April 26, 2024 Project No. CA0021660.3734

Ms. Debra Walker
MHBC Planning
7050 Weston Road, Suite 230
Woodbridge, ON L4L 8G7

Subject: **Hydrogeological Monitoring Program Site Plan Notes**
Proposed Upper's Quarry

Dear Ms. Walker:

We are pleased to provide our response to agency review comments on the WSP Canada Inc. (WSP) Level 1 and 2 Water Report for the proposed the proposed Upper's Quarry (Site).

The Level 1 and 2 Water Report (WSP, October 2021) was submitted as part of the ARA Licence Application package in 2021. A number of comments related to the reports were provided by the Joint Agency Review Team (JART) in their correspondence dated August 23, 2022. A subsequent comment related to the ARA Site Plan's hydrogeology notes was provided by JART in their letter response of November 2023, and email correspondence dated April 11, 2024. The comment is as follows:

> In regards to the ARA Site Plans and notes **it is recommended consideration be given to including more explicit details about the water monitoring program**, such as including Table 1 and Figure 29 of WSP (2021). The Site Plan notes currently only provide details regarding the sump monitoring program but with respect to the groundwater, wells and surface water monitoring program only state "*A long-term monitoring program will be implemented during the quarry operation and rehabilitation phases, until stable conditions are observed after quarry decommissioning.*"

A copy of Table 1 and Figure 29 of the Level 1 and 2 Water Report are appended to this memorandum.

It is recommended that Report Recommendations (ARA Site Plan Figure 4 of 6) note H.1 be revised as follows:

1. A long-term monitoring program will be implemented during the quarry operational and rehabilitation phases until the licence is surrendered. The monitoring program includes:
   a. Semi-annual water level measurement and logger download at five (5) standpipes and fifty-five (55) monitoring wells.
   b. Annual groundwater sampling at five (5) standpipes and fifty-two (52) monitoring wells, including six (6) blind duplicate samples and six (6) trip blanks for QA / QC purposes.
   c. Three (3) monitoring wells included in items (a) and (b) above are located within the proposed quarry extraction area and will be decommissioned according to applicable regulations as the quarry excavation proceeds.

d. Sampling every four (4) years at three (3) monitoring wells screened in the lower aquitard.
e. Annual water level measurement, datalogger download and sampling at all private supply wells pending owner permission. The program currently includes eleven (11) private wells, but wells may be added or removed in future years based on owner permission.
f. The Groundwater List for laboratory analysis includes general parameters, major ions, nutrients, dissolved metals and selected VOCs. Field measurements including pH, conductivity and temperature will be obtained at the time of sampling.
g. Semi-annual stage measurement and logger download at eleven (11) staff gauges / drivepoints.
h. Semi-annual flow measurement at four (4) staff gauges.
i. Semi-annual sampling at six (6) staff gauges / drivepoints, including one (1) blind duplicate sample and one (1) trip blank for QA / QC purposes.
j. The Surface Water List for laboratory analysis includes general parameters, major ions, nutrients, total metals and selected VOCs. Field measurements including pH, conductivity, temperature and dissolved oxygen will be obtained at the time of sampling.
k. Over the operational life of the quarry, the locations and frequency of hydrogeologic monitoring included in the program may be modified by the District Manager of the MECP from time to time as part of the OWRA approval process without the need for an ARA Site Plan Amendment.

We trust that this response meets your expectations. Please contact us if you have additional questions or concerns.

Yours truly,

WSP Canada Inc.

Leigh Davis

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Project Engineer, Earth & Environment

Kevin Fitzpatrick

Kevin Fitzpatrick, P.Eng.
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JLD/KJF/jld

Attachments: Table 1 – Proposed Monitoring Program (reproduced from Level 1 and 2 Water Report)
Figure 29 – Proposed Monitoring Program (reproduced from Level 1 and 2 Water Report)

https://wsponlinecan.sharepoint.com/sites/ca-ca00216603734/shared documents/05. technical/hydrog site plan notes/uppers quarry - hydrogeology site plan notes - wsp april 2024.docx

Table 1 Proposed Monitoring Program

Activity	Location and Geologic Unit	Frequency	Analysis / Measurement
Groundwater Monitoring			
Groundwater Level Monitoring	**Upper Aquitard Standpipes (5):** MW16-9SP, MW17-20SP *, MW17-21SP, MW17-22SP, MW17-23SP **Contact Aquifer Wells (23):** MW11-1OB, MW11-2OB, MW11-3OBR, MW11-4OB, MW16-5OB, MW16-6OB, MW16-7OB, MW16-8OB, MW16-9OB, MW16-10OB, MW16-11, MW16-12, MW16-13OB, MW16-14, MW16-15, MW16-16, MW16-17 †, MW16-18OB †, MW16-19OB, MW17-20OB *, MW17-21OB, MW17-22OB, MW17-23OB **Shallow Bedrock Aquifer Wells (18):** BH03-2B, MW11-1B, MW11-2B, MW11-3BR, MW11-4B, MW16-5B, MW16-6B, MW16-7B, MW16-8B, MW16-9B, MW16-10B, MW16-13B, MW16-18B †, MW16-19B, MW17-20B *, MW17-21B, MW17-22B, MW17-23B **Deep Bedrock Aquifer Wells (11):** BH03-2A, MW11-3AR, MW16-5A, MW16-5AR, MW16-6A, MW16-7A, MW16-8A, MW16-9A, MW16-10A, MW16-13A, MW17-20A * **Lower Aquitard Wells (3):** MW11-1A, MW11-2A, MW11-4A	Semi-Annually (May and October)	Water level measurement and logger download.
Groundwater Quality Monitoring	**Upper Aquitard Standpipes (5)** **Contact Aquifer Wells (23)** **Shallow Bedrock Aquifer Wells (18)** **Deep Bedrock Aquifer Wells (11)** **QA / QC:** 6 blind duplicates / trip blanks	Annually (May)	**Groundwater List** **Field measurements:** pH, conductivity, temperature **General Parameters:** pH, conductivity, TDS, hardness, sulphide **Major Ions:** alkalinity, chloride, sulphate, calcium, magnesium, sodium, potassium **Nutrients/Organic Indicators:** nitrate, nitrite, TKN, ammonia, total phosphorus, DOC, phenols **Dissolved Metals:** aluminum, arsenic, barium, boron, total chromium, cobalt, copper, iron, lead, manganese, molybdenum, nickel, strontium, uranium, vanadium, zinc **VOCs:** BTEX compounds
	Lower Aquitard Wells (3)	Every 4 Years (May)	
Well Inspection	**All Wells (60)**	Semi-Annually (May and October)	Check well / logger condition.

* Well nest MW17-20 situated on privately owned land; access subject to resident consent.

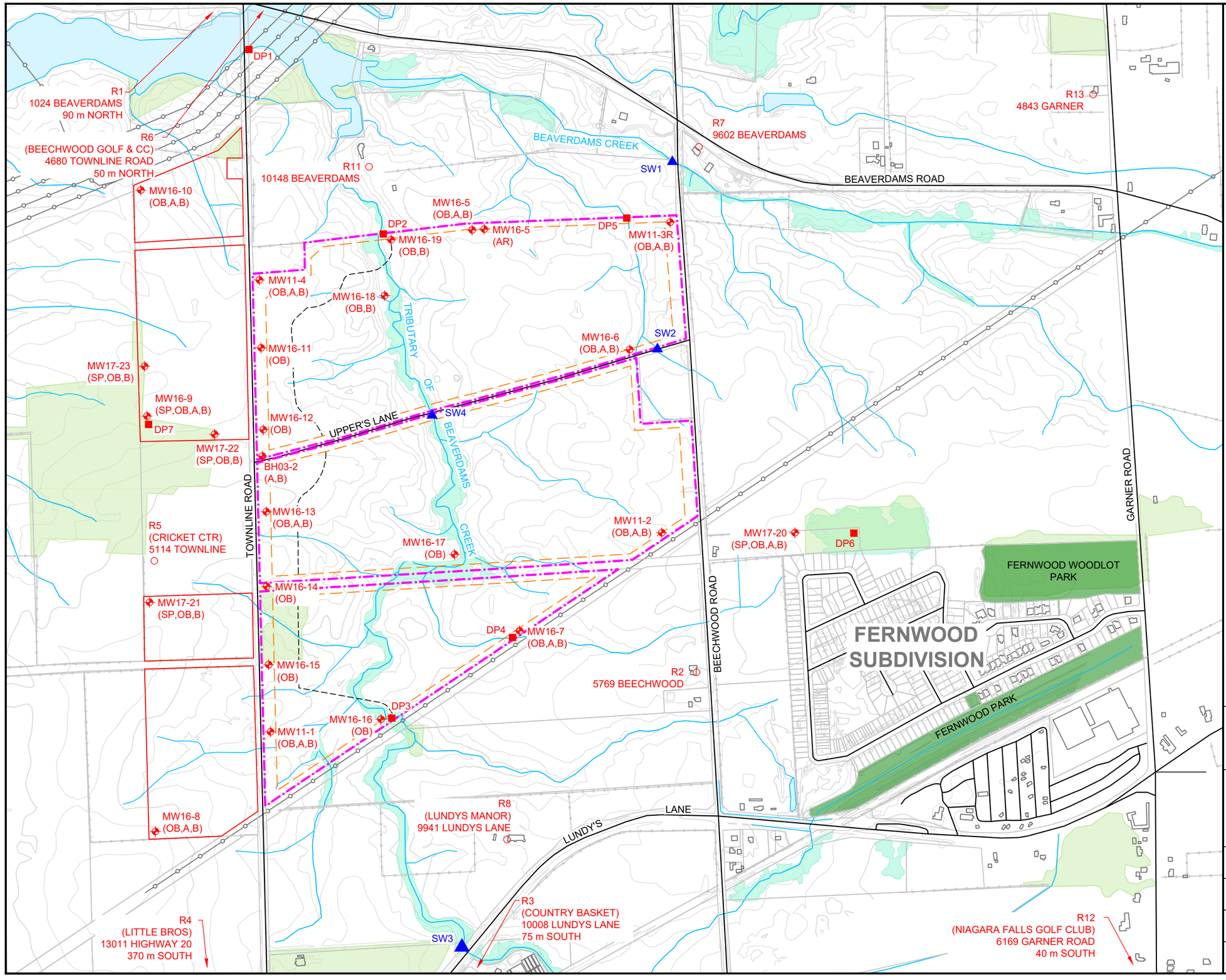
† Well situated within quarry footprint, to be decommissioned as quarry excavation proceeds.

Table 1 Proposed Monitoring Program

Activity	Location and Geologic Unit	Frequency	Analysis / Measurement
Groundwater Monitoring *(cont'd)*			
Private Supply Well Monitoring **	**Private Supply Wells (11):** R1 to R8, R11 to R13	Annually (May)	Water level measurement and logger download. Sample collection for analysis of the **Groundwater List**.
Surface Water Monitoring			
Stage / Flow Measurement	**Beaverdams Creek (2):** SW1, DP1 **Existing Watercourse (7):** SW2, SW3, SW4 †, DP2, DP3, DP4, DP5 **East Wetland (1):** DP6 **West Woodlot (1):** DP7	Semi-Annually (May and October)	Water level stage measurement and logger download. Measure flow rate at all SW staff gauges (4). Check drivepoint / staff gauge and logger condition.
Surface Water Quality Monitoring	**Beaverdams Creek (2):** SW1, DP1 **Existing Watercourse (4):** SW2, SW3, SW4, DP2 **QA / QC:** 1 blind duplicate / trip blank		**Surface Water List** **Field measurements:** pH, conductivity, temperature, dissolved oxygen **General Parameters:** pH, conductivity, TSS, hardness, turbidity, sulphide, un-dissociated hydrogen sulphide (calculated) **Major Ions:** alkalinity, chloride, sulphate, calcium, magnesium, sodium, potassium **Nutrients/Organic Indicators:** nitrate, nitrite, TKN, ammonia, un-ionized ammonia (calculated), TOC, total phosphorus, phenols **Total Metals:** aluminum, arsenic, barium, boron, total chromium, cobalt, copper, iron, lead, manganese, molybdenum, nickel, strontium, uranium, vanadium, zinc **VOCs:** BTEX compounds
Sump Discharge Monitoring	**Quarry Sump Discharge (1)**	Daily / Monthly	Record daily pumping volume. **Flow measurement device to be calibrated at least once annually by qualified hydrogeologist.* Monthly sample collection for analysis of the **Surface Water List**.

** Monitoring of private supply wells subject to resident consent.

† Station situated within quarry footprint, to be decommissioned as quarry excavation proceeds.



LEGEND

- SITE BOUNDARY
- PROPOSED LIMIT OF EXTRACTION
- REALIGNED WATERCOURSE SETBACK
- ADDITIONAL LANDS OWNED BY WAI
- APPROXIMATE LAND PARCELS
- WOODLOT
- WETLAND
- DESIGNATED PARK AREA
- SURFACE WATER COURSE
- GROUND SURFACE CONTOUR, 5 m INTERVAL
- GROUND SURFACE CONTOUR, 1 m INTERVAL
- FENCELINE
- UTILITY LINE
- MW11-1 — MONITORING WELL NEST LOCATION AND DESIGNATION
- R1 — PRIVATE SUPPLY WELL LOCATION AND DESIGNATION
- DP1 — DRIVEPOINT (STILLING WELL) SURFACE WATER STATION LOCATION AND DESIGNATION
- SW1 — STAFF GAUGE SURFACE WATER STATION LOCATION AND DESIGNATION

0 180 360 m

PROPOSED MONITORING PROGRAM

LEVEL 2 WATER REPORT
PROPOSED UPPER'S QUARRY
THOROLD / NIAGARA FALLS, ON
For Walker Aggregates Inc.

DATE: OCTOBER 2021	
PROJECT: 161-11633-00	
SCALE: 1 : 9,000	
DRAWN BY: JLD	FIGURE No: 29

55 KING STREET, SUITE 700
ST. CATHARINES, ON L2R 3H5
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