

MEMO

To:	Dirk Kassenaar
From:	Garry T. Hunter, M.A.Sc., P.Eng.
Date:	August 26, 2024
File:	21-407
Subject	Peer Review of Strada Draft Impact Assessment Report August 14, 2024 – Appendix E

Strada Draft Impact Assessment Report August 14, 2024 – Appendix E

This Model Report, subject to improved calibration as discussed in prior communications (see Matrix), does provide a realistic and useful virtual framework for Quantity Impact Assessment of the Strada Aggregate Site Plan proposal. Comments included herein are based on the current model output taken at face value. Only one Site Plan scenario has been analyzed. Modeling should lend itself to analyzing multiple scenarios.

A number of Figures and Tables are enclosed by separate email, which include the simplified essence of this Peer Review for public communication.

A. PEER REVIEW CONCLUSION

The Strada current Site Plan is not acceptable or even feasible for reasons stated below. An alternative Site Plan model scenario should be considered, based more or less, on the scenario outlined by Hunter on July 30, 2024 in an email to MHBC. This scenario, however, did not consider setback related to sinking cuts, noise, blasting (fly rock), air quality or for nearby private wells.

There is a fundamental disconnect (conflict) between the Strada groundwater model assumptions and the geotechnical assessment. This Peer Review questions the stability of the lower bench berm under the high ground pressures (50 m ±) in the Gasport Aquifer under Phase 4 Conditions. What is the contingency plan for barrier berm failure or alternatively for potential rupture of the quarry floor with extraction to the base of the Guelph Eramosa (Strada Lift 1).

The Assessment Report goes to great length to analyze Water Budgets for Wetlands but completely ignores impacts of rising water levels on farm fields, residential lots, septic fields and on adjacent aggregate operations.

Surprisingly, no water budgets are provided for the Quarry Operational Phase Conditions. No diversion quantities are provided for flows from the Pine River groundwater catchment to the Boyne River catchment. This is a mandatory requirement.

No Water Quality Impact Assessment is provided for pumped quarry effluents recharged to groundwater (drinking water).

This Peer Review suggests that drawdowns to the west may be more acceptable to the NDACT Community than drawdowns to the east of the proposed Quarry. There may be tradeoffs required with wetland protection (NRSI 2024 Report not seen) as wetland water level rises may adversely impact surrounding farm fields.

This Peer Review Site Plan Concept is much more flexible and capable of adaptive management to resolve operational issues. It does not leave bench barrier groundwater dams in place after quarry abandonment. It proposes 'clean' water recharge to the Gasport Aquifers. It may also be less expensive to implement.

The above conclusions are tentative and subject to change due to the incomplete nature of the Strada actual baseline studies as delivered and the rough model calibration to date.

B. GENERAL OVERVIEW

The one half Township Lot and Concession Fabric is not recognized in this or other Strada Reports. This fabric provides important local reference information.

The Map Legends are small, cryptic, often not complete, contain errors and are difficult to read. A disproportionate amount of space is utilized for the Map Titles and Corporate Authors.

Hydrographs with multi-stations need stations identified in the map windows.

No geodetic vertical datum is specified throughout the Report.

A glossary of terminology definitions is needed for the specific terms utilized in this and other reports. What is the difference between 'surface leakage' and 'groundwater discharge'?

This report is very difficult to read and requires improved visualization throughout. Especially 3D Visualization of the Quarry Extraction Phases are necessary for public communication.

C. SPECIFICS (page by page)

This Peer Review is long because the draft Impact Assessment is long.

**s2.3.3, 2.3.4
(pg 14 and 15)
and s3.2 (pg 36)**

It is important to recognize that The Baseline Conditions in Appendix D and E are virtual model baselines not actual baselines.

These virtual baseline conditions do not currently recognize many prior Peer Review comments.

Fig 3.2 (pg 18)	These 5 m contours do not correctly describe extraction in Lot 11 and 12. See Hunter LiDAR Figure H.4 of the Strada Pit environs.
s3.4 (pg 19)	If Strada is proposing the Manitoulin / Whirlpool Dolostones / Sandstones as a potential alternative drinking water aquifer, then water quality and quantity (yield) information is required. Also, this Layer and the Cabot Head Shale Layer should be included in the model.
Fig 3.3 (pg 20), Fig 3.4 (pg 21) and Fig 3.5 (pg 22)	These L1, L4 and L6 Layers employ 5m contour intervals. This is not acceptable within the Strada site environs. Once again, we request the Site error statistics, and for audit purposes, the groundwater monitoring and water well data files that are informing this model. Compare to the Hunter compiled dry weather Epikarst / Upper Bedrock (Layer 4) Fig H.1 and Gasport (Layer 6) Fig H.2 potentials based on Strada site monitoring data. These potentially support one (1) meter contours despite the poorly distributed and insufficient 2024 site multi-level groundwater monitors.
Fig 3.7 (pg 24)	What is the geological authority for the thinning Gasport and reverse dipping Goat Island near the escarpment frontal slopes? What is the authority for the widespread Tavistock Till? Where is the geotechnical characterization of the on-site glacial tills?
Fig 3.8 (pg 25)	What is Oak Boreholes QA-6? Note '5 m' contours.
Fig 3.9 (pg 26)	High water tables occur on Strada site Lot 11 and 12 and demonstrate local extraction within 1.5 m of the water table contrary to Site Plan Licence conditions.
Fig 3.11 (pg 28)	STR not defined in legend. Additional STR's would be useful: - North of STR10 at main stream crossing of Main Street - East of STR4 at second stream crossing on SR 15 - Two tributaries on Mill Street - At River Road Mill Pond Dam coincidental with Genivar location - At Pine River Honeywood Line crossing above the Provincial Fishing Area
Fig 3.12 to Fig 3.17 inclusive	GSE and BAS not defined. Typical 'R192 C276' not defined. There is little difference in L1 versus L4 potentials except at GWP2 (Fig 3.13).
Fig 3.18 (pg 32)	STR14 is at CR 124 (Shelburne Golf Course). No information is provided for irrigation water taking at this golf course.

s3.5.2 (pg 32)	No information is provided for the nature of the dam (control structure) on Horning's Mills Lake. Is this dam substantial? (NRSI 2024?)
Fig 3.19 (pg 34) and Fig 3.21 (pg 36)	These Figures need to extend to Honeywood Line and include additional STRs as discussed above for Fig 3.11.
Fig 3.20 (pg 35)	Additional Comparative Plots are required for all STR's including at Honeywood line.
Fig 3.22 (pg 37)	Model virtual baseline surface dry weather flows at STR2 cannot be correct. A fish hatchery and rearing ponds were operated just downstream for many years (see Rob Uffen / Doug Newell YouTube videos (see Matrix).
Fig 3.23 to 3.25 (pg 39 to 41)	Again, these Figures demonstrate below Water Table + 1.5 m extraction in Strada Lot 11 and 12. A number of farm fields are planted in corn / potatoes / wheat or soybean rotations in Lot 10 and 11 but are shown with discharge under average and high conditions. These fields and E½ Lot 9, Con 2 on CR 124 are very sensitive to any increase (less than 30 cm) in water tables. These Figures need to extend easterly to CR 124 and STR 14
Fig 3.26 (pg 42)	GSE and BAS not defined. Are these plots the virtual Model Base Line conditions for Model Layer 1? Compare to Fig H.1 and H.2.
s3.6.1 (pg 43)	Increase in wetland water budgets will potentially adversely affect adjacent farm fields. Decrease in wetland water budgets will potentially positively affect adjacent farm fields. This model report does not recognize adverse impacts to farm fields.
Fig 3.27 (pg 44 to 48)	The NRSI 2024 Report has not been provided. Therefore, we have not yet included Wetland Water Budget comments. Increase in wetland water levels will adversely affect surrounding farm fields.
s3.7 (pg 49)	No Baseline Conclusions are provided related to farm fields. No Figures comparable to Fig 3.23 to 3.25 are provided for farm fields to the north of the proposed Strada quarry site. These Figures are required for Model Base Line audit and assessment purposes.
s4.1.2 (pg 50)	There is a disconnect between the Model assumptions and the Geotechnical Assessment. This must be resolved.
Fig 4.1 (pg 51)	The proposed Quarry Phase lines (?) are not shown in the Legend.

The Southern Infiltration Gallery is in a model groundwater discharge zone (see Fig 3.23 to 3.25). There will be little infiltration to the Gasport Aquifers (see also Fig H.1 and H.2). There will be no discharge to the Upper Bedrock aquifers except under reservoir increased hydraulic head or quarry induced drawdowns. Under quarry induced drawdowns the flow will be back into the quarry, except where pond liners are provided.

The Northern Infiltration Trenches and Central Infiltration Gallery have some capability of recharging the Upper Aquifers (Fig 3.9 pg 26) but little capability to recharge the Gasport Aquifers and offset drawdowns due to the underlying Goat Island aquitards.

No information is provided on quarry effluent flows or the sizing (volumes) of the infiltration facilities versus the seasons of the year.

Table 4.1 (pg 52)

The proposed Central Infiltration Gallery with a water control elevation of 495 m asl (CGVD?) is located in an area with LiDAR ground elevations of 491 to about 497 m asl (CVD2013). Perimeter berms including one (1) m freeboard will be up to 4 m high. Discharge may also occur to farm fields and wetlands to the east of the Strada site. It is not clear how this gallery will overflow (pumped) to the higher water level control elevation Southern Gallery?

The proposed Southern Infiltration Gallery water control elevation is 497 m asl (CGVD?) versus a LiDAR Oct / Nov 2022 elevation of 490 m asl. Berms including one (1) m freeboard will be up to 8 m high. This proposed reservoir will either discharge (seep) under the required berm enclosures or overflow the berms into the Boyne River tributaries.

Table 4.2 (pg 53)

Groundwater Aquifers – The water quality effects are in the redirection of flows and in the Quarry Pumped Effluent Discharge classified as sewage by MECP. Reduction in pond throughflow may also be a concern. The potential for adverse water quality effects is not limited.

s4.4 (pg 53)

The four (4) phases of extraction being modeled are not obvious in the Model Figures presented. Phases need to be explicitly defined. Cross sections are required. This Peer Review does not currently have access to the details as referenced in the MHBC Site Plans. How do we know that selected Model 4A is the critical Phase for modelling?

s4.5.1 (pg 55)

Are these model or real quarry floor drains? How will this quarry effluent sump water be treated prior to discharge to drinking water aquifers?

Where is the predicted quarry effluent water quality reported in the Applicant documents?

Fig 4.2 (pg 56)

Base Line refers to Model Virtual Baseline not actual data. No model detail is provided on the Bench Barrier Berms.

Fig 4.5.2 (pg 57)	The discussion is oblivious to impacts on farm fields. Low lying depressions in fields may be adversely influenced by water level increases of as little as 15 to 30 cm or less.
Fig 4.3 (pg 58) and Fig 4.4 (pg 59)	Farm field depressions are impacted by higher water tables to the northwest in W½ in Lots 14, 15 and 16 Con 4, Lots 11 Con 2 and 3 and in Lots 10 in Con 2,3 and 4.
Fig 4.5 (pg 60)	This Figure appears to show the Gasport Aquifer potential depressurized about 15 m (contours not labelled or illegible). Drawdowns, even at 0.5 m, will adversely impact springs, pond flowthrough (quality) and streamflow in Hornings Mills.
Fig 4.6 (pg 61) and Fig 4.7 (pg 62)	Average streamflow is increased to Boyne River headwater tributaries and decreased to Pine River headwater tributaries. How much is this change? Figures need to include the full Target Participation Area.
s4.5.3 (pg 63)	Is P1 Phase 1? Reductions of summer (dry season) headwater springs, pond flowthrough and streamflows of 44% (STR9), 20% (STR8) and 24% (STR7) and related decreased pond flowthrough (decreased quality) and decreased water levels are unlikely to be acceptable.
Fig 4.12 (pg 66) and Fig 4.13	Again, Average Phase 1 shows an increase in surface discharge (leakage?) to the Boyne and decrease to the Pine River headwaters. Note: Phase 1 not defined.
s4.5.5 (pg 68 to 73)	Need NRSI (2024) report to further comment.
s4.5.6 (pg 74)	This report continues to be oblivious to farm field rising water tables. Reduced dry weather streamflow impacts to headwater streams, springs and ponds are not acknowledged as significant quantity and quality impacts.
s4.6.1 (pg 75)	Again, the Model Phases and Floor Drains are not clearly articulated. Are the floor drains constructed down dip to the southwest? Where is the quarry sump? How is the pumped quarry effluent water treated and transported to the Infiltration Galleries? Again, baseline conditions are model virtual baselines not real data.
Fig 4.18 (pg 76)	Legends are incomplete.

s4.6.2 (pg 77)

Is P2 Phase 2?

A 2 m thick layer of Niagara Falls Formation is unlikely to be sufficient to prevent quarry floor rupture and uncontrolled flooding. In Centre Wellington the Niagara Formation is a municipal aquifer.

The 5 m drawdown criteria should be based on the results of the private well monitoring in the Target Participation Area not on a generalized statement.

Again, there are no comments on impacts of rising water levels on farm fields. The decrease in Horning's Mills springs, pond flowthrough and streamflows (NAT 18) is unlikely to be acceptable.

**Fig 4.19 (pg 78),
Fig 4.20 (pg 79)
and
Fig 4.21 (pg 80)**

These Phase 2 C Figures collectively demonstrate the appropriateness of the selected Target Participation Area.

These Figures demonstrate rising water level averages adverse to farm field depressions in Parts of Lots 9, 10 and 11 and Con 2, 3 and 4.

Drawdowns adverse to headwater springs, ponds and streamflow at Horning's Mills are demonstrated in Layer 1 (Overburden), Layer 4 (Guelph) and especially Layer 6 (Gasport) at up to 2 m at the western end of Horning's Mills Lake.

On the Strada Site the Gasport Aquifer (Layer 6) potential is shown by the model to be drawn down (depressurized) by about 15 m. The infiltration galleries have limited effect on this aquifer. Fig 4.23

**Fig 4.22 (pg 81) and
Fig 4.23 (pg 82)**

These Phase 2 C Figures show increased streamflow to the Boyne and decreased streamflow to the Pine River headwaters including to streams east of CR124 and north of 15 SR. This decreased streamflow to the Pine River is not acceptable.

The increased streamflow to the Boyne may marginally increase stream assimilative capacity for the Shelburne Sewage Treatment Plant but is also indicative of adverse higher water tables in nearby farm fields.

s4.6.3 (pg 83)

Summer water levels predicted to be reduced by 2.5 m and summer streamflows reduced by 63% (STR9), 30% (STR8) and 23% (STR7) are unlikely to be acceptable.

**Fig 4.24 and 4.25
(pg 84)**

Legends incomplete and confusing?

**Fig 4.26 and 4.27
(pg 85)**

Dramatic, unacceptable reduction in Pine River headwater streamflows. Where are STR2, STR3, STR1, STR4 and STR13 in all scenarios?

Fig 4.28 (pg 86) and Fig 4.29	Please define ‘surface leakage’ vs ‘groundwater discharge’ Why is surface leakage increased in STR4 vicinity? Again, there is increased surface leakage in the Boyne tributaries and decreased leakage in the Pine River tributaries with related adverse impacts as previously discussed.
s4.6.5.1 (pg 88)	A simulated streamflow reduction in NAT18 by 18.7 L/s (from 53.6 L/s) to 34.9 L/s is not acceptable (35% reduction).
s4.6.5.2 (pg 91)	Higher water tables in the wetlands will adversely impact nearby farm fields. This Peer Review does not have currently have access to the NRSI (2024) report.
s4.6.6 (pg 94)	The Phase 2 quarry extraction area is not clearly articulated. This extraction will have adverse effects on Pine River headwater springs, ponds and streamflows as well as on farm fields some distance from quarry excess water infiltration areas (15 to 30 cm rise in water tables).
s4.7.1 (pg 95)	Are these floor drains actually constructed drains or are they model virtual drains? Do they follow the Cabot Head formation dips to a quarry floor sump at the southwest? It is noted that Base Line conditions are model virtual conditions.
Fig 4.34 (pg 96)	Legend incomplete. Where is Phase 4A? How did the Phase 3 Barrier get constructed? Need labels and cross sections to understand Phase progression.
s4.7.2 (pg 97)	The Gasport drawdown at 1 m extends approximately 2 km to Horning’s Mills east of the site. This Peer Review does not agree that decrease in spring, pond and streamflow is moderate or that the proposed infiltration systems significantly mitigate the effects of drawdowns. Again, this modeling report is silent (oblivious to) the adverse effects of water level rise due to proposed quarry excess water infiltration and barrier berm systems on farm fields, residential lots and septic fields.
Fig 4.35 (pg 98), Fig 4.36 (pg 99) and Fig 4.37 (pg 100)	Where is Phase 4A? This Phase 4A raises the Duivenvoorden water table (Layer 1) by up to 5 m (to about 505 m asl – CGVD2013) in the E½ Lot 14 farm existing fields and proposed Pit expansion area adversely reducing the above water table aggregate resource quantity. This is not acceptable.

The barrier induced 0.5 m contour water table rise extends westerly into already high water table imperfectly drained fields west of the 5th Line, Dufferin County Rd 2 and along 280 SR at Model face value. These flat fields will be permanently flooded, creating wetlands. Adjacent wetlands will also be adversely flooded with tree kill. This is unacceptable.

The barrier induced 0.5 m contour water table rise will also adversely impact depressional parts of fields on Lots 14, 15, 16 and 17 Con 3 and 4 north of the proposed quarry. This is unacceptable.

The proposed infiltration galleries in W½ Lot 11 and 12 will adversely impact farm field depressional areas to the west, south, southeast and east of the Pit / Quarry site. This is unacceptable.

These water table rises will also adversely impact a number of residential lots and septic fields.

The Gasport Potentials (Fig 4.37) are raised by 10 m or more compared to model Base Line west of the Prince Pit and the 4th Line. This will inevitably lead to failure of the Strada Layer 3 (Gasport) Barriers and uncontrolled quarry flooding. This will not be acceptable to Strada but provide relief to farmers.

The Gasport drawdown contours extend into Main Street Hornings Mills.

The northeast infiltration trenches have raised water levels in the Guelph Layer 4 but have reduced effect on the Gasport Layer 6.

**Fig 4.38 (pg 101) and
Fig 4.39 (pg 102)**

Increase in streamflows extend into tributaries west of the 5th Line north of 280 SR, north of 15th SR in W½ Lot 16/17 and in tributaries east, southeast, south and southwest of the proposed southern infiltration galleries on the Strada site. These all indicate wetter farm field, residential lot and septic field conditions.

Decrease in streamflows occur in Pine River tributaries to Hornings Mills Lake and to 15th SR tributaries east of Main Street.

**Fig 4.44 (pg 106) and
Fig 4.45 (pg 107)**

Where is Phase 4A? How does surface leakage differ from groundwater discharge?

Increase in surface leakage on Duivenvoorden lands and to the Boyne tributaries and to Pine source tributaries.

Decreases in surface leakage at Hornings Mills.

s4.7.5.1 (pg 108)

How are mm/month units converted?

Simulated streamflow for NAT 18 decreases from model baseline condition 47.9 L/s to 31.2 L/s (loss of 16.7 L/s or 35%). This is not acceptable.

s4.7.5.2 (pg 111)

NRSI (2024) Report required to support Peer Review comments.

s4.76 (pg 114)

Phase 4 Gasport 1 m drawdown extends 2 km. This drawdown will adversely impact Pine River headwater springs, ponds (quantity and quality) and streamflows. Flows at STR7 and STR8 are significantly reduced, especially during summer. This is not acceptable.

The reference to 5 m operational drawdown being acceptable for private wells needs to be addressed based on local data, not on abstract statements.

Again, adverse impacts on farm fields, residential lots and septic fields are not recognized or discussed in this model report.

**Fig 4.5.1 (pg 118),
Fig 4.52 (pg 119) and
Fig 4.53 (pg 120)**

The Rehabilitation Condition drawdown 0.0 m contours are incomplete or go beyond the Map windows. There are adverse impacts on nearby wetlands but not farm fields and residential lots.

**Fig 4.54 (pg 121) and
Fig 4.55 (pg 122)**

For the rehabilitation condition, increase in streamflow occurs in the Boyne headwater tributaries and decrease in the Pine River tributaries. Is this acceptable?

**Fig 4.58 (pg 124) and
Fig 4.59 (pg 125)**

Dry weather streamflows at STR9 are reduced by an estimated 20 to 35%, this is not acceptable.

Fig 4.59 legend appears incorrect (No STR7?). Cannot comment without correction.

**Fig 4.60 (pg 126) and
Fig 4.61 (pg 127)**

Legend titles are different on each Figure. Is it Surface Discharge or Surface Leakage?

In general, the decrease in surface discharge is more extensive. However, the map windows are not sufficiently extensive to fully comment.

s4.8.11 (pg 128)

Streamflows into the NAT-18 Wetland (Horning's Mills Lake) are decreased 2 to 6 L/s compared to Model Base Line.

The simulated lake stage has recovered to within 0.02 of Model Base Line condition. Note, this Lake has reported an outlet control (dam). No information on this control structure is provided. NRSI (2024) report is not available.

s4.8.2 (pg 134)

As already stated, adequate drawdown statements need to be derived from local private well data.

Streamflows will be reduced under model rehabilitation conditions. Is this acceptable?

**s5.1 (pg 135),
Fig 5.1 (pg 136),
Table 5.1
(pg 137 to 140)
and Table 5.2**

Fig 5.1 and Table 5.1 are very misleading as they do not recognize deficiencies in monitor distribution by Model layers. Model Layer representation needs to be added. Are all these monitors functional or being monitored? How many monitors are multi-level with respect to key Model Layers 4 and 6?

The existing Monitor screen interval classification needs to be revised to reflect the Model Layers and Open Hole status of some monitors.

Annual Water Quality Monitoring needs to be conducted during October near the end of the operational season. Semi-Annual Water Quality Monitoring to be conducted during June and October.

Where is the recent water quality data for the monitors screened in the Gasport aquifers?

In Table 5.2, why the water quality 'no's in some monitors?

What does water quality semi-annual and annual mean? Does 'annual' mean that Hydrocarbons will be monitored at only these monitors, why?

We agree with the water quality analytical parameters proposed, except TDS to be calculated.

Please show the water quality monitoring plan on a map to permit visualization.

**s5.2 (pg 140 and 141)
and Fig 5.2 (pg 142)**

The pg 141 para 1 text description of the TPA is inaccurate.

We understand baseline conditions in full para 1 and 2 on pg 141 means actual field observations baseline and not model baseline. How will this information be incorporated into the model calibration?

**Table 5.3 and
Table 5.4 (pg 144)**

This long term sentry well proposal is incomplete (see Peer Review Matrix).

**Fig 6.1 (pg 147),
Table 6.1 (pg 148)
and
Table 6.3 (pg 149)**

This information has been withheld and has not been seen before by this Peer Review.

In Fig 6.1, the very important Pine River Honeywood Line symbol designation is cut off.

Why doesn't Fig 6.1 provide visualization of Table 6.3. What is the rationale for the No's in Table 6.3?

Fig 6.1 is very misleading without knowing what is actually being monitored. Is it the responsibility of the Peer Reviewer to do the GIS integration and visualization?

Where is the monitoring data for Fig 6.1 to support this process?

Why are domestic wells shown (small red dots) on the map? Legend not clear.
How will this actual base line monitoring data be incorporated into the model calibration to improve the model base line?

Who implements the footnote recommendation in Table 6.3?

**s7 and Table 7.1
(pg 151)**

Paragraph 1 discusses satisfaction of ecological hydro periods and protection of surrounding wetlands but ignores protection of surrounding farm fields, residential lots and septic fields. Why?

Table 7.1 does not provide time scales for water management fluxes for the selected Phases. Are these fluxes averages per year?

Where are the Phases located? How do we know that other Phases do not have higher fluxes?

What are the fluxes to the Pine and Boyne River versus Model Base Line Condition?

Where are the Quarry Monthly Water Balances by Phase? Typical monthly or daily fluxes are required to assess peak reservoir storage volume requirements for pumping out accumulated quarry floor groundwater discharge, snow melt and spring rainfall event volumes.

s8 (pg 152)

This Peer Review does not agree with the Strada Model Impact Assessment conclusions as stated for the many reasons cited above.

First, the Model Calibration has not included many of the prior Peer Review comments or provided data supported reasons, why not? Secondly, no site specific model calibration error statistics have been provided. Thirdly requested model input data has not been provided for audit.

The currently proposed quarry operational Site Plan does not minimize spring, pond throughflow (quantity and quality) and streamflow reductions in the Pine River headwater tributaries. The Model Report ignores and does not assess the adverse impacts of rising water tables on surrounding farm fields, residential lots and septic fields.

Furthermore, the proposed lower Gasport barrier is destined to failure due to the much higher Model hydraulic heads around part of the excavation perimeter (see Fig 4.37, pg 100) than assumed by the Strada's Geotechnical Consultant.

The currently proposed Site Plan, taking the August 2024 Impact Assessment Report at face value, is not acceptable.

s10 (pg 163 and 164)

As acknowledged in para 1, the resultant model size raises questions about the accuracy of the local calibration. This statement indicates the importance of the Honeywood Line Pine River surface monitoring station.

For simplicity, the word ‘local’ should be equated with the more precise ‘Target Participation Area’.

There were likely no other Gasport monitor wells other than Open Hole OW2-07 and OW1 at the time of the June 2009 Pump Test.

With regard to PW1 Pump Test at 138 m³/day and an assigned rate 300 m³/day, this open hole well extends only into the top and does not penetrate the full depth of Gasport Formation (the zone of higher conductive materials extending to the east towards Horning’s Mills). A Pump Test is still required with full penetration of the Gasport in this vicinity.

**Fig 10.2 (pg 166) and
Fig 10.3 and 10.4
(pg 167)**

Lot 13 / 14 Fig 10.3 Cross Section has north and south mislabeled in upper corners. What is the authority for pinching out the Guelph Formation and thickening of the Eramosa on the east side of Fig 10.3. Where is the mid Township Lot Cross Section?

OW2-07 area would appear to be appropriate for the Quarry Phase 1 sinking cut and initiation of extraction due to the tight hydrogeological unit at this location. This area is downdip at least at the Cabot Head basement level for efficient quarry floor drainage to a sump.

s10.2.2 (pg 170)

Regardless, the Bonnefield Test wells are remote from and not on the Strada proposed quarry site.

s10.2.3 (pg 171)

Regardless the Shelburne Wells at a capacity of 1,634 m³/day are remote from and not on the Strada site. There is not a 25 m head gradient across the Niagara Falls unit on the Strada site.

The cell resolution issue may, perhaps, be resolved by continuous streamflow monitoring at the Pine River at Honeywood Line and limiting the model domain to the Pine River headwaters.

**s10.2.4
(pg 172 and 173)**

Please explain with diagrams how the Lugeon packer tests were employed in the model.

Why are there only three borehole Lugeon tests? Why not seven?

**s10.3 (pg 173) and
Fig 10.9 (pg 174),
Fig 10.10 (pg 175)
and
Fig 10.11 (pg 176)**

This Peer Review agrees with the concept of the model refinement zones of enhanced permeability (karstic / fracture zone) on coincidental model layer flow convergence troughs (see Fig H.1 and H.2). These are likely narrower than portrayed in the Figures. However, there is an inadequate number of Model Layer groundwater monitors on the Strada site to define these enhanced permeability zones. These features are important to recognize in Site Extraction Planning and Phasing.

These enhanced permeability zone features are interpreted by this Peer Review to extend from the east side of the Melancthon Pit through Prince Pit into Duivenvoorden lands on E½ Lot 14, Con 4 OS.

s10.4
(pg 177 and 178)

Local scale should be equated to the TPA.

The Applicant needs to edit, with the assistance of the TPA results, the MECF water well database to reduce the intrinsic error in the model input data and reduce the limiting nugget value. Inclusion of streamflow monitoring will also enhance the model results. This will improve the confidence in the model results.

The Spitz and Moreno (1996) comparison has no relevance when there are obvious calibration improvements which may be undertaken.

The model report still does not include error statistics specific to the site monitoring data with screens statistically stratified to the Model Layers.

Fig 10.12 (pg 179),
Fig 10.13 (pg 181) and
Fig 10.14

All of these Figures with 5 m contour interval are not adequate for purpose, especially on the proposed Quarry site (see Fig H.1 and H.2).

Fig 10.15 (pg 182),
Fig 10.16 (pg 183),
Fig 10.17 (pg 184)
and Fig 10.18

Local should be equated to the TPA. The MAE and the RMS errors on these Figures are thence of contour interval greater than 5 m.

The modelers have refused to provide the model input data for Peer Review audit.

s11 (pg 186 to pg 245)

We require the NRSI (2024) Report to comment.

C. s12 GEOTECHNICAL ASSESSMENT

s12.1 (pg 246)

See comments below within the Geotechnical Report. Note, Scope of Work for this Assessment was not made available to this Peer Review.

s3.0 (pg 3)

No field work or site specific geotechnical investigations or site visits were undertaken. The geotechnical consultant apparently relied on two Melancthon Mega Quarry 'Genivar' Boreholes (BH08-18 and BH08-19) located on Duivenvoorden lands 150 to 300 m from the Strada proposed Quarry site. The Borehole logs are included in Appendix A of the Geotechnical Assessment.

Appendix A

BH08-18 reported silty sand overburden to 18.3 m depth. BH-08 19 reported sandy silt becoming clayey silt at 9.4 m depth. No static water levels are included on the logs or included in the report.

There is silty sand till reported but no obvious Tavistock Till in any of the 10 Boreholes included in Appendix A.

The Genivar Borehole location map has illegible overprinting of Borehole Labels. This needs to be corrected.

BH08-18 on the Duivenvoorden Site is 88.4 m deep and extends to the Cabot Head Shales at 83.0 m (434 m CGVD28?).

s4.0 (pg 3, 4 and 5)

The Geotechnical Consultant reports that limited subsurface information was provided by the Client and therefore its report provides only feasibility level guidance.

The Client proposed low permeability / impermeable berms to limit infiltration of groundwater through the identified permeable soil and bedrock strata. The proposed berms would be placed on the benches where the permeable units have been identified.

The Client provided 3 cross sections through the quarry and proposed 2H:1V slope inclinations. The Geotechnical Consultant concluded that proposed berm configurations did not meet the target minimum factor of safety for global stability or sliding. The Consultant proposed:

Decreasing the slope inclination from 2:1 to 3:1

Lower the groundwater level in the berms

A combination of both

It is not possible to lower the ground levels in the berms, especially those intended to be bench barriers.

In the alternative, the Consultant proposed a composite berm structure that could provide a satisfactory Factor of Safety for both global and sliding stability at a 2:1 berm inclination slope.

s4.2 (pg 6)

The Consultant proposes re-use of any on site fine grained (clayey) soils to construct impermeable pond liners and (berm) cores. The Consultant also notes there are no site specific borings to verify that the soils encountered on this site are suitable for impermeable core use. Impermeable liners are apparently proposed on the north (Central) 'infiltration' pond adjacent to the quarry excavation.

Typical particle size range were specified for a compacted clay liner:

Percent Fines $\geq 50\%$

Clay Content $\geq 20\%$

Sand Content $\leq 45\%$

The Appendix A "Genivar Three Particle Size Distribution Envelopes" do not meet these Clay Content criteria for the specified 28 Boreholes (not all logs included this report).

The Consultant advises that an as constructed field hydraulic conductivity of 1×10^{-9} m/s is required for the clay core.

The only hydraulic conductivity reported in the May 2024 Model Calibration Report in this range is the inaccessible Cabot Head Shale at 5×10^{-9} m/s. Tavistock Till thought to be present under the south Strada Pits (Lots 12 and 11) has a Hydraulic Conductivity two orders of magnitude higher at 5×10^{-7} m/s. (Table 5.3, pg 131 Model Calibration Report).

Clay core materials will likely have to be imported to the Strada site.

Appendix B

Legends are incomplete for all Figures.

West East Sec AA through the Prince Pit (Lot 14) shows the base of the Gasport (proposed) Quarry Floor) 50 to 60 m below and the base of the Guelph Eramosa at 20 to 25 m below the existing water table.

West East Sec BB through the Melancthon Pit (Lot 13) also shows the base of the Gasport 50 to 60 m and the base of the Guelph Eramosa about 25 m below the existing water table.

North South Section CC through Lot 13 and 12 also shows the base of the Gasport about 60 m below and the base of the Guelph Eramosa about 25 m below the existing water table.

The Geotechnical Consultant does not acknowledge these very high hydraulic heads in the design of the Lower Bench Barrier Berm. Was the Geotechnical Consultant provided with a copy of fig 4.37 (pg 100) of the Draft Impact Assessment Report? There is a disconnect between this figure and the Geotechnical Lower Berm Barren Slope Stability Analysis.

This Peer Review, based on the information provided in the Draft Impact Assessment, concludes this lower berm will fail during Phase 4 C with flooding of the quarry floor. Strada needs to further address this issue.

**Appendix C -
Setbacks**

This Peer Review does not address the Infiltration Pond and Trenches Stability as these may be more easily remedied under operational conditions compared to the proposed bench berms.

The Section CC Upper Bench and Lower Bench Berms at 2:1 slopes not including the Goat Island Formation Thickness, at face value, as shown require a horizontal setback of about 75 m from the pit extraction limit.

A composite 2:1 slope for the total pit and quarry extraction face would require a 100 m horizontal setback and a 3:1 slope 150 m setbacks. These setbacks will significantly reduce Gasport reserves.
