Operation, 9' - 20' Mounting Height [24]
MS-L40W=Motion Sensor for ON/OFF Operation, 21' - 40' Mounting Height [24]
MS/DIM-L08= Motion Sensor for Dimming Operation, Maximum 8' Mounting Height [24]
MS/DIM-L20= Motion Sensor for Dimming Operation, 9' - 20' Mounting Height [24]
MS/DIM-L40W=Motion Sensor for Dimming Operation, 21' - 40' Mounting Height [24]
MS/X-L08=Bi-Level Motion Sensor, Maximum 8' Mounting Height [24, 25]
MS/X-L20=Bi-Level Motion Sensor, 9' - 20' Mounting Height [24, 25]
MS/X-L40W=Bi-Level Motion Sensor, 21' - 40' Mounting Height [24, 25]
MS-L08=Motion Sensor for ON/OFF Operation, Maximum 8' Mounting Height [24]
LWR-LW=LumaWatt Pro Wireless Sensor, Wide Lens for 8' - 16' Mounting Height [26]
LWR-LN=LumaWatt Pro Wireless Sensor, Narrow Lens for 16' - 40' Mounting Height [26]
ZW =WaveLinx-enabled 4-PIN Twistlock Receptacle [19, 33]
ZW-SWPD4WH=Wavelinx Wireless Sensor, 7' – 15' Mounting Height, White [19, 33]
ZW-SWPD4BZ=Wavelinx Wireless Sensor, 7' – 15' Mounting Height, Bronze [19, 33]
ZW-SWPD5WH=Wavelinx Wireless Sensor, 15' – 40' Mounting Height, White [19, 33]
ZW-SWPD5BZ=Wavelinx Wireless Sensor, 15' – 40' Mounting Height, Bronze [19, 33]

Accessories (Order Separately)

OA/RA1016=NEMA Photocontrol Multi-Tap - 105-285V
OA/RA1027=NEMA Photocontrol - 480V
OA/RA1201=NEMA Photocontrol - 347V
OA/RA1013=Photocontrol Shorting Cap
OA/RA1014=120V Photocontrol
MA1252=10kV Surge Module Replacement
MA1036-XX=Single Tenon Adapter for 2-3/8" O.D. Tenon
MA1037-XX=2@180° Tenon Adapter for 2-3/8" O.D. Tenon
MA1197-XX=3@120° Tenon Adapter for 2-3/8" O.D. Tenon
MA1188-XX=4@90° Tenon Adapter for 2-3/8" O.D. Tenon
MA1189-XX=2@90° Tenon Adapter for 2-3/8" O.D. Tenon
MA1190-XX=3@90° Tenon Adapter for 2-3/8" O.D. Tenon
MA1191-XX=2@120° Tenon Adapter for 2-3/8" O.D. Tenon
MA1038-XX=Single Tenon Adapter for 3-1/2" O.D. Tenon
MA1039-XX=2@180° Tenon Adapter for 3-1/2" O.D. Tenon
MA1192-XX=3@120° Tenon Adapter for 3-1/2" O.D. Tenon
MA1193-XX=4@90° Tenon Adapter for 3-1/2" O.D. Tenon
MA1194-XX=2@90° Tenon Adapter for 3-1/2" O.D. Tenon
MA1195-XX=3@90° Tenon Adapter for 3-1/2" O.D. Tenon
FSIR-100=Wireless Configuration Tool for Occupancy Sensor [24]
GLEON-MT1=Field Installed Mesh Top for 1-4 Light Squares
GLEON-MT2=Field Installed Mesh Top for 5-6 Light Squares
GLEON-MT3=Field Installed Mesh Top for 7-8 Light Squares
GLEON-MT4=Field Installed Mesh Top for 9-10 Light Squares
GLEON-QM=Quick Mount Arm Kit [11]
GLEON-QMEA=Quick Mount Extended Arm Kit [12]
LS/HSS=Field Installed House Side Shield [28, 30]
WOLC-7P-10A=WaveLinx Outdoor Control Module [19, 31]
SWPD4-WH=Wavelinx Wireless Sensor, 7' – 15' Mounting Height, White [19, 33, 34]
SWPD4-BZ=Wavelinx Wireless Sensor, 7' – 15' Mounting Height, Bronze [19, 33, 34]
SWPD5-WH=Wavelinx Wireless Sensor, 15' – 40' Mounting Height, White [19, 33, 34]
SWPD5-BZ=Wavelinx Wireless Sensor, 15' – 40' Mounting Height, Bronze [19, 33, 34]

NOTES:
1 Customer is responsible for engineering analysis to confirm pole and fixture compatibility for all applications. Refer to our white paper WP513001EN for additional support information. **2** DesignLights Consortium® Qualified. Refer to www.designlights.org Qualified Products List under Family Models for details. **3** Standard 4000K CCT and minimum 70 CRI. **4** Not compatible with MS/4-LXX or MS/1-LXX sensors. **5** Not compatible with extended quick mount arm (QMEA). **6** Not compatible with standard quick mount arm (QM) or extended quick mount arm (QMEA). **7** Requires the use of an internal step down transformer when combined with sensor options. Not available with sensor at 1200mA. Not available in combination with the HA high ambient and sensor options at 1A. **8** Only for use with 480V Wye systems. Per NEC, not for use with ungrounded systems, impedance grounded systems or corner grounded systems (commonly known as Three Phase Three Wire Delta, Three Phase High Leg Delta and Three Phase Corner Grounded Delta systems). **9** May be required when two or more luminaires are oriented on a 90° or 120° drilling pattern. Refer to arm mounting requirement table. **10** Factory installed. **11** Maximum 8 light squares. **12** Maximum 6 light squares. **13** Extended lead times apply. Use dedicated IES files for 2700K, 3000K, 5000K and 6000K when performing layouts. **14** Reserved **15** 1 Amp standard. Use dedicated IES files for 600mA, 800mA and 1200mA when performing layouts. **16** Not available with HA option. **17** 2L is not available with MS, MS/X or MS/DIM at 347V or 480V. 2L in AF-02 through AF-04 requires a larger housing, normally used for AF-05 or AF-06. Extended arm option may be required when mounting two or more fixtures per pole at 90° or 120°. Refer to arm mounting requirement table. **18** Not available with LumaWatt Pro wireless sensors. **19** Cannot be used with other control options. **20** Low voltage control lead brought out 18" outside fixture. **21** Not available if any "MS" sensor is selected. Motion sensor has an integral photocell. **22** Requires the use of P photocontrol or the PER7 or R photocontrol receptacle with photocontrol accessory. See After Hours Dim supplemental guide for additional information. **23** 50°C lumen maintenance data applies to 600mA, 800mA and 1A drive currents. **24** The FSIR-100 configuration tool is required to adjust parameters including high and low modes, sensitivity, time delay, cutoff and more. Consult your lighting representative at Eaton for more information. **25** Replace X with number of Light Squares operating in low output mode. **26** LumaWatt Pro wireless sensors are factory installed only requiring network components LWP-EM-1, LWP-GW-1 and LWP-PoE8 in appropriate quantities. See www.eaton.com/lighting for LumaWatt Pro application information. **27** Not available with house side shield (HSS). **28** Only for use with SL2, SL3, SL4 and AFL distributions. The Light Square trim plate is painted black when the HSS option is selected. **29** CE is not available with the LWR, MS, MS/X, MS/DIM, P, R or PER7 options. Available in 120-277V only. **30** One required for each Light Square. **31** Requires PER7. **32** Reserved. **33** WAC Gateway required to enable field-configurability: Order WAC-PoE and WPOE-120 (10V to PoE injector) power supply if needed. **34** Requires ZW. **35** Reserved.

LumenSafe Integrated Network Security Camera Technology Options (Add as Suffix)

Product Family	Camera Type	Data Backhaul	
L=LumenSafe Technology* LumenSafe Technology CLICK HERE	**D**=Dome Camera, Standard **H**=Dome Camera, Hi-Res **Z**=Dome Camera, Remote PTZ	**C**=Cellular, Customer Installed SIM Card **A**=Cellular, Factory Installed AT&T SIM Card **V**=Cellular, Factory Installed Verizon SIM Card **S**=Cellular, Factory Installed Sprint SIM Card	**W**=Wi-Fi Networking w/ Omni-Directional Antenna **E**=Ethernet Networking

*Consult LumenSafe system pages for additional details and compatibility.

McGraw-Edison

DESCRIPTION

The Galleon™ LED luminaire delivers exceptional performance in a highly scalable, low-profile design. Patented, high-efficiency AccuLED Optics™ system provides uniform and energy conscious illumination to walkways, parking lots, roadways, building areas and security lighting applications. IP66 rated and UL/cUL Listed for wet locations.

OVERALL
MOUNTING HEIGHT
16'-0" A.F.G.

Catalog #		Type
Project	FRED LAVERY PORSCHE	L1
Comments		Date
Prepared by		

SPECIFICATION FEATURES

Construction
Extruded aluminum driver enclosure thermally isolated from Light Squares for optimal thermal performance. Heavy-wall, die-cast aluminum end caps enclose housing and die-cast aluminum heat sinks. A unique, patent pending interlocking housing and heat sink provides scalability with superior structural rigidity. 3G vibration tested and rated. Optional tool-less hardware available for ease of entry into electrical chamber. Housing is IP66 rated.

Optics
Patented, high-efficiency injection-molded AccuLED Optics technology. Optics are precisely designed to shape the distribution maximizing efficiency and application spacing. AccuLED Optics create consistent distributions with the scalability to meet customized application requirements. Offered standard in 4000K (+/- 275K) CCT 70 CRI. Optional 3000K, 5000K and 6000K CCT.

Electrical
LED drivers are mounted to removable tray assembly for ease of maintenance. 120-277V 50/60Hz, 347V 60Hz or 480V 60Hz operation. 480V is compatible for use with 480V Wye systems only. Standard with 0-10V dimming. Shipped standard with Eaton proprietary circuit module designed to withstand 10kV of transient line surge. The Galleon LED luminaire is suitable for operation in -40°C to 40°C ambient environments. For applications with ambient temperatures exceeding 40°C, specify the HA (High Ambient) option. Light Squares are IP66 rated. Greater than 90% lumen maintenance expected at 60,000 hours. Available in standard 1A drive current and optional 600mA, 800mA and 1200mA drive currents (nominal).

Mounting
STANDARD ARM MOUNT: Extruded aluminum arm includes internal bolt guides allowing for easy positioning of fixture during mounting. When mounting two or more luminaires at 90° and 120° apart, the EA extended arm may be required. Refer to the arm mounting requirement table. Round pole adapter included. For wall mounting, specify wall mount bracket option. QUICK MOUNT ARM: Adapter is bolted directly to the pole. Quick mount arm slide into place on the adapter and is secured via two screws, facilitating quick and easy installation. The versatile, patent pending, quick mount arm accommodates multiple drill patterns ranging from 1-1/2" to 4-7/8". Removal of the door on the quick mount arm enables wiring of the fixture without having to access the driver compartment. A knock-out enables round pole mounting.

Finish
Housing finished in super durable TGIC polyester powder coat paint, 2.5 mil nominal thickness for superior protection against fade and wear. Heat sink is powder coated black. Standard housing colors include black, bronze, grey, white, dark platinum and graphite metallic. RAL and custom color matches available.

Warranty
Five-year warranty.

GLEON
GALLEON LED

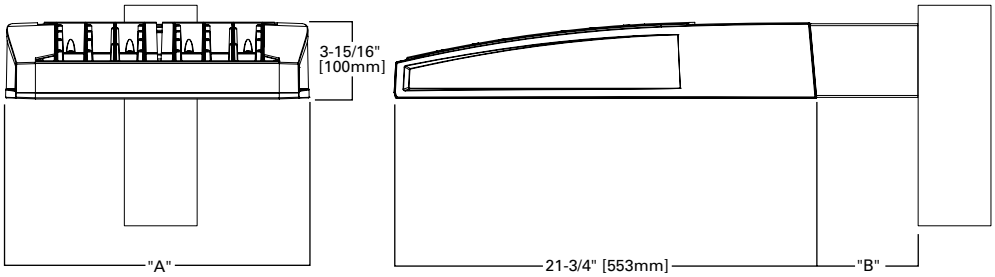
1-10 Light Squares
Solid State LED

AREA/SITE LUMINAIRE

LumenSafe Technology
CLICK HERE

WaveLinx

DIMENSIONS



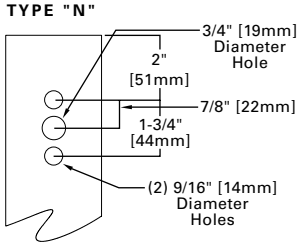
DIMENSION DATA

Number of Light Squares	"A" Width	"B" Standard Arm Length	"B" Optional Arm Length [1]	Weight with Arm (lbs.)	EPA with Arm [2] (Sq. Ft.)
1-4	15-1/2" (394mm)	7" (178mm)	10" (254mm)	33 (15.0 kgs.)	0.96
5-6	21-5/8" (549mm)	7" (178mm)	10" (254mm)	44 (20.0 kgs.)	1.00
7-8	27-5/8" (702mm)	7" (178mm)	13" (330mm)	54 (24.5 kgs.)	1.07
9-10	33-3/4" (857mm)	7" (178mm)	16" (406mm)	63 (28.6 kgs.)	1.12

NOTES: 1. Optional arm length to be used when mounting two fixtures at 90° on a single pole. **2.** EPA calculated with optional arm length.

DRILLING PATTERN

TYPE "N"



CERTIFICATION DATA
3G Vibration Rated
DesignLights Consortium® Qualified*
IP66 Rated
ISO 9001
LM79 / LM80 Compliant
UL/cUL Wet Location Listed

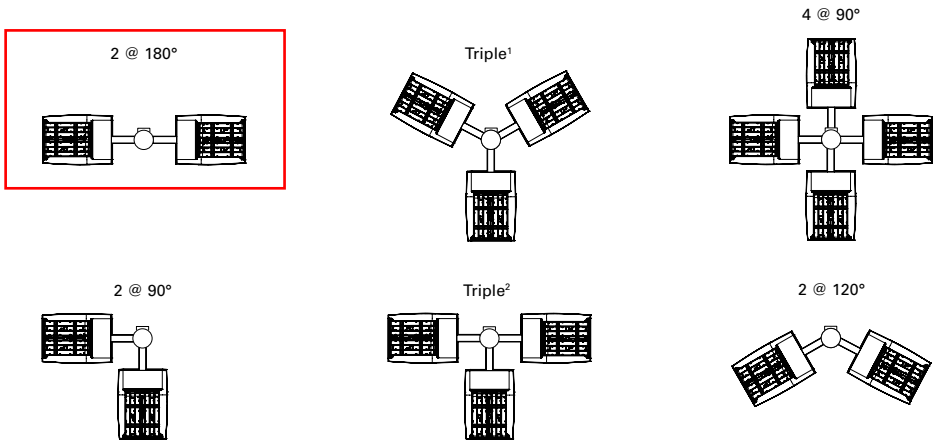
ENERGY DATA
Electronic LED Driver
>0.9 Power Factor
<20% Total Harmonic Distortion
120V-277V 50/60Hz
347V, 480V 60Hz
-40°C Min. Temperature
40°C Max. Temperature
50°C Max. Temperature (HA Option)

*www.designlights.org

Powering Business Worldwide

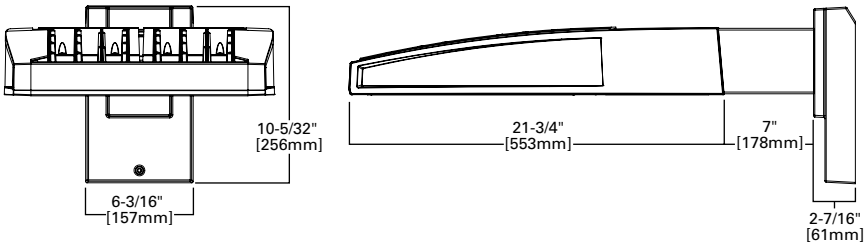
ARM MOUNTING REQUIREMENTS

Configuration	90° Apart	120° Apart
GLEON-AF-01	7" Arm (Standard)	7" Arm (Standard)
GLEON-AF-02	7" Arm (Standard)	7" Arm (Standard)
GLEON-AF-03	7" Arm (Standard)	7" Arm (Standard)
GLEON-AF-04	7" Arm (Standard)	7" Arm (Standard)
GLEON-AF-05	10" Extended Arm (Required)	7" Arm (Standard)
GLEON-AF-06	10" Extended Arm (Required)	7" Arm (Standard)
GLEON-AF-07	13" Extended Arm (Required)	13" Extended Arm (Required)
GLEON-AF-08	13" Extended Arm (Required)	13" Extended Arm (Required)
GLEON-AF-09	16" Extended Arm (Required)	16" Extended Arm (Required)
GLEON-AF-10	16" Extended Arm (Required)	16" Extended Arm (Required)

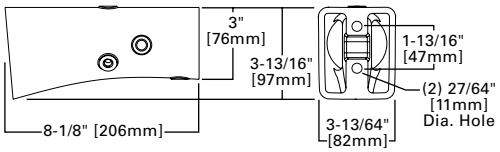


NOTES: 1 Round poles are 3 @ 120°. Square poles are 3 @ 90°. **2** Round poles are 3 @ 90°.

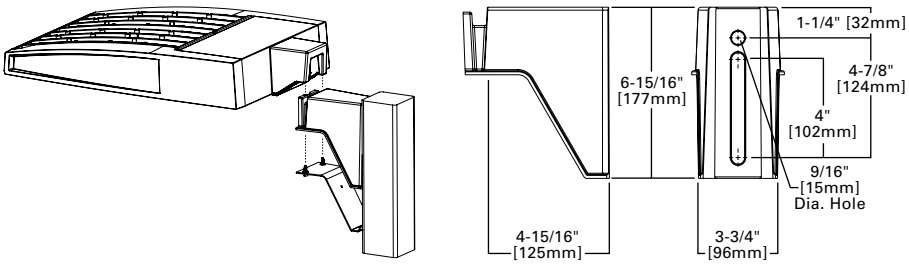
STANDARD WALL MOUNT



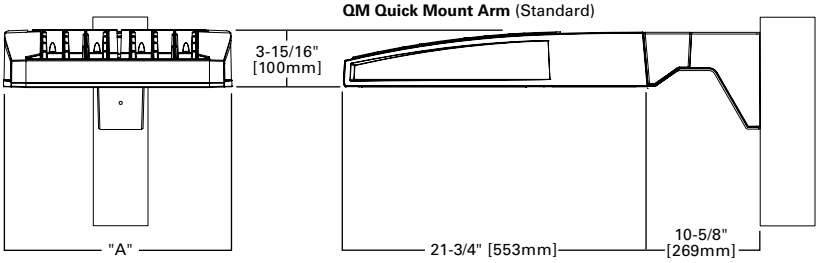
MAST ARM MOUNT



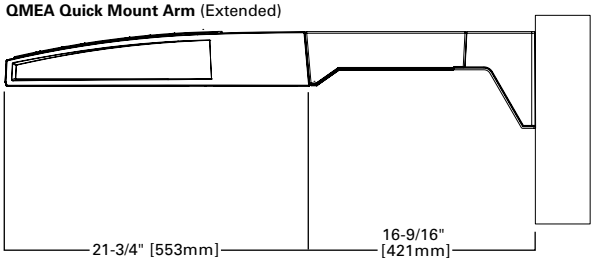
QUICK MOUNT ARM (INCLUDES FIXTURE ADAPTER)



QM Quick Mount Arm (Standard)



QMEA Quick Mount Arm (Extended)

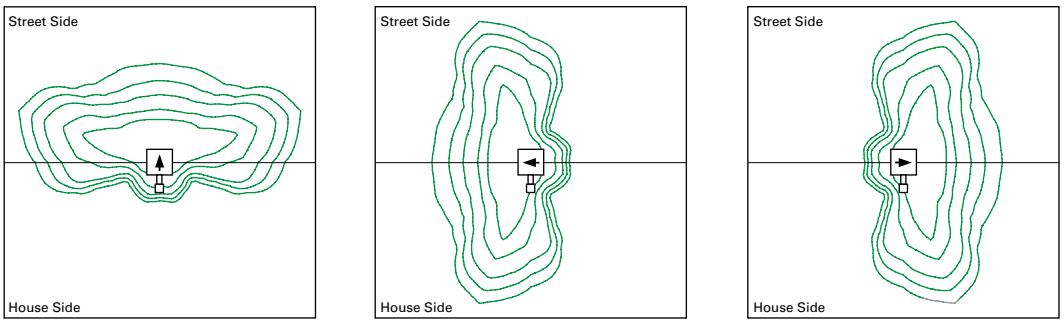


QUICK MOUNT ARM DATA

Number of Light Squares [1, 2]	"A" Width	Weight with QM Arm (lbs.)	Weight with QMEA Arm (lbs.)	EPA (Sq. Ft.)
1-4	15-1/2" (394mm)	35 (15.91 kgs.)	38 (17.27 kgs.)	1.11
5-6 [3]	21-5/8" (549mm)	46 (20.91 kgs.)	49 (22.27 kgs.)	
7-8	27-5/8" (702mm)	56 (25.45 kgs.)	N/A	

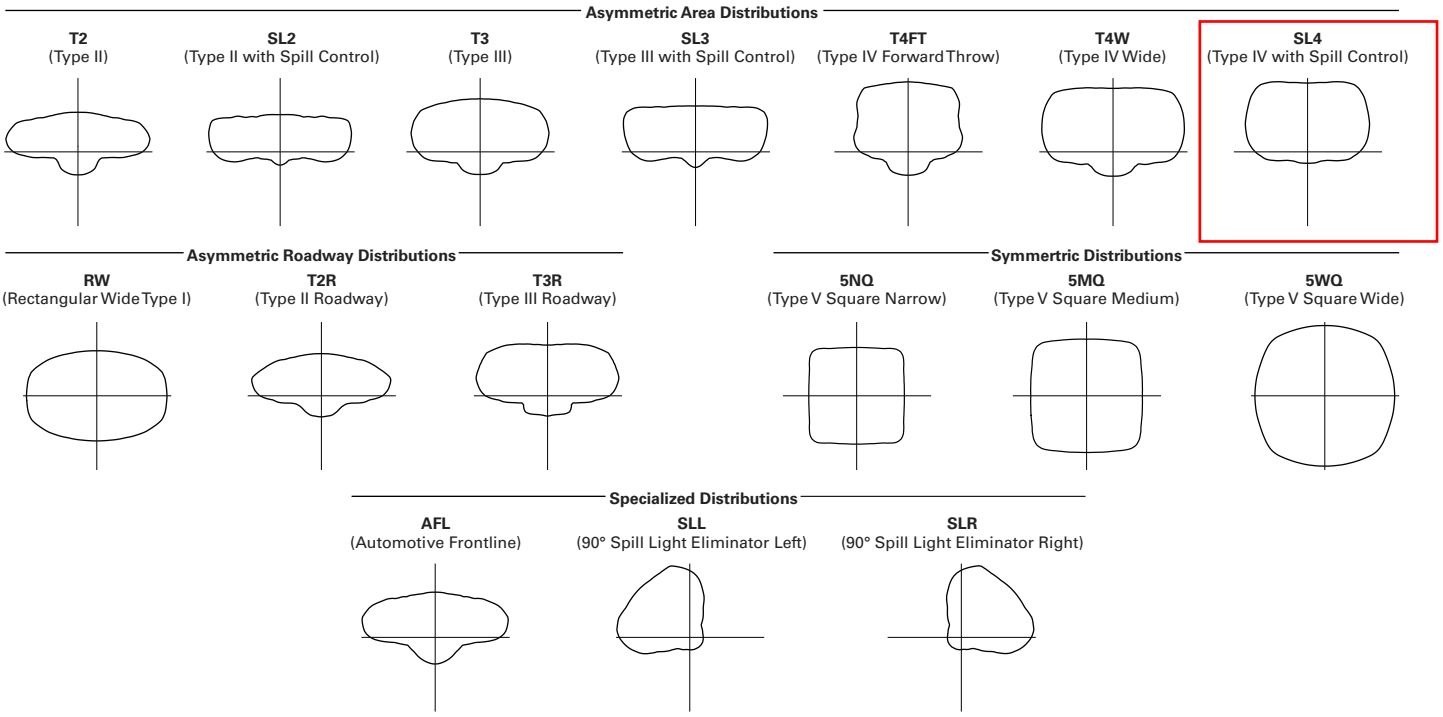
NOTES: 1 QM option available with 1-8 light square configurations. **2** QMEA option available with 1-6 light square configurations. **3** QMEA arm to be used when mounting two fixtures at 90° on a single pole.

OPTIC ORIENTATION



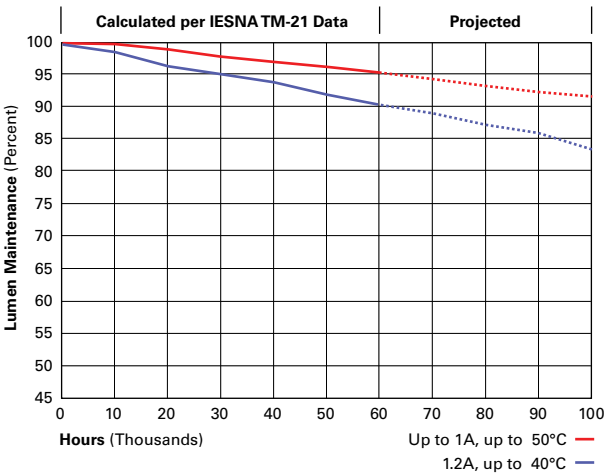
Standard | **Optics Rotated Left @ 90°** [L90] | **Optics Rotated Right @ 90°** [R90]

OPTICAL DISTRIBUTIONS



LUMEN MAINTENANCE

Drive Current	Ambient Temperature	TM-21 Lumen Maintenance (60,000 Hours)	Projected L70 (Hours)
Up to 1A	Up to 50°C	> 95%	416,000
1.2A	Up to 40°C	> 90%	205,000



LUMEN MULTIPLIER

Ambient Temperature	Lumen Multiplier
0°C	1.02
10°C	1.01
25°C	1.00
40°C	0.99
50°C	0.97

NOMINAL POWER LUMENS (1A)

Number of Light Squares		1	2	3	4	5	6	7	8	9	10
Nominal Power (Watts)		59	113	166	225	279	333	391	445	501	558
Input Current @ 120V (A)		0.51	1.02	1.53	2.03	2.55	3.06	3.56	4.08	4.60	5.07
Input Current @ 208V (A)		0.29	0.56	0.82	1.11	1.37	1.64	1.93	2.19	2.46	2.75
Input Current @ 240V (A)		0.26	0.48	0.71	0.96	1.19	0.41	1.67	1.89	2.12	2.39
Input Current @ 277V (A)		0.23	0.42	0.61	0.83	1.03	1.23	1.45	1.65	1.84	2.09
Input Current @ 347V (A)		0.17	0.32	0.50	0.64	0.82	1.00	1.14	1.32	1.50	1.68
Input Current @ 480V (A)		0.14	0.24	0.37	0.48	0.61	0.75	0.91	0.99	1.12	1.28
Optics											
T2	4000K/5000K Lumens	6,256	12,225	18,242	24,104	29,865	35,739	42,265	47,888	53,420	59,144
	3000K Lumens	5,915	11,559	17,248	22,789	28,236	33,790	39,960	45,277	50,506	55,919
	BUG Rating	B1-U0-G2	B2-U0-G2	B3-U0-G3	B3-U0-G4	B3-U0-G4	B3-U0-G4	B4-U0-G5	B4-U0-G5	B4-U0-G5	B4-U0-G5
T2R	4000K/5000K Lumens	6,642	12,979	19,366	25,589	31,705	37,941	44,870	50,840	56,711	62,789
	3000K Lumens	6,280	12,271	18,311	24,193	29,976	35,872	42,423	48,068	53,619	59,365
	BUG Rating	B1-U0-G1	B2-U0-G2	B2-U0-G2	B3-U0-G3	B3-U0-G4	B3-U0-G4	B3-U0-G4	B3-U0-G5	B4-U0-G5	B4-U0-G5
T3	4000K/5000K Lumens	6,377	12,461	18,593	24,568	30,439	36,426	43,077	48,810	54,447	60,282
	3000K Lumens	6,029	11,781	17,580	23,229	28,781	34,441	40,731	46,150	51,480	56,997
	BUG Rating	B1-U0-G2	B2-U0-G2	B3-U0-G3	B3-U0-G4	B3-U0-G4	B3-U0-G5	B4-U0-G5	B4-U0-G5	B4-U0-G5	B4-U0-G5
T3R	4000K/5000K Lumens	6,518	12,739	19,006	25,113	31,116	37,235	44,036	49,895	55,658	61,622
	3000K Lumens	6,029	11,781	17,579	23,229	28,779	34,440	40,729	46,148	51,478	56,995
	BUG Rating	B1-U0-G2	B2-U0-G2	B2-U0-G3	B3-U0-G4	B3-U0-G4	B3-U0-G5	B3-U0-G5	B3-U0-G5	B4-U0-G5	B4-U0-G5
T4FT	4000K/5000K Lumens	6,414	12,533	18,702	24,710	30,616	36,637	43,328	49,093	54,763	60,631
	3000K Lumens	6,064	11,849	17,681	23,363	28,946	34,638	40,966	46,417	51,776	57,325
	BUG Rating	B1-U0-G2	B2-U0-G3	B2-U0-G4	B3-U0-G4	B3-U0-G5	B3-U0-G5	B3-U0-G5	B3-U0-G5	B4-U0-G5	B4-U0-G5
T4W	4000K/5000K Lumens	6,331	12,372	18,459	24,391	30,221	36,163	42,769	48,459	54,056	59,849
	3000K Lumens	5,986	11,697	17,452	23,061	28,572	34,192	40,436	45,817	51,108	56,585
	BUG Rating	B1-U0-G2	B2-U0-G3	B3-U0-G4	B3-U0-G4	B3-U0-G5	B3-U0-G5	B4-U0-G5	B4-U0-G5	B4-U0-G5	B4-U0-G5
SL2	4000K/5000K Lumens	6,245	12,205	18,212	24,062	29,813	35,677	42,192	47,807	53,326	59,042
	3000K Lumens	5,904	11,539	17,218	22,750	28,187	33,732	39,891	45,199	50,418	55,822
	BUG Rating	B1-U0-G2	B2-U0-G3	B3-U0-G3	B3-U0-G4	B3-U0-G4	B3-U0-G5	B4-U0-G5	B4-U0-G5	B4-U0-G5	B4-U0-G5
SL3	4000K/5000K Lumens	6,376	12,460	18,591	24,564	30,436	36,421	43,072	48,803	54,439	60,273
	3000K Lumens	6,028	11,780	17,578	23,224	28,776	34,435	40,723	46,141	51,471	56,986
	BUG Rating	B1-U0-G2	B2-U0-G3	B2-U0-G3	B3-U0-G4	B3-U0-G4	B3-U0-G5	B3-U0-G5	B3-U0-G5	B4-U0-G5	B4-U0-G5
SL4	4000K/5000K Lumens	6,058	11,838	17,664	23,340	28,918	34,605	40,924	46,370	51,727	57,269
	3000K Lumens	5,727	11,193	16,701	22,067	27,341	32,718	38,692	43,841	48,906	54,146
	BUG Rating	B1-U0-G2	B1-U0-G3	B2-U0-G4	B2-U0-G4	B2-U0-G5	B3-U0-G5	B3-U0-G5	B3-U0-G5	B3-U0-G5	B3-U0-G5
5NQ	4000K/5000K Lumens	6,577	12,851	19,176	25,336	31,392	37,566	44,426	50,337	56,151	62,170
	3000K Lumens	6,218	12,151	18,131	23,955	29,680	35,517	42,003	47,592	53,089	58,779
	BUG Rating	B2-U0-G1	B3-U0-G2	B4-U0-G2	B4-U0-G2	B5-U0-G2	B5-U0-G3	B5-U0-G3	B5-U0-G3	B5-U0-G4	B5-U0-G4
5MQ	4000K/5000K Lumens	6,697	13,088	19,528	25,803	31,970	38,258	45,243	51,264	57,185	63,313
	3000K Lumens	6,332	12,374	18,463	24,395	30,227	36,171	42,776	48,468	54,066	59,861
	BUG Rating	B3-U0-G1	B4-U0-G2	B4-U0-G2	B5-U0-G3	B5-U0-G4	B5-U0-G4	B5-U0-G4	B5-U0-G5	B5-U0-G5	B5-U0-G5
5WQ	4000K/5000K Lumens	6,715	13,122	19,580	25,871	32,055	38,360	45,365	51,401	57,337	63,482
	3000K Lumens	6,348	12,406	18,513	24,461	30,307	36,268	42,891	48,599	54,210	60,021
	BUG Rating	B3-U0-G2	B4-U0-G2	B5-U0-G3	B5-U0-G3	B5-U0-G4	B5-U0-G4	B5-U0-G5	B5-U0-G5	B5-U0-G5	B5-U0-G5
SLL/SLR	4000K/5000K Lumens	5,604	10,949	16,337	21,586	26,745	32,004	37,850	42,886	47,838	52,965
	3000K Lumens	5,298	10,351	15,446	20,409	25,287	30,258	35,786	40,547	45,229	50,077
	BUG Rating	B1-U0-G2	B1-U0-G3	B2-U0-G3	B2-U0-G4	B3-U0-G4	B3-U0-G5	B3-U0-G5	B3-U0-G5	B3-U0-G5	B3-U0-G5
RW	4000K/5000K Lumens	6,517	12,735	19,002	25,107	31,109	37,227	44,025	49,883	55,644	61,607
	3000K Lumens	6,162	12,040	17,965	23,738	29,413	35,197	41,623	47,163	52,609	58,247
	BUG Rating	B3-U0-G1	B3-U0-G2	B4-U0-G2	B4-U0-G2	B5-U0-G3	B5-U0-G3	B5-U0-G3	B5-U0-G4	B5-U0-G4	B5-U0-G4
AFL	4000K/5000K Lumens	6,541	12,781	19,072	25,199	31,221	37,362	44,185	50,065	55,846	61,831
	3000K Lumens	6,184	12,084	18,032	23,825	29,519	35,325	41,775	47,334	52,801	58,459
	BUG Rating	B1-U0-G1	B2-U0-G2	B2-U0-G2	B3-U0-G2	B3-U0-G3	B3-U0-G3	B3-U0-G3	B3-U0-G3	B4-U0-G4	B4-U0-G4

* Nominal data for 70 CRI.

CONTROL OPTIONS

0-10V (DIM)
This fixture is offered standard with 0-10V dimming driver(s). The DIM option provides 0-10V dimming wire leads for use with a lighting control panel or other control method.

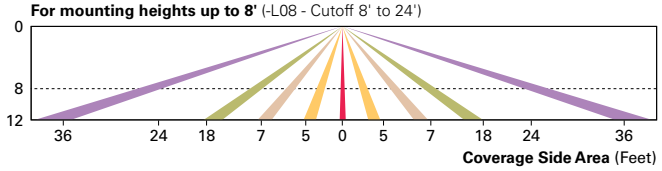
Photocontrol (P, R and PER7)
Optional button-type photocontrol (P) and photocontrol receptacles (R and PER7) provide a flexible solution to enable "dusk-to-dawn" lighting by sensing light levels. Advanced control systems compatible with NEMA 7-pin standards can be utilized with the PER7 receptacle.

After Hours Dim (AHD)
This feature allows photocontrol-enabled luminaires to achieve additional energy savings by dimming during scheduled portions of the night. The dimming profile will automatically take effect after a "dusk-to-dawn" period has been calculated from the photocontrol input. Specify the desired dimming profile for a simple, factory-shipped dimming solution requiring no external control wiring. Reference the After Hours Dim supplemental guide for additional information.

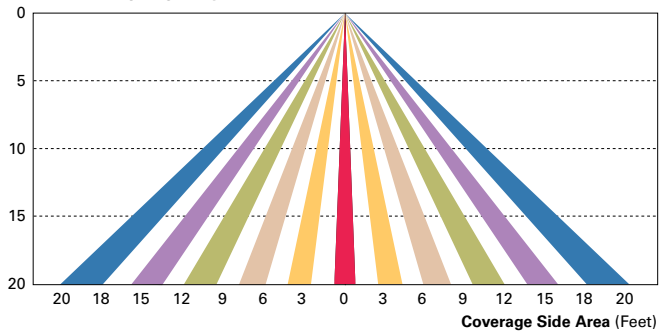
Dimming Occupancy Sensor (MS/DIM-LXX, MS/X-LXX and MS-LXX)
These sensors are factory installed in the luminaire housing. When the MS/DIM-LXX sensor option is selected, the occupancy sensor is connected to a dimming driver and the entire luminaire dims when there is no activity detected. When activity is detected, the luminaire returns to full light output. The MS/DIM sensor is factory preset to dim down to approximately 50 percent power with a time delay of five minutes. The MS-LXX sensor is factory preset to turn the luminaire off after five minutes of no activity. The MS/X-LXX is also preset for five minutes and only controls the specified number of light engines to maintain steady output from the remaining light engines.

These occupancy sensors includes an integral photocell that can be activated with the FSIR-100 accessory for "dusk-to-dawn" control or daylight harvesting - the factory preset is OFF. The FSIR-100 is a wireless tool utilized for changing the dimming level, time delay, sensitivity and other parameters. A variety of sensor lens are available to optimize the coverage. pattern for mounting heights from 8'-40'.

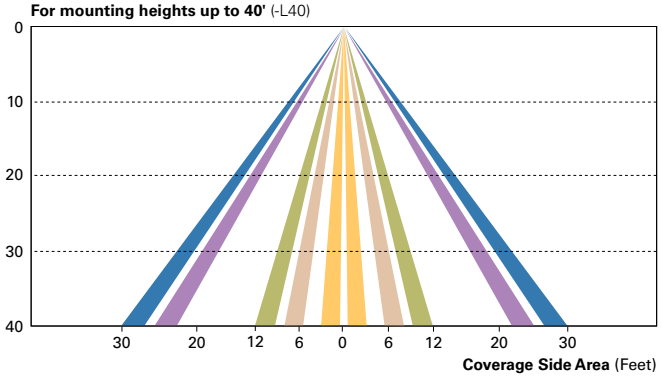
For mounting heights up to 8' (-L08 - Cutoff 8' to 24')



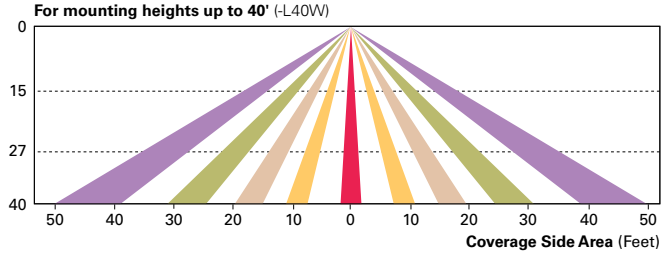
For mounting heights up to 20' (-L20)



For mounting heights up to 40' (-L40)

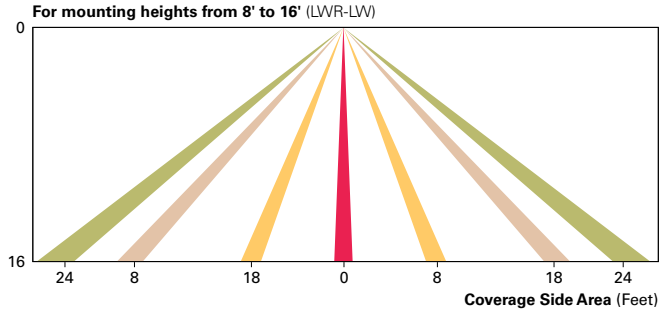


For mounting heights up to 40' (-L40W)

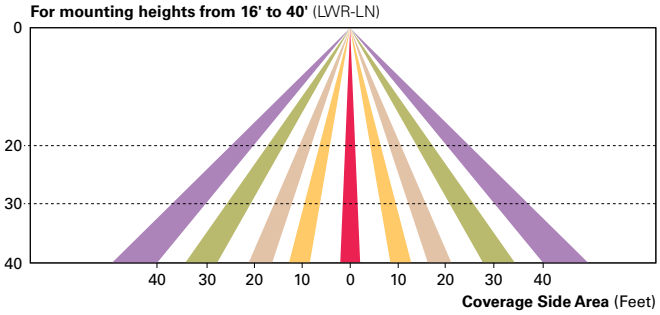


LumaWatt Pro Wireless Control and Monitoring System (LWR-LW and LWR-LN)
The Eaton's LumaWatt Pro powered by Enlighted is a connected lighting solution that combines a broad selection of energy-efficient LED luminaires with a powerful integrated wireless sensor system. The sensor controls the lighting system in compliance with the latest energy codes and collects valuable data about building performance and use. Software applications turn the granular data into information through energy dashboards and specialized apps that make it simple and help optimize the use of building resources, beyond lighting.

For mounting heights from 8' to 16' (LWR-LW)



For mounting heights from 16' to 40' (LWR-LN)



WaveLinx Wireless Outdoor Lighting Control Module (WOLC-7P-10A)
The 7-pin wireless outdoor lighting control module enables WaveLinx to control outdoor area, site and flood lighting. WaveLinx controls outdoor lighting using schedules to provide ON, OFF and dimming controls based on astronomic or time schedules based on a 7 day week.

LumenSafe Integrated Network Security Camera (LD)
Eaton brings ease of camera deployment to a whole new level. No additional wiring is needed beyond providing line power to the luminaire. A variety of networking options allows security integrators to design the optimal solution for active surveillance. As the ideal solution to meet the needs for active surveillance, the LumenSafe integrated network camera is a streamlined, outdoor-ready fixed dome that provides HDTV 1080p video. This IP camera is optimally designed for deployment in the video management system or security software platform of choice.

ORDERING INFORMATION

Sample Number: GLEON-AF-04-LED-E1-T3-GM-QM

Product Family [1, 2]	Light Engine	Number of Light Squares [3]	Lamp Type	Voltage	Distribution	Color	Mounting
GLEON=Galleon	**AF**=1A Drive Current	**01**=1 **02**=2 **03**=3 **04**=4 **05**=5 [4] **06**=6 **07**=7 [5] **08**=8 [5] **09**=9 [6] **10**=10 [6]	**LED**=Solid State Light Emitting Diodes	**E1**=120-277V **347**=347V [7] **480**=480V [7,8]	**T2**=Type II **T2R**=Type II Roadway **T3**=Type III **T3R**=Type III Roadway **T4FT**=Type IV ForwardThrow **T4W**=Type IV Wide **5NQ**=Type V Narrow **5MQ**=Type V Square Medium **5WQ**=Type V Square Wide **SL2**=Type II w/Spill Control **SL3**=Type III w/Spill Control **SL4**=Type IV w/Spill Control **SLL**=90° Spill Light Eliminator Left **SLR**=90° Spill Light Eliminator Right **RW**=Rectangular Wide Type I **AFL**=Automotive Frontline	**AP**=Grey **BZ**=Bronze **BK**=Black **DP**=Dark Platinum **GM**=Graphite Metallic **WH**=White FINISH AS SELECTED BY ARCHITECT	**[Blank]**=Arm for Round or Square Pole **EA**=Extended Arm [9] **MA**=Mast Arm Adapter [10] **WM**=Wall Mount **QM**=Quick Mount Arm (Standard Length) [11] **QMEA**=Quick Mount Arm (Extended Length) [12]

Options (Add as Suffix)

7027=70 CRI 2700K [13]
7030=70 CRI 3000K [13]
8030=80 CRI 3000K [13]
7050=70 CRI 5000K [13]
7060=70 CRI 6000K [13]
600=Drive Current Set to Nominal 600mA [15]
800=Drive Current Set to Nominal 800mA [15]
1200=Drive Current Set to Nominal 1200mA [15,16]
F=Single Fuse (120, 277 or 347V. Specify Voltage)
FF=Double Fuse (208, 240 or 480V. Specify Voltage)
2L=Two Circuits [17,18]
DIM=External 0-10V Dimming Leads [19,20]
AHD145=After Hours Dim, 5 Hours [22]
AHD245=After Hours Dim, 6 Hours [22]
AHD255=After Hours Dim, 7 Hours [22]
AHD355=After Hours Dim, 8 Hours [22]
HA=50°C High Ambient [23]
L90=Optics Rotated 90° Left
R90=Optics Rotated 90° Right
MT=Installed Mesh Top
TH=Tool-less Door Hardware
HSS=Installed House Side Shield [28]
CE=CE Marking [29]
LCF=Light Square Trim Painted to Match Housing [27]
P=Button Type Photocontrol (120, 208, 240 or 277V. Must Specify Voltage) [21]
PER7=NEMA 7-PIN Photocontrol Receptacle [21]
R=NEMA Photocontrol Receptacle [21]
MS-L20=Motion Sensor for ON/OFF Operation, 9' - 20' Mounting Height [24]
MS-L40W=Motion Sensor for ON/OFF Operation, 21' - 40' Mounting Height [24]
MS/DIM-L08= Motion Sensor for Dimming Operation, Maximum 8' Mounting Height [24]
MS/DIM-L20= Motion Sensor for Dimming Operation, 9' - 20' Mounting Height [24]
MS/DIM-L40W=Motion Sensor for Dimming Operation, 21' - 40' Mounting Height [24]
MS/X-L08=Bi-Level Motion Sensor, Maximum 8' Mounting Height [24,25]
MS/X-L20=Bi-Level Motion Sensor, 9' - 20' Mounting Height [24,25]
MS/X-L40W=Bi-Level Motion Sensor, 21' - 40' Mounting Height [24,25]
MS-L08=Motion Sensor for ON/OFF Operation, Maximum 8' Mounting Height [24]
LWR-LW=LumaWatt Pro Wireless Sensor, Wide Lens for 8' - 16' Mounting Height [26]
LWR-LN=LumaWatt Pro Wireless Sensor, Narrow Lens for 16' - 40' Mounting Height [26]
ZW =WaveLinx-enabled 4-PIN Twistlock Receptacle [19,33]
ZW-SWPD4WH=Wavelinx Wireless Sensor, 7' – 15' Mounting Height, White [19,33]
ZW-SWPD4BZ=Wavelinx Wireless Sensor, 7' – 15' Mounting Height, Bronze [19,33]
ZW-SWPD5WH=Wavelinx Wireless Sensor, 15' – 40' Mounting Height, White [19,33]
ZW-SWPD5BZ=Wavelinx Wireless Sensor, 15' – 40' Mounting Height, Bronze [19,33]

Accessories (Order Separately)

OA/RA1016=NEMA Photocontrol Multi-Tap - 105-285V
OA/RA1027=NEMA Photocontrol - 480V
OA/RA1201=NEMA Photocontrol - 347V
OA/RA1013=Photocontrol Shorting Cap
OA/RA1014=120V Photocontrol
MA1252=10kV Surge Module Replacement
MA1036-XX=Single Tenon Adapter for 2-3/8" O.D. Tenon
MA1037-XX=2@180° Tenon Adapter for 2-3/8" O.D. Tenon
MA1197-XX=3@120° Tenon Adapter for 2-3/8" O.D. Tenon
MA1188-XX=4@90° Tenon Adapter for 2-3/8" O.D. Tenon
MA1189-XX=2@90° Tenon Adapter for 2-3/8" O.D. Tenon
MA1190-XX=3@90° Tenon Adapter for 2-3/8" O.D. Tenon
MA1191-XX=2@120° Tenon Adapter for 2-3/8" O.D. Tenon
MA1038-XX=Single Tenon Adapter for 3-1/2" O.D. Tenon
MA1039-XX=2@180° Tenon Adapter for 3-1/2" O.D. Tenon
MA1192-XX=3@120° Tenon Adapter for 3-1/2" O.D. Tenon
MA1193-XX=4@90° Tenon Adapter for 3-1/2" O.D. Tenon
MA1194-XX=2@90° Tenon Adapter for 3-1/2" O.D. Tenon
MA1195-XX=3@90° Tenon Adapter for 3-1/2" O.D. Tenon
FSIR-100=Wireless Configuration Tool for Occupancy Sensor [24]
GLEON-MT1=Field Installed Mesh Top for 1-4 Light Squares
GLEON-MT2=Field Installed Mesh Top for 5-6 Light Squares
GLEON-MT3=Field Installed Mesh Top for 7-8 Light Squares
GLEON-MT4=Field Installed Mesh Top for 9-10 Light Squares
GLEON-QM=Quick Mount Arm Kit [11]
GLEON-QMEA=Quick Mount Extended Arm Kit [12]
LS/HSS=Field Installed House Side Shield [28,30]
WOLC-7P-10A=WaveLinx Outdoor Control Module [19,31]
SWPD4-WH=Wavelinx Wireless Sensor, 7' – 15' Mounting Height, White [19,33,34]
SWPD4-BZ=Wavelinx Wireless Sensor, 7' – 15' Mounting Height, Bronze [19,33,34]
SWPD5-WH=Wavelinx Wireless Sensor, 15' – 40' Mounting Height, White [19,33,34]
SWPD5-BZ=Wavelinx Wireless Sensor, 15' – 40' Mounting Height, Bronze [19,33,34]

NOTES:
1 Customer is responsible for engineering analysis to confirm pole and fixture compatibility for all applications. Refer to our white paper WP513001EN for additional support information. **2** DesignLights Consortium® Qualified. Refer to www.designlights.org Qualified Products List under Family Models for details. **3** Standard 4000K CCT and minimum 70 CRI. **4** Not compatible with MS/4-LXX or MS/1-LXX sensors. **5** Not compatible with extended quick mount arm (QMEA). **6** Not compatible with standard quick mount arm (QM) or extended quick mount arm (QMEA). **7** Requires the use of an internal step down transformer when combined with sensor options. Not available with sensor at 1200mA. Not available in combination with the HA high ambient and sensor options at 1A. **8** Only for use with 480V Wye systems. Per NEC, not for use with ungrounded systems, impedance grounded systems or corner grounded systems (commonly known as Three Phase Three Wire Delta, Three Phase High Leg Delta and Three Phase Corner Grounded Delta systems). **9** May be required when two or more luminaires are oriented on a 90° or 120° drilling pattern. Refer to arm mounting requirement table. **10** Factory installed. **11** Maximum 8 light squares. **12** Maximum 6 light squares. **13** Extended lead times apply. Use dedicated IES files for 2700K, 3000K, 5000K and 6000K when performing layouts. **14** Reserved **15** 1 Amp standard. Use dedicated IES files for 600mA, 800mA and 1200mA when performing layouts. **16** Not available with HA option. **17** 2L is not available with MS, MS/X or MS/DIM at 347V or 480V. 2L in AF-02 through AF-04 requires a larger housing, normally used for AF-05 or AF-06. Extended arm option may be required when mounting two or more fixtures per pole at 90° or 120°. Refer to arm mounting requirement table. **18** Not available with LumaWatt Pro wireless sensors. **19** Cannot be used with other control options. **20** Low voltage control lead brought out 18" outside fixture. **21** Not available if any "MS" sensor is selected. Motion sensor has an integral photocell. **22** Requires the use of P photocontrol or the PER7 or R photocontrol receptacle with photocontrol accessory. See After Hours Dim supplemental guide for additional information. **23** 50°C lumen maintenance data applies to 600mA, 800mA and 1A drive currents. **24** The FSIR-100 configuration tool is required to adjust parameters including high and low modes, sensitivity, time delay, cutoff and more. Consult your lighting representative at Eaton for more information. **25** Replace X with number of Light Squares operating in low output mode. **26** LumaWatt Pro wireless sensors are factory installed only requiring network components LWP-EM-1, LWP-GW-1 and LWP-PoE8 in appropriate quantities. See www.eaton.com/lighting for LumaWatt Pro application information. **27** Not available with house side shield (HSS). **28** Only for use with SL2, SL3, SL4 and AFL distributions. The Light Square trim plate is painted black when the HSS option is selected. **29** CE is not available with the LWR, MS, MS/X, MS/DIM, P, R or PER7 options. Available in 120-277V only. **30** One required for each Light Square. **31** Requires PER7. **32** Reserved. **33** WAC Gateway required to enable field-configurability: Order WAC-PoE and WPOE-120 (10V to PoE injector) power supply if needed. **34** Requires ZW. **35** Reserved.

LumenSafe Integrated Network Security Camera Technology Options (Add as Suffix)

Product Family	Camera Type	Data Backhaul	
L=LumenSafe Technology* LumenSafe Technology CLICK HERE	**D**=Dome Camera, Standard **H**=Dome Camera, Hi-Res **Z**=Dome Camera, Remote PTZ	**C**=Cellular, Customer Installed SIM Card **A**=Cellular, Factory Installed AT&T SIM Card **V**=Cellular, Factory Installed Verizon SIM Card **S**=Cellular, Factory Installed Sprint SIM Card	**W**=Wi-Fi Networking w/ Omni-Directional Antenna **E**=Ethernet Networking

*Consult LumenSafe system pages for additional details and compatibility.

City of Birmingham
A Walkable Community

Special Land Use Permit Application

Planning Division

Form will not be processed until it is completely filled out.

1. Applicant

Name: Lavery Michigan Dealership Properties No. 1, LLC
Address: 440 Lake Park
Birmingham, MI 48009
Phone Number: (248) 645-5930
Fax Number: (248) 540-1260
Email address: fredlavery@USAutoGroup.com

2. Property Owner

Name: Lavery Michigan Dealership Properties No. 1, LLC
Address: 440 Lake Park
Birmingham, MI 48009
Phone Number: (248) 645-5930
Fax Number: (248) 540-1260
Email address: fredlavery@USAutoGroup.com

3. Applicant's Attorney/Contact Person

Name: Richard D. Rattner, Esq .
Address: 380 N. Old Woodward Avenue. Suite 300
Birmingham, MI 48009
Phone Number: (248) 642-0333
Fax Number: (248) 642-0856
Email address: rdr@wwrplaw.com

4. Project Designer/Developer

Name: Luckenbach, Ziegelman, Gardner Architects PLLC
Address: 555 S. Old Woodward, Ste. 2L
Birmingham, MI 48009
Phone Number: (248) 644-0600
Fax Number:
Email address: rziegelman@lzarch.com

5. Required Attachments

I. Two (2) paper copies and one (1) digital copy of all project plans including:
   i. A detailed Existing Conditions Plan including the subject site in its entirety, including all property lines, buildings, structures, curb cuts, sidewalks, drives, ramps and all parking on site and on the street(s) adjacent to the site, and must show the same detail for all adjacent properties within 200 ft. of the subject site's property lines;
   ii. A detailed and scaled Site Plan depicting accurately and in detail the proposed construction, alteration or repair;
   iii. A certified Land Survey;
   iv. Interior floor plans;
   v. A Landscape Plan;
   vi. A Photometric Plan;
   vii. Colored elevation drawings for each building elevation;
5. Specification sheets for all proposed materials, light fixtures and mechanical equipment;
6. Samples of all proposed materials;
7. Photographs of existing conditions on the site including all structures, parking areas, landscaping and adjacent structures;
8. Current aerial photographs of the site and surrounding properties;
9. Warranty Deed, or Consent of Property Owner if applicant is not the owner;
10. Any other data requested by the Planning Board, Planning Department, or other City Departments.

6. Project Information

Address/Location of the property: 907 - 911 Haynes Avenue
Former Spa Mariana Site
Name of development: Fred Lavery Renovation
Sidwell #: 19-36-281-030
Current Use: Office/Personal Services
Proposed Use: Accessory Use to Principal Business
Area of Site in Acres: .41 acres
Current zoning: B2/Triangle Overlay MU5-MU7
Is the property located in the floodplain? No
Name of Historic District Site is located in:
Date of Historic District Commission Approval:
Date of Application for Preliminary Site Plan:
Date of Preliminary Site Plan Approval:

Date of Application for Final Site Plan:
Date of Final Site Plan Approval:
Date of Application for Revised Final Site Plan:
Date of Revised Final Site Plan Approval:
Date of Design Review Board Approval:
Is there a current SLUP in effect for this site? SLUP for 34350 Woodward Ave, previously 835 Haynes
Date of Application for SLUP:
Date of SLUP Approval:
Date of Last SLUP Amendment:
Will proposed project require the division of platted lots? ____
Will proposed project require the combination of platted lots?

7. Details of the Proposed Development (attach separate sheet if necessary)

Applicant proposes to amend the existing SLUP for its dealership property at 34350 Woodward Ave, previously 835 Haynes, demolish the existing 2-story commercial building on the adjacent parcel at 907 - 911 Haynes, and redevelop it as a contiguous part of the existing car dealership to be used for parking inventory and electric vehicle infrastructure. This is an accessory use to Applicant's principal business operation of the Lavery Porsche Dealership on its parcel.

8. Buildings and Structures

Number of Buildings on Site: 1
Height of Buildings & # of Stories: 2 stories, 29'

Use of Buildings: Demolish/surface lot
Height of Rooftop Mechanical Equipment: N/A

9. Floor Use and Area (in Square Feet)

Proposed Commercial Structures:

Total basement floor area: N/A
Number of square feet per upper floor:
Total floor area:
Floor area ratio (total floor area ÷ total land area):

Open space:
Percent of open space:

Office Space:
Retail Space:
Industrial Space:
Assembly Space:
Seating Capacity:
Maximum Occupancy Load:

Proposed Residential Structures:

Total number of units: N/A
Number of one bedroom units:
Number of two bedroom units:
Number of three bedroom units:
Open space:
Percent of open space:

Rental units or condominiums?
Size of one bedroom units:
Size of two bedroom units:
Size of three bedroom units:
Seating Capacity:
Maximum Occupancy Load:

Proposed Additions:

Total basement floor area, if any, of addition: N/A
Number of floors to be added:
Square footage added per floor:
Total building floor area (including addition):
Floor area ratio (total floor area ÷ total land area):

Open Space:
Percent of open space:

Use of addition:
Height of addition:
Office space in addition:
Retail space in addition:
Industrial space in addition:
Assembly space in addition:
Maximum building occupancy load (including addition):

10. Required and Proposed Setbacks

Required front setback: 5'
Required rear setback:
Required total side setback: 0
Side setback:

Proposed front setback: 5'
Proposed rear setback N/A
Proposed total side setback: 0
Second side setback: 0

11. Required and Proposed Parking

Required number of parking spaces: 25
Typical angle of parking spaces: See drawings
Typical width of maneuvering lanes: See drawings
Location of parking on site: At side of dealership
Location of parking off site: N/A
Number of light standards in parking area:
Screenwall material:

Proposed number of parking spaces: 27
Typical size of parking spaces:
Number of spaces <180 sq. ft.:
Number of handicap spaces: 2
Shared parking agreement? No
Height of light standards in parking area:
Height of screenwall: 3'

12. Landscaping

Location of landscape areas: Existing landscaping in front and to side of dealership building and between 34350 Woodward Ave., previously 835 Haynes, and 909 Haynes shall remain, as will some of the trees along S. Elm and Haynes Streets. See drawings attached.

Proposed landscape material: New concrete screen wall along 907 to 911 Haynes consistent in size and materials to that already existing along 34350 Woodward Ave., previously 835 Haynes, with new and relocated trees along the lot line at 907- 911 Haynes. New landscaping at the NE and SE corners of 907-911 Haynes, and along the Lot line of 907- and 911 Haynes. New trees to be added and relocated to conform to City's tree spacing requirements. See Drawings attached.

13. Streetscape

Sidewalk width: Same as existing
Number of benches: 2
Number of planters: 12 planter bases with trees
Number of existing street trees: 12
Number of proposed street trees: 12 with planter base
Streetscape plan submitted? Yes

Description of benches or planters: See drawings

Species of existing trees: See drawings

Species of proposed trees: See drawings

14. Loading

Required number of loading spaces: 1
Typical angle of loading spaces: Parallel
Screenwall material: Wood/metal as existing
Location of loading spaces on site: Where currently located behind Dealership at 34350 Woodward Ave.

Proposed number of loading spaces: 4 angled spaces.

Typical size of loading spaces: See drawings
Height of screenwall: 8' as existing
Typical time loading spaces are used: 1 hour
Proposed number of waste receptacles: 1 for combined lots.
Size of waste receptacles: Same as existing at 34350 Woodward Ave., previously 835 Haynes.

15. Exterior Waste Receptacles

Required number of waste receptacles: 0
Location of waste receptacles: Remains in current location at 34350 Woodward Ave.
Screenwall material: Wood/Metal Gate

Height of screenwall: 8' H

16. Mechanical Equipment

Utilities and Transformers:

Number of ground mounted transformers: 1 at 34350 Woodward Ave. and 1 DC transformer battery box at 909 Haynes.
Size of transformers (L•W•H): See attached drawings
Number of utility easements: See attached drawings
Screenwall material: Wood/metal gate and bushes

Location of all utilities & easements: See attached drawings

Height of screenwall: 8' existing wall

Ground Mounted Mechanical Equipment:

Number of ground mounted units: 1 battery box Size of ground mounted units (L•W•H): See attached drawings
Screenwall material: Bushes

Location of all ground mounted units: See attached drawings

Height of screenwall: 48" H

Rooftop Mechanical Equipment:

Number of rooftop units: None at 907-911 Haynes
Type of rooftop units: None at 907-911 Haynes
Screenwall material: Metal siding
Location of screenwall: Extension of building facade

Location of all rooftop units: No change to existing units on roof of Porsche building.
Size of rooftop units (L•W•H:
Percentage of rooftop covered by mechanical units:
Height of screenwall:
Distance from rooftop units to all screenwalls:

17. Accessory Buildings

Number of accessory buildings: None
Location of accessory buildings:

Size of accessory buildings:
Height of accessory buildings:

18. Building Lighting

Number of light standards on building: See attached drawings

Type of light standards on building:

Size of light fixtures (L•W•H):_____
Maximum wattage per fixture:_____
Light level at each property line:_____

Height from grade:_____
Proposed wattage per fixture:_____

19. Site Lighting

Number of light fixtures: 5
Size of light fixtures (L•W•H): 21 3/4" x 33 3/4" x 3 15/16"
Maximum wattage per fixture: 558 Watts
Light level at each property line: See photometric

Type of light fixtures: GLEON GALLEON LED
Height from grade: 16'
Proposed wattage per fixture: 113 Lum. Watts
Holiday tree lighting receptacles: NA

20. Adjacent Properties

Number of properties within 200 ft.:6-see attached Schedule A

Property #1

Number of buildings on site:_____
Zoning district:_____
Use type:_____
Square footage of principal building:_____
Square footage of accessory buildings:_____
Number of parking spaces:_____

Property Description:_____
_____
_____
_____
_____
North, south, east or west of property? _____

Property #2

Number of buildings on site:_____
Zoning district:_____
Use type:_____
Square footage of principal building:_____
Square footage of accessory buildings:_____
Number of parking spaces:_____

Property Description:_____
_____
_____
_____
_____
North, south, east or west of property? _____

Property #3

Number of buildings on site:_____
Zoning district:_____
Use type:_____
Square footage of principal building:_____
Square footage of accessory buildings:_____
Number of parking spaces:_____

Property Description:_____
_____
_____
_____
_____
North, south, east or west of property? _____

Property #4

Number of buildings on site:_____
Zoning district:_____
Use type:_____
Square footage of principal building:_____
Square footage of accessory buildings:_____
Number of parking spaces:_____

Property Description:_____
_____
_____
_____
_____
North, south, east or west of property? _____

Property #5

Number of buildings on site:_____
Zoning district:_____
Use type:_____
Square footage of principal building:_____
Square footage of accessory buildings:_____
Number of parking spaces:_____

Property Description:_____
_____
_____
_____
_____
North, south, east or west of property? _____

City of Birmingham
A Walkable Community

SPECIAL LAND USE PERMIT APPLICATION CHECKLIST – PLANNING DIVISION

Applicant: Lavery Michigan Dealership No. 1, LLC Case #: _____ Date: _____

Address: 440 Lake Park Drive, Birmingham, MI 48009 Project: 909/911 Haynes / Porsche Dealership SLUP

All site plans and elevation drawings prepared for approval shall be prepared in accordance with the following specifications and other applicable requirements of the City of Birmingham. If more than one page is used, each page shall be numbered sequentially. All plans must be legible and of sufficient quality to provide for quality reproduction or recording. Plans must be no larger than 24" x 36", and must be folded and stapled together. The address of the site must be clearly noted on all plans and supporting documentation.

Site Plan for Special Land Use Permit

A full Site Plan detailing the proposed changes for which approval is requested shall be drawn at a scale no smaller than 1" = 100' (unless the drawing will not fit on one 24" X 36" sheet) and shall include:

X 1. Name and address of applicant and proof of ownership;

X 2. Name of Development (if applicable);

X 3. Address of site and legal description of the real estate;

X 4. Name and address of the land surveyor;

X 5. Legend and notes, including a graphic scale, north point, and date;

X 6. A separate location map;

X 7. A map showing the boundary lines of adjacent land and the existing zoning of the area proposed to be developed as well as the adjacent land;

X 8. Aerial photographs of the subject site and surrounding properties;

X 9. A detailed and scaled Site Plan depicting accurately and in detail the proposed construction, alteration or repair;

X 10. A detailed Existing Conditions Plan including the subject site in its entirety, including all property lines, buildings, structures, curb cuts, sidewalks, drives, ramps and all parking on site and on the street(s) adjacent to the site, and must show the same detail for all adjacent properties within 200 ft. of the subject site's property lines;

N/A 11. Interior floor plans;

X 12. A chart indicating the dates of any previous approvals by the Planning Board, Board of Zoning Appeals, Design Review Board, or the Historic District Commission ("HDC");

X 13. Existing and proposed layout of streets, open space and other basic elements of the plan;

N/A 14. Existing and proposed utilities and easements and their purpose;

X 15. Location of natural streams, regulated drains, 100-year flood plains, floodway, water courses, marshes, wooded areas, isolated preserve-able trees, wetlands, historic features, existing structures, dry wells, utility lines, fire hydrants and any other significant feature(s) that may influence the design of the development;

X 16. General description, location, and types of structures on site;

X 17. Location of sidewalks, curb cuts, and parking lots on subject site and all sites within 200 ft. of the property line;

X 18. Details of existing or proposed lighting, signage and other pertinent development features;

X 19. Elevation drawings showing proposed design;

X 20. Screening to be utilized in concealing any exposed mechanical or electrical equipment and all trash receptacle areas;

X 21. Location of all exterior lighting fixtures;

X 22. A Photometric Plan depicting proposed illuminance levels at all property lines;

X 23. A Landscape Plan showing all existing and proposed planting and screening materials, including the number, size, and type of plantings proposed and the method of irrigation; and

X 24. Any other information requested in writing by the Planning Division, the Planning Board, or the Building Official deemed important to the development.

Elevation Drawings

Complete elevation drawings detailing the proposed changes for which approval is requested shall be drawn at a scale no smaller than 1" = 100' (unless the drawing will not fit on one 24" X 36" sheet) and shall include:

X 25. Color elevation drawings showing the proposed design for each façade of the building;

X 26. List of all materials to be used for the building, marked on the elevation drawings;

X 27. Elevation drawings of all screenwalls to be utilized in concealing any exposed mechanical or electrical equipment, trash receptacle areas and parking areas;

X 28. Details of existing or proposed lighting, signage and other pertinent development features;

N/A 29. A list of any requested design changes;

N/A 30. Itemized list and specification sheets of all materials, light fixtures and mechanical equiptment to be used, including exact size specifications, color, style, and the name of the manufacturer;

X 31. Location of all exterior lighting fixtures, exact size specifications, color, style and the name of the manufacturer of all fixtures, and a photometric analysis of all exterior lighting fixtures showing light levels to all property lines; and

X 32. Any other information requested in writing by the Planning Division, the Planning Board, or the Building Official deemed important to the development.

The undersigned states the above information is true and correct, and understands that it is the responsibility of the applicant to advise the Planning Division and / or Building Division of any additional changes made to an approved site plan. The undersigned further states that they have reviewed the procedures and guidelines for Site Plan Review in Birmingham, and have complied with same. The undersigned will be in attendance at the Planning Board meeting when this application will be discussed.

Signature of Owner: _____ Date: 11/29/19

Print Name: Frederick A. Lavery, Jr., Authorized Representative

Signature of Applicant: _____ Date: 11/29/19

Print Name: Frederick A. Lavery, Jr. Authorized Representative

Signature of Architect: _____ Date: _____

Print Name: _____

Office Use Only

Application #: _____ Date Received: _____ Fee: _____

Date of Approval: _____ Date of Denial: _____ Accepted by: _____

The undersigned states the above information is true and correct, and understands that it is the responsibility of the applicant to advise the Planning Division and / or Building Division of any additional changes made to an approved site plan. The undersigned further states that they have reviewed the procedures and guidelines for Site Plan Review in Birmingham, and have complied with same. The undersigned will be in attendance at the Planning Board meeting when this application will be discussed.

Signature of Owner: _____ Date: _____

Print Name: Frederick A. Lavery, Jr., Authorized Representative

Signature of Applicant: _____ Date: _____

Print Name: Frederick A. Lavery, Jr.

Signature of Architect: John H. Gardner Date: 12.02.2019

Print Name: JOHN H. GARDNER

Office Use Only

Application #: _____ Date Received: _____ Fee: _____

Date of Approval: _____ Date of Denial: _____ Accepted by: _____

City of Birmingham
A Walkable Community

Notice Signs - Rental Application
Community Development

1. Applicant
Name: Lavery Michigan Dealership No. 1, LLC
Address: 440 Lake Park
Birmingham, MI 48009
Phone Number: c/o Richard D. Rattner, Esq.
Fax Number: (248) 642-0333
Email address: rdr@wwrplaw.com

Property Owner
Name: Same
Address: _____
Phone Number: _____
Fax Number: _____
Email address: _____

2. Project Information
Address/Location of Property: 907-911 Haynes
Name of Development: Lavery Porsche Dealership
Area in Acres: _____

Name of Historic District site is in, if any: None
Current Use: Office/parking
Current Zoning: B2/Triangle Overlay MU5-MU7

3. Date of Board Review
Board of Building Trades Appeals: _____
City Commission: _____
Historic District Commission: _____
Planning Board: _____

Board of Zoning Appeals: _____
Design Review Board: _____
Housing Board of Appeals: _____

The undersigned states the above information is true and correct, and understands that it is the responsibility of the applicant to post the Notice Sign(s) at least 15 days prior to the date on which the project will be reviewed by the appropriate board or commission, and to ensure that the Notice Sign(s) remains posted during the entire 15 day mandatory posting period. The undersigned further agrees to pay a rental fee and security deposit for the Notice Sign(s), and to remove all such signs on the day immediately following the date of the hearing at which the project was reviewed. The security deposit will be refunded when the Notice Sign(s) are returned undamaged to the Community Development Department. Failure to return the Notice Sign(s) and/or damage to the Notice Sign(s) will result in forfeiture of the security deposit.

Signature of Applicant: Frederick D Lavery Jr by RSM Date: 11/29/19

Office Use Only

Application #: _____ Date Received: _____ Fee: _____

Date of Approval: _____ Date of Denial: _____ Reviewed by: _____


Bowers St
Woodward Ave
T-Mobile
S Elm St
Parmley's Paint & Body Works
Studio 4 Bodywork
Eisenberg & Spilman, PLLC
S Adams Rd
B K Corporation
Fred Lavery Porsche
909 Haynes Street
Spa Mariana
Goodwin & Scieszka
Imagine Health, P.C.
Michigan's Premier DJ & Photo Booth
Haynes St
Elm St
S Worth St
Citizens Bank
Walgreens Pharmacy
Walgreens
Google

Since 1973
W|W|R|P
Williams Williams Rattner & Plunkett, P.C.
Attorneys and Counselors
380 North Old Woodward Avenue
Suite 300
Birmingham, Michigan 48009
Tel: (248) 642-0333
Fax: (248) 642-0856

Richard D. Rattner
rdr@wwrplaw.com

December 2, 2019

Planning Board
City of Birmingham
151 Martin Street
Birmingham, MI 48009

Re: ***Amendment to Special Land Use Permit – Lavery Porsche, 34350 Woodward Ave. (formerly 835 Haynes) and 907-911 Haynes, Birmingham, MI 48009 ("Applicant")***

Dear Members of the Planning Board:

Please accept this letter as the Applicant's request to amend its Special Land Use Permit for 34350 Woodward Avenue to include the property located at 907-911 Haynes. The 34350 Woodward parcel is currently zoned B-2 General Business and is in the MU-7 zone of the Triangle Overlay District. The 907-911 Haynes property also is zoned B-2 General Business and is in the MU-5 zone of the Triangle Overlay. Auto show rooms and sales agencies are permitted uses in the MU-5 and MU-7 zones of the Triangle Overlay pursuant to a Special Land Use Permit.

Background

In 2016, the Planning Board and City Commission approved a temporary expansion of the existing SLUP for the dealership property at 34350 Woodward Avenue to include the property at 907-911 Haynes Street. This expansion allowed the existing Bardha salon building to be used as dealership offices during completion of renovations of the neighboring Audi dealership at 34602 Woodward. While the Applicant desired a permanent expansion in 2016, the Applicant had not finalized a site plan design to incorporate the 34350 Woodward Avenue and the Haynes Street parcels into one unified property. With a finalized site plan design, the Applicant now desires to move forward with an expansion of the SLUP and, concurrently with this request, has applied to combine the 34350 Woodward and the 907-911 Haynes Street lots into one parcel with one seamless design.

Under the temporary SLUP, the 907-911 Haynes property could be used as offices for the car dealership while Spa Mariana remained on the second floor. The Applicant proposes to modify the site plan of Woodward Avenue Porsche dealership and Haynes Street parcels after demolition of the existing building at 907-911 Haynes, pursuant to the enclosed site plan in order to accommodate changes to the dealership's business. The site plan will not change the use of the property from an auto sales agency, but it will allow for a change in the type of vehicles offered

for sale at the dealership. By 2025, under United States and European Union regulations, Porsche must have an all-electric (full electric and hybrid) fleet of vehicles. Porsche is mandated to significantly reduce its use of internal combustion engines by 2025. The result is that an electric and hybrid vehicle fleet is being sold by the Porsche dealership at 34350 Woodward. This new fleet of electrified cars requires new electric vehicle infrastructure. Four parking spaces at 34350 Woodward will be converted for electric vehicle charging stations and will no longer be available for customer and inventory parking. All four of the charging stations will be available for public use -- two AC stations and two DC charging stations will be open to the public. (See the enclosed articles regarding the need for investment in electric vehicle charging infrastructure.) Also included in the site plan design is relocation of customer parking from 34350 Woodward to 907-911 Haynes to accommodate the charging stations and new car parking, plus an extension of the screening wall along Haynes, an update to the Haynes streetscape that is compliant with the Triangle Overlay standards, and the addition of green areas, trees and shrubbery. Further, since the SLUP for the Porsche dealership was issued in 2010, the dealership has been and continues to be a thriving Birmingham business with an overall sales growth rate of approximately 20%. The sales growth has an associated increase in inventory volume.

Triangle District Plan

A review of the Applicant's request to expand the SLUP must include a discussion of the Triangle District Urban Design Plan, adopted by the City in 2007 ("Triangle Plan"). The Triangle Plan is an urban design for a vibrant, mixed-use neighborhood with homes, shops, restaurants, offices and a public plaza. Central to the Triangle Plain is the creation of Worth Plaza at Worth Street and Haynes, directly across from 907-909 Haynes. Worth Plaza would be created by an extension of Worth Street through the Walgreen's parking lot and continuing through the 907-911 Haynes parcel, dead-ending at Bowers. Worth Plaza, according to the Triangle Plan, is the focal point for development of the Triangle District. Unfortunately, other than the vision of Worth Plaza set forth in the Triangle Plan, Worth Plaza has not been built and Worth Street has not been extended through the 907-911 Haynes parcel. The Applicant understands that the City has no plans to build Worth Plaza, nor extend Worth Street to Bowers at any time soon.

The Triangle Plan also calls for a more efficient means of accommodating parking, with a managed parking system using a combination of on-street parking and structures, with limited surface parking. "Construction of a parking structure is an imperative element of the plan and should be implemented during the first phase." Triangle Plan, p. 20. Once a managed parking system is in place, the Triangle Plan anticipates new development of mixed-use buildings in the place of areas now used for surface parking. In fact, the Triangle Plan includes the development of a mixed-use building to cover the entire block consisting partly of the subject property at

34350 Woodward and 907-911 Haynes. See Triangle Plan, p. 31. Today, however, after more than a decade since the Triangle Overlay District was created, there is no managed parking system for the Triangle District. A parking garage has not been built in the Triangle District to alleviate the need for surface parking, nor does it appear there are any plans for a parking structure and implementation of a managed parking system. Although these improvements would facilitate the redevelopment of those surface parking areas for the envisioned, large, mixed-use buildings, the simple facts are that nothing has been done to permit the Triangle Plan to come to fruition.

The Applicant's proposed site plan in no way forecloses the installation of Worth Plaza and the extension of Worth Street once the managed parking system is implemented or any other envisioned improvement in the Triangle Plan. The use of the 907-911 Haynes site for the Porsche dealership electric car infrastructure and parking is an appropriate place-holder until the time comes when a future parking deck and managed parking system becomes a reality, Worth Plaza is built, and the entire block between the extended Worth Street and Woodward is redeveloped into a mixed-use building. It is not possible to support an MU-5 or MU-7 building on the subject property simply because without parking capacity, such as a structure, the use is not supported by the City's parking infrastructure. Further, if a building were to be newly developed on the subject property (907-911 Haynes), there is no practical way the vision of a Worth Plaza can be accomplished without a very costly condemnation of a multi-story building. What the petitioner requests in this Application is that 907-911 Haynes be continued as a surface use. In this way, the land is open to future use for development in accordance with the Triangle Plan.

Compliance with Current Zoning

The Applicant's proposed site plan for an expansion of the existing SLUP is consistent with the vision of the Triangle Plan. The requested SLUP does not foreclose the future development of Worth Plaza, or the extension of Worth Street, or the construction of a large mixed-use building over the entire block, once the Triangle Plan is further implemented to include a managed parking system. Further, the Ordinance standards for approval of the expansion of the SLUP as set forth below are satisfied. The proposed site plan incorporating 907-911 Haynes into the rest of the dealership property will provide a new coherence to the entire property to create a permitted ancillary use for the subject property and redevelop the streetscape along Haynes while awaiting future development. In addition, the streetscape will be improved to comply with the requirements of the Triangle Overlay District.

The 34350 Woodward parcel is currently zoned B-2 General Business and is in the MU-7 zone of the Triangle Overlay District. The 907-911 Haynes property also is zoned B-2 General Business and is in the MU-5 zone of the Triangle Overlay. Auto show rooms and sales agencies

are permitted uses in the MU-5 and MU-7 zones of the Triangle Overlay pursuant to a Special Land Use Permit.

The electric car charging stations and parking will be screened in accordance with Article 4, Section 4.53 of the Zoning Ordinance, with a 36-inch masonry screen wall. Four new canopy trees will be added to the existing trees, plus street lights, a bicycle rack, benches, a trash receptacle, and new sidewalk materials will be installed to create a streetscape that is compliant with the requirements of the Triangle Overlay Zone. Further landscaping and trees will be added to a greenbelt area on the inside of the screening wall, plus two additional green areas on the east and west corners of the 907-911 Haynes property, as depicted on the site plan. The total parking area is 29,000 square feet. The landscape requirement is 5% of the parking area, or 1450 square feet of landscaping. The Applicant proposes 2575 square feet of landscaped area under the combined site plan, exceeding the required landscaping for parking lots set forth in Article 4.20 F of the Zoning Ordinance.

The site plan includes the elimination of one driveway entrance on Haynes Street at the southwest corner of the 907-911 Haynes parcel and leaves the other access points to the dealership unchanged. With the elimination of a driveway, the streetscape along Haynes will be improved with public electric car charging stations, new trees, benches, trash receptacle and a green area adjacent to the screening wall. The screened loading area directly to the east of the dealership building will remain unchanged.

Under the 2016 temporary expansion of the SLUP, some of the 33 off-street parking spaces located on the 907-911 Haynes property were used for parking demonstration vehicles and for office tenant parking. See Minutes of the April 27, 2016 Planning Board Meeting. Under the proposed site plan for the combined lots, 907-911 Haynes will continue to be used for dealership vehicle parking and additional customer parking due to the loss of customer parking at 34350 Woodward for electric charging stations. There are 66 proposed parking spaces on the combined lots, 43 of which sit on the 907-911 Haynes property (28 standard spaces and 15 compact spaces). There are ten more parking spaces on the 907-911 Haynes property included in the current proposed site plan compared with those existing under the temporary SLUP. The proposed site plan surpasses the parking required in the B-2 zone for the 5730 square feet dealership, which is 23 parking spaces (5730/300= 19.10 spaces, plus three additional spaces for the three service bays).

In the MU-5 and MU-7 zones, the off-street parking on the combined dealership property is permitted as accessory to the dealership in accordance with Article 03, section 3.07.

The Requirements for Special Land Use Permit Approval of Article 07, Section 7.21 are Satisfied

The Ordinance at Article 07, section 7.21 provides five standards for approval of a special land use permit. Article 07, section 7.21 states:

"The City Commission shall approve a request for a regulated use if it determines that all of the following standards are met:

1. The use will be compatible with adjacent uses of land, considering the proximity of dwellings, churches, schools, public structures, and other places of public gatherings.

2. The use will not adversely impact the capabilities of public services and facilities including sewers, water, schools, transportation, and the ability of the City to supply such services.

3. The use will not adversely impact any cultural or historic landmarks.

4. The use in in compliance with all other requirements of the Zoning Ordinance.

5. The use is in compliance with federal, state, and local laws and regulations."

All the above standards are met for the expansion of the existing SLUP to include the 907-911 Haynes parcel.

1. The use will be compatible with adjacent uses of land, considering the proximity of dwellings, churches, schools, public structures, and other places of public gatherings.

The use of the 907-911 Haynes property as an ancillary use for the dealership is compatible with the adjacent uses of car dealerships, parking lots, office buildings, a bank drive-thru, a drug store, and an abandoned auto repair shop. With the demolition of the salon building, ten new parking spaces will be created for the dealership, and the design of the parking area flows consistently with the existing Porsche dealership. The screen wall will continue east on Haynes Street from the existing screen wall next to the dealership. The inclusion of 907-911 Haynes in the dealership SLUP will have no impact on residential structures or other gathering spaces, as none are located within the vicinity.

2. The use will not adversely impact the capabilities of public services and facilities including sewers, water, schools, transportation, and the ability of the City to supply such services.

The proposed expansion of the SLUP will have no material impact on public services and facilities. A new DC electric transformer and DC battery box will be installed to support the car charging stations. No other additional utility services will result from the use of the 907-911 Haynes property as an ancillary use of the dealership. The Applicant will be providing a public service to the community with the installation of electric car charging stations that will be available for public use. In fact, the current public parking capacity in this part of the Triangle District could not reasonably support an MU-5 or MU-7 building on this property.

3. The use will not adversely impact any cultural or historic landmarks.

No historical or cultural landmarks are affected by the proposed expansion of the Porsche dealership SLUP.

4. The use in in compliance with all other requirements of the Zoning Ordinance.

As set forth in this letter above, the proposed site plan design complies with the requirements of the Zoning Ordinance for the MU-5/MU-7 Triangle Overlay District. The site plan design for electric car charging, infrastructure, and parking is a continuation of the use of the property as an auto dealership and is accessory to the dealership. Such use of 907-911 Haynes for off-street parking is permissible in the MU-5/MU-7 zones.

During the Planning Board's consideration of the 2016 temporary SLUP expansion, some concern was expressed that the expansion of the SLUP to 907-911 Haynes was not consistent with the vision of the Triangle District. The Triangle Plan, however, has yet to be implemented. Phase I of the Triangle Plan calls for an extension of Worth Street through the 907-911 Haynes parcel to connect it to Bowers Street. In addition, the Triangle Plan calls for a new parking structure that is "essential to realizing the vision of the Plan." See Triangle Plan, p. 26. There are no present approvals for the extension of Worth Street, nor is there a pending proposed development for a new parking garage in the Triangle District. The Applicant's proposed site plan design does not prohibit the future development of 907-911 Haynes to include the extension of Worth Street or of a multi-story mixed used building when the Triangle Plan is implemented. The proposed expansion of the SLUP for use as additional dealership parking and electric car infrastructure is a fitting placeholder for future Triangle District development.

5. The use is in compliance with federal, state, and local laws and regulations.

The use of the property as a Porsche dealership is in full compliance with all federal, state, and local laws and regulations by which it is governed.

Conclusion

For the reasons outlined above, the Applicant requests the Planning Board recommend that the City Commission approve the Applicant's proposed site plan for the combined Porsche dealership property.

Please contact the undersigned for any additional information that may be needed for the Planning Board to conduct its review.

Very truly yours,

WILLIAMS, WILLIAMS, RATTNER & PLUNKETT, P.C.

Richard D. Rattner

Enclosures
Site Plan Drawings
Electric Vehicle Charging News Articles (Crain's and Shift)
cc: Mr. Fred Lavery
Mr. Robert Ziegelman

CRAIN

autonews.com

Automotive News

NOVEMBER 18, 2019

$159/YEAR; $6/COPY

California to shape charging grid

Station count a hurdle in meeting EV sales growth

Laurence Iliff
liliff@crain.com

SAN DIEGO — In an ad running on social media, San Diego Gas & Electric boasts that public EV chargers in the region are more plentiful than surfers at popular Swami's Beach, apple pies in the mountain town of Julian, or gas stations in all of San Diego.

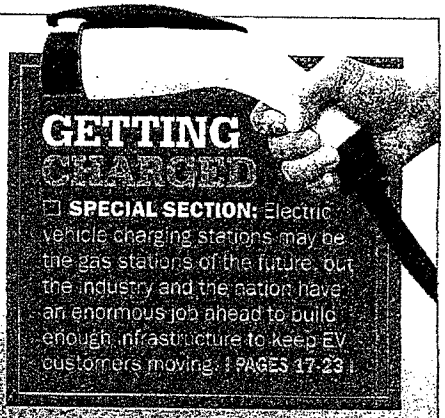
The same is true in much of the rest of California.

But that still might not be enough to meet electric-vehicle growth projections.

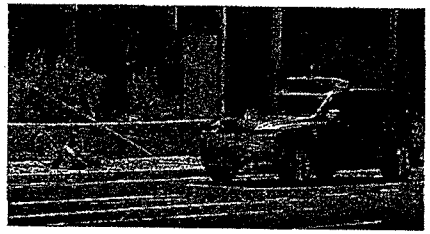
SDG&E, a private utility, estimates there are 1,500 public charging stations in the San Diego-South Orange County area. That sounds like a lot. But finding them and getting charged in Southern California or San Francisco can be a chore. Unlike gas stations, they're not always in high-traffic areas, and their fill-up time takes longer than five minutes.

A recent trip to the beach in San Diego went like this for one new EV driver: The location of the station was mislabeled on the map, resulting in a low-speed search through several parking lots; the charging

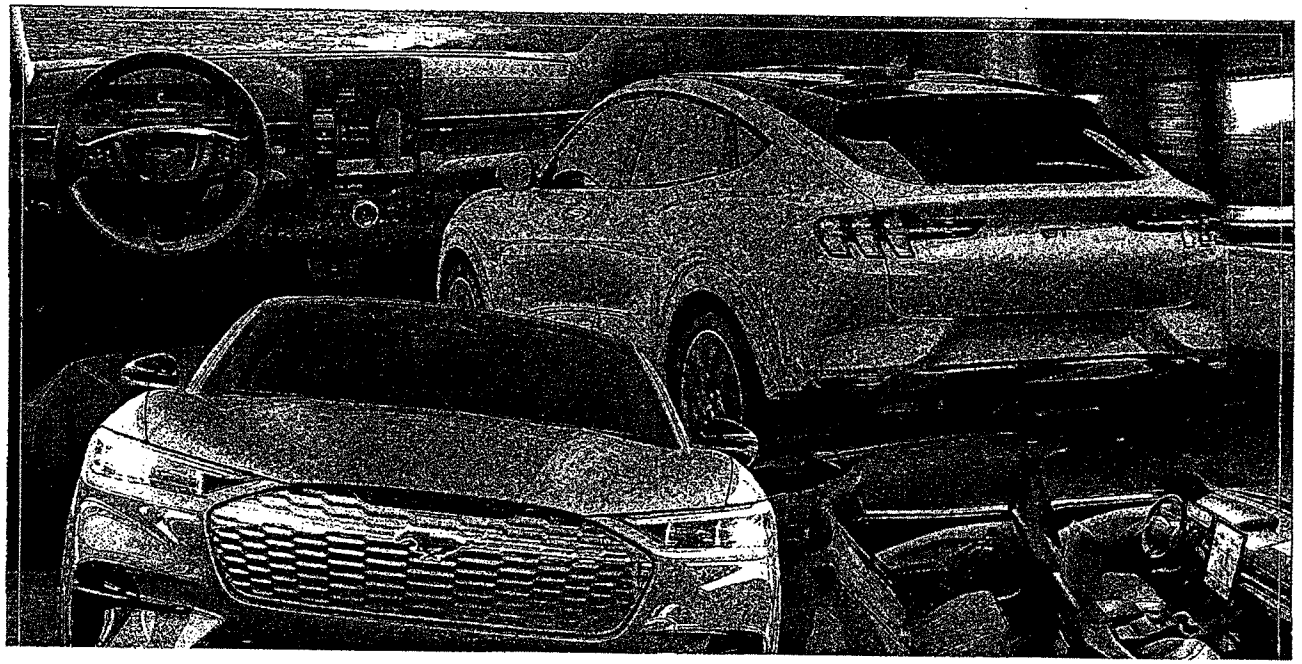
See CALIFORNIA, Page 26



SPECIAL SECTION: Electric vehicle charging stations may be the gas stations of the future, but the industry and the nation have an enormous job ahead to build enough infrastructure to keep EV customers moving. | PAGES 17-23 |



Elaine Herzberg died in March of last year after being struck by a self-driving Uber test vehicle.



Disabled fail-safe at issue in Uber crash

New revelations ahead of

CALIFORNIA

Meeting growth of EV sales will shape grid

continued from Page 1

company required downloading a smartphone app and registering a credit card. After two hours of charging, the Level 2 device added just 25 miles of electric range.

The popular PlugShare app that's a clearinghouse for EV chargers is full of similar stories: broken chargers, payment problems and inconsistent prices and charging speeds. There are bright spots, to be sure. Tesla superchargers and companies such as Electrify America get good marks for easy-to-find locations and hassle-free payment.

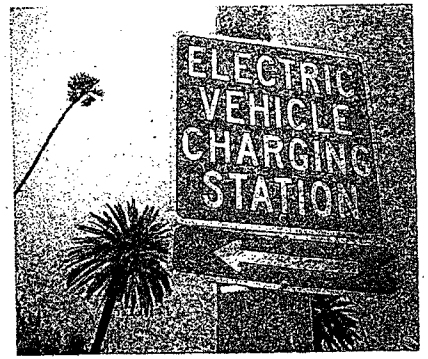
California is the epicenter for EV driving in the U.S., and it is central to the industry's projections on electric-vehicle sales in the coming decade. The solutions that the state and its cities and counties reach on how to keep all of its future EVs charged will shape the national charging grid.

Of the more than 60,000 existing public charging connections estimated in the U.S. by the Department of Energy, about 22,000 are in California. But the details of that number are complicated. California's network is a patchwork of Level 2 chargers that take hours for a full battery, Level 3 that are much faster and different plug standards.

Up to 150,000 public chargers

While early EV adopters often charge at home, public options are critical to promote ownership by people who need to charge at work or add miles while on the road, advocates say. The California Energy Commission estimates about 100,000 to 150,000 public chargers are needed to support a goal of 1.5 million zero-emissions vehicles by 2025.

"We know when we talk to EV candidate drivers that, beyond the upfront cost of the vehicle, their next questions are commonly: How far can this thing go? And, where can I refuel my car?" said Josh Boone, executive director of the nonprofit group Veloz, whose members include automakers, government agencies and EV charging companies.



"So we know that having a reliable, redundant, ubiquitous charging network up and down the state of California is really important to a successful EV market."

Josh Boone, Veloz executive director

"So we know that having a reliable, redundant, ubiquitous charging network up and down the state of California is really important to a successful EV market," Boone told *Automotive News*. How much investment is required to reach those goals is a difficult question because EV range and charging speeds are rapidly improving. "I don't think anyone can answer that question. I think what we know is that we need more," he said.

The good news is that billions of dollars are headed into charging infrastructure around the country over the next decade, coming from government entities such as the state of California and from private companies such as Electrify America, which has $2 billion to spend from Volkswagen's legal settlement over its diesel emissions cheating scandal. That settlement earmarked $800 million for California over 10 years.

Electrify America has built 435 charging sites across the U.S. — 118 of them in California — with an average of five chargers per site. Its initial focus when it started in 2017 was to create a national fast-charging corridor along highways. It is now transitioning to the next stage of investment — called "Cycle 2" — that focuses on urban EV infrastructure, COO Brendan Jones said in an interview.

The $153 million Cycle 2 investment in California will focus on providing Level 3 fast-charging in nine metro areas that are home to 80 percent of California's population, from Sacramento in the north to San Diego in the south, according to Electrify America.

Jones says the first and last steps in each construction project are often the most difficult: obtaining a real estate site and installing the utility power to make it functional. California takes a little longer than other states for permitting because of an extra step to make sure that charging sites are aesthetically pleasing and fit into the community.

"The first hurdle we face, and it's one that is not readily obvious to a lot of people, is actually the acquisition of sites," Jones said. "Customers actually have preferences where they want to charge their car. And they much prefer a site that is well-lit, is in a retail environment, has a bathroom, has someplace to eat."

Next challenge: After going through the permit and construction process, sites are often ready for customers before the local utility can connect them. Jones said about 100 completed sites — most of them in California — are waiting for electricity. The goal nationwide by the end of 2021 is to have 800 operating stations and 3,500 individual chargers, with California having the highest number because it gets 40 percent of the Electrify America investment.

Compatibility challenges

One complication in laying out the public charging grid is that EV brands and models have different specifications, Jones said. "We're accommodating all vehicles, and we estimate there are between 40 and 50 new vehicles coming to market within the next three to four years. We're already seeing a slew of them coming out this year," he said.

Veloz, the nonprofit group, estimates that 655,000 EVs have been sold in California since they started appearing in 2010, including plug-in hybrids. Although the overall market share for EVs is relatively low, California leads the nation and new models are fueling the segment's growth, especially the Tesla Model 3.

The California New Car Dealers Association said pure EVs accounted for 5.5 percent of sales in the first half of this year. That was an increase of 64 percent from a year earlier.

But Jones believes that if the state's forecasts for continuing EV sales hold true, the big dollars that Electrify America is investing in public charging are just a small percentage of what will be needed.

Different paths

While Electrify America sells charging services directly to final users, ChargePoint provides the hardware, software and a cloud platform for fleet operators, apartment owners, employers and retailers to provide charging services to their customers. Not all of those stations are open to the general public, and Veloz estimates there are probably as many private, nonresidential chargers in California as there are purely public ones (around 22,000).

"If you're a workplace, you do it because it's now an essential amenity to retain and to recruit new talent," said Darryll Harrison Jr., communications leader at the company. "If you're a retailer, you may know that if a customer goes to your store and spends an hour, they spend X percent more dollars than if they spent 30 minutes."

ChargePoint's growth in charging locations illustrates the rapidly evolving landscape. The company started 12 years ago; two years ago, it had 17,000 public and private charging connections in California. Today it has 40,000.

"We're kind of seeing the beginning of that hockey stick in the market," Harrison said, "where vehicle adoption, driver demand, interest from policymakers and others are converging for this perfect storm, as new models hit the market."

Other companies are working toward the same end, including EVgo and Blink Charging. The state itself is promoting charging infrastructure. Last year, California's Public Utilities Commission approved $768 million in expenditures for charging stations focused on trucks and buses.

The state also has rebate programs for the installation of public EV chargers in underserved areas and for the installation of residential chargers. AN

PLUG *without* DRUDGE

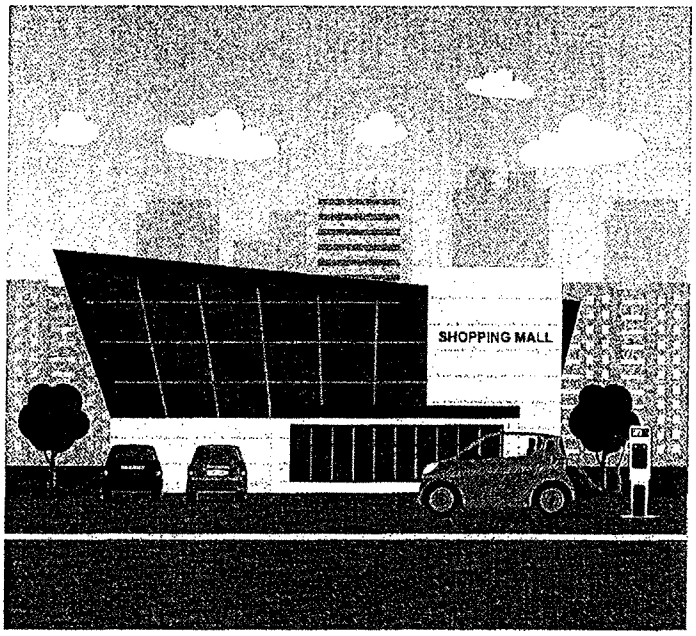
Charge providers want to make juicing up an EV faster, more pleasant

BY JACK KEEBLER

Charging an electric vehicle can take several hours, depending on the charger, level of discharge, battery size and the vehicle's capability to accept a jolt of 240- or 480-volt DC juice.

But charging is as dull as watching paint dry. So if your EV needs a charge while you're driving across town or across country, what can you do instead of staring at the state-of-charge display? How about shopping, seeing a movie, catching a meal or hitting the Internet?

Charge providers are crafting shorter and more pleasant experiences. That starts with strategically placing powerful chargers, from 50 to 350 kilowatt-hours, at locations that are well lit and feel safe, such as retail businesses that are open 24/7, restaurants, hotels and entertainment venues — places with Wi-Fi and clean bathrooms and where you can get waited on while you wait.



Automakers are investing billions to meet emissions requirements and create multisegment EV portfolios. Buyers want greater range, better affordability and more charge points. Focus groups confirm that easier, quicker charging positively affects EV-purchase consideration.

Electrify America, a subsidiary of VW Group of America, is managing the company's investments in EV education and in growing the nation's charging infrastructure. It was established as part of the settlement with the EPA and the California Air Resources Board for VW's excess diesel emissions. Its management expects that by December 2021, the company will install or have under development about 800 stations with a total of 3,500 chargers in its network.

Other large charging networks include EVgo and ChargePoint.

"The charging site should be easy to see and should be positioned close to the entrance to the retail amenities, whether it's a shopping mall, a grocery store, a restaurant or the National Corvette Museum," says Wayne Killen, director of infrastructure planning and business development at Electrify America. "It's easy to get inside, as opposed to around the back of the parking lot or around on the side in a place where you don't think it's a premium experience."

Killen points out that with apps from carmakers, such as FordPass, and charge providers, owners can check charge-station availability, pay digitally and roam a shopping center while keeping up on charging progress and finish time.

Charging speed is getting better. Killen says charges take 30 to 90 minutes or even less. For example, the Porsche Taycan EV can accept a 270-kWh charge at a 350-kWh Electrify America station, going from 5 percent to 80 percent charged in a bit more than 22 minutes. Barely enough time to stroll away for a leisurely cup of coffee, sip some soup or pick out some cool socks.

Each Electrify America facility has four to 12 charging stations. Chances are there won't be a line for a quick-charge spot.

Killen says choosing charger locations also depended on convenience to major highways, visibility, security and even how environmentally friendly the local utility was in terms of power generation.

Even considering emissions from power plants, driving an EV is equivalent to cruising in a 51-mpg internal combustion engine vehicle. Green, clean — and getting more convenient. ■

835/909 HAYNES
PORSCHE DEALERSHIP
SLUP HISTORY

DATE	BOARD/COMMISSION	DECISION
2010	City Commission	Special Land Use Permit granted for the Porsche Dealership at 835 Haynes.
03/23/2016	Planning Board	Hearing on Planning Board Application for temporary expansion of SLUP to include use of 909 Haynes as part of an auto sales agency. Planning Board adjourned the hearing to 04/24/2016.
04/27/2016	Planning Board	Hearing on application to expand SLUP adjourned from 03/23/2016. The Planning Board approved to expansion of the SLUP to temporarily include 909 Haynes as part of an auto sales agency.
06/27/2016	City Commission	Public Hearing on application to expand SLUP as recommended by the Planning Board on 04/27/2016. City Commission granted the temporary expansion of the SLUP to include 909 Haynes.

SCHEDULE A

TO SLUP APPLICATION

Properties within 200' of 907-911 Haynes:

611 Elm Street – single story commercial building

870 Bowers Avenue – parking lot

874/880 Bowers – garages and 2 story commercial building

999 Haynes Street - 3 story office building and parking lot

34300 Woodward Avenue – Walgreens Pharmacy, parking lot

1000 Haynes Street – Citizen's Bank and drive thru

1006 Bowers Avenue – single story commercial building

611 ELM ST BIRMINGHAM, MI 48009-6768 (Property Address)

Parcel Number: 08-19-36-281-028 Account Number: 10171-24134

Property Owner: ELSMAN, JAMES

Summary Information

- Commercial/Industrial Building Summary
  - Yr Built: ***
  - # of Buildings: ***
  - Total Sq Ft: ***
- *** Special Assessments found
- 9 Building Department records found
- *** Invoices Found, Amount Due: *,***.**
- Assessed Value: $***,*** | Taxable Value: $***,***
- Property Tax information found
- Utility Billing information found

Access additional record information for a small convenience fee. *

- Additional areas of information include: *Property Information, Tax Information, Special Assessments Information, Utility Bill Info., Invoices*

Hide Purchase Options

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Address:
City:
State:
Zip:
Card Number:
Security Code: What is this?
Expiration: 01 2019

Cost of Service: $2.00

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870 BOWERS AVE BIRMINGHAM, MI 48009-6714 (Property Address)

Parcel Number: 08-19-36-281-003 Account Number: 00000-11455

Property Owner: BIRMINGHAM BOWERS LLC

Summary Information

- Assessed Value: $***,*** | Taxable Value: $***,***
- Property Tax information found
- Utility Billing information found
- *** Special Assessments found
- 20 Building Department records found

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- Additional areas of information include: *Property Information, Tax Information, Special Assessments Information, Utility Bill Info.*

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999 HAYNES AVE BIRMINGHAM, MI 48009-6712 (Property Address)

Parcel Number: 08-19-36-281-029 Account Number: 10137-24110

Property Owner: 999 HAYNES ASSOCIATES

Summary Information

- Commercial/Industrial Building Summary
  - Yr Built: *** # of Buildings: ***
  - Total Sq Ft: ***
- *** Special Assessments found
- 14 Building Department records found
- *** Invoices Found, Amount Due: *,***.**
- Assessed Value: $***,*** | Taxable Value: $***,***
- Property Tax information found
- Utility Billing information found

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Address:
City:
State:
Zip:
Card Number:
Security Code: What's this?
Expiration: 01 2019

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Submit

34300 WOODWARD AVE BIRMINGHAM, MI 48009-0919 (Property Address)

Parcel Number: 08-19-36-282-006 Account Number: 11250-00000

Property Owner: 8600 ORLANDO LLC

Summary Information

- Commercial/Industrial Building Summary
  - Yr Built: *** - # of Buildings: ***
  - Total SqFt: ***
- *** Special Assessments found
- 1 Building Department records found
- *** Invoice Found, Amount Due: *,***.**
- Assessed Value: $***,*** | Taxable Value: $***,***
- Property Tax information found
- Utility Billing information found

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1000 HAYNES AVE BIRMINGHAM, MI 48009-6778 (Property Address)

Parcel Number: 08-19-36-283-024 Account Number: 10139-11212

Property Owner: CITIZENS BANK/CHARTER ONE BANK

Summary Information

- Commercial/Industrial Building Summary
  - Yr Built: ***
  - # of Buildings: ***
  - Total SqFt: ***
- *** Special Assessments found
- 22 Building Department records found
- *** Invoices Found, Amount Due: *.***.**
- Assessed Value: $***,***.* | Taxable Value: $***,***
- Property Tax information found
- Utility Billing information found

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1006 BOWERS AVE BIRMINGHAM, MI 48009-6728 (Property Address)

Parcel Number: 08-19-36-281-017 Account Number: 10157-24122

Property Owner: ROSSO DEVELOPMENT CO

Summary Information

- Commercial/Industrial Building Summary
  - Yr Built: ***
  - # of Buildings: ***
  - Total Sq Ft: ***
- *** Special Assessments found
- 5 Building Department records found
- Assessed Value: $***,*** | Taxable Value: $***,***
- Property Tax information found
- Utility Billing information found

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Google

OAKLAND COUNTY TREASURER'S CERTIFICATE
This is to certify that there are no delinquent property taxes as of this date owed to our office on this property. No representation is made as to the status of any taxes, tax liens or titles owed to any other entities.

MAY 15 2015

1.00 PV ANDREW E. MEISNER, County Treasurer
Sec 135, Act 206, 1893 as amended

LIBER 48188 PAGE 142
$22.00 DEED - COMBINED
$4.00 REMONUMENTATION
$17,200.00 TRANSFER TX COMBINED
05/18/2015 03:32:24 PM RECEIPT# 56415
PAID RECORDED - Oakland County, MI
Lisa Brown, Clerk/Register of Deeds

STATE OF MICHIGAN REAL ESTATE TRANSFER TAX
OAKLAND 05/18/2015 56415
$2,200.00 CO
$15,000.00 ST
001002777

WARRANTY DEED

THEODORE N. MITCHELL AND KATHY MITCHELL, husband and wife, GREGORY MITCHELL AND ATHINA MITCHELL, husband and wife, AND MARK MITCHELL AND MARTHA MITCHELL, husband and wife (collectively, "**Grantor**"), whose address is 339 N. Center Street, Northville, Michigan 48167 ("**Grantor**"), conveys and warrants to Lavery Michigan Dealership Properties* Michigan limited liability company ("**Grantee**"), whose address is 33583 Woodward Ave. Birmingham** the premises situated in the City of Birmingham, Oakland County, Michigan, more specifically described as: **MI 48009

*No. 1, LLC, a Michigan limited liability company

See **Exhibit A** hereto

for the sum set forth on the Real Estate Transfer Tax Valuation Affidavit filed herewith, subject only to the exceptions set forth on **Exhibit B** hereto.

If the land being conveyed is unplatted, the following is deemed to be included:

Grantor grants to Grantee the right to make all division(s) under Section 108 of the Land Division Act, Act No. 288 of the Public Acts of 1967, as amended.

This property may be located within the vicinity of farmland or a farm operation. Generally accepted agricultural and management practices which may generate noise, dust, odors, and other associated conditions may be used and are protected by the Michigan Right to Farm Act.

RECEIVED
OAKLAND COUNTY
REGISTER OF DEEDS
2015 MAY 13 AM 10:59

SP A Cert

Dated: April 30, 2015 OK - LB

[SIGNATURES BEGIN ON NEXT PAGE]

1508076

GRANTOR:

Theodore N. Mitchell

Kathy Mitchell, his wife

Gregory Mitchell

Athina Mitchell, his wife

Mark Mitchell

Martha Mitchell, his wife

STATE OF MICHIGAN)
) ss.
COUNTY OF Oakland)

The foregoing instrument was acknowledged before me in Oakland County, Michigan, this 1st day of June, 2010, by Theodore N. Mitchell and Kathy Mitchell, his wife.

Sandra J Meiki
Print name: Sandra J. Meiki
Notary Public
State of Michigan, County of _____
My commission expires _____
Acting in the County of _____

Sandra J Meiki
Notary Public of Michigan
Oakland County
Expires 05/13/2013
Acting in the County of Oakland

STATE OF MICHIGAN)
) ss.
COUNTY OF Oakland)

The foregoing instrument was acknowledged before me in Oakland County, Michigan, this 16th day of June, 2010, by Gregory Mitchell and Athina Mitchell, his wife.

Sandra J Meiki
Print name: Sandra J. Meiki
Notary Public
State of Michigan, County of
My commission expires
Acting in the County of

Sandra J Meiki
Notary Public of Michigan
Oakland County
Expires 05/13/2013
Acting in the County of Oakland

STATE OF MICHIGAN)
) ss.
COUNTY OF Oakland)

The foregoing instrument was acknowledged before me in Oakland County, Michigan, this 16th day of June, 2010, by Mark Mitchell and Martha Mitchell, his wife.

Sandra J Meiki
Print name: Sandra J. Meiki
Notary Public
State of Michigan, County of
My commission expires
Acting in the County of

Sandra J Meiki
Notary Public of Michigan
Oakland County
Expires 05/13/2013
Acting in the County of Oakland

Drafted by and when recorded return to:
Howard N. Luckoff, Esq.
Honigman Miller Schwartz and Cohn LLP
2290 First National Building
660 Woodward Avenue
Detroit, MI 48226

Send subsequent tax bills to: Grantee

Recording Fee: $_____

Transfer Tax: See Real Estate Transfer Tax Valuation Affidavit

EXHIBIT A

LEGAL DESCRIPTION

Land situated in the City of Birmingham, Oakland County, Michigan, more particularly described as:

Lot 3 of "Bowers Addition", according to the plat thereof recorded in Liber 8 of Plats, Page 26, Oakland County Records, except that part taken for highway; also together with:

All of Lots 4 and 5 of "Bowers Addition", according to the plat thereof recorded in Liber 8 of Plats, Page 26, Oakland County Records; also together with

Lot 6 of "Bowers Addition", according to the plat thereof recorded in Liber 8 of Plats, Page 26, Oakland County Records, except the Easterly part, beginning at the Northeast Lot corner; thence West 1.35 feet along the Lot line; thence Southerly 65.50 feet parallel to the East Lot line; thence South 52.89 feet to the Southeast Lot corner; thence Northerly along said Lot line to the beginning.

Sidwell #:	19-36-281-022
Commonly Known As:	835 and 845 Haynes Street

EXHIBIT B

EXCEPTIONS

1. Taxes and assessments for the year 2010 and thereafter which constitute a lien on the Property but are not yet due and payable.

2. Highway Easement recorded in Liber 53, Page 355 of Miscellaneous Records, Oakland County Records, Michigan.

OAKLAND.1841170.1

OAKLAND COUNTY TREASURER'S CERTIFICATE
I HEREBY CERTIFY that there are no TAX LIENS or TITLES held by the state or any individual against the within description and all TAXES on same are paid for five years previous to the date of this instrument as appears by the records in the office except as stated.

JUN 06 2014

1.00 ANDREW E. MEISNER, County Treasurer
Sec. 135, Act 206, 1893 as amended

00-1862

LIBER 47102 PAGE 586
$19.00 DEED - COMBINED
$4.00 REMONUMENTATION
[redacted]
06/06/2014 03:17:34 PM RECEIPT# 53438
PAID RECORDED - Oakland County, MI
Lisa Brown, Clerk/Register of Deeds

[redacted]

COVENANT DEED

Agim Bardha and Sheriban Bardha, husband and wife (collectively, "Grantor"), whose address is 550 Bates, Birmingham, Michigan 48009, hereby sells, conveys, grants and bargains to Lavery Michigan Dealership Properties No. 1, LLC, a Michigan limited liability company ("Grantee"), whose address is 440 Lake Park Drive, Birmingham, Michigan 48009, the premises situated in the City of Birmingham, Oakland County, Michigan, more specifically described as:

See **Exhibit A** hereto

for the sum set forth on the Real Estate Transfer Tax Valuation Affidavit filed herewith.

Grantor, for itself, its successors and assigns, covenants, grants, bargains, and agrees to and with Grantee, its successors and assigns, that, subject to the exceptions set forth on **Exhibit B** hereto, Grantor has not done, committed or knowingly suffered to be done or committed any act, matter, or thing whatsoever, whereby the premises hereby granted, or any part thereof, is, or shall or may be, charged or encumbered in title, estate or otherwise.

If the land being conveyed is unplatted, the following is deemed to be included:

Grantor grants to Grantee the right to make all division(s) under Section 108 of the Land Division Act, Act No. 288 of the Public Acts of 1967, as amended.

This property may be located within the vicinity of farmland or a farm operation. Generally accepted agricultural and management practices which may generate noise, dust, odors, and other associated conditions may be used and are protected by the Michigan Right to Farm Act.

[SIGNATURES ON NEXT PAGE]

OK - LG

RECEIVED
OAKLAND COUNTY
REGISTER OF DEEDS
2014 JUN -6 PM 3:17
[redacted]

REVENUE TO BE AFFIXED AFTER RECORDING

SIGNATURE PAGE TO COVENANT DEED FROM SHERIBAN AND AGIM BARDHA TO LAVERY MICHIGAN DEALERSHIP PROPERTIES NO. 1, LLC

GRANTOR:

Sheriban Bardha

Agim Bardha

Dated as of June 2, 2014

STATE OF MICHIGAN)
) SS.
COUNTY OF OAKLAND)

This instrument was acknowledged before me in Oakland County, Michigan, on the 2nd of June, 2014, by Sheriban Bardha and Agim Bardha.

Print Name of Notary Public: Jennifer L. Schreiner
Notary Public, State of Michigan, County of Oakland.
My commission expires: 4/14/20.
Acting in the County of Oakland.

Drafted by ~~and when recorded return to~~:
Sarah Baumgartner, Esq.
Honigman Miller Schwartz and Cohn LLP
660 Woodward Avenue
2290 First National Building
Detroit, MI 48226-3506

When Recorded Return to:
Title Source, Inc. -
Commercial Team
660 Woodward Avenue
Detroit, MI 48226
TSI#: 58767941

Send subsequent tax bills to: Grantee

Recording Fee: $_____

Transfer Tax: See Real Estate Transfer Tax Valuation Affidavit

14933055.3

EXHIBIT A - LEGAL DESCRIPTION

Tax Id Number(s): 19-36-281-030

Land Situated in the City of Birmingham in the County of Oakland in the State of MI

Town 2 North, Range 10 East, Section 36, BOWERS ADDITION SUBDIVISION, as recorded in Liber 8, Page 26 of Plats, Oakland County Records. Easterly part of Lot 6 beginning at Northeast lot corner, thence Westerly 1.35 feet along North lot line, thence South 01 degrees 00 minutes 00 seconds West 65.50 feet parallel to East lot line, thence Southeasterly 52.89 feet to Southeast lot corner, thence Northerly 118.42 feet along East lot line to beginning, also all of Lots 7, 8 and 9, also Westerly part of Lot 10 measures 10.14 feet along North lot line and 10.58 feet along South lot line.

Client Reference: 907 & 911 Haynes St., Birmingham, MI 48009

EXHIBIT B

EXCEPTIONS

1. Lease dated June 3, 2010 between Sheriban and Agim Bardha and Spa Mariana, LLC, successor in interest to Corpo Chair Massage, LLC.

City of Birmingham
A Walkable Community

MEMORANDUM

Planning Division

DATE: **January 16th, 2020**

TO: **Planning Board Members**

FROM: **Nicholas Dupuis, City Planner**

SUBJECT: **501 S. Eton – Whistle Stop Diner – Design Review**

The owner of the Whistle Stop Diner located at 501 S. Eton has submitted a Design Review application for an interior and exterior renovation of an existing one story commercial building currently separated into three tenant spaces. The renovations proposed include an expansion into an adjacent tenant space, a new canopy, new signage, outdoor dining, a new walk in cooler, and several other exterior changes.

1.0 Land Use and Zoning

1.1 Existing Land Use – The existing land use is commercial.

1.2 Zoning – The property is zoned MX (Mixed-Use)

1.3 Summary of Adjacent Land Use and Zoning –

	North	South	East	West
Existing Land Use	Commercial	Commercial	Mixed-Use	Single-Family Residential
Existing Zoning District	MX (Mixed Use)	MX (Mixed Use)	MX (Mixed Use)	R3 (Single-Family Residential)
Overlay Zoning District	N/A	N/A	N/A	N/A

2.0 Setback and Height Requirements

The attached summary analysis provides the required and proposed bulk, area, and placement regulations for the proposed project.

3.0 Screening and Landscaping

3.1 Dumpster Screening – No changes are proposed to the existing dumpster location or

screening. The dumpster is currently placed at the southeast corner of the property in the existing parking lot, and could be considered screened on one side by a row of arborvitae plantings. **The Planning Board may wish to require the applicant to fully screen the existing dumpster.**

3.2 Parking Lot Screening – There are no changes proposed to the existing parking lot screening. The parking lot is currently screened by a masonry screen wall and landscaping on the front (west) and side (south) of the lot, with the rear of the property/lot screened by an existing 6 ft. wood fence.

3.3 Mechanical Equipment Screening – A parapet wall on the front and sides of the building screens the existing rooftop mechanical equipment. The plans submitted suggest a new rooftop mechanical system will be installed and screened by a perforated metal screenwall. The plans indicate that the rooftop units are yet to be selected, and that the screenwall will be fabricated and installed at a height that will fully screen the rooftop mechanical units. Thus, **the applicant must provide specification sheets for all proposed rooftop mechanical units and the dimensions of the proposed screenwall to verify the units will be fully screened.**

3.4 Landscaping – No changes are proposed to the landscaping on site. There currently exists landscaping on the north end of the property including Arborvitae and shrubs. The City easement adjacent to their property contains grass and three street trees.

3.5 Streetscape Elements – The streetscape currently contains three street trees and a news box. There are currently no streetlights installed on the easement, which measures 130.2 ft. With streetlights every 40 ft., the easement would need three to complete the streetscape. **The Planning Board may wish to require the applicant to install bike racks, benches, streetlights and/or waste receptacles to continue the streetscape established to the north and south.**

4.0 Parking, Loading and Circulation

4.1 Parking – The subject site currently contains an off-street parking facility with 13 parking spaces. The proposed restaurant expansion will require one space per 75 sq. ft. of floor area, while the commercial tenant to the south will require one space per 550 sq. ft. of floor area. A parking requirement breakdown is provided below:

Land Use	Sq. Ft.	Required Parking
Restaurant (Whistle Stop)	2,718	36
Commercial (Yoga)	1,175	3
Total:	3,893	39

For the proposed expansion, the applicant is required to provide 39 off-street parking spaces, which is an additional 26 spaces from the existing 13-space lot. The applicant has been working with the neighboring property owners at Griffin Claw to forge a shared parking agreement between the two properties, as the hours of operation are conducive to such an agreement. However, the City has not received an executed parking agreement for the 26 outstanding space. Therefore, **the applicant must**

provide 26 additional off-street parking spaces, enter into a shared parking agreement with the adjacent property owner, or obtain a variance from the Board of Zoning Appeals.

It is worth noting that public on street parking exists in front of the subject property along S. Eton St., as well as on both sides along Hazel St. and Palmer St. totaling roughly twelve parking spaces.

4.2 Loading – Because the building is less than 5,000 sq. ft. in floor area, there are no off-street loading spaces required.

4.3 Vehicular Circulation and Access – Vehicular circulation and access is proposed to remain, as it exists, with vehicles accessing the off-street parking facility via a drive at the south side of the property.

4.4 Pedestrian Circulation and Access – Pedestrian circulation and access is proposed to remain, with access to the main entrance via the public sidewalk along S. Eton St. In the event of a shared parking agreement between two property owners, **the Planning Board may wish to require or inquire upon enhanced pedestrian facilities for those patrons crossing Palmer St. to reach the Whistle Stop Diner.**

5.0 Lighting

The applicant is proposing four new MRD LED light fixtures on the side and rear of the building, twenty-five ID+ LED downlights, and twelve Covelum LED Litebars. Article 4, Section 4.21 requires (among other things) that:

1. All luminaries shall be full cutoff or cutoff. Exception to cutoff luminaries can be made at the discretion of the Planning Board if the light is found to be not obtrusive or distracting, designed for architectural enhancement, or is compatible with the surrounding neighborhood.
2. The intensity of light on a site shall not exceed six-tenths (0.6) maintained foot-candles at any property line that abuts a single-family residential zoned property or one and one half (1.5) maintained foot-candles at any property line for any other zoned property.

The 12 LED litebars do not appear to be cutoff as defined by the Zoning Ordinance. However, the Planning Board may find the fixtures to be architectural enhancements and unobtrusive.

Additionally, there is a small portion of light at the rear property line that exceeds 1.5 foot-candles, and the entire frontage line exceeds 1.5 foot-candles. **The applicant must revise the lighting proposals and photometric plan to not exceed 1.5 foot-candles at all property lines or obtain a variance from the Board of Zoning Appeals.**

6.0 Departmental Reports

6.1 Engineering Division – The Engineering Division has not provided any comments at this time. All comments will be made available at the Planning Board review meeting.

6.2 Department of Public Services – The Department of Public Services has not provided any comments at this time. All comments will be made available at the Planning Board review meeting.

6.3 Fire Department – The Fire Department has no concerns at this time.

6.4 Police Department – The Police Department has not provided any comments at this time. All comments will be made available at the Planning Board review meeting.

6.5 Building Division – The Building Division has not provided any comments at this time. All comments will be made available at the Planning Board review meeting.

7.0 Design Review

As noted above, the applicant is proposing a thorough renovation of the existing façade to go along with the proposed fresh new interior renovations. The work would consist of the removal of the existing awning/parapet to reconstruct a new parapet in brick to match the existing façade. The applicant is also proposing a wood element across the front façade (spilling over on the side) covered by a perforated metal panel which will house the proposed signage (signage discussed below). Additionally, the applicant is proposing two new steel and wood canopies, new guardrails, and a perforated metal screening system for the rooftop units. The following table details the newly proposed materials:

Feature	Material	Color
Parapet & Infill	Brick	To match existing
Wood Panel	1" x 6" Cedar	Raw cedar/unpainted
Metal Panel	Perforated Metal	Black
Metal Screening (Rooftop)	Perforated Metal	Bunglehouse Gray
Entryway Guardrail	Metal Tube	Black
Canopies	Steel & Wood	Black

The applicant is also proposing a new outdoor dining area located on the large easement between the public sidewalk and S. Eton St., which will be constructed of brown Trex Decking and a black metal railing. Article 4, Section 4.44 of the Zoning Ordinance requires:

1. Outdoor dining areas shall provide and service refuse containers within the outdoor dining area and maintain the area in good order.
2. All outdoor activity must cease at the close of business or as noted in subsection 3 below.
3. When an outdoor dining area is immediately adjacent to any single-family or multiple-family residential district, all outdoor activity must cease at the close of business or 10:00 p.m., whichever is earlier.
4. Outdoor dining may be permitted on the sidewalk throughout the year with a valid Outdoor Dining License, provided that all outdoor dining fixtures and furnishings

must be stored indoors each night between November 16 and March 31 to allow for snow removal.

5. All tables and chairs provided in the outdoor dining area shall be constructed primarily of metal, wood, or material of comparable quality.
6. Table umbrellas shall be considered under Site Plan Review and shall not impede sight lines into a retail establishment, pedestrian flow in the outdoor dining area, or pedestrian or vehicular traffic flow outside the outdoor dining area.
7. For outdoor dining located in the public right-of-way:
    a. All such uses shall be subject to a license from the city, upon forms provided by the Community Development Department, contingent on compliance with all city codes, including any conditions required by the Planning Board in conjunction with Site Plan approval.
    b. In order to safeguard the flow of pedestrians on the public sidewalk, such uses shall maintain an unobstructed sidewalk width as required by the Planning Board, but in no case less than 5 feet.
    c. Outdoor dining is permitted to extend in the right-of-way in front of neighboring properties, with the written permission of the property owner(s) and with Planning Board approval, if such property is vacant or the first floor storefront(s) is/are vacant. Outdoor dining areas may extend up to 50% of the width of the neighboring lot(s) storefront(s), or up to 50% of the lot(s) frontage, if such lot is vacant.
    d. City Commission approval is also required for outdoor dining extensions onto neighboring property if the establishment making such a request holds a bistro license.
    e. An elevated, ADA compliant, enclosed platform may be erected on the street in front of an eating establishment to create an outdoor dining area from April 1 through November 15 only if the Engineering Department determines there is sufficient space available for this purpose given parking and traffic conditions.
    f. No such facility shall erect or install permanent fixtures in the public right-of-way.

The outdoor dining area is proposed as seasonal, with the entire platform being removed for the winter months. The twenty-six chairs are proposed as red in color, and the ten tables are proposed in black. No trash receptacle is shown on the plans. **The applicant must submit specification sheets on the proposed tables and chairs to ensure they are constructed primarily of metal, wood, or material of comparable quality and submit new plans with outdoor dining hours and a trash receptacle within the outdoor dining area.**

On the rear of the building, the applicant is proposing to add a 164 sq. ft. walk in cooler/freezer to support the expansion of the restaurant. The proposal is to add a prefabricated freezer with slanted roof to roughly the middle of the façade, cutting space for one new interior access door and refitting an existing door. Additional work on the rear will involve one new door, the removal of a roll down door (and subsequent infill to match existing), and replacing one window with a door. It is unclear if the rear and side elevations will receive a new coat of paint.

Finally, the applicant is also proposing new internally illuminated channel letter signage. The building contains roughly 91 ln. ft. of frontage, which allows for 91 sq. ft. of signage. Illumination is permitted in this district, with electrical raceways measuring no greater than 4 in. The applicant has not submitted details on the proposed signage. **Therefore, the applicant must provide details to the Planning Division and/or the Design Review Board for approval for all proposed signage.**

8.0 Required Attachments

Article 7, Section 7.26 states that Each Site Plan submitted to the Planning Board in accordance with the requirements of the Zoning Ordinance shall be on such forms and contain such information as the Planning Board shall determine necessary, including but not limited to a site plan, photometric plan, landscape plan, elevation drawings, interior floor plans, current aerial photos of the subject site and surrounding properties, specification sheets for all lighting and exterior mechanical equipment, and samples of all exterior building materials. All site plans submitted for review and approval must show the subject site in its entirety, must include all property lines, buildings and structures, and must show the same details for all adjacent properties within 200 feet of the subject site's property lines.

The applicant has submitted the following documents:

	Submitted	Not Submitted	Not Required
Existing Conditions Plan	☐	☐	☒
Scaled Site Plan	☒	☐	☐
Certified Land Survey	☐	☐	☒
Interior Floor Plans	☒	☐	☐
Landscape Plan	☐	☐	☒
Photometric Plan	☒	☐	☐
Colored Elevation Drawings	☒	☐	☐
Material Specification Sheets	☒	☐	☐
Material Samples	☐	☒	☐
Existing Site Photographs	☒	☐	☐
Aerial Photographs	☒	☐	☐
Proof of Ownership	☒	☐	☐

9.0 Approval Criteria

In accordance with Article 7, section 7.27 of the Zoning Ordinance, the proposed plans for development must meet the following conditions:

1) The location, size and height of the building, walls and fences shall be such that there is adequate landscaped open space so as to provide light, air and access to the persons occupying the structure.
2) The location, size and height of the building, walls and fences shall be such that there will be no interference with adequate light, air and access to adjacent lands and buildings

3) The location, size and height of the building, walls and fences shall be such that they will not hinder the reasonable development of adjoining property and not diminish the value thereof.
4) The site plan, and its relation to streets, driveways and sidewalks, shall be such as to not interfere with or be hazardous to vehicular and pedestrian traffic.
5) The proposed development will be compatible with other uses and buildings in the neighborhood and will not be contrary to the spirit and purpose of this chapter.
6) The location, shape and size of required landscaped open space is such as to provide adequate open space for the benefit of the inhabitants of the building and the surrounding neighborhood.

10.0 Recommendation

Based on a review of the site plan revisions submitted, the Planning Division recommends that the Planning Board **APPROVE** the Design Review for 501 S. Eton St. – Whistle Stop Diner – with the following conditions:

1. The applicant must provide specification sheets for all proposed rooftop mechanical units and the dimensions of the proposed screenwall to verify the units will be fully screened;
2. The applicant must provide 26 additional off-street parking spaces, enter into a shared parking agreement with the adjacent property owner, or obtain a variance from the Board of Zoning Appeals;
3. The applicant must request that the Planning Board approve the LED Litebars as architectural enhancements and/or unobtrusive;
4. The applicant must revise the lighting proposals and photometric plan to not exceed 1.5 foot-candles at all property lines or obtain a variance from the Board of Zoning Appeals;
5. The applicant must submit specification sheets on the proposed tables and chairs to ensure they are constructed primarily of metal, wood, or material of comparable quality and submit new plans with outdoor dining hours and a trash receptacle within the outdoor dining area;
6. The applicant must provide details to the Planning Division and/or the Design Review Board for approval for all proposed signage;
7. The applicant must submit material samples; and
8. Comply with the requests of the Planning Board all City departments.

11.0 Sample Motion Language

Motion to **APPROVE** the Design Review for 501 S. Eton St. – Whistle Stop diner – with the following conditions:

1. The applicant must provide specification sheets for all proposed rooftop mechanical units and the dimensions of the proposed screenwall to verify the units will be fully screened;
2. The applicant must provide 26 additional off-street parking spaces, enter into a shared parking agreement with the adjacent property owner, or obtain a variance from the Board of Zoning Appeals;

3. The applicant must request that the Planning Board approve the LED Litebars as architectural enhancements and/or unobtrusive;
4. The applicant must revise the lighting proposals and photometric plan to not exceed 1.5 foot-candles at all property lines or obtain a variance from the Board of Zoning Appeals;
5. The applicant must submit specification sheets on the proposed tables and chairs to ensure they are constructed primarily of metal, wood, or material of comparable quality and submit new plans with outdoor dining hours and a trash receptacle within the outdoor dining area;
6. The applicant must provide details to the Planning Division and/or the Design Review Board for approval for all proposed signage;
7. The applicant must submit material samples; and
8. Comply with the requests of the Planning Board and all City departments.

Motion to **POSTPONE** the Preliminary Site Plan Review for 501 S. Eton St. – Whistle Stop – pending receipt of the following:

1. _____
2. _____
3. _____

OR

Motion to **DENY** the Preliminary Site Plan Review for 501 S. Eton St. – Whistle Stop – for the following reasons:

1. _____
2. _____
3. _____

Zoning Compliance Summary Sheet
Final Site Plan Review
501 S. Eton St. – Whistle Stop

Existing Site: 1-story commercial building

Zoning: MX – (Mixed Use)

Land Use: Commercial

Existing Land Use and Zoning of Adjacent Properties:

	North	South	East	West
Existing Land Use	Commercial	Commercial	Mixed-Use	Single-Family Residential
Existing Zoning District	MX (Mixed Use)	MX (Mixed Use)	MX (Mixed Use)	R3 (Single-Family Residential)
Overlay Zoning District	N/A	N/A	N/A	N/A

Land Area:
Existing: 0.26 ac.
Proposed: 0.26 ac. (no changes proposed)

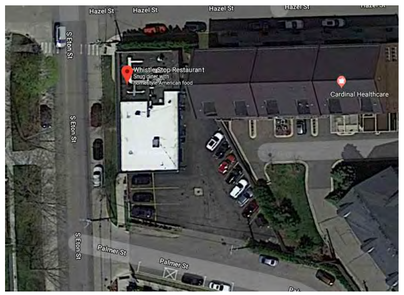
Dwelling Units:
Existing: 0 units
Proposed: 0 units (no changes proposed)

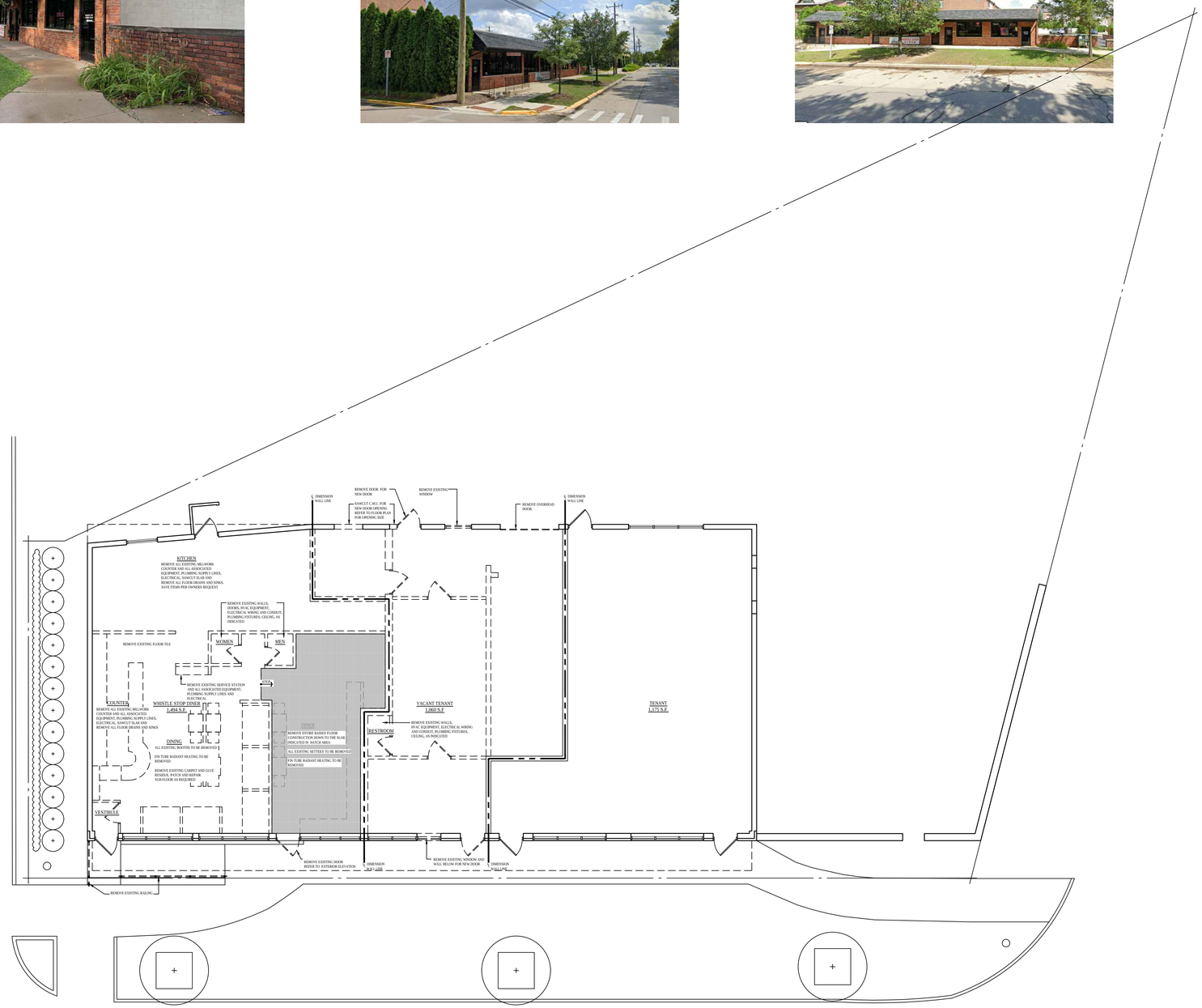
Minimum Lot Area/Unit:
Required: 1,500 sq. ft. (one bedroom)
2,000 sq. ft. (two bedroom)
2,500 sq. ft. (three or more bedroom)
Proposed: N/A (no changes proposed)

Min. Floor Area /Unit:
Required: 400 sq. ft. (efficiency)
600 sq. ft. (one bedroom)
800 sq. ft. (two bedroom)
1,000 sq. ft. (three or more bedroom)

	Proposed:	N/A
Max. Total Floor Area:	Required:	100% 6,000 sq. ft. for commercial, office, and service uses
	Proposed:	3,893 sq. ft.
Min. Open Space:	Required:	N/A
	Proposed:	N/A
Max. Lot Coverage:	Required:	N/A
	Proposed:	N/A
Front Setback:	Required:	0 ft.
	Proposed:	5 ft. (no changes proposed)
Side Setbacks	Required:	0 ft.
	Proposed:	8 ft. (no changes proposed)
Rear Setback:	Required:	10 ft.
	Proposed:	1.5 ft. – 41 ft. (no changes proposed)
Min. Front+Rear Setback	Required:	N/A
	Proposed:	N/A
Max. Bldg. Height:	Permitted:	45 ft., 4 stories
	Proposed:	16 ft., 1 story
Min. Eave Height:	Required:	18 ft.
	Proposed:	14 ft. (no changes proposed)
Floor-Ceiling Height:	Required:	12 ft.
	Proposed:	None listed
Front Entry:	Required:	On frontage line
	Proposed:	On frontage line (no changes proposed)
Absence of Bldg. Façade:	Required:	32 in. screenwall
	Proposed:	32 in. screenwall (no changes proposed)
Opening Width:	Required:	25 ft.
	Proposed:	3 ft. (no changes proposed)
Parking:	Required:	39 off-street
	Proposed:	13 off-street **The applicant must provide 39 off-street parking spaces, enter into a shared parking agreement**

		with the adjacent property owner, or obtain a variance from the Board of Zoning Appeals.
Min. Parking Space Size:	Required:	180 sq. ft.
	Proposed:	180 sq. ft.
Parking in Frontage:	Required:	Off-street parking contained in the first story shall not be permitted within 10 feet of any building facade on a frontage line or between the building facade and the frontage line.
	Proposed:	No parking in 1st story (no changes proposed)
Loading Area:	Required:	0 loading spaces
	Proposed:	0 loading spaces (no changes proposed)
Screening:		
Parking:	Required:	32 in. masonry screen wall
	Proposed:	32 in. masonry screen wall (no changes proposed)
Loading:	Required:	Minimum 6 ft. screen wall
	Proposed:	N/A
Rooftop Mechanical:	Required:	Fully screened from public view
	Proposed:	Perforated metal screen wall **The applicant must provide specification sheets for all proposed rooftop mechanical units and the dimensions of the proposed screenwall to verify the units will be fully screened.**
Elect. Transformer:	Required:	Obscured from public view
	Proposed:	N/A
Dumpster:	Required:	6 ft. masonry screen wall with wood gate
	Proposed:	None (no changes proposed) **The Planning Board may wish to require the applicant to fully screen the existing dumpster.**





1 / A010 EXISTING SITE PICTURES
EXISTING FLOOR/DEMOLITION PLAN

SCALE: 1/8" = 1'-0"

NORTH

JAWAN MATTI
586-321-7727
jawanmatti@gmail.com

PROJECT:

WHISTLE STOP
501 SOUTH ETON
BIRMINGHAM, MICHIGAN

SHEET TITLE:
EXISTING SITE PICTURES
EXISTING FLOOR/DEMOLITION PLAN

(DO NOT SCALE DRAWING)

DATE:	ISSUED FOR:
SITE PLAN & DESIGN REVIEW	12/11/2019

PROJECT NO: 18052

SHEET NUMBER:

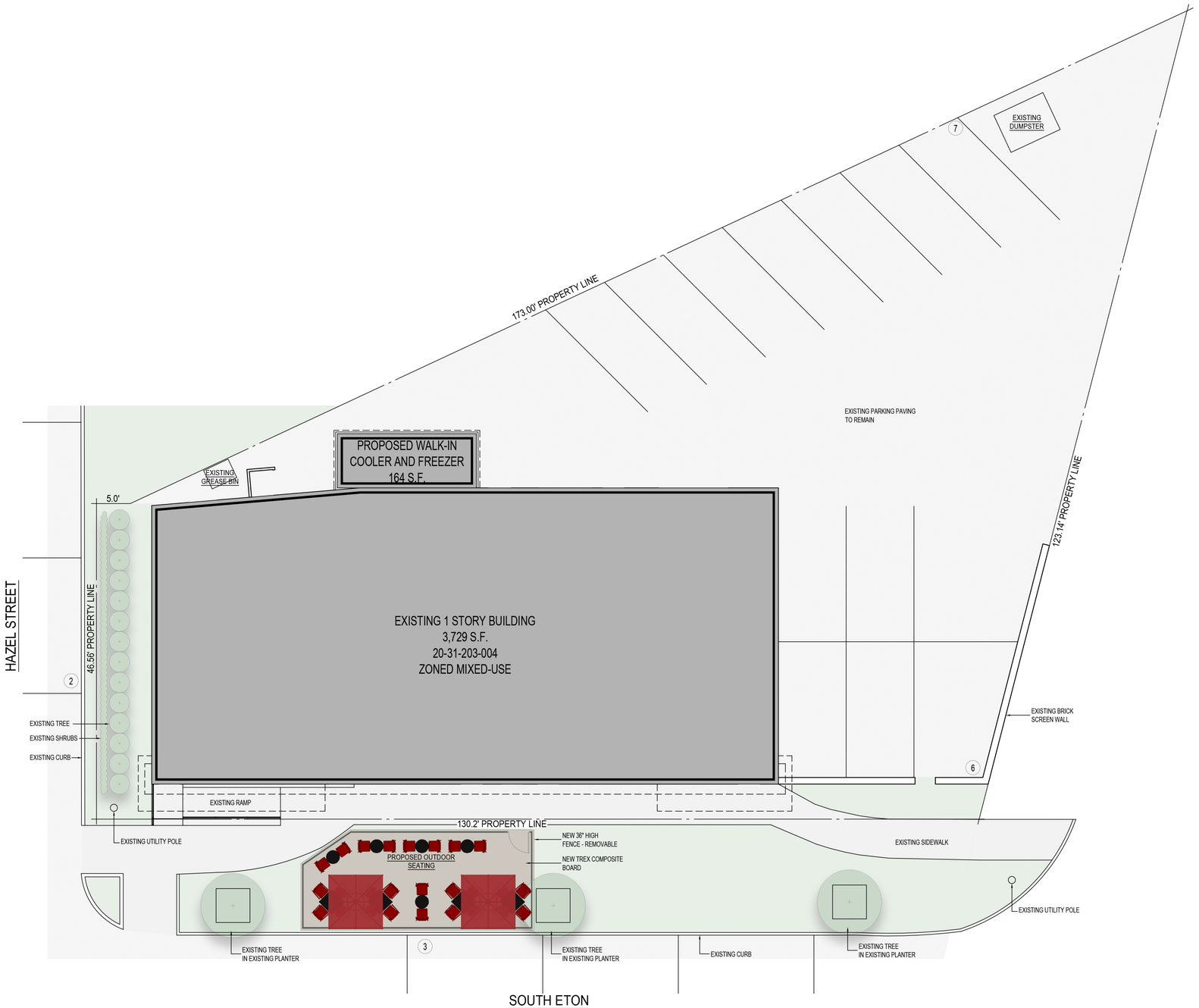
A010

ZONING DATA:

ZONING:	MX (MIXED USE)
OVERLAY RAIL DISTRICT	MX (MIXED USE)

PARKING:

RESTAURANT:	1 SPACE PER 75 S.F. OF FLOOR SPACE TOTAL 2,554 / 75 = 34 SPACES REQUIRED
HEALTH STUDIO:	1 SPACE PER 550 S.F. OF FLOOR SPACE TOTAL 1,175 / 550 = 3 SPACES REQUIRED
TOTAL REQUIRED:	37 PARKING SPACES
TOTAL PROVIDED:	13 PARKING SPACES



1 / A050 ARCHITECTURAL SITE PLAN

SCALE: 1/8" = 1'-0"

NORTH

JAWAN MATTI
586-321-7727
jawanmatti@gmail.com

PROJECT:

WHISTLE STOP
501 SOUTH ETON
BIRMINGHAM, MICHIGAN

SHEET TITLE:
ARCHITECTURAL SITE PLAN

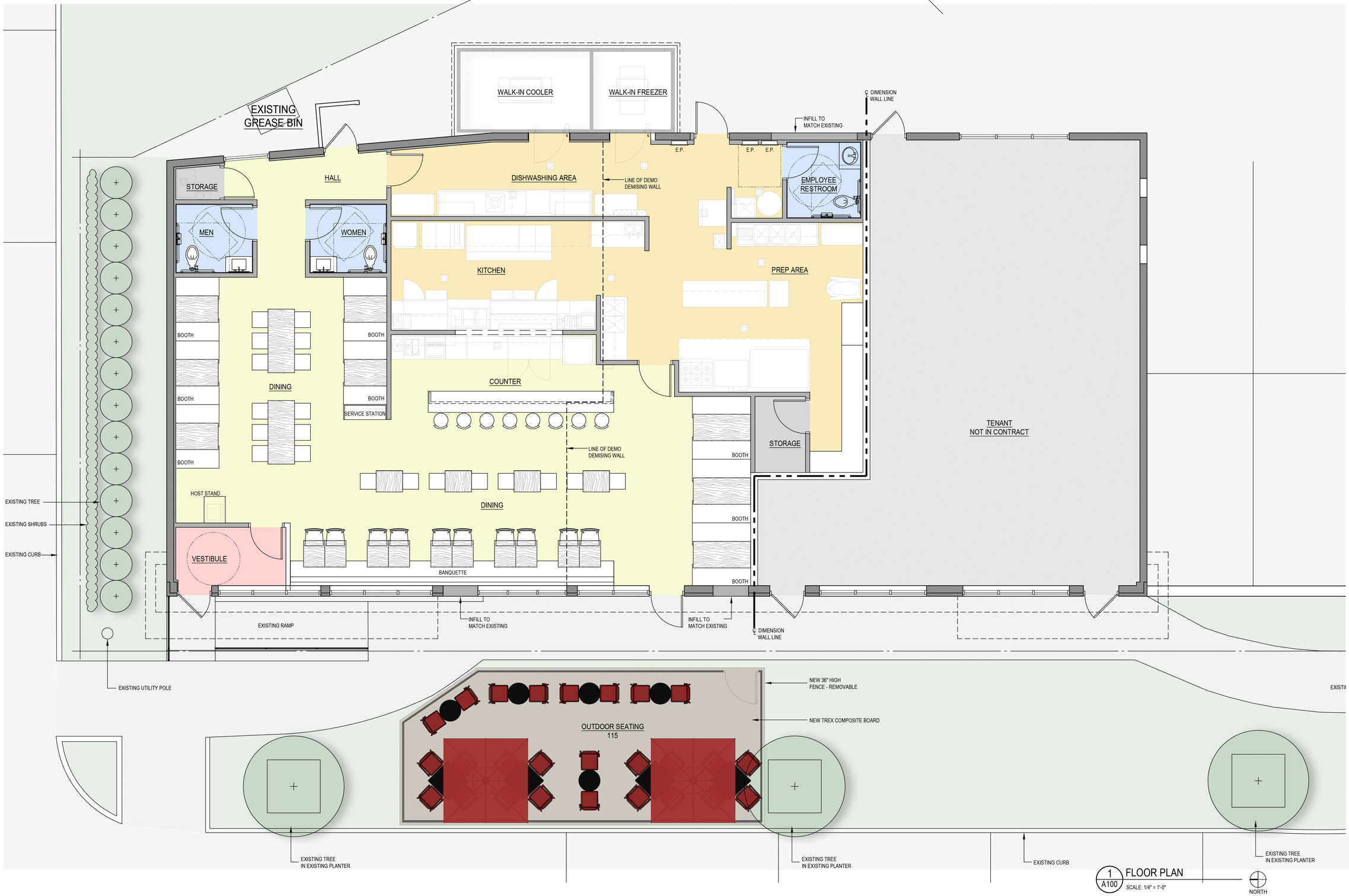
(DO NOT SCALE DRAWING)

DATE:	ISSUED FOR:
SITE PLAN & DESIGN REVIEW	12/11/2019

PROJECT NO: 18052

SHEET NUMBER:

A050



1 A100 FLOOR PLAN
SCALE: 1/4" = 1'-0"

NORTH

JAWAN MATTI
586-321-7727
jawanmatti@gmail.com

PROJECT:

WHISTLE STOP
501 SOUTH ETON
BIRMINGHAM, MICHIGAN

SHEET TITLE:
FLOOR PLAN

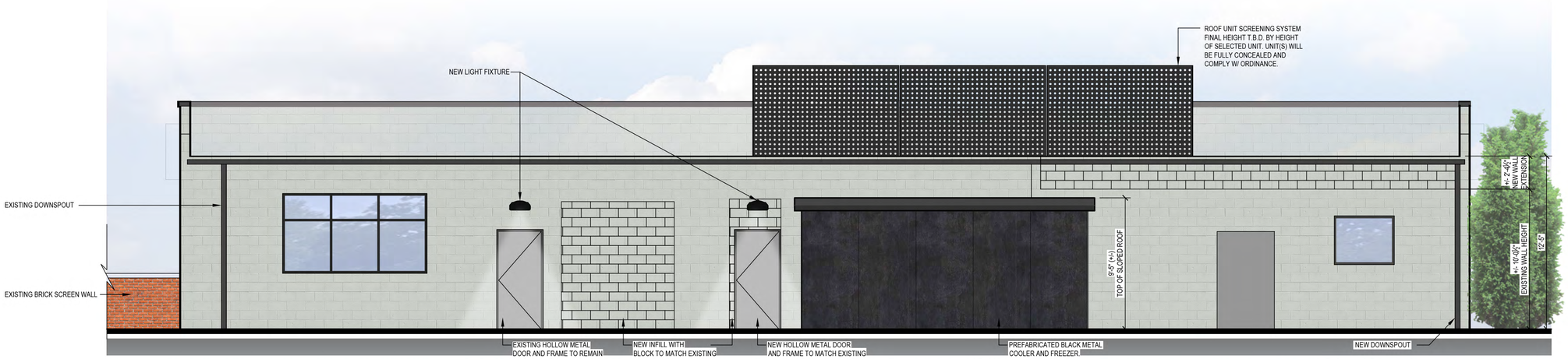
(DO NOT SCALE DRAWING)

DATE:	ISSUED FOR:
SITE PLAN & DESIGN REVIEW	12/11/2019

PROJECT NO: 18052

SHEET NUMBER:

A100

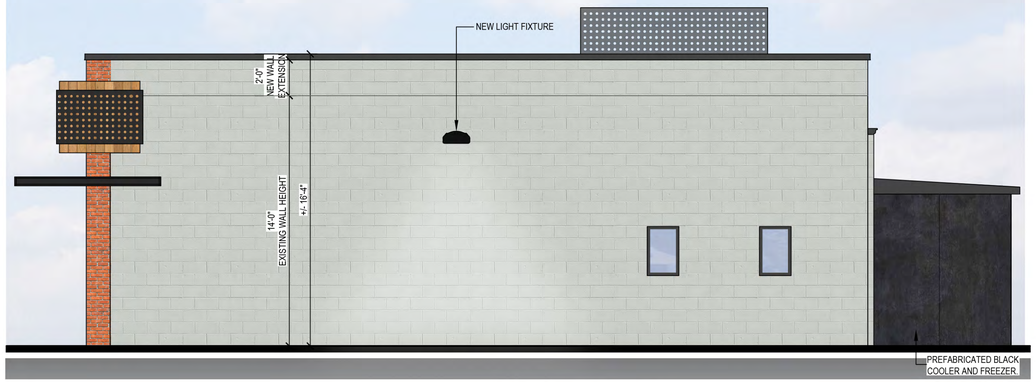


4 A200 **EAST ELEVATION**

SCALE: 1/4" = 1'-0"

3 A200 **NORTH ELEVATION**

SCALE: 1/4" = 1'-0"



2 A200 **SOUTH ELEVATION**

SCALE: 1/4" = 1'-0"

1 A200 **WEST (ETON) ELEVATION**

SCALE: 1/4" = 1'-0"

JAWAN MATTI
586-321-7727
jawanmatti@gmail.com

PROJECT:

WHISTLE STOP
501 SOUTH ETON
BIRMINGHAM, MICHIGAN

SHEET TITLE:
ELEVATIONS

(DO NOT SCALE DRAWING)

DATE:	ISSUED FOR:
SITE PLAN & DESIGN REVIEW	12/11/2019

PROJECT NO: 18052

SHEET NUMBER:

A200

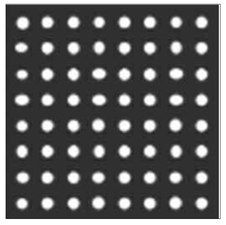
SIGN CALCULATION (ETON STREET FACADE/WEST ELEVATION):

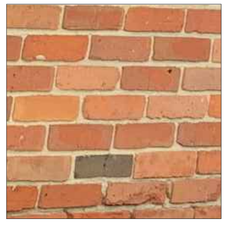
MAXIMUM ALLOWABLE AREA :
(1.0) x LINEAR FEET OF FRONTAGE = 92'-5" = 92.4 SF

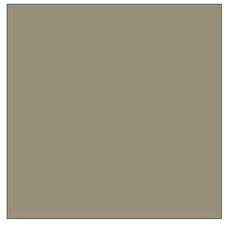
PROPOSED:
1'-6" x 18'-8 $\frac{1}{2}$" CHANNEL LETTERS READING "WHISTLE STOP DINER" = 28.1 SF

1 A201 ENLARGED WEST (ETON) ELEVATION
SCALE: 1/2" = 1'-0"


1"x6" CEDAR


PERFORATED BLACK METAL PANEL


EXISTING BRICK:
NEW BRICK TO MATCH


SHERWIN WILLIAMS PAINT:
SW 2845 BUNGLEHOUSE GRAY


PATIO: TREX
COLOR: BROWN


CHAIR AT SQUARE TABLE
EMU FURNITURE COLOR:
RED


32"x32" TABLE
EMU FURNITURE COLOR:
BLACK


CHAIR AT ROUND TABLE
EMU FURNITURE COLOR:
RED


24" TABLE
EMU FURNITURE COLOR:
BLACK


8'x8' TUUCI UMBRELLA
SUNBRELLA COLOR:
LOGO RED

JAWAN MATTI
586-321-7727
jawanmatti@gmail.com

PROJECT:

WHISTLE STOP
501 SOUTH ETON
BIRMINGHAM, MICHIGAN

SHEET TITLE:

SIGNAGE
ENLARGED ELEVATION
EXTERIOR MATERIALS
EXTERIOR FURNITURE

(DO NOT SCALE DRAWING)

DATE:	ISSUED FOR:
SITE PLAN & DESIGN REVIEW	12/11/2019

PROJECT NO: 18052

SHEET NUMBER:

A201

JAWAN MATTI
586-321-7727
jawanmatti@gmail.com

PROJECT:

WHISTLE STOP
501 SOUTH ETON
BIRMINGHAM, MICHIGAN

SHEET TITLE:
3D

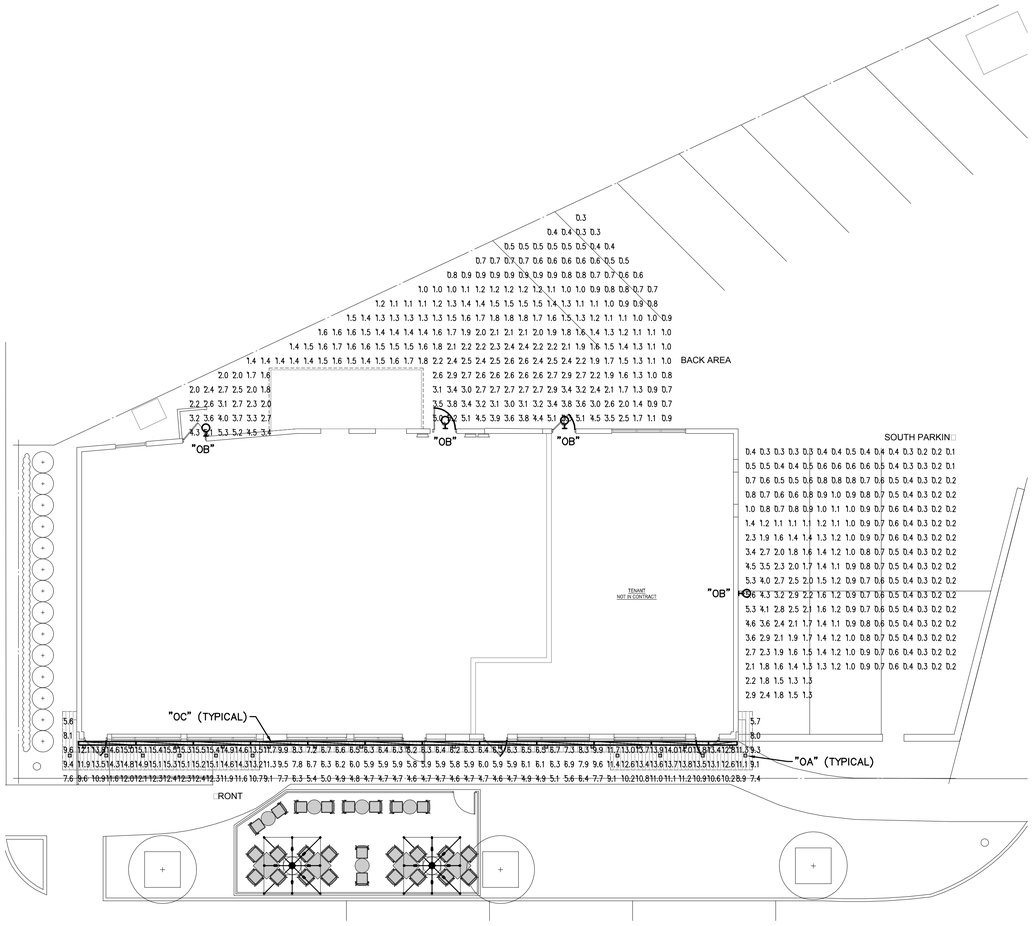
(DO NOT SCALE DRAWING)

DATE:	ISSUED FOR:
SITE PLAN & DESIGN REVIEW	12/11/2019

PROJECT NO: 18052

SHEET NUMBER:

A202



SITE PLAN -LIGHTING PHOTOMETRIC CALCULATIONS

SCALE: 1" = 10'-0"

LUMINAIRE SCHEDULE

S□□ □□□	L□□e□	□ □□	C□□□□N□□□er	De□ri□□□	L□□ □	□ie	L□□e□□	LL□	W□□□
	OA	2□	□LC□□D.SO□□00L□ 120.LD1T.LC□□□ SDO□□00L.□□K□ DSS.VW□L.CD	□□r□ed □ee□□□□l□□□□ r□□ed □□□□□i□er□□□e□□ e□□□□□re.w□ie □n□ed □□□□□i□er□□re□e□□r□ □e□i□□e□□□r e□er□□r e□e□□r□□e□r□□er□ed □□□□e□□e□□□□re	O□e w□ie LED	□LC□□DSO□00 L□□KDSSVW□ LCD□E□□le□	A□□□□e	0.□□	8.6□
	OB	□	MRW LED P1 SR□ □0K MVOLT	MRW LED WITH P1□ PER□ORMANCE PACKA□E□□000K□ AND SR□OPTIC TYPE	LED	MRW□LED□P1 □SR□□□0K□MV OLT.le□	A□□□□e	0.□□	1□□.6
	OC	12	LIVOLI□CAT. NO. ADNM.60.1□□12D	8'L□□□ □ve□□ □□d□□r□□ve □□□□□	LED	ADNM.60.1 □□12D.le□	A□□□□e	0.□□	2□.0

REFER TO ARCHITECTURAL ELEVATION SHEET FOR ALL MOUNTING HEIGHTS

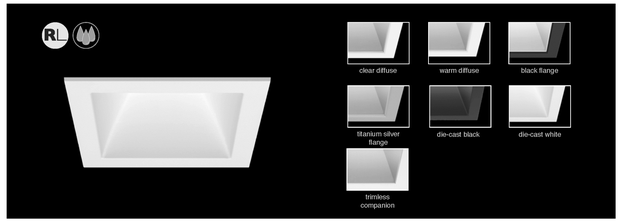
STATISTICS

De□ri□□□	S□□ □□□	Av□	M□□	Mi□	M□□/Mi□	Av□/Mi□
BACK AREA	+	1.□ □□	□.□ □□	0.□ □□	1□.□1	6.□1
□RONT	+	□.□ □□	1□.□ □□	□.6 □□	□.□1	2.1:1
SOUTH PARKIN□	+	1.0 □□	□.6 □□	0.1 □□	□6.0:1	10.0:1

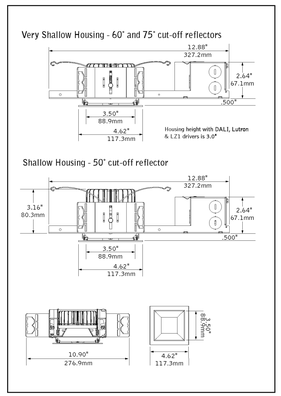
ID+ 3.5" x 3.5"

LED DOWNLIGHT

FOCAL POINT



DIMENSIONAL DATA



FEATURES

Less than 2.64" low profile housing available.

Field adjustability of ceiling thickness from 0.5" - 1.5".

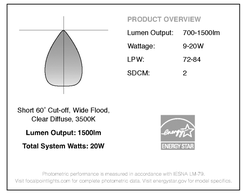
50°, 60° and 75° cut-off reflector options available.

Outdoor rating permits use in outdoor covered ceiling applications.

Solite lens with die-cast trim and 70° or 90° beam spread options available.

Solite lens and trim allows for a coordinated aesthetic with companion ID+ 3.5" Adjustable Accent.

PERFORMANCE



TYPE "OA"

MRW LED

Architectural Wall Sconce

OMERO

Inverted available with WLU option only.

Catalog Number

Notes

Type

Specifications

Luminaire

Height: 7-1/4" (18.4 cm)

Width: 18" (457.2 mm)

Depth: 9" (22.8 cm)

Weight: 18 lbs (8.2 kg)

Optional Back Box (BBW)

Height: 4" (10.2 cm)

Width: 5-1/2" (14.0 cm)

Depth: 1-1/2" (3.8 cm)

Introduction

Classic Architectural Wall Sconce with the LED technology. Long-life, maintenance-free product with typical energy savings of 80% compared to metal halide versions. The integral battery backup option provides emergency egress lighting, without the use of a back-box or remote gear, so installations maintain their aesthetic integrity. The MRW LED is ideal for replacing existing 50 – 250W metal halide wall-mounted products. The expected service life is 20+ years of nighttime use.

Ordering Information

EXAMPLE: MRW LED P2 40K SR3 MVOLT DDBTXD

MRW LED Series	Performance Package	Color Temperature	Distribution	Voltage	Mounting	Options	Finish (required)
MRW LED	P1 P2 P3 P4	30K 40K 50K	SR2 Type II SR3 Type III SR4 Type IV	MVOLT 120 208 240 277 347 480	**Shipped included** (blank) Surface mount **Shipped separately** BBW Surface-mounted back box	**Shipped installed** PE Photoelectric cell, button type [2] SF Single fuse (120, 277, 347V) [3] DF Double fuse (208, 240, 480V) [3] DMG 0-10v dimming wires pulled outside fixture (for use with an external control, ordered separately) E20WC Emergency battery backup, Certified in CA Title 20 MAEDBS (8W, 20°C) [4] E10WH Emergency battery backup, Certified in CA Title 20 MAEDBS (10W, 5°C)[4] WLU Wet location door for up orientation [5] PIR Motion/ambient light sensor [6] DS Dual switching [7] SPD Separate Surge Protection [8] **Shipped separately** VG Vandal guard WG Wire guard	DDBXD Dark bronze DBLXD Black DNAXD Natural aluminum DWHXD White DSSXD Sandstone DDBTXD Textured dark bronze DBLBXD Textured black DNATXD Textured natural aluminum DWHGXD Textured white DSSTXD Textured sandstone

Emergency Battery Operation

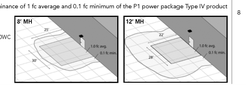
The emergency battery backup (E20WC & E10WH options) is integral to the luminaire - no external housing required! This design provides reliable emergency operation while maintaining the aesthetics of the product.

All E20WC & E10WH configurations include an independent secondary driver with an integral relay to immediately detect AC power loss.

The emergency battery will power the luminaire for a minimum duration of 90 minutes (maximum duration of three hours) from the time supply power is lost, per International Building Code section 1006 and NFPA 101 Life Safety Code, Section 7.9. Provided luminaires are mounted at an appropriate height and illuminate an open space with no major obstructions.

The examples below show illuminance of 1 fc average and 0.1 fc minimum of the P1 power package Type IV product in emergency mode.

MRW LED P1 40K SR4 MVOLT E20WC
10' x 10' Gridlines
8' and 12' Mounting Height



NOTES

1. MVOLT driver operates on any line voltage from 120-277V (50/60 Hz).
2. Not available with 480V option.
3. Single fuse (SF) requires 120V, 277V or 347V options. Double fuse (DF) requires 208V, 240V or 480V options.
4. Not available with 347V or 480V. Not available with WLU.
5. WLU not available with PIR, E20WC or E10WH.
6. See PIR Table for default settings.
7. Only available with P3 & P4 packages. Provides 50/50 luminaire operation via two independent drivers and light engines on two separate circuits. Not available with E20WC, E10WH, WLU, SF, or DF. When ordered with photocell (PE) or motion sensor (PIR), only the primary power source leads will be controlled.
8. See electrical section on page 2 for more details.

TYPE "OB"

12V | Covelum™ Outdoor (Litebar)

tivoli

CAT: FEET:

TYPE: PROJECT:

Covelum™ Outdoor provides the same performance as our indoor versions with technology upgrades to the PCB bringing mature and highly reliable product. In 2017 Tivoli upgraded the PCB and added a whole range of color temperatures with Nichia LEDs. Covelum™ Outdoor is a low voltage rigid festoon system that is designed for indirect outdoor applications.

Features

- Standard fixtures are factory assembled with lens, LEDs and outdoor connection system.
- Plug & Play connections are set back from fixture end for smooth illumination without shadowing or scalloping between fixtures.
- Low Voltage (12V DC)
- Nichia LEDs
- Nichia LEDs
- 425 Lumens/ft.
- Six (6) temperatures available from 2200K to 4000K and eleven (11) additional static color options.
- Optional clear or frosted lens available

Mounting
Swivel mounting feet come attached to fixture base every 12".

Applications
Ideal for exterior wet cove illumination.

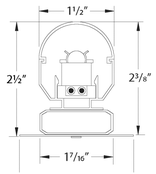
Warranty
5 years

Technical Information

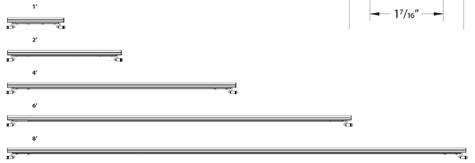
Available Lengths	1'	2'	4'	6'	8'
LED Spacing	2.5"				
*Lumens/Fixture	425	851	1701	2552	3402
*Watts/Fixture	4.3	8.6	17.2	25.8	34.4
*Lumens/Watt	99				
CRI	>80/TYP 83				
Kelvin Temp & Static Color	2200K, 2500K, 2700K, 3000K, 3500K, 4000K (±80K) 3SDCM Red, Orange, Royal Blue Green, Amber, Yellow, Burgundy, Purple, Leaf Green, Teal Green, Soft Blue				
Rated Life	75,000 hrs.				
Max Connected Fixtures	14	7	3	2	2
Operating Voltage	12V DC				
Power Supply	Class 2				
Dimmable	Yes				

* 3000K Sample / Clear Lens

Profile Dimensions



Available Lengths



TYPE "OC"

JAWAN MATTI
586-321-7727
jawanmatti@gmail.com

PROJECT:

WHISTLE STOP
501 SOUTH ETON STREET
BIRMINGHAM, MICHIGAN

SHEET TITLE:

SITE PLAN – LIGHTING
PHOTOMETRIC CALCULATIONS

ELECTRICAL ENGINEER:
SADEGH DANESH
586-484-6568
P.O. BOX 725026
BERKLEY, MI 48072
sadegh314@gmail.com

(DO NOT SCALE DRAWING)

DATE:	ISSUED FOR:
SITE PLAN APPROVAL	11/22/19

PROJECT NO: 19058

SHEET NUMBER:

ES100

City of Birmingham
A Walkable Community

Final Site Plan & Design Review Application
Planning Division

Form will not be processed until it is completely filled out.

1. Applicant
Name: Elda Xhomaqi
Address: 2415 Warwick Drive
Troy, MI 48084
Phone Number: 248-635-2554
Fax Number:
Email address: vali2@ymail.com

2. Property Owner
Name: Whistle Stop Diner
Address: 2415 Warwick Drive
Troy, MI 48084
Phone Number: 248-635-2554
Fax Number:
Email address: vali2@ymail.com

3. Applicant's Attorney/Contact Person
Name: Contact person: Jawan Matti
Address:
Phone Number: 586-321-7727
Fax Number:
Email address: jawanmatti@gmail.com

4. Project Designer/Developer
Name: Jawan Matti
Address:
Phone Number: 586-321-7727
Fax Number:
Email address: jawanmatti@gmail.com

5. Required Attachments
I. Two (2) paper copies and one (1) digital copy of all project plans including:
  i. A detailed Existing Conditions Plan including the subject site in its entirety, including all property lines, buildings, structures, curb cuts, sidewalks, drives, ramps and all parking on site and on the street(s) adjacent to the site, and must show the same detail for all adjacent properties within 200 ft. of the subject sites property lines;
  ii. A detailed and scaled Site Plan depicting accurately and in detail the proposed construction, alteration or repair;
  iii. A certified Land Survey;
  iv. Interior floor plans;
  v. A Landscape Plan;
  vi. A Photometric Plan;
  vii. Colored elevation drawings for each building elevation;

II. Specification sheets for all proposed materials, light fixtures and mechanical equipment;
III. Samples of all proposed materials;
IV. Photographs of existing conditions on the site including all structures, parking areas, landscaping and adjacent structures;
V. Current aerial photographs of the site and surrounding properties;
VI. Warranty Deed, or Consent of Property Owner if applicant is not the owner;
VII. Any other data requested by the Planning Board, Planning Department, or other City Departments.

6. Project Information
Address/Location of the property: 501 South Eton Street
Name of development: Whistle Stop Diner
Sidwell #: 20-31-203-004
Current Use: Restaurant (Assembly A-2)
Proposed Use: Restaurant (Assembly A-2)
Area of Site in Acres: .26 acres - 11,311.75 sq. ft.
Current zoning: MX (Mixed-Use)
Is the property located in the floodplain? No
Name of Historic District Site is Located in: N/A
Date of Historic District Commission Approval: N/A

Date of Application for Preliminary Site Plan:
Date of Preliminary Site Plan Approval:
Date of Application for Final Site Plan:
Date of Final Site Plan Approval:
Date of Application for Revised Final Site Plan:
Date of Revised Final Site Plan Approval:
Date of Design Review Board Approval:
Will proposed project require the division of platted lots? ___
Will proposed project require the combination of platted lots?

7. Details of the Proposed Development (attach separate sheet if necessary)

Renovation to expand the existing restaurant into the adjacent space. The renovation will also include the exterior and new outdoor seating

8. Buildings and Structures

Number of Buildings on Site: 1
Height of Buildings & # of Stories: 14' existing /1 16' proposed/1

Use of Buildings: Restaurant and adjacent space vacant
Height of Rooftop Mechanical Equipment: TBD

9. Floor Use and Area (in Square Feet)

Proposed Commercial Structures:

Total basement floor area: N/A
Number of square feet per upper floor:
Total floor area:
Floor area ratio (total floor area ÷ total land area):

Open space:
Percent of open space:

Office Space:
Retail Space:
Industrial Space:
Assembly Space:
Seating Capacity:
Maximum Occupancy Load:

Proposed Residential Structures:

Total number of units: N/A
Number of one bedroom units:
Number of two bedroom units:
Number of three bedroom units:
Open space:
Percent of open space:

Rental units or condominiums?
Size of one bedroom units:
Size of two bedroom units:
Size of three bedroom units:
Seating Capacity:
Maximum Occupancy Load:

Proposed Additions:

Total basement floor area, if any, of addition: N/A
Number of floors to be added:
Square footage added per floor:
Total building floor area (including addition):
Floor area ratio (total floor area ÷ total land area):

Open Space:
Percent of open space:

Use of addition:
Height of addition:
Office space in addition:
Retail space in addition:
Industrial space in addition:
Assembly space in addition:
Maximum building occupancy load (including addition):

10. Required and Proposed Setbacks

Required front setback: 0
Required rear setback: 10'-0"
Required total side setback: 0
Side setback: 0

Proposed front setback: 0
Proposed rear setback 10'-0'
Proposed total side setback: 0
Second side setback: 0

11. Required and Proposed Parking

Required number of parking spaces: 37
Typical angle of parking spaces: 45 degrees
Typical width of maneuvering lanes: 12'-25'+/-
Location of parking on site: East and South
Location of parking off site:
Number of light standards in parking area:
Screenwall material:

Proposed number of parking spaces: 13
Typical size of parking spaces: 9'x20'
Number of spaces <180 sq. ft.: 0
Number of handicap spaces: 1
Shared parking agreement? Yes(Griffin Claw Brewing Company)
Height of light standards in parking area:
Height of screenwall:

12. Landscaping

Location of landscape areas: Existing
Eton street: 3 trees
Hazel street: 14 Arborvitae and shrubs

Proposed landscape material: Existing

13. Streetscape

Sidewalk width: Existing 6'
Number of benches:
Number of planters:
Number of existing street trees:
Number of proposed street trees:
Streetscape Plan submitted? N/A

Description of benches or planters:
Species of existing trees:
Species of proposed trees:

14. Loading

Required number of loading spaces: N/A
Typical angle of loading spaces:
Screenwall material:
Location of loading spaces on site:

Proposed number of loading spaces:
Typical size of loading spaces:
Height of screenwall:
Typical time loading spaces are used:

15. Exterior Waste Receptacles

Required number of waste receptacles: Existing 1 dumpster
Location of waste receptacles: East side parking lot
Screenwall material:

Proposed number of waste receptacles: Existing I dumpster
Size of waste receptacles:
Height of screenwall:

16. Mechanical Equipment

Utilities and Transformers:

Number of ground mounted transformers: 1
Size of transformers (L•W•H): TBD
Number of utility easements:
Screenwall material:

Location of all utilities & easements:
Height of screenwall:

Ground Mounted Mechanical Equipment:

Number of ground mounted units: 0
Size of ground mounted units (L•W•H):
Screenwall material:

Location of all ground mounted units:
Height of screenwall:

Rooftop Mechanical Equipment:

Number of rooftop units: 4
Type of rooftop units: (1) HVAC, (1) MAU, (2) Condensers
Screenwall material: Perforated Metal
Location of screenwall: At all roof top units

Location of all rooftop units: On roof above the kitchen area
Size of rooftop units (L•W•H): TBD
Percentage of rooftop covered by mechanical units: 11% +/-
Height of screenwall: 18'-10" +/-
Distance from rooftop units to all screenwalls: Varies

17. Accessory Buildings

Number of accessory buildings: 1
Location of accessory buildings: East

Size of accessory buildings: 20' x 8'
Height of accessory buildings: 9'-4" +/-

18. Building Lighting

Number of light standards on building: 28
Size of light fixtures (L•W•H): See cut sheets

Type of light standards on building: See cut sheet
Height from grade: See photometric study

Maximum wattage per fixture: See cut sheets
Light level at each property line: See photometric study

Proposed wattage per fixture: See cut sheets

19. Site Lighting

Number of light fixtures: Existing
Size of light fixtures (L•W•H):
Maximum wattage per fixture:
Light level at each property line:

Type of light fixtures:
Height from grade:
Proposed wattage per fixture:
Holiday tree lighting receptacles:

20. Adjacent Properties

Number of properties within 200 ft.: 5

Property #1

Number of buildings on site: 1
Zoning district: Mixed-Use
Use type:
Square footage of principal building:
Square footage of accessory buildings:
Number of parking spaces:

Property Description: Griffin Claw Brewing Company

North, south, east or west of property? South

Property #2

Number of buildings on site:
Zoning district: Mixed-Use
Use type:
Square footage of principal building:
Square footage of accessory buildings:
Number of parking spaces:

Property Description: Iron Gate

North, south, east or west of property? North

Property #3

Number of buildings on site: 1
Zoning district: R-3
Use type:
Square footage of principal building:
Square footage of accessory buildings:
Number of parking spaces:

Property Description: Homes

North, south, east or west of property? West

Property #4

Number of buildings on site: 1
Zoning district: R-3
Use type:
Square footage of principal building:
Square footage of accessory buildings:
Number of parking spaces:

Property Description: Mixed Used: Offices and condos

North, south, east or west of property? East

Property #5

Number of buildings on site: 1
Zoning district: Mixed-Use
Use type:
Square footage of principal building:
Square footage of accessory buildings:
Number of parking spaces:

Property Description: Mixed Used: Offices and condos

North, south, east or west of property? East

Property #6

Number of buildings on site:
Zoning district:
Use type:
Square footage of principal building:
Square footage of accessory buildings:
Number of parking spaces:

Property Description:

North, south, east or west of property?

The undersigned states the above information is true and correct, and understands that it is the responsibility of the applicant to advise the Planning Division and / or Building Division of any additional changes made to an approved site plan. The undersigned further states that they have reviewed the procedures and guidelines for Site Plan Review in Birmingham, and have complied with same. The undersigned will be in attendance at the Planning Board meeting when this application will be discussed.

Signature of Owner: Elda Xhomaqi **Date:** 11/15/19

Print Name: ELDA XHOMAQI

Signature of Applicant: Elda Xhomaqi **Date:** 11/15/19

Print Name: ELDA XHOMAQI

Signature of Architect: _____ **Date:** _____

Print Name: _____

Office Use Only

Application #: PFSP19-0006 Date Received: 11/15/19 Fee: $500.00 ~~1DB 18/19~~

Date of Approval: _____ Date of Denial: _____ Accepted by: _____

CITY OF BIRMINGHAM
Date 11/15/2019 2:57:46 PM
Ref 00164596
Receipt 513225
Amount $100.00

CITY OF BIRMINGHAM
Date 11/15/2019 2:57:46 PM
Ref 00164595
Receipt 513225
Amount $400.00

City of Birmingham
A Walkable Community

Notice Signs - Rental Application
Community Development

1. Applicant

Name: Elda Xhomaqi
Address: 2415 Warwick Drive

Phone Number: 248-635-2554
Fax Number:
Email address: vali2@ymail.com

Property Owner

Name:
Address:

Phone Number:
Fax Number:
Email address:

2. Project Information

Address/Location of Property: 501 South Eton Street
Name of Development: Whistle Stop Diner
Area in Acres:

Name of Historic District site is in, if any:
Current Use:
Current Zoning:

3. Date of Board Review

Board of Building Trades Appeals:
City Commission:
Historic District Commission:
Planning Board:

Board of Zoning Appeals:
Design Review Board:
Housing Board of Appeals:

The undersigned states the above information is true and correct, and understands that it is the responsibility of the applicant to post the Notice Sign(s) at least 15 days prior to the date on which the project will be reviewed by the appropriate board or commission, and to ensure that the Notice Sign(s) remains posted during the entire 15 day mandatory posting period. The undersigned further agrees to pay a rental fee and security deposit for the Notice Sign(s), and to remove all such signs on the day immediately following the date of the hearing at which the project was reviewed. The security deposit will be refunded when the Notice Sign(s) are returned undamaged to the Community Development Department. Failure to return the Notice Sign(s) and/or damage to the Notice Sign(s) will result in forfeiture of the security deposit.

Signature of Applicant: Elda Xhomaqi Date: 11/15/19

Office Use Only

Application #: PFSP19-0001 Date Received: 11/15/19 Fee: $100.00 + 50.00

Date of Approval: Date of Denial: Reviewed by:

City of Birmingham
A Walkable Community

MEMORANDUM

Planning Division

DATE: **January 2, 2020**

TO: **Planning Board Members**

FROM: **Nicholas Dupuis, City Planner**

APPROVED: **Jana Ecker, Planning Director**

SUBJECT: **1026 Canterbury – Solar Panel Installation – Design Review**

Article 4, Section 4.09 of the Zoning Ordinance requires roof-mounted solar electric systems to be located on a rear- or side-facing roof, which do not front any street, unless such installation is proven to be ineffective or impractical. If installation is not practical on a rear- or side-facing roof, any other placement in all zoning districts shall be subject to a Design Review by either the Planning Board (non-historic properties) or the Historic District Commission (historic properties).

The applicant is proposing an addition of solar panels to the street-facing front facade and the side facing façade of the non-historic home at 1026 Canterbury, which requires a Design Review by the Planning Board. The proposed installation will consist of 9 Panasonic 330A AC solar panels on the second story roof. The solar panels are black in color with black mounting rails/hardware, are proposed to be flush-mounted, and will not project vertically above the peak of the roof to which it is attached. The applicant is also proposing two Tesla Power Wall battery systems, both of which will be located inside the home.

1.0 Land Use and Zoning

1.1 Existing Land Use – The subject property is single-family residential.

1.2 Zoning – The property is zoned R-1 (Single-Family Residential)

1.3 Summary of Adjacent Land Use and Zoning –

	North	South	East	West
Existing Land Use	Single-Family Residential	Single-Family Residential	Single-Family Residential	Single-Family Residential
Existing Zoning District	R-1 (Single-Family Residential)	R-1 (Single-Family Residential)	R-1 (Single-Family Residential)	R-1 (Single-Family Residential)
Overlay Zoning District	N/A	N/A	N/A	N/A

2.0 Setback and Height Requirements

There are no changes proposed to the setbacks or height of the building.

3.0 Screening and Landscaping

3.1 Dumpster Screening – Not applicable.

3.2 Parking Lot Screening – Not applicable.

3.3 Mechanical Equipment Screening – Not applicable.

3.4 Landscaping – No changes proposed.

3.5 Streetscape – No changes proposed.

4.0 Parking, Loading and Circulation

4.1 Parking – No changes proposed.

4.2 Loading – Not applicable.

4.3 Vehicular Circulation and Access – No changes proposed.

4.4 Pedestrian Circulation and Access – No changes proposed.

5.0 Lighting

There are no changes in lighting associated with the proposed solar panel installation.

6.0 Departmental Reports

6.1 Engineering Division – The Engineering Division has no concerns at this time.

6.2 Department of Public Services – The Department of Public Services has no concerns at this time.

6.3 Fire Department – The Fire Department has no concerns at this time.

6.4 Police Department – The Police Department has no concerns at this time.

6.5 Building Division – As requested, the Building Department has examined the plans for the proposed project referenced above. The plans were provided to the Planning Department for site plan review purposes only and present conceptual elevations and floor plans. Although the plans lack sufficient detail to perform a code review, the following comments are offered for Planning Design Review purposes and applicant consideration:

Applicable Building Codes:

- 2015 Michigan Building Code. Applies to all buildings other than those regulated by the Michigan Residential Code.
- 2015 Michigan Residential Code. Applies to all detached one and two-family dwellings and multiple single-family dwellings (townhouses) not more than three stories in height with a separate means of egress and their accessory structures.
- 2015 Michigan Mechanical Code. (Residential requirements for mechanical
- construction in all detached one and two-family dwellings and multiple single-family dwellings (townhouses) not more than three stories in height with a separate means of egress and their accessory structures are contained in the Michigan Residential Code)
- 2015 Michigan Plumbing Code. (Residential requirements for plumbing construction in all detached one and two-family dwellings and multiple single-family dwellings (townhouses) not more than three stories in height with a separate means of egress and their accessory structures are contained in the Michigan Residential Code)
- 2017 National Electrical Code along with the Michigan Part 8 Rules. (Residential
- requirements for electrical construction in all detached one and two-family dwellings and multiple single-family dwellings (townhouses) not more than three stories in height with a separate means of egress and their accessory structures are contained in the Michigan Residential Code)

Review Comments:

- Building and electrical permits will be required for the installation of the solar panels.

7.0 Design Review

The proposed roof-mounted solar panels are made by Panasonic, and the dimensions are roughly 5 ft. x 3.5 ft. x 1.6 in. for one panel. The installation of 9 panels will be entirely on the front facing roof, and will measure 162 sq. ft. in area.

The panels and installation hardware are black in color. The existing roof construction on the home consists of dark grey/black asphalt shingles. There will be service equipment (AC disconnect, utility meter) located on the east (side) facade of the house.

8.0 Approval Criteria

In accordance with Article 7, section 7.09 of the Zoning Ordinance, the proposed plans for development must meet the following conditions:

1. All of the materials required by this section have been submitted for review.

2. All provisions of this Zoning Ordinance have been complied with.

3. The appearance, color, texture and materials being used will preserve property values in the immediate neighborhood and will not adversely affect any property values.

4. The appearance of the building exterior will not detract from the general harmony of and is compatible with other buildings already existing in the immediate neighborhood.

5. The appearance of the building exterior will not be garish or otherwise offensive to the sense of sight.

6. The appearance of the building exterior will tend to minimize or prevent discordant and unsightly properties in the City.

7. The total design, including but not limited to colors and materials of all walls, screens, towers, openings, windows, lighting and signs, as well as treatment to be utilized in concealing any exposed mechanical and electrical equipment, is compatible with the intent of the urban design plan or such future modifications of that plan as may be approved by the City Commission.

9.0 Recommendation

Based on a review of the plans submitted, the Planning Division finds that the proposed Design Plan meets the requirements of Article 7, section 7.09 of the Zoning Ordinance and recommends that the Planning Board **APPROVE** the Design Plan for 1026 Canterbury.

10.0 Sample Motion Language

Motion to **APPROVE** the Design Plan for 1026 Canterbury.

OR

Motion to **POSTPONE** the Design Plan for 1026 Canterbury, pending receipt of the following:

1._____
2._____
3._____

OR

Motion to **DENY** the Design Plan for 1026 Canterbury for the following reasons:

1. _____
2. _____
3. _____

CITY OF BIRMINGHAM
Date 12/26/2019 1:11:28 PM
Ref 00165540
Receipt 518895
Amount $100.00

CITY OF BIRMINGHAM
Date 12/26/2019 1:11:29 PM
Ref 00165539
Receipt 518895
Amount $400.00

City of Birmingham
A Walkable Community

Final Site Plan & Design Review Application
Planning Division

Form will not be processed until it is completely filled out.

1. Applicant
Name: Lauren Sonk
Address: 4023 S Old US 23, Suite #115
Brighton, MI 48114
Phone Number: 866 633 8553
Fax Number: 810 225 9932
Email address: permitting@thegreenpanel.com

2. Property Owner
Name: Holly & Doug Cutler
Address: 1026 Canterbury St
Birmingham, MI 48009
Phone Number: 248 971 3866
Fax Number:
Email address: Dougdcutler@hotmail.com

3. Applicant's Attorney/Contact Person
Name: Same as Applicant
Address:

Phone Number:
Fax Number:
Email address:

4. Project Designer/Developer
Name: The Green Panel, Inc
Address: 4023 S Old US 23, Suite #115

Phone Number: 866 633 8553
Fax Number: 810 225 9932
Email address: permitting@thegreenpanel.com

5. Required Attachments
I. Two (2) paper copies and one (1) digital copy of all project plans including:
  i. A detailed Existing Conditions Plan including the subject site in its entirety, including all property lines, buildings, structures, curb cuts, sidewalks, drives, ramps and all parking on site and on the street(s) adjacent to the site, and must show the same detail for all adjacent properties within 200 ft. of the subject sites property lines;
  ii. A detailed and scaled Site Plan depicting accurately and in detail the proposed construction, alteration or repair;
  iii. A certified Land Survey;
  iv. Interior floor plans;
  v. A Landscape Plan;
  vi. A Photometric Plan;
  vii. Colored elevation drawings for each building elevation;

II. Specification sheets for all proposed materials, light fixtures and mechanical equipment;
III. Samples of all proposed materials;
IV. Photographs of existing conditions on the site including all structures, parking areas, landscaping and adjacent structures;
V. Current aerial photographs of the site and surrounding properties;
VI. Warranty Deed, or Consent of Property Owner if applicant is not the owner;
VII. Any other data requested by the Planning Board, Planning Department, or other City Departments.

6. Project Information
Address/Location of the property: 1026 Canterbury St
Birmingham, MI 48009
Name of development: Birmingham Hills
Sidwell #: 08-19-35-427-020
Current Use:
Proposed Use:
Area of Site in Acres: .384
Current zoning: RI
Is the property located in the floodplain?
Name of Historic District Site is Located in:
Date of Historic District Commission Approval:

Date of Application for Preliminary Site Plan:
Date of Preliminary Site Plan Approval:
Date of Application for Final Site Plan:
Date of Final Site Plan Approval:
Date of Application for Revised Final Site Plan:
Date of Revised Final Site Plan Approval:
Date of Design Review Board Approval:
Will proposed project require the division of platted lots? ___

Will proposed project require the combination of platted lots?

7. Details of the Proposed Development (attach separate sheet if necessary)

Installation of a 2.64 roof mount solar array
(8) Panasonic 330A AC Panels, built-in microinverters
(2) Tesla Powerwalls

8. Buildings and Structures

Number of Buildings on Site: 1
Height of Buildings & # of Stories:
Use of Buildings: Residential
Height of Rooftop Mechanical Equipment:

9. Floor Use and Area (in Square Feet)

Proposed Commercial Structures:

Total basement floor area:
Number of square feet per upper floor:
Total floor area:
Floor area ratio (total floor area ÷ total land area):
Open space:
Percent of open space:
Office Space:
Retail Space:
Industrial Space:
Assembly Space:
Seating Capacity:
Maximum Occupancy Load:

Proposed Residential Structures:

Total number of units:
Number of one bedroom units:
Number of two bedroom units:
Number of three bedroom units:
Open space:
Percent of open space:
Rental units or condominiums?
Size of one bedroom units:
Size of two bedroom units:
Size of three bedroom units:
Seating Capacity:
Maximum Occupancy Load:

Proposed Additions:

Total basement floor area, if any, of addition:
Number of floors to be added:
Square footage added per floor:
Total building floor area (including addition):
Floor area ratio (total floor area ÷ total land area):
Open Space:
Percent of open space:
Use of addition:
Height of addition:
Office space in addition:
Retail space in addition:
Industrial space in addition:
Assembly space in addition:
Maximum building occupancy load (including addition):

10. Required and Proposed Setbacks

Required front setback:
Required rear setback:
Required total side setback:
Side setback:
Proposed front setback:
Proposed rear setback
Proposed total side setback:
Second side setback:

11. Required and Proposed Parking

Required number of parking spaces:
Typical angle of parking spaces:
Typical width of maneuvering lanes:
Location of parking on site:
Location of parking off site:
Number of light standards in parking area:
Screenwall material:
Proposed number of parking spaces:
Typical size of parking spaces:
Number of spaces <180 sq. ft.:
Number of handicap spaces:
Shared parking agreement?
Height of light standards in parking area:
Height of screenwall:

12. Landscaping

Location of landscape areas:

Proposed landscape material:

13. Streetscape

Sidewalk width:
Number of benches:
Number of planters:
Number of existing street trees:
Number of proposed street trees:
Streetscape Plan submitted?

Description of benches or planters:
Species of existing trees:
Species of proposed trees:

14. Loading

Required number of loading spaces:
Typical angle of loading spaces:
Screenwall material:
Location of loading spaces on site:

Proposed number of loading spaces:
Typical size of loading spaces:
Height of screenwall:
Typical time loading spaces are used:

15. Exterior Waste Receptacles

Required number of waste receptacles:
Location of waste receptacles:
Screenwall material:

Proposed number of waste receptacles:
Size of waste receptacles:
Height of screenwall:

16. Mechanical Equipment

Utilities and Transformers:

Number of ground mounted transformers:
Size of transformers (L•W•H):
Number of utility easements:
Screenwall material:

Location of all utilities & easements:
Height of screenwall:

Ground Mounted Mechanical Equipment:

Number of ground mounted units:
Size of ground mounted units (L•W•H):
Screenwall material:

Location of all ground mounted units:
Height of screenwall:

Rooftop Mechanical Equipment:

Number of rooftop units: (8) solar panels
Type of rooftop units: Panasonic 330W AC Panels
Screenwall material:
Location of screenwall:

Location of all rooftop units: South side of roof
Size of rooftop units (L•W•H): 12' x 7.5' x 5"
Percentage of rooftop covered by mechanical units:
Height of screenwall:
Distance from rooftop units to all screenwalls:

17. Accessory Buildings

Number of accessory buildings:
Location of accessory buildings:

Size of accessory buildings:
Height of accessory buildings:

18. Building Lighting

Number of light standards on building:
Size of light fixtures (L•W•H):

Type of light standards on building:
Height from grade:

Maximum wattage per fixture:_____ Proposed wattage per fixture:_____
Light level at each property line:_____

19. Site Lighting

Number of light fixtures:_____ Type of light fixtures:_____
Size of light fixtures (L•W•H):_____ Height from grade:_____
Maximum wattage per fixture:_____ Proposed wattage per fixture:_____
Light level at each property line:_____ Holiday tree lighting receptacles:_____

20. Adjacent Properties

Number of properties within 200 ft.:_____

Property #1

Number of buildings on site:_____ Property Description:_____
Zoning district:_____
Use type:_____
Square footage of principal building:_____
Square footage of accessory buildings:_____
Number of parking spaces:_____ North, south, east or west of property? _____

Property #2

Number of buildings on site:_____ Property Description:_____
Zoning district:_____
Use type:_____
Square footage of principal building:_____
Square footage of accessory buildings:_____
Number of parking spaces:_____ North, south, east or west of property? _____

Property #3

Number of buildings on site:_____ Property Description:_____
Zoning district:_____
Use type:_____
Square footage of principal building:_____
Square footage of accessory buildings:_____
Number of parking spaces:_____ North, south, east or west of property? _____

Property #4

Number of buildings on site:_____ Property Description:_____
Zoning district:_____
Use type:_____
Square footage of principal building:_____
Square footage of accessory buildings:_____
Number of parking spaces:_____ North, south, east or west of property? _____

Property #5

Number of buildings on site:_____ Property Description:_____
Zoning district:_____
Use type:_____
Square footage of principal building:_____
Square footage of accessory buildings:_____
Number of parking spaces:_____ North, south, east or west of property? _____

Property #6

Number of buildings on site:_____ Property Description:_____
Zoning district:_____
Use type:_____
Square footage of principal building:_____
Square footage of accessory buildings:_____
Number of parking spaces:_____ North, south, east or west of property? _____

The undersigned states the above information is true and correct, and understands that it is the responsibility of the applicant to advise the Planning Division and / or Building Division of any additional changes made to an approved site plan. The undersigned further states that they have reviewed the procedures and guidelines for Site Plan Review in Birmingham, and have complied with same. The undersigned will be in attendance at the Planning Board meeting when this application will be discussed.

By providing your e-mail to the City, you agree to receive news notifications from the City. If you do not wish to receive these messages, you may unsubscribe at any time.

Signature of Owner: _____ Date: _____

Print Name: _____

Signature of Applicant: Lauren Sonk Date: 12/11/2019

Print Name: Lauren Sonk

Signature of Architect: _____ Date: _____

Print Name: _____

Office Use Only

Application #: PFSP19-0009 Date Received: 12/12/19 Fee: $500.00

Date of Approval: _____ Date of Denial: _____ Accepted by: _____

City of Birmingham

CONSENT OF PROPERTY OWNER

I, Doug Cutler (Name of property owner), OF THE STATE OF MI AND COUNTY OF OAKLAND STATE THE FOLLOWING:

1. That I am the owner of the real estate located at 1026 Canterbury St. (Address of affected property);
2. That I have read and examined the Application made to the City of Birmingham by: Doug Cutler (Name of applicant);
3. That I have no objections to, and consent to the request(s) described in the Application made to the City of Birmingham.

Dated: 12-14-19

Doug Cutler
Owner's Name (Please Print)

Owner's Signature

RECEIVED
DEC 16 2019
CITY OF BIRMINGHAM
COMMUNITY DEVELOPMENT DEPT.

City of Birmingham
A Walkable Community

Notice Sign Rental Application

Community Development

1. Applicant

Name: Lauren Sonk
Address: 4023 S Old US 23
Brighton, MI 48114
Phone Number: 866 633 8553
Fax Number: 810 225 9932
Email address: permitting@thegreenpanel.com

2. Property Owner

Name: Holly & Doug Cutler
Address: 1026 Canterbury St
Birmingham, MI 48009
Phone Number: 248 971 3866
Fax Number:
Email address: dougdcutler@hotmail.com

3. Project Information

Address/Location of Property: 1026 Canterburg St
Name of Development:
Area in Acres:

Name of Historic District, if any:
Current Use: Residential
Current Zoning: Residential

4. Date of Board/Commission Review

City Commission:
Planning Board:
Historic District Commission:
Design Review Board:

Board of Zoning Appeals:
Board of Building Trades Appeals:
Housing Board of Appeals:
Other:

The undersigned states the above information is true and correct, and understands that it is the responsibility of the applicant to post the Notice Sign(s) at least 15 days prior to the date on which the project will be reviewed by the appropriate board or commission, and to ensure that the Notice Sign(s) remains posted during the entire 15 day mandatory posting period. The undersigned further agrees to pay a rental fee and security deposit for the Notice Sign(s), and to remove all such signs on the day immediately following the date of the hearing at which the project was reviewed. The security deposit will be refunded when the Notice Sign(s) are returned undamaged to the Community Development Department. Failure to return the Notice Sign(s) and/or damage to the Notice Sign(s) will result in forfeiture of the security deposit.

Signature of Applicant: _____ **Date:** 12/16/2019

Office Use Only

Application#: Date Received: Fee:

Date of Approval: Date of Denial: Reviewed By:

The Green Panel, Inc.

Created for: Holly & Doug Cutler (TH)
1026 Canterbury St
Birmingham, MI 48009, USA
(248) 971-3866 | dougdcutler@hotmail.com

CUSTOMER SIGNATURE

I hereby agree to move forward with the solar project as described above and agree to terms of the contract provided by the installer, The Green Panel, Inc., joined to this proposal.

Holly & Doug Cutler (TH)

11/24/19

Date of Signature (MM/DD/YY)

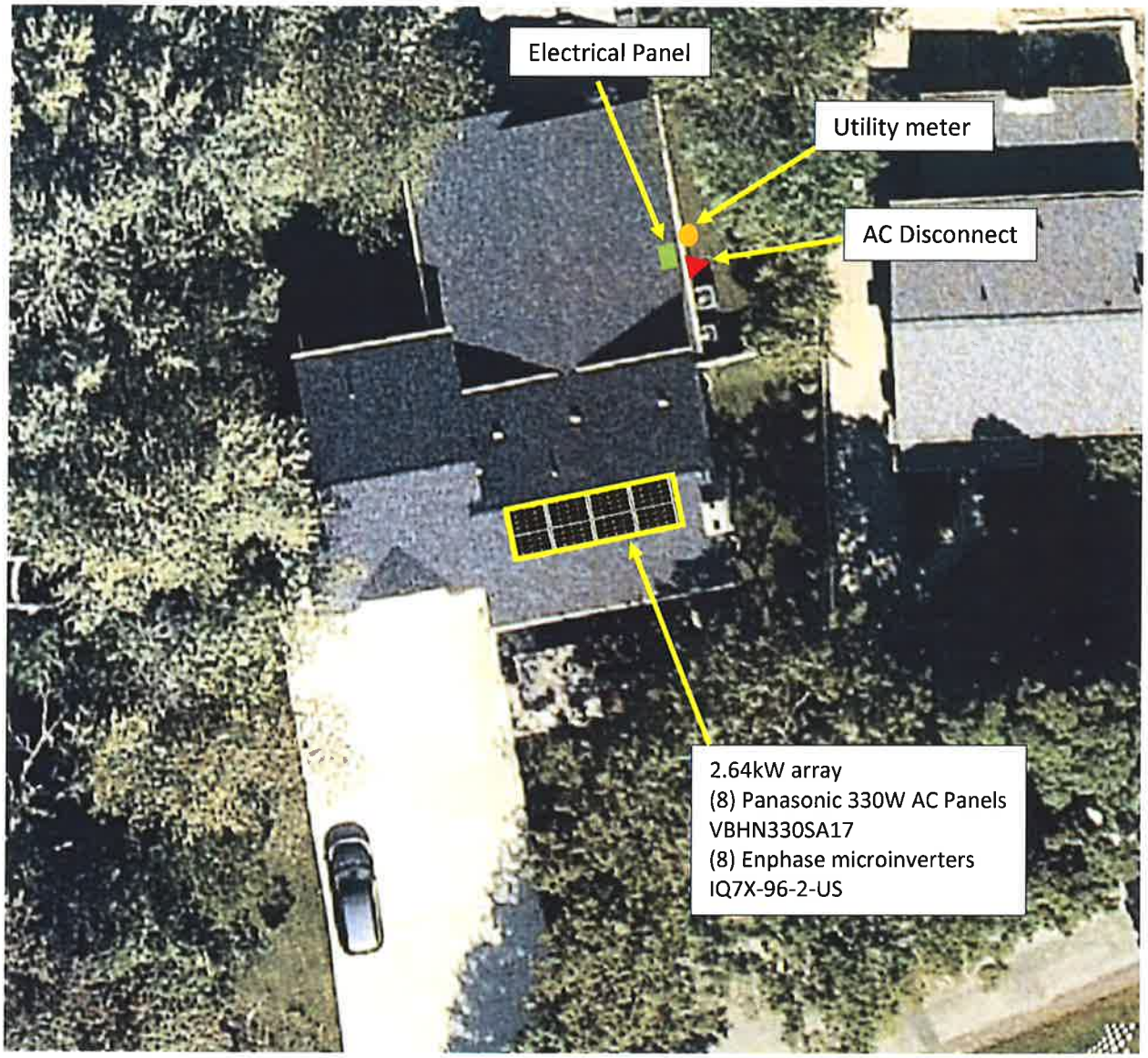
The Green Panel, Inc.

12/3/2019

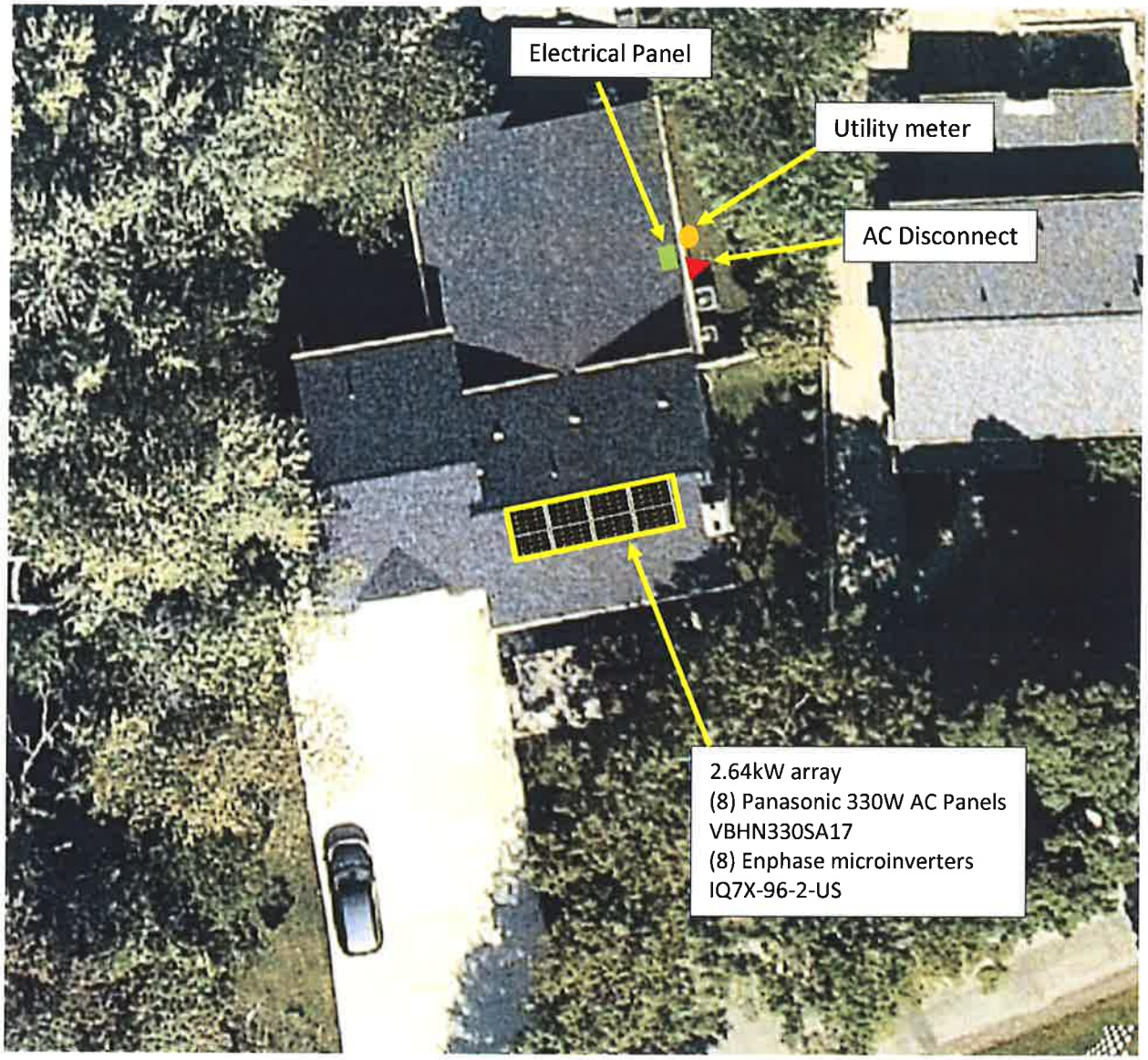
Date of Signature (MM/DD/YY)

YOUR REPRESENTATIVE

Tara Hillaker
Email: thillaker@thegreenpanel.com
Phone: 8102067444



Holly and Doug Cutler
1026 Canterbury St
Birmingham, MI 48009
Created by: The Green Panel, Inc
11/26/2019



Holly and Doug Cutler
1026 Canterbury St
Birmingham, MI 48009
Created by: The Green Panel, Inc
11/26/2019

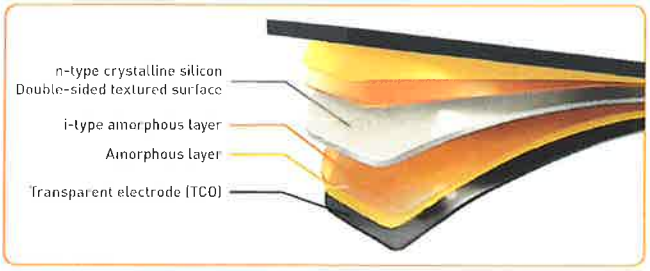
HIT®
Photovoltaic Module

Panasonic

N330E AC MODULE

Panasonic HIT® AC Modules combine the efficiency of HIT® solar panels with the intelligence of seventh-generation Enphase IQ 7X Microinverters. Delivers a smart grid-ready module with high efficiency and high power output for residential solar systems.

HIT® heterojunction technology uses dual ultra-thin amorphous silicon layers which reduce electron losses and produce greater power output than conventional panels.



MADE IN USA
FROM IMPORTED PARTS

The Panasonic HIT® Advantage

High Efficiency at High Temperatures
As temperature increases, HIT® continues to perform at high levels due to the industry leading temperature coefficient of -0.258% /ºC. No other module comes close to our temperature characteristics. That means more energy throughout the day.

TripleGuard 25-Year Warranty**
TripleGuard covers your solar panel system's performance, workmanship, parts, and labor for 25 years**. Whether in year three or year 25, rest assured your Panasonic warranty protection will be there when you need it.

Quality and Reliability
Panasonic's vertical integration, over 20 years of experience manufacturing HIT® and 20 internal tests beyond those mandated by current standards provides extreme quality assurance.

Higher Efficiency 19.7%
Enables higher power output and greater energy yields. HIT® provides maximum production for your limited roof space.

Low Degradation
HIT "N-type" cells result in extremely Low Light Induced Degradation (LID) and zero Potential Induced Degradation (PID) which supports reliability and longevity. This technology reduces annual degradation to 0.26% compare to 0.70% in conventional panels, guaranteeing more power for the long haul.

Enhanced Frame Design
A 40mm frame increases durability and strength, handling loads of up to 5400Pa. A special water drainage system prevents rain water accumulation and eliminates water stains from the panel surface, allowing optimal sunlight penetration and panel efficiency.

HIT®
Photovoltaic Module

Panasonic

N330E AC MODULE

AC ELECTRICAL SPECIFICATIONS

Peak Power Output	320VA
Maximum Continuous Output Power	315VA
Nominal (L-L) voltage/range[1]	240V / 211 – 264V
Maximum Continous Output Current	1.31A @ 240VAC / 1.51A @ 208VAC
Maximum Units per 20 A (L-L) branch circuit	12 @ 240VAC / 10 @ 208VAC
Nominal Frequency	60Hz
Extended Frequency Range	47 – 68Hz
AC Short Circuit Fault Current Over 3 Cycles	5.8Arms
Overvoltage Class AC Port	III
AC Port Backfeed Current	0A
Power Factor Setting	1.0
Power Factor (adjustable)	0.7 leading / 0.7 lagging
CEC Weighted Efficiency	97.5% @ 240V / 96.5% @ 208V

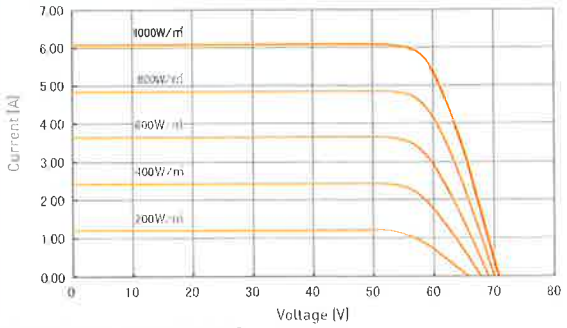
DC ELECTRICAL SPECIFICATIONS

Rated Power (Pmax)[1]	330W
Temperature Coefficient (Pmax)	-0.258%/°C
CEC PTC Rating	311.7W
CEC PTC to STC Ratio	94.45%
Cell Efficiency	22.09%
Module Efficiency	19.7%
Watts per Ft.²	18.3W
Warranted Tolerance (-/+)	+10%/-0%*

FEATURES

Communication	Power Line Communication (PLC)
Communication	Enlighten Manager and MyEnlighten monitoring options. Compatible with Enphase IQ Envoy
Disconnecting means	The AC and DC connectors have been evaluated and approved by UL for use as the load-break disconnect required by NEC 690.
Compliance	CA Rule 21 UL 62109-1, UL1741/IEEE1547, FCC Part 15 Class B, ICES-0003 Class B, CAN/CSA-C22.2 NO. 107.1-01 Safety & Rating Certifications UL 1703, UL 1741, CEC This product is UL Listed as PV Rapid Shut Down Equipment and conforms with NEC-2014 and NEC-2017 section 690.12 and C22.1-2015 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors, when installed according to manufacturer's instructions

DEPENDENCE ON IRRADIANCE



Reference data for model: VBHN330SA17
(Cell temperature: 25°C)

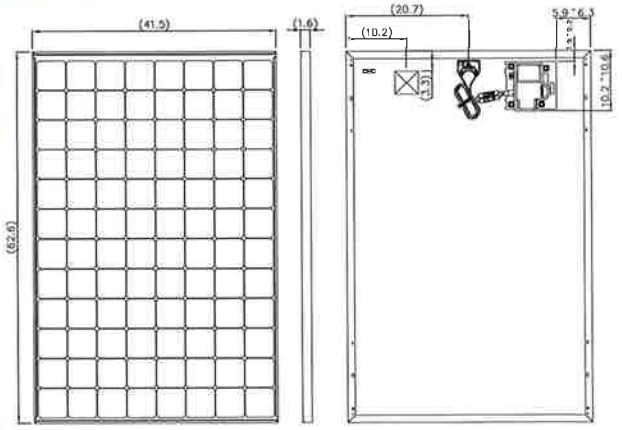
MECHANICAL SPECIFICATIONS

Internal Bypass Diodes	4 Bypass Diodes
Module Area	18.02 Ft.² (1.67m²)
Weight	42.99 Lbs. (19.5kg)
Dimensions LxWxH	62.6x41.5x1.6 in. (1590x1053x40 mm)
Static Wind / Snow Load	112 PSF (5400Pa)
Pallet Dimensions LxWxH	65.3 x 43.7 x 48.5 in.
Quantity per Pallet / Pallet Weight	24 pcs./1098 Lbs. (498 kg)
Quantity per 40' Container	672 pcs.
Quantity per 20' Container	288 pcs.

OPERATING CONDITIONS & SAFETY RATINGS

Operating Temperature	-22°F to 185°F (-30°C to 85°C)
Hail Safety Impact Velocity	1" hailstone (25mm) at 52 mph (23m/s)
UL 1703 Fire Classification	Type 2
Limited Warranty	Module and Microinverter: 25** Yrs Workmanship, Materials and Power Output (Linear)***
Manufacturing Locations	USA

DIMENSIONS



NOTE: Standard Test Conditions: Air mass 1.5; irradiance = 1000W/m²; cell temp. 25°C
* Maximum power at delivery. For guarantee conditions, please check our guarantee document.
** Equipment must be installed by Panasonic Authorized or Premium installer and registered through our website www.panasonicusahitwarranty.com within 60 days in order to receive twenty-five (25) year product and labor
*** DC Warranty Performance: 1st year 97%, after 2nd year 0.26% annual degradation to year 25.
[1] Nominal voltage range can be extended beyond nominal if required by the utility.
[2] Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.
[3] Microinverter warranty provided by Panasonic.
[4] STC: Cell temp. 25°C, AM1.5, 1000W/m²
[5] Safety locking clip (PV-SSH4) is not supplied with the module.
NOTE: Specifications and information above may change without notice.

UL LISTED GRID SUPPORT UTILITY INTERACTIVE AC MODULE WITH RAPID SHUTDOWN FUNCTIONALITY E502579
Module Fire Performance Type2

⚠ CAUTION! Please read the installation manual carefully before using the products.

Used electrical and electronic products must not be mixed with general household waste. For proper treatment, recovery and recycling of old products, please take them to applicable collection points in accordance with your national legislation.

Panasonic

Panasonic Life Solutions Company of America
Two Riverfront Plaza, 5th Floor, Newark, NJ 07102
panasonicHIT@us.panasonic.com
na.panasonic.com/us/solar

RS1900855_R13

Enphase IQ 7X Microinverter

The high-powered smart grid-ready Enphase IQ 7X Micro™ dramatically simplifies the installation process while achieving the highest system efficiency for systems with 96-cell modules.

Part of the Enphase IQ System, the IQ 7X Micro integrates with the Enphase IQ Envoy™, Enphase IQ Battery™, and the Enphase Enlighten™ monitoring and analysis software.

The IQ Series Microinverters extend the reliability standards set forth by previous generations and undergo over a million hours of power-on testing, enabling Enphase to provide an industry-leading warranty of up to 25 years.

Easy to Install

- Lightweight and simple
- Faster installation with improved, lighter two-wire cabling
- Built-in rapid shutdown compliant (NEC 2014 & 2017)

Efficient and Reliable

- Optimized for high powered 96-cell* modules
- Highest CEC efficiency of 97.5%
- More than a million hours of testing
- Class II double-insulated enclosure
- UL listed

Smart Grid Ready

- Complies with advanced grid support, voltage and frequency ride-through requirements
- Remotely updates to respond to changing grid requirements
- Configurable for varying grid profiles
- Meets CA Rule 21 (UL 1741-SA)

* The IQ 7X is required to support 96-cell modules.

UL CERTIFIED SAFETY US-CA E341165

To learn more about Enphase offerings, visit **enphase.com**

ENPHASE

Enphase IQ 7X Microinverter

INPUT DATA (DC)	IQ7X-96-2-US	
Commonly used module pairings[1]	320 W - 460 W +	
Module compatibility	96-cell PV modules	
Maximum input DC voltage	79.5 V	
Peak power tracking voltage	53 V - 64 V	
Operating range	25 V - 79.5 V	
Min/Max start voltage	33 V / 79.5 V	
Max DC short circuit current (module Isc)	10 A	
Overvoltage class DC port	II	
DC port backfeed current	0 A	
PV array configuration	1 x 1 ungrounded array; No additional DC side protection required; AC side protection requires max 20A per branch circuit	
OUTPUT DATA (AC)	**@ 240 VAC**	**@ 208 VAC**
Peak output power	320 VA	
Maximum continuous output power	315 VA	
Nominal (L-L) voltage/range[2]	240 V / 211-264 V	208 V / 183-229 V
Maximum continuous output current	1.31 A (240 VAC)	1.51 A (208 VAC)
Nominal frequency	60 Hz	
Extended frequency range	47 - 68 Hz	
AC short circuit fault current over 3 cycles	5.8 Arms	
Maximum units per 20 A (L-L) branch circuit[3]	12 (240 VAC)	10 (208 VAC)
Overvoltage class AC port	III	
AC port backfeed current	18 mA	
Power factor setting	1.0	
Power factor (adjustable)	0.85 leading ... 0.85 lagging	
EFFICIENCY	**@240 VAC**	**@208 VAC**
CEC weighted efficiency	97.5 %	97.0 %
MECHANICAL DATA		
Ambient temperature range	-40°C to +60°C	
Relative humidity range	4% to 100% (condensing)	
Connector type (IQ7X-96-2-US)	MC4 (or Amphenol H4 UTX with optional Q-DCC-5 adapter)	
Dimensions (WxHxD)	212 mm x 175 mm x 30.2 mm (without bracket)	
Weight	1.08 kg (2.38 lbs)	
Cooling	Natural convection - No fans	
Approved for wet locations	Yes	
Pollution degree	PD3	
Enclosure	Class II double-insulated, corrosion resistant polymeric enclosure	
Environmental category / UV exposure rating	NEMA Type 6 / outdoor	
FEATURES		
Communication	Power Line Communication (PLC)	
Monitoring	Enlighten Manager and MyEnlighten monitoring options Compatible with Enphase IQ Envoy	
Disconnecting means	The AC and DC connectors have been evaluated and approved by UL for use as the load-break disconnect required by NEC 690.	
Compliance	CA Rule 21 (UL 1741-SA) UL 62109-1, UL1741/IEEE1547, FCC Part 15 Class B, ICES-0003 Class B, CAN/CSA-C22.2 NO. 107.1-01 This product is UL Listed as PV Rapid Shut Down Equipment and conforms with NEC-2014 and NEC-2017 section 690.12 and C22.1-2015 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors, when installed according manufacturer's instructions.	

1. No enforced DC/AC ratio. See the compatibility calculator at https://enphase.com/en-us/support/module-compatibility.
2. Nominal voltage range can be extended beyond nominal if required by the utility.
3. Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.

To learn more about Enphase offerings, visit **enphase.com**

ENPHASE

2019-3-26

Tech Brief

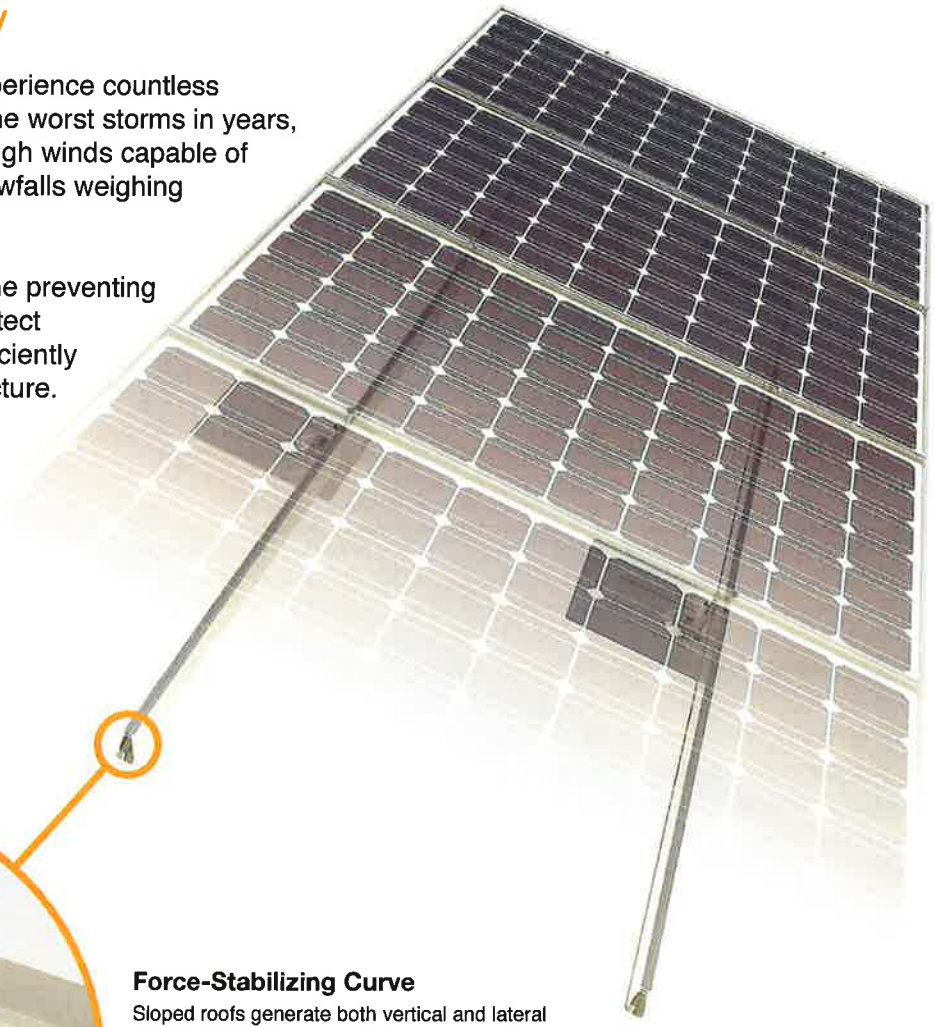
IRONRIDGE

XR Rail Family

Solar Is Not Always Sunny

Over their lifetime, solar panels experience countless extreme weather events. Not just the worst storms in years, but the worst storms in 40 years. High winds capable of ripping panels from a roof, and snowfalls weighing enough to buckle a panel frame.

XR Rails are the structural backbone preventing these results. They resist uplift, protect against buckling and safely and efficiently transfer loads into the building structure. Their superior spanning capability requires fewer roof attachments, reducing the number of roof penetrations and the amount of installation time.



Force-Stabilizing Curve

Sloped roofs generate both vertical and lateral forces on mounting rails which can cause them to bend and twist. The curved shape of XR Rails is specially designed to increase strength in both directions while resisting the twisting. This unique feature ensures greater security during extreme weather and a longer system lifetime.

Compatible with Flat & Pitched Roofs

XR Rails are compatible with FlashFoot and other pitched roof attachments.

IronRidge offers a range of tilt leg options for flat roof mounting applications.

Corrosion-Resistant Materials

All XR Rails are made of 6000-series aluminum alloy, then protected with an anodized finish. Anodizing prevents surface and structural corrosion, while also providing a more attractive appearance.

XR Rail Family

The XR Rail Family offers the strength of a curved rail in three targeted sizes. Each size supports specific design loads, while minimizing material costs. Depending on your location, there is an XR Rail to match.

XR10

XR10 is a sleek, low-profile mounting rail, designed for regions with light or no snow. It achieves 6 foot spans, while remaining light and economical.

- 6' spanning capability
- Moderate load capability
- Clear & black anodized finish
- Internal splices available

XR100

XR100 is the ultimate residential mounting rail. It supports a range of wind and snow conditions, while also maximizing spans up to 8 feet.

- 8' spanning capability
- Heavy load capability
- Clear & black anodized finish
- Internal splices available

XR1000

XR1000 is a heavyweight among solar mounting rails. It's built to handle extreme climates and spans 12 feet or more for commercial applications.

- 12' spanning capability
- Extreme load capability
- Clear anodized finish
- Internal splices available

Rail Selection

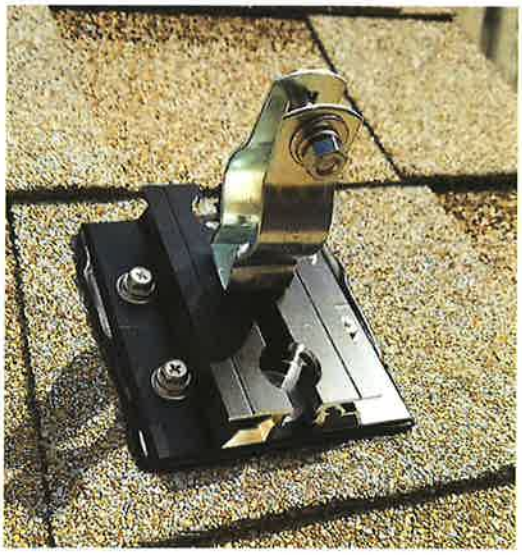
The following table was prepared in compliance with applicable engineering codes and standards. Values are based on the following criteria: ASCE 7-10, Roof Zone 1, Exposure B, Roof Slope of 7 to 27 degrees and Mean Building Height of 30 ft. Visit IronRidge.com for detailed span tables and certifications.

Load		Rail Span					
Snow (PSF)	Wind (MPH)	4'	5' 4"	6'	8'	10'	12'
None	100	XR10		XR100		XR1000	
	120						
	140						
	160						
10-20	100						
	120						
	140						
	160						
30	100						
	160						
40	100						
	160						
50-70	160						
80-90	160						

RT-MINI

Self-flashing base for asphalt & metal roof-top PV mounting systems

RT-MINI is suitable for mounting any rail system with a conventional L-Foot.



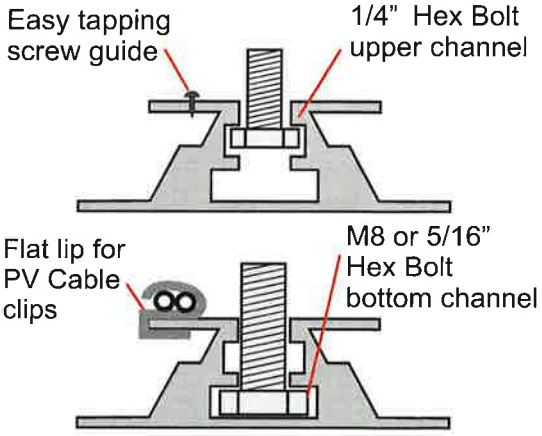
Dual bolt design: M8 or 5/16" for L-Foot & 1/4" for EMC

ICC ES®

ICC ESR 3575

Call Now for more details

858-935-6064



Roof Tech

Smarter PV mounting solutions from top of roof to bottom line®

www.roof-tech.us info@roof-tech.us

RT-MINI

Flexible Flashing certified by the International Code Council (ICC)

Engineered to ASTM D 1761 (Standard Test Methods for Mechanical Fasteners in Wood)

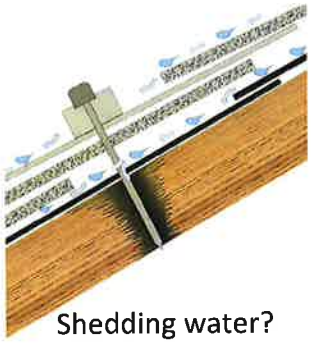
Components

RT2-00-MINIBK
PAT : PENDING

MINI base : 20 ea.
Screw : 40 ea.
Extra RT-Butyl : 10 ea.

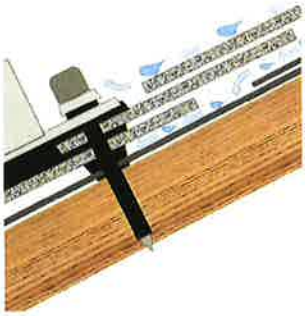
RT-Butyl is Roof Tech's flexible flashing used in 550,000 residential PV systems for the last 20 years. It is the first PV mounting system with Flexible Flashing certified by the ICC.

Metal Flashing Retrofit



Shedding water?

Flexible Flashing



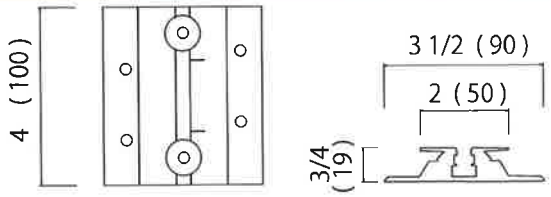
100% Waterproof

ICC ESR-3575

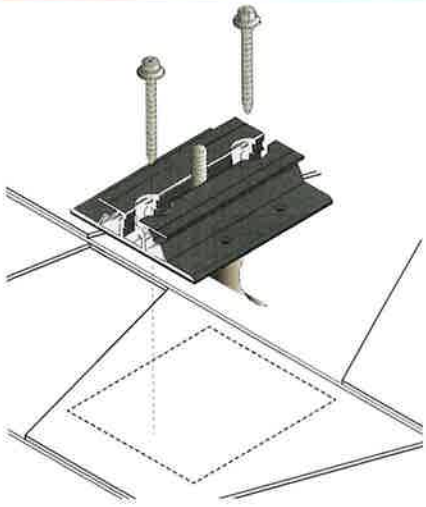
ASTM2140 testing

UV testing (7500 hrs.)

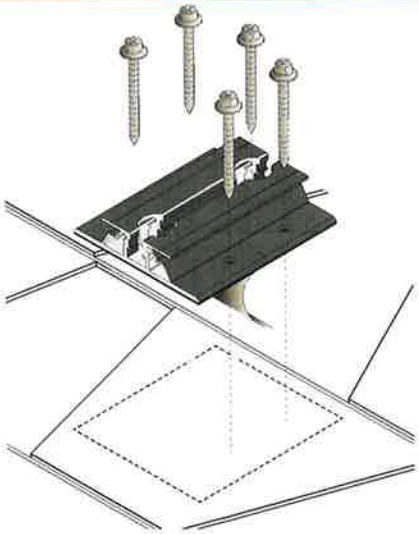
Dimensions in (mm)



Rafter installation

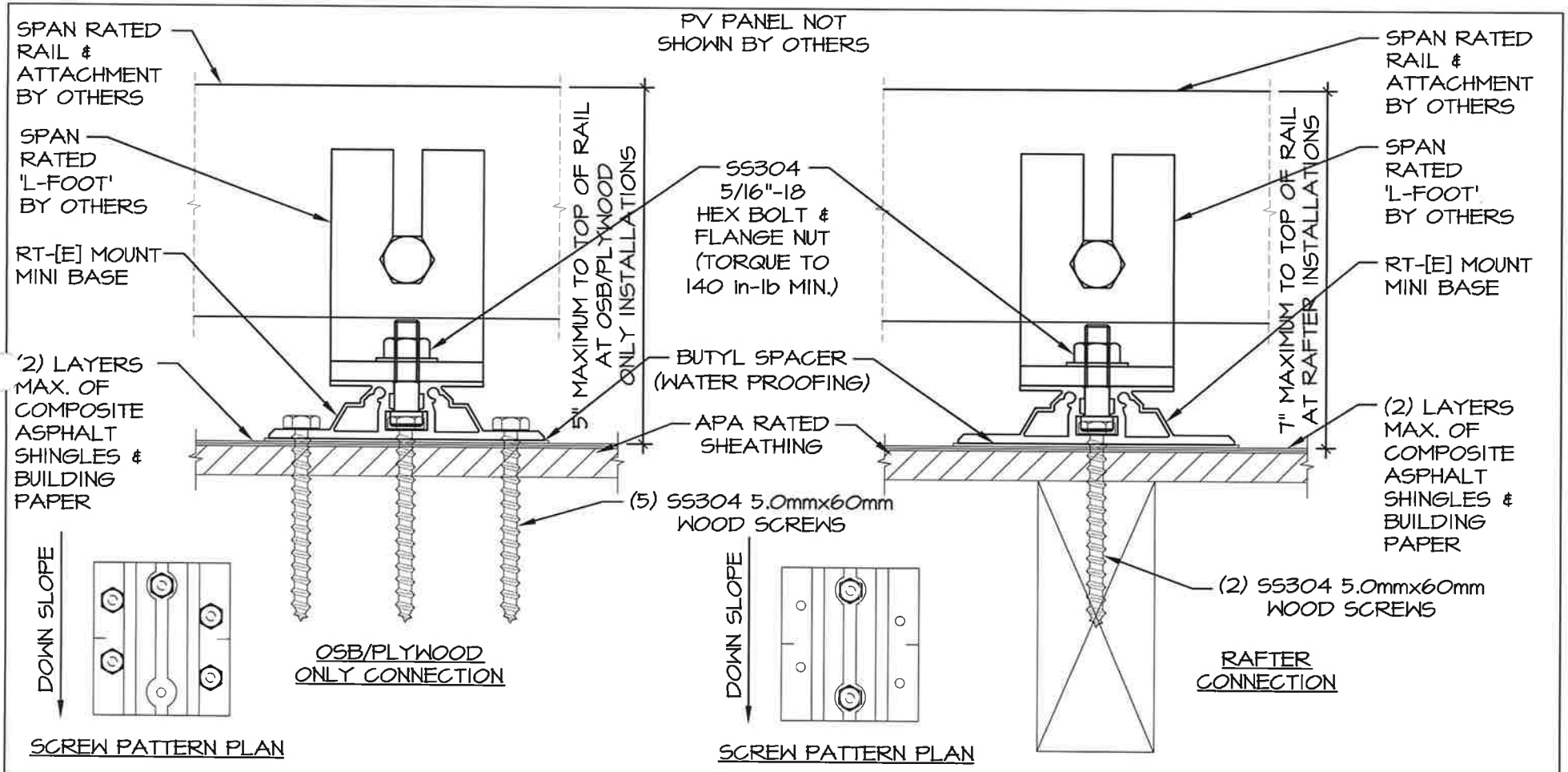


Deck installation



P.E. Stamped Letters available at www.roof-tech.us/support

Roof Tech Inc.
www.roof-tech.us info@roof-tech.us
10620 Treena Street, Suite 230, San Diego, CA 92131
858.935.6064



1 'RAIL OPTION' - RAIL AND 'L-FOOT' ORIENTATION

SCALE: N.T.S.

Starling Madison Lofquist, Inc.
5224 S. 39th Street
Phoenix, Arizona 85040
(602) 438-2500
fax. (602) 438-2505

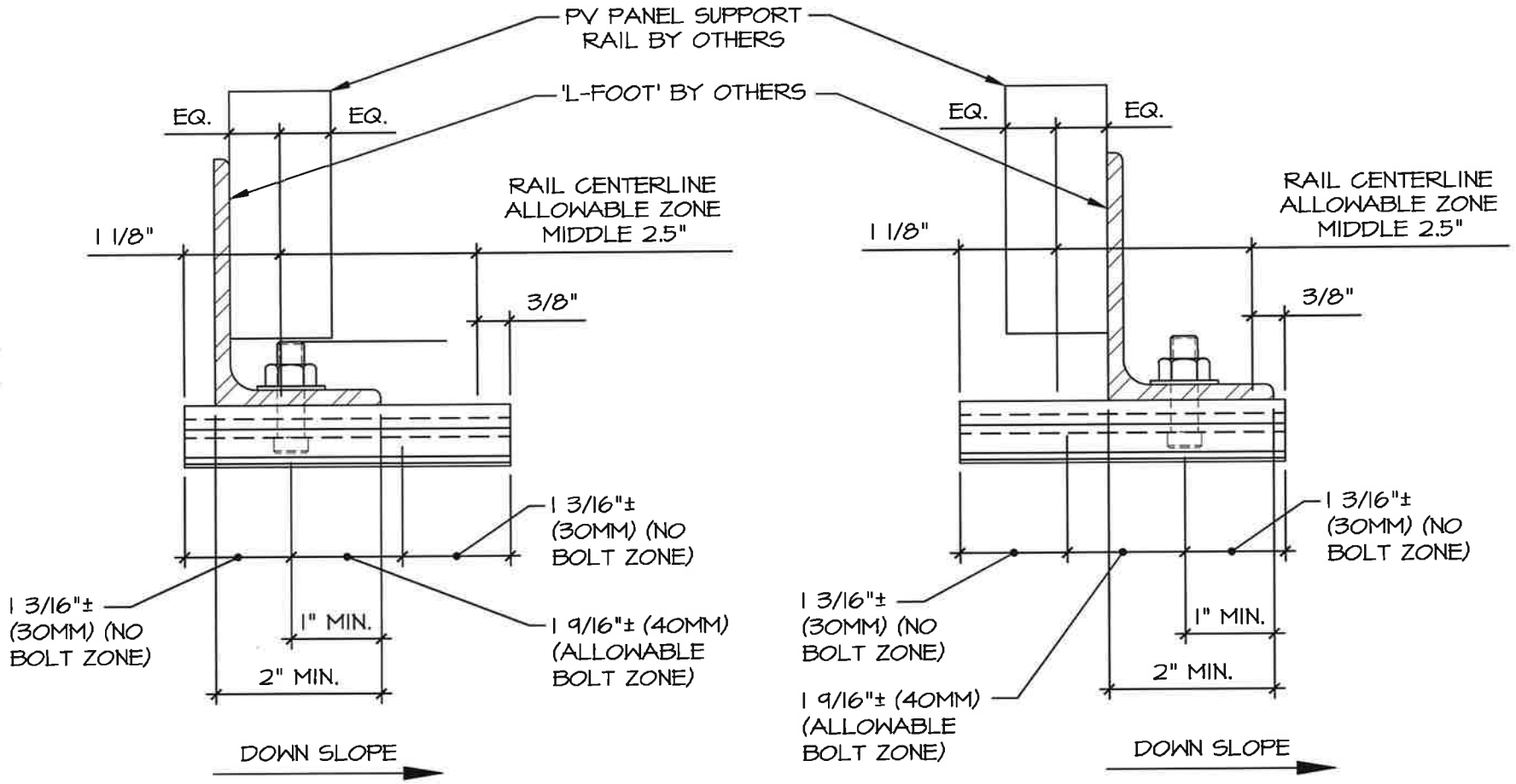
Consulting Structural and Forensic Engineers

DRAWN BY:	J.S.	DATE:	7-3-18
DESIGNED BY:	D.H.	JOB NO:	471-13

ROOF TECH
RT-[E] MOUNT MINI + RAIL
STRUCTURAL ANALYSIS

ROOF TECH, INC.
333 H STREET, SUITE 5000
CHULA VISTA, CA 91910

EXHIBIT A
1 OF 4



2 'RAIL OPTION' - RAIL AND 'L-FOOT' ORIENTATION

SCALE: N.T.S.

Starling Madison Lofquist, Inc.
5224 S. 39th Street
Phoenix, Arizona 85040
(602) 438-2500
fax. (602) 438-2505

Consulting Structural and Forensic Engineers

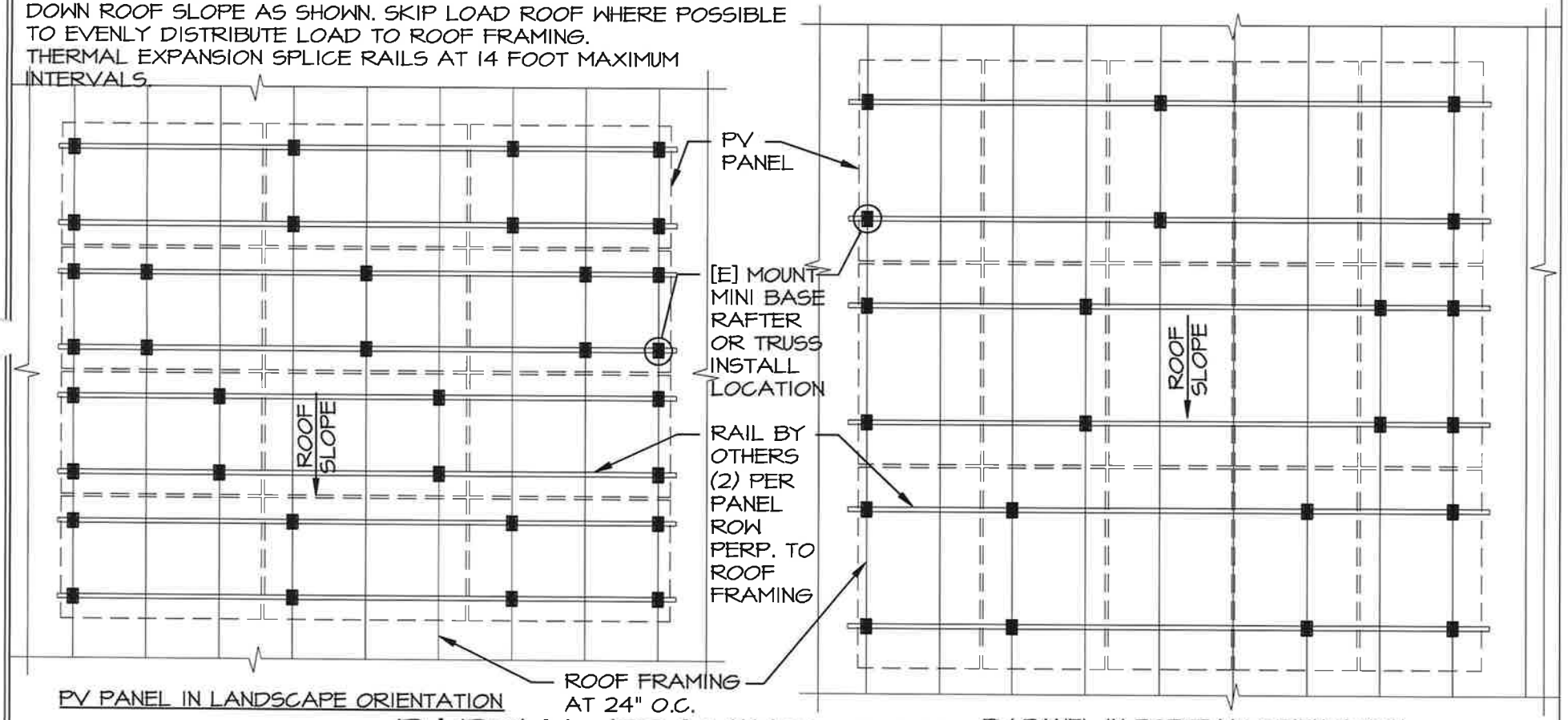
DRAWN BY:	J.S.	DATE:	7-3-18
DESIGNED BY:	D.H.	JOB NO:	471-13

ROOF TECH
RT-[E] MOUNT MINI + RAIL
STRUCTURAL ANALYSIS

ROOF TECH, INC.
333 H STREET, SUITE 5000
CHULA VISTA, CA 91910

EXHIBIT A
2 OF 4

NOTE: [E] MOUNT MINI BASE TO BE ORIENTED WITH LONG DIRECTION DOWN ROOF SLOPE AS SHOWN. SKIP LOAD ROOF WHERE POSSIBLE TO EVENLY DISTRIBUTE LOAD TO ROOF FRAMING.
THERMAL EXPANSION SPLICE RAILS AT 14 FOOT MAXIMUM INTERVALS.



3 PARTIAL FRAMING PLAN (RAFTER INSTALLATION)

SCALE: N.T.S.

SML
Starling Madison Lofquist, Inc.
5224 S. 39th Street
Phoenix, Arizona 85040
(602) 438-2500
fax. (602) 438-2505
Consulting Structural and Forensic Engineers

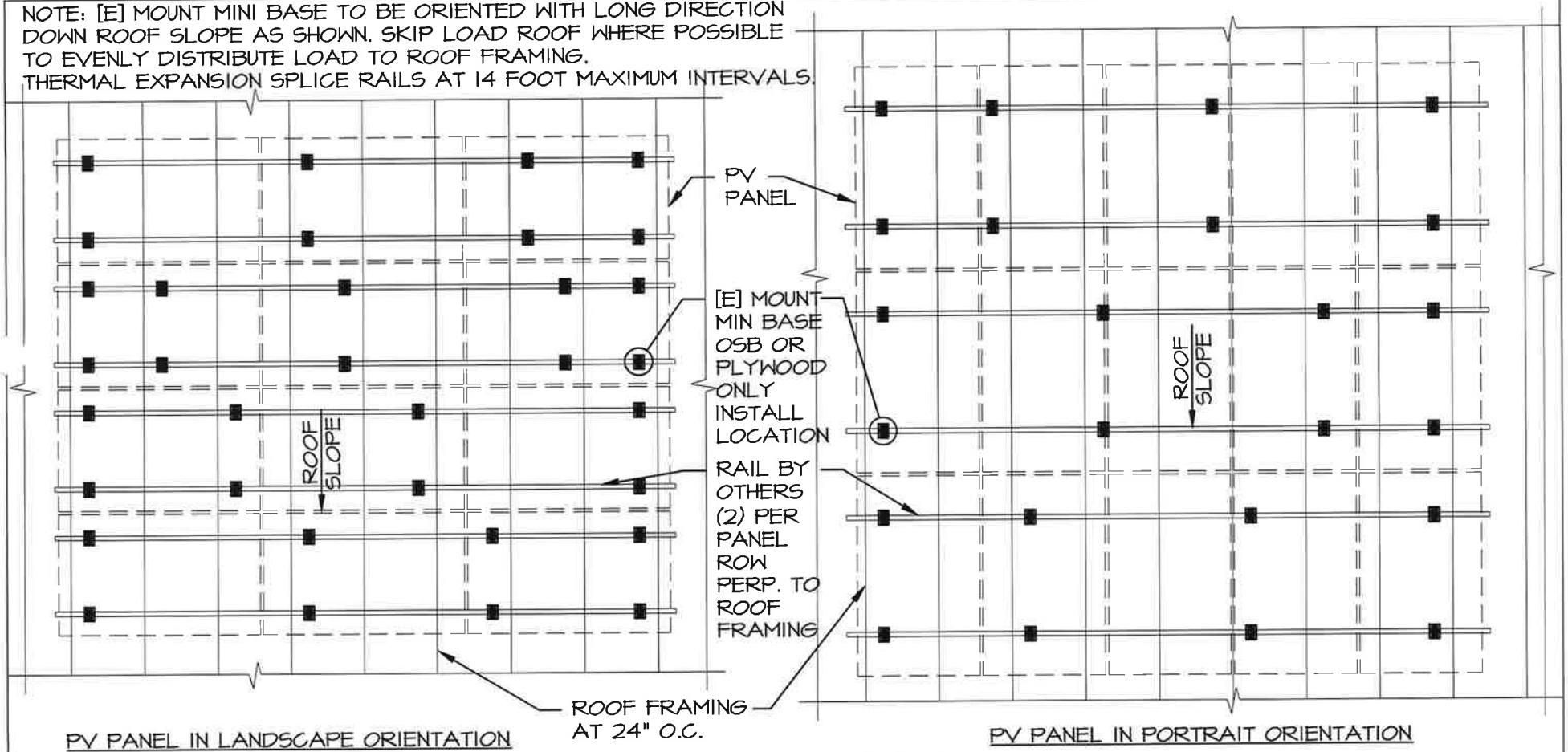
DRAWN BY:	J.S.	DATE:	7-3-18
DESIGNED BY:	D.H.	JOB NO:	471-13

ROOF TECH
RT-[E] MOUNT MINI + RAIL
STRUCTURAL ANALYSIS

ROOF TECH, INC.
333 H STREET, SUITE 5000
CHULA VISTA, CA 91910

EXHIBIT A
3 OF 4

NOTE: [E] MOUNT MINI BASE TO BE ORIENTED WITH LONG DIRECTION DOWN ROOF SLOPE AS SHOWN. SKIP LOAD ROOF WHERE POSSIBLE TO EVENLY DISTRIBUTE LOAD TO ROOF FRAMING.
THERMAL EXPANSION SPLICE RAILS AT 14 FOOT MAXIMUM INTERVALS.



4 PARTIAL FRAMING PLAN (OSB/PLYWOOD ONLY INSTALLATION)

SCALE: N.T.S.

Starling Madison Lofquist, Inc.
5224 S. 39th Street
Phoenix, Arizona 85040
(602) 438-2500
fax. (602) 438-2505

Consulting Structural and Forensic Engineers

DRAWN BY:	J.S.	DATE:	7-3-18
DESIGNED BY:	D.H.	JOB NO:	471-13

ROOF TECH
RT-[E] MOUNT MINI + RAIL
STRUCTURAL ANALYSIS

ROOF TECH, INC.
333 H STREET, SUITE 5000
CHULA VISTA, CA 91910

EXHIBIT A
4 OF 4

POWERWALL

Tesla Powerwall is a fully-integrated AC battery system for residential or light commercial use. Its rechargeable lithium-ion battery pack provides energy storage for solar self-consumption, time-based control, and backup.

Powerwall's electrical interface provides a simple connection to any home or building. Its revolutionary compact design achieves market-leading energy density and is easy to install, enabling owners to quickly realize the benefits of reliable, clean power.

PERFORMANCE SPECIFICATIONS

AC Voltage (Nominal)	120/240 V
Feed-In Type	Split Phase
Grid Frequency	60 Hz
Total Energy[1]	14 kWh
Usable Energy[1]	13.5 kWh
Real Power, max continuous[2]	5 kW (charge and discharge)
Real Power, peak (10 s, off-grid/backup)[2]	7 kW (charge and discharge)
Apparent Power, max continuous	5.8 kVA (charge and discharge)
Apparent Power, peak (10 s, off-grid/backup)	7.2 kVA (charge and discharge)
Maximum Supply Fault Current	10 kA
Maximum Output Fault Current	32 A
Overcurrent Protection Device	30 A
Imbalance for Split-Phase Loads	100%
Power Factor Output Range	+/– 1.0 adjustable
Power Factor Range (full-rated power)	+/– 0.85
Internal Battery DC Voltage	50 V
Round Trip Efficiency[1,3]	90%
Warranty	10 years

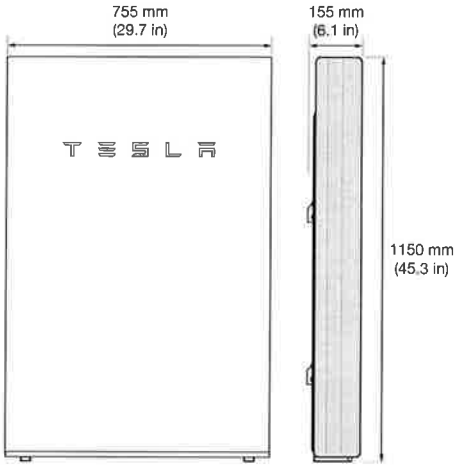
[1] Values provided for 25°C (77°F), 3.3 kW charge/discharge power.
[2] In Backup mode, grid charge power is limited to 3.3 kW.
[3] AC to battery to AC, at beginning of life.

COMPLIANCE INFORMATION

Certifications	UL 1642, UL 1741, UL 1973, UL 9540, IEEE 1547, UN 38.3
Grid Connection	Worldwide Compatibility
Emissions	FCC Part 15 Class B, ICES 003
Environmental	RoHS Directive 2011/65/EU
Seismic	AC156, IEEE 693-2005 (high)

MECHANICAL SPECIFICATIONS

Dimensions	1150 mm x 755 mm x 155 mm (45.3 in x 29.7 in x 6.1 in)
Weight	125 kg (276 lbs)
Mounting options	Floor or wall mount

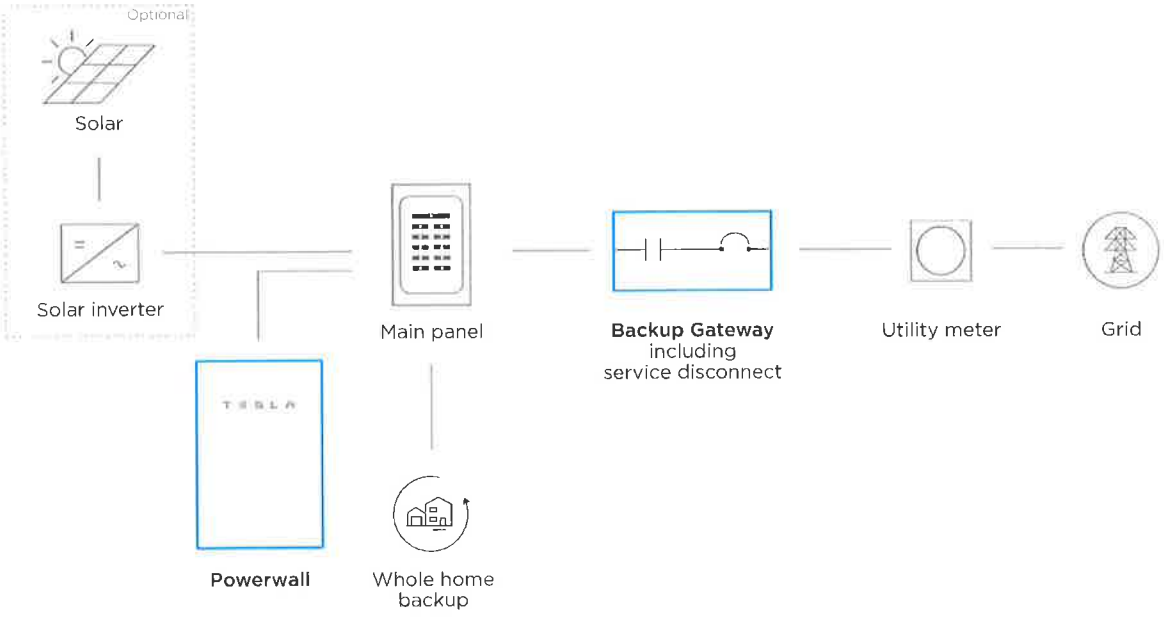


ENVIRONMENTAL SPECIFICATIONS

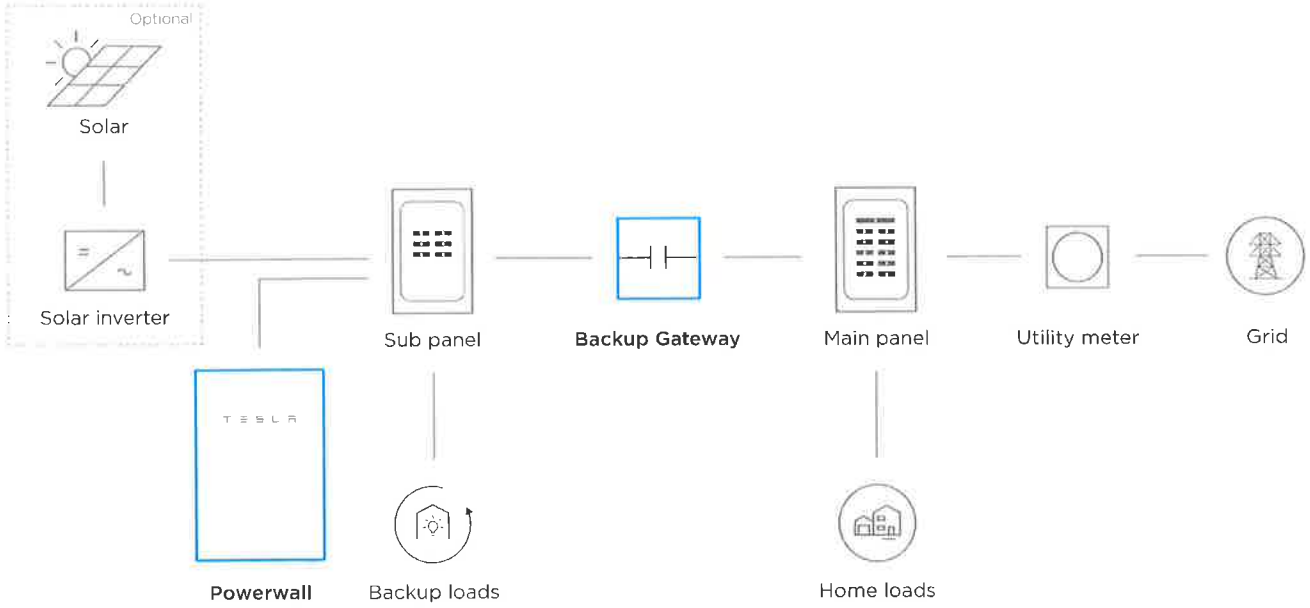
Operating Temperature	–20°C to 50°C (–4°F to 122°F)
Optimum Temperature	0°C to 30°C (32°F to 86°F)
Operating Humidity (RH)	Up to 100%, condensing
Storage Conditions	-20°C to 30°C (–4°F to 86°F) Up to 95% RH, non-condensing State of Energy (SoE): 25% initial
Maximum Elevation	3000 m (9843 ft)
Environment	Indoor and outdoor rated
Enclosure Type	NEMA 3R
Ingress Rating	IP67 (Battery & Power Electronics) IP56 (Wiring Compartment)
Wet Location Rating	Yes
Noise Level @ 1m	< 40 dBA at 30°C (86°F)

TYPICAL SYSTEM LAYOUTS

WHOLE HOME BACKUP



PARTIAL HOME BACKUP

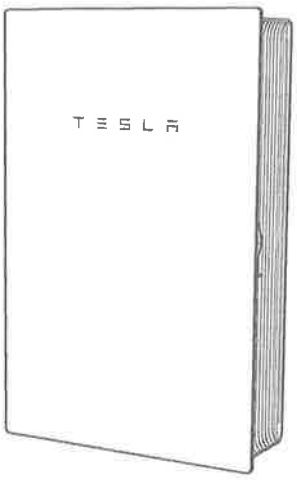


POWERWALL
Backup Gateway 2

Backup Gateway 2 for Tesla Powerwall provides energy management and monitoring for solar self-consumption, time-based control, and backup operation.

When the Powerwall system is in Backup mode, Backup Gateway 2 controls connection to the grid, automatically detecting outages and providing seamless transition to backup power.

Communicating directly with Powerwall, Backup Gateway 2 allows you to monitor energy use and manage backup energy reserves from any mobile device with the Tesla app.



PERFORMANCE SPECIFICATIONS

AC Voltage (Nominal)	240 V (Line-to-Neutral) 440 V (Line-to-Line)
Feed-In Type	Single Phase, Three Phase
Grid Frequency	50/60 Hz
Nominal Current	100 A per phase (Single Phase) 80 A per phase (Three Phase)
Maximum Input Short Circuit Current	16 kA[1]
Overvoltage Category	Category III
AC Meter	Revenue accurate (+/– 0.2 %)
Connectivity	Ethernet, Wi-Fi, Cellular (LTE/4G)[2]
User Interface	Tesla App or Local Network Monitoring
Operating Modes	Support for solar self-consumption, time-based control, and backup
Backup Operation	Backup of selected single phase; Automatic disconnect of all phases
Modularity	Supports up to 10 AC-coupled Powerwalls
Warranty	10 years

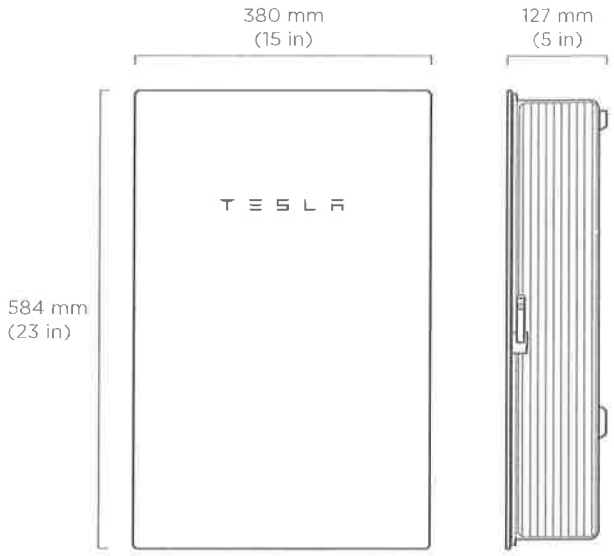
[1]16 kA rating when installed with DIN-mount fuse; 10 kA rating without fuse. 2Cellular connectivity subject to network operator service coverage and signal strength (2G-3G supported where LTE/4G unavailable).

COMPLIANCE INFORMATION

Safety	IEC-62109-1, IEC 62053-22, IEC 61439-1, IEC 61439-3
EMC and Radio Equipment	EMC Directive 2014/30/EU, Radio Equipment Directive 2014/53/EU, IEC 61000-6-1, IEC 61000-6-3, EN 55024, EN 300 328, EN 300 440, EN 301 489-1, EN 301 489-17, EN 301 489-52, EN 301 511, EN 301 893, EN 301 908-1
Environmental	RoHS Directive 2011/65/EU, WEEE Directive 2012/19/EU, Battery Directive 2006/66/EC REACH Regulation EC 1907/2006
Seismic	AC156, IEEE 693-2005 (high)

MECHANICAL SPECIFICATIONS

Dimensions	584 mm x 380 mm x 127 mm (23 in x 15 in x 5 in)
Weight	114 kg (251 lb)
Breaker space (DIN rail)	Main breaker: 1-, 2- or 3-pole Generation/Load breakers: 6 spaces
Mounting options	Wall mount



ENVIRONMENTAL SPECIFICATIONS

Operating Temperature	-20°C to 50°C (-4°F to 122°F)
Operating Humidity (RH)	Up to 100%, condensing
Maximum Elevation	3000 m (9843 ft)
Environment	Indoor and outdoor rated
Ingress Rating	IP55

City of Birmingham
A Walkable Community

MEMORANDUM

Planning Division

DATE: **January 2, 2020**

TO: **Planning Board Members**

FROM: **Nicholas Dupuis, City Planner**

APPROVED: **Jana Ecker, Planning Director**

SUBJECT: **1800 Pine – Solar Panel Installation – Design Review**

Article 4, Section 4.09 of the Zoning Ordinance requires roof-mounted solar electric systems to be located on a rear- or side-facing roof, which do not front any street, unless such installation is proven to be ineffective or impractical. If installation is not practical on a rear- or side-facing roof, any other placement in all zoning districts shall be subject to a Design Review by either the Planning Board (non-historic properties) or the Historic District Commission (historic properties).

The applicant is proposing an addition of solar panels to the street-facing front facade and the side facing façade of the non-historic home at 1800 Pine, which requires a Design Review by the Planning Board. The proposed installation will consist of 17 Panasonic 330 Watt AC solar panels on the second story roof. The solar panels are black in color with black mounting rails/hardware, are proposed to be flush-mounted, and will not project vertically above the peak of the roof to which it is attached.

1.0 Land Use and Zoning

1.1 Existing Land Use – The subject property is single-family residential.

1.2 Zoning – The property is zoned R-2 (Single-Family Residential)

1.3 Summary of Adjacent Land Use and Zoning –

	North	South	East	West
Existing Land Use	Single-Family Residential	Single-Family Residential	Single-Family Residential	Single-Family Residential
Existing Zoning District	R-2 (Single-Family Residential)	R-2 (Single-Family Residential)	R-2 (Single-Family Residential)	R-2 (Single-Family Residential)
Overlay Zoning District	N/A	N/A	N/A	N/A

2.0 Setback and Height Requirements

There are no changes proposed to the setbacks or height of the building.

3.0 Screening and Landscaping

3.1 Dumpster Screening – Not applicable.

3.2 Parking Lot Screening – Not applicable.

3.3 Mechanical Equipment Screening – Not applicable.

3.4 Landscaping – No changes proposed.

3.5 Streetscape – No changes proposed.

4.0 Parking, Loading and Circulation

4.1 Parking – No changes proposed.

4.2 Loading – Not applicable.

4.3 Vehicular Circulation and Access – No changes proposed.

4.4 Pedestrian Circulation and Access – No changes proposed.

5.0 Lighting

There are no changes in lighting associated with the proposed solar panel installation.

6.0 Departmental Reports

6.1 Engineering Division – The Engineering Division has no concerns at this time.

6.2 Department of Public Services – The Department of Public Services has no concerns at this time.

6.3 Fire Department – The Fire Department has no concerns at this time.

6.4 Police Department – The Police Department has no concerns at this time.

6.5 Building Division – As requested, the Building Department has examined the plans for the proposed project referenced above. The plans were provided to the Planning Department for site plan review purposes only and present conceptual elevations and floor plans. Although the plans lack sufficient detail to perform a code review, the following comments are offered for Planning Design Review purposes and applicant consideration:

Applicable Building Codes:

- 2015 Michigan Building Code. Applies to all buildings other than those regulated by the Michigan Residential Code.
- 2015 Michigan Residential Code. Applies to all detached one and two-family dwellings and multiple single-family dwellings (townhouses) not more than three stories in height with a separate means of egress and their accessory structures.
- 2015 Michigan Mechanical Code. (Residential requirements for mechanical
- construction in all detached one and two-family dwellings and multiple single-family dwellings (townhouses) not more than three stories in height with a separate means of egress and their accessory structures are contained in the Michigan Residential Code)
- 2015 Michigan Plumbing Code. (Residential requirements for plumbing construction in all detached one and two-family dwellings and multiple single-family dwellings (townhouses) not more than three stories in height with a separate means of egress and their accessory structures are contained in the Michigan Residential Code)
- 2017 National Electrical Code along with the Michigan Part 8 Rules. (Residential
- requirements for electrical construction in all detached one and two-family dwellings and multiple single-family dwellings (townhouses) not more than three stories in height with a separate means of egress and their accessory structures are contained in the Michigan Residential Code)

Review Comments:

- Building and electrical permits will be required for the installation of the solar panels.

7.0 Design Review

The proposed roof-mounted solar panels are made by Panasonic, and the dimensions are roughly 5 ft. x 3.5 ft. x 1.6 in. for one panel. The installation of 17 panels will be split into three separate arrays:

1. Front of house (southwest): 9 panels, 162 sq. ft.
2. Front of house (southeast): 4 panels, 72 sq. ft.
3. Rear/side of house: 4 panels, 72 sq. ft.

The panels and installation hardware are black in color. The existing roof construction on the home consists of grey/brown asphalt shingles. There will be service equipment (AC disconnect, utility meter) located on the west facade of the house, on the portion that is significantly set back from the property line.

8.0 Approval Criteria

In accordance with Article 7, section 7.09 of the Zoning Ordinance, the proposed plans for development must meet the following conditions:

1. All of the materials required by this section have been submitted for review.

2. All provisions of this Zoning Ordinance have been complied with.

3. The appearance, color, texture and materials being used will preserve property values in the immediate neighborhood and will not adversely affect any property values.

4. The appearance of the building exterior will not detract from the general harmony of and is compatible with other buildings already existing in the immediate neighborhood.

5. The appearance of the building exterior will not be garish or otherwise offensive to the sense of sight.

6. The appearance of the building exterior will tend to minimize or prevent discordant and unsightly properties in the City.

7. The total design, including but not limited to colors and materials of all walls, screens, towers, openings, windows, lighting and signs, as well as treatment to be utilized in concealing any exposed mechanical and electrical equipment, is compatible with the intent of the urban design plan or such future modifications of that plan as may be approved by the City Commission.

9.0 Recommendation

Based on a review of the plans submitted, the Planning Division finds that the proposed Design Plan meets the requirements of Article 7, section 7.09 of the Zoning Ordinance and recommends that the Planning Board **APPROVE** the Design Plan for 1800 Pine.

10.0 Sample Motion Language

Motion to **APPROVE** the Design Plan for 1800 Pine.

OR

Motion to **POSTPONE** the Design Plan for 1800 Pine, pending receipt of the following:

1._____
2._____
3._____

OR

Motion to **DENY** the Design Plan for 1800 Pine for the following reasons:

1._____
2._____
3._____

CITY OF BIRMINGHAM
Date 12/26/2019 12:39:27 PM
Ref 00165536
Receipt 518865
Amount $400.00

Bond Ref # 00165538

City of Birmingham
A Walkable Community

Final Site Plan & Design Review Application
Planning Division

Form will not be processed until it is completely filled out.

1. Applicant
Name: Lauren Sonk
Address: 4023 South Old US 23, Suite #115
Brighton, MI 48114
Phone Number: 866 633 8553
Fax Number: 810 225 9932
Email address: permitting@thegreenpanel.com

2. Property Owner
Name: David Williams
Address: 1800 Pine St
Birmingham, MI 48009
Phone Number: 248 229 8395
Fax Number: 810 225 9932
Email address: dayanddebby@wowway.com

3. Applicant's Attorney/Contact Person
Name: Same as applicant
Address:
Phone Number:
Fax Number:
Email address:

4. Project Designer/Developer
Name: The Green Panel, Inc
Address: 4023 S Old US 23, Suite #115
Brighton, MI 48114
Phone Number: 866 633 8553
Fax Number: 810 225 8553
Email address: permitting@thegreenpanel.com

5. Required Attachments
I. Two (2) paper copies and one (1) digital copy of all project plans including:
   i. A detailed Existing Conditions Plan including the subject site in its entirety, including all property lines, buildings, structures, curb cuts, sidewalks, drives, ramps and all parking on site and on the street(s) adjacent to the site, and must show the same detail for all adjacent properties within 200 ft. of the subject sites property lines;
   ii. A detailed and scaled Site Plan depicting accurately and in detail the proposed construction, alteration or repair;
   iii. A certified Land Survey;
   iv. Interior floor plans;
   v. A Landscape Plan;
   vi. A Photometric Plan;
   vii. Colored elevation drawings for each building elevation;

II. Specification sheets for all proposed materials, light fixtures and mechanical equipment;
III. Samples of all proposed materials;
IV. Photographs of existing conditions on the site including all structures, parking areas, landscaping and adjacent structures;
V. Current aerial photographs of the site and surrounding properties;
VI. Warranty Deed, or Consent of Property Owner if applicant is not the owner;
VII. Any other data requested by the Planning Board, Planning Department, or other City Departments.

6. Project Information
Address/Location of the property: 1800 Pine St
Birmingham, MI 48009
Name of development:
Sidwell #:
Current Use:
Proposed Use:
Area of Site in Acres:
Current zoning:
Is the property located in the floodplain?
Name of Historic District Site is Located in:
Date of Historic District Commission Approval:

Date of Application for Preliminary Site Plan:
Date of Preliminary Site Plan Approval:
Date of Application for Final Site Plan:
Date of Final Site Plan Approval:
Date of Application for Revised Final Site Plan:
Date of Revised Final Site Plan Approval:
Date of Design Review Board Approval:
Will proposed project require the division of platted lots? ___
Will proposed project require the combination of platted lots?

7. Details of the Proposed Development (attach separate sheet if necessary)

5.61kW rooftop solar array
(17) Panasonic 330W AC Panels, built-in microinverters

8. Buildings and Structures

Number of Buildings on Site: 1
Height of Buildings & # of Stories:
Use of Buildings: Residential
Height of Rooftop Mechanical Equipment:

9. Floor Use and Area (in Square Feet)

Proposed Commercial Structures:

Total basement floor area:
Number of square feet per upper floor:
Total floor area:
Floor area ratio (total floor area ÷ total land area):
Open space:
Percent of open space:
Office Space:
Retail Space:
Industrial Space:
Assembly Space:
Seating Capacity:
Maximum Occupancy Load:

Proposed Residential Structures:

Total number of units:
Number of one bedroom units:
Number of two bedroom units:
Number of three bedroom units:
Open space:
Percent of open space:
Rental units or condominiums?
Size of one bedroom units:
Size of two bedroom units:
Size of three bedroom units:
Seating Capacity:
Maximum Occupancy Load:

Proposed Additions:

Total basement floor area, if any, of addition:
Number of floors to be added:
Square footage added per floor:
Total building floor area (including addition):
Floor area ratio (total floor area ÷ total land area):
Open Space:
Percent of open space:
Use of addition:
Height of addition:
Office space in addition:
Retail space in addition:
Industrial space in addition:
Assembly space in addition:
Maximum building occupancy load (including addition):

10. Required and Proposed Setbacks

Required front setback:
Required rear setback:
Required total side setback:
Side setback:
Proposed front setback:
Proposed rear setback
Proposed total side setback:
Second side setback:

11. Required and Proposed Parking

Required number of parking spaces:
Typical angle of parking spaces:
Typical width of maneuvering lanes:
Location of parking on site:
Location of parking off site:
Number of light standards in parking area:
Screenwall material:
Proposed number of parking spaces:
Typical size of parking spaces:
Number of spaces <180 sq. ft.:
Number of handicap spaces:
Shared parking agreement?
Height of light standards in parking area:
Height of screenwall:

12. Landscaping

Location of landscape areas:

Proposed landscape material:

13. Streetscape

Sidewalk width:
Number of benches:
Number of planters:
Number of existing street trees:
Number of proposed street trees:
Streetscape Plan submitted?

Description of benches or planters:
Species of existing trees:
Species of proposed trees:

14. Loading

Required number of loading spaces:
Typical angle of loading spaces:
Screenwall material:
Location of loading spaces on site:

Proposed number of loading spaces:
Typical size of loading spaces:
Height of screenwall:
Typical time loading spaces are used:

15. Exterior Waste Receptacles

Required number of waste receptacles:
Location of waste receptacles:
Screenwall material:

Proposed number of waste receptacles:
Size of waste receptacles:
Height of screenwall:

16. Mechanical Equipment

Utilities and Transformers:

Number of ground mounted transformers:
Size of transformers (L•W•H):
Number of utility easements:
Screenwall material:

Location of all utilities & easements:
Height of screenwall:

Ground Mounted Mechanical Equipment:

Number of ground mounted units:
Size of ground mounted units (L•W•H):
Screenwall material:

Location of all ground mounted units:
Height of screenwall:

Rooftop Mechanical Equipment:

Number of rooftop units: (17) Solar Panels
Type of rooftop units: Panasonic 330W AC Panels
Screenwall material:
Location of screenwall:

Location of all rooftop units:
Size of rooftop units (L•W•H): 27' x 7.5' x 5" and 10' x 7.5; x 5"
Percentage of rooftop covered by mechanical units:
Height of screenwall:
Distance from rooftop units to all screenwalls:

17. Accessory Buildings

Number of accessory buildings:
Location of accessory buildings:

Size of accessory buildings:
Height of accessory buildings:

18. Building Lighting

Number of light standards on building:
Size of light fixtures (L•W•H):

Type of light standards on building:
Height from grade:

Maximum wattage per fixture:_____ Proposed wattage per fixture:_____
Light level at each property line:_____

19. Site Lighting

Number of light fixtures:_____ Type of light fixtures:_____
Size of light fixtures (L•W•H):_____ Height from grade:_____
Maximum wattage per fixture:_____ Proposed wattage per fixture:_____
Light level at each property line:_____ Holiday tree lighting receptacles:_____

20. Adjacent Properties

Number of properties within 200 ft.:_____

Property #1

Number of buildings on site:_____ Property Description:_____
Zoning district:_____
Use type:_____
Square footage of principal building:_____
Square footage of accessory buildings:_____
Number of parking spaces:_____ North, south, east or west of property? _____

Property #2

Number of buildings on site:_____ Property Description:_____
Zoning district:_____
Use type:_____
Square footage of principal building:_____
Square footage of accessory buildings:_____
Number of parking spaces:_____ North, south, east or west of property? _____

Property #3

Number of buildings on site:_____ Property Description:_____
Zoning district:_____
Use type:_____
Square footage of principal building:_____
Square footage of accessory buildings:_____
Number of parking spaces:_____ North, south, east or west of property? _____

Property #4

Number of buildings on site:_____ Property Description:_____
Zoning district:_____
Use type:_____
Square footage of principal building:_____
Square footage of accessory buildings:_____
Number of parking spaces:_____ North, south, east or west of property? _____

Property #5

Number of buildings on site:_____ Property Description:_____
Zoning district:_____
Use type:_____
Square footage of principal building:_____
Square footage of accessory buildings:_____
Number of parking spaces:_____ North, south, east or west of property? _____

Property #6

Number of buildings on site:_____ Property Description:_____
Zoning district:_____
Use type:_____
Square footage of principal building:_____
Square footage of accessory buildings:_____
Number of parking spaces:_____ North, south, east or west of property? _____

The undersigned states the above information is true and correct, and understands that it is the responsibility of the applicant to advise the Planning Division and / or Building Division of any additional changes made to an approved site plan. The undersigned further states that they have reviewed the procedures and guidelines for Site Plan Review in Birmingham, and have complied with same. The undersigned will be in attendance at the Planning Board meeting when this application will be discussed.

By providing your e-mail to the City, you agree to receive news notifications from the City. If you do not wish to receive these messages, you may unsubscribe at any time.

Signature of Owner: _____ Date: _____

Print Name: _____

Signature of Applicant: Lauren Sonk Date: 12/12/2019

Print Name: Lauren Sonk

Signature of Architect: _____ Date: _____

Print Name: _____

Office Use Only

Application #: PFSP 19-0008 Date Received: 12/12/19 Fee: $500.00

Date of Approval: _____ Date of Denial: _____ Accepted by: _____

City of Birmingham
A Walkable Community

CONSENT OF PROPERTY OWNER

I, David Williams (Name of property owner), OF THE STATE OF Michigan AND COUNTY OF Oakland STATE THE FOLLOWING:

1. That I am the owner of the real estate located at 1800 Pine St. (Address of affected property);
2. That I have read and examined the Application made to the City of Birmingham by: Lauren Sonk (Name of applicant);
3. That I have no objections to, and consent to the request(s) described in the Application made to the City of Birmingham.

Dated: 12/12/2019

David Williams
Owner's Name (Please Print)

Owner's Signature

RECEIVED
DEC 16 2019
CITY OF BIRMINGHAM
COMMUNITY DEVELOPMENT DEPT.

City of Birmingham
A Walkable Community

Notice Sign Rental Application

Community Development

1. Applicant

Name: Lauren Sonk
Address: 4023 S Old US 23, Suite #115
Brighton, MI 48114
Phone Number: 866 633 8553
Fax Number: 810 225 9932
Email address: permitting@thegreenpanel.com

2. Property Owner

Name: David Williams
Address: 1800 Pine St
Birmingham, MI 48009
Phone Number: 248 229 8395
Fax Number: 810 225 9932
Email address: dayanddebby@wowway.com

3. Project Information

Address/Location of Property: 1800 Pine St Birmingham, MI 48009
Name of Development:
Area in Acres:

Name of Historic District, if any:
Current Use: Residential
Current Zoning: Residential

4. Date of Board/Commission Review

City Commission:
Planning Board:
Historic District Commission:
Design Review Board:

Board of Zoning Appeals:
Board of Building Trades Appeals:
Housing Board of Appeals:
Other:

The undersigned states the above information is true and correct, and understands that it is the responsibility of the applicant to post the Notice Sign(s) at least 15 days prior to the date on which the project will be reviewed by the appropriate board or commission, and to ensure that the Notice Sign(s) remains posted during the entire 15 day mandatory posting period. The undersigned further agrees to pay a rental fee and security deposit for the Notice Sign(s), and to remove all such signs on the day immediately following the date of the hearing at which the project was reviewed. The security deposit will be refunded when the Notice Sign(s) are returned undamaged to the Community Development Department. Failure to return the Notice Sign(s) and/or damage to the Notice Sign(s) will result in forfeiture of the security deposit.

Signature of Applicant: Lauren Sonk **Date:** 12/16/2019

Office Use Only

Application#: Date Received: Fee:

Date of Approval: Date of Denial: Reviewed By:

The Green Panel, Inc.

Created for: David Williams
1800 Pine St
Birmingham, MI 48009, USA
248.229.8395 | dayanddebby@wowway.com

CUSTOMER SIGNATURE

I hereby agree to move forward with the solar project as described above and agree to terms of the contract provided by the installer, The Green Panel, Inc., joined to this proposal.

David Williams

11/12/19

Date of Signature (MM/DD/YY)

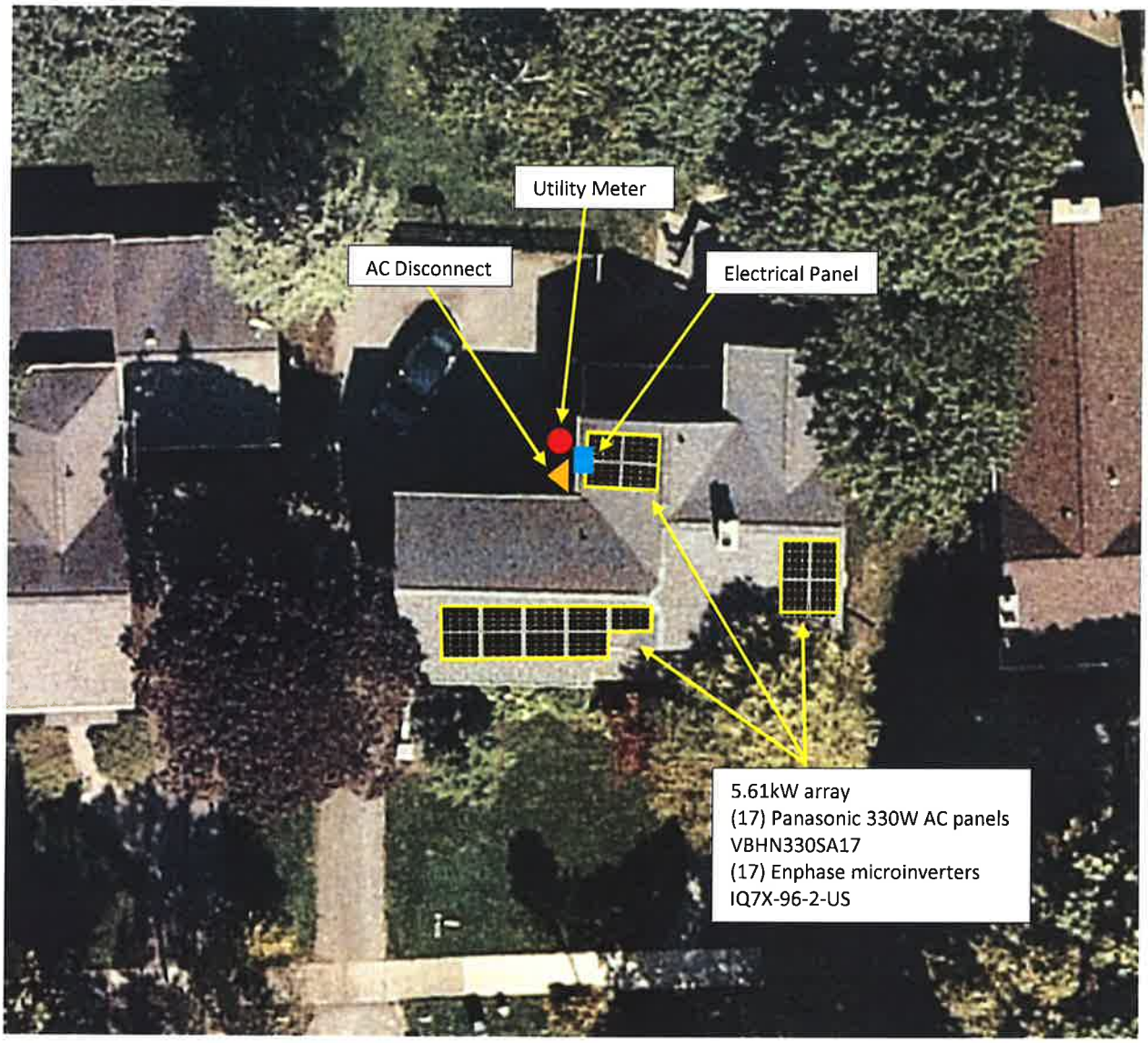
The Green Panel, Inc.

11/22/2019

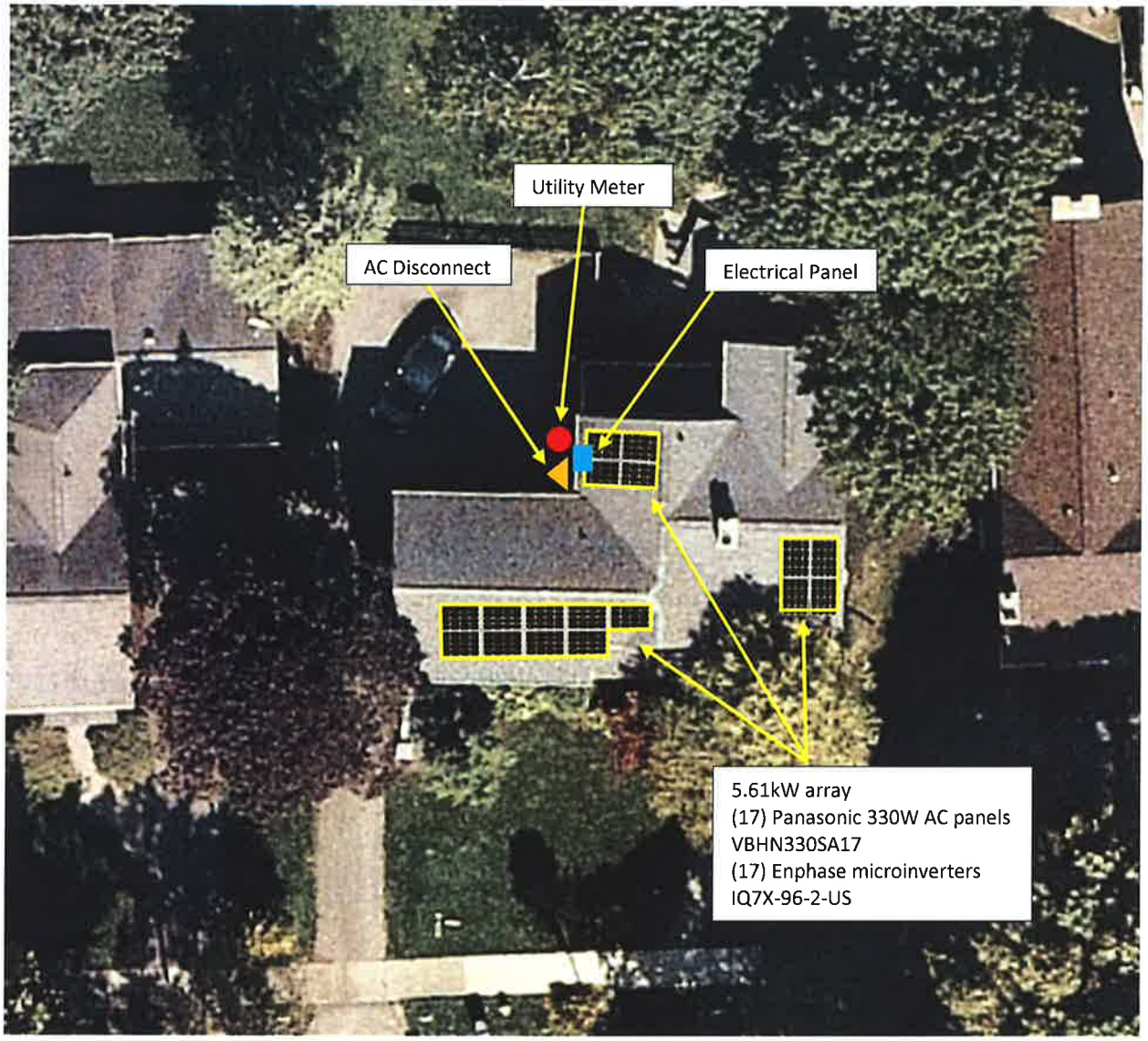
Date of Signature (MM/DD/YY)

YOUR REPRESENTATIVE

Eric Roberts
Email: eroberts@thegreenpanel.com



David W Williams
1800 Pine St
Birmingham, MI 48009-1165
Created by: The Green Panel, Inc
11/21/2019



David W Williams
1800 Pine St
Birmingham, MI 48009-1165
Created by: The Green Panel, Inc
11/21/2019

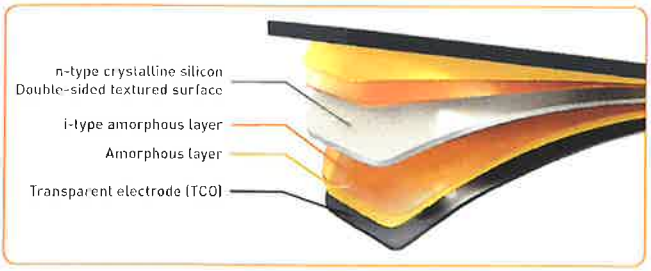
HIT®
Photovoltaic Module

Panasonic

N330E AC MODULE

Panasonic HIT® AC Modules combine the efficiency of HIT® solar panels with the intelligence of seventh-generation Enphase IQ 7X Microinverters. Delivers a smart grid-ready module with high efficiency and high power output for residential solar systems.

HIT® heterojunction technology uses dual ultra-thin amorphous silicon layers which reduce electron losses and produce greater power output than conventional panels.



MADE IN USA
FROM IMPORTED PARTS

The Panasonic HIT® Advantage

High Efficiency at High Temperatures
As temperature increases, HIT® continues to perform at high levels due to the industry leading temperature coefficient of -0.258% /ºC. No other module comes close to our temperature characteristics. That means more energy throughout the day.

TripleGuard 25-Year Warranty**
TripleGuard covers your solar panel system's performance, workmanship, parts, and labor for 25 years**. Whether in year three or year 25, rest assured your Panasonic warranty protection will be there when you need it.

Quality and Reliability
Panasonic's vertical integration, over 20 years of experience manufacturing HIT® and 20 internal tests beyond those mandated by current standards provides extreme quality assurance.

Higher Efficiency 19.7%
Enables higher power output and greater energy yields. HIT® provides maximum production for your limited roof space.

Low Degradation
HIT "N-type" cells result in extremely Low Light Induced Degradation (LID) and zero Potential Induced Degradation (PID) which supports reliability and longevity. This technology reduces annual degradation to 0.26% compare to 0.70% in conventional panels, guaranteeing more power for the long haul.

Enhanced Frame Design
A 40mm frame increases durability and strength, handling loads of up to 5400Pa. A special water drainage system prevents rain water accumulation and eliminates water stains from the panel surface, allowing optimal sunlight penetration and panel efficiency.

HIT®
Photovoltaic Module

Panasonic

N330E AC MODULE

AC ELECTRICAL SPECIFICATIONS

Peak Power Output	320VA
Maximum Continuous Output Power	315VA
Nominal (L-L) voltage/range[1]	240V / 211 – 264V
Maximum Continous Output Current	1.31A @ 240VAC / 1.51A @ 208VAC
Maximum Units per 20 A (L-L) branch circuit	12 @ 240VAC / 10 @ 208VAC
Nominal Frequency	60Hz
Extended Frequency Range	47 – 68Hz
AC Short Circuit Fault Current Over 3 Cycles	5.8Arms
Overvoltage Class AC Port	III
AC Port Backfeed Current	0A
Power Factor Setting	1.0
Power Factor (adjustable)	0.7 leading / 0.7 lagging
CEC Weighted Efficiency	97.5% @ 240V / 96.5% @ 208V

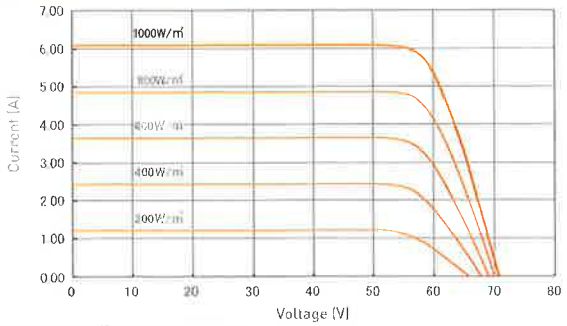
DC ELECTRICAL SPECIFICATIONS

Rated Power (Pmax)[1]	330W
Temperature Coefficient (Pmax)	-0.258%/°C
CEC PTC Rating	311.7W
CEC PTC to STC Ratio	94.45%
Cell Efficiency	22.09%
Module Efficiency	19.7%
Watts per Ft.²	18.3W
Warranted Tolerance (-/+)	+10%/-0%*

FEATURES

Communication	Power Line Communication (PLC)
Communication	Enlighten Manager and MyEnlighten monitoring options. Compatible with Enphase IQ Envoy
Disconnecting means	The AC and DC connectors have been evaluated and approved by UL for use as the load-break disconnect required by NEC 690.
Compliance	CA Rule 21 UL 62109-1, UL1741/IEEE1547, FCC Part 15 Class B, ICES-0003 Class B, CAN/CSA-C22.2 NO. 107.1-01 Safety & Rating Certifications UL 1703, UL 1741, CEC This product is UL Listed as PV Rapid Shut Down Equipment and conforms with NEC-2014 and NEC-2017 section 690.12 and C22.1-2015 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors, when installed according to manufacturer's instructions

DEPENDENCE ON IRRADIANCE



Reference data for model: VBHN330SA17
(Cell temperature: 25°C)

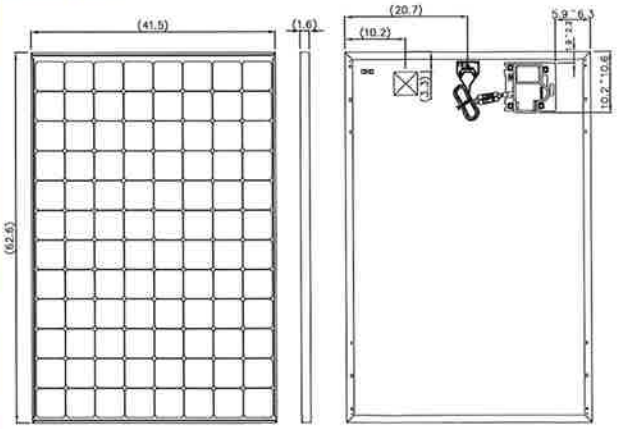
MECHANICAL SPECIFICATIONS

Internal Bypass Diodes	4 Bypass Diodes
Module Area	18.02 Ft.² (1.67m²)
Weight	42.99 Lbs. (19.5kg)
Dimensions LxWxH	62.6x41.5x1.6 in. (1590x1053x40 mm)
Static Wind / Snow Load	112 PSF (5400Pa)
Pallet Dimensions LxWxH	65.3 x 43.7 x 48.5 in.
Quantity per Pallet / Pallet Weight	24 pcs./1098 Lbs. (498 kg)
Quantity per 40' Container	672 pcs.
Quantity per 20' Container	288 pcs.

OPERATING CONDITIONS & SAFETY RATINGS

Operating Temperature	-22°F to 185°F (-30°C to 85°C)
Hail Safety Impact Velocity	1" hailstone (25mm) at 52 mph (23m/s)
UL 1703 Fire Classification	Type 2
Limited Warranty	Module and Microinverter: 25** Yrs Workmanship, Materials and Power Output (Linear)***
Manufacturing Locations	USA

DIMENSIONS



NOTE: Standard Test Conditions: Air mass 1.5; irradiance = 1000W/m²; cell temp. 25°C
* Maximum power at delivery. For guarantee conditions, please check our guarantee document.
** Equipment must be installed by Panasonic Authorized or Premium installer and registered through our website www.panasonicusahitwarranty.com within 60 days in order to receive twenty-five (25) year product and labor
*** DC Warranty Performance: 1st year 97%, after 2nd year 0.26% annual degradation to year 25.
[1] Nominal voltage range can be extended beyond nominal if required by the utility.
[2] Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.
[3] Microinverter warranty provided by Panasonic.
[4] STC: Cell temp. 25°C, AM1.5, 1000W/m²
[5] Safety locking clip (PV-SSH4) is not supplied with the module.
NOTE: Specifications and information above may change without notice.

GRID SUPPORT UTILITY INTERACTIVE AC MODULE WITH RAPID SHUTDOWN FUNCTIONALITY E502579
LISTED
Module Fire Performance Type2

⚠ CAUTION! Please read the installation manual carefully before using the products.

Used electrical and electronic products must not be mixed with general household waste. For proper treatment, recovery and recycling of old products, please take them to applicable collection points in accordance with your national legislation

Panasonic

Panasonic Life Solutions Company of America
Two Riverfront Plaza, 5th Floor, Newark, NJ 07102
panasonicHIT@us.panasonic.com
na.panasonic.com/us/solar

RS1900BSS_R13

Enphase IQ 7X Microinverter

The high-powered smart grid-ready Enphase IQ 7X Micro™ dramatically simplifies the installation process while achieving the highest system efficiency for systems with 96-cell modules.

Part of the Enphase IQ System, the IQ 7X Micro integrates with the Enphase IQ Envoy™, Enphase IQ Battery™, and the Enphase Enlighten™ monitoring and analysis software.

The IQ Series Microinverters extend the reliability standards set forth by previous generations and undergo over a million hours of power-on testing, enabling Enphase to provide an industry-leading warranty of up to 25 years.

Easy to Install

- Lightweight and simple
- Faster installation with improved, lighter two-wire cabling
- Built-in rapid shutdown compliant (NEC 2014 & 2017)

Efficient and Reliable

- Optimized for high powered 96-cell* modules
- Highest CEC efficiency of 97.5%
- More than a million hours of testing
- Class II double-insulated enclosure
- UL listed

Smart Grid Ready

- Complies with advanced grid support, voltage and frequency ride-through requirements
- Remotely updates to respond to changing grid requirements
- Configurable for varying grid profiles
- Meets CA Rule 21 (UL 1741-SA)

* The IQ 7X is required to support 96-cell modules.

UL CERTIFIED SAFETY US-CA E341165

To learn more about Enphase offerings, visit **enphase.com**

ENPHASE

Enphase IQ 7X Microinverter

INPUT DATA (DC)	IQ7X-96-2-US	
Commonly used module pairings[1]	320 W - 460 W +	
Module compatibility	96-cell PV modules	
Maximum input DC voltage	79.5 V	
Peak power tracking voltage	53 V - 64 V	
Operating range	25 V - 79.5 V	
Min/Max start voltage	33 V / 79.5 V	
Max DC short circuit current (module Isc)	10 A	
Overvoltage class DC port	II	
DC port backfeed current	0 A	
PV array configuration	1 x 1 ungrounded array; No additional DC side protection required; AC side protection requires max 20A per branch circuit	
OUTPUT DATA (AC)	**@ 240 VAC**	**@ 208 VAC**
Peak output power	320 VA	
Maximum continuous output power	315 VA	
Nominal (L-L) voltage/range[2]	240 V / 211-264 V	208 V / 183-229 V
Maximum continuous output current	1.31 A (240 VAC)	1.51 A (208 VAC)
Nominal frequency	60 Hz	
Extended frequency range	47 - 68 Hz	
AC short circuit fault current over 3 cycles	5.8 Arms	
Maximum units per 20 A (L-L) branch circuit[3]	12 (240 VAC)	10 (208 VAC)
Overvoltage class AC port	III	
AC port backfeed current	18 mA	
Power factor setting	1.0	
Power factor (adjustable)	0.85 leading ... 0.85 lagging	
EFFICIENCY	**@240 VAC**	**@208 VAC**
CEC weighted efficiency	97.5 %	97.0 %
MECHANICAL DATA		
Ambient temperature range	-40°C to +60°C	
Relative humidity range	4% to 100% (condensing)	
Connector type (IQ7X-96-2-US)	MC4 (or Amphenol H4 UTX with optional Q-DCC-5 adapter)	
Dimensions (WxHxD)	212 mm x 175 mm x 30.2 mm (without bracket)	
Weight	1.08 kg (2.38 lbs)	
Cooling	Natural convection - No fans	
Approved for wet locations	Yes	
Pollution degree	PD3	
Enclosure	Class II double-insulated, corrosion resistant polymeric enclosure	
Environmental category / UV exposure rating	NEMA Type 6 / outdoor	
FEATURES		
Communication	Power Line Communication (PLC)	
Monitoring	Enlighten Manager and MyEnlighten monitoring options Compatible with Enphase IQ Envoy	
Disconnecting means	The AC and DC connectors have been evaluated and approved by UL for use as the load-break disconnect required by NEC 690.	
Compliance	CA Rule 21 (UL 1741-SA) UL 62109-1, UL1741/IEEE1547, FCC Part 15 Class B, ICES-0003 Class B, CAN/CSA-C22.2 NO. 107.1-01 This product is UL Listed as PV Rapid Shut Down Equipment and conforms with NEC-2014 and NEC-2017 section 690.12 and C22.1-2015 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors, when installed according manufacturer's instructions.	

1. No enforced DC/AC ratio. See the compatibility calculator at https://enphase.com/en-us/support/module-compatibility.
2. Nominal voltage range can be extended beyond nominal if required by the utility.
3. Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.

To learn more about Enphase offerings, visit **enphase.com**

ENPHASE

2019-3-26

Tech Brief

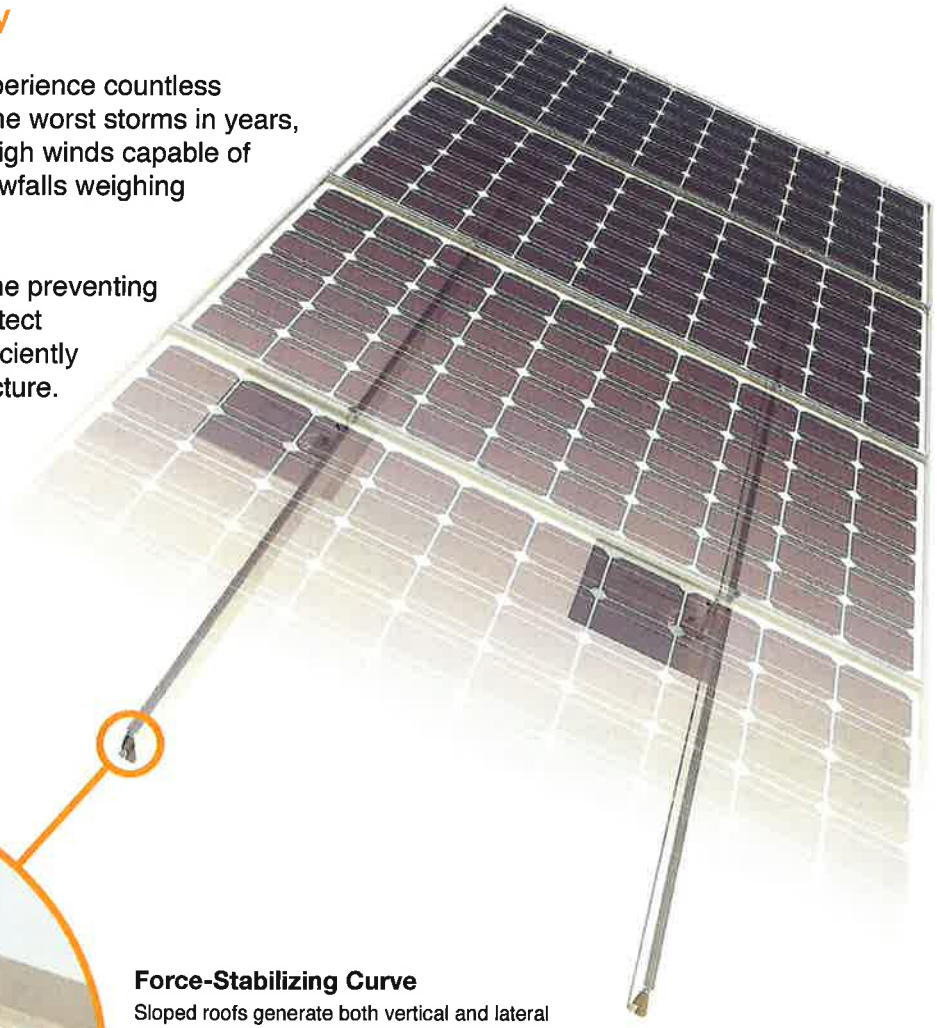
IRONRIDGE

XR Rail Family

Solar Is Not Always Sunny

Over their lifetime, solar panels experience countless extreme weather events. Not just the worst storms in years, but the worst storms in 40 years. High winds capable of ripping panels from a roof, and snowfalls weighing enough to buckle a panel frame.

XR Rails are the structural backbone preventing these results. They resist uplift, protect against buckling and safely and efficiently transfer loads into the building structure. Their superior spanning capability requires fewer roof attachments, reducing the number of roof penetrations and the amount of installation time.



Force-Stabilizing Curve

Sloped roofs generate both vertical and lateral forces on mounting rails which can cause them to bend and twist. The curved shape of XR Rails is specially designed to increase strength in both directions while resisting the twisting. This unique feature ensures greater security during extreme weather and a longer system lifetime.

Compatible with Flat & Pitched Roofs

XR Rails are compatible with FlashFoot and other pitched roof attachments.

IronRidge offers a range of tilt leg options for flat roof mounting applications.

Corrosion-Resistant Materials

All XR Rails are made of 6000-series aluminum alloy, then protected with an anodized finish. Anodizing prevents surface and structural corrosion, while also providing a more attractive appearance.

XR Rail Family

The XR Rail Family offers the strength of a curved rail in three targeted sizes. Each size supports specific design loads, while minimizing material costs. Depending on your location, there is an XR Rail to match.

XR10

XR10 is a sleek, low-profile mounting rail, designed for regions with light or no snow. It achieves 6 foot spans, while remaining light and economical.

- 6' spanning capability
- Moderate load capability
- Clear & black anodized finish
- Internal splices available

XR100

XR100 is the ultimate residential mounting rail. It supports a range of wind and snow conditions, while also maximizing spans up to 8 feet.

- 8' spanning capability
- Heavy load capability
- Clear & black anodized finish
- Internal splices available

XR1000

XR1000 is a heavyweight among solar mounting rails. It's built to handle extreme climates and spans 12 feet or more for commercial applications.

- 12' spanning capability
- Extreme load capability
- Clear anodized finish
- Internal splices available

Rail Selection

The following table was prepared in compliance with applicable engineering codes and standards. Values are based on the following criteria: ASCE 7-10, Roof Zone 1, Exposure B, Roof Slope of 7 to 27 degrees and Mean Building Height of 30 ft. Visit IronRidge.com for detailed span tables and certifications.

Load		Rail Span					
Snow (PSF)	Wind (MPH)	4'	5' 4"	6'	8'	10'	12'
None	100	XR10		XR100		XR1000	
	120						
	140						
	160						
10-20	100						
	120						
	140						
	160						
30	100						
	160						
40	100						
	160						
50-70	160						
80-90	160						

RT-MINI

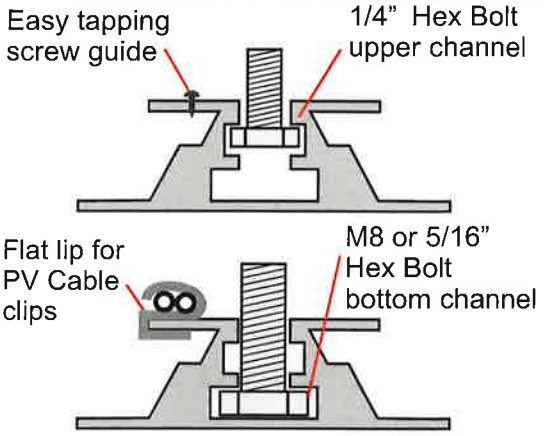
Self-flashing base for asphalt & metal roof-top PV mounting systems

RT-MINI is suitable for mounting any rail system with a conventional L-Foot.

Dual bolt design: M8 or 5/16" for L-Foot & 1/4" for EMC

ICC ES®

ICC ESR 3575



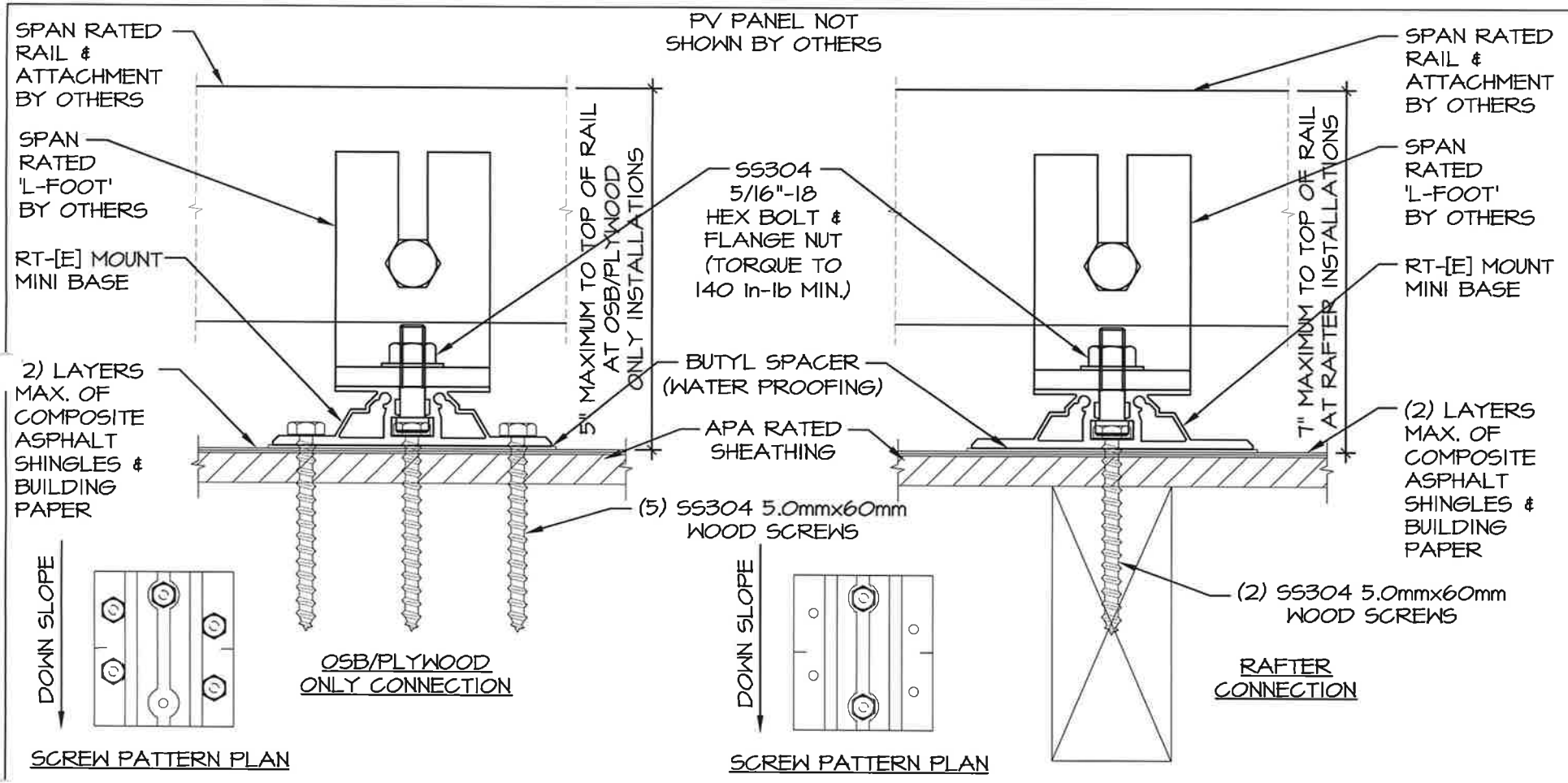
Call Now for more details

858-935-6064

Roof Tech

Smarter PV mounting solutions from top of roof to bottom line®

www.roof-tech.us info@roof-tech.us



1 'RAIL OPTION' - RAIL AND 'L-FOOT' ORIENTATION

SCALE: N.T.S.

Starling Madison Lofquist, Inc.
5224 S. 39th Street
Phoenix, Arizona 85040
(602) 438-2500
fax. (602) 438-2505

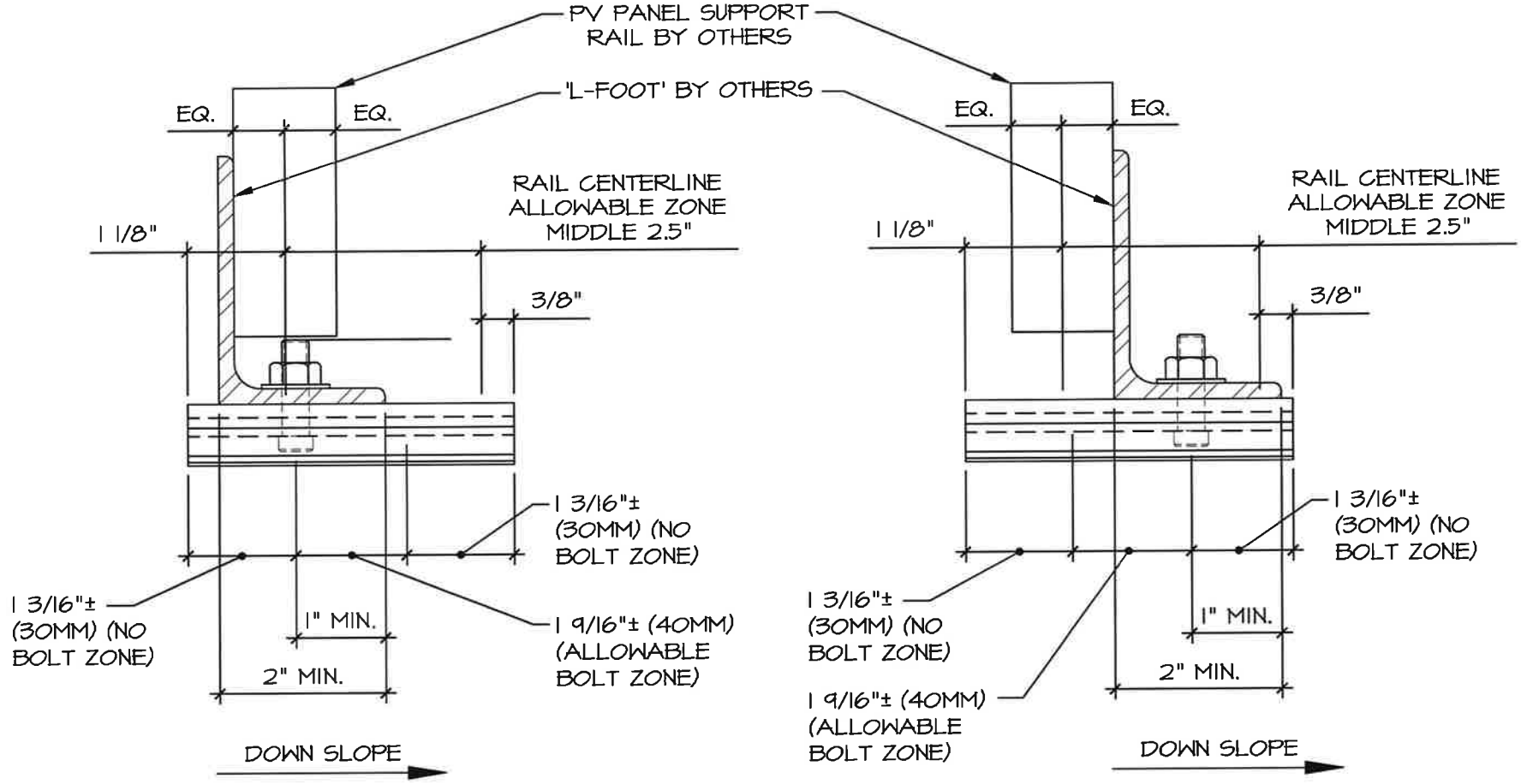
Consulting Structural and Forensic Engineers

DRAWN BY:	J.S.	DATE:	7-3-18
DESIGNED BY:	D.H.	JOB NO:	471-13

ROOF TECH
RT-[E] MOUNT MINI + RAIL
STRUCTURAL ANALYSIS

ROOF TECH, INC.
333 H STREET, SUITE 5000
CHULA VISTA, CA 91910

EXHIBIT A
1 OF 4



2 'RAIL OPTION' - RAIL AND 'L-FOOT' ORIENTATION

SCALE: N.T.S.

Starling Madison Lofquist, Inc.
5224 S. 39th Street
Phoenix, Arizona 85040
(602) 438-2500
fax. (602) 438-2505

Consulting Structural and Forensic Engineers

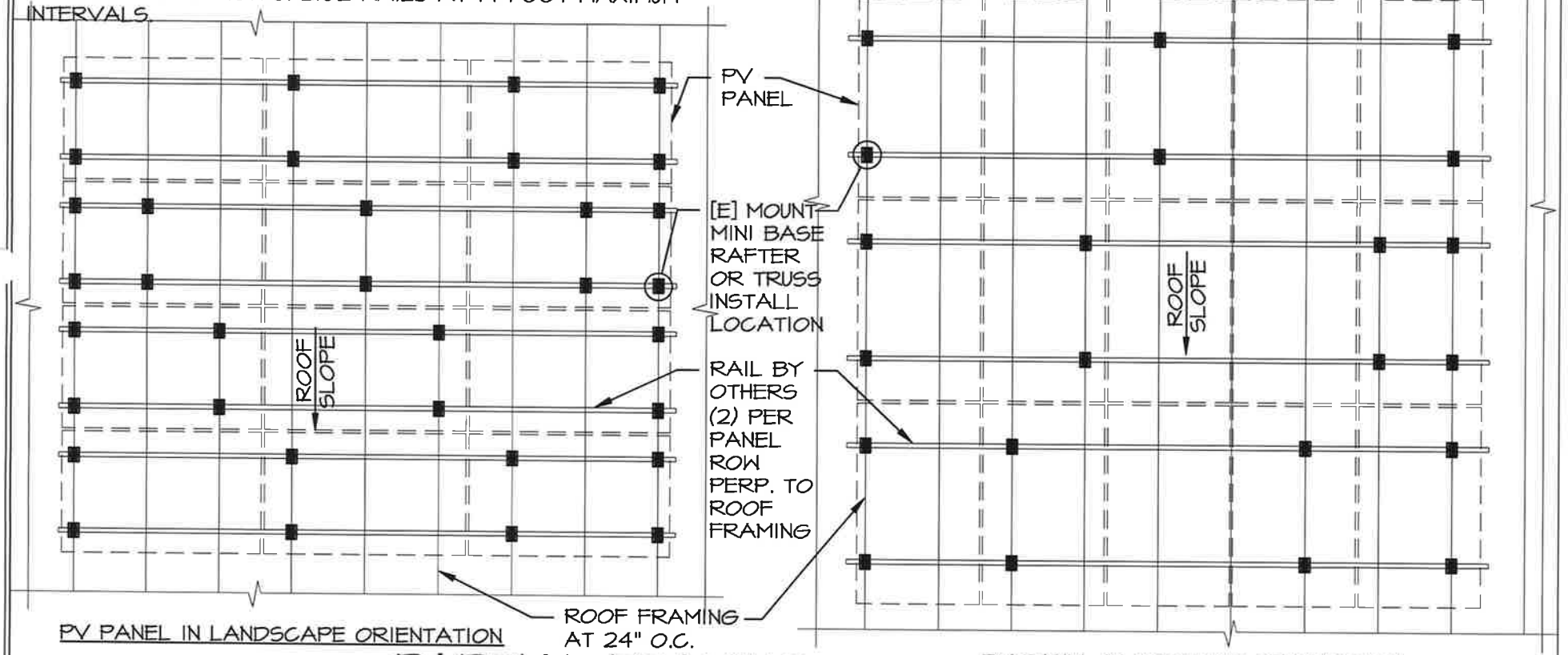
DRAWN BY:	J.S.	DATE:	7-3-18
DESIGNED BY:	D.H.	JOB NO:	471-13

ROOF TECH
RT-[E] MOUNT MINI + RAIL
STRUCTURAL ANALYSIS

ROOF TECH, INC.
333 H STREET, SUITE 5000
CHULA VISTA, CA 91910

EXHIBIT A
2 OF 4

NOTE: [E] MOUNT MINI BASE TO BE ORIENTED WITH LONG DIRECTION DOWN ROOF SLOPE AS SHOWN. SKIP LOAD ROOF WHERE POSSIBLE TO EVENLY DISTRIBUTE LOAD TO ROOF FRAMING.
THERMAL EXPANSION SPLICE RAILS AT 14 FOOT MAXIMUM INTERVALS.



3 PARTIAL FRAMING PLAN (RAFTER INSTALLATION)

SCALE: N.T.S.

SML

Starling Madison Lofquist, Inc.
5224 S. 39th Street
Phoenix, Arizona 85040
(602) 438-2500
fax. (602) 438-2505

Consulting Structural and Forensic Engineers

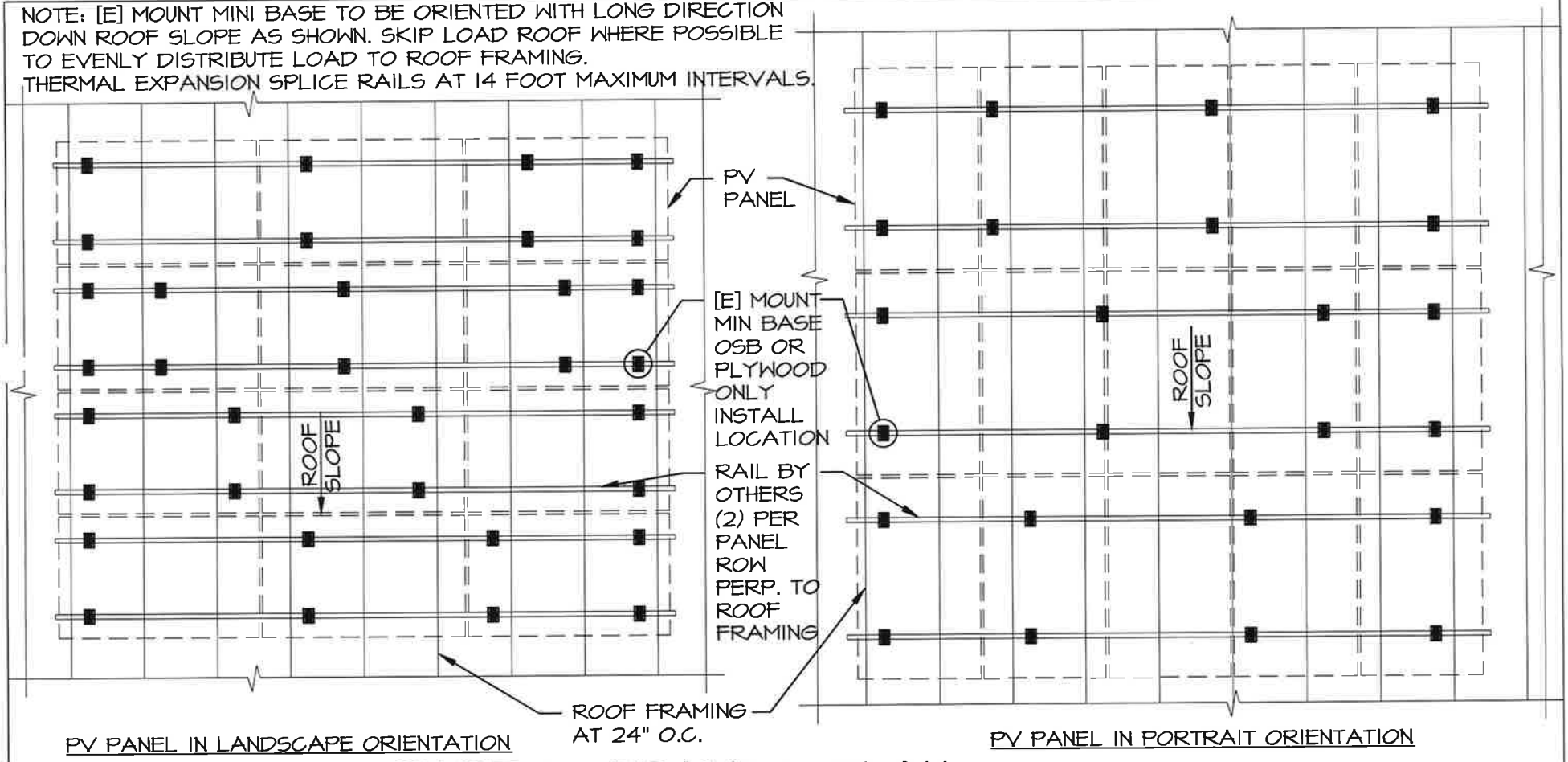
DRAWN BY:	J.S.	DATE:	7-3-18
DESIGNED BY:	D.H.	JOB NO:	471-13

ROOF TECH
RT-[E] MOUNT MINI + RAIL
STRUCTURAL ANALYSIS

ROOF TECH, INC.
333 H STREET, SUITE 5000
CHULA VISTA, CA 91910

EXHIBIT A
3 OF 4

NOTE: [E] MOUNT MINI BASE TO BE ORIENTED WITH LONG DIRECTION DOWN ROOF SLOPE AS SHOWN. SKIP LOAD ROOF WHERE POSSIBLE TO EVENLY DISTRIBUTE LOAD TO ROOF FRAMING.
THERMAL EXPANSION SPLICE RAILS AT 14 FOOT MAXIMUM INTERVALS.



4 PARTIAL FRAMING PLAN (OSB/PLYWOOD ONLY INSTALLATION)

SCALE: N.T.S.

SML
Consulting Structural and Forensic Engineers

Starling Madison Lofquist, Inc.
5224 S. 39th Street
Phoenix, Arizona 85040
(602) 438-2500
fax. (602) 438-2505

DRAWN BY:	J.S.	DATE:	7-3-18
DESIGNED BY:	D.H.	JOB NO:	471-13

ROOF TECH
RT-[E] MOUNT MINI + RAIL
STRUCTURAL ANALYSIS

ROOF TECH, INC.
333 H STREET, SUITE 5000
CHULA VISTA, CA 91910

EXHIBIT A
4 OF 4

FLEIS&VANDENBRINK
DESIGN. BUILD. OPERATE.

January 6, 2020

VIA EMAIL

Ms. Jana L. Ecker
Planning Director
City of Birmingham
151 Martin Street, P.O. Box 3001
Birmingham, MI 48012

RE: 770 S. Adams, Birmingham, MI
Site Plan and Traffic Impact Study Review

Dear Ms. Ecker:

Fleis & VandenBrink (F&V) staff have completed our review of 770 S. Adams Preliminary Site Plan and the revised Traffic Impact dated December 20, 2019 which was received by F&V on January 3, 2020. Based on our review of the TIS we have the following comments and observations.

1. Rowe PSC completed a Traffic Analysis which included the Form A – Transportation Study Questionnaire. Some of the data shown on the preliminary site plan is not consistent with the data on Form A; however, the impact of these inconsistencies does not impact the results of the traffic study. Prior to final site plan approval the correct values should be provided.

Variable	Form A	Preliminary Site Plan
Parking Spaces	113 spaces	110 spaces
Retail Square Footage	2,090 SF	2,100 SF

2. The trip generation table presented in Table 1 of the TIS does not have the correct values for the projected daily trip generation for the proposed retail land use (shown in the TIS 1,577, correct value 433). The correct trip generation comparison table is provided below. The discrepancy in the values does not affect the results of the traffic study, and no changes are required to the TIS to address this error.

Scenario	Land Use	ITE Code	Size	Unit	Average Daily Traffic (vpd)	AM Peak Hour (vph)			PM Peak Hour (vph)		
						In	Out	Total	In	Out	Total
Existing	General Office Building	710	20,574	SF	229	40	6	46	4	21	25
Proposed	Multi-Family Housing (Mid-Rise)	221	61	DU	331	5	16	21	17	11	28
	Shopping Center-Small	820	2,090	SF	433	1	1	2	15	16	31
Difference					535	-34	11	-23	28	6	34

3. The queuing analysis performed indicates that there will be minimal left-turn queueing on Adams Road at the parking garage access and at the Alley, with peak hour vehicles queue lengths at 1 vehicle or less.

4. Angle parking should be considered in the public parking facility located adjacent to the south side of the building. The alley is one-way westbound and the proposed head-in (90 degree) parking creates the potential for wrong-way drivers in the alley. If angle parking is not feasible, additional one-way and wrong-way signage should be provided.

27725 Stansbury Boulevard, Suite 195
Farmington Hills, MI 48334
P: 248.536.0080
F: 248.536.0079
www.fveng.com

SUMMARY

- The proposed development plan is expected to generate *less* AM traffic than the previous office land use and an increase of approximately 3% in traffic volumes during the PM peak hour. Generally, changes in traffic volumes 5% or less are indiscernible to adjacent street traffic.
- At this time the proposed retail land use is unknown. If the proposed retail land is determined in the future to be more intense than was previously assumed for this site, further analysis may be required at that time.
- Angle parking should be considered in the public parking facility located adjacent to the south side of the building. The alley is one-way westbound and the proposed head-in (90 degree) parking creates the potential for wrong-way drivers in the alley. If angle parking is not feasible, additional one-way and wrong-way signage should be provided.
- Prior to final site plan, the Form A or the site plan should be revised to reflect the correct values regarding parking counts and retail square footage.

We hope that this report addresses the City's needs regarding this project. If you have any questions, please do not hesitate to contact us at your convenience.

Sincerely,

FLEIS & VANDENBRINK ENGINEERING, INC.

Julie M. Kroll

Julie M. Kroll, PE, PTOE
Traffic Engineering Services Manager

CITY OF BIRMINGHAM
Date 01/02/2020 12:11:02 PM
Ref 00165616
Receipt 519607
Amount $100.00

Administrative Approval Application

Planning Division

Form will not be processed until it is completely filled out

1. Applicant

Name: Frank Dalio, Black & Veatch agent for AT&T
Address: 900 Oakmont Lane Ste. 100
Westmont, IL 60559
Phone Number: 630-686-3402
Fax Number:
Email: DalioF@bv.com

Property Owner

Name: Verizon Wirelesss
Address: 24242 Northwestern Hwy. Southfield, MI 48075
Phone Number:
Fax Number:
Email:

2. Applicant's Attorney/Contact Person

Name:
Address:
Phone Number:
Fax Number:
Email:

Project Designer

Name: Black & Veatch, Ping Jiang
Address: 900 Oakmont Lane Ste. 100
Westmont, IL 60559
Phone Number: 630-686-3402
Fax Number:
Email: DalioF@bv.com

3. Project Information

Address/Location of Property: 2080 E. Maple Rd.
Birmingham, MI 48009
Name of Development:
Parcel ID #: 08-20-31-602-001
Current Use:
Area in Acres:
Current Zoning:

Name of Historic District site is in, if any:
Date of HDC Approval, if any:
Date of Application for Preliminary Site Plan:
Date of Preliminary Site Plan Approval:
Date of Application for Final Site Plan:
Date of Final Site Plan Approval:
Date of Revised Final Site Plan Approval:

4. Attachments

- Warranty Deed with legal description of property
- Authorization from Owner(s) (if applicant is not owner)
- Completed Checklist
- Material Samples
- Digital Copy of plans
- Two (2) folded copies of plans including an itemized list of all changes for which administrative approval is requested, with the changes marked in color on all elevations

5. Details of the Request for Administrative Approval

Minor modification to an existing wireless communication facility.
Install (1) DC12 Surge Protection Unit, Swap (1) DC Power Plant cabinet, Remove (6) coax, Swap (6) Antennas, Swap (6) RRH's, Install (3) RRH's, Install (1) Fiber Trunk, Install (1) DC Power trunk, Install (1) DC9 Surge Protection Unit

The undersigned states the above information is true and correct, and understands that it is the responsibility of the applicant to advise the Planning Division and / or Building Division of any additional changes to the approved site plan.

Signature of Applicant: Frank Dalio Digitally signed by Frank Dalio DN: C=US, E=daliof@bv.com, O="Black & Veatch ", OU="Telecom, Site Acquistion", CN="Frank Dalio " Date: 2019.12.03 10:59:13 06'00' Date: 12/03/19

Office Use Only

Application #: PAA20-0001 Date Received: 12/3/19 Fee: $100.00

Date of Approval: 1/7/2020 Date of Denial: N/A Reviewed by:

BLACK & VEATCH
Building a world of difference.

BLACK & VEATCH CORPORATION
900 OAKMONT LANE SUITE 100
WESTMONT, IL 60559
+1 630-686-3402 |**DALIOF@BV.COM**

December 3, 2019

VIA FEDERAL EXPRESS DELIVERY
City of Birmingham, MI
151 Martin Street
Birmingham, MI 48009
Attn: Building Official
(248) 530-1850

RE: AT&T Application for Building Permit & Administrative Approval at Existing Wireless Communication Facility Modification
Site ID: MI3820 / 2080 EAST MAPLE RD. BIRMINGHAM, MI 48009
FA# 10076512 / PACE ID: MRIND026317

Building Official:

Enclosed please find AT&T's completed Application for Building Permit; Administrative Approval Application; Four (4) sets of 11"x 17" signed and sealed construction drawings dated 11/26/19; Four (4) copies of the passing Structural Analysis Report dated 11/04/19;

The following checks are enclosed:
Check #35140759: Bond Fee $200.00
Check #35140757: Plan Review Fee $150.00
Check #35140758: Building Permit Fee $225.00

AT&T is proposing to upgrade its existing wireless facility at the above refrenced address. The scope of work being performed is very minor, specifically swapping/adding antennas and related equipment on the tower. **Please reference pages C-1 & T-1 of construction drawing for specific scope of work.**

Once your review is complete, please issue the BP & Admin Approval to me via email at DalioF@bv.com. I have also provided a prepaid envelope to send the BP if you cannot email, but email is preferred.

Please contact me at daliof@bv.com and or 630-686-3402 if you have any questions, concerns, or require any additional information.

Sincerely,
Black & Veatch Corporation

Frank Dalio

Frank Dalio, Sr. Site Acquistion Associate

SITE PHOTO

PROJECT INFORMATION

SITE ADDRESS:	2080 EAST MAPLE ROAD BIRMINGHAM, MI 48009
COUNTY:	OAKLAND
SITE NAME:	MAPLE AND ADAMS
SITE NUMBER:	MI3820
FA NUMBER:	10076512
USID NUMBER:	42108
LATITUDE:	42° 32' 43.00" N
LONGITUDE:	83° 11' 36.99" W
GROUND ELEVATION:	745' AMSL
TOWER OWNER:	VERIZON WIRELESS 24242 NORTHWESTERN HWY SOUTHFIELD, MI 48075
SITE ACQUISITION MANAGER:	KRISTEN CHASE 412.269.5950
CONSTRUCTION MANAGER:	FRANK VITTO 913.458.6194
LEAD ENGINEER:	JORDAN HENRY 913.458.4293

PROJECT MANAGER:	STEPHANIE HARDWICK
PHONE:	317.462.2269
APPLICANT:	AT&T MOBILITY
CONTACT:	-
PHONE:	-

AT&T MOBILITY

PROJECT: LTE 4C/5C/6C
AT&T SITE ID: MI3820
AT&T FA#: 10076512
VERIZON SITE#: MI-035 BIRMINGHAM

MAPLE AND ADAMS
BIRMINGHAM, MI 48009

AREA MAP

NO SCALE

ENGINEERING

2015 MICHIGAN BUILDING CODE
2014 MICHIGAN ELECTRICAL CODE
TIA-222-G OR LATEST EDITION

DRAWING INDEX

SHEET NO:	SHEET TITLE
TITLE PAGE	TITLE PAGE
-	-
C-1	OUTDOOR PLAN & DC CIRCUIT SCHEDULE
C-2	EQUIPMENT DETAILS
-	-
T-1	ELEVATION
T-2	ANTENNA LAYOUTS
T-3	ANTENNA CONFIGURATION
T-4	EQUIPMENT DETAILS
T-5	STRUCTURAL NOTES
T-6	EQUIPMENT NOTES
-	-
E-1	ELECTRICAL SECTION NOTES
-	-
N-1	GENERAL NOTES
N-2	GENERAL NOTES
-	-
S-1	MOUNT VIEWS & MODIFICATION SCHEDULE
S-2	MODIFICATION DETAIL VIEWS
-	-
-	AT&T RF PLUMBING DIAGRAMS ATTACHED
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Digitally signed by [illegible] Date: 2019.11.26 13:49:06-06'00'

REFERENCE MATERIALS

THESE LTE DRAWINGS ARE BASED ON THE AT&T RFDS DATED 04/01/2019

11"x17" PLOT WILL BE HALF SCALE UNLESS OTHERWISE NOTED

CONTRACTOR SHALL VERIFY ALL PLANS & EXISTING DIMENSIONS & CONDITIONS ON THE JOB SITE & SHALL IMMEDIATELY NOTIFY THE ENGINEER IN WRITING OF ANY DISCREPANCIES BEFORE PROCEEDING WITH THE WORK OR BE RESPONSIBLE FOR SAME

TO OBTAIN LOCATION OF PARTICIPANTS UNDERGROUND FACILITIES BEFORE YOU DIG IN MICHIGAN, CALL MISS DIG

811 OR (800) 482-7171
www.missdig.org

48 HOURS BEFORE YOU DIG

-THESE PLANS ADHERE TO ALL OF THE REQUIREMENTS CALLED OUT IN THE JURISDICTION PLANNING AND ZONING FOR ANTENNAS AND SUPPORT STRUCTURES WHERE SITE IS LOCATED.
-SUBCONTRACTOR SHALL VERIFY ALL PLANS AND EXISTING CONDITIONS ON SITE. IMMEDIATELY NOTIFY ENGINEER OF ANY DISCREPANCIES PRIOR TO PERFORMING ANY WORK OR BE RESPONSIBLE FOR THE SAME

APPLICANT/OWNER:

AT&T MOBILITY

16025 NORTHLAND DR
SOUTHFIELD, MI 48075

PREPARED BY:

BLACK & VEATCH

6800 W. 115TH ST, SUITE 2292
OVERLAND PARK, KANSAS 66211
(913) 458-2000

PROJECT NUMBER: 129056

PING JIANG
ENGINEER
No.
6201062190

11/26/2019

IT IS A VIOLATION OF LAW FOR ANY PERSON, UNLESS THEY ARE ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS DOCUMENT.

LANDLORD/PROPERTY OWNER SIGNATURE

REV	DATE	DESCRIPTION
1	11.26.19	RESCOPE
0	08.11.19	ISSUED FOR CONSTRUCTION

PROJECT LOCATION: USID (42108)

MAPLE AND ADAMS

2080 EAST MAPLE ROAD
BIRMINGHAM, MI 48009

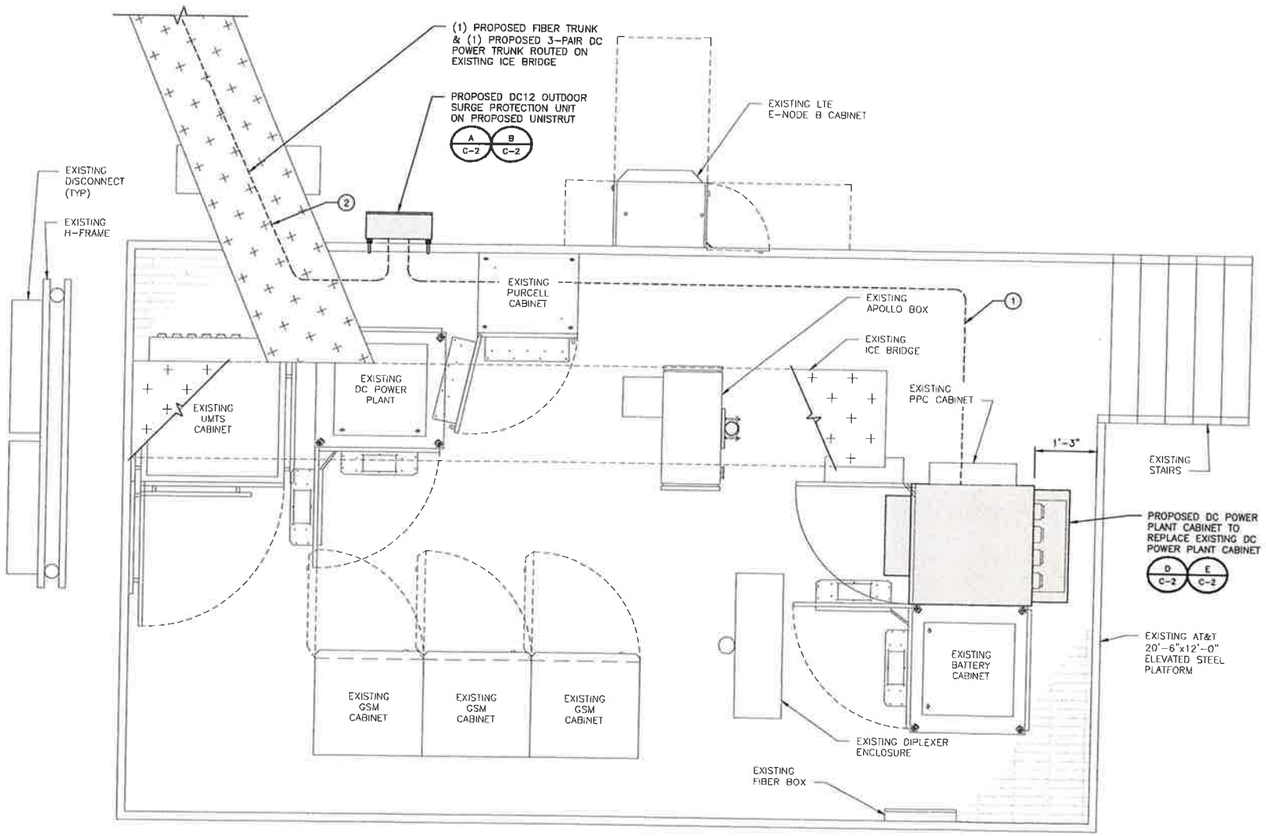
DRAWING DESCRIPTION:

TITLE PAGE

DRAWING NUMBER:

TITLE PAGE

APPROVED
1/7/2020
PHA20-0001



FINAL OUTDOOR PLAN

12" 6" 0 1' 2' 3'
3/4"=1'-0"

1

SCOPE OF WORK

1. CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS.
2. CONTRACTOR SHALL MAINTAIN A 10'-0" MINIMUM SEPARATION BETWEEN THE EXISTING/PROPOSED LTE GPS ANTENNA AND TRANSMITTING ANTENNAS.
3. DC POWER WIRING SHALL BE COLOR CODED AT EACH END FOR IDENTIFYING +24V AND -48V CONDUCTORS. RED MARKINGS SHALL IDENTIFY +24V AND BLUE MARKINGS SHALL IDENTIFY -48V. REFER TO ATT-002-290-701.
4. NON-LTE DC POWER WIRING SIZE 14 AWG TO 10 AWG SHALL BE TELCOFLEX III. DC POWER WIRING 8 AWG AND LARGER SHALL BE TELCOFLEX IV.
5. LTE POWER WIRING SHALL BE IN ACCORDANCE WITH ATT-002-290-531.
6. THE PROPOSED ELECTRICAL WORK FOR THE SCOPE OF THIS PROJECT IS LOW VOLTAGE DC POWER ONLY.
7. PROPOSED LTE BBU TO BE INSTALLED AND GROUNDED BY OTHERS, PER AT&T INSTALLATION STANDARDS.
8. EXISTING RACK MOUNTED DC SURGE PROTECTION UNIT SHALL BE SWAPPED OUT WITH PROPOSED RACK MOUNTED DC SURGE PROTECTION UNIT, WHEN REQUIRED FOR UPGRADE.

NOTES

NO	FROM	TO	CONFIGURATION
1	24VDC/48VDC DISTRIBUTION PANEL	RAYCAP SURGE PROTECTION DC12 (OUTDOOR)	(2) 1-#6 TELCOFLEX IV DC CABLE (FOR RRHS REQUIRING 12 AWG WIRING)
2	RAYCAP SURGE PROTECTION DC12 (OUTDOOR)	RAYCAP SURGE PROTECTION DC9 (TOWER)	6-#6 THHN/THWN/VW-1 TYPE TC-ER DC CABLE

DC CIRCUIT SCHEDULE

INSTALL:
(1) PROPOSED DC12 SURGE PROTECTION UNIT
(1) PROPOSED DC POWER PLANT CABINET

REMOVE:
(1) EXISTING DC POWER PLANT CABINET
(6) EXISTING GSM COAX

APPLICANT/OWNER:
AT&T MOBILITY
16025 NORTHLAND DR
SOUTHFIELD, MI 48075

PREPARED BY:
BLACK & VEATCH
6800 W. 115TH ST, SUITE 2292
OVERLAND PARK, KANSAS 66211
(913) 458-2000

PROJECT NUMBER: 129056

STATE OF MICHIGAN
PING JIANG
ENGINEER
No.
6201062190
LICENSED PROFESSIONAL ENGINEER
11/26/2019

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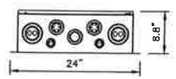
PROJECT LOCATION: USID (42108)
MAPLE AND ADAMS
2080 EAST MAPLE ROAD
BIRMINGHAM, MI 48009

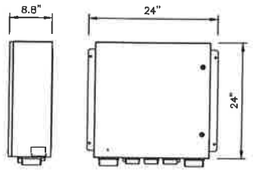
DRAWING DESCRIPTION:
OUTDOOR PLAN & DC CIRCUIT SCHEDULE

DRAWING NUMBER:
C-1

RAYCAP DC12-48-60-0-25E

DIMENSIONS, WxDxH:	610x224x610mm (24"x8.8"x24")
ENCLOSURE TYPE:	NEMA 4
INPUT SIZE QUANTITY & SIZE:	(2) 2" (2) M63 CABLE GLANDS
NOMINAL OPERATING VOLTAGE:	48 VDC
NOMINAL DISCHARGE CURRENT:	20 kA 8/20μs
MAXIMUM DISCHARGE CURRENT:	60 kA 8/20μs
MAXIMUM CONTINUOUS OPERATING VOLTAGE:	75 VDC
VOLTAGE PROTECTION RATING:	400 V
TOTAL WEIGHT:	56.3 lbs

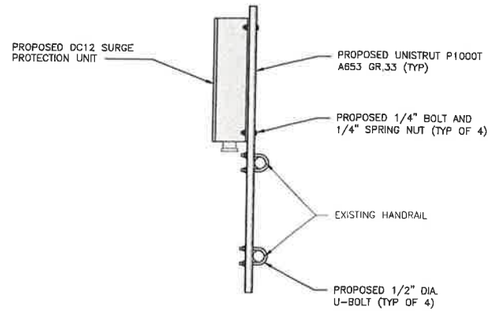




NOTE:
THERE ARE (2) GROUND AND BOTH MUST BE BONDED.

GROUND LEVEL - DC12 SURGE PROTECTION BOX SPECIFICATIONS

NO SCALE | A



DC12 SURGE PROTECTION UNIT MOUNTING DETAIL

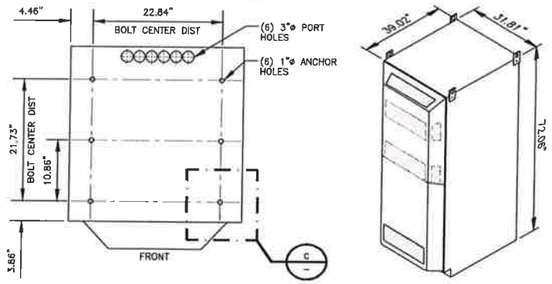
NO SCALE | B

NOT USED

NO SCALE | C

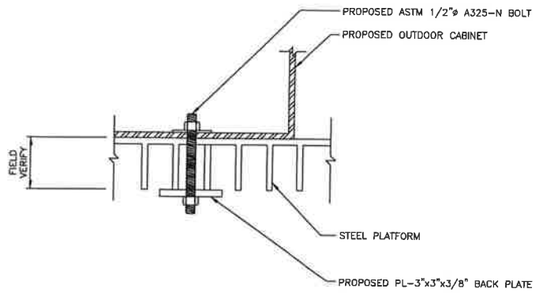
EMERSON NETSURE 512 CABINET

DIMENSIONS, WxDxH:	762x960x1829mm (30"x39"x72")
COLOR:	GRAY
FINISH:	POWDER COAT
WEIGHT, EMPTY/MAX:	690 lbs. / 2300 lbs.



OUTDOOR DC POWER PLANT SPECIFICATIONS

NO SCALE | D



GRATING ANCHOR DETAIL

NO SCALE | E

NOT USED

NO SCALE | F

NOT USED

NO SCALE | G

NOT USED

NO SCALE | H

NOT USED

NO SCALE | J

APPLICANT/OWNER:

AT&T MOBILITY

16025 NORTHLAND DR
SOUTHFIELD, MI 48075

PREPARED BY:

BLACK & VEATCH

6800 W. 115TH ST, SUITE 2292
OVERLAND PARK, KANSAS 66211
(913) 458-2000

PROJECT NUMBER: 129056

STATE OF MICHIGAN
PING JIANG
ENGINEER
No.
6201062190
LICENSED PROFESSIONAL ENGINEER

11/26/2019

LANDLORD/PROPERTY OWNER SIGNATURE

REV	DATE	DESCRIPTION
1	11.26.19	RESCOPE
0	06.11.19	ISSUED FOR CONSTRUCTION

PROJECT LOCATION: USID (42108)

MAPLE AND ADAMS

2080 EAST MAPLE ROAD
BIRMINGHAM, MI 48009

DRAWING DESCRIPTION:

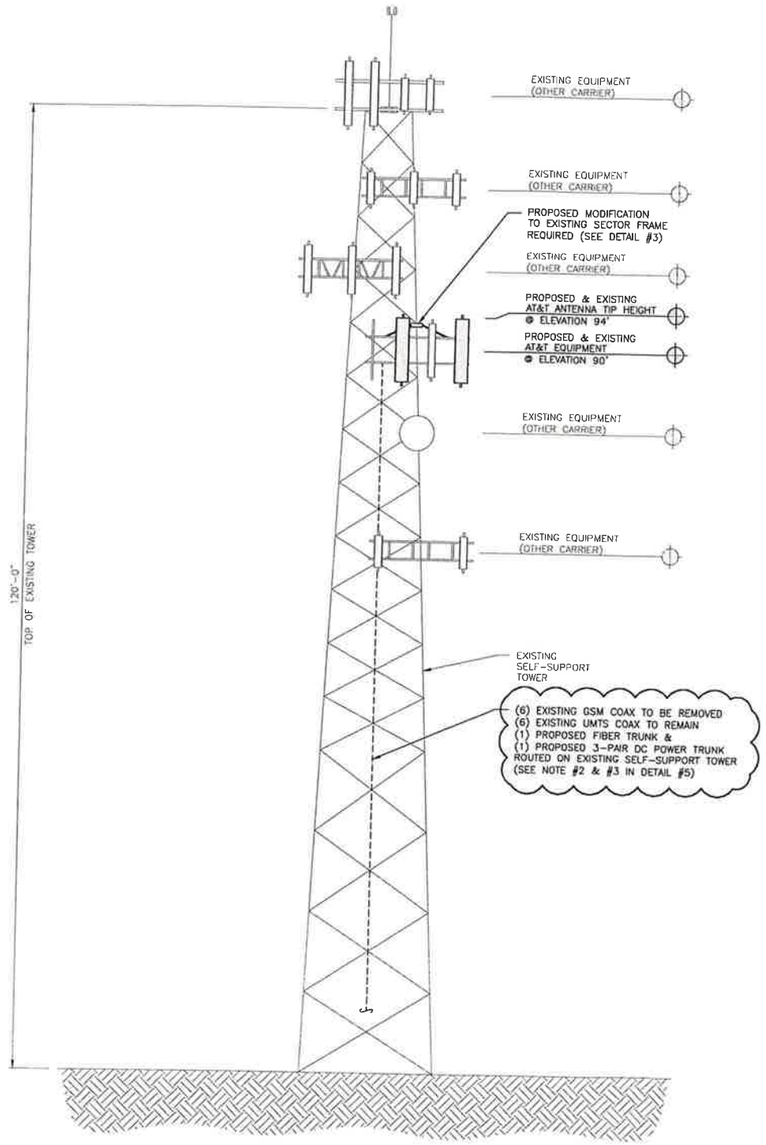
EQUIPMENT DETAILS

DRAWING NUMBER:

C-2

THIS DOCUMENT WAS PREPARED BASED ON THE INFORMATION PROVIDED TO BLACK & VEATCH. IF EXISTING CONDITIONS DO NOT REFLECT THOSE REPRESENTED, THESE CONSTRUCTION DRAWINGS ARE NO LONGER VALID.

NOTES:
1. GROUND EQUIPMENT AND/OR EQUIPMENT SHELTERS OMITTED FOR CLARITY.



FINAL TOWER ELEVATION

8' 4' 0 8' 16'
1/8"=1'-0"

1

THE PASSING STRUCTURAL ANALYSIS FOR THE EXISTING TOWER AT THIS SITE WAS COMPLETED BY PAUL J. FORD & COMPANY ON NOVEMBER 4, 2019 CONFORMING TO TIA-222-G. ACCORDING TO THE PAUL J. FORD & COMPANY STRUCTURAL ANALYSIS, THE TOWER HAS SUFFICIENT CAPACITY.

STRUCTURAL ANALYSIS NOTE 2

MOUNT MODIFICATIONS REQUIRED: SEE GPD GROUP DESIGN DATED JUNE 4, 2019. PLEASE REFERENCE SHEETS S-1 AND S-2. NO PROPOSED LTE WORK SHALL COMMENCE ON THIS TOWER UNTIL AFTER MOUNT MODIFICATIONS HAVE BEEN COMPLETED AND PROPERLY INSPECTED.

MOUNT ANALYSIS NOTE 3

INSTALL:
(6) PROPOSED LTE ANTENNAS
(9) PROPOSED RRHs
(1) PROPOSED FIBER TRUNK
(1) PROPOSED 3-PAIR DC POWER TRUNK
(1) PROPOSED DC9 SURGE PROTECTION UNIT

REMOVE:
(6) EXISTING LTE ANTENNAS
(3) EXISTING LTE 700 RRHs
(3) EXISTING LTE 1900 RRHs
(6) EXISTING GSM COAX

SCOPE OF WORK 4

1. WHEN STACKING CABLES 3 OR MORE DEEP, USE STACKABLE SNAP-INS, TALLEY PART NUMBER SSH-158-3 (OR ENGINEER APPROVED EQUAL).
2. CONTRACTOR SHALL CONFIRM THE FINAL CABLE ROUTING PLAN WITH THE STRUCTURAL ANALYSIS.
3. CONTRACTOR TO FIELD VERIFY NUMBER OF GSM COAX TO BE REMOVED. (6) UMTS COAX TO REMAIN.

NOTES 5

APPLICANT/OWNER:
AT&T MOBILITY
16025 NORTHLAND DR
SOUTHFIELD, MI 48075

PREPARED BY:
BLACK & VEATCH
6800 W. 115TH ST, SUITE 2292
OVERLAND PARK, KANSAS 66211
(913) 458-2000

PROJECT NUMBER: 129056

STATE OF MICHIGAN
PING JIANG
ENGINEER
No.
6201062190
LICENSED PROFESSIONAL ENGINEER
11/26/2019

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LANDLORD/PROPERTY OWNER SIGNATURE

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1	11.26.19	RESCOPE
0	08.11.19	ISSUED FOR CONSTRUCTION

PROJECT LOCATION: USID (42108)
MAPLE AND ADAMS
2080 EAST MAPLE ROAD
BIRMINGHAM, MI 48009

DRAWING DESCRIPTION:
ELEVATION

DRAWING NUMBER:
T-1

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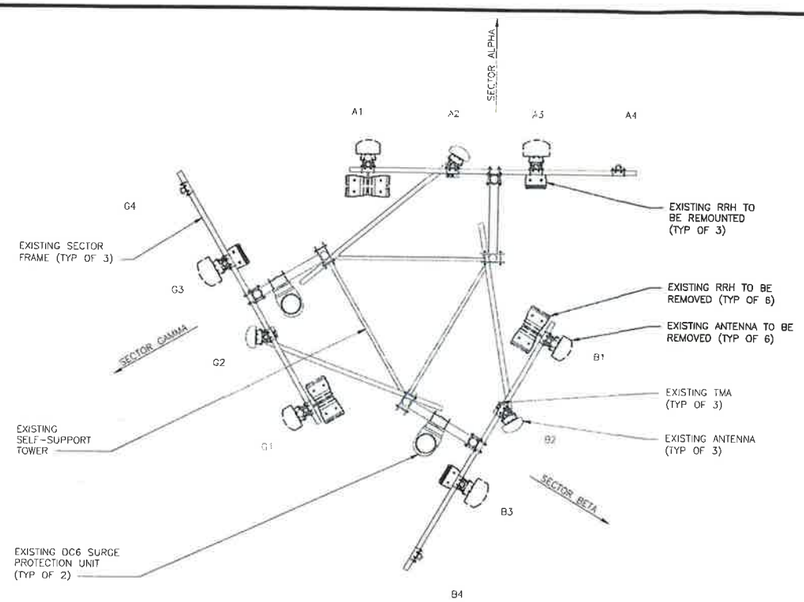
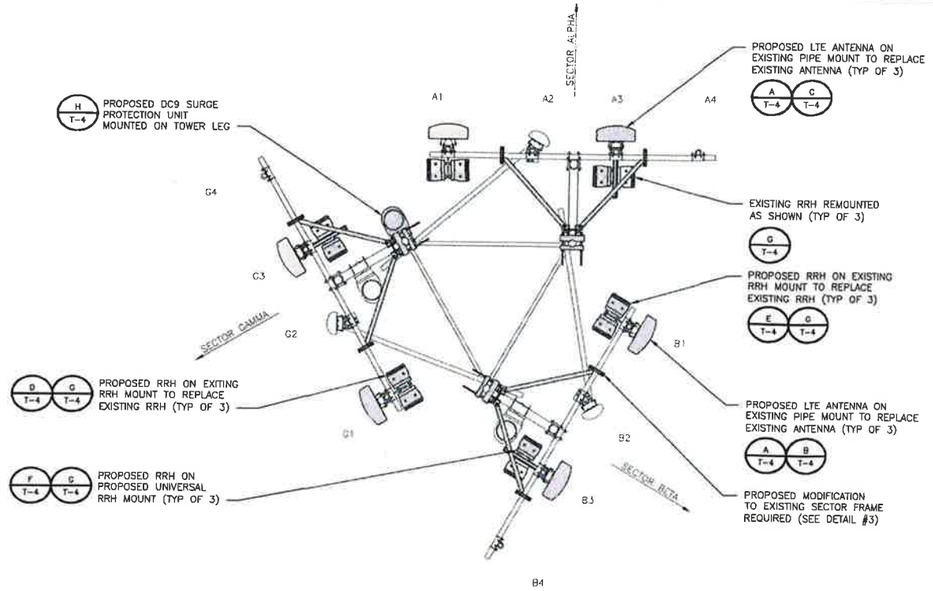


EXISTING ANTENNA LAYOUT

12" 6" 0 1' 2' 3' 4' 5' 6' 7'
3/8"=1'-0"

1



FINAL ANTENNA LAYOUT

12" 6" 0 1' 2' 3' 4' 5' 6' 7'
3/8"=1'-0"

2

MOUNT MODIFICATIONS REQUIRED: SEE QPD GROUP DESIGN DATED JUNE 4, 2019. PLEASE REFERENCE SHEETS S-1 AND S-2. NO PROPOSED LTE WORK SHALL COMMENCE ON THIS TOWER UNTIL AFTER MOUNT MODIFICATIONS HAVE BEEN COMPLETED AND PROPERLY INSPECTED.

MOUNT ANALYSIS NOTE 3

1. CONTRACTOR SHALL REFER TO THE LATEST RFDS PRIOR TO THE CONSTRUCTION COMMENCING.
2. BLACK AND VEATCH RECOMMENDS EQUAL HORIZONTAL SPACING OF ANTENNAS TO ENSURE ADEQUATE WEIGHT DISTRIBUTION.
3. CONTRACTOR SHALL ENSURE 3'-0" MINIMUM SPACING BETWEEN LTE 700 B17 AND LTE 700 B14 (FIRSTNET) ANTENNAS. ANY VARIATION FROM THIS DIRECTIVE SHALL REQUIRE APPROVAL FROM THE AT&T PROJECT MANAGER PRIOR TO CLOSEOUT.

NOTES 4

1. GROUNDING SHALL BE IN ACCORDANCE WITH ATT-TP-76416.
2. CONTRACTOR SHALL HAVE A COMPLETE UNDERSTANDING OF THE CONTENTS OF AT&T STANDARD TP-76416.
3. ALL INSTALLATIONS SHALL BE FIELD VERIFIED.
4. ALL GROUNDING CONDUCTORS SHALL BE #2 AWG SUNLIGHT RESISTANT-TINNED STRANDED COPPER UNLESS NOTED OTHERWISE.
5. ALL RRH4X25-B30 RRH MODELS WILL REQUIRE A #6 AWG SUNLIGHT RESISTANT-TINNED STRANDED COPPER DUE TO THE LIMITED SPACE AT THE GROUNDING TERMINATION POINT.
6. ALL 2X60W 850 & 1900 RRHS MODELS WILL REQUIRE A TOP AND BOTTOM CONNECTION.

GROUNDING NOTES 5

APPLICANT/OWNER:

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SOUTHFIELD, MI 48075

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OVERLAND PARK, KANSAS 66211
(913) 458-2000

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MAPLE AND ADAMS

2080 EAST MAPLE ROAD
BIRMINGHAM, MI 48009

DRAWING DESCRIPTION:

ANTENNA LAYOUTS

DRAWING NUMBER:

T-2

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Antenna Requirements (verify with current RFDS)

Sector	Technology	Final Antenna Configuration	Antenna	Antenna Azimuth	Number of TMAs		Number of RRHs		RRH Model #	RRH Model #	Number of Surge Protection		Surge Protection Model #
			Final	Final	Exist.	Final	Exist.	Final	Final	Final	Exist.	Final	Final
A1	LTE 1C/2C/4C/5C	ACE XXQLH-654L8H8-iVT	Proposed	0°	-	-	2	2	AirScale Dual RRH 4T4R B12/14 320W AHLBA	AirScale Dual RRH 4T4R B25/66 320W AHFIB	2	2	Raycap DC6
A2	UMTS	Powerwave RA21.7772.00	Existing	-	1	1	-	-	-	-	-	-	-
A3	LTE 3C/6C	Andrew NNH4-65C-R6	Proposed	0°	-	-	1	2	AirScale Dual RRH 4T4R B5 160W AHCA	Alcatel-Lucent RRH4x25-WCS-4R	0	1	Raycap DC9
A4	-	-	-	-	-	-	-	-	-	-	-	-	-
B1	LTE 1C/2C/4C/5C	ACE XXQLH-654L8H8-iVT	Proposed	120°	-	-	2	2	AirScale Dual RRH 4T4R B12/14 320W AHLBA	AirScale Dual RRH 4T4R B25/66 320W AHFIB	-	-	-
B2	UMTS	Powerwave RA21.7772.00	Existing	-	1	1	-	-	-	-	-	-	-
B3	LTE 3C/6C	Andrew NNH4-65C-R6	Proposed	120°	-	-	1	2	AirScale Dual RRH 4T4R B5 160W AHCA	Alcatel-Lucent RRH4x25-WCS-4R	-	-	-
B4	-	-	-	-	-	-	-	-	-	-	-	-	-
G1	LTE 1C/2C/4C/5C	ACE XXQLH-654L8H8-iVT	Proposed	240°	-	-	2	2	AirScale Dual RRH 4T4R B12/14 320W AHLBA	AirScale Dual RRH 4T4R B25/66 320W AHFIB	-	-	-
G2	UMTS	Powerwave RA21.7772.00	Existing	-	1	1	-	-	-	-	-	-	-
G3	LTE 3C/6C	Andrew NNH4-65C-R6	Proposed	240°	-	-	1	2	AirScale Dual RRH 4T4R B5 160W AHCA	Alcatel-Lucent RRH4x25-WCS-4R	-	-	-
G4	-	-	-	-	-	-	-	-	-	-	-	-	-

FINAL ANTENNA CONFIGURATION

1

APPLICANT/OWNER:

AT&T MOBILITY

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BLACK & VEATCH

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MAPLE AND ADAMS

2080 EAST MAPLE ROAD
BIRMINGHAM, MI 48009

DRAWING DESCRIPTION:

ANTENNA CONFIGURATION

DRAWING NUMBER:

T-3

APPROVED 1/15/2020 PAA20-0007

CITY OF BIRMINGHAM
Date 01/16/2020 3:23:08 PM
Ref 00165983
Receipt 521382
Amount $100.00

City of Birmingham
A Walkable Community

Administrative Approval Application
Planning Division

Form will not be processed until it is completely filled out.

1. Applicant
Name: LPH Ventures III
Address: 2010 Cole St., Birmingham, MI 48009

Phone Number: 248-613-0300; 586-924-3694
Fax Number:
Email Address:

2. Property Owner
Name: LPH Ventures III
Address: 2010 Cole St., Birmingham, MI 48009

Phone Number: 248-613-0300; 586-924-3694
Fax Number:
Email Address:

3. Applicant's Attorney/Contact Person
Name: Thomas Lasky; Andy Petcoff
Address: 2010 Cole St., Birmingham, MI 48009

Phone Number: 248-613-0300; 586-924-3694
Fax Number:
Email Address:

4. Project Designer/Developer
Name: Krieger Klatt Architects (Jason Krieger)
Address: 2120 E. 11 Mile., Royal Oak, MI 48067

Phone Number: 248-414-9270
Fax Number: 248-414-9275
Email Address: eric@kriegerklatt.com

5. Project Information
Address/Location of Property: 2010 Cole Street

Name of Development: 2010 Cole Street
Parcel ID#: 08-20-31-252-010
Current Use: Buisness (B)
Area in Acres: 0.77 Acres
Current Zoning: Mixed Use (MX)

Name of Historic District if any: N/A
Date of HDC Approval, if any: N/A
Date of Application for Preliminary Site Plan:
Date of Preliminary Site Plan Approval:
Date of Application for Final Site Plan: June 8th, 2018
Date of Final Site Plan Approval:
Date of Revised Final Site Plan Approval: June 22nd, 2018

6. Required Attachments
- Warranty Deed with legal description of property
- Authorization from Owner(s) (if applicant is not owner)
- Completed Checklist
- Material Samples
- Specification sheets for all proposed materials, fixtures, and/or mechanical equipment
- One (1) digital copy of plans
- Two (2) folded copies of plans including an itemized list of all changes for which administrative approval is requested, with the changes marked in color on all elevations
- Photographs of existing conditions on the site where changes are proposed

7. Details of the Request for Administrative Approval
Per inspection by Nicholas Dupuis, certain elements of completed project were not in line with plan documents. As-Built conditions are required to be shown on documents. Write up included with submittal detail the list of changes shown.

The undersigned states the above information is true and correct, and understands that it is the responsibility of the applicant to advise the Planning Division and/or Building Division of any additional changes to the approved site plan.

Signature of Applicant: _____ Date: 1.15.2020

Office Use Only

Application #: PAA20-0007 Date Received: 1/15/2020 Fee: $ 100.00

Date of Approval: 1/15/2020 Date of Denial: N/A Reviewed By:

City of Birmingham
A Walkable Community

CONSENT OF PROPERTY OWNER

I, Andrew Petcoff (Name of Property Owner), OF THE STATE OF Michigan AND

COUNTY OF Oakland STATE THE FOLLOWING:

1. That I am the owner of real estate located at 2010 Cole Street (Address of Affected Property);

2. That I have read and examined the Application for Administrative Approval made to the City of Birmingham by: LPH Ventures III, LLC (Name of Applicant);

3. That I have no objections to, and consent to the request(s) described in the Application made to the City of Birmingham.

By providing your e-mail to the City, you agree to receive news notifications from the City. If you do not wish to receive these messages, you may unsubscribe at any time.

Name of Owner (Printed): Andrew Petcoff

Signature of Owner: _____ **Date:** 1.15.2020

krieger klatt
ARCHITECTS
architecture interiors consulting

Transmittal

To: City of Birmingham Planning Department **Date**: January 15, 2020

Re: Administrative Approval Request for 2010 Cole Street

Sent Via: ☐ Mail ☐ Express Mail ☒ Hand Delivered ☐ Fax

Enclosed herewith, please find the following:

☒ For your review and approval ☐ Per your request

☐ For your records ☐ For your use

COPIES	DESCRIPTION
2 Sets	Landscape Plans - As-Built Conditions Shown
1	Administrative Approval Application
1	Administrative Approval Check
1	Write Up of As-built conditions shown on updated sheet
1	Transmittal

SIGNED: **Eric Meyers**

COPY TO: 1.15.20

RECEIVED
JAN 15 2020
CITY OF BIRMINGHAM
COMMUNITY DEVELOPMENT DEPARTMENT

Krieger Klatt Architects Inc. 1412 East 11 Mile Road Royal Oak MI 48067
P.248.414.9270 F.248.414.9275 www.kriegerklatt.com

krieger klatt
ARCHITECTS
architecture interiors consulting

January 15, 2020

City of Birmingham
Planning Department

151 Martin St.
Birmingham, MI 48009

Re: 2010 Cole Street

Thank you for your review of the 2010 Cole Street project. Below is the list of changes to the A.001 Landscaping Plan to show the as-built conditions. All responses will be cross referenced with revised documents dated 1-14-2020 Admin. Approval.

Planning (Nicholas Dupuis):

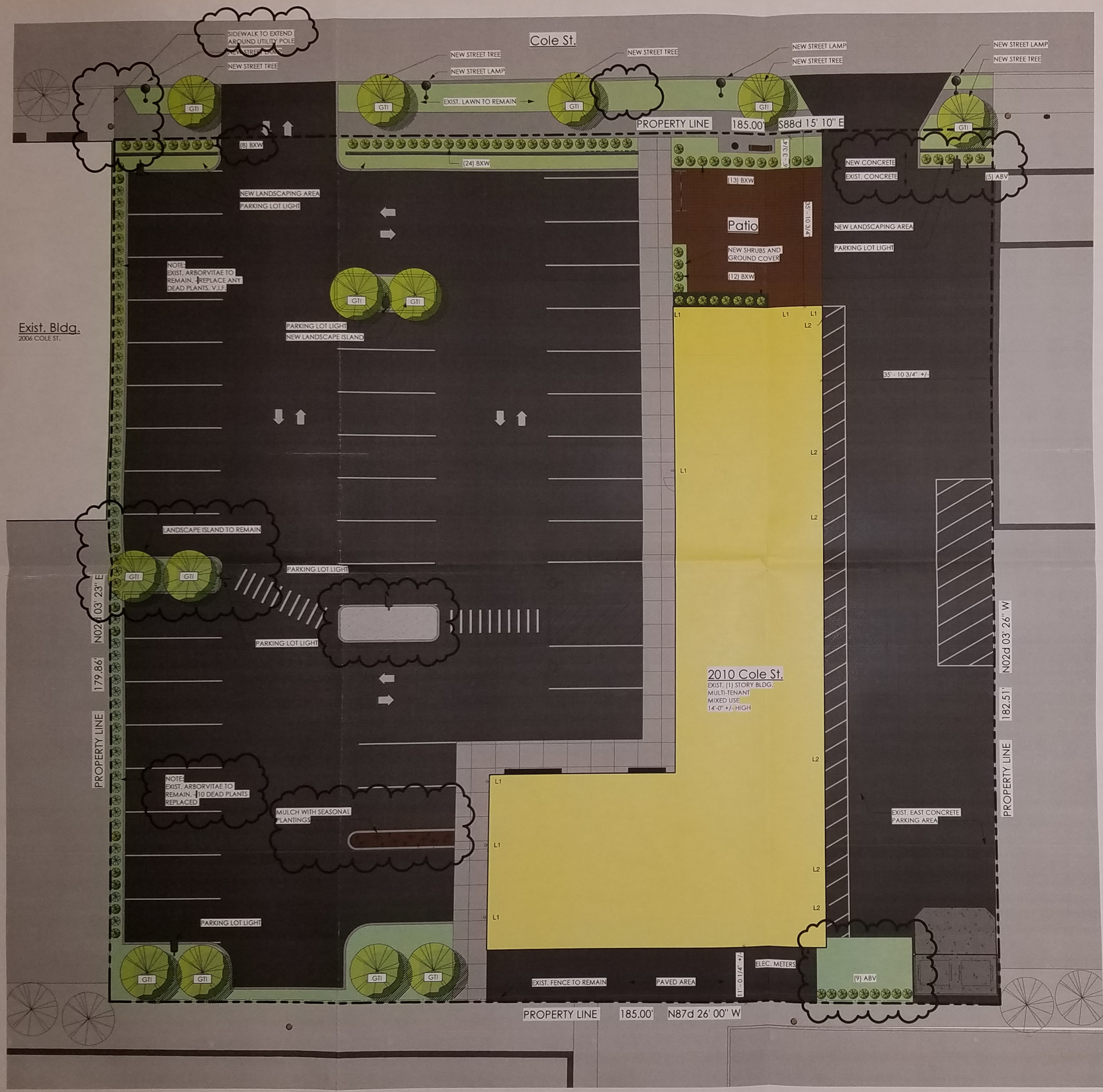
1. Transformer was shown removed from project. Green space where transformer had been remains and has increased in size to maintain minimum 5% landscaping of parking lot.
2. 5th Street Light pole in middle of project has been removed. Only 4 light poles were installed.
3. Plants at Northeast corner of project designated as Arborvitae. Plantings Legend updated to reflect this change.
4. Boxwoods at Northwest corner reduced to 8. Only 8 Boxwoods planted. Plantings Legend updated to reflect this change.
5. Note regarding "EXIST. ARBORVITAE TO REMAIN – REPLACE ANY DEAD PLANTS. V.I.F." updated to reflect that 10 Arborvitae were replaced due to dead conditions.
6. Sidewalk shown to be running around utility pole at Northwest corner of project.
7. Western most landscaping island updated to show new trees planted. Light pole location updated to show location at east edge of island.
8. Central island of west parking lot shown as built with no ramps and no grass on island.
9. Slim island at southern end of west parking lot has mulch and seasonal plantings, instead of grass. Note added and drawing updated to reflect this.
10. Note added showing extent of new vs. exist concrete in east parking lot at this stage of project.
11. Percentage of total parking lot landscaping updated. Remains above minimum 5% required.

If you have any further comments, concerns or questions; please do not hesitate to contact me.

Thank you,

Eric Meyers
Draftsmen

Krieger Klatt Architects Inc. 2120 East 11 Mile Road Royal Oak MI 48067
P.248.414.9270 F.248.414.9275 www.kriegerklatt.com



LANDSCAPE & SCREENING:

PARKING LOT LANDSCAPING:
MINIMUM OF 5% OF TOTAL LOT AREA

SITE LANDSCAPING PROVIDED:

5.02% OF TOTAL PARKING LOT AREA TO CONSIST OF LANDSCAPING

PARKING LOT LANDSCAPING:

EA. INTERIOR PLANTING AREA SHALL BE AT LEAST 150 SQ. FT. IN SIZE AND NOT LESS THAN 8' IN ANY SINGLE DIMENSION

AT LEAST 1 CANOPY TREE FOR EA. 150 SQ. FT. OF INTERIOR PLANTING

PROPOSED PARKING LOT LANDSCAPING:

ALL LANDSCAPING AREAS THAT IS CONSIDERED PARK OF THE PARKING LOT WILL BE A MINIMUM OF 150 SQ. FT.

EACH INTERIOR PLANTING AREA SHALL HAVE 2 CANOPY TREES.

STREET LANDSCAPING REQUIREMENTS:

(1) STREET TREE FOR EA. 40 LINEAR FEET OF FRONTAGE

PROPOSED STREET LANDSCAPING:

(5) NEW STREET TREES ARE BEING ADDED AT INTERVALS OF 40 LINEAR FEET ALONG COLE ST.

CITY STANDARDS NOTE:

ALL BIKE RACKS, BENCHES, TRASH CANS, AND LAMPS WILL MEET CITY OF BIRMINGHAM STANDARDS

SYMBOL LEGEND

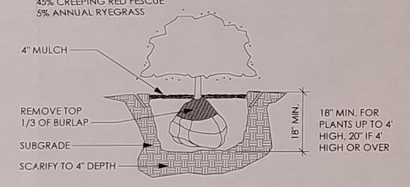
SYMBOL	DESCRIPTION
	TREE (SEE LEGEND)
	LAWN AREA
	ASPHALT AREA
	SHRUB (SEE LEGEND)

PLANTINGS LEGEND

KEY	QTY.	BOTANICAL NAME	COMMON NAME	SIZE
GTI	13	Gleditsia Triacanthos Inermis	THORNLESS HONEYLOCUST	3 1/2" CAL.
BXW	57	Buxus Sempervirens	BOXWOODS	1'- 6"
ABV	24	Thuja Occidentalis	ARBOR VITAE	SEE NOTE
ABV	XX+/-	Thuja Occidentalis	ARBOR VITAE	EXIST.

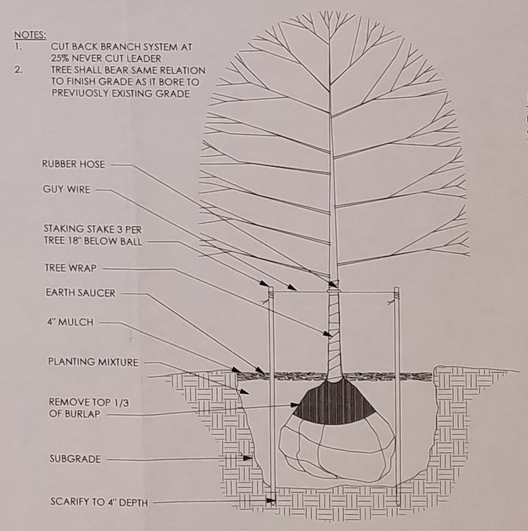
NOTES:

1. ALL TREES ARE TO COMPLY WITH TREE PROTECTION DETAILS
2. ARBOR VITAE IS TO BE SIZED TO COMPLETELY CONCEAL LOADING ZONE AND ELECTRICAL TRANSFORMER
2. LAWN SOD MIX:
   30% PERENNIAL RYGRASS
   20% PARK KENTUCKY BLUEGRASS
   45% CREEPING RED FESCUE
   5% ANNUAL RYEGRASS



Landscape Planting Shrub Detail
3/32" = 1'-0"

NOTES:
1. CUT BACK BRANCH SYSTEM AT 25% NEVER CUT LEADER
2. TREE SHALL BEAR SAME RELATION TO FINISH GRADE AS IT BORE TO PREVIUOSLY EXISTING GRADE



Landscape Planting Tree Detail
3/32" = 1'-0"

krieger klatt ARCHITECTS
architecture interiors consulting
1412 E. 11 Mile Rd. | Royal Oak, MI 48067
P: 248.414.9270 F: 248.414.9275
www.kriegerklatt.com

Client:
LPH Ventures III
550 W. Merrill St. #200,
Birmingham, MI 48009

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CITY OF BIRMINGHAM
PLANNING & ZONING DEPARTMENT

Project:
Renovation
2010 Cole St.
Birmingham, MI 48009

	Issued	Description	By
1	05.23.18	PRE-APP	
2	06.06.18	SPA Submittal	
3	06.21.2018	City Comments	
5	08.30.2018	Admin Approval	
6	09.07.2018	Admin Approval	
7	01.14.2020	Admin Approval	

Seal:

STATE OF MICHIGAN
JASON P. KRIEGER
ARCHITECT
No. 53578
LICENSED ARCHITECT

Note:
Do not scale drawings. Use calculated dimensions only. Verify existing conditions in field.

North Arrow:
North

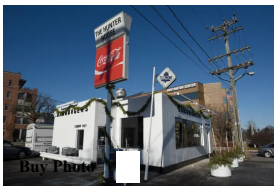
Sheet Title:
Landscaping Plan

Project Number:
18-043

Sheet Number:
A.001

Proposed development would demolish iconic Hunter House Hamburgers building

Sharon Dargay, Hometownlife.com Published 9:20 a.m. ET Jan. 4, 2019 | **Updated 11:59 a.m. ET Jan. 4, 2019**



(Photo: Dan Dean | hometownlife.com)

Hunter House Hamburgers will lose its iconic white building to the wrecking ball if proposed plans for a mixed-use, five-story development at its site are approved.

The restaurant would gain a space in the northeast corner on the ground floor of the new building, but Kelly Cobb, who oversees operations for his family's restaurant, doesn't support the plan.

“Hunter House has a number of concerns about the development and we have not approved the project,” Cobb said during a recent phone interview.

He declined to elaborate on specifics.

The Birmingham Planning Board looked at site plans and a community impact study in December, but postponed a decision on the project. Kevin Byrnes, Birmingham communications director, said the board wanted more information about a traffic study.

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More: Perfect Game transforms former bowling alley into huge family fun center (/story/money/business/2018/12/18/farmington-hills-bowling-center-gets-new-name-arcade-laser-tag/2263027002/)

More: Local slider joints deliver greasy goodness (/story/life/food/2017/03/12/local-slider-joints-deliver-greasy-goodness/98477998/)

In its report to the board, the city planning department also listed six unresolved issues, including mitigation strategies for noise and dust, in connection with the community impact study. Fourteen other unresolved issues, including the minimum size of fifth-floor residential units, were related to the site plans.

The board’s next meeting is 7:30 p.m. Wednesday, Jan. 9, at city hall, 151 Martin.

Inside of the Hunter House in Birmingham. *(Photo: Junfu Han | Staff Photographer)*

The developer, Hesham Gayar of Grand Blanc, submitted an application for the combined community impact study and site plan review in late November.

Hotel, commercial uses

The half-acre site includes Hunter House and land currently leased to the city for public parking. The new development would consist of two levels of underground parking, commercial and parking on the first floor, a hotel on the second through fourth floors and residential units on the fifth floor. Eighty-one parking spaces would be located in underground parking and 14 ground-level spaces would be for Hunter House. The main entrance to The Maple would be on Park, where a valet lane also is proposed.

A report to planning board members noted that the “proposed development will help improve the visual appearance of the area, by creating a denser, more compact development with enough height to create a street wall along Woodward.”

The report noted that the proposed development would “meet the spirit and intent” of the Downtown Birmingham 2016 Master Plan, creating a “harmonious facade” along Maple. The Greenleaf Trust building on the south side of Maple at Park is of similar height and massing.

Although the building dates to the 1950s, according to the Hunter House website, the community impact study notes that the property does not appear on the National Register of Historic Places and is not in the city’s inventory of historic structures.

Hunter House is a favorite location to fuel up on hamburgers during the annual Woodward Dream Cruise. *(Photo: Dan Dean)*

Cobb's grandparents, Al and Martha Papazian, bought the business from another family in 1982 and ran Hunter House Hamburgers together until Martha died in the mid-1990s. Cobb's mother, Susan Papazian Cobb, has been in charge of the Birmingham location for 20 years. Cobb became involved with the family business five years ago. He runs the Ann Arbor location, oversees company operations and is in charge of the Hunter House food trucks.

"We have property rights," Cobb said of the Birmingham location. He said the proposed project would trample on those rights.

Gayar was unavailable for comment.

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