



CITY of NOVI CITY COUNCIL

Agenda Item G
September 16, 2013

SUBJECT: Approval to award a contract for design engineering services for a new traffic signal at the intersection of 13 Mile Road and Cabot Drive to Orchard, Hiltz & McCliment for a design fee of \$13,920 (of which 50% is to be paid by Northern Equities).

SUBMITTING DEPARTMENT: Department of Public Services, Engineering Division *BC*

CITY MANAGER APPROVAL: *[Signature]*

EXPENDITURE REQUIRED	\$13,920 (offset by \$6,960 received from Northern Equities)
AMOUNT BUDGETED	\$ 0
APPROPRIATION REQUIRED	\$13,920 (To be included in 1 st quarter Budget Amendment)
LINE ITEM NUMBER	204-204.00-863.507

BACKGROUND INFORMATION:

The intersection of Cabot Drive and 13 Mile Road was studied in 2012 for the installation of a traffic signal. The attached June 2012 study indicated that a traffic signal at the intersection is warranted. The project was included in the Capital Improvement Program (CIP) discussion and is shown in FY2016-17 in the approved CIP.

Northern Equities contacted staff offering to share in the cost of design to expedite the installation of the signal (see August 14, 2014 Coburn memo for additional background). The City Attorney prepared the attached Memorandum of Understanding (MOU) to formalize the discussion between the Administration and Northern Equities regarding the design of the traffic signal. The MOU states that the City will pay 50% of the design fee (\$6,690) and that Northern Equities will pay the remaining \$6,690. The MOU covers only the design phase engineering and does not obligate the City to proceed with the construction of the project. The MOU has been executed and Northern Equities has deposited its share of the design fee with the City Treasurer.

Orchard Hiltz & McCliment's (OHM) engineering fees are based on the fixed fee schedule established in the Agreement for Professional Engineering Services for Public Projects. The design fees for this project will be \$13,920 (8.00% of the estimated construction cost of \$174,000). The construction phase engineering fees will be awarded at the time of construction award, whenever that would occur, and will be based on the contractor's bid price and the fee percentage established in the Agreement for Professional Engineering Services for Public Projects. A draft of the Supplemental Professional Engineering Services Agreement for this project is enclosed and includes the project scope and schedule.

It is anticipated that the project design would be completed in early 2014 and that a revised construction cost estimate would be available for additional discussion regarding construction schedule and costs during City Council budget discussions in spring 2014. Only the design engineering for the signal is scheduled for completion at this time.

RECOMMENDED ACTION: Approval to award a contract for design engineering services for a new traffic signal at the intersection of 13 Mile Road and Cabot Drive to Orchard, Hiltz & McCliment for a design fee of \$13,920 (of which 50% is to be paid by Northern Equities).

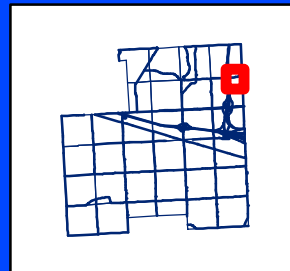
	1	2	Y	N
Mayor Gatt				
Mayor Pro Tem Staudt				
Council Member Casey				
Council Member Fischer				

	1	2	Y	N
Council Member Margolis				
Council Member Mutch				
Council Member Wrobel				

13 Mile Rd. and Cabot Dr. Signal Location Map



Map Author: M. D. McCreddie Jr
 Date: 7/29/13
 Project: 13 Mile Rd. and Cabot Dr. Signal
 Version #: 1



City of Novi
 Engineering Division
 Department of Public Services
 26300 Lee BeGole Drive
 Novi, MI 48375
cityofnovi.org



1 inch = 400 feet

MAP INTERPRETATION NOTICE

Map information depicted is not intended to replace or substitute for any official or primary source. This map was intended to meet National Map Accuracy Standards and use the most recent, accurate sources available to the people of the City of Novi. Boundary measurements and area calculations are approximate and should not be construed as survey measurements performed by a licensed Michigan Surveyor as defined in Michigan Public Act 232 of 1970 as amended. Please contact the City GIS Manager to confirm source and accuracy information related to this map.



JOHNSON ROSATI SCHULTZ JOPPICH PC

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Phone: 248.489.4100 | Fax: 248.489.1726

Elizabeth Kudla Saarela
esaarela@jrsjlaw.com

www.jrsjlaw.com

August 13, 2013

Brian Coburn, Engineering Manager
CITY OF NOVI
Department of Public Services
Field Services Complex
26300 Lee BeGole Drive
Novi, MI 48375

RE: Memorandum of Understanding Between the City of Novi and Northern Equities Group

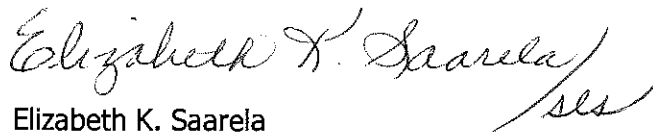
Dear Mr. Coburn:

Enclosed please find the Memorandum of Understanding Between the City of Novi and Northern Equities Group which we have prepared. The Memorandum is intended to state the terms and conditions under which the City and NEG will split the design fees and conduct the evaluation of the design for the traffic signal improvements at the intersection of Cabot Drive and Thirteen Mile Road. We see no legal impediment to signing the Memorandum of Understanding.

If you have any questions, please feel free to contact me.

Very truly yours,

JOHNSON ROSATI SCHULTZ JOPPICH P.C.


Elizabeth K. Saarela

EKS/sls

Enclosure

C: Maryanne Cornelius, Clerk (w/Enclosure)
Rob Hayes, Public Services Director (w/Enclosure)
Thomas R. Schultz, Esquire (w/Enclosure)

MEMORANDUM OF UNDERSTANDING BETWEEN

THE CITY OF NOVI

AND

NORTHERN EQUITIES GROUP

This Memorandum of Understanding ("MOU") is entered into this 27th day of Aug 2013, by and between the City of Novi (the "City") and Northern Equities Group, Inc. ("NEG").

NEG owns a development near the intersection of Thirteen Mile Road and Cabot Drive in the City of Novi (the "Intersection").

The City has obtained a traffic study showing that a traffic signal is warranted at the Intersection.

For the benefit of the citizens of the City of Novi, the driving public and NEG and its development, the parties propose to cooperate to determine whether the installation of a traffic signal at the Intersection is feasible, cost effective and mutually beneficial.

The City has proposed to select a City consultant to design an appropriate traffic signal consistent with City design standards and all applicable laws and ordinance.

The parties propose to split the fees required for the City consultant to design an appropriate traffic signal for the intersection.

Once the design has been prepared, the parties will consider the design and further explore the viability and potential costs of such improvements, with the expectation that, if the improvements prove feasible and cost-effective, a formal agreement for sharing the cost of the installation of the signal would be entered into by the City and NEG in the future.

Though NEG has requested that the City review the feasibility of the traffic signal installation project (the "Project") at this time, the Project is not scheduled for design and construction until 2017 based on the City's most recent Capital Improvement Plan.

This MOU is intended to state the terms and conditions under which the City and NEG will split the design fees and conduct the evaluation of the design for the traffic signal improvements.

NOW, THEREFORE, be it agreed between the parties as follows:


1. The City and NEG will equally split the cost of preparing any and all designs, plans, drawings and/or reviews, with respect to a potential traffic signal for the Intersection.
2. The cost of design, plans and drawings shall not exceed \$13,920.00. NEG shall pay its portion of the fees prior to the City awarding a contract to the consultant.

3. The signal will be designed to meet current standards and regulations for the design of a box span traffic control signal. The City shall, in preparing its plans, take into consideration the needs of both NEG and the City.


4. NEG shall not be responsible for the cost of constructing the signal unless and until the parties have entered into a formal Cost Sharing Agreement stating the terms and conditions of the payment of costs to construct the mutually approved signal. Until such time as the Cost Sharing Agreement is approved by City Council, the City shall not be obligated to proceed with the Project.

SIGNATURES:

CITY OF NOVI

By: 
Clay Pearson, City Manager

NORTHERN EQUITIES GROUP, INC.

By: 
Matthew S. Sosin, President

MEMORANDUM



TO: ROB HAYES, P.E; DIRECTOR OF PUBLIC SERVICES/CITY ENGINEER
FROM: BRIAN COBURN, P.E.; ENGINEERING MANAGER *BTC*
SUBJECT: PROPOSED CABOT AND 13 MILE ROAD TRAFFIC SIGNAL
DATE: AUGUST 14, 2013

8/14/2013
To: Mayor and City
Council members
FYI. Clay

In preparation for the FY13-14 budget process, the Engineering Division worked with the City's traffic consultant, Clearzoning (formerly Birchler Arroyo Associates) in June 2012 to prepare the attached traffic signal warrant study for the intersection of 13 Mile Road and Cabot Drive. Based on the criteria in the Michigan Manual for Uniform Traffic Control Devices (MMUTCD), a traffic signal is warranted at the intersection. The project was included in the Capital Improvement Program (CIP) discussion and is shown in FY2016-17 in the approved CIP.

We were contacted by Brian Hughes with Northern Equities in July 2013 and he inquired about the signalization of the Cabot and 13 Mile intersection. Northern Equities owns much of the land north and south of 13 Mile Road along Cabot Drive and several tenants have expressed concerns regarding traffic safety at this intersection. Northern Equities would like to share the design costs for the project with the City to develop construction plans and detailed construction cost estimates in an effort to signalize the intersection sooner. The engineering fee for design is \$13,920, which is calculated based on the fee curve in the general consulting agreements (8% of the preliminary construction cost estimate of \$174,000). Once a detailed construction estimate is prepared, Northern Equities would be open to a discussion on sharing the cost of construction.

The City Attorney has prepared the attached Memorandum of Understanding (MOU) to formalize the discussion between the Administration and Northern Equities regarding the design of the traffic signal. The MOU states that the City will pay 50% of the design fee (\$6,690) and that Northern Equities will pay the remaining \$6,690. The MOU covers only the design phase engineering and does not obligate the City to proceed with the construction of the project.

If there are no objections, we will proceed by sending the draft MOU to Northern Equities for review and approval. Since the agreement is under \$15,000 in value, the City Charter allows the City Manager to sign on behalf of the City. The funding for the design fee would be added to the first quarter budget amendment for City Council consideration.

SUPPLEMENTAL PROFESSIONAL ENGINEERING SERVICES AGREEMENT

CABOT DRIVE AND 13 MILE ROAD TRAFFIC SIGNAL

This Agreement shall be considered as made and entered into as of the date of the last signature hereon, and is between the City of Novi, 45175 W. Ten Mile Road, Novi, MI 48375-3024, hereafter, "City," and Orchard, Hiltz & McCliment, Inc., whose address is 34000 Plymouth Road, Livonia, Michigan 48150, hereafter, "Consultant."

RECITALS:

This Agreement shall be supplemental to, and hereby incorporates the terms and conditions of the AGREEMENT FOR PROFESSIONAL ENGINEERING SERVICES FOR PUBLIC PROJECTS, and attached exhibits, entered into between the City and the Consultant on December 18, 2012.

The project includes the design and the preparation of plans and specifications for the construction of a new traffic signal at the intersection of 13 Mile Road and Cabot Drive including necessary pedestrian improvements for compliance with current Americans with Disabilities Act standards.

NOW, THEREFORE, in consideration of the foregoing, the City and Consultant agree as follows:

Section 1. Professional Engineering Services.

For and in consideration of payment by the City as provided under the "Payment for Engineering Services" section of this Agreement, Consultant shall perform the work described in the manner provided or required by the following Scope of Services, which is attached to and made a part of this Agreement as Exhibit A, all of said services to be done in a competent, efficient, timely, good and workmanlike manner and in compliance with all terms and conditions of this Agreement.

Exhibit A Scope of Services

Section 2. Payment for Professional Engineering Services.

1. Basic Fee.

- a. Design Phase Services: The Consultant shall complete the design phase services as described herein for a lump sum fee of \$13,920, which is 8.0% of the estimated construction cost (\$174,000) as indicated on the design and construction engineering fee curve provided in Exhibit B of the Agreement for Professional Engineering Services for Public Projects.
- b. Construction Phase Services will be awarded at the time of construction award, should it occur.

2. Payment Schedule for Professional Engineering Services Fee.

Consultant shall submit monthly statements for professional engineering services rendered. The statements shall be based on Consultant's estimate of the proportion of the total services actually completed for each task as set forth in Exhibit A at the time of billing. The City shall confirm the correctness of such estimates, and may use the City's own engineer for such purposes. The monthly statements should be accompanied by such properly completed reporting forms and such other evidence of progress as may be required by the City. Upon such confirmation, the City shall pay the amount owed within 30 days.

Final billing under this agreement shall be submitted in a timely manner but not later than three (3) months after completion of the services. Billings for work submitted later than three (3) months after completion of services will not be paid. Final payment will be made upon completion of audit by the City.

3. Payment Schedule for Expenses.

All expenses required to complete the scope of services described herein, including but not limited to costs related to mileage, vehicles, reproduction, computer use, etc., shall be included in the basic fee and shall not be paid separately. However, as compensation for expenses that are not included in the standard scope of services, when incurred in direct connection with the project, and approved by the City, the City shall pay the Consultant its actual cost times a factor of 1.15.

Section 4. Ownership of Plans and Documents; Records.

1. Upon completion or termination of this agreement, all documents prepared by the Consultant, including tracings, drawings, estimates, specifications, field notes, investigations, studies, etc., as instruments of service shall become the property of the City.

2. The City shall make copies, for the use of the Consultant, of all of its maps, records, laboratory tests, or other data pertinent to the work to be performed by the Consultant under this Agreement, and also make available any other maps, records, or other materials available to the City from any other public agency or body.

3. The Consultant shall furnish to the City, copies of all maps, records, field notes, and soil tests that were developed in the course of work for the City and for which compensation has been received by the Consultant.

Section 5. Termination.

1. This Agreement may be terminated by either party upon 7- days' prior written notice to the other party in the event of substantial failure by the other party to fulfill its obligations under this agreement through no fault of the terminating party.

2. This Agreement may be terminated by the City for its convenience upon 90 days' prior written notice to the Consultant.

3. In the event of termination, as provided in this Article, the Consultant shall be paid as compensation in full for services performed to the date of that termination, an amount calculated in accordance with Section 2 of this Agreement. Such amount shall be paid by the City upon the Consultant's delivering or otherwise making available to the City, all data, drawings, specifications, reports, estimates, summaries, and that other information and materials as may have been accumulated by the Consultant in performing the services included in this Agreement, whether completed or in progress.

Section 6. Disclosure.

The Consultant affirms that it has not made or agreed to make any valuable gift whether in the form of service, loan, thing, or promise to any person or any of the person's immediate family, having the duty to recommend, the right to vote upon, or any other direct influence on the selection of consultants to provide professional engineering services to the City within the two years preceding the execution of this Agreement. A campaign contribution, as defined by Michigan law shall not be considered as a valuable gift for the purposes of this Agreement.

Section 7. Insurance Requirements.

1. The Consultant shall maintain at its expense during the term of this Agreement, the following insurance:

- A. Worker's Compensation insurance relative to all Personnel engaged in performing services pursuant to this Agreement, with coverage not less than that required by applicable law.
- B. Comprehensive General Liability insurance with maximum bodily injury limits of \$1,000,000 (One Million Dollars) each occurrence and/or aggregate and minimum Property Damage limits of \$1,000,000 (One Million Dollars) each occurrence and/or aggregate.
- C. Automotive Liability insurance covering all owned, hired, and non-owned vehicles with Personal Protection insurance to comply with the provisions of the Michigan No Fault Insurance Law including Residual Liability insurance with minimum bodily injury limits of \$1,000,000 (One Million Dollars) each occurrence and/or aggregate minimum property damage limits of \$1,000,000 (One Million Dollars) each occurrence and/or aggregate.
- D. The Consultant shall provide proof of Professional Liability coverage in the amount of not less than \$1,000,000 (One Million Dollars) per occurrence and/or aggregate, and Environmental Impairment coverage.

2. The Consultant shall be responsible for payment of all deductibles contained in any insurance required hereunder.

3. If during the term of this Agreement changed conditions or other pertinent factors should in the reasonable judgment of the City render inadequate insurance limits, the Consultant will furnish on demand such additional coverage as may reasonably be required under the

circumstances. All such insurance shall be effected at the Consultant's expense, under valid and enforceable policies, issued by the insurers of recognized responsibility which are well-rated by national rating organizations and are acceptable to the City.

4. All policies shall name the Consultant as the insured and shall be accompanied by a commitment from the insurer that such policies shall not be canceled or reduced without at least thirty (30) days prior notice to the City.

With the exception of professional liability, all insurance policies shall name the City of Novi, its officers, agents, and employees as additional insured. Certificates of Insurance evidencing such coverage shall be submitted to Sue Morianti, Purchasing Manager, City of Novi, 45175 West Ten Mile Road, Novi, MI 48375-3024 prior to commencement of performance under this Agreement and at least fifteen (15) days prior to the expiration dates of expiring policies.

5. If any work is sublet in connection with this Agreement, the Consultant shall require each subconsultant to effect and maintain at least the same types and limits of insurance as fixed for the Consultant.

6. The provisions requiring the Consultant to carry said insurance shall not be construed in any manner as waiving or restricting the liability of the Consultant under this Agreement.

Section 8. Indemnity and Hold Harmless.

A. The Consultant agrees to indemnify and hold harmless the City, its elected and appointed officials and employees, from and against any and all claims, demands, suits, losses and settlements, including actual attorney fees incurred and all costs connected therewith, for any damages which may be asserted, claimed or recovered against the City by reason of personal injury, death and/or property damages which arises out of or is in any way connected or associated with the actions or inactions of the Consultant in performing or failing to perform the work.

The Consultant agrees that it is its responsibility and not the responsibility of the City to safeguard the property and materials used in performing this Agreement. Further, this Consultant agrees to hold the City harmless for any loss of such property and materials used pursuant to the Consultant's performance under this Agreement.

Section 9. Nondiscrimination.

The Consultant shall not discriminate against any employee, or applicant for employment because of race, color, sex, age or handicap, religion, ancestry, marital status, national origin, place of birth, or sexual preference. The Consultant further covenants that it will comply with the Civil Rights Act of 1973, as amended; and the Michigan Civil Rights Act of 1976 (78. Stat. 252 and 1976 PA 4563) and will require a similar covenant on the part of any consultant or subconsultant employed in the performance of this Agreement.

Section 10. Applicable Law.

This Agreement is to be governed by the laws of the State of Michigan and the City of Novi Charter and Ordinances.

Section 11. Approval; No Release.

Approval of the City shall not constitute nor be deemed release of the responsibility and liability of Consultant, its employees, associates, agents and subconsultants for the accuracy and competency of their designs, working drawings, and specifications, or other documents and services; nor shall that approval be deemed to be an assumption of that responsibility by the City for any defect in the designs, working drawings and specifications or other documents prepared by Consultant, its employees, subconsultants, and agents.

After acceptance of final plans and special provisions by the City, Consultant agrees, prior to and during the construction of this project, to perform those engineering services as may be required by City to correct errors or omissions on the original plans prepared by Consultant and to change the original design as required.

Section 12. Compliance With Laws.

This Contract and all of Consultants professional services and practices shall be subject to all applicable state, federal and local laws, rules or regulations, including without limitation, those which apply because the City is a public governmental agency or body. Consultant represents that it is in compliance with all such laws and eligible and qualified to enter into this Agreement.

Section 13. Notices.

Written notices under this Agreement shall be given to the parties at their addresses on page one by personal or registered mail delivery to the attention of the following persons:

City: Rob Hayes, P.E., Director of Public Services and Maryanne
Cornelius, Clerk, with a copy to Thomas R. Schultz, City Attorney

Consultant: James Stevens, P.E.

Section 14. Waivers.

No waiver of any term or condition of this Agreement shall be binding and effective unless in writing and signed by all parties, with any such waiver being limited to that circumstance only and not applicable to subsequent actions or events.

Section 15. Inspections, Notices, and Remedies Regarding Work.

During the performance of the professional services by Consultant, City shall have the right to inspect the services and its progress to assure that it complies with this Agreement. If such inspections reveal a defect in the work performed or other default in this Agreement, City shall provide Consultant with written notice to correct the defect or default within a specified

number of days of the notice. Upon receiving such a notice, Consultant shall correct the specified defects or defaults within the time specified. Upon a failure to do so, the City may terminate this Agreement by written notice and finish the work through whatever method it deems appropriate, with the cost in doing so being a valid claim and charge against Consultant; or, the City may preserve the claims of defects or defaults without termination by written notice to Consultant.

All questions which may arise as to the quality and acceptability of work, the manner of performance and rate of progress of the work, and the interpretation of plans and specifications shall be decided by the City. All questions as to the satisfactory and acceptable fulfillment of the terms of this agreement shall be decided by the City.

Section 16. Delays.

No charges or claims for damages shall be made by the Consultant for delays or hindrances from any cause whatsoever during the progress of any portions of the services specified in this agreement, except as hereinafter provided.

In case of a substantial delay on the part of the City in providing to the Consultant either the necessary information or approval to proceed with the work, resulting, through no fault of the Consultant, in delays of such extent as to require the Consultant to perform its work under changed conditions not contemplated by the parties, the City will consider supplemental compensation limited to increased costs incurred as a direct result of such delays. Any claim for supplemental compensation must be in writing and accompanied by substantiating data.

When delays are caused by circumstances or conditions beyond the control of the Consultant as determined by the City, the Consultant shall be granted an extension of time for such reasonable period as may be mutually agreed upon between the parties, it being understood, however, that the permitting of the Consultant to proceed to complete the services, or any part of them, after the date to which the time of completion may have been extended, shall in no way operate as a waiver on the part of the City of any of its rights herein set forth.

Section 17. Assignment.

No portion of the project work, heretofore defined, shall be sublet, assigned, or otherwise disposed of except as herein provided or with the prior written consent of the City. Consent to sublet, assign, or otherwise dispose of any portion of the services shall not be construed to relieve the Consultant of any responsibility for the fulfillment of this agreement.

Section 18. Dispute Resolution.

The parties agree to try to resolve any disputes as to professional engineering services or otherwise in good faith. In the event that the parties cannot resolve any reasonable dispute, the parties agree to seek alternative dispute resolution methods agreeable to both parties and which are legally permissive at the time of the dispute. The parties agree to use their best efforts to resolve any good faith dispute within 90 (ninety) days notice to the other party. In the event the parties cannot resolve that dispute as set forth above, they may seek such remedies as may be permitted by law.

WITNESSES

Orchard, Hiltz & McCliment, Inc.

By:
Its:

The foregoing _____ was acknowledged before me this ____ day of _____,
20____, by _____ on behalf of

_____.

Notary Public
_____ County, Michigan
My Commission Expires: _____

WITNESSES

CITY OF NOVI

By: Robert J. Gatt
Its: Mayor

The foregoing _____ was acknowledged before me this ____ day of _____,
20____, by _____ on behalf of the City of Novi.

Notary Public
Oakland County, Michigan
My Commission Expires: _____

EXHIBIT A - SCOPE OF SERVICES

Consultant shall provide the City professional engineering services in all phases of the Project to which this Agreement applies as hereinafter provided. These services will include serving as the City's professional engineering representative for the Project, providing professional engineering consultation and advice and furnishing customary civil, structural, mechanical and electrical engineering services and customary engineering services incidental thereto, as described below.

A. Basic Services.

[see attached]

B. Performance.

1. The Consultant agrees that, immediately upon the execution of this Agreement, it will enter upon the duties prescribed in this agreement, proceed with the work continuously, and make the various submittals on or before the dates specified in the attached schedule. The City is not liable and will not pay the Consultant for any services rendered before written authorization is received by the Consultant.
2. The Consultant shall submit, and the City shall review and approve a timeline for submission of plans and/or the completion of any other work required pursuant to this Scope of Services. The Consultant shall use its best efforts to comply with the schedule approved by the City.
3. If any delay is caused to the Consultant by order of the City to change the design or plans; or by failure of the city to designate right-of-way, or to supply or cause to be supplied any data not otherwise available to the Consultant that is required in performing the work described; or by other delays due to causes entirely beyond the control of the Consultant; then, in that event, the time schedules will be adjusted equitably in writing, as mutually agreed between the City and the Consultant at the moment a cause for delay occurs.
4. Since the work of the Consultant must be coordinated with the activities of the City (including firms employed by and governmental agencies and subdivisions working with the City), the Consultant shall advise the City in advance, of all meetings and conferences between the Consultant and any party, governmental agency, political subdivision, or third party which is necessary to the performance of the work of the Consultant.

EXHIBIT A - Scope of Services

Cabot at 13 Mile Traffic Signal

OHM Advisors is pleased to provide engineering services to the City of Novi. We understand that the City wishes to install a traffic signal at the intersection of Cabot Drive and 13 Mile Road. As part of the improvements, left turn striping and possible improvements to the median in the north approach to Cabot Street may be required to facilitate this movement. The intersection's pedestrian facilities are likely already compliant with current ADA standard, but will be checked to see if they need to be upgraded.

The scope of engineering services shall include the following tasks:

1. Perform the necessary topographical survey of the project area.
2. Conduct an initial site design visit. The field information pertaining to the following plan elements would be gathered to produce useable drawing(s):
 - a. Streets laneage and striping, lane use, parking, stop bars, and crosswalks on each leg.
 - b. Curb radius, sidewalks, poles, pedestals, fire hydrant, right-of-way, buildings, and any other existing above-ground facilities.
 - c. Posted speeds for all approaches.
3. Prepare a drawing (1"=30') with all the above features shown. We will request utility company information that may be located in the vicinity of the proposed project. We will utilize this information in the design to avoid conflicts, aerial and underground, with proposed signal structures. If the design cannot be adjusted to avoid utility conflicts, we will organize and attend a utility coordination meeting to resolve any conflicts.
4. Arrange an on-site meeting with representatives designated by the City of Novi, including staff from the City, Road Commission for Oakland County (RCOC), and (if applicable) various utility companies that may be located in the vicinity of the proposed project. At the on-site meeting, using the knowledge of attending representatives and/or our own investigations, obtain all necessary information to produce a traffic signal design preliminary plan, which shows the following:
 - a. Removal plan, if needed, with appropriate bid items.
 - b. Installation plan drawing showing traffic and pedestrian signal head placement, supporting structures (poles and pedestals), new conduit, handholes, controllers, signal head mounting details, any necessary phasing diagrams or span calculation diagrams, the reinstallation of any other items disturbed by this design such as street lights, etc., and material list showing all appropriate pay items and quantities.
 - c. Sidewalk and sidewalk ramp upgrades to current standards.
5. Coordinate with the City's Geotechnical Engineer on soil borings, if applicable.
6. Prepare the plans and specifications in accordance with the City of Novi and RCOC standards. We will send preliminary plans for review to the City of Novi, RCOC, and other concerned agencies. Plans will be modified based on recommendations by the reviewing agencies. We will schedule necessary on-site visit(s) to resolve any conflicts with all parties involved.
7. Prepare final plans with any changes that have occurred due to utility conflicts. Prepare final specifications, measurement and payment items, and engineer's estimate.
8. Provide copies of the plans and specifications to facilitate the bidding process.

The following services are not anticipated to be required for this project and have not included:

- ▼ Permit or application fees

City of Novi

Cabot Dr at 13 Mile Rd Traffic Signal Improvements

Capital Improvement Plan: Engineer's Opinion of Probable Construction Cost

Project Assumptions:

- 1 Box span configuration with span wire per RCOC standards.
- 2 Signal components will meet RCOC standards.
- 3 Dedicated left turn phasing is needed for 13 Mile due to turn path overlap.
- 4 Pedestrian crossings are desired on all four quadrants.

Item #	Item Description	Quantity	Unit	Unit Price	Cost
1	Steel Strain Pole and Foundation	4	Ea	\$ 11,000.00	\$ 44,000.00
2	Span wire, Box (RCOC Spec)	1	LS	\$ 2,000.00	\$ 2,000.00
3	Traffic Signal, Span Wire Mounted, LED (RCOC Spec)	10	Ea	\$ 1,000.00	\$ 10,000.00
4	Pedestrian TS, Countdown, LED	8	Ea	\$ 1,000.00	\$ 8,000.00
5	Pushbutton, signs, and pedestals	8	Ea	\$ 1,500.00	\$ 12,000.00
6	Controller, cabinet, and foundation	1	Ea	\$ 15,000.00	\$ 15,000.00
7	Optical Priority Control System (RCOC spec)	1	Ea	\$ 5,000.00	\$ 5,000.00
8	RCOC Force Account (controller program, autoscope cameras, SCATS)	1	LS	\$ 30,000.00	\$ 30,000.00
9	Median pavement reconstruction	1	LS	\$ 15,000.00	\$ 15,000.00
10	Pavement striping	1	LS	\$ 5,000.00	\$ 5,000.00
11	Mobilization (10%)	1	LS	\$ 14,000.00	\$ 14,000.00
12	Contingency (10%)	1	LS	\$ 14,000.00	\$ 14,000.00

TOTAL \$ 174,000.00

- ▼ Design of pedestrian sidewalks or ramps.
- ▼ Coordination or design for utility relocations or repairs
- ▼ Remediation or removal of contaminated or hazardous soils or materials.
- ▼ Preparation of signal timing permit.

We can perform any of these above-mentioned services. In the event any of these services are required, an addendum to the supplemental engineering agreement will be submitted for your approval prior to performing said services.

Tentative Schedule:

1. Design completed by January, 2014
 - Initial on-site meeting with City of Novi, RCOC, and utilities – October, 2013
 - Preliminary plan submittal to City of Novi and RCOC – November, 2013
 - Final submittal – December, 2013
2. Bids received March 2014.
3. Construction to begin June 2014.

June 29, 2012

Brian T. Coburn, P.E.
Engineering Manager
Dept. of Public Services, City of Novi
26300 Lee BeGole Drive
Novi, MI 48375



Subject: Signal Warrant Study at Cabot Drive and 13 Mile Road

Dear Mr. Coburn:

We have completed the signal warrant study outlined in our approved proposal of May 17, 2012. As reported below, existing conditions were found to meet two warrants for the installation of a traffic signal at Cabot at 13 Mile: Warrant 2 (Four-Hour Vehicular Volume) and Warrant 3B (Peak-Hour Vehicular Volume). Based on the satisfaction of these two warrants and our observations of existing traffic conditions, we are recommending that the intersection be signalized at the earliest opportunity. We are also offering recommendations for how the new signal should operate so as to afford reasonable levels of both service and safety – given the unique intersection design – as well as for future road improvements that are likely to be needed within the next ten years (see Conclusions section on page 15).

Existing Conditions

Geometrics – Figure 1 shows that the subject intersection is located approximately ¼ mile from the nearest existing signals, at M-5 and at Haggerty. This spacing is generally considered the minimum acceptable spacing of signals along a 45-road such as 13 Mile.

Figures 2-5 show that:

- ❑ All four intersection approaches feature a left-turn lane, through lane, and right-turn lane.
- ❑ Cabot now has boulevard islands designed so that the north-south left-turn lanes are directly aligned (Figure 4), allowing northbound and southbound left turns to move at the same time without conflicting with each other (the original undivided intersection design also permitted this to happen).
- ❑ Opposing east-west left turns can proceed simultaneously only with great care, however, since the insertion of islands in Cabot has shifted the northbound and southbound departure legs further apart and created an “interlock.” In the most general case, a left-turn vehicle approaching from one direction or the other on 13 Mile can be expected to advance to a position consistent with a minimum-radius left turn onto Cabot (e.g., white vehicle in Figure 5). While this vehicle waits to turn left, another left-turn vehicle could arrive from the opposite direction (yellow vehicle) and have to either make a very flat turn to avoid the first vehicle, or wait until the first vehicle completes its turn before advancing to a more normal turning position. This situation may work satisfactorily with relatively light opposing left-turn volumes (as it apparently has to date); however, in the example illustrated, the eastbound left-turn volume is expected to grow substantially as further land development occurs north of 13 Mile.



Figure 1. Haggerty Corridor Corporate Park

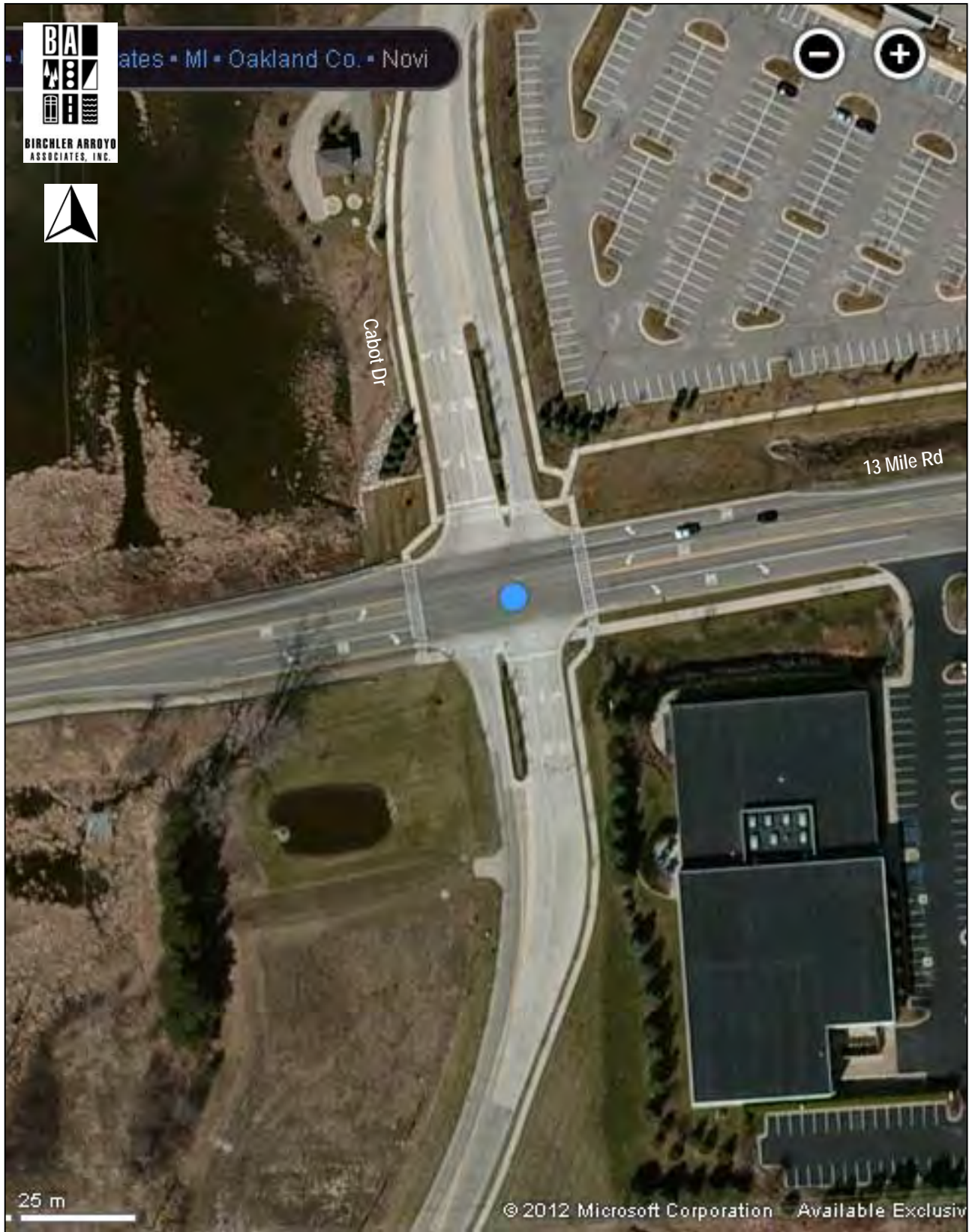


Figure 2. Intersection of 13 Mile Road and Cabot Drive



Figure 3. Eastbound 13 Mile Road at Cabot Drive



Figure 4. Cabot Drive at 13 Mile Road, Looking South

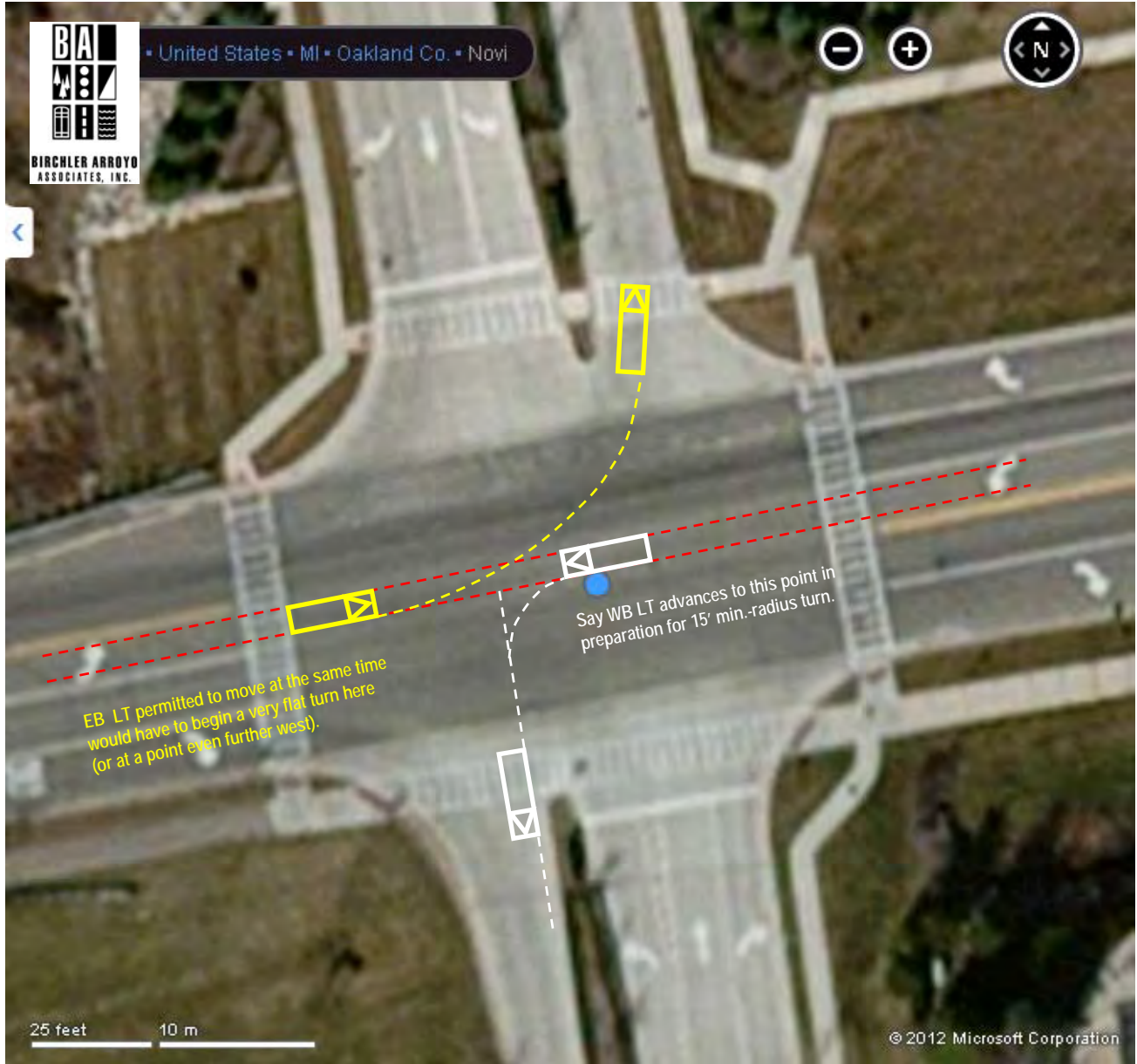


Figure 5. Illustration of East-West Left-Turn Interlock

Hourly Approach Volumes – Most signal warrants of interest evaluate hourly approach volumes. For this study, City personnel installed automated (hose) counting equipment on all four intersection approaches and collected 48 hours of volume and speed data, beginning around midday on a recent Tuesday. We have summarized the raw volume data provided by the City in a single table; see appendix Table A-1.

Peak-Hour Turning-Movement Volumes – To facilitate an analysis of intersection operations with and without a signal, Birchler Arroyo staff made manual turning-movement counts in the usual commuting peak periods (7:00-9:00 a.m. and 4:00-6:00 p.m.) of a recent weekday. Our results are detailed in Appendix B and summarized in Table 1 (below). As indicated in the table, the peak hours within the two count periods were found to be 7:30-8:30 a.m. and 4:45-5:45 p.m.

Recent Crash History – Five full calendar years of summary crash data (2006-2010) had already been obtained from the Traffic Improvement Association (TIA) for Birchler Arroyo's use in the Citywide Crash Study. To update that data base to the present day, TIA checked its data base at our request; however, it was found that there were no additional crashes reported for this intersection since January 1, 2011.

Table 2 (below) shows that there were only three reported crashes in the most recent six years and five months. The two most recent crashes – both occurring in 2010 – were apparently due largely to poor weather and/or road conditions. It appears that the third crash – occurring in 2006 – may have been the result of an eastbound through vehicle straying into the westbound left-turn lane, since "improper lane use" was cited by the reporting officer.

Evaluation of Signal Installation Warrants

As discussed at some length in the 2011 *Michigan Manual on Uniform Traffic Control Devices*, new traffic signals can offer disadvantages to the motoring public – such as increased rear-end crashes – as well as (the more obvious) advantages – such as more orderly movement of traffic and decreased side-road delays. Hence, the installation of a new signal requires careful engineering study. A key part of such study is the evaluation of a series of warrants prescribed by the *MMUTCD*. Although strictly speaking, the need for a signal can be justified with the satisfaction of only one warrant, meeting multiple warrants can be viewed as establishing a stronger case for signal installation. In no case does warrant satisfaction require that a signal be actually installed; engineers are repeatedly advised to consider alternatives (see, for instance, *MMUTCD* Section 4B.04).

Warrants Evaluated – The *MMUTCD* offers nine different signal warrants for possible evaluation, some containing multiple parts. Not all warrants apply to a given situation. Since experience has shown that most warrants will not be met if Warrant 3B, the Peak-Hour Volume Warrant, is not also met, we prefer to first evaluate only the applicable volume-related warrants; in this case the following:

- Warrant 1, Eight-Hour Vehicular Volume – This warrant includes two conditions: A - Minimum Vehicular Volume and B – Interruption of Continuous Traffic. A is "intended for application at locations where a large volume of intersecting traffic is the principal reason to consider installing a traffic control signal," and B is "intended for application at locations where Condition A is not satisfied and where the traffic volume on a major street is so heavy that traffic on a minor intersecting street suffers excessive delay or conflict in entering or crossing the major street." Warrant 1 is treated as a single warrant: If A is satisfied, Warrant 1 is satisfied and further analysis of the warrant is unnecessary; if A is not satisfied but B is, further analysis is similarly unnecessary; however, if neither A nor B is satisfied, Warrant 1 is satisfied if both A and B are satisfied at the 80% level. Warranting volumes are presented in our Results section (below).

Table 1. Peak-Hour Turning-Movement Volumes and Percent Trucks¹

Approach	Movement	7:30-8:30 AM Peak Hour			4:45-5:45 PM Peak Hour		
		# Trucks	Total Volume	% Trucks	# Trucks	Total Volume	% Trucks
EB	LT	1	179	1%	0	6	0%
	TH	6	479	1%	0	411	0%
	RT	0	370	0%	0	14	0%
WB	LT	0	50	0%	2	12	17%
	TH	0	419	0%	4	711	1%
	RT	0	13	0%	0	1	0%
NB	LT	0	10	0%	0	188	0%
	TH	0	3	0%	0	6	0%
	RT	1	6	17%	6	103	6%
SB	LT	0	0	0%	0	0	0%
	TH	0	1	0%	0	0	0%
	RT	0	11	0%	0	148	0%

¹ See detailed count data in Appendix B.

Table 2. Summary of Crashes Reported Occurring at 13 Mile and Cabot, 1-1-06 to 5-31-12

Year	Date	Time	Distance from Intersection	Crash Type						Crash Severity (# Persons)				Contributing Factors	
				Angle	Head-On	Sideswipe		Rear-End	Single-Vehicle	Fatal	Personal Injury				Property Damage Only
						Opposite Direction	Same Direction				A	B	C		
2010	12/01	11:00	9' E	NB-WB									2	NB thru "failed to yield" on "snowy" road	
	02/24	08:00	100' W						Fixed object				1	SB right-turn vehicle from Cabot "unable to stop" on wet road (was snowing)	
2006	06/26	08:00	0'	EB-WBL								1	1	Head-on / left-turn crash; EB thru vehicle cited for "improper lane use"	
Totals				2	0	0	0	0	1	0	0	0	1	4	

- ❑ Warrant 2, Four-Hour Vehicular Volume – This warrant is “intended to be applied where the volume of intersecting traffic is the principal reason to consider installing a traffic control signal.” The warrant is considered satisfied if, for each of any four hours of an average day, the combination of major and minor approach volumes defines a point located above the applicable curve of the appropriate figure in the *MMUTCD*. The appropriate figure in this case is presented in Appendix C of this report and referenced in our Results section (below).
- ❑ Warrant 3, Peak Hour – This warrant is “intended for use at a location where traffic conditions are such that for a minimum of one hour of an average day, the minor-street traffic suffers undue delay when entering or crossing the major street.” A related *MMUTCD* “standard” states: “This signal warrant shall be applied only in unusual cases, such as office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time.” Similar to Warrant 1, Warrant 3 has two parts: A – Combination of minor-approach stopped delay, minor-approach volume, and total volume entering intersection, and B – At least one point located above an applicable curve. The appropriate figure for part B in this case is presented in Appendix C, on the same page as the applicable figure for Warrant 2, and is referenced in our Results section (below). Warrant 3 is met if conditions in either part are met; since part B was first found to be met, the evaluation of part A was found unnecessary and therefore not done.
- ❑ Warrant 7, Crash Experience – This warrant is “intended for application where the severity and frequency of crashes are the principal reasons to consider installing a traffic control signal.” This warrant is met only if three separate criteria are demonstrated: A – Adequate trial of alternatives (to signalization) has failed to reduce crash frequency; B – There were five or more reported crashes, of types susceptible to “correction” by a signal, within a 12-month period; and C – Eight-hour volumes reached or exceeded threshold values specified in the Manual.

Speeds on Major Street – The *MMUTCD* reduces the threshold values by 30% when the major street’s posted or statutory speed limit, or 85th-percentile speed, exceeds 40 mph. The posted speed limit on 13 Mile at Cabot is 45 mph, so this warrant reduction applies.

According to the hose counts conducted by the City for this study, the 85th-percentile speeds on 13 Mile at Cabot are now 47.1 mph eastbound and 44.2 mph westbound, or 45.7 mph overall (i.e., very close to the speed limit, as it should be). Interestingly, a little over two years ago when the speed limit was still 40 mph, the corresponding 85th-percentile speeds were remarkably similar, at 47.2 mph and 44.7 mph, respectively.

Warrant Evaluation Results – Table 3 summarizes our evaluation of Warrants 1A, 1B, 2, and 3B, and Table 4 summarizes our evaluation of the Warrant 1 Combination of A and B. Key findings are as follows:

- ❑ Warrant 1A, Eight-Hour Minimum Vehicular Volume, is not met since the required minor-approach hourly volume (140 vehicles) exists during only three hours of the day.
- ❑ Warrant 1B, Eight-Hour Interruption of Continuous Traffic, is not yet quite met, since the required minor-approach hourly volume (70 vehicles) exists in six rather than eight hours. It is worth noting, however, that increasing the volume on northbound Cabot in each of two midday hours by only eight vehicles would result in this warrant being met; this could occur due to random volume variations and/or a modest increase in building occupancy south of 13 Mile.

Table 3. Evaluation of Signal Warrants 1A, 1B, 2, and 3B at Intersection of 13 Mile Road and Cabot Drive ¹

Hour Beginning	Weekday Hourly Volumes (June 2012)		Warrant 1A (8 hrs - Minimum Vehicular Volume)			Warrant 1B (8 hrs - Interruption of Continuous Traffic)			Warrant 2 (4-Hr Veh. Vol.)	Warrant 3B (Peak Hr - Vol.)
	13 Mile Road - Major Road: Total of EB & WB Approaches	Cabot Drive - Minor Road: NB Approach	Meets Major Street Warrant? (420)	Meets Minor Street Warrant? (140)	Meets Both (Major + Minor) Warrants?	Meets Major Street Warrant? (630)	Meets Minor Street Warrant? (70)	Meets Both (Major + Minor) Warrants?	Meets Warrant? (4 hrs re: MMUTCD Fig. 4C-2)	Meets Warrant? (1 hr re: MMUTCD Fig. 4C-4)
12 a.m.	49	6								
1 a.m.	32	3								
2 a.m.	29	0								
3 a.m.	20	1								
4 a.m.	90	0								
5 a.m.	275	1								
6 a.m.	815	2	Y			Y				
7 a.m.	1077	15	Y			Y				
8 a.m.	730	30	Y			Y				
9 a.m.	545	34	Y							
10 a.m.	530	41	Y							
11 a.m.	698	138	Y			Y	Y	Y	Y	
12 p.m.	728	140	Y	Y	Y	Y	Y	Y	Y	
1 p.m.	669	62	Y			Y				
2 p.m.	711	62	Y			Y				
3 p.m.	791	96	Y			Y	Y	Y		
4 p.m.	997	183	Y	Y	Y	Y	Y	Y	Y	Y
5 p.m.	1048	242	Y	Y	Y	Y	Y	Y	Y	Y
6 p.m.	757	72	Y			Y	Y	Y		
7 p.m.	571	38	Y							
8 p.m.	463	22	Y							
9 p.m.	312	19								
10 p.m.	210	12								
11 p.m.	106	7								
Total	12245	1218	Yes (15)	No (3<8)	NO (3<8)	Yes (11)	No (6<8)	NO (6<8)	YES (4)	YES (2)

Ref: *Michigan Manual on Uniform Traffic Control Devices (MMUTCD)*, published in December 2011 by the Michigan Departments of Transportation and State Police.

¹ Since the 85th-percentile speed on 13 Mile is 45.7 mph, the MMUTCD's "70% Factor" applies (+ Figs. 4C-2 and 4C-4). Both streets have 2 or more lanes on their approaches.

Table 4. Evaluation of Signal Warrant 1 - Combination of A and B - at 13 Mile Road and Cabot Drive

Hour Beginning	Weekday Hourly Volumes (June 2012)		80% of Warrant 1.A (8 hrs)			80% of Warrant 1.B (8 hrs)			Combination Warrant (8 hrs)
	13 Mile Road - Major Road: Total of EB & WB Approaches	Cabot Drive - Minor Road: NB	Meets MajorStreet Warrant? (336)	Meets MinorStreet Warrant? (112)	Meets Both Warrants?	Meets MajorStreet Warrant? (504)	Meets Minor Street Warrant? (56)	Meets Both Warrants?	Meets 80% of Warrants 1.A & 1.B?
12 a.m.	49	6							
1 a.m.	32	3							
2 a.m.	29	0							
3 a.m.	20	1							
4 a.m.	90	0							
5 a.m.	275	1							
6 a.m.	815	2	Y			Y			
7 a.m.	1077	15	Y			Y			
8 a.m.	730	30	Y			Y			
9 a.m.	545	34	Y			Y			
10 a.m.	530	41	Y			Y			
11 a.m.	698	138	Y	Y	Y	Y	Y	Y	Y
12 p.m.	728	140	Y	Y	Y	Y	Y	Y	Y
1 p.m.	669	62	Y			Y	Y	Y	
2 p.m.	711	62	Y			Y	Y	Y	
3 p.m.	791	96	Y			Y	Y	Y	
4 p.m.	997	183	Y	Y	Y	Y	Y	Y	Y
5 p.m.	1048	242	Y	Y	Y	Y	Y	Y	Y
6 p.m.	757	72	Y			Y	Y	Y	
7 p.m.	571	38	Y			Y			
8 p.m.	463	22	Y						
9 p.m.	312	19							
10 p.m.	210	12							
11 p.m.	106	7							
Total	12245	1218	Yes (15)	No (4<8)	NO (4<8)	Yes (14)	Yes (8)	YES (8)	NO (4<8)

Ref: *Michigan Manual on Uniform Traffic Control Devices (MMUTCD)*, published in December 2011 by the Michigan Departments of Transportation and State Police.

¹ Since the 85th-percentile speed on 13 Mile is 45.7 mph, the 56% columns in MMUTCD Table 4C-1 apply, along with the rows for 2 or more lanes on the approaches of both streets.

- ❑ Warrant 1, Combination of A and B, is not met. Although Table 4 shows that 1B is met at the 80% level in the needed minimum of eight hours, 1A is met at that level in only four hours.
- ❑ Warrant 2, Four-Hour Vehicular Volume, IS met. Volumes on both streets exceeded the plotted threshold values in four (but no more than the necessary four) hours: 11 a.m-1:00 p.m. and 4:00-6:00 p.m. (corresponding to the lunchtime and afternoon commuting peak periods). The satisfaction of this warrant is illustrated in this report via a marked-up copy of MMUTCD Figure 4C-2; see the top part of the page included as Appendix C.
- ❑ Warrant 3B, Peak-Hour Volume, IS met. Volumes on both streets exceeded the plotted threshold values in two hours (one more than the minimum necessary): 4:00-6:00 p.m. The satisfaction of this warrant is illustrated in this report via a marked-up copy of MMUTCD Figure 4C-4; see the lower part of the page included as Appendix C.

Peak-Hour Capacity Analyses

The *MMUTCD* states (in Section 4C.01) that “A traffic control signal should not be installed unless an engineering study indicates that installing a traffic control signal will improve the overall safety and/or operation of the intersection.” To assist in an operational evaluation of 13 Mile and Cabot, this study modeled peak-hour intersection operation under existing volumes, both with and without a fully-actuated (SCATS) signal. The study also modeled the signalized operation assumed to exist in the year 2022.

Method and Criteria – Intersection capacity analyses were conducted using *Synchro 7* software, based on methodologies contained in the *Highway Capacity Manual* (Transportation Research Board, 2000). The primary objective of such analyses is to determine the level of service, a qualitative measure of the “ease” of traffic flow based on average vehicular delay. Analytical models are used to estimate the average control delay for specific vehicular (through or turning) movements – and in the case of all-way stop-controlled and signalized intersections – each approach and the overall intersection as well. The models account for lane configuration, grade (if any), type of traffic control, traffic volume and composition, and other traffic flow parameters. Detailed printouts from the *Synchro* analyses are presented in Appendix D.

Level of service (LOS) is expressed using a letter grading scale, with A being the highest level and F being the lowest level. Achieving an overall intersection and/or approach LOS of D or better is the normal objective in an urbanized area.

Table 5 (below) defines LOS, in terms of average control delay per vehicle, for signalized intersections and unsignalized intersections, respectively.

Table 5. Level of Service Criteria

Level of Service	Control Delay per Vehicle (sec)	
	Signalized Intersections	Unsignalized Intersections
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

Results for Existing Unsignalized Operation – Table 6 shows relatively poor conditions in the current AM peak hour – with an average northbound left-turn delay of 91.1 sec (level of service F) – and extremely poor conditions in the current PM peak hour – with longer delays for the southbound right turn as well as the northbound left turn than the traffic model is able to compute with any confidence.

Table 6. Unsignalized Levels of Service at 13 Mile and Cabot

Approach	Movement	AM Peak Hour			PM Peak Hour		
		Volume (veh)	Avg. Delay (sec/veh)	LOS	Volume (veh)	Avg. Delay (sec/veh)	LOS
Current Traffic							
EB	L	179	9.3	A	6	9.3	A
WB	L	50	10.9	B	12	8.8	A
NB	L	10	91.1	F	188	> 9999	F
	T	3	28.7	D	6	14.8	B
	R	6	28.7	D	103	14.8	B
SB	L	0	0.0	-	0	0.0	-
	T	1	19.4	C	0	0	-
	R	11	19.4	C	148	> 9999	F

Results for Existing Volumes – Due to the east-west left-turn interlock discussed above, we strongly recommend that 13 Mile Road be “split-phased” in the new signal operating plan. East-west split phasing (with overlap phasing of the northbound and southbound right turns) was first assumed for both peak-hour analyses, and the results are summarized in the upper block of Table 7 (on next page). Given the unacceptably poor results for the PM peak hour, however, that hour’s analysis was repeated under two possible plans providing satisfactory levels of service:

- ❑ East-west split phasing and north-south right-turn overlap, but with a second westbound through lane added, from east of Cabot to northbound M-5. As can be seen in the middle block of Table 7, this would provide an overall LOS of C and an acceptable LOS for the northbound left of D.
- ❑ East-west permissive left (only) phasing, with no road widening, only in those hours when the opposing left-turn volumes are sufficiently light that the interlock can be judged to provide a reasonable level of safety (this may be from mid-morning until the start of the commuting period the following morning; the specific hours should be determined based on further analysis). Per the bottom block of Table 7, permissive left-turn phasing in the PM peak hour – when there are currently only 6 eastbound left turns and 12 westbound left turns – would afford an overall LOS of B, with the northbound left-turn experiencing LOS C.

Results for 2022 Signalized Volumes – For this exercise, it was assumed that all movements not feeding into or out of the new development area north of 13 Mile will grow at an annually compounded rate of 2% per year, resulting in a 10-year growth factor of 1.22. For all movements entering that area (eastbound left, northbound through, and westbound right), and all movements exiting that area (southbound left, through, and right), it was assumed that current volumes will triple.

A note of caution is appropriate regarding the assumption that certain current movement volumes will triple over the next ten years: the increase could be even greater. We note, for instance, that the 1999 traffic

Table 7. Signalized Levels of Service at 13 Mile and Cabot – with Current Volumes

Approach	Movement	AM Peak Hour			PM Peak Hour		
		Volume (veh)	Avg. Delay (sec/veh)	LOS	Volume (veh)	Avg. Delay (sec/veh)	LOS
With E-W Split Phasing & N-S Right-Turn Overlap							
Intersection		1541	22.0	C	1600	64.1	E
EB	L	179	14.6	B	6	28.9	C
	T	479	24.6	C	411	64.4	E
	R	370	15.0	B	14	28.9	C
WB	L	50	16.0	B	12	20.4	C
	T	419	29.5	C	711	64.2	E
	R	13	15.4	B	1	20.2	C
NB	L	10	31.6	C	188	119.2	F
	T	3	30.1	C	6	38.3	D
	R	6	15.4	B	103	21.0	C
SB	L	0	0.0	-	0	0.0	-
	T	1	29.7	C	0	0.0	-
	R	11	12.7	B	148	31.7	C
With E-W Split Phasing & N-S Right-Turn Overlap, & with 2nd WB Through Lane Added							
Intersection					1600	33.8	C
EB	L				6	17.3	B
	T				411	33.7	C
	R				14	17.3	B
WB	L				12	20.9	C
	T				711	34.1	C
	R				1	20.7	C
NB	L				188	53.9	D
	T				6	23.3	C
	R				103	21.3	C
SB	L				0	0.0	-
	T				0	0.0	-
	R				148	19.3	B
With Permissive Turns on All Approaches, & with No Widening							
Intersection					1600	13.9	B
EB	L				6	6.6	A
	T				411	9.1	A
	R				14	6.4	A
WB	L				12	6.5	A
	T				711	14.9	B
	R				1	6.4	A
NB	L				188	20.8	C
	T				6	13.5	B
	R				103	13.9	B
SB	L				0	0.0	-
	T				0	0.0	-
	R				148	14.4	B

impact study for what is now known as Haggerty Corridor Corporate Park forecasted that the entire park would build-out by the year 2006, and that the AM peak-hour eastbound left turn from 13 Mile onto the park's collector road (now known as Cabot Drive) would be an astounding 1,165 vehicles, or 6.5 times its current value and slightly more than double what we are assuming in our present analysis of year 2022. We also note that the 1999 study projected only about half as much westbound through traffic in the AM peak hour as already exists, and that a signal at the collector would not require split phasing; rather, the extremely heavy eastbound left turn could be accommodated by lagging the eastbound green some 51 sec past the cessation of westbound green.

Also noteworthy from the 1999 traffic study is its prediction that a second westbound through lane on 13 Mile would be required to provide acceptable levels of service in the PM peak hour. Given that the through volumes that hour on 13 Mile have already exceeded earlier forecasts (by 13% westbound and 25% eastbound), and that significant volume increases have yet to occur on Cabot, it appears reasonable to assume that some road widening will be necessary, at least to the extent previously projected.

Table 8 (on next page) shows the results of providing east-west split phasing and north-south right-turn overlap for the projected 2022 volumes:

- ❑ As can be seen in the upper block of the table, no road widening is needed to afford satisfactory levels of service in the AM peak hour. However, with no widening in the PM peak hour, the overall LOS would be a clearly unacceptable F (128.8 sec average delay).
- ❑ Per the middle block of the table, adding only a second westbound through lane would still provide only LOS E (58.7 sec delay) overall and LOS F (108.9 sec delay) for the northbound left.
- ❑ Finally, in the bottom block of the table, adding a second through lane in each direction would also provide LOS E overall, but with an average delay only 0.3 sec above the maximum value for LOS D. The northbound left would also still operate at LOS F, but the delay would nearly 15 sec less than preceding plan without the second eastbound through lane.

Permissive-only left-turn phasing on 13 Mile (as well as on Cabot) was also evaluated for the projected 2022 volumes in the PM peak hour. Under the traffic growth assumptions stated above, the opposing left-turn volumes that hour would remain relatively low: only 18 eastbound versus 15 eastbound. Per Table 9 (on the page after next), the overall LOS would be C (32.0 sec delay), the northbound left-turn LOS would be C (25.4 sec delay), and the southbound right-turn LOS would be D (53.4 sec delay).

Conclusions

- ❑ A signal is warranted at 13 Mile and Cabot and should be installed at the earliest opportunity.
- ❑ Given the existing interlock of eastbound and westbound left turns, traffic safety requires that the signal be split-phased, at least through the AM peak period until an hour of the day that opposing left turns decrease to much smaller volumes, at which time opposing left turns might be permitted to move simultaneously. *In no case should permissive-protected left-turn phasing be used on 13 Mile Road, since "protection" is not present (and can not be provided) due to the interlock.*
- ❑ Split-phasing could operate at all hours – for maximum safety – if a second westbound through lane were added (from east of Cabot to northbound M-5) to serve current volumes, or a second through lane were added in each direction to serve projected 2022 volumes.

Table 8. Signalized Levels of Service at 13 Mile and Cabot – E-W Split-Phased with 2022 Volumes

Approach	Movement	AM Peak Hour			PM Peak Hour		
		Volume (veh)	Avg. Delay (sec/veh)	LOS	Volume (veh)	Avg. Delay (sec/veh)	LOS
With E-W Split Phasing & N-S Right-Turn Overlap							
Intersection		2247	33.4	C	2238	128.8	F
EB	L	537	33.0	C	18	37.4	D
	T	584	35.7	D	501	107.5	F
	R	451	19.8	B	17	37.3	D
WB	L	61	19.8	B	15	26.8	C
	T	511	47.3	D	867	136.0	F
	R	39	19.3	B	3	26.6	C
NB	L	12	40.4	D	229	195.4	F
	T	9	39.9	D	18	52.0	D
	R	7	19.1	B	126	27.8	C
SB	L	0	0.0	-	0	0.0	-
	T	3	39.0	D	0	0.0	-
	R	33	15.1	B	444	146.2	F
With E-W Split Phasing & N-S Right-Turn Overlap, & with 2nd WB Through Lane Added							
Intersection					2238	58.7	E
EB	L				18	21.7	C
	T				501	41.0	D
	R				17	21.7	C
WB	L				15	30.3	C
	T				867	63.3	E
	R				3	30.0	C
NB	L				229	108.9	F
	T				18	34.9	C
	R				126	31.0	C
SB	L				0	0.0	-
	T				0	0.0	-
	R				444	56.1	E
With E-W Split Phasing & N-S Right-Turn Overlap, & with 2nd WB & EB Through Lanes Added							
Intersection					2238	55.3	E
EB	L				18	21.2	C
	T				501	25.4	C
	R				17	21.0	C
WB	L				15	28.2	C
	T				867	64.0	E
	R				3	27.9	C
NB	L				229	94.0	F
	T				18	31.7	C
	R				126	28.8	C
SB	L				0	0.0	-
	T				0	0.0	-
	R				444	64.1	E

Table 9. Signalized Levels of Service at 13 Mile and Cabot – Permissive Lefts with 2022 Volumes

Approach	Movement	AM Peak Hour			PM Peak Hour		
		Volume (veh)	Avg. Delay (sec/veh)	LOS	Volume (veh)	Avg. Delay (sec/veh)	LOS
Assumed 2022 Traffic							
Intersection					2238	32.0	C
EB	L				18	13.3	B
	T				501	16.4	B
	R				17	10.5	B
WB	L				15	10.9	B
	T				867	34.7	C
	R				3	10.4	B
NB	L				229	25.4	C
	T				18	18.6	B
	R				126	19.1	B
SB	L				0	0.0	-
	T				0	0.0	-
	R				444	53.4	D


Given the above findings and conclusions, you may want to have us conduct some additional study to help you determine the hourly profile of interlocking left-turn volumes; the delays associated with controlling those volumes by the alternative means (split-phase versus simultaneous-permissive); and the potential safety consequences of changing over from the split phasing required for safety in the morning to the permissive phasing required for capacity (absent road widening) later in the day.

Feel free to call us with any questions and to discuss the next step(s) in this matter.

Sincerely,
BIRCHLER ARROYO ASSOCIATES, INC.



Rodney L. Arroyo, AICP
Vice President



William A. Stimpson, P.E.
Director of Traffic Engineering

See attached -

- Appendix A: Current Approach Volumes
- Appendix B: Current Turning-Movement Volumes
- Appendix C: Signal Warrant Charts from the MMUTCD
- Appendix D: Intersection Capacity Analyses (Synchro Printouts)