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Toronto, Ontario
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TOWN OF CALEDON
PLANNING
RECEIVED

September 23, 2025

Attention: Stephanie Volpentesta, Senior Development Manager

Re: Road Classification Analysis
Falling Weight Deflectometer Investigation
Creditview Road, Caledon, Ontario

GEMTEC Consulting Engineers and Scientists Limited (GEMTEC) is pleased to submit the following memorandum, summarizing the results of our Falling Weight Deflectometer (FWD) testing investigation completed along Creditview Road in the Town of Caledon, Ontario.

BACKGROUND

GEMTEC has previously been retained by 12100 Creditview Developments Limited c/o Fieldgate Commercial (Fieldgate), to carry out a geotechnical study, concurrently with a Phase One Environmental Site Assessment (ESA), Phase Two ESA, and a hydrogeological investigation, in support of a proposed commercial development of the property located at 12100 Creditview Road in Caledon, Ontario (i.e., the Site).

It is understood that Creditview Road at the Site location is presently subject to spring load restrictions (SLR) – in place between March 1st and April 30th annually – which may impact the feasibility of the proposed commercial development. SLR are commonly imposed in order to minimize damage during the spring thaw, when pavements are typically at their weakest due to saturated, poorly draining subgrade conditions.

As such, GEMTEC has been retained by Fieldgate to complete an FWD investigation adjacent to the Site (i.e. along Creditview Road from Mayfield Road to Old School Road, approximately 3.1 kilometres in length) and comment on the FWD deflection results as they pertain to the potential warrant for SLR removal.

FWD is a non-destructive test method used to assess pavement strength by simulating dynamic loading from a truck wheel, where a series of load impulses are applied to the pavement surface and the response (i.e. deflections) are measured using seismic transducers. In-situ structural

characteristics of the pavement can be evaluated based on the deflection results. Stiffness is generally able to be inferred as the road's ability to resist deflections, and higher stiffness is correlated with higher structural capacity. For this analysis, the results will be compared against industry parameters, as existing subsurface data is unavailable at this time.

EXISTING CONDITIONS

Creditview Road is presently a two-lane undivided facility, with a posted speed limit of 70 kilometres per hour. Based on a review of the Town of Caledon Town-wide Transportation Network mapping, it is understood that between Mayfield Road and Old School Road, Creditview is considered a "Town Arterial".

To date, subsurface geotechnical investigations by GEMTEC have not been carried out along Creditview Road within the project study area. However, based on a desktop review of soil lithology mapping, bedrock geology mapping, Ministry of Environment Well Records, and the results of the available geotechnical investigations at the nearby Site, the soil conditions in the project area are anticipated to be deposits of Till (varying from silty sand to silty clay). Interbedded limestone and shale bedrock of the Queenston Formation is mapped in the region at depths of up to 100 metres below ground surface.

The subsurface conditions and bedrock geology is anticipated to be consistent throughout the project limits and is not anticipated to contribute to differences in the measured deflection values.

There is one medium sized culvert located within the project limit at approximate station 11+100, as measured from the centreline of Mayfield Road, north along Creditview Road. No other structures potentially affecting deflection results have been identified within the project limits at this time.

METHODOLOGY

FWD deflection basin testing was carried out on April 23rd, 2025 by a subconsultant to GEMTEC. The ambient air temperature ranged between 13 degrees Celsius and 16 degrees Celsius. Linear reference Stationing was established by GEMTEC and the testing subconsultant, starting from 10+000 at the centreline of Mayfield Road and ending at approximately 13+100 at the centreline of Old School Road. Testing locations were placed at 100 metre intervals in one lane and offset by 50 metres in the opposing lane, resulting in data points at 50 metre intervals throughout the investigation limits. FWD testing procedures were in accordance with Ministry of Transportation Ontario (MTO), Materials Engineering and Research Office Report MERO-053, *Falling Weight Deflectometer (FWD) Testing Manual.*

Based on the existing roadway classification, planned FWD load levels of 31 kilonewtons, 42 kilonewtons, and 57 kilonewtons were selected. The existing roadway was assumed to comprise a flexible pavement structure. For analysis, the deflection measured at the centre of the loading

plate (d_0) was normalized to a 40 kilonewton load and 21°C pavement layer temperature equivalent, using the following equation:

$$D_0 = \frac{566}{P} \times d_0 \times TCF$$

Where,

D_0 = Normalized and corrected deflection of the sensor at the loading plate (micrometres),
P = Actual applied load (kilopascals),
d_0 = Measured deflection of the sensor at loading plate (micrometres), and
TCF = Temperature correction factor.

Temperature correction was carried out according to guidance provided in Federal Highway Administration (FWHA) Publication Number FHWA-RD-98-085, in combination with the Transportation Research Board's (TRB's) Journal Record 1473[1].

Completing the testing during spring serves to capture deflection data when the pavement is expected to be at or near its weakest seasonal condition thus providing a conservative opinion.

FALLING WEIGHT DEFLECTOMETER RESULTS

The normalized and corrected deflection results are summarized in Figure 1 below.

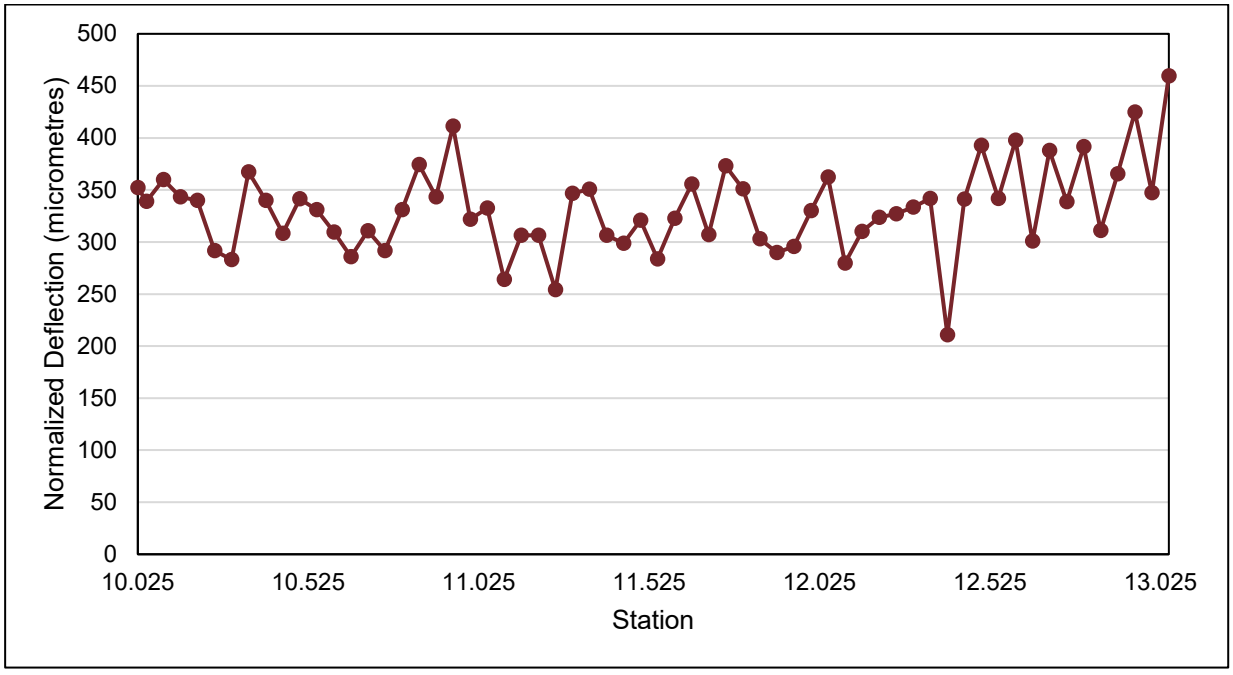


Figure 1 – Normalized and Corrected (D_0) Deflection Measurements

[1] Kim, Y. Richard, Bradley O. Hibbs, And Yung-Chien Lee. 1995. "Temperature Correction of Deflections and Backcalculated Asphalt Concrete Moduli." Transportation Research Record: Journal of the Transportation Research Board, 1473, 55-62.

The average D_0 deflection measured along Creditview Road during the investigation was approximately 332 micrometres, ranging from 211 to 460 micrometres. The deflection values were generally non-uniform with some notable scatter, which may indicate some inconsistencies in the pavement structure.

To further examine the deflection results along Creditview Road, the deflection data has been used to back-calculate the subgrade resilient modulus at each of the test points, which is shown in Figure 2. The resilient modulus is specifically a measure of the elastic response of the subgrade soil (the foundation layer beneath a pavement) under repeated traffic loading, and a key parameter for structural pavement design. Other subgrade soil properties could also be inferred based on the resilient modulus data.

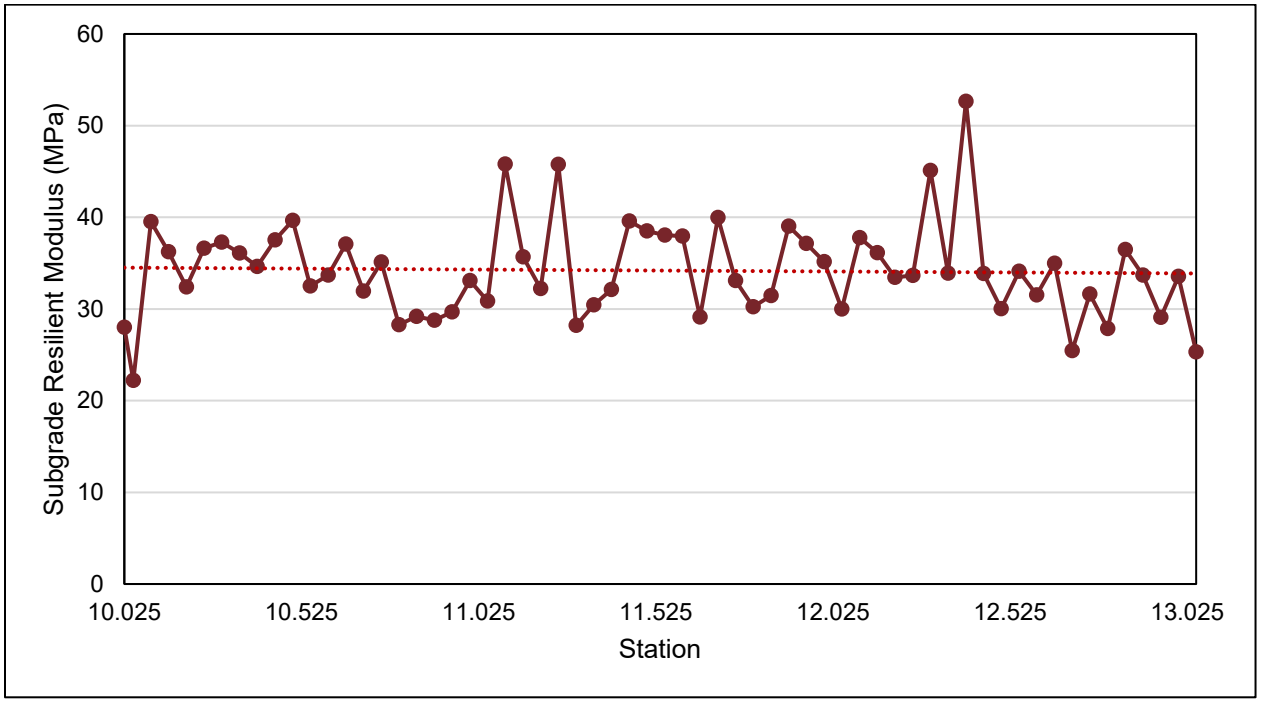


Figure 2 – Corrected Back-calculated Subgrade Resilient Modulus

Recommended correction factors were applied to the back-calculated resilient moduli values according to MERO-053, but the values were not adjusted seasonally, considering the survey was done when subgrade support is expected to be at or near its weakest (i.e. during spring thaw). The average subgrade resilient modulus along Creditview Road was estimated at approximately 34 MPa, with a local maximum of 53 MPa and a local minimum of 22 MPa. This range is consistent with typical estimated values for soils with fair to semi-pervious drainage characteristics based on the MTO *Adaptation and Verification of AASHTO Pavement Design Guide for Ontario Conditions* Report MI-183, which is in general agreement with the expected ground conditions.

The study identified some isolated areas of peak subgrade resilient modulus. There are no visible features throughout the road that may be attributed to these increased values, as such, variations in the pavement structure at these locations are the likely cause. The local peak values should not be considered in the determination of road classification or dictate any design decisions.

In addition to the corrected deflection measurements and the subgrade resilient modulus, the Federal Aviation Administration's (FAA) layer resilient modulus back calculation software BAKFAA Version 3.4 has been used to estimate an existing structural number for the existing pavement. It should be noted that the existing pavement structure along Creditview Road was unknown to GEMTEC at the time of this letter, and is a requirement for layer level analysis.

As such, the following assumed rural cross section has been developed using an iterative approach through the BAKFAA software:

- 150 millimetres of Hot Mix Asphalt (HMA), over
- 200 millimetres of Crushed Granular Base, over
- 500 millimetres of Uncrushed Sand Subbase.

Based on the analysis, the average resilient modulus of each assumed layer has been identified and converted to an approximate structural layer coefficient using conversion tables provided in the AASHTO 1993 design guidelines.

Layer	Assumed Thickness (mm)	Resilient Modulus (MPa)	Layer Coefficient	Structural Number (SN)
HMA	150	-	0.24[1]	30
Granular Base	200	450		
Sand Subbase	500	400		
Estimated Composite Structural Number (SN)				

Note 1: Determined based on existing pavement condition

TRAFFIC DATA

Forecasted traffic data along Creditview Road has been provided to GEMTEC by Fieldgate. Based on discussions, the following is understood about traffic movements at the site:

- Annual Average Daily Traffic (AADT) after development of 10,640,
- Truck distribution as follows:
    - 8 – 9 six axle trucks (FHWA Class 10) per day;
    - 2 – 3 gas bar trucks (FHWA Class 9) per day;
    - 3 – 4 single unit trucks (FHWA Class 6) per day;
- Additional 18 trucks per day servicing various parts of the commercial development (conservatively assumed as a Class 10).

Based on the above, a combined truck factor of 3.37 has been calculated for vehicles accessing the commercial site. Assuming a 1.0 percent growth rate, the estimated 20-year Equivalent Single Axle Loads on Creditview Road servicing the commercial development is 461,086.

DISCUSSION

Neither the Town of Caledon nor the Ministry of Transportation Ontario have a dedicated standard for classifying roads, or guideline for implementation of spring load restrictions, based on deflection data. The most applicable guidelines are detailed in the Federal Highway Administration (FWHA) Publication Number FHWA-HRT-16-011 dated December 2017. The FHWA guidelines for evaluating the structural condition of a pavement with a granular base is summarized in Table 2.

Table 2 – Structural Condition Rating for Normalized Deflection Ranges

Structural Condition Rating	D_0 Deflection (micrometres)
Sound	< 500
Warning	500 to 750
Severe	> 750

As previously discussed, the average normalized deflections measured during the spring investigation was approximately 332 micrometres, which is within the “Sound” structural rating according to FHWA. The spring deflection values along the length of the road are shown in Figure 3, in comparison to the structural condition rating categories.

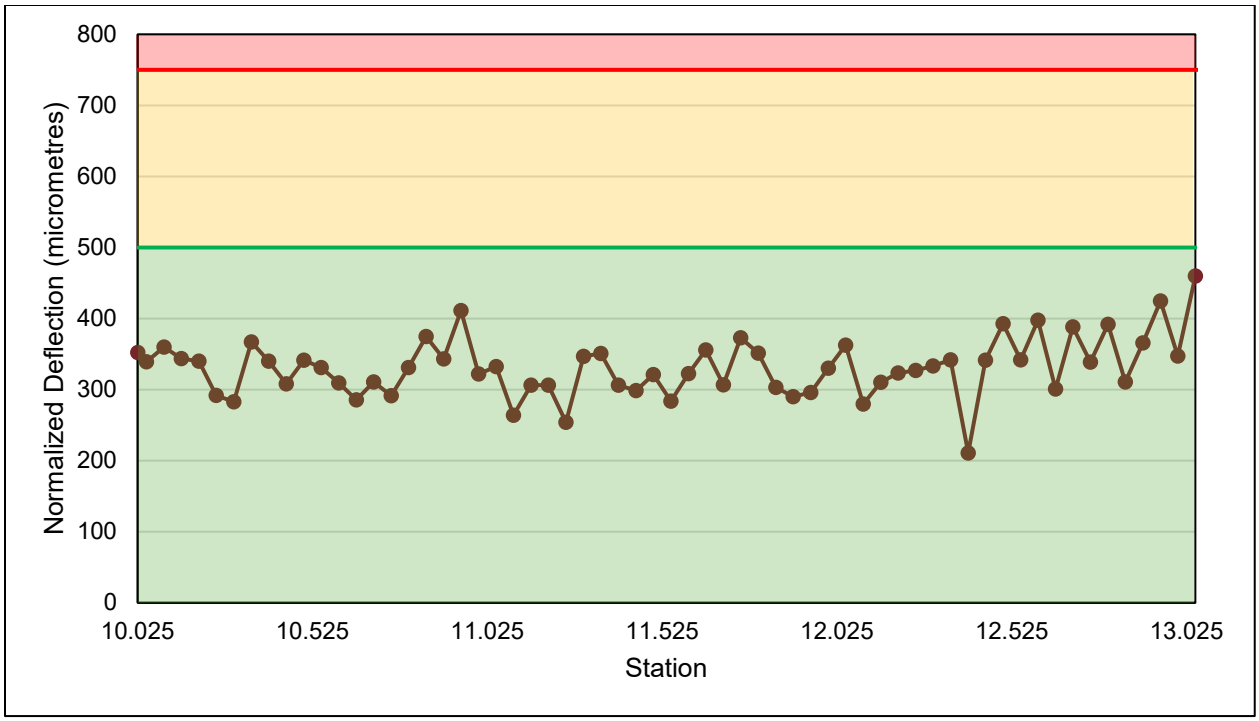


Figure 3 – Deflection Measurements and FWHA Condition Rating Categories

Based on Figure 3, **all deflections are considered to indicate a "Sound" pavement structure according to FHWA.** The northernmost portion of Creditview Road (approx. station 12+750 and upward) may be showing an upward trend, possibly encroaching on the "Warning" category, however, it is expected that the southernmost part would experience the bulk of truck traffic should the commercial development advance as proposed. Mayfield Road links to Highway 410 through Hurontario Street and to the developed sectors of Caledon, which would see the greatest portion of traffic accessing the Site.

Furthermore, according to Figure C4 of the Future Caledon Official Plan, dated February 2024, the Township of Caledon intends to classify Creditview Road from Mayfield Road to Old School Road as a local transit route prior to 2051. Fieldgate has indicated to GEMTEC that preliminary works facilitating the reclassification may begin as early as 2026. Busses have a high relative damage impact on pavement: if Creditview Road were upgraded to a bus route by the Town this may trigger the need for pavement strengthening (and associated reduction in sensitivity to seasonal loading).

CONCLUSIONS AND RECOMMENDATIONS

Based on the FWD investigation and the threshold of observed deflections, it is our opinion that this section of Creditview Road is a candidate for the removal of spring load restrictions, as it is not abnormally sensitive to seasonal damage.

This considers that:

- The normalized and temperature corrected deflections are well within the allowable range as indicated by the FHWA, and the study was completed during the period anticipated to demonstrate the highest deflections;
- The range of back-calculated resilient modulus values are consistent with fairly draining soil types which are expected to be less sensitive to seasonal weakening; and,
- It is understood that the Township plans to ultimately reconstruct Creditview and strengthen the pavement to accommodate buses and urbanized vehicle loads. If strengthening is carried out, seasonal sensitivity to pavement damage is expected to be reduced.

If confirmation of the results of the study for removal of SLR is required, for use of the current pavement structure prior to upgrades, which is anticipated to occur before the construction season of 2028, consideration could be given to repeating the study in the summer of 2025 to quantify the percent increase between summer and spring deflection. A limited subsurface geotechnical investigation would also potentially aid in structural pavement assessment and commentary on seasonal impacts of traffic loading.

CLOSURE

It is trusted that the above information is satisfactory to your intended purposes. Should you have any questions, please do not hesitate to contact the undersigned.

Sincerely,

GEMTEC Consulting Engineers and Scientists Limited





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