Green Light Consulting

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R Lucente Engineering Inc
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Att'n: Rocco Lucente, Peng

Re : **General Project Issues**
Manning Road & Tecumseh Road Improvements
Town of Tecumseh & County of Essex

To address unacceptable traffic delays and operational service problems along the above two arterial roadways, a combined project has been initiated by the Town and the County to provide the following general improvements to the individual sections of roadway under each authority's jurisdiction :

1. major widening of both arterials to provide two Through lanes each direction
2. intersection geometric improvements to provide appropriate turn lanes and storage facilities in order to allow optimum safety and efficiency of signalized traffic operations
3. construct 2 new and upgrade 5 existing traffic control signals along Manning Road and construct 2 new signals along Tecumseh Road
4. signal phasing updates to address individual intersection movement requirements
5. implement a hard-wire interconnect co-ordinated signal system to improve traffic flow along both arterials.

In my estimation, there are a few specific issues and additional general recommendations that can be identified and should be discussed with the road authorities at the start of this project, in order to eliminate delays or changes within the ongoing road and signal design processes and ensure that all parties are agreeable to the general design and operational "direction" this project is going in.

Geometric Design Issues & Comments

1. Traffic Projections

Projected PM Peak Hour data for the horizon year 2021 – Total Traffic Condition , from FRBerry's Traffic Impact Studies for Manning Road (April 2002), Tecumseh Road (May 2002) and the Shopping Mall at Manning/Tecumseh (November 2003), will be used to analyse the geometric requirements for this entire project.

2. Right-Lane-Must Exit

There are several locations where a proposed transition from four-lane cross-section to two-lane cross-section occurs at an intersection, generating a "Right-Lane-Must-Exit" situation. This is not advisable or appropriate in ensuring safe and efficient flow of traffic through a signalized intersection. This condition promotes sideswipe and rear-end collisions in advance of the intersection and reduces the effectiveness of signal phase Green times at the intersection. It is noted that with the intent on providing a co-ordinated signal progression, every effort should be made to eliminate or reduce any cause of congestion or delays approaching or within the intersections themselves.

For Northbound Manning at St Gregory's and Eastbound Tecumseh at Manning, it is recommended that the two Through lanes be extended through and past the intersection for a minimum distance of 55m or a preferred distance of 100m (based on 70 km/hr Design Speed) before transitioning to a single Through with a 70m taper.

This treatment will not be practical for Westbound Tecumseh through the Lacasse Blvd intersection, due to the curved alignment and railway crossing. It is therefore recommended that the two-to-one lane drop occur just west of Revland for the 55/100 parallel and 70m taper, or as originally proposed, carry two lanes all the way to Lacasse and depend on Regulatory signage and Right Turn Arrow markings to identify the "Must-Exit" situation.

3. **Start of Widening Sections**

At the north end of the Manning Road improvement section, generate the start of the Southbound two-lane widening in advance of St Gregory's Road, applying a 60m taper and 75m parallel. The advantages to providing widening in advance of signalized intersections are to increase operational efficiency of traffic flow through the signals and to eliminate any further need to reconstruct the intersection and signal installation, at any time in the future, should widening become necessary to the north.

The above is also recommended for EB Tecumseh approaching the start of widening at Manning Road.

4. **Unsignalized Intersection Left Turn Lanes**

The Geometric Design Manual identifies that generally, considerably less turning volume is necessary to justify implementation of a separate Left turn lane on a four-lane cross-section (15 vph) than on a two-lane section (50+ vph). Unsignalized locations along Manning Road; such as Sylvestre Drive and Little Baseline Road, should be re-examined to determine a need for including this type of facility in the design concept. Volume data for these locations has not been provided, however.

While not at a municipal intersection, traffic operations along Tecumseh Road adjacent to the access to Green Giant would likely benefit from a separate Left turn lane. This could be facilitated by extending the originally-proposed five-lane cross-section, that presently ends at Revland Drive, further west to include coverage for the Green Giant entrance.

There may also be operational and safety merit to providing a continuous Left turn facility along Manning Road from Jamsyl Drive to south of Sylvestre Drive

5. **Commercial Accesses Opposing Signalized "T" Intersections**

There are several locations where multiple commercial accesses are situated across from signalized municipal streets (T intersections). If these accesses are within the confines of intersection signal control, ie. inside of intersection cross-walks or stop bars, then they too must be governed by signalization. To ensure effective flow of movements within the intersection and simplify signalization of these accesses, multi-accesses should be combined to only allow a single access directly opposite the municipal street, with lanes aligned properly. This situation occurs at Revland Drive and Green Valley Drive on Tecumseh.

The commercial access opposite Lanoue Street on Manning Road should be relocated directly opposite the municipal street.

6. **Access North of Via Rail**

The Left turn facility into the access located on the west side of Manning Road immediately north of the Via Rail crossing should be examined to provide as much storage capability as possible, in order to prevent queuing across the tracks. This will be an issue with the rail authorities.

While the spacing between the entrance and tracks are quite limited, reducing the median island length would allow more storage. Should analysis indicate that there will be a plausible potential for queuing across the tracks, then a turn prohibition will have to be instituted.

7. **Sidewalk Buffer Zone**

The proposed cross-section along Manning Road south of Essex County Road 22 indicates the presence of sidewalk directly adjacent to the edge of roadway curb. This section is within a more rural area where prevailing speeds may be appreciably higher than through the distinctively urban section to the north. To increase pedestrian safety, a buffer zone of 0.5m – 1.0m would be recommended between the sidewalk and the edge of curb.

8. **Double Left Opposing Single Left Design**

The Left turn lane alignments proposed for both roadways at Manning/Essex 22 need to be revised to eliminate opposing turn overlaps. The appropriate design requires that the Single Left turn must be made from directly opposite the "outside" Double Left lane.

9. **Shopping Mall Access onto Manning Rd – SE Corner Manning/Tecumseh**

Northbound Left turn (440 vph – 130m queue) and Through (735 vph – 105m queue) demands on Manning at Tecumseh will block Southbound Left turn access into and Westbound Left turn access out of the Shopping Mall in the SE corner of Manning/Tecumseh. There is also insufficient spacing between the two to accommodate both the NB and SB back-to-back Left turn storage requirements (145m b-t-b requirement).

The only method of properly mitigating this situation is to prohibit all Left turn movements in and out of this access. Extention of the median island along Manning south of Tecumseh to south of the Mall access would also be recommended to ensure compliance to the turn prohibition.

10. **Right Turn Channelization – Manning/Essex Rd 22**

The W-S Right Channelization from Essex 22 to Manning Road should be provided with an appropriate Acceleration parallel lane + taper away. This is a high speed ramp which requires a proper design to facilitate an uncontrolled Free-Flow movement.

Railway Pre-Emption

The issue of interconnection (RR Pre-Emption) of Railway control and intersection Traffic Signal control will be examined and confirmed with Transport Canada and Via Rail. Preliminary indications are that co-ordination between the two controls will not be necessary, based on the premise that traffic queuing along Manning Road southbound from the signals at Tecumseh and northbound from the signals at Lanoue Street will not extend to the Via Rail crossing.

Traffic Signal Design Issues & Comments

1. **Traffic Signal Heads**

It is recommended that for all applications where Left turn signal phasing is being promoted, 4-section # 9 heads be used instead of the outmoded 5-section heads that appear to be the standard throughout Tecumseh, at this time. These shorter heads are the industry-standard throughout the province and consist of a 30cm Red, a 20cm Amber, a 20cm Green ball, and a 30cm LED Amber/Green Left turn Arrow. All signal head lenses throughout this project could be LED.

Use of the 4-section head, as compared to the 5-section, will reduce weight of the head itself and resultant windload, thereby reducing stress and maintenance requirements on the complete mast arm, pole and mounting bracket assembly. The 20cm Arrow used in the 5-section heads provide considerably less conspicuity and positive display than the 30cm Arrow lens.

2. Signal Head Backboards

Many signal heads at existing installations within the project limits do not have backboards. It is recommended that proposed signal designs for all new and upgraded installations should have backboards. Given the visual interference that is present under "downtown" type of urban conditions; ie. neon signs, buildings, poles, wires, Christmas decorations, etc. there is a need to increase signal head conspicuity with backboards.

3. Actuated Signal Operations

It is generally recommended that all but two signals within this project operate in semi-actuated mode; ie. vehicle loop detectors in all Sideroad approach lanes and in Main Street Left turn lanes (where Left turn signal phasing will be in operation). The exceptions are Manning at Essex 22 and Manning at Tecumseh.

The Manning/Essex 22 signal controls a high speed, rural operation which would definitely benefit from application of full actuation; including Long Distance detection on Essex 22. The characteristics of this intersection's signalized operation also do not lend itself to being included in a north-south arterial co-ordination system along Manning Road. If this occurs, there may be some benefit in upgrading detection at the isolated Jamsyl Drive intersection to a fully-actuated operation; ie. with Long Distance detection in N-S Through lanes.

The Manning/Tecumseh signal will be the nexus of two major arterial co-ordinated signal systems, thereby precipitating an increased need to "fix" both the N-S and E-W Through phases. The Left turn phases can still be provided with detection.

4. Vehicle Loop Detectors

The present mode of vehicular loop detection at the stop bars is 1.8m Diamond loops. This application is acceptable for Long Distance detection or arterial counting purposes, however, are not as versatile or efficient in addressing multi-faceted operational needs of queuing and vehicle disbursion right at the intersection. It is recommended that "quadrupole" loop designs be used for signalized presence detection. These will consist of 1.8m wide rectangular loops starting 12m behind each stop bar and continuing to minimum 1.0m in front of each stop bar.

There is also the option of locating Left turn lane loops, where Protected/Permissive Left turn phasing is in use, 15m back from their stop bars. This will allow the Left turn phase to be skipped if less than a 3 vehicle demand is present in that lane (based on the premise that two vehicles can clear on Amber + All Red). This type of operation increases co-ordinated system efficiency.

5. Pedestrian Signal Control & Cross-Walks

Existing pedestrian control facilities at most signalized intersections within this project are terribly deficient in meeting public safety and liability requirements for pedestrians. Pedestrian control (signal heads & cross-walks) should be provided for <u>all</u> crossings at a 4-way intersection, along with pedestrian pushbuttons for crossing the major arterial roadway (where full or semi-actuated signal operation is in use). The road authority is placing itself in legal jeopardy by not providing completely adequate signal displays/controls for pedestrians. Court interpretation is such that pedestrians cannot be restricted from crossing any particular roadway within a signalized intersection unless there is a physical impediment that prevents them from doing so.

6. **Emergency Vehicle Pre-Emption**

Is there any requirement for Emergency Vehicle Pre-Emption (Opticom) at any signals within this project? If so, specific directions will have to be determined for both signal design and operational timing requirements.

7. **HTA Legal Approvals**

Section 144 (31) of the Highway Traffic Act mandates that all traffic control signal installation plans (PH-M-125's) must obtain legal approval by a council by-law designate of the governing road authority. Within this project there are two road jurisdictions; the County of Essex – all signals on Manning Road south of the Via Rail crossing (3), and the Town of Tecumseh – all signals on Manning north of the Via Rail crossing (4) and all signals along Tecumseh Road (2).

Traffic Signal Timings & Co-ordination

1. **Traffic Volume Data**

While geometric improvements are better determined using long range volume projections, accurate local signal phase timing, time-of-day requirements and system co-ordination parameters are best determined using recent existing or near-future volume data. Projected data in recent studies for the horizon year 2006 would be acceptable except for the fact that, as is normal for these types of studies, only one peak is represented. Proper determination of peak directional flows, phase Max Green times and whether co-ordination is required during various times of the day (free-flow vs co-ordinated) requires more precise info.

It would be recommended that, if recent 8 Hr Turning Movements and/or 24 Hr Inventory counts are not available from the Town and County, that they be collected as soon as possible.

2. **System Co-ordination**

As a preliminary recommendation at this time, based on the expected individual operating characteristics of all the signalized intersections within this project, it is proposed that the signals on Manning Road from Amy Croft Drive northerly to St Gregory's and both signals on E-W Tecumseh Road can likely operate within one co-ordinated network. Since the Manning/Tecumseh signal is the nexus of both arterial directions, it should probably house the Master controller. As identified previously, the Manning/Tecumseh signal would be recommended to operate in Fixed-time mode for each roadways' Through phases (Left turn phases can still be actuated).

The high speed, rural, multi-phase signal at Manning/Essex Rd 22 would be proposed for fully-actuated, Free-mode operation. This would isolate the remaining Manning Road signal at Jamsyl Drive.

Co-ordination should be maintained by physical (hard-wire) interconnection to ensure the integrity of system communications between the Master and all Locals.

3. **Traffic Signal Controllers**

Since the co-ordinated signal system proposed will involve installations under two road jurisdictions, there will have to be an agreement between the two authorities to accept a common traffic signal controller, along with Local and Master control Proms. It would probably prove more beneficial to have one authority accept responsibility for operating the entire system.

Since, I think, the Model 170 controller is already common to both jurisdictions, it would be a matter of agreeing on the operating Proms. BITrans Local 233 and FM210 Proms are recommended, instead of the older Local 114 and Master A4 Proms. The County already has an agreement with BITrans to use their control software.

I would be pleased to meet with you, the Town and County representatives, at your earliest convenience to discuss and resolve any issues.

Norm WJ Kelly
President