MEMO

To:	Natalie Kotyck and Carl Cosack
From:	Garry T. Hunter, M.A.Sc., P.Eng.
Date:	January 27, 2025
File:	21-407
Subject	**Strada January 24, 2025 Meeting – Continuing Discussion**

This memo continues the constructive discussions from the NDACT/Strada meeting on Friday, January 24 at Eagle's Nest. This memo does not replace my previous Peer Review Memos. This memo is intended to solicit factual critique (positive or negative) from all Strada and NDACT Team Members present. An updated Water Management Alternative Scenario is included.

A. QUESTIONS AND COMMENTS

A.1 Questions and Comments for Brian Zeman

Please comment on my working assumptions below:

1. With regard to my proposed Adaptive Management Zone, I would prefer that this AMZ be included within the Quarry extraction footprint with the planning equivalent of a 'holding category' with appropriate site plan trigger notes.

2. I am assuming that the Quarry Site Plans will replace the 3 Pit Site Plans and that after 12 to 24 months of new / existing Site and Sentry Well Monitoring that below the water table + 0.5 m extraction may then commence. Redundant pit monitors no longer required may then be abandoned.

3. Site and Sentry monitor wells, may of course, may be constructed prior to Quarry Site Plan approval at Strada's discretion.

A.2 Questions and Comments for NRSI

4. The critical groundwater discharge and flow condition is assumed to be dry weather flow for Brook Trout Habitat.

5. The key stream water quality criteria for spawning and long-term protection of aquatic life is 3 mg/L Nitrate (as N).

6. I suggest your Report also considers the Stantec Mega Quarry stream and fisheries surveys. These surveys overlap the Pine River headwater streams, including Marshall(?) Brook.

7. Also report sections are needed on the Pine River Provincial Fishing Area and on the legacy and recent Fish Hatcheries / Rearing Facilities.

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8. Comments on wetland denitrification opportunities.

B. CONTACT / NON-CONTACT WATER QUALITY MANAGEMENT CONCEPT UPDATE

9. Based on Airphoto Interpretation, Landscape Geomorphology, the available LiDAR digital elevation model, the available Strada geodetic survey quality down hole water quantity (water levels) and water quality data, and discussions at our January 24 meeting I have prepared a words concept update of my July 24, 2024 Alternative Site Plan Concept.

10. These concepts are evolving as new design data becomes available. They are based on initial extraction in the southwest corner of the Quarry footprint and excavation up dip generally towards Concession northeast.

11. Impacts to the CBM Pit site have not been considered.

12. I have not seen the Blasting, Noise, Transportation and Air Quality (Dust) Reports so I have not rationalized and balanced my evolving Site Plan to these reports.

13. My Site Plan concept is based on the high horizontal and vertical (3 D) groundwater flow convergence across the Site to the rear of the Melancthon Pit No1 and the former Bonnefield Pit Site.

14. Hydraulic conductivity is interpreted to be highest at the lowest static water level contours and lowest at the highest contours in the northeast and southwest of October 2024 Site Plan footprints.

15. Availability of 3rd Line Sentry Well information may indicate convergence (mixing) of Upper and Lower Aquifer flow west of Horning's Mills and suggest additional solutions for Quarry Water management.

16. My evolving Site Plan, unlike Strada's October 2024 water quantity based silo Site Plan recognizes the three distinctive separate water quality environments – Upper Aquifer (Guelph), Deep Aquifer (Gasport) and Mixed Contact Quarry Water.

17. These three water environments offer possibility for implementation of specific quality treatment as required to meet performance criteria to be determined.

18. My Site Plan does not yet specifically recognize ANFO/ Emulsion contaminants as expected to be contained in contact quarry sump water.

19. The Strada October 2024 Document Stack does not contain any water treatment proposals to assist the Site Plan development design process.

20. All elevations expressed below are in CGVD2013. Directions are expressed relative to Concession north.

B.1 Upper Aquifer (Guelph Eramosa) 4th Line Interceptor

21. I am now proposing that the Upper Aquifer (Guelph Epikarst) Interceptor Infiltration Drain as proposed on the Strada October 2024 Site Plans flow to the south buried below the existing water table along the upper Lift bedrock bench more or less as on the Strada Site Plans.

22. The perforated drain to be wrapped in filter fabric and constructed in an epikarst rock trench wherever possible and with surrounding inverse graded granular backfill.

23. The drain invert is proposed at about 489 m asl towards the northern limit of the Prince Property decreasing to about 488 m asl at the southwest corner of the quarry footprint.

24. This 4th Line interceptor drain will be constructed progressively from south to north parallel to the 4th Line as overburden / granular excavation continues northerly.

25. This interceptor drain will capture the shallow groundwater inflow from the eastern limit of NAT-01 currently utilized by Strada for make up wash water.

26. The drain will continue in the subsurface, avoiding the sinking cut Quarry access as a gravity solid pipe setback from the south limit of the Quarry footprint and within the northern area of Melancthon Pit 2.

27. The solid gravity pipe will continue northerly in the Adaptive Management Zone on the former Bonnefield Pit to the Melancthon Pit No. 2 south boundary more or less with an invert at 487 m asl the Melancthon Pit No. 1 boundary.

28. The solid pipe will connect to a perforated buried exfiltration pipe with invert decreasing to about 486.5 m asl towards the Melancthon Pit No. 1 north boundary.

29. At this pipe invert elevation in Melancthon Pit 1 , the perforated pipe is expected to be in the Guelph 'epikarst' and above the existing Upper Aquifer water level as indicated by Hunter's bedrock surface and Upper Aquifer static water level (potentials) contour mapping.

30. The pipe trench will be located approximately 30 m inside of the east Quarry Licence boundary. Bedrock trench excavation (broken rock ripping) will be required.

31. A second parallel perforated pipe trench may be established about 60 m inside of the east Quarry boundary to provide operational flexibility for alternative resting and dosing.

32. Alternatively, a large gravity fed granular infiltration bed (Manheim) could be constructed with multiple tile runs to permit resting and dosing.

33. This infiltration bed could be excavated into the bedrock to reflect hydrogeological conditions encountered.

34. There may also be surface or deeper granular deposits which may be utilized along the Adaptive Management Corridor.

35. This design is currently 'run of the quarry' and does not yet fully recognize 24/7/365 operation requirements.

36. The next step is to prepare surface soil, overburden character, bedrock surface, water table and pipe invert profiles (Autodesk Civil 3D / LiDar technology) from the high quality

existing site data already processed and in our files (Scott MacPhee). Plan views will also be prepared.

37. This will result in further invert and gradient adjustments; perforated infiltration, solid and exfiltration section details; site specific filter bed concepts and construction phasing. Locally elevated sealed maintenance access holes will be required.

38. Strada may then further develop design details.

39. There is reasonable certainty that Duivenvoorden will not object to related drawdowns west of the 4th Line in its existing and proposed pit expansion area.

40. However there may be water well issues in Township E ½ Lot 12 and 13, Con 4 OS.

41. Some reduction of Nitrate (as N) will occur with taking the MacTaggart Farm out of agricultural production by Duivenvoorden.

42. I would suggest that agricultural cropping in the Prince Pit be limited to corn, soybean, canola or wheat (not potatoes).

43. This gravity solution will permit extraction of Lift 1 and a small area of Lift 2 and perhaps even Lift 3 in the low hydraulic conductivity south west quarry area.

44. Because of the bedrock matrix low hydraulic conductivity, minimal backflow into the quarry excavation is expected during the initial Phase 1 Lift 1 extraction in the southwest corner of the quarry.

45. However stronger inflow is expected through the quarry walls and floor as extraction proceeds northerly into the higher conductivity likely fractured rock Is encountered in the Prince Pit underground stream area (Pump Test required).

46. This stronger groundwater inflow into Lift 1 may accommodate hydraulic barrier walls / wedges at the specified 2:1 side slopes constructed with on-site overburden fine textured tills.

47. Lift 2 as extraction proceeds northerly through the Prince Pit will need to be addressed with dewatering (pressure relief) wells (see below).

48. Dewatering wells and hydraulic barriers will be installed outside the underground stream area on an as needed basis at Strada's discretion in accordance with conditions found and Site Plan note constraints.

B.2 Deep (Gasport) Aquifer Non-Contact Water

49. Non-Contact Deep Aquifer Water will be extracted (dewatering / pressure relief wells) along the 4th Line frontage of Prince Pit underground stream area.

50. Extracted Deep Aquifer water will be transmitted by closed pipe to the Adaptive Management Zone to injection (recharge) wells to the Gasport Aquifers downgradient of the site.

51. The closed pipe route would parallel the Upper Aquifer pipe route perhaps in a common trench around the south quarry footprint likely with similar invert.

52. Both the south west and north east quarry areas appear to be low conductivity matrix rock where Quarry inflow will be relatively low (similar to Walker's Quarry Duntroon).

53. Only the Lift 1 Hydraulic Barrier may be required locally to partially to control agriculturally contaminated water inflow.

54. The underground stream along the 4th Line may need a vertical hydraulic barrier for Lift 3 extraction.

55. The dewatering / pressure relief wells along the 4th line would be designed to lower water level potentials below the top of the Deep Gasport Aquifer to permit safe Lift 2 extraction and for Lift 3 to the Quarry Floor at the Lift 3 extraction limit located about 50 m distant from the upgradient extraction wells.

56. Backflow prevention into the Quarry for lift 1 extraction adjacent Infiltration Adaptive Management Zone may be required despite the 200 m width of this corridor (about 150 m from infiltration infrastructure).

57. Dewatering wells may also be required here to permit Lift 2 and 3 as extraction approaches the Adaptive Management Zone .

58. Other solutions to control backflow may also be considered.

B.3 Quarry Sump Contact Water

59. Implementation of the above water management framework will reduce barrier wall construction, pumping and energy costs and minimize quarry contact water for treatment and disposal compared to Strada's October 2024 Site Plan proposal.

60. Quarry sump contact water will be used for wash plant make up water to compensate for wash pond evaporation, shipping and infiltration (back into the quarry excavation) losses.

61. Excess Quarry sump contact water may be pumped to the southern storage pond (operational range 491 to 494 m asl) and treated considering water fowl pathogen issues with gravity discharge after treatment to selected Adaptive Management Zone Upper Aquifer infiltration infrastructure.

62. A potential treatment solution for Nitrate (as N) reduction should be prepared for both non-contact and contact by Strada's Stormwater consultant.

63. Potential treatment solutions should be prepared for both non-contact Upper Aquifer and Deep Aquifer waters and for quarry contact water by Strada's Stormwater consultant.

64. The most recent Strada productions including the October 2024 Site Plans are totally silent on treatment possibilities to improve contact and non-contact infiltration water quality.

65. Practical treatment possibilities could result in revisions to the above proposed water management segregation process.

66. The Integrated resolution of water quality issues now at Site Plan stage will facilitate both MNRF Site Plan approval and the MECP Water Taking and Discharge Permitting process.

B.4 Rehabilitation

67. The current October 2024 Site Plans contemplate leaving the upgradient Deep (Gasport) Aquifer Open (No Hydraulic Barrier Walls) to flow into the future Quarry Lake. However this area is shown by Ken Goff's single pump test to be low conductivity matrix rock. Minimal inflow should be expected in this area.

68. The current October 2024 Site Plans contemplate leaving Lift 1 and Lift 3 Hydraulic Barriers at the rear of Melancthon Pit No. 1 and from Bonnefield Pit in place after Quarry closure and have the Quarry fill and overflow through the top of the Guelph Epikarst or overburden at 487 m asl.

69. As part of quarry rehabilitation, at least part of the Deep Aquifer underground stream area vertical wall inlet and outlet must remain open as at present.

70. A Design water level of about 480 m asl similar to the existing Deep Gasport Aquifer at the east boundary of the Melancthon Pit No. 1 is currently proposed.

B.5 Model Scenario No. 2 Alternative (Water Quality Segregation)

71. The October 2024 Hydraulic Barrier Wall Alternative is considered Model Scenario No. 1 Alternative (Water Quantity)

72. Once the Model has been Approved for Purpose, the above Water Quality Management scenario No. 2 will be further conceptualized and used to predict flows (fluxes) and size the infiltration quantity and quality treatment infrastructure, including hydraulic barriers.

73. Regardless of the merits, due to appearance issues, I am not prepared to participate in backroom meetings when NDACT is not invited to attend and observe.

C. ISSUES LIST JANUARY 10, 2025 UPDATE JANUARY 24, 2025 MEETING

74. The following comments result specifically from the January 24, 2025 meeting and new information in the Strada Hydrogeological Peer Review Issues Handout.

75. This discussion is intended to move this project forward to a satisfactory conclusion.

C.1 Issue 1

76. The process set in place is expected to resolve this issue.

77. However the Modeler's statement and belief that its model is correct and that the compendium of multi-source and multi-date observational flow data in the Horning's Mills Pine River headwaters is wrong, strains credibility.

78. The Modeler does not seem to be aware that there is considerable Pine River headwater flow data available within the Model WSC simulation period.

79. The Strada October 2024 Model may be a fully transient integrated surface water and groundwater model that ensures that all water is accounted for in the water budget but it is calibrated to remote gauge sites in Simcoe County

80. The nearby headwater tributary stream flow convergence sites say in the Pine River Provincial Fishery area underlain by Cabot Head / Queenston Shale aquitards (reduced groundwater underflow bypass) would be more appropriate calibration or waypoint sites.

81. This Peer Review is interested in dry weather stream flows not average flows.

82. Whether or not the Shelburne model has been approved by Review Agencies has little relevance to this Peer Review.

83. This Peer Review is only interested in the Horning's Mills Pine River headwater environment.

84. As part of this process, we again request that the Earthfx be compelled to provide its MECP water well input data and the Strada groundwater monitoring input data employed in its October 2024 Model Run (also, who is the owner of this data?).

85. We request that Tatham be compelled to provide the now available 12 complete months of monitoring well water level data (January 1 to December 31, 2024) with screens classified by Model Layer in .xls or equivalent format to permit independent GIS processing, graphic plotting and analysis.

86. At present, this Peer Review has only about 3 months of transient site observations in pdf format for the Deep Aquifer (Gasport) Wells. We simply don't know if the Strada Model, especially the Deep Aquifer area, is supported by the on-site transient groundwater level data.

87. We request that Tatham be compelled to deliver the continuous stream flow monitoring data as collected during the 2024 year. Data to be in .xls or equivalent to facilitate independent GIS processing, analysis and graphic plotting.

88. We request that Tatham provide the 2024 Annual Strada Pits Compliance Report as soon as available.

89. We also request that Strada deliver to NDACT the WELLness Check data as currently completed.

90. We also request that Tatham completes the single day Dry Weather flow observations at the three additional stations requested. This is required to partition Upper and Deep Aquifer flows.

91. This Peer Review has deferred comprehensive analysis and assessment of water well impacts pending receipt of the WELLness data. This data may inform the ongoing Site Plan development. This is not a Silo task.

C.2 Issue 2

92. Issue 2 is expected to be resolved by relocation of infiltration infrastructure and the evolution and adoption of a mutually acceptable version of the above Water Management Plan. The process may be similar to the resolution of Issue 1.

C.3 Issue 3

93. Issue 3 is also expected to be resolved as in Issue 2 and 1.

94. Strada's consultants have not understood the concept of Operational Performance Criteria. As an example, this means that under what circumstances and triggers will Quarry extraction be terminated due to violations of infiltration water quantity management criteria including drawdowns or stream flow.

95. Crafting of Site Plan trigger notes is required. My documents contain initial recommendations.

C.4 Issue 4

96. Issue 4 is also expected to be resolved as in Issue 1.

97. However Strada's consultants in the January 24 metering did not understand the concept of Operational Performance Criteria.

98. As an example, this means that under what circumstances and triggers will Quarry extraction be terminated due to violations of infiltration water quality management criteria.

99. Crafting of Site Plan trigger notes is required. My documents contain initial recommendations

100. Strada's September 2024 Deep Aquifer Water Quality survey need to be repeated to confirm the September 2024 results validity to support water management design.

101. Furthermore, the September 2024 survey did not include Deep (Gasport) Aquifer Monitor 30C in the water quality observations. This is required to support integrated Site Plan design.

C.5 Issue 5

102. Issue 5 is also expected to be resolved as in Issue 1.

103. The Water Management framework proposed above may resolve this issue.

C.6 Issue 6

104. Issue 6 is also expected to be resolved as in issue 1.

105. Tatham has objected since early in my Peer Review and again in the January 24 meeting to reclassification of groundwater monitors on the basis of Pit Compliance Report consistency.

106. I note that the pit groundwater monitor classifications have already been reclassified previously in 2017 by Tecia White. The 'C' categories at that time related to the Upper (Guelph) Aquifers.

107. I understand that the approved Quarry licence will be in place for many decades and will supercede and result in near term cancellation of the legacy Pit Licences.

108. Consider Monitor Well 29C that appears in a 2023 Compliance Report 'Deep' Water level plot I showed in the January 2024 Meeting. Is Monitor Well 29C screen deep in the Guelph or deep in the Gasport Aquifer?

109. The confusing well nomenclature does not allow for routine efficient GIS processing queries to facilitate error trapping , data analysis and just leads to high potentials for interpretation errors.

D. MATRIX

110. Regarding my referencing the Matrix as a 'mess' during the January 24 meeting, this was in reference to the Strada consultants single discipline silo approach and frequent comments that my Peer Review was out of scope, that I was not following Strada's notion of Peer Review Guidelines, Strada dictating which reports I could look at but was not supposed to comment on and following some external guideline notion as to how to conduct Peer Reviews.

111. I have considered but often placed little weight on the Strada consultants comments. Many comments were arbitrary without a science base.

112. From the beginning, I have conducted my integrated Peer Review, with due diligence, always leading towards the Site Plan legal documents, which is the current stage.

113. I prefer that this integration includes a cooperative Strada Team.

114. I have also been providing more than 5 decades of local and agricultural experience to the process in the absence of this experience by the Strada Team.

115. My Peer Review work is not 'out of scope' at all as frequently contended by Strada consultants in the Matrix.

E. REPORTS (Myopia)

E.1 Strada Report Synchronicity

116. I had previously observed that the Earthfx October 2024 Report is based on an earlier NRSI Draft with different wetland delineations than NRSI. NRSI also acknowledged during the January 24 meeting that its October 2024 report was based on an earlier Earthfx Report.

117. These reports almost certainly will have to be replaced in any event as they are no longer suitable for legal challenges related to Site Plan support .

E.2 Map Colours and Legends

118. Strada's Consultants during again made light of my critique of map colours and omissions from legends. We are just trying to improve the data communications and avoid interpretation errors.

119. Also in my routine review procedure, I print out the project reports and make frequent use of post-its and highlights. I really 'hate' reading these reports and content more than once. I now have a ridiculous unanticipated 4 (5,000 page each) office paper boxes of materials and binders for this Peer Review project, now going into its 5th Cycle.

F. SITE PLAN NOTES

120. I suggest that the NDACT Peer Reviewer update the current MHBC October 2024 site Plan Notes and pass these back to Strada / MHBC for further review. MHBC is the Site Plan publisher.

G. PROJECT COMPLETION AND APPLICATION SUBMISSION

121. From my perspective, this Project is many months behind schedule due to the Silo approach taken, the parking of comments in the Project Matrix, the very deep dive on the October 2024 Single Model Scenario (300 pages) and ignoring my July 2024 Alternative Site Plan Concept until very recently.

122. These Site Plan Notes are likely to involve considerable back and forth between NDACT and Strada and an improved draft may be prepared while Model issues are resolved.

123. Hopefully, we can now efficiently move forward with an integrated Site Plan submission.