

MEMO

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Subject	Strada Quarry Preliminary Issues List	

1.0 GENERAL ISSUES

For this proposed 149 hectare (368 acre) quarry licence area and proposed depth of extraction to about 70 m (230 ft) below existing ground and about 55 m (180 ft) below the water table:

- 1) Is the Quarry Site groundwater monitoring suitable to support the groundwater model and inform the Site Plans?
- 2) Is the groundwater model fit for predictive purposes?
- 3) Do the Site Plans protect the Horning's Mills Pine River headwater groundwater and stream flows quantity and quality?
- 4) Do the Site Plans protect the nearby and remote residences, farm fields and aggregate properties from rising water levels related to the quarry hydraulic barriers and infiltration infrastructure?
- 5) Do the Site Plans anticipate appropriate operational contingencies?
- 6) Do the Site Plans have sufficient regulatory triggers to terminate aggregate extraction if minimum water level and stream flows are not achieved?

2.0 SPECIFIC ISSUES

The following specific issues have been identified during this 4th Cycle Peer Review.

A. Pine River Headwater Tributaries – Reduced Flow

1. Reduction of Groundwater Discharge and Stream Flows to Horning's Mills Main Street Pine River Headwaters by up to 40 % during various extraction phases
2. Adverse impacts on Drinking Water Aquifers due reduced groundwater flows and village effluent dilution (septics, water softener salts and road salt).
3. Adverse impact on Brook Trout Habitat.

B. Boyne River Headwaters and Wetlands – Water Level Rise

4. Increase in Boyne River headwater stream flows and rise in wetland water levels
5. Use of NAT 19 Wetland as a default excess surface water overflow outlet from the proposed Quarry site.
6. Possible introduction of Brook Trout due to increased headwater tributary stream flows.
7. Adverse impact on residential sites (septics) and ‘lots of record’ located within and contiguous with headwater tributaries and wetlands.
8. Adverse impact on low lying agricultural fields, drainage tiles, outlets and municipal drains contiguous with rising waters in headwater tributaries and wetlands.

C. In Quarry Vertical Hydraulic Barrier Walls

9. Damming of natural groundwater flows upgradient of the proposed Quarry foot print.
10. Rising water levels and bypass flows with damage to wetlands, farm lands and aggregate properties.
11. Increased down slope groundwater discharge and damage to farm lands.

D. Unnatural Location of Proposed Infiltration Trenches and Ponds

12. Unnatural slope breakout of increased groundwater discharge (mounding) with related damage to farm lands contiguous with wetlands remote from the Quarry site.

E. Disregard for Ambient Aquifer Drinking Water Quality Protection

13. Quarry floor mixing and co-mingling of agriculturally contaminated Upper Aquifer seepage and pristine Deep Aquifer inflow with Quarry drilling blasting and processing plant dust, blasting AN/FO residuals and equipment hydrocarbons.
14. Collection of Quarry floor drainage in a limited area turbid Quarry sump pond in turn pumped directly, without further treatment, to Drinking Water Aquifer Infiltration Infrastructure.
15. Perforated Drain Interception of agriculturally elevated Nitrate (N) contaminated Upper Aquifer water at the Melancthon No 1 / Prince Pit 4th Line OS areas and conveyance to Upper and Lower Aquifer Drinking Water injection (infiltration) wells on Melancthon No 1 Pit area east boundary.

F. Groundwater Monitoring Network Deficiencies

16. Incomplete distribution of the legacy Pit monitoring network infrastructure across the Quarry site by Water Table, Upper and Deep Aquifer Model Layer. Monitoring deficiency mainly in multi- level flow convergence / underground stream corridor.

17. Many proposed long-term monitors at sites are not protected from future Quarry extraction and ancillary activities.
18. Some legacy pit monitors are no longer relevant to proposed Quarry extraction and should be abandoned.
19. No new site specific pump tests in Underground Stream Area.
20. Water level monitoring data and hydrographs are not classified by accepted Model Layers / Quarry Lifts and are of limited use to inform Quarry site planning.

G. Groundwater Modeling Deficiencies

21. The groundwater model is opaque. There has been no response to Peer Review requests to audit model input data.
22. Entire focus of Model is on water quantity and drawdowns not maintenance of stream flow or protection of water quality.
23. Incomplete calibration and unacceptable local model error statistics in the average ± 5 m with extreme vertical range at 10 m or more.
24. No response to Peer Review request for specific Quarry site water level error statistics.
25. High quality site groundwater monitoring data with vertical accuracy in the 10 to 20 cm range is apparently degraded in the Model environment.
26. Model calibration is to remote Pine and Boyne River stream gauge stations in Simcoe County.
27. The Model is uninformed by integrated Niagara Escarpment intermediate headwater tributary stations in the Pine River Provincial Fishing Area (Honeywood Line / Prince of Wales Road areas).
28. Validation to model virtual stream flow base conditions, where possible, indicates model headwater stream base flows (groundwater discharge) are underestimated by a 2 to 3 times.
29. Quarry groundwater inflows and infiltration quantities may be underestimated by a similar amount.
30. Modelers zone of 'inferred hydraulic conductivity' not informed by site water level data or by geomorphic conditions at Horning's Mills Lake or River Road.
31. Resultant distortion of groundwater mounding (rise) and drawdown locations.
32. Accuracy of vertical groundwater mounding (rise) or drawdown predictions are unknown.
33. No dewatering / infiltration water management alternative scenarios considered or modeled.
34. A partial pressure relief well / hydraulic barrier scenario should be modelled.
35. No alternative extraction footprint modelled.
36. No consideration to employing underwater extraction of the Gasport rock.

H. Site Plan Deficiencies

37. The primary focus is on extraction benefits and not on the fundamental protection of four season 365 day Pine River headwater tributary minimum groundwater flows and discharge required for extraction to take place.
38. No specific Site Plan consideration is given to isolation of Quarry Inflow water and / or treatment of Quarry floor sump water prior to infiltration to Drinking Water Aquifers.
39. Proposed Initial Phase extraction within the Pine River headwater ground water flow convergence zone (underground stream) versus in a lower more benign hydraulic conductivity area.
40. Initial extraction location in this underground stream area (Melancthon Pit No 1 east) ensures that Extraction will encounter maximum dewatering quantities and related risks from the outset.
41. Failure to protect an adaptive management infiltration corridor (say 150 to 200 m wide) along the east quarry boundary to allow protection of Upper and Deep Aquifer groundwater levels at the proposed Quarry east boundary to maintain existing headwater groundwater flows and character.
42. In the alternative, initiate extraction in the lower hydraulic conductivity southwest corner of the Site Plan proposed quarry footprint where groundwater inflow (dewatering) will be lower and the initial learning curve for vertical hydraulic barrier construction more forgiving.
43. The southeast corner will also be a more benign location for Quarry abandonment if extraction of lower quality upper rock lifts does not prove to be commercially viable.
44. There is no contingency plan for Quarry Lift 2 extraction floor rupture due to high underlying aquifer pressures, related rapid Quarry floor flooding, emergency pump out to protect processing equipment and storage of pumpage water without uncontrolled off-site release during Lift 2 extraction.
45. There has been no incorporation of pressure relief (dewatering) wells to reduce quarry groundwater inflow, facilitate vertical hydraulic barrier construction and stability, relieve Deep Aquifer uplift pressures for Lift 2 extraction and to deliver clean Water uninfluenced by Quarry extraction activities to proposed downgradient east boundary Drinking Water Injection Wells.
46. No existing pit floor storage pond to provide 'emergency' and 'treatment' pond storage to maintain infiltration facilities and 24 hour / 7 day / 365 day downgradient water level controls.
47. The use of upgradient pressure relief (dewatering) wells to provide improved SCADA operational downgradient aquifer water level control has not been considered.
48. These upgradient pressure relief wells may also relieve the requirements for surface storage and reduce the water quantities requiring treatment.
49. No downgradient multi-level Sentry Wells are proposed on the 3rd Line OS. The use of operating private wells is not appropriate for sentry water level monitoring.

I. Termination of Extraction in the Event of Record Headwater Stream Flow

50. The Site Plans contain no provision for immediate termination of extraction if downgradient minimum water levels at the Quarry east boundary and at multi-level sentry wells on the 3rd Line OS and dry weather stream flows in Horning's Mills are not maintained by the Quarry operator.