MHBC | PLANNING URBAN DESIGN & LANDSCAPE ARCHITECTURE

December 5, 2024

MNR Aggregates Section
Regional Operations Division
300 Water Street
Peterborough, ON K9J 3C7

RE: Mill Creek Pit (Licence No. 5738) – Proposed Site Plan Amendment
OUR FILE 9061DX

On behalf of Dufferin Aggregates, a CRH Company (Dufferin), we are pleased to submit the following Site Plan Amendment for the Mill Creek Pit (Licence No. 5738) located at Part of Lots 21, 22, 23 and 24, Concession 2 and Part of Lot 24, Concession 1, in the Township of Puslinch, County of Wellington. The Mill Creek Pit is licenced by the University of Guelph and operated by Dufferin.

The Mill Creek Pit is currently licenced for above and below the water table extraction, and the proposed Site Plan Amendment seeks to extend the limit of above/below water extraction to include a 2.5 ha area. The proposed Site Plan Amendment also seeks to update the licence boundary to remove 2.7 ha of land expropriated by the Ministry of Transportation Ontario (MTO). The ARA licence was already updated in 2019 to reflect the updated licence boundary of 185.9 ha.

In accordance with the requirements under the Aggregate Resources Act and MNR's email to Dufferin on November 19, 2021 (see attached), please find the following material enclosed in support of the Site Plan Amendment application:

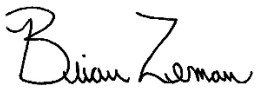
1. Signed Amendment Form;
2. Redline ARA Site Plans prepared by MHBC, dated October 2024;
3. Planning and Land Use Considerations Letter prepared by MHBC, dated September 17, 2024;
4. Water Report prepared by WSP, dated July 23, 2024; and
5. Natural Environment Technical Report prepared by Goodban Ecological Consulting Inc., dated August 2024.

A cheque for the Site Plan Amendment fee of $500 which references the Licence number has been couriered to the attention of Mahnaz Rahman-Larochelle.

We look forward to MNR's 25 day review to determine if the application is complete so that we can proceed to complete the consultation requirements in Section 0.4 and 0.5 of O.Reg 244/97. Should you have any questions, please do not hesitate to contact the undersigned.

Yours truly,

MHBC



Brian Zeman, BES, MCIP, RPP
Partner

cc. *Kevin Mitchell | Dufferin*
Jennah Pettenuzzo | Dufferin
Ellen Ferris | MHBC

From: Zuber, Sonya (NDMNRF) <Sonya.Zuber@ontario.ca>
Sent: Friday, November 19, 2021 1:43 PM
To: Mitchell, Kevin (CRH Canada Group Inc.) <kevin.mitchell@ca.crh.com>
Subject: RE: [EXT] FW: Request for Site Plan Amendment, Licence ID No 5738

Hi Kevin,

Thank you for taking the time to speak with me today and for your patience as I sorted through the details of this application. On February 7, 2020 a submission was made for a below water extraction amendment for Aggregate Licence 5738 for 2.4 hectares. The submission included draft site plans and a Letter of Opinion.

During this time the ARA Section 13.1 (2) stated that "The licensee may apply at any time to the Minister for an amendment to the licence or site plan and the following rules apply:

1. If there are no prescribed requirements and procedures in respect of the amendment, the licensee shall comply with the requirements and procedures that would apply under the regulations if the application were being made for a new licence."

Note: Historical version of the ARA for the period December 10, 2019 to August 31, 2020.

Based on the above, your application was incomplete at the time of submission, and a full application would have been required.

In the current version of the ARA, an amendment application to lower the depth of extraction in an area of a licence that does not allow extraction below the water table under ARA section 13.1 must be accompanied by the documents described in the Aggregate Resources of Ontario Amendment Standards, which include:

- Water Assessment
- Natural Environment Assessment
- Planning and Land Use Considerations
- Source Water Considerations

Aggregate Resources of Ontario: Amendment Standards

Based on the current standards, the amendment application submitted on February 7, 2020 is incomplete. In order to move forward with this submission a completed amendment package following the current standards will be required and if deemed complete, the consultation process will follow what is outlined in the Aggregate Resources of Ontario Circulation Standards(Aggregate Resources of Ontario: Circulation Standards) and the Regulation.

If you have any questions about this information please let me know.

Have a great weekend,

Sonya Zuber
A/Aggregate Specialist
NDMNRF | Integrated Aggregate Operations Section
(Cell) 807-708-3405 | sonya.zuber@ontario.ca

1

Attachment 1

Ontario

Ministry of Natural Resources and Forestry

Amendment Form *Aggregate Resources Act* (August 2020)

Instructions

Applications for an Amendment

This form is to be completed by any licence or permit holder applying to the ministry to make a change to their licence, permit, or site plan under sections 13, 13.1, 13.2, 30.1, or 37.2 of the Act.

When notification is required, this form must be circulated with the amendment application package.

As part of an application for an amendment, the licensee or permittee must submit a sketch or a draft copy of an updated site plan or site plan pages to the ministry.

Following confirmation from the ministry that the proposed amendment is acceptable, the licensee or permittee must make changes to the site plan to reflect the noted changes and submit the updated site plan or site plan pages to the ministry for approval.

Following ministry approval, the licensee or permittee must include a description of the amendment and the date the amendment was approved on a schedule to the site plan and must forward the site plan to the ministry for their records.

Submit this form and any additional information online using the Natural Resources Information Portal. If you have any questions about using the Natural Resources Information Portal, contact NRIP@ontario.ca. If web access is unavailable, submit the form and additional information by mail to Integrated Aggregate Operations Section, Ministry of Natural Resources and Forestry, 300 Water Street, Peterborough ON K9J 3C7.

When an amendment requires consultation and you are participating in the *Aggregates Resources Act* (ARA) notification and consultation process, all personal information (PI) you provide may be subject to the *Freedom of Information and Protection of Privacy Act* (FIPPA), whether provided to the Applicant or MNRF at any point during the consultation process. The MNRF collects your PI under the authority of s.7, s. 11, s.13.1, s.23, s. 34, s. 35 and other provisions of the ARA and maintains it for the purposes of ensuring consultation and other requirements in the ARA are met. Under the authority of s. 11(2),s.13.1(3), s.23(7), s.35(2) of the ARA, your name and address will form part of the public record (that is available to the general public as described in s 37 of FIPPA) and will appear with your comments, unless you request in your submission that your name and address be kept confidential. If you have any questions about the collection and use of your personal information, please contact Ministry of Natural Resources and Forestry, Natural Resources Information and Support Centre (NRISC) 300 Water Street, Peterborough ON K9J 3C7. Toll free: 1-800-667-1940.

Fields marked with an asterisk (*) are mandatory.

Section A: Site Identification

Licence/Permit ID Number *

5738

Licensee/Permittee Name *

University of Guelph

Local Municipality

Township of Puslinch

Upper Tier Municipality

County of Wellington

Site Location (e.g. lot and concession, geographic township, 911 address) *

Part of Lots 21, 22, 23 and 24, Concession 2 and
Part of Lot 24, Concession 1
Township of Puslinch, County of Wellington

Section B: Contact Information

Last Name *	First Name *	Middle Initial
University of Guelph		

Telephone Number *	Extension	Email
519-824-4120	52586	vpfo@uoguelph.ca

Address

Unit Number	Street Number *	Street Name *	PO Box
	50	Stone Road East	

City/Town *	Country *	Province/State *	Postal Code/Zip Code *
Guelph	Canada	Ontario	N1G2W1

Input all necessary information for correspondence
MHBC is assisting with the application. The contact is Brian Zeman: Email bzeman@mhbcplan.com, 705-627-9004, 113 Collier Street, Barrie ON, L4M 1H2

The operator is Dufferin Aggregates. The contact is Kevin Mitchell: Email kevin.mitchell@ca.crh.com, 416-788-0015, 2300 Steeles Avenue West, 4th Floor, Concord ON L4K 5X6

☑ I authorize the person named above to provide correspondence and proceed with amendments on my behalf.

☑ I authorize the person applying on my behalf to use their company name and address to be used for correspondence on behalf of the licensee/permittee during the site plan amendment process.

Section C: Description of Amendment

Check the box that best represents the amendment that is the subject of this form. *

☑ Amendment to lower the depth of extraction in an area of a licence or aggregate permit that does not allow extraction below the water table under section 13.1 or 37.2 of the *Aggregate Resources Act*

- If selected, include technical reports, information and an updated site plan in your submission as described in *Aggregate Resources of Ontario: Amendment Standards*.

☐ Amendment to expand a licence boundary into an adjacent road allowance under section 13.2 of the Act

- If selected, ensure that technical reports, information and an updated site plan are attached in your submission as described in *Aggregate Resources of Ontario: Amendment Standards*.

☑ Other amendments (not including Amendment Without Approval)

- The ministry may require the applicant to provide additional information.
- The ministry may direct you to circulate this form to organization(s) and individual(s) for comment(s).

Description *

Provide a description of the proposed amendment(s)
- Reduced licence area by 2.7 ha to account for land expropriated by the Ministry of Transportation adjacent to Highway 401.
- Increased limit of extraction by 2.5 ha.
- Existing Phase 5 is identified as Phase 5A and the 2.5 ha increased extraction area is identified as Phase 5B.
- Added the technical recommendations from the natural environment report (i.e. restriction on tree clearing and ground vegetation removal to protect bats and breeding birds, requirement for Barn Swallow searches prior to removal of buildings in Phase 5B to ensure compliance with the Endangered Species Act and rehabilitation details for Phase 5B) and water resources report (i.e. confirming site is not located within a Wellhead Protection Area or Surface Water Protection Zone).
- Update rehabilitated land form to account for extraction of Phase 5B.

Provide reasons for the site plan amendment request

The site plan amendment will provide access to additional aggregate resources and represents good resource management.

Select all the apply:

☐ Enclosed is a sketch/picture outlining proposed changes to the site plan.

☑ Enclosed is a draft version of a page(s) of the site plan altered to demonstrate the desired changes to the site plan.

☑ Enclosed is additional information and/or technical reports. See list of technical reports below signature line.

Last Name * *	First Name *
Rasheed	Sharmilla

Signature (Licencee/Permittee)

S. Rasheed

Digitally signed by Sharmilla Rasheed
DN: cn=Sharmilla Rasheed, o=University of Guelph, ou=Vice-President (Finance & Operations), email=rasheeds@uoguelph.ca, c=CA
Date: 2024.11.27 14:58:50 -05'00'

Date (yyyy/mm/dd) *

2024/11/27

Save Form | Print Form | Clear Form

Technical Reports:

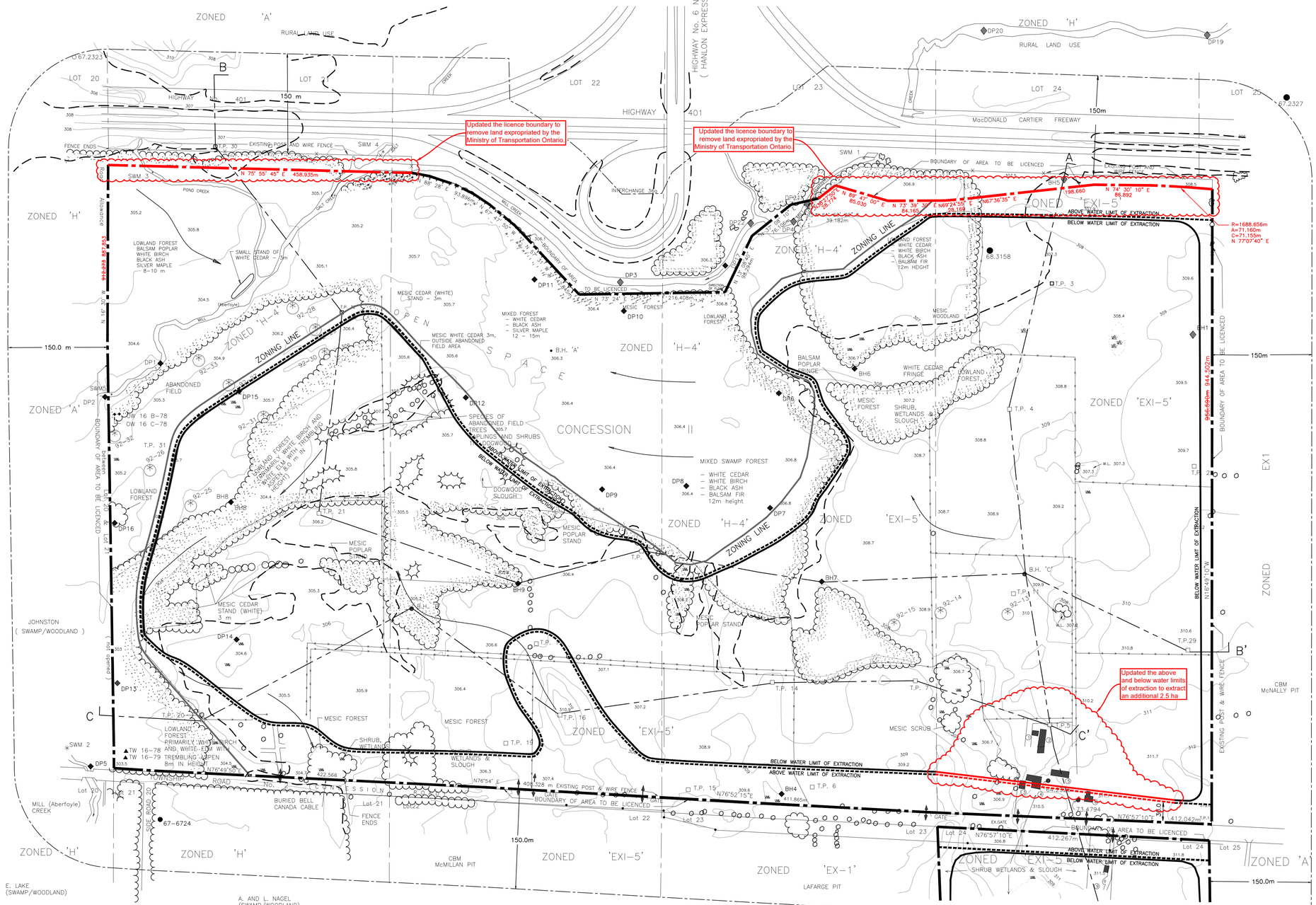
1. Natural Environment Technical Report (NETR), Proposed Site Plan Amendment (SPA) Mill Creek Pit, Dufferin Aggregates, Township of Puslinch, prepared by Goodban Ecological Consulting, August 2024.

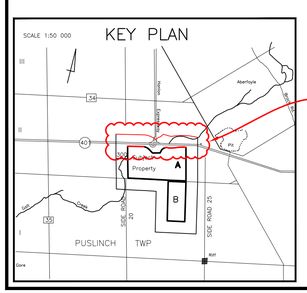
2. Mill Creek Pit – Proposed Site Plan Amendment, Water Report, prepared by WSP, July 23, 2024.

3. Mill Creek Pit Site Plan Amendment (Licence No. 5738) Planning and Land Use Considerations Letter, prepared by MHBC, September 17, 2024.

2

Attachment 2





Legend:

- ZONING LINE
- 310 CONTOUR LINE (Meters ASL)
- 314.2 SPOT ELEVATION (Meters ASL)
- T.P.3 TEST PIT
- B.H'A' BOREHOLE
- HYDRO/TELEPHONE LINE
- EX. POST AND WIRE FENCE
- BUILDING
- TEST WELLS
- BH9 BOREHOLE OBSERVATION MONITOR INSTALLATION
- SWM 4 SURFACE WATER MONITORING STATION
- 92–27 GROUNDWATER MONITORING STATION (TEMPERATURE AND LEVEL)
- WETLANDS
- REGIONAL STORM FLOODLINE
- 65 3692 WATER WELL
- CREEK
- 1.2m FARM–TYPE GATE (TYP.)
- WOODLANDS/FOREST (MIXED)
- OW16B–78 OBSERVATION WELL
- DP5 DRIVE POINT
- ZONED 'H' HAZARD LAND ZONING
- ZONED 'EXI' EXTRACTIVE INDUSTRIAL ZONING
- POND
- DIRECTION OF NATURAL DRAINAGE
- BOUNDARY OF PROPERTY TO BE LICENCED
- EXISTING ENTRANCE/EXIT
- LINE OF CROSS SECTION
- ABOVE WATER LIMIT OF EXTRACTION
- BELOW WATER LIMIT OF EXTRACTION

Notes:

1. BOUNDARY INFORMATION FROM A VARIETY OF SOURCES.
2. TOPOGRAPHY INFORMATION WAS OBTAINED FROM NORTHWAY MAPPING CORP., MARCH 1969.
3. ZONING INFORMATION WAS OBTAINED FROM THE TOWNSHIP OF PUSLINCH ZONING BYLAW 19 / 85 AND AMENDED BY OMB ORDER MAY 13, 1991.
4. TOTAL AREA OF SUBJECT LANDS = 185.9 ~~188.6~~ ha.
5. TOTAL AREA TO BE LICENCED = 143.7 ~~146.4~~ ha (NORTH PORTION)
   42.2 ha (SOUTH PORTION)
   185.9 ~~188.6~~ ha (TOTAL)
6. TOTAL AREA TO BE EXTRACTED = 80.8 ~~83.3~~ ha (NORTH PORTION)
   38.8 ha (SOUTH PORTION)
   119.6 ~~122.1~~ ha (TOTAL)
7. THIS SITE PLAN IS PREPARED FOR SUBMISSION TO THE MINISTRY OF NATURAL RESOURCES IN CONJUNCTION WITH AN APPLICATION FOR A CLASS "A" LICENCE UNDER THE AGGREGATE RESOURCES ACT AND REGULATIONS.
8. REFER TO SHEET 2 FOR CROSS SECTIONS.
9. REFER TO SHEET 2 FOR EXISTING FEATURES FOR SUBJECT LANDS LOCATED SOUTH OF TOWNSHIP ROAD 2.
10. REFER TO SHEET 2 FOR WELL INFORMATION AND BUILDING LIST.
11. THE ELEVATION OF THE WATER TABLE VARIES FROM APPROXIMATELY 303.5 mASL TO 306.5 mASL AS DETERMINED BY GENIVAR.
12. GEOLOGIC INFORMATION BASED ON A REPORT ENTITLED GEOLOGICAL RESEARCH RESULTS AND INFORMATION ON AGGREGATE RESOURCES EXTRACTION POTENTIAL BY PEIL, 1981.
13. ORIGINAL SITE PLANS PREPARED BY PLANNING INITIATIVES LTD., AUGUST 1987. SITE PLAN AMENDMENTS IN 2000, 2002, 2003, AND 2010 BY JAGGER HIMS LIMITED / GENIVAR. SITE PLAN AMENDMENTS IN 2015 BY J.H. COHOON ENGINEERING LTD.

MINISTRY OF NATURAL RESOURCES AND FORESTRY
GUELPH DISTRICT
SITE PLANS APPROVED
UNDER THE AGGREGATE RESOURCES ACT
AGGREGATE INSPECTOR
DATE June 19/2019

SITE PLAN AMENDMENTS

NO.	DESCRIPTION	DATE	INIT.
1.	HOUSEKEEPING ITEMS.	AUG. /93	K.M.
2.	MINOR AMENDMENT ON PHASE 3 AREA AND SILT POND 3	FEB. /10	K.M.
3.	MAJOR AMENDMENT TO ENLARGE LIMIT OF EXTRACTION IN PHASE 2	SEPT. /15	K.M.
4.	INCREASES THE LIMIT OF EXTRACTION IN THE SOUTHEAST CORNER OF THE NORTH LICENCE. REDUCED THE NORTH LICENCE AREA DUE TO LAND BEING EXPROPRIATED BY THE MTO ALONG HIGHWAY 401.	OCT. 2024	K.M.

REVISIONS

NO.	DESCRIPTION	DATE	INIT.
1.	AS PER SUB-CONSULTANTS AND M.N.R.	OCT. /88	J.L.S.
2.	AS PER SUB-CONSULTANTS AND M.N.R.	APR. /89	C.A.O'B.
3.	AS PER SUB-CONSULTANTS AND M.N.R.	MAY /90	C.A.O'B.
4.	UPDATED TO COMPLY WITH THE AGGREGATE RESOURCES ACT.	JUNE/90	L.L.H.
5.	AS PER O.M.B. CONDITIONS + FILL PERMIT APPLICATION	OCT. /90	J.J.M.
6.	AS PER MINISTER CONDITIONS AND TRANSFERRED ONTO AUTOCAD	DEC. /91	J.J.M.
7.	INCLUDING NEW AND RELOCATED MONITORING STATION LOCATIONS	AUG. /92	R.E.G.
8.	AS PER M.N.R.	NOV. /92	R.E.G.
9.	ADDITIONAL DRIVE POINTS ADDED	NOV. /93	R.E.G.
10.	BLDG #8 DELETED, SURFACE WATER STATIONS RE-POSITIONED	SEPT. /00	A.G.H.
11.	REGIONAL STORM FLOODLINE ADDED	MAY /01	A.G.H.
12.	HOUSEKEEPING ITEMS	AUG. /03	K.M.
13.	EXPAND TOTAL AREA TO BE EXTRACTED	MAY /05	K.M.
14.	ADDED LIMIT OF EXTRACTION ABOVE AND BELOW	SEPT. /17	K.M.

MILL CREEK AGGREGATES

PART OF LOTS 21, 22, 23 AND 24, CONCESSION II
PART OF LOT 24, CONCESSION I
TOWNSHIP OF PUSLINCH, COUNTY OF WELLINGTON

University of Guelph
854 GORDON STREET
GUELPH, ONTARIO
N1G 1Y7

Scale 1:3000
50 0 50 100 150 m

J. KEVIN MITCHELL IS AUTHORIZED BY THE MINISTRY OF NATURAL RESOURCES TO PREPARE SITE PLANS FOR AMENDMENTS.

DRAFT

J.H. COHOON ENGINEERING LIMITED
CONSULTING ENGINEERS
440 HARDY ROAD , UNIT #1
BRANTFORD – ONTARIO , N3T 5L8
TEL. (519) 753-2656
FAX. (519) 753-4263

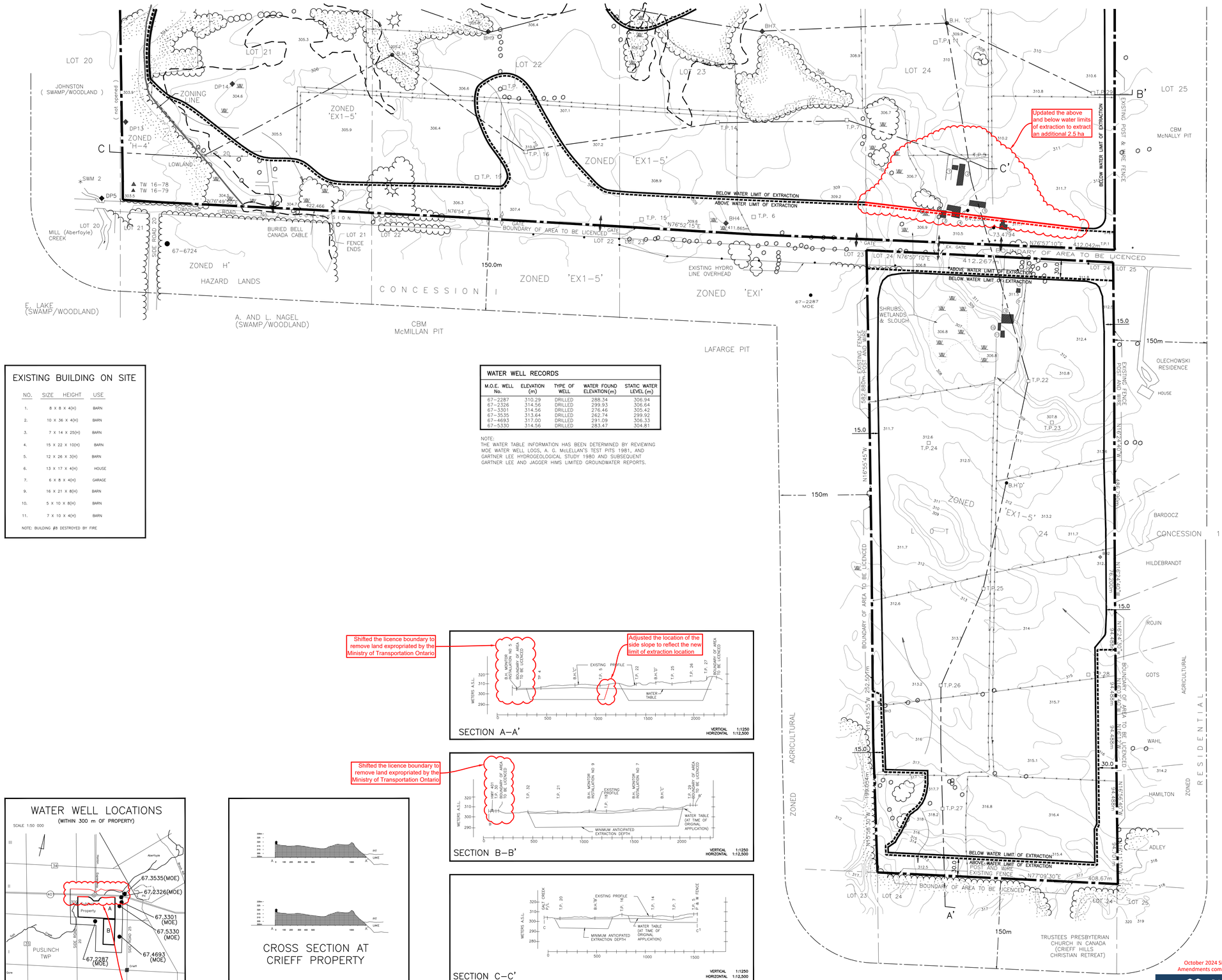
October 2024 Site Plan Amendments completed by:

MHBC PLANNING URBAN DESIGN & LANDSCAPE ARCHITECTURE
113 COLLIER STREET, BARRIE ON L4M 1H2
P: 705 728 0045 F: 705 728 2010 | WWW.MHBCPLAN.COM

EXISTING FEATURES NORTH OF TOWNSHIP ROAD 2

JOB: 11132

Drawing No. 1 OF 8



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MINISTRY OF NATURAL RESOURCES AND FORESTRY
GUELPH DISTRICT
SITE PLANS APPROVED
UNDER THE AGGREGATE RESOURCES ACT
AGGREGATE INSPECTOR
DATE June 19/2019

EXISTING BUILDING ON SITE

NO.	SIZE	HEIGHT	USE
1.	8 X 8 X 4(H)		BARN
2.	10 X 36 X 4(H)		BARN
3.	7 X 14 X 25(H)		BARN
4.	15 X 22 X 10(H)		BARN
5.	12 X 26 X 3(H)		BARN
6.	13 X 17 X 4(H)		HOUSE
7.	6 X 8 X 4(H)		GARAGE
9.	16 X 21 X 8(H)		BARN
10.	5 X 10 X 8(H)		BARN
11.	7 X 10 X 4(H)		BARN

NOTE: BUILDING #8 DESTROYED BY FIRE

WATER WELL RECORDS

M.O.E. WELL No.	ELEVATION (m)	TYPE OF WELL	WATER FOUND ELEVATION(m)	STATIC WATER LEVEL (m)
67-2287	310.29	DRILLED	288.34	306.94
67-2326	314.56	DRILLED	299.93	306.64
67-3301	314.56	DRILLED	276.46	305.42
67-3535	313.64	DRILLED	262.74	299.92
67-4693	317.00	DRILLED	291.09	306.33
67-5330	314.56	DRILLED	283.47	304.81

NOTE:
THE WATER TABLE INFORMATION HAS BEEN DETERMINED BY REVIEWING MOE WATER WELL LOGS, A. G. McLELLAN'S TEST PITS 1981, AND GARTNER LEE HYDROGEOLOGICAL STUDY 1980 AND SUBSEQUENT GARTNER LEE AND JAGGER HIMS LIMITED GROUNDWATER REPORTS.

Shifted the licence boundary to remove land expropriated by the Ministry of Transportation Ontario

SECTION A–A'

Shifted the licence boundary to remove land expropriated by the Ministry of Transportation Ontario

SECTION B–B'

SECTION C–C'

WATER WELL LOCATIONS
(WITHIN 300 m OF PROPERTY)

Updated the licence boundary to remove land expropriated by the Ministry of Transportation Ontario

October 2024 Site Plan Amendments completed by:

MHBC PLANNING URBAN DESIGN & LANDSCAPE ARCHITECTURE
7 C. COLLIER STREET, BARRIE ON L4M 1H2
P: 705 728 0045 F: 705 728 2010 | WWW.MHBCPLAN.COM

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10.	BLDG #8 DELETED, SURFACE WATER STATIONS RE-POSITIONED	SEPT. /00	A.G.H.
11.	REGIONAL STORM FLOODLINE ADDED	MAY /01	A.G.H.
12.	HOUSEKEEPING ITEMS	AUG. /03	K.M.
13.	EXPAND SP1 & SP3, EXPAND LIMIT OF EXTRACTION OF PHASE 2 BARN AREA.	MAY /05	K.M.
14.	REVISIONS TO ADDRESS AGENCY COMMENTS DURING PUBLIC COMMENT PERIOD	SEPT. /17	K.M.

MILL CREEK AGGREGATES

PART OF LOTS 21, 22, 23 AND 24, CONCESSION II
PART OF LOT 24, CONCESSION I
TOWNSHIP OF PUSLINCH, COUNTY OF WELLINGTON

University of Guelph

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Scale 1:3000
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DRAFT

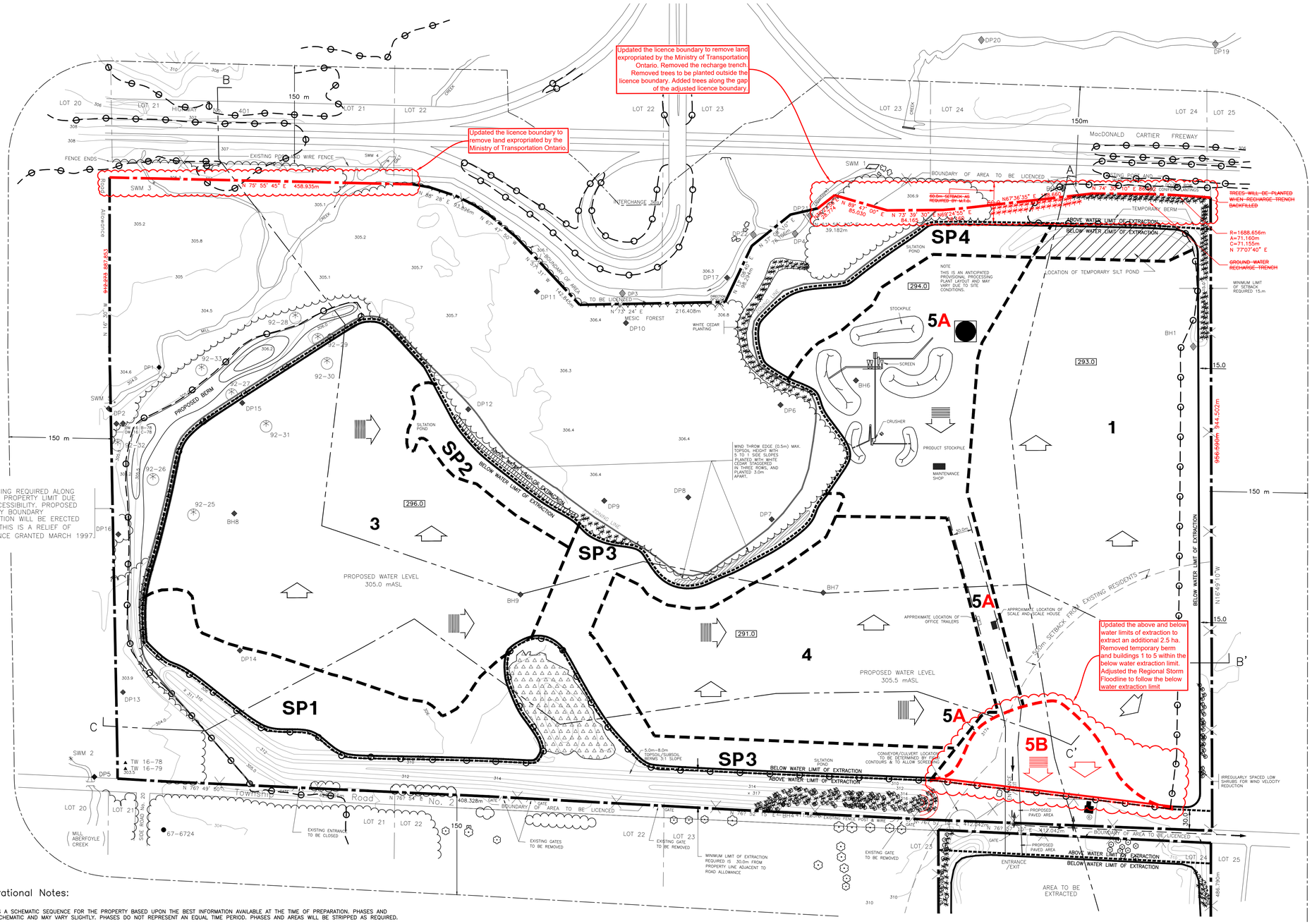
J.H. COHOON ENGINEERING LIMITED
CONSULTING ENGINEERS

440 HARDY ROAD , UNIT #1
BRANTFORD – ONTARIO , N3T 5L8
TEL: (519) 753-2656
FAX. (519) 753-4263

EXISTING FEATURES SOUTH OF TOWNSHIP ROAD 2

JOB: 11132

Drawing No. 2 OF 8



Legend:

- BOUNDARY OF PROPERTY TO BE LICENCED
- 310 PROPOSED CONTOUR (Meters ASL)
- 314.2 SPOT ELEVATION (Meters ASL)
- T.P.3 TEST PIT
- B.H."A" BOREHOLE
- DP5 DRIVE POINT
- FENCE (EX./PROPOSED) POST & WIRE
- BUILDING (EXISTING)
- TEST WELLS
- OW 16 B-78 OBSERVATION WELL
- BH9 BOREHOLE OBSERVATION MONITOR INSTALLATION
- SWM 4 SURFACE WATER MONITORING STATION
- 92-27 GROUNDWATER MONITORING STATION (TEMPERATURE AND LEVEL)
- REGIONAL STORM FLOODLINE AT END OF EXTRACTION
- ZONING LINE
- 293.0 APPROXIMATE FINAL DEPTH OF EXTRACTION
- REFORESTATION
- GATE (EXISTING/PROPOSED)
- MIXED TREED AREA
- WIND THROW EDGE PLANTING BED
- EXISTING TREED AREA
- ~~RECHARGE TRENCH~~
- PROPOSED BERM
- INTERNAL HAUL ROUTES
- HAUL ROUTE TO MARKET
- PROCESSING PLANT PRODUCT STOCK PILE SCARP AREA AUX. ACTIVITIES
- PHASING LIMIT
- 3 EXTRACTION PHASE
- SP3 SILT POND PHASING
- DIRECTION OF EXTRACTION (ABOVE WATER TABLE)
- DIRECTION OF EXTRACTION (BELOW WATER TABLE)
- A L A' LINE OF CROSS SECTION
- ABOVE WATER LIMIT OF EXTRACTION
- BELOW WATER LIMIT OF EXTRACTION

Technical Recommendations:

1. A PERIMETER BERM SHALL BE CONSTRUCTED AROUND ALL OPERATIONAL SILT PONDS WITH THE EXCEPTION OF THE PORTION OF SP3 CREATING THE BARRIER BETWEEN PHASES 3 & 4. THE PERIMETER BERM SHALL BE CONSTRUCTED AS FOLLOWS:
   - THE TOP OF THE BERM SHALL HAVE A CREST ELEVATION THAT WILL PROVIDE A MINIMUM 1.25 METRE FREEBOARD THAT WILL ACCOMMODATE SEASONAL FLUCTUATION OF THE SILT POND LEVEL.
   - THE BERM SHALL HAVE AN INNER SLOPE OF NOT GREATER THAN 2H:1V.
   - THE BERM SHALL HAVE AN OUTER SLOPE OF NOT GREATER THAN 3H:1V.
   - THE BERM SHALL BE CONSTRUCTED USING ON SITE GRANULAR MATERIALS.
2. WHEN AGGREGATE WASHING IS OCCURRING AND SILT LADEN WATER IS DISCHARGED TO THE SILT POND, CLEAN WATER WILL BE RECYCLED/PUMPED BACK TO THE MAIN POND AS REQUIRED TO MAINTAIN THE MNR APPROVED OPERATING WATER LEVEL THRESHOLD FOR THE SILT POND.
3. MONITORING AND OPERATION OF THE SITE SHALL BE DONE IN ACCORDANCE WITH THE APPROVED REPORT ENTITLED UPDATED COORDINATED ENVIRONMENTAL MONITORING PROGRAMS FOR MILL CREEK, LICENCE NO. 5738. MONTHLY SUMMARY REPORTS WILL BE SUBMITTED TO THE MINISTRY OF NATURAL RESOURCES, TOWNSHIP OF PUSLINCH AND THE GRAND RIVER CONSERVATION AUTHORITY WITHIN TEN WORKING DAYS OF THE LAST DAY OF EACH MONTH.
4. ALL EQUIPMENT WITHIN PHASE 2 SHALL BE KEPT AS CLOSE AS POSSIBLE TO THE EXTRACTION FACE. A PORTABLE CRUSHER MAY OPERATE WITHIN PHASE 2. THE PORTABLE CRUSHER MAY NOT OPERATE WITHIN 200 METRES OF THE RESIDENCE ADJACENT TO THE NORTHEAST CORNER OF PHASE 2 AS ILLUSTRATED BELOW.

SITE PLAN AMENDMENTS

NO.	DESCRIPTION	DATE	INIT.
1.	REDUCTION OF AREA TO BE EXTRACTED AS A RESULT OF ADDITIONAL WETLAND BUFFER.	JUNE /92	
2.	REMOVAL OF 2.0m BERM TO ADJACENT TO MILL CREEK.	JUNE /92	
3.	CONSOLIDATION OF ENTRANCE / EXIT TO BE LOCATED WEST OF EXISTING BUILDINGS.	JUNE /92	
4.	VARIOUS MINOR AMENDMENTS AS PER MNR MARCH/97 APPROVAL (SILT POND, FENCING, SLURRY PIPE, TREE PLANTING, USE OF GENSETS.)	MAR./97	
5.	REVISIONS TO THE STOCKPILE HEIGHT	SEPT./99	
6.	VARIOUS MINOR AMENDMENTS AS PER MNR APPROVAL SEPT. /00 (SILT PONDS SP1, SP2, GRCA CUT & FILL PERMIT LINE, AMPHITHEATRE, TEMPORARY BERM IN PHASE 1, EXTRACTION PHASE 1')	SEPT. /00	
7.	MINOR AMENDMENTS AS PER MNR APPROVAL APRIL 2001 (RECHARGE TRENCH IN SET-BACK NORTH OF PHASE 1, EXTRACTION OUTLINE SOUTH END OF PHASE I, AND SP1 / SP2 OUTLINES AND HAUL ROADS IN PHASE 3).	MAY /01	
8.	VARIOUS MINOR AMENDMENTS AND HOUSEKEEPING.	AUG. /03	
9.	REVISIONS TO GENERAL OPERATION NOTES (ITEM 16) AND TECHNICAL RECOMMENDATION.	JAN. /05	
10.	MINOR AMENDMENT ON PHASE 3 AREA AND SILT POND 3	FEB. /10	K.M.
11.	MAJOR AMENDMENT TO ENLARGE LIMIT OF EXTRACTION IN PHASE 2	SEPT. /15	K.M.
12.	MINOR AMENDMENT TO PERMIT EXTRACTION OF PHASE 1 EAST BOUNDARY ADJACENT TO OTHER LICENSED PROPERTY TO 1.5m ABOVE THE WATER TABLE.	SEPT. /17	K.M.
13.	INCREASES THE LIMIT OF EXTRACTION IN THE SOUTHEAST CORNER OF THE NORTH LICENCE. REDUCED THE NORTH LICENCE AREA DUE TO LAND BEING EXPROPRIATED BY THE MTO ALONG HIGHWAY 401. REMOVED RECHARGE TRENCH.	OCT. 2024	K.M.

REVISIONS

NO.	DESCRIPTION	DATE	INIT.
1.	AS PER SUB CONSULTANTS AND MINISTRIES	OCT.26/88	A.L.S.
2.	AS PER SUB CONSULTANTS AND MINISTRIES	APR. /89	A.L.B.
3.	MODIFICATION TO SEQUENCE	SEPT./89	A.B.M.
4.	UPDATED TO CONFORM WITH THE AGGREGATE RESOURCES ACT	JUNE/90	L.L.H.
5.	AS PER D.M.R. CONDITIONS & FILL PERMIT APPLICATION	OCT. /90	J.J.M.
6.	AS PER MINISTERS CONDITIONS & TRANSFERRED ONTO AUTOCAD	DEC. /91	J.J.M.
7.	TO CONFORM WITH G.R.C.A. FILL PERMIT APPLICATION AND REVISED MONITORING STATION LOCATIONS	AUG. /92	R.E.G.
8.	AS PER M.N.R.	NOV. /92	R.E.G.
9.	ADDITIONAL DRIVE POINTS ADDED	NOV. /93	R.E.G.
10.	BLDG. #8 DELETED, SURFACE WATER STATIONS RE-LOCATED	SEPT. /00	A.G.H.
11.	REGIONAL STORM FLOODLINE ADDED	MAY /01	A.G.H.
12.	AS PER M.N.R. COMMENTS	JAN. /04	K.M.
13.	EXPAND SP1 & SP3, EXPAND LIMIT OF EXTRACTION OF PHASE 2 BARN AREA.	MAY /05	K.M.
14.	EXTRACT COMMON SETBACK WITH ADJACENT LICENCE (ABOVE WATER)	SEPT. /17	K.M.

General Operational Notes:

1. THIS PLAN DEPICTS A SCHEMATIC SEQUENCE FOR THE PROPERTY BASED UPON THE BEST INFORMATION AVAILABLE AT THE TIME OF PREPARATION. PHASES AND AREAS ARE SHOWN SCHEMATIC AND MAY VARY SLIGHTLY. PHASES DO NOT REPRESENT AN EQUAL TIME PERIOD. PHASES AND AREAS WILL BE STRIPPED AS REQUIRED.
2. TOPSOIL AND OVERBURDEN SHALL BE STRIPPED AND STORED SEPARATELY (SEE THE NATURAL ENVIRONMENT TECHNICAL RECOMMENDATIONS ON DRAWING 4 OF 8 FOR ADDITIONAL INFORMATION).
3. TREE PLANTING WILL BE ONGOING IN THOSE AREAS ILLUSTRATED IN ALL PHASES.
4. THE PROCESSING PLANT SHALL BE LOCATED AS SHOWN. USE OF A PORTABLE PROCESSING PLANT WILL BE ALLOWED ON A PERMANENT BASIS (AS PER LETTER DATED FEB. 15, 2000) SUBJECT TO MEETING MOE GUIDELINES. A PORTABLE CRUSHER MAY ALSO BE LOCATED WITHIN PHASE 2 AND 6 AND WILL OPERATE IN ACCORDANCE WITH THE TECHNICAL RECOMMENDATIONS.
5. AGGREGATE MATERIALS WILL BE REMOVED BY DRY EXTRACTION AND WILL BE FOLLOWED IMMEDIATELY BY WET/DRAGLINE EXTRACTION. DIRECTION OF MINING ABOVE AND BELOW THE WATER TABLE WILL PROCEED AS SHOWN ON THE PHASING DRAWINGS ON SHEET 5. FOR BLENDING PURPOSES, AGGREGATE SOURCES IN MORE THAN ONE PHASE MAY BE REQUIRED.
6. DRY AND WET EXTRACTION WILL PROCEED TOGETHER AS DESCRIBED IN THE NOISE STUDY AND WILL PROCEED AS SHOWN ON THE PHASING DRAWINGS ON SHEET 5.
7. IT IS THE INTENT TO REMOVE ALL COMMERCIAL SAND AND GRAVEL DOWN TO GLACIAL TILL, CLAY OR BEDROCK. THE MAXIMUM DEPTH OF EXTRACTION VARIES FROM ±7.5 m TO ±24.4 m BELOW ORIGINAL GROUND SURFACE.
8. INTERNAL HAUL ROUTES TO THE PROCESSING AREA FROM THE EXTRACTION LOCATIONS WILL BE DEVELOPED AND DISBANDED AS REQUIRED. THE MAIN USE HOWEVER IS EXPECTED TO BE FOR SERVICING PURPOSES SINCE THE USE OF CONVEYOR BELT SYSTEMS IS ANTICIPATED. CONVEYOR BELT SYSTEM TO BE LOCATED TO ACCOMMODATE EXTRACTION IN OPERATIONAL PHASE(S). CONVEYOR BELT SYSTEM MAY REQUIRE MINOR GRADING OR ADJUSTMENT IN BERM LENGTH.
9. INTERNAL HAUL ROUTES WILL BE TREATED FOR DUST AS REQUIRED WITH WATER AND/OR MOE APPROVED DUST SUPPRESSANT.
10. SILTATION PONDS ARE AN ESSENTIAL PART OF: A) ENSURING SUCCESSFUL PROCESSING OF THE RAW AGGREGATE AND B) ENSURING THAT THE DESIRED WATER TABLES AND SUBSURFACE FLOWS ARE GUARANTEED. IN ORDER TO ENSURE THE LATTER, IT IS ESSENTIAL THAT SILT PONDS SP1 AND SP2 ARE UTILIZED TO THEIR FULL PRACTICAL ACCOMMODATION CAPACITY BEFORE UTILIZING THE THIRD SILT POND (SP.3). THE SP1 AND SP.3 EXTENSIONS WILL BE UTILIZED AFTER THEY HAVE BEEN EXTRACTED.
11. SILTATION SLURRY WILL BE PIPED FROM THE PROCESSING OPERATION. CLEAN PROCESS RETURN WATER WILL BE PUMPED FROM THE SILTATION PONDS (AS APPROPRIATE) AND DISCHARGED INTO THE PHASE I POND.
12. A STABILITY BUFFER ZONE WITH A MINIMUM TOP WIDTH OF 1.5 m (5 FEET) WILL BE PROVIDED BETWEEN ALL SILT PONDS AND EXTRACTION AREAS.
13. THE SHORELINES AND STABILITY BUFFER ZONE OF ALL SILTATION PONDS WILL BE STABILIZED AND VEGETATED IMMEDIATELY UPON CREATION OR AT THE NEXT APPROPRIATE PLANTING SEASON.
14. WITH THE EXCEPTION OF THE DRAINAGE SWALES LOCATED AT THE PERIMETER OF THE EXTRACTION AREA, NO SURFACE WATER SHALL LEAVE THE SITE AS A RESULT OF SILT ALTERATIONS AND/OR OPERATIONS.
15. DURING TIMES WHEN THE PROCESSING PLANT IS OPERATING AND/OR BELOW WATER EXTRACTION IS OCCURRING, WATER LEVELS IN ALL OPERATIONAL SILT PONDS SHALL BE VISUALLY AND PHYSICALLY MONITORED DAILY AND REPORTED TO THE MINISTRY OF NATURAL RESOURCES, THE TOWNSHIP OF PUSLINCH AND THE GRAND RIVER CONSERVATION AUTHORITY MONTHLY. THIS EXCLUDES PERIODS WHEN PONDS ARE FROZEN.
16. DURING TIMES WHEN THE PROCESSING PLANT IS OPERATING AND/OR BELOW WATER TABLE EXTRACTION IS OCCURRING, ALL SILT PONDS SHALL BE OPERATED IN ACCORDANCE WITH THEIR SPECIFIC OPERATIONAL WATER LEVELS.
17. A 1.2 m FENCE SHALL BE ERECTED WHERE SHOWN DURING STARTUP OPERATIONS. ALL UNFENCED BOUNDARIES SHALL BE MARKED WITH PAINTED POSTS, ENTRANCE/EXITS SHALL BE GATED.
18. THE OPERATOR WILL ENSURE THAT ALL PROPOSED BERM GROUND COVERS WILL BE REPLACED DURING THE NEXT APPROPRIATE PLANTING SEASON IF IT DIES. ALL REHABILITATED AREAS WILL BE PREPARED TO ENCOURAGE NATURAL REGENERATION.
19. USE OF PORTABLE GENERATORS WILL BE PERMITTED AS PER RELIEF OF COMPLIANCE GRANTED MARCH 1997.
20. ~~A TEMPORARY GROUNDWATER TRENCH WILL BE CONSTRUCTED IN THE SETBACK NORTH OF PHASE 1. FEED WATER WILL BE PUMPED FROM THE POND IN PHASE 1. THE USE OF THE RECHARGE TRENCH WILL NOT EXTEND PAST THE END OF PHASE 5 AND WILL BE BACKFILLED PRIOR TO CLOSEOUT OF OPERATIONS AT THE SITE. REFER TO RECHARGE TRENCH PROPOSAL APRIL 30, 2001.~~
20. SCRAP SHALL BE STORED WITHIN THE PROCESSING PLANT AND STOCKPILING AREA. SCRAP SHALL BE REMOVED ON AN ONGOING BASIS.
21. ANY FUEL STORED ON SITE SHALL BE IN ABOVE GROUND TANKS LOCATED NEAR BUILDING 1 OR AT GENSET LOCATIONS.
22. BUILDINGS MAY BE REMOVED FROM THE SITE AT LICENSE HOLDERS DISCRETION (SEE THE NATURAL ENVIRONMENT TECHNICAL RECOMMENDATIONS ON DRAWING 4 OF 8 FOR ADDITIONAL INFORMATION). BUILDINGS DEMOLITION WASTE WILL BE DISPOSED OF AT APPROVED FACILITY.
23. REFER TO SHEET 4 FOR GENERAL OPERATIONAL PLAN FOR SUBJECT LANDS SOUTH OF TOWNSHIP ROAD 2 AND SHEET 5 FOR PHASING SCHEMATICS AND INDIVIDUAL PHASE NOTES.
24. REFER TO SHEET 4 FOR SITE PLAN OVERRIDES.
25. REFER TO SHEET 4 FOR TREE PLANING DETAILS.
26. REFER TO SHEET 5 FOR BERM DETAILS.
27. THE ELEVATION OF THE WATER TABLE VARIES FROM APPROXIMATELY 303.5 mASL TO 306.5 mASL AS DETERMINED BY GENIVAR.
28. THE EQUIPMENT OPERATING ON SITE SHALL INCLUDE BUT NOT BE LIMITED TO THE FOLLOWING: LOADERS, EXCAVATORS, DRAG LINES, PROCESSING EQUIPMENT, SITE MAINTENANCE EQUIPMENT, SITE PREPARATION AND REHABILITATION EQUIPMENT AND TRUCKS. USE OF PORTABLE GENERATORS WILL BE PERMITTED AS PER RELIEF OF COMPLIANCE GRANTED MARCH 1997, SUBJECT TO MEETING MOE NOISE GUIDELINES.
29. SAND, GRAVEL AND LIMESTONE PRODUCTS MAY BE IMPORTED FOR BLENDING OR RESALE. NO CONCRETE OR ASPHALT WILL BE IMPORTED FOR RECYCLING.
30. ANY TREES REMOVED FROM THE SITE SHALL BE USED FOR FIREWOOD OR CHIPPED OR USED FOR REHABILITATION (SEE THE NATURAL ENVIRONMENT TECHNICAL RECOMMENDATIONS ON DRAWING 4 OF 8 FOR ADDITIONAL INFORMATION).
31. DURING EXTRACTION OF PHASES 5A, 5B & 6, OFFICE TRAILERS, THE SCALE AND SCALE HOUSE SHALL ~~MAY~~ BE RELOCATED TO FACILITATE EXTRACTION ~~THE AREA OCCUPIED BY THE FORMER HOUSE AND BARN AREA TO PERMIT~~ EXTRACTION ~~IN PHASE 5~~ BELOW THE WATER TABLE. ~~THE STRUCTURES SHALL BE RELOCATED IN CLOSE PROXIMITY TO THE PIT ENTRANCE/EXIT BUT NOT WITHIN THE 30M SETBACK ALONG TOWNSHIP ROAD NO. 2.~~
32. THE SITE IS NOT LOCATED WITHIN A WELLHEAD PROTECTION AREA OR A SURFACE WATER INTAKE PROTECTION ZONE. THEREFORE, SOURCE WATER PROTECTION POLICIES DO NOT APPLY TO THIS LICENCE.

October 2024 Site Plan Amendments completed by:

PLANNING URBAN DESIGN & LANDSCAPE ARCHITECTURE
MHBC
113 COLLIER STREET, BARRIE ON L4M 1H2
P: 705 728 0045 F: 705 728 2010 | WWW.MHBCPLAN.COM

MILL CREEK AGGREGATES

PART OF LOTS 21, 22, 23 AND 24, CONCESSION II
PART OF LOT 24, CONCESSION I
TOWNSHIP OF PUSLINCH, COUNTY OF WELLINGTON

University of Guelph
854 GORDON STREET
GUELPH, ONTARIO
N1G 1Y7

Scale 1:3000
50 0 50 100 150 m

J. KEVIN MITCHELL IS AUTHORIZED BY THE MINISTRY OF NATURAL RESOURCES TO PREPARE SITE PLANS FOR PUBLIC CONSULTATIONS.

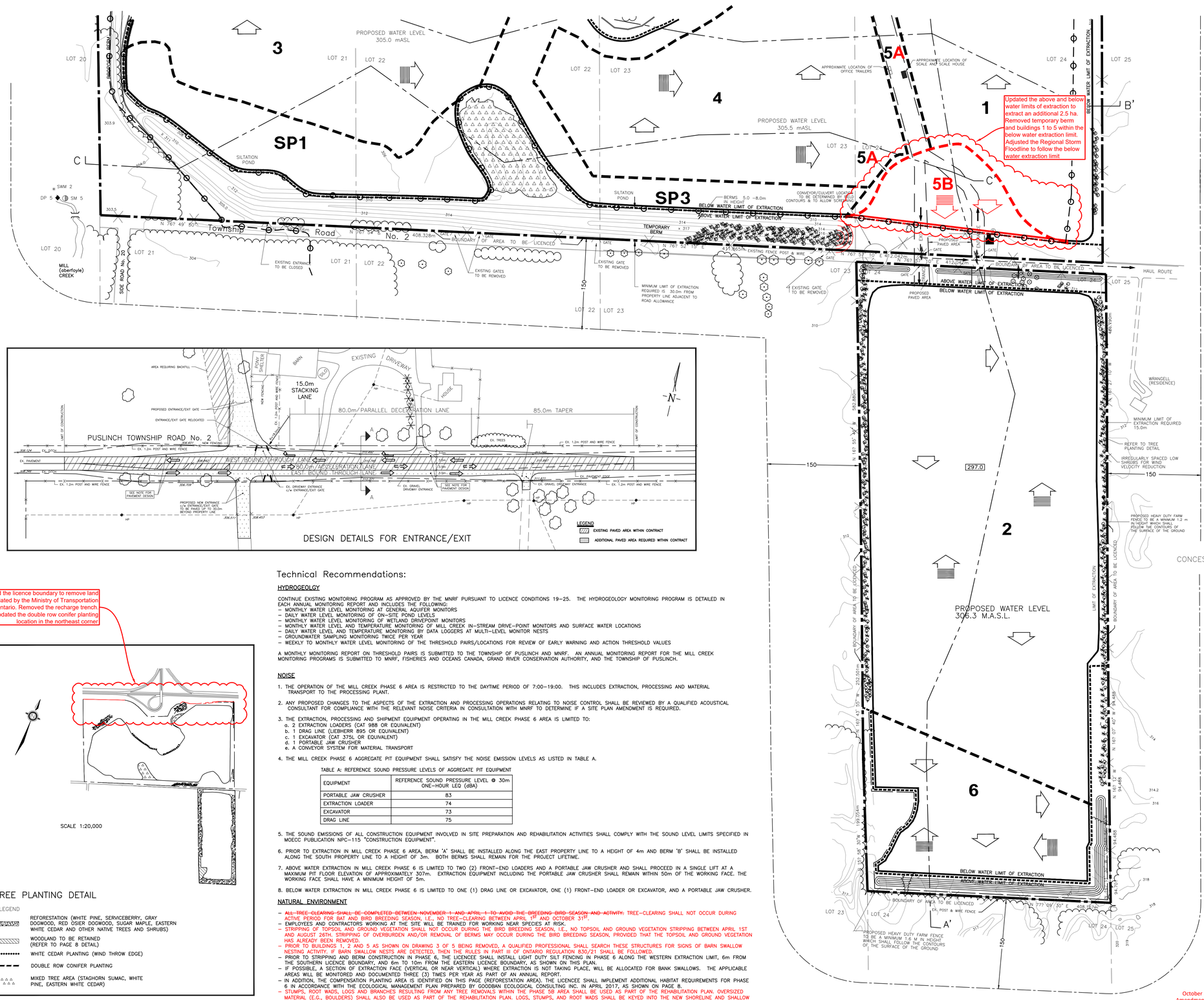
DRAFT

J.H. COHOON ENGINEERING LIMITED
CONSULTING ENGINEERS
440 HARDY ROAD , UNIT #1
BRANTFORD – ONTARIO , N3T 5L8
TEL. (519) 753-2656
FAX. (519) 753-4263

OPERATIONS PLAN NORTH OF TOWNSHIP ROAD 2

JOB: 11132

Drawing No. 3 OF 8



DESIGN DETAILS FOR ENTRANCE/EXIT

Updated the licence boundary to remove land expropriated by the Ministry of Transportation Ontario. Removed the recharge trench. Updated the double row conifer planting location in the northeast corner.

TREE PLANTING DETAIL

LEGEND

- REFORESTATION (WHITE PINE, SERVICEBERRY, GRAY DOGWOOD, RED OSIER DOGWOOD, SUGAR MAPLE, EASTERN WHITE CEDAR AND OTHER NATIVE TREES AND SHRUBS)
- WOODLAND TO BE RETAINED (REFER TO PAGE 8 DETAIL)
- WHITE CEDAR PLANTING (WIND THROW EDGE)
- DOUBLE ROW CONIFER PLANTING
- MIXED TREE AREA (STAGHORN SUMAC, WHITE PINE, EASTERN WHITE CEDAR)

Technical Recommendations:

HYDROGEOLGY

CONTINUE EXISTING MONITORING PROGRAM AS APPROVED BY THE MNRF PURSUANT TO LICENCE CONDITIONS 19–25. THE HYDROGEOLOGY MONITORING PROGRAM IS DETAILED IN EACH ANNUAL MONITORING REPORT AND INCLUDES THE FOLLOWING:
- MONTHLY WATER LEVEL MONITORING AT GENERAL AQUIFER MONITORS
- DAILY WATER LEVEL MONITORING OF ON–SITE POND LEVELS
- MONTHLY WATER LEVEL MONITORING OF WETLAND DRIVEPOINT MONITORS
- MONTHLY WATER LEVEL AND TEMPERATURE MONITORING OF MILL CREEK IN–STREAM DRIVE–POINT MONITORS AND SURFACE WATER LOCATIONS
- DAILY WATER LEVEL AND TEMPERATURE MONITORING BY DATA LOGGERS AT MULTI–LEVEL MONITOR NESTS
- GROUNDWATER SAMPLING MONITORING TWICE PER YEAR
- WEEKLY TO MONTHLY WATER LEVEL MONITORING OF THE THRESHOLD PAIRS/LOCATIONS FOR REVIEW OF EARLY WARNING AND ACTION THRESHOLD VALUES

A MONTHLY MONITORING REPORT ON THRESHOLD PAIRS IS SUBMITTED TO THE TOWNSHIP OF PUSLINCH AND MNRF. AN ANNUAL MONITORING REPORT FOR THE MILL CREEK MONITORING PROGRAMS IS SUBMITTED TO MNRF, FISHERIES AND OCEANS CANADA, GRAND RIVER CONSERVATION AUTHORITY, AND THE TOWNSHIP OF PUSLINCH.

NOISE

1. THE OPERATION OF THE MILL CREEK PHASE 6 AREA IS RESTRICTED TO THE DAYTIME PERIOD OF 7:00–19:00. THIS INCLUDES EXTRACTION, PROCESSING AND MATERIAL TRANSPORT TO THE PROCESSING PLANT.
2. ANY PROPOSED CHANGES TO THE ASPECTS OF THE EXTRACTION AND PROCESSING OPERATIONS RELATING TO NOISE CONTROL SHALL BE REVIEWED BY A QUALIFIED ACOUSTICAL CONSULTANT FOR COMPLIANCE WITH THE RELEVANT NOISE CRITERIA IN CONSULTATION WITH MNRF TO DETERMINE IF A SITE PLAN AMENDMENT IS REQUIRED.
3. THE EXTRACTION, PROCESSING AND SHIPMENT EQUIPMENT OPERATING IN THE MILL CREEK PHASE 6 AREA IS LIMITED TO:
   a. 2 EXTRACTION LOADERS (CAT 988 OR EQUIVALENT)
   b. 1 DRAG LINE (LIEBHERR 895 OR EQUIVALENT)
   c. 1 EXCAVATOR (CAT 375L OR EQUIVALENT)
   d. 1 PORTABLE JAW CRUSHER
   e. A CONVEYOR SYSTEM FOR MATERIAL TRANSPORT
4. THE MILL CREEK PHASE 6 AGGREGATE PIT EQUIPMENT SHALL SATISFY THE NOISE EMISSION LEVELS AS LISTED IN TABLE A.

TABLE A: REFERENCE SOUND PRESSURE LEVELS OF AGGREGATE PIT EQUIPMENT

EQUIPMENT	REFERENCE SOUND PRESSURE LEVEL @ 30m ONE–HOUR LEQ (dBA)
PORTABLE JAW CRUSHER	83
EXTRACTION LOADER	74
EXCAVATOR	73
DRAG LINE	75

5. THE SOUND EMISSIONS OF ALL CONSTRUCTION EQUIPMENT INVOLVED IN SITE PREPARATION AND REHABILITATION ACTIVITIES SHALL COMPLY WITH THE SOUND LEVEL LIMITS SPECIFIED IN MOECC PUBLICATION NPC–115 "CONSTRUCTION EQUIPMENT".
6. PRIOR TO EXTRACTION IN MILL CREEK PHASE 6 AREA, BERM 'A' SHALL BE INSTALLED ALONG THE EAST PROPERTY LINE TO A HEIGHT OF 4m AND BERM 'B' SHALL BE INSTALLED ALONG THE SOUTH PROPERTY LINE TO A HEIGHT OF 3m. BOTH BERMS SHALL REMAIN FOR THE PROJECT LIFETIME.
7. ABOVE WATER EXTRACTION IN MILL CREEK PHASE 6 IS LIMITED TO TWO (2) FRONT–END LOADERS AND A PORTABLE JAW CRUSHER AND SHALL PROCEED IN A SINGLE LIFT AT A MAXIMUM PIT FLOOR ELEVATION OF APPROXIMATELY 307m. EXTRACTION EQUIPMENT INCLUDING THE PORTABLE JAW CRUSHER SHALL REMAIN WITHIN 50m OF THE WORKING FACE. THE WORKING FACE SHALL HAVE A MINIMUM HEIGHT OF 5m.
8. BELOW WATER EXTRACTION IN MILL CREEK PHASE 6 IS LIMITED TO ONE (1) DRAG LINE OR EXCAVATOR, ONE (1) FRONT–END LOADER OR EXCAVATOR, AND A PORTABLE JAW CRUSHER.

NATURAL ENVIRONMENT

- ~~ALL TREE CLEARING SHALL BE COMPLETED BETWEEN NOVEMBER 1 AND APRIL 1 TO AVOID THE BREEDING BIRD SEASON AND ACTIVITY.~~ TREE–CLEARING SHALL NOT OCCUR DURING ACTIVE PERIOD FOR BAT AND BIRD BREEDING SEASON, I.E., NO TREE–CLEARING BETWEEN APRIL 1ST AND OCTOBER 31ST.
- EMPLOYEES AND CONTRACTORS WORKING AT THE SITE WILL BE TRAINED FOR WORKING NEAR SPECIES AT RISK.
- STRIPPING OF TOPSOIL AND GROUND VEGETATION SHALL NOT OCCUR DURING THE BIRD BREEDING SEASON, I.E., NO TOPSOIL AND GROUND VEGETATION STRIPPING BETWEEN APRIL 1ST AND AUGUST 26TH. STRIPPING OF OVERBURDEN AND/OR REMOVAL OF BERMS MAY OCCUR DURING THE BIRD BREEDING SEASON, PROVIDED THAT THE TOPSOIL AND GROUND VEGETATION HAS ALREADY BEEN REMOVED.
- PRIOR TO BUILDINGS 1, 2 AND 5 AS SHOWN ON DRAWING 3 OF 5 BEING REMOVED, A QUALIFIED PROFESSIONAL SHALL SEARCH THESE STRUCTURES FOR SIGNS OF BARN SWALLOW NESTING ACTIVITY. IF BARN SWALLOW NESTS ARE DETECTED, THEN THE RULES IN PART III OF ONTARIO REGULATION 830/21 SHALL BE FOLLOWED.
- PRIOR TO STRIPPING AND BERM CONSTRUCTION IN PHASE 6, THE LICENCEE SHALL INSTALL LIGHT DUTY SILT FENCING IN PHASE 6 ALONG THE WESTERN EXTRACTION LIMIT, 6m FROM THE SOUTHERN LICENCE BOUNDARY, AND 6m TO 10m FROM THE EASTERN LICENCE BOUNDARY, AS SHOWN ON THIS PLAN.
- IF POSSIBLE, A SECTION OF EXTRACTION FACE (VERTICAL OR NEAR VERTICAL) WHERE EXTRACTION IS NOT TAKING PLACE, WILL BE ALLOCATED FOR BANK SWALLOWS. THE APPLICABLE AREA WILL BE MONITORED AND DOCUMENTED THREE (3) TIMES PER YEAR AS PART OF AN ANNUAL REPORT.
- IN ADDITION, THE COMPENSATION PLANTING AREA IS IDENTIFIED ON THIS PAGE (REFORESTATION AREA). THE LICENCEE SHALL IMPLEMENT ADDITIONAL HABITAT REQUIREMENTS FOR PHASE 6 IN ACCORDANCE WITH THE ECOLOGICAL MANAGEMENT PLAN PREPARED BY GOODBAN ECOLOGICAL CONSULTING INC. IN APRIL 2017, AS SHOWN ON PAGE 8.
- STUMPS, ROOT WADS, LOGS AND BRANCHES RESULTING FROM ANY TREE REMOVALS WITHIN THE PHASE 5B AREA SHALL BE USED AS PART OF THE REHABILITATION PLAN. OVERSIZED MATERIAL (E.G., BOULDERS) SHALL ALSO BE USED AS PART OF THE REHABILITATION PLAN. LOGS, STUMPS, AND ROOT WADS SHALL BE KEYED INTO THE NEW SHORELINE AND SHALLOW WATER AREAS. TREE TOPS AND BRANCHES SHALL BE CUT UP AND PLACED AS BRUSH PILES IN SHALLOW WATER, SUCH THAT THEY ARE MOSTLY/TOTALLY SUBMERGED. OVERSIZE MATERIAL SHALL ALSO BE PLACED ALONG THE NEW SHORELINE AND SHALLOW WATER AREAS.

ARCHAEOLOGY

- SHOULD PREVIOUSLY UNDOCUMENTED ARCHAEOLOGICAL RESOURCES BE DISCOVERED, ALTERATION OF THE SITE MUST BE CEASED IMMEDIATELY AND A LICENSED CONSULTANT ARCHAEOLOGIST MUST CARRY OUT ARCHAEOLOGICAL FIELDWORK.
- ANY PERSON DISCOVERING OR HAVING KNOWLEDGE OF A BURIAL SITE SHALL IMMEDIATELY NOTIFY THE POLICE OR CORONER. IT IS RECOMMENDED THAT THE REGISTRAR OF CEMETERIES AT THE MINISTRY OF CONSUMER SERVICES IS ALSO IMMEDIATELY NOTIFIED.

Legend:

- BOUNDARY OF PROPERTY TO BE LICENCED
- 310 PROPOSED CONTOUR (Meters ASL)
- 314.2 SPOT ELEVATION (Meters ASL)
- T.P.3 TEST PIT
- B.H'A' BOREHOLE
- DP5 DRIVE POINT
- FENCE (EX./PROPOSED) POST & WIRE
- BUILDING (EXISTING)
- TEST WELLS
- OW 16 B–78 OBSERVATION WELL
- BH9 BOREHOLE OBSERVATION MONITOR INSTALLATION
- SWM 4 SURFACE WATER MONITORING STATION
- 92–27 GROUNDWATER MONITORING STATION (TEMPERATURE AND LEVEL)
- REGIONAL STORM FLOODLINE AT END OF EXTRACTION
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- GATE (EXISTING/PROPOSED)
- MIXED TREED AREA
- WIND THROW EDGE PLANTING BED
- EXISTING TREED AREA
- PROPOSED BERM
- INTERNAL HAUL ROUTES
- HAUL ROUTE TO MARKET
- PHASING LIMIT
- 3 EXTRACTION PHASE
- SP3 SILT POND PHASING
- DIRECTION OF EXTRACTION (ABOVE WATER TABLE)
- DIRECTION OF EXTRACTION (BELOW WATER TABLE)
- 297.0 APPROXIMATE FINAL DEPTH OF EXTRACTION
- A L LINE OF CROSS SECTION
- ABOVE WATER LIMIT OF EXTRACTION
- BELOW WATER LIMIT OF EXTRACTION

Notes:

1. REFER TO SHEET 3 FOR GENERAL OPERATIONAL NOTES.
2. REFER TO SHEET 3 FOR OPERATIONAL PLAN NORTH OF TOWNSHIP ROAD 2.

MINISTRY OF NATURAL RESOURCES AND FORESTRY
GUELPH DISTRICT
SITE PLANS APPROVED
UNDER THE AGGREGATE RESOURCES ACT
AGGREGATE INSPECTOR
DATE June 19/2019

NO.	ITEM	SECTION
1.	THE FENCING REQUIREMENTS ALONG THE WEST PROPERTY LINE NORTH OF TOWNSHIP ROAD AND IN THE PORTION OF THE WEST BOUNDARY OF PHASE 2 AND THE ADJACENT LICENCE WHERE THE ACCESS AND CONVEYOR ARE LOCATED SHALL BE ELIMINATED.	~~5.1 (3)(a)~~
2.	~~GROUND WATER RECHARGE TRENCH WILL BE CONSTRUCTED IN EXCAVATION SETBACK AREA OF NORTH OF PHASE 1.~~	~~5.11~~
3.	CONVEYOR AND OFF ROAD EQUIPMENT ACCESS MAY BE INSTALLED IN THE EXCAVATION SETBACK AREA.	~~5.11~~ (1)10.2
4.	AN INTERNAL ACCESS ROAD TO ALLOW OFF–ROAD EQUIPMENT FROM PHASE 2 TO THE ADJACENT LICENSED PIT ALONG THE WEST BOUNDARY OF SETBACK.	~~5.11~~ (1)10.2
5.	THE EXCAVATION SETBACK AREA AND THE FENCING REQUIREMENT ALONG THE PHASE 2 EAST AND WEST BOUNDARIES WITH THE ADJACENT LICENSED LANDS SHALL BE ELIMINATED UPON SUBMITTING AN AGREEMENT WITH THE APPLICABLE LAND OWNER MNR.	~~5.1 5.11~~ (3)(a) & (1)10.2
6.	AS A RESULT OF THE MTO EXPROPRIATION ALONG THE NORTH BOUNDARY, THE EXCAVATION SETBACK AREA SHALL BE LESS THAN 30m SINCE THE AREA WAS PREVIOUSLY EXTRACTED.	~~5.11~~ (1)10.2
7.	THE LICENSED LIMIT ON THE NORTH BOUNDARY SHALL BE FENCED ON THE ORIGINAL LICENCE LIMIT PRIOR TO MTO EXPROPRIATION	~~5.1~~ (3)(a)

NO.	SITE PLAN AMENDMENTS	DATE	INIT.
1.	VARIOUS MINOR AMENDMENTS AS PER M.N.R. APPROVAL SEP. /00.	SEPT. /00	
2.	VARIOUS MINOR AMENDMENTS AS PER MNR APPROVAL, APRIL 2001.	MAY. /01	
3.	VARIOUS MINOR AMENDMENTS AND HOUSEKEEPING.	AUG. /03	K.M.
4.	MINOR AMENDMENT ON PHASE 3 AREA AND SILT POND 3	FEB. /10	K.M.
5.	MAJOR AMENDMENT TO ENLARGE LIMIT OF EXTRACTION IN PHASE 2	SEPT. /15	K.M.
6.	MINOR AMENDMENT TO PERMIT EXTRACTION OF PHASE 2 EAST AND WEST BOUNDARIES ADJACENT TO OTHER LICENSED PROPERTIES TO 1.5m ABOVE THE WATER TABLE.	MAY /16	K.M.
7.	MINOR AMENDMENT TO PERMIT EXTRACTION OF PHASE 1 EAST BOUNDARY ADJACENT TO OTHER LICENSED PROPERTY TO 1.5m ABOVE THE WATER TABLE.	SEPT. /16	K.M.
8.	INCREASED THE LIMIT OF EXTRACTION IN THE SOUTHEAST CORNER OF THE NORTH LICENCE, REDUCED THE NORTH LICENCE AREA DUE TO LAND BEING EXPROPRIATED BY THE MTO ALONG HIGHWAY 401, REMOVED RECHARGE TRENCH.	OCT. 2024	K.M.

NO.	REVISIONS	DATE	INIT.
1.	AS REQUESTED BY SUB CONSULTANTS AND MINISTRIES	OCT. /88	L.L.M.
2.	AS REQUESTED BY SUB CONSULTANTS AND MINISTRIES	APR. /89	A.L.B.
3.	MODIFICATION TO SEQUENCE	SEPT. /89	A.B.M.
4.	UPDATED TO CONFORM WITH THE AGGREGATE RESOURCES ACT	JUNE. /90	L.L.M.
5.	AS PER O.M.B. CONDITIONS & FILL PERMIT APPLICATION	OCT. /90	J.J.M.
6.	TRANSFERRED ON TO AUTOCAD	DEC. /91	J.J.M.
7.	REVISIONS RE: BARRIER WALL.	SEPT. /00	A.G.H.
8.	REGIONAL STORM FLOODLINE AT END OF EXTRACTION ADDED	MAY /01	A.G.H.
9.	EXPAND SP1 & SP3, EXPAND LIMIT OF EXTRACTION OF PHASE 2 BARN AREA.	MAY /05	K.M.
10.	EXTRACT COMMON SETBACK WITH ADJACENT LICENSES (ABOVE WATER)	MAY /16	K.M.
11.	EXTRACT COMMON SETBACK WITH ADJACENT LICENSE (ABOVE WATER)	SEPT. /17	K.M.
12.	REVISIONS TO ADDRESS AGENCY COMMENTS DURING PUBLIC COMMENT PERIOD	SEPT. /17	K.M.
13.	ADDITIONS TO ADDRESS MNRF COMMENTS	MAR. /18	K.M.

MILL CREEK AGGREGATES

PART OF LOTS 21, 22, 23 AND 24, CONCESSION II
PART OF LOT 24, CONCESSION I
TOWNSHIP OF PUSLINCH, COUNTY OF WELLINGTON

University of Guelph

854 GORDON STREET
GUELPH, ONTARIO
N1G 1Y7

Scale 1:3000
50 0 50 100 150 m

J. KEVIN MITCHELL IS AUTHORIZED BY THE MINISTRY OF NATURAL RESOURCES AND FORESTRY TO PREPARE SITE PLANS FOR PUBLICATION.

DRAFT

J.H. COHOON ENGINEERING LIMITED
CONSULTING ENGINEERS

440 HARDY ROAD , UNIT #1
BRANTFORD – ONTARIO , N3T 5L8
TEL. (519) 753–2656
FAX. (519) 753–4263

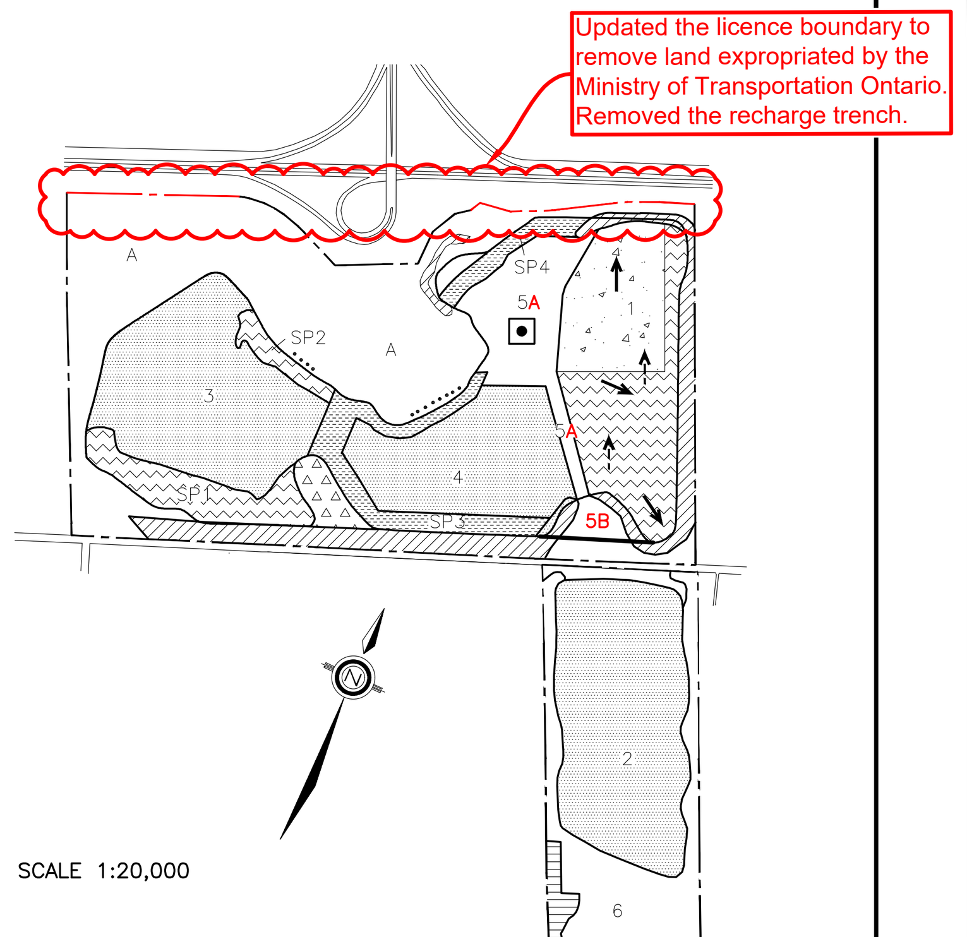
October 2024 Site Plan Amendments completed by:

MHBC PLANNING URBAN DESIGN & LANDSCAPE ARCHITECTURE
113 COLLIER STREET, BARRIE ON L4M 1H2
P: 705 726 0045 F: 705 726 2018 | WWW.MHBCPLAN.COM

OPERATIONS PLAN SOUTH OF TOWNSHIP ROAD 2

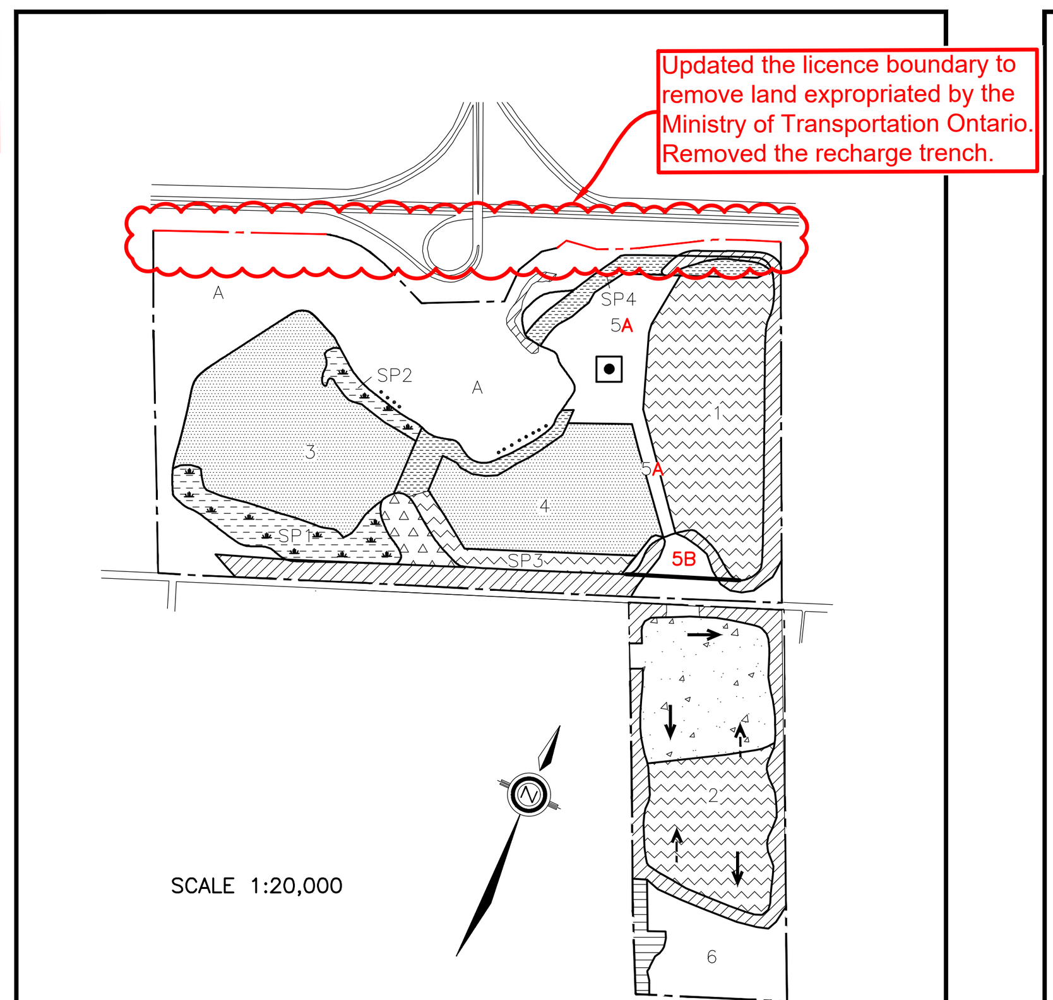
JOB: 11132

Drawing No. 4 OF 8



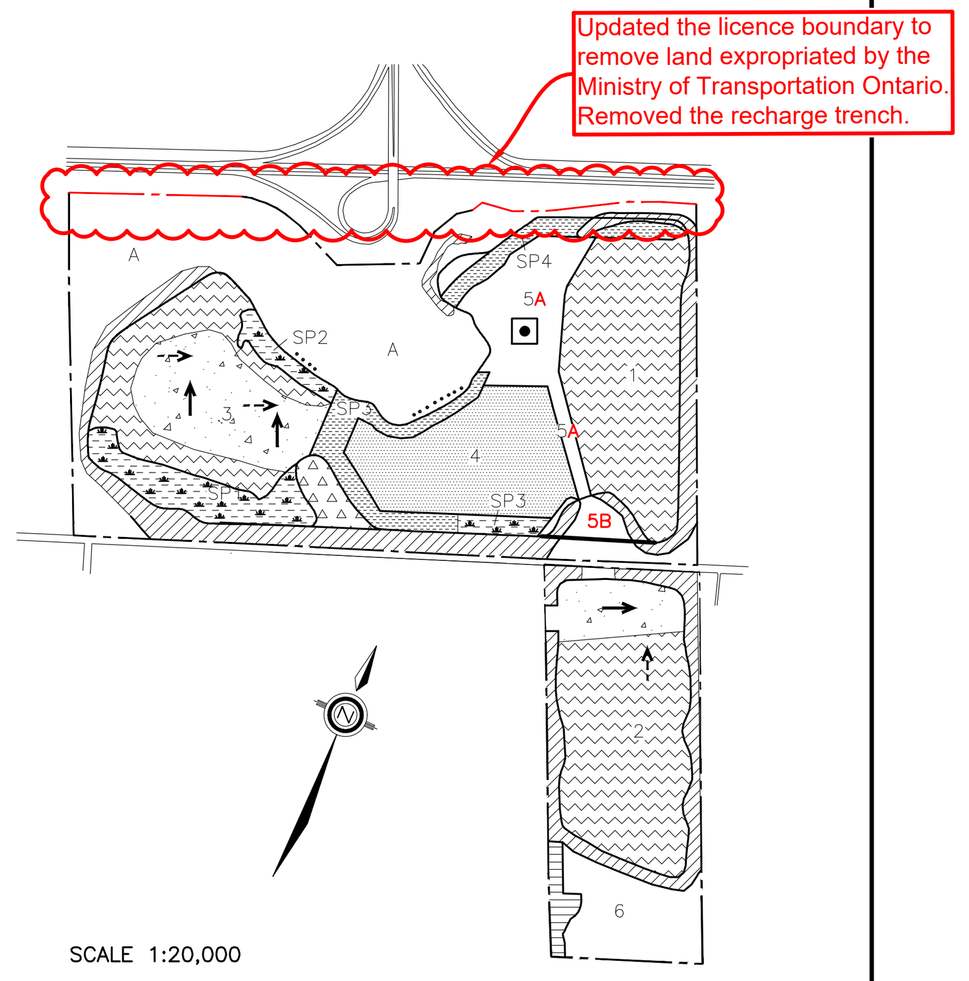
Phase 1

- Topsoil and overburden shall be removed separately and used to construct perimeter berms around Phase 3 and 4 as illustrated.
- A temporary berm will be constructed along Phase I and Highway 401 partially over silt pond SP4 and blended into the existing berm along the east boundary as field conditions permit. The berm will consist of either topsoil or subsoil which will be separated when and where possible and needed. The berm may remain as a permanent structure unless the material is required for rehabilitation purposes or may be removed in order to excavate silt pond SP4.
- Berms shall be seeded with a maintenance free ground cover (perennial rye 20 %, tall fescue 80%)
- In Phase 1, extraction generally is to be from south to north. An exception to this is permitted along the eastern limit of Phase 1 to allow extraction to extend northwards up to silt pond SP4.
- Sub water table resources in areas designated for the operation silt ponds (SP1 and SP2) will be extracted first. Ponds to be excavated in spring or fall. Extraction and temporary use of silt pond SP4 during startup of Phase 1 is permitted.
- Dry excavation in Phase 1 will be in direction as shown. Aggregate materials will be removed by dry excavation and will be followed immediately by wet/dragline extraction.
- Minimum width of siltation pond (SP1 and SP2) adjacent to Phase 3 of northern property will be 40 metres. Actual width will be dependent on depth of resource and sideslope that can be excavated.
- ~~A temporary groundwater recharge trench will be constructed in the setback north of Phase 1. Feed water will be pumped from the pond in Phase 1. The use of the recharge trench will not extend past the end of Phase 5 and it will be backfilled prior to the closeout of operations at the site. Please refer to recharge trench proposal (April 30, 2001) for details and monitoring program requirements.~~
- Phases 2, 3 and 4 will remain in agricultural use (excluding haul roads and silt ponds).



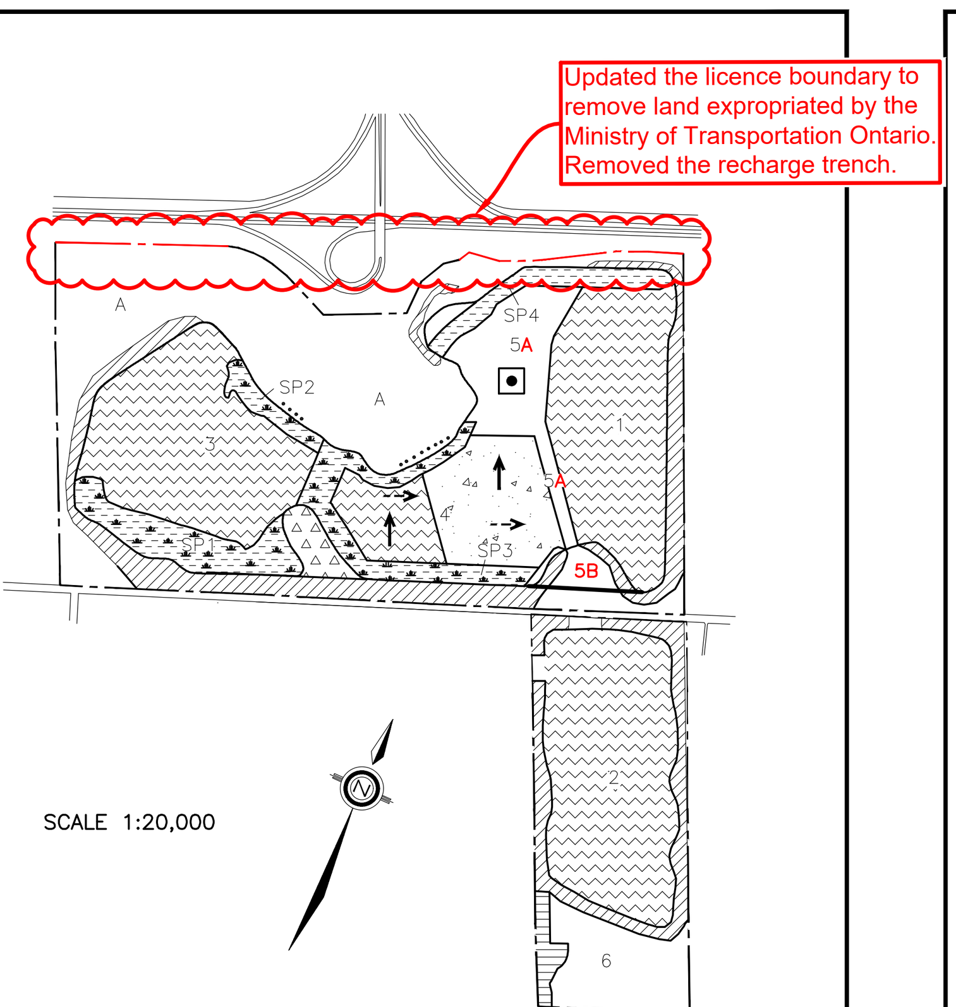
Phase 2

- Silt pond SP3 stripped of topsoil and excavated above and below the water table and siltation pond basin created and available for use as soon as SP1 and SP2 are completed.
- Phase 1 exhausted of its aggregate resources as practical.
- Strip topsoil and overburden separately from Phase 2 and use to complete perimeter berms around Phase 2 as shown.
- Excavation in Phase 2 will occur above and below the water table in the direction shown.
- Tree planting continues.
- Completion of appropriate grading, stabilization and vegetating of shorelines in Phase I.
- It is the intention of the applicant to transport the aggregate deposits from Phase 2 to the processing plant area by conveyor belt. This will involve the construction of a culvert system under Township Road No. 2. The design and location of the culvert under Concession Road 2 will be subject to the approval of the Township of Puslinch.
- The location of the conveyor system will vary to accommodate extraction. The conveyor installation may require minor grading and berm alterations.
- A temporary haul route across Township Road No. 2 will facilitate the movement of aggregate from Phase 2 to the processing area until the conveyor system is in place. Oversized bank material may also be required to be hauled to the processing area by truck throughout the life of Phase 2.
- Phases 3 and 4 will remain in agricultural use (excluding haul roads and silt ponds).



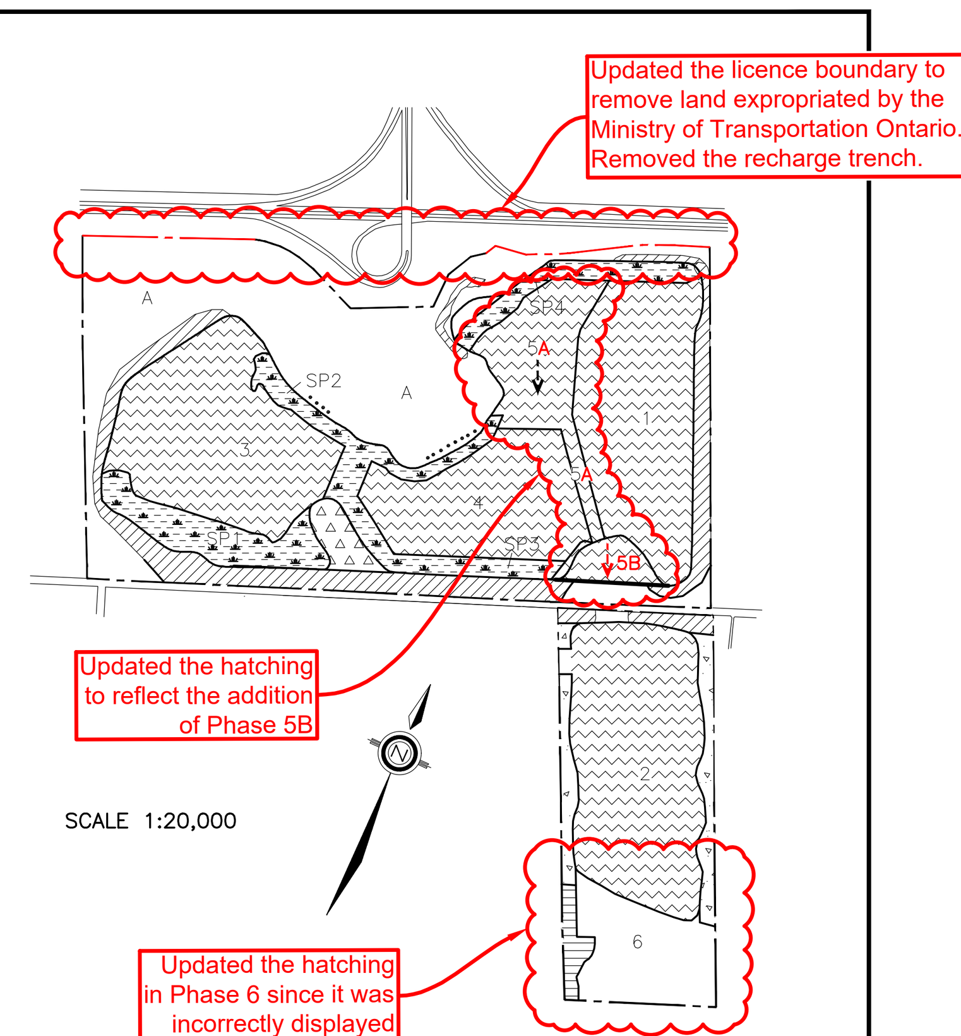
Phase 3

- Topsoil stripping of Phase 3 and initial above water table removal of aggregate.
- Final removal of all available aggregate resource in Phase 2.
- Phase 4 to continue in agricultural use.
- Tree planting continues.
- Completion of appropriate grading, stabilization and vegetating of shorelines in Phase 2.
- Haul roads in Phase 3 can be extracted during Phase 3, in conformance with Rehabilitation Plan, or may remain for extraction during Phases 5A and 5B.



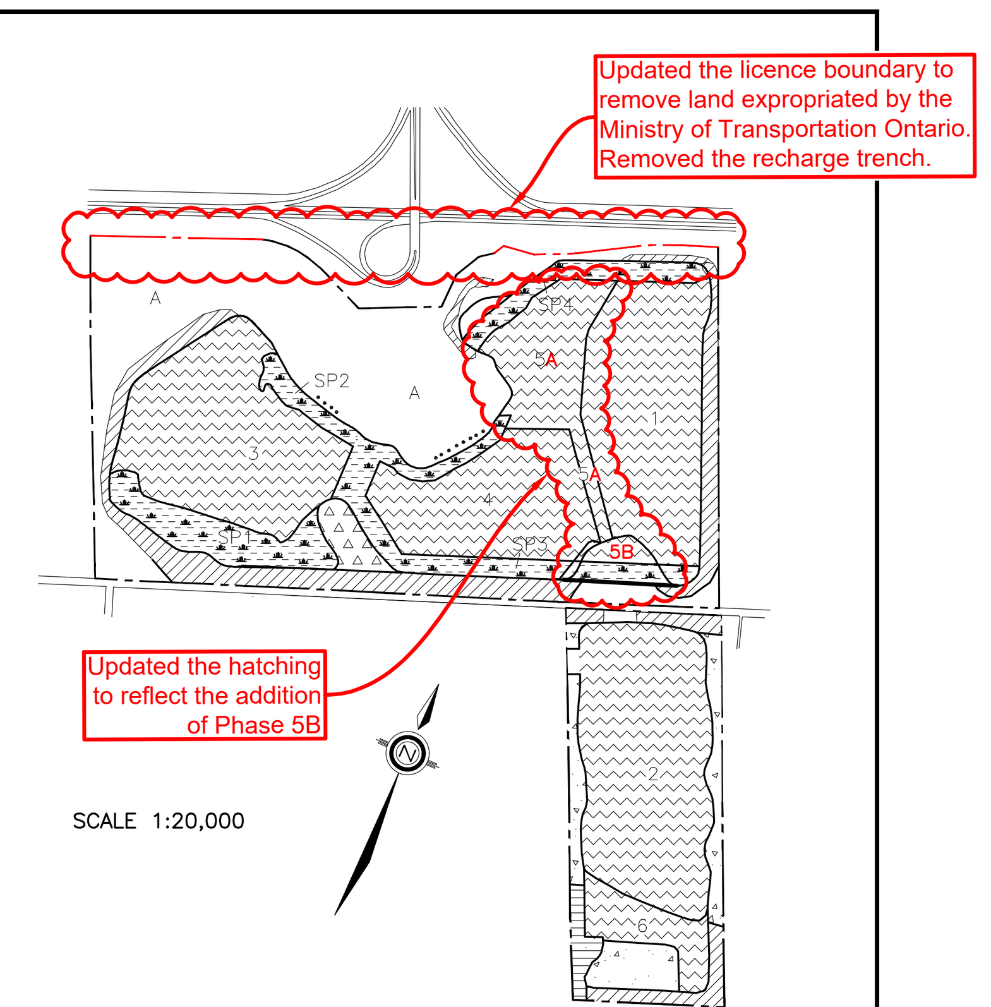
Phase 4

- Silt pond 3 between Phases 3 and 4 shall be filled with silt prior to commencement of extraction in Phase 4.
- Removal of topsoil and above the water table extraction of the sand and gravel.
- Final removal of all available resources in Phase 3.
- Tree planting continues.
- Completion of appropriate grading, stabilization and vegetating of shorelines in Phase 3.
- Removal of redundant haul routes.
- Silt pond 4 north of Phases 1 and 5A will be excavated above and below the water table and siltation pond basin created and available for use as soon as SP3 is completed.



Phases 5A and 5B

- Final removal of available resources from Phase 4 and resources from redundant haul routes.
- Relocation of mobile processing plant as Phase 5A is extracted.
- Stripping and above water table extraction followed by below water table extraction for Phases 5A and 5B. Material may be hauled off site for processing.



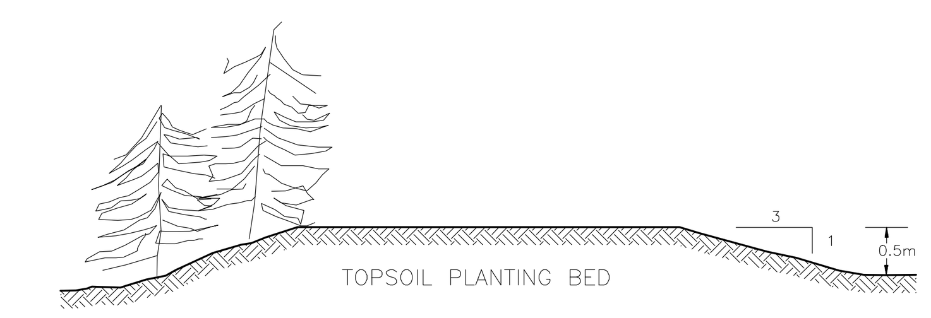
Phase 6

- Prior to extraction commencing in Phase 6, the licensee shall provide MNRF confirmation that Holding Zone H-8 has been lifted.
- Removal of all haul routes except those required for rehabilitation land uses. (eg. island habitat locations)
- Transplanting of final tree stock.
- Completion of appropriate grading, stabilization and vegetating of shorelines.
- Replacing top soils on islands and revegetating them.
- Side slopes of the pit toward the final lakes shall be no steeper than 3:1 except where certain objectives demand a shallower slope. (see Details of Final Rehabilitation on page 7 of 8 and page 8 of 8)
- Excess topsoil and overburden in the berms will be used to create additional promontory(ies).
- Topsoil and overburden removed from Phase 6 and used to rehabilitate sideslopes in Phase 2 and to create acoustic berms
- Commence extraction of Phase 6. Resources may be conveyed to processing plant in Phase 5A or shipped off site. Extraction in Phase 6 may occur at the same time as Phases 5A and 5B.

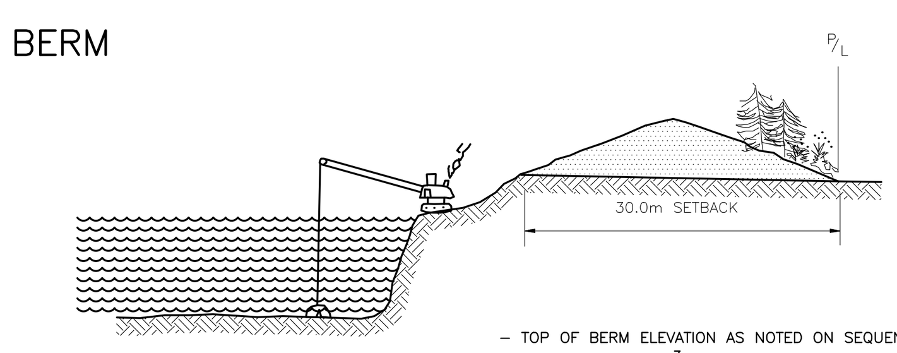
DESIGN OF SPECIAL BERMS

EROSION PROTECTION / WIND THROW EDGE

- BERM TO BE 0.5m IN HEIGHT
- TOP TO BE FLAT FOR PEDESTRIAN ACCESS
- BERM TO BE PLANTED WITH WHITE CEDAR
- BERM TO BE LOCATED WHERE NOTED ON SHEET 2A, AND IN THE TREE PLANTING DETAIL (ON THIS SHEET)



TYPICAL BERM



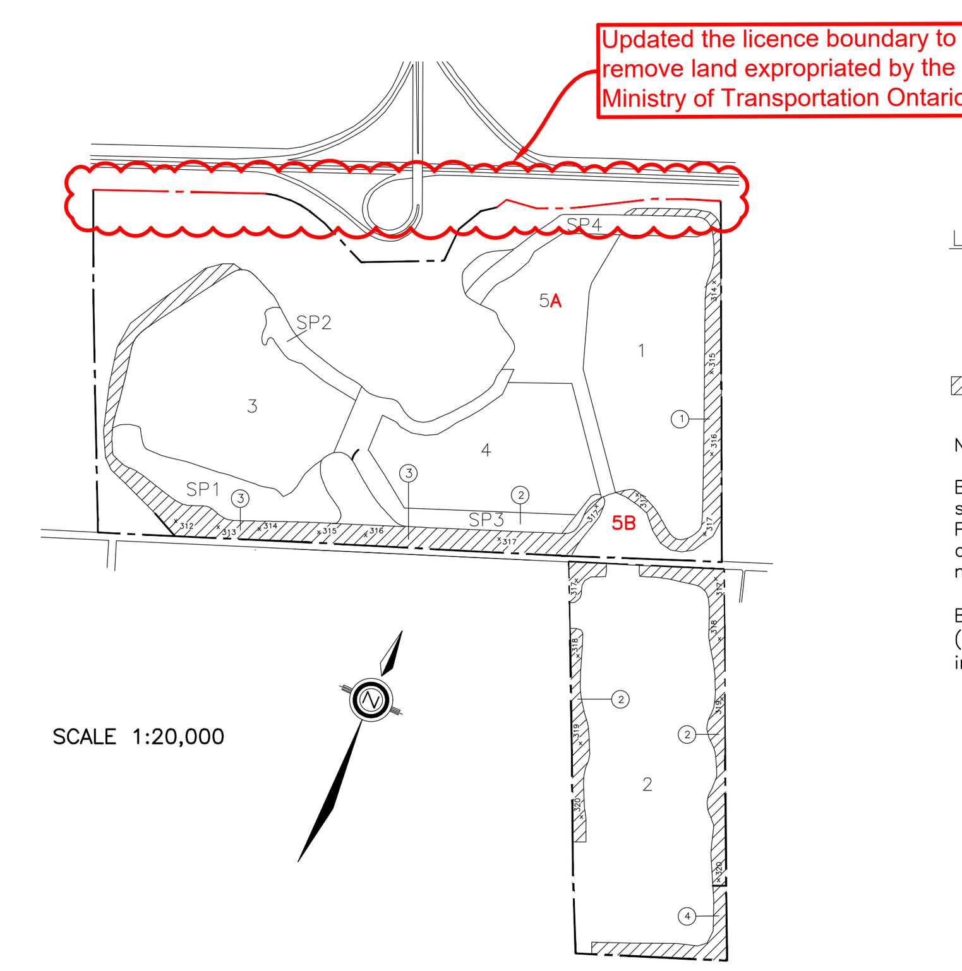
A CONTINUOUS DOUBLE ROW CONIFER TREE PLANTING WITH A POROSITY OF 50% (eg. WHITE PINE) WILL BE REQUIRED AS SHOWN, AT THE BOTTOM OF BERMS AT FENCE LINE, ADJACENT TO PHASES 1, 2a, 2b, AND 4a FOR DUST SCREEN PURPOSES.

IRREGULAR SPACED LOW SHRUBS AS SHOWN WILL BE REQUIRED FOR WIND VELOCITY REDUCTION.

- TOP OF BERM ELEVATION AS NOTED ON SEQUENTIAL OPERATIONS DRAWING.
- BERM SLOPE 3 : 1
- SHORELINE TO BE REHABILITATED AS PER SKETCH ON SHEET 3b.

SPECIAL BERM PROVISIONS

(NOISE / EROSION PROTECTION / VISIBILITY SCREENING)



LEGEND

①	SEQUENTIAL ORDER OF BERM CONSTRUCTION
x 317	FINAL BERM ELEVATIONS
(hatched)	PERIMETER BERMS

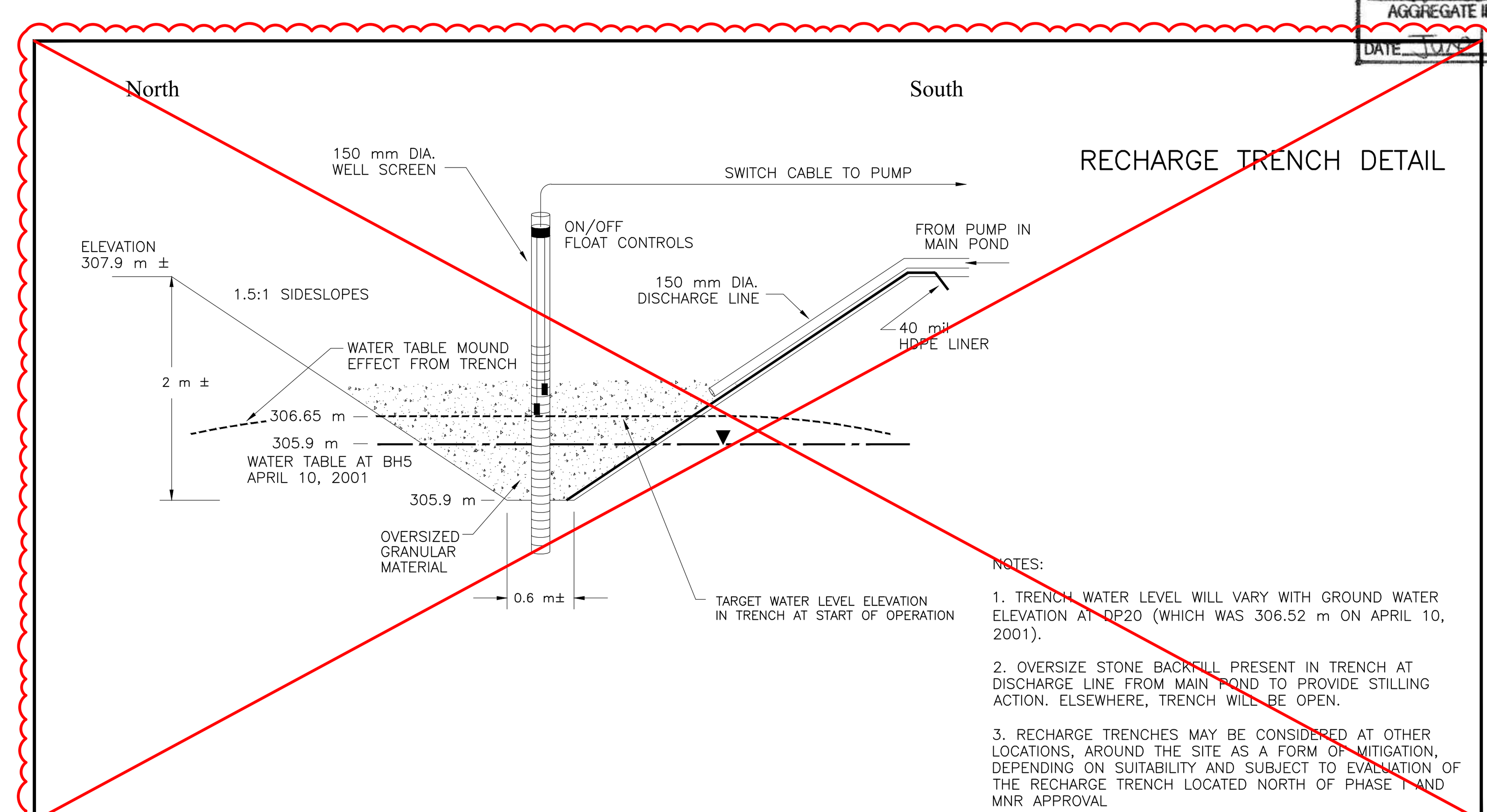
Notes:

Berms will be constructed to the minimum height and dimensions as shown. However, subsequent applications by other Aggregate Producers may render the berm redundant. If this happens application may be made to the Ministry of Natural Resources for a more appropriate design.

Berms will be designed using a ground cover (ie: white clover, (trifolium repens), bird's foot trefoil (lotus corniculatus) and interspersed with a variety of deciduous and coniferous shrubs/trees.

MINISTRY OF NATURAL RESOURCES AND FORESTRY GUELPH DISTRICT
SITE PLANS APPROVED UNDER THE AGGREGATE RESOURCES ACT
AGGREGATE INSPECTOR
DATE .../2019

RECHARGE TRENCH DETAIL



NOTES:

1. TRENCH WATER LEVEL WILL VARY WITH GROUND WATER ELEVATION AT OP20 (WHICH WAS 306.52 m ON APRIL 10, 2001).
2. OVERSIZE STONE BACKFILL PRESENT IN TRENCH AT DISCHARGE LINE FROM MAIN POND TO PROVIDE STILLING ACTION. ELSEWHERE, TRENCH WILL BE OPEN.
3. RECHARGE TRENCHES MAY BE CONSIDERED AT OTHER LOCATIONS, AROUND THE SITE AS A FORM OF MITIGATION, DEPENDING ON SUITABILITY AND SUBJECT TO EVALUATION OF THE RECHARGE TRENCH LOCATED NORTH OF PHASE 1 AND MNR APPROVAL.

Removed the recharge trench detail due to land being expropriated by the Ministry of Transportation Ontario

October 2024 Site Plan Amendments completed by:

MHBC PLANNING URBAN DESIGN & LANDSCAPE ARCHITECTURE

Legend:

EXTRACTION BELOW WATER TABLE	PROCESSING PLANT AREA
EXTRACTION ABOVE WATER TABLE	WIND THROW EDGE
AWAITING SILT POND	X AREA TO BE MONITORED
AWAITING EXTRACTION INTERIM AGRICULTURAL USE	~~TEMPORARY GROUNDWATER RECHARGE TRENCH~~
BERM	DIRECTION OF EXTRACTION (ABOVE WATER TABLE)
SILT POND BEING PROGRESSIVELY REHABILITATED TO WETLAND AND MEADOW HABITAT	DIRECTION OF EXTRACTION (BELOW WATER TABLE)
WOODLAND AREA	
HAUL ROUTE	
A/B NO EXTRACTION -A- ECOLOGICAL -B- REFORESTATION	

Notes:

1. REFER TO SHEET 3 FOR GENERAL OPERATIONAL NOTES.
2. REFER TO THE FOLLOWING STUDIES AND REPORTS USED IN PREPARING THE OPERATIONAL PLAN:

A) ABERFOYLE PIT TRAFFIC IMPACT STUDY BY UMA ENGINEERING LTD., NOVEMBER 1987.

B) ANTICIPATED FUGITIVE DUST AT THE UNIVERSITY OF GUELPH PROPERTY IN PUSLINCH TOWNSHIP BY ARKTOS LTD., OCTOBER 1987.

C) TERRESTRIAL BIOLOGY IMPACT ASSESSMENT BY PAUL F. G. EAGLES PLANNING LTD, NOVEMBER 1988.

D) MILL CREEK STUDY BY FAUN AQUATICS CANADA LTD., 1987.

E) THE IMPACT AND ABATEMENT OF NOISE FROM A PROPOSED GRAVEL PIT IN THE TOWNSHIP OF PUSLINCH BY J. S. KEELER LTD., 1987, REVISED MAY 10, 1989.

F) WATER RESOURCES STUDY – BASELINE CONDITIONS FOR A PROPOSED SAND AND GRAVEL PIT, UNIVERSITY OF GUELPH BY GARTNER LEE LTD., 1987.

G) POTENTIAL IMPACT ASSESSMENT REPORT AND GROUNDWATER, SURFACE WATER ASPECTS PROPOSED SAND AND GRAVEL PIT, TOWNSHIP OF PUSLINCH BY GARTNER LEE LTD., 1987.

H) SUPPLEMENTAL GROUNDWATER INFORMATION BY JAGGER HIMS LTD., ONGOING FROM 1987 TO 1992.

3. THE FOLLOWING REPORTS WERE PREPARED FOR EXTRACTION OF PHASE 6:

A) HYDROGEOLOGICAL ASSESSMENT REPORT BY HIMS GEOENVIROMENTAL LTD., 2015.

B) NOISE IMPACT STUDY BY AERCOUSTICS ENGINEERING LTD., 2015.

C) LEVEL 1 & 2 NATURAL ENVIRONMENT ASSESSMENT BY AECOM, 2015.

D) STAGE 1 ARCHAEOLOGICAL ASSESSMENT BY GOLDER ASSOCIATES LTD., 2015.

E) PLANNING JUSTIFICATION REPORT BY GSP GROUP INC., 2015.

F) ECOLOGICAL MANAGEMENT PLAN AND REHABILITATION PLAN BY GOODBAN ECOLOGICAL CONSULTING INC. 2017

G) NATURAL ENVIRONMENT TECHNICAL REPORT, PROPOSED SITE PLAN AMENDMENT BY GOODBAN ECOLOGICAL CONSULTING INC., AUGUST 2024.

H) WATER REPORT, PROPOSED SITE PLAN AMENDMENT BY WSP CANADA INC., JULY 23, 2024.

SITE PLAN AMENDMENTS

NO.	DESCRIPTION	DATE	INIT.
1.	REDUCTION OF AREA TO BE EXTRACTED AS A RESULT OF ADDITIONAL WETLAND BUFFER	JUNE /92	
2.	REMOVAL OF 2.0m BERM TO ADJACENT TO MILL CREEK	JUNE /92	
3.	CONSOLIDATION OF ENTRANCE / EXIT TO BE LOCATED WEST OF EXISTING BUILDINGS.	JUNE /92	
4.	CONSTRUCTION OF DYKE WALL ADJACENT TO PHASE 3	AUG. /92	
5.	VARIOUS MINOR AMENDMENTS AS PER MNR MARCH/97 APPROVAL (SILT POND, FENCING, SLURRY PIPE, TREE PLANTING, USE OF GENSETS, ETC.)	MARCH/97	
6.	INCLUSION OF BERM ALONG 401	MARCH/99	
7.	VARIOUS MINOR AMENDMENTS AS PER M.N.R. APPROVAL SEPT. /00 (SILT PONDS SP1, SP2, GRCA CUT AND FILL PERMIT LINE, AMPHITHEATRE TEMPORARY BERM IN PHASE 1, EXTRACTION IN PHASE 1, ETC.)	SEPT. /00	
8.	VARIOUS MINOR AMENDMENTS AS PER MNR APPROVAL, MAY /01 (RECHARGE TRENCH, MODIFICATIONS TO EXTRACTION OUTLINE IN PHASE I AND SILT PONDS SP1/SP2 IN PHASE 3).	MAY /01	
9.	MINOR AMENDMENT RE TRANSPORT AGGREGATE ACROSS CONCESSION ROAD 2.	OCT. /02	
10.	VARIOUS MINOR AMENDMENTS AND HOUSEKEEPING.	AUG. /03	K.M.
11.	MINOR AMENDMENT ON PHASE 3 AREA AND SILT POND 3	FEB. /10	K.M.
12.	MAJOR AMENDMENT TO ENLARGE LIMIT OF EXTRACTION IN PHASE 2	SEPT. /15	K.M.
13.	INCREASED THE LIMIT OF EXTRACTION IN THE SOUTHEAST CORNER OF THE NORTH LICENCE. REDUCED THE NORTH LICENCE AREA DUE TO LAND BEING EXPROPRIATED BY THE MTO ALONG HIGHWAY 401. REMOVED RECHARGE TRENCH.	OCT. 2024	K.M.

REVISIONS

NO.	DESCRIPTION	DATE	INIT.
1.	AS PER REQUEST BY SUB. CONSULTANTS AND MINISTRIES	OCT./88	J.L.S.
2.	AS PER STUDY BY SUB. CONSULTANTS AND MINISTRIES	APR./89	A.L.B.
3.	MODIFICATION TO SEQUENCE	SEPT./89	A.B.M.
4.	UPDATED TO CONFORM WITH THE AGGREGATE RESOURCES ACT	JUNE/90	J.J.M.
5.	AS PER O.M.B. CONDITIONS AND FILL PERMIT APPLICATION	OCT./90	J.J.M.
6.	AS PER MINISTER CONDITIONS AND TRANSFERRED ONTO AUTOCAD	DEC./91	J.J.M.
7.	TO CONFORM WITH G.R.CA. FILL PERMIT APPLICATION AND REVISED MONITORING STATION LOCATIONS	AUG./92	R.E.G.
8.	AS PER M.N.R.	NOV./92	R.E.G.
9.	AS PER APPROVAL BY M.N.R. SEPT. /00	SEPT./00	A.G.H.
10.	AS PER APPROVAL BY MNR, MAY /01.	MAY /01	A.G.H.
11.	AS PER M.N.R. COMMENTS	JAN. /04	K.M.
12.	EXPAND SP1 & SP3, EXPAND LIMIT OF EXTRACTION OF PHASE 2 BARN AREA.	MAY /05	K.M.
13.	REVISED PHASING NOTES AND REVISIONS TO ADDRESS AGENCY COMMENTS DURING PUBLIC COMMENT PERIOD	SEPT. /17	K.M.
14.	REVISIONS TO PHASING NOTES TO ADDRESS COMMENTS	FEB. /19	K.M.

MILL CREEK AGGREGATES

PART OF LOTS 21, 22, 23 AND 24, CONCESSION II
PART OF LOT 24, CONCESSION I
TOWNSHIP OF PUSLINCH, COUNTY OF WELLINGTON

University of Guelph
854 GORDON STREET
GUELPH, ONTARIO
N1G 1Y7

Scale 1:3000
50 0 50 100 150 m

J. KEVIN MITCHELL IS AUTHORIZED BY THE ... OF NATURAL RE... PREPARE ... FO... SITE PLANS ...

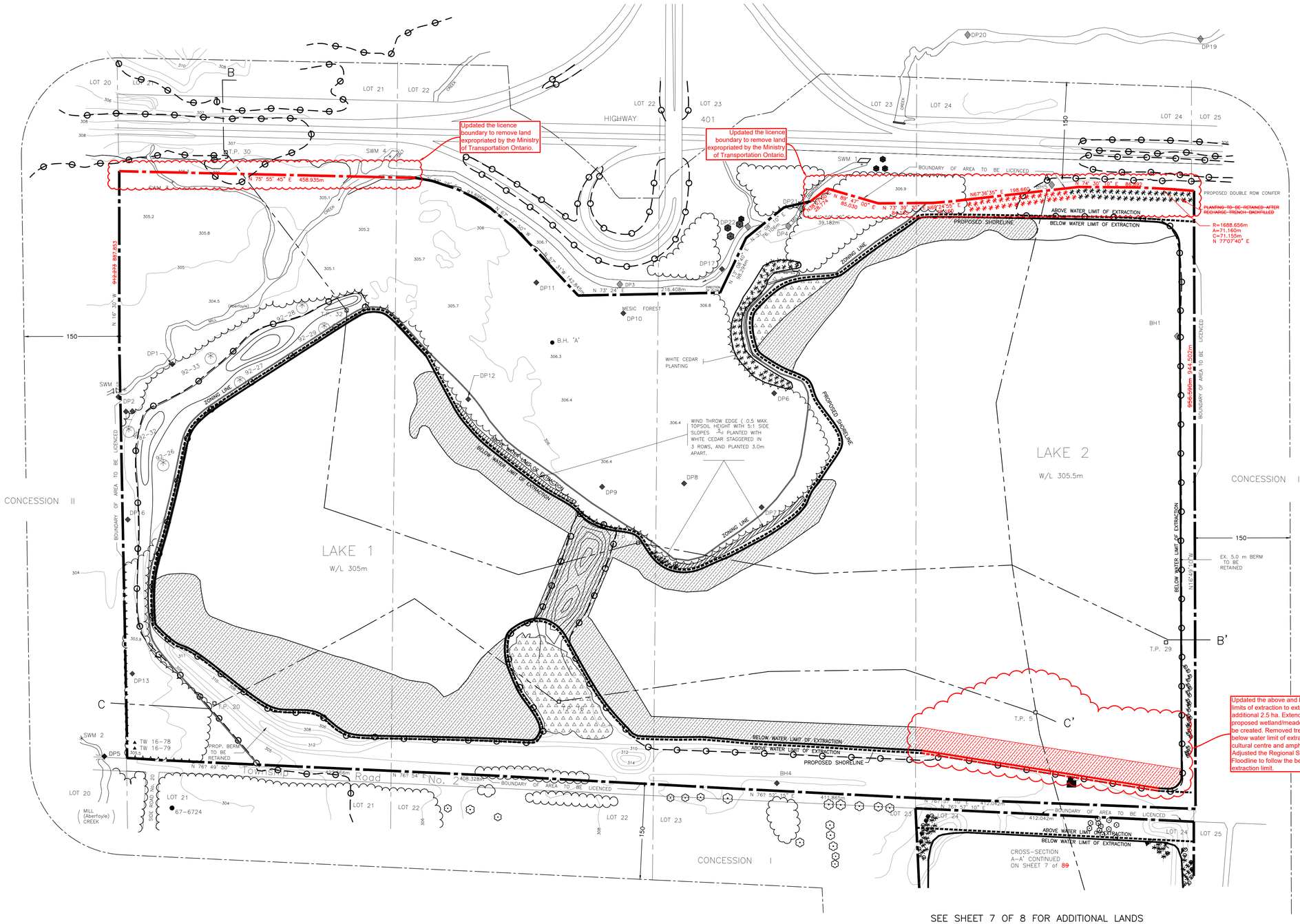
DRAFT

J.H. COHOON ENGINEERING LIMITED
CONSULTING ENGINEERS
440 HARDY ROAD, UNIT #1
BRANTFORD – ONTARIO, N3T 5L8
TEL. (519) 753-2656
FAX. (519) 753-4263

OPERATION PHASING DETAILS

Drawing No. 5 OF 8

JOB: 11132



Legend:

- ZONING LINE
- PROPOSED CONTOUR (Metres A.S.L.)
- BOUNDARY OF AREA TO BE LICENCED
- EXISTING TREED AREA
- MIXED TREED AREA
- BUILDING (TO BE RETAINED)
- DP5 DRIVE POINT
- REVEGETATED ISLANDS
- DW 16 B-78 OBSERVATION WELL
- 92-27 GROUNDWATER MONITORING STATION (TEMPERATURE AND LEVEL)
- REGIONAL STORM FLOODLINE AT END OF EXTRACTION
- PROPOSED SHORELINE
- ~~RECHARGE TRENCH~~
- WIND THROW EDGE PLANTING BED
- REFORESTATION
- PROPOSED WETLANDS/MEADOWS HABITAT TO BE CREATED
- T.P.3 TEST PIT
- SWM 4 SURFACE WATER MONITORING STATION
- B.H. 5 BORE HOLE OBSERVATION MONITOR INSTALLATION
- B.H. 'B' BORE HOLE
- FA5 STREAM QUALITY AND FISHERIES MONITORING STATION (Water Quality, Biological/Fisheries as per Fau/Aquatics Report)
- TW 16-74 TEST WELLS
- ABOVE WATER LIMIT OF EXTRACTION
- BELOW WATER LIMIT OF EXTRACTION

Notes:

1. REFER TO SHEET 7 FOR REHABILITATION DETAILS SOUTH OF TOWNSHIP ROAD 2.
2. AREA TO BE REHABILITATED = ~~80.8~~ 83.3 ha NORTH
   38.8 ha SOUTH
   119.6 ~~122.1~~ ha TOTAL
3. BUILDINGS MAY REMAIN ON SITE AT DISCRETION OF LICENCE HOLDER.
4. REFER TO SHEET 7 FOR REHABILITATION CROSS-SECTIONS.
5. PERIMETER BERMS MAY REMAIN IF MATERIAL NOT REQUIRED FOR REHABILITATION.
6. THE CULVERT UNDER CONCESSION ROAD 2 SHALL BE REMOVED PRIOR TO THE SURRENDER OF THE LICENCE.
7. OFFICE TRAILERS, SCALE AND SCALE HOUSE, ALL PROCESSING EQUIPMENT AND SCRAP SHALL BE REMOVED.

MINISTRY OF NATURAL RESOURCES AND FORESTRY
GUELPH DISTRICT
SITE PLANS
APPROVED
UNDER THE AGGREGATE RESOURCES ACT
Aggregate Inspector
DATE June 19/2019

SITE PLAN AMENDMENTS

NO.	DESCRIPTION	DATE	INIT.
1.	VARIOUS MINOR AMENDMENTS AS PER M.N.R. APPROVAL SEP. /00.	SEPT. /00	
2.	SUBMERGED SIDESLOPES 2:1 OR FLATTER.	SEPT. /00	
3.	VARIOUS MINOR AMENDMENTS AS PER MNR APPROVAL APRIL /01. RECHARGE TRENCH TO BE BACKFILLED.	MAY /01	
4.	VARIOUS MINOR AMENDMENTS AND HOUSEKEEPING.	AUG. /03	K.M.
5.	MINOR AMENDMENT ON PHASE 3 AREA AND SILT POND 3	FEB. /10	K.M.
6.	MAJOR AMENDMENT TO ENLARGE LIMIT OF EXTRACTION IN PHASE 2	SEPT. /15	K.M.
7.	MINOR AMENDMENT TO PERMIT EXTRACTION OF PHASE 1 EAST BOUNDARY ADJACENT TO OTHER LICENSED PROPERTY TO 1.5m ABOVE THE WATER TABLE.	SEPT. /17	K.M.
8.	INCREASED THE LIMIT OF EXTRACTION IN THE SOUTHEAST CORNER OF THE NORTH LICENCE, REDUCED THE NORTH LICENCE AREA DUE TO LAND BEING EXPROPRIATED BY THE MTO ALONG HIGHWAY 401, REMOVED RECHARGE TRENCH.	OCT. 2024	K.M.

REVISIONS

NO.	DESCRIPTION	DATE	INIT.
1.	AS PER SUB-CONSULTANTS AND M.N.R.	OCT. /88	J.L.S.
2.	AS PER SUB-CONSULTANTS AND M.N.R.	APR. /89	C.A.O'B.
3.	AS PER SUB-CONSULTANTS AND M.N.R.	MAY /90	C.A.O'B.
4.	UPDATED TO COMPLY WITH THE AGGREGATE RESOURCES ACT.	JUNE/90	L.L.H.
5.	AS PER O.B.M. CONDITIONS + FILL PERMIT APPLICATION	OCT. /90	J.J.M.
6.	AS PER MINISTER CONDITIONS & TRANSFERRED ONTO AUTOCAD	DEC. /91	J.J.M.
7.	TO CONFORM WITH G.R.C.A. FILL PERMIT APPLICATION AND REVISED MONITORING STATION LOCATIONS	AUG. /92	R.E.G.
8.	AS PER M.N.R.	NOV. /92	R.E.G.
9.	ADDITIONAL DRIVE POINTS ADDED	NOV. /93	R.E.G.
10.	BLDG. #3 DELETED, SURFACE WATER STATIONS RE-LOCATED	SEPT. /00	A.G.H.
11.	REGIONAL STORM FLOODLINE AT END OF EXTRACTION ADDED.	MAY /01	A.G.H.
12.	EXPAND SP1 & SP3, EXPAND LIMIT OF EXTRACTION OF PHASE 2 BARN AREA.	MAY /05	K.M.
13.	EXTRACT COMMON SETBACK WITH ADJACENT LICENCE (ABOVE WATER)	SEPT. /17	K.M.

MILL CREEK AGGREGATES

PART OF LOTS 21, 22, 23 AND 24, CONCESSION II
PART OF LOT 24, CONCESSION I
TOWNSHIP OF PUSLINCH, COUNTY OF WELLINGTON

University of Guelph
854 GORDON STREET
GUELPH, ONTARIO
N1G 1Y7

Scale 1:3000
50 0 50 100 150 m

J. KEVIN MITCHELL IS AUTHORIZED BY THE MINISTRY OF NATURAL RESOURCES TO PREPARE SITE PLANS FOR LICENCE APPLICATIONS.

DRAFT

J.H. COHOON ENGINEERING LIMITED
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440 HARDY ROAD , UNIT #1
BRANTFORD – ONTARIO , N3T 5L8
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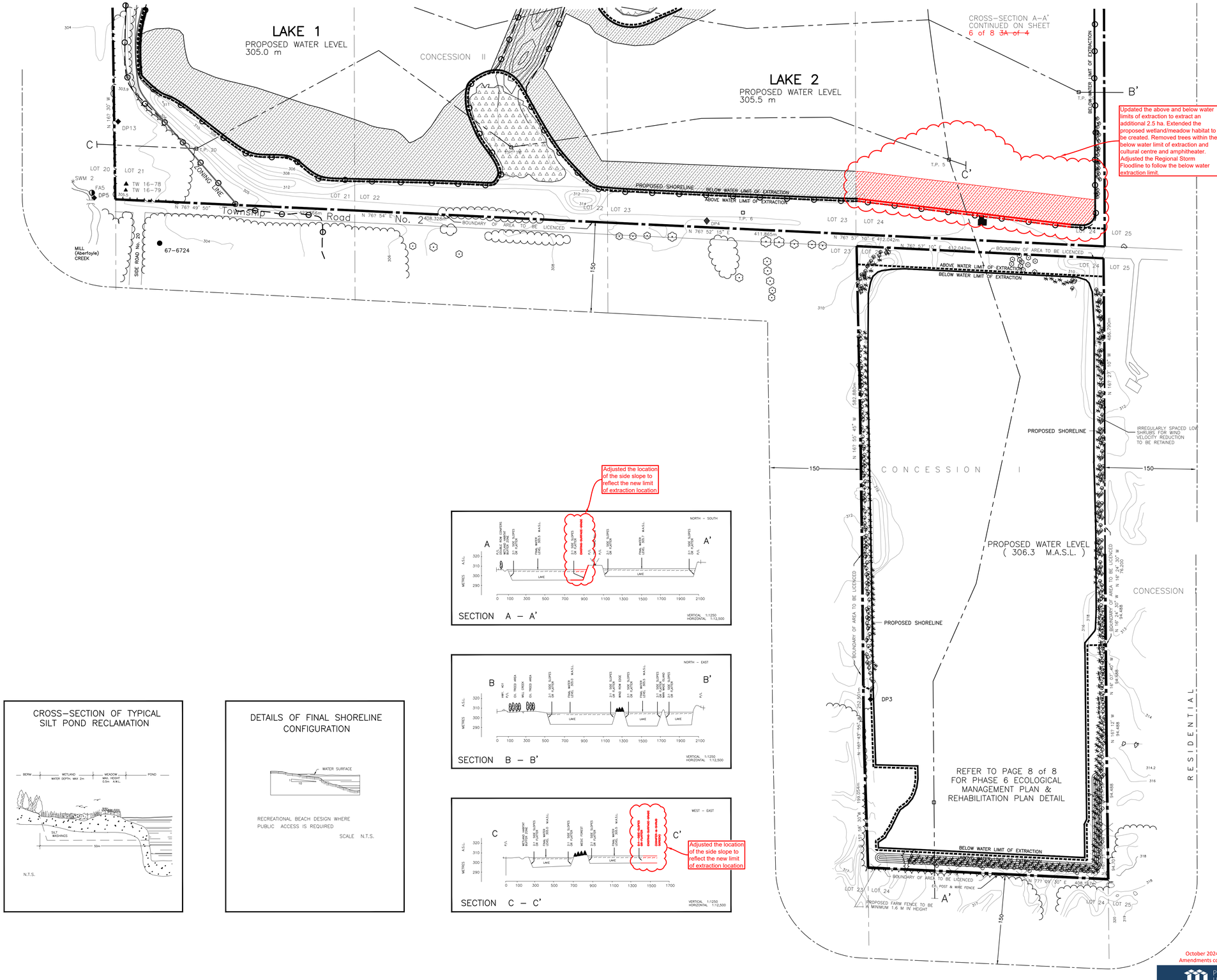
October 2024 Site Plan Amendments completed by:

MHBC PLANNING URBAN DESIGN & LANDSCAPE ARCHITECTURE
113 COLLIER STREET, BARRIE ON L4M 1H2
P: 705 728 0045 F: 705 728 2010 | WWW.MHBCPLAN.COM

PROGRESSIVE & FINAL REHABILITATION PLAN NORTH OF TOWNSHIP ROAD 2

JOB: 11132

Drawing No. 6 OF 8



Legend:

- ZONING LINE
- PROPOSED CONTOUR (Metres A.S.L.)
- BOUNDARY OF AREA TO BE LICENCED
- EXISTING TREED AREA
- MIXED TREED AREA
- BUILDING (TO BE RETAINED)
- DP5 DRIVE POINT
- REVEGETATED ISLANDS
- DW 16 B-78 OBSERVATION WELL
- 92-27 GROUNDWATER MONITORING STATION (TEMPERATURE AND LEVEL)
- REGIONAL STORM FLOODLINE AT END OF EXTRACTION
- PROPOSED SHORELINE
- ~~RECHARGE TRENCH~~
- WIND THROW EDGE PLANTING BED
- REFORESTATION
- PROPOSED WETLANDS/MEADOW HABITAT TO BE CREATED
- T.P.3 TEST PIT
- SWM 4 SURFACE WATER MONITORING STATION
- B.H. 5 BORE HOLE OBSERVATION MONITOR INSTALLATION
- B.H. 'B' BORE HOLE
- FA5 STREAM QUALITY AND FISHERIES MONITORING STATION (Water Quality, Biological/Fisheries as per FaunAquatics' Report)
- TW 16-74 TEST WELLS
- BERM
- ABOVE WATER LIMIT OF EXTRACTION
- BELOW WATER LIMIT OF EXTRACTION

Notes:

1. REFER TO SHEET 6 FOR REHABILITATION DETAILS NORTH OF TOWNSHIP ROAD 2.
2. AREA TO BE REHABILITATED = ~~80.8~~ ~~83.3~~ ha NORTH
   38.8 ha SOUTH
   119.6 ~~122.1~~ ha TOTAL
3. BUILDINGS MAY REMAIN ON SITE AT DISCRETION OF LICENCE HOLDER.
4. PERIMETER BERMS MAY REMAIN IF MATERIAL NOT NEEDED FOR REHABILITATION.

MINISTRY OF NATURAL RESOURCES AND FORESTRY
GUELPH DISTRICT
SITE PLANS
APPROVED
UNDER THE AGGREGATE RESOURCES ACT
AGGREGATE INSPECTOR
DATE JUN 19/2019

CROSS-SECTION OF TYPICAL SILT POND RECLAMATION

DETAILS OF FINAL SHORELINE CONFIGURATION

RECREATIONAL BEACH DESIGN WHERE PUBLIC ACCESS IS REQUIRED

SCALE N.T.S.

Adjusted the location of the side slope to reflect the new limit of extraction location

Adjusted the location of the side slope to reflect the new limit of extraction location

October 2024 Site Plan Amendments completed by:

MHBC PLANNING URBAN DESIGN & LANDSCAPE ARCHITECTURE
113 COLLIER STREET, BARRIE ON L4M 1H2
P: 705 728 0045 F: 705 728 2010 | WWW.MHBCPLAN.COM

SITE PLAN AMENDMENTS

NO.	DESCRIPTION	DATE	INIT.
1.	VARIOUS MINOR AMENDMENTS AS PER M.N.R. APPROVAL SEP. /00.	SEPT. /00.	
2.	VARIOUS MINOR AMENDMENTS AS PER MNR APPROVAL APRIL /01.	MAY /01	
3.	VARIOUS MINOR AMENDMENTS AND HOUSEKEEPING.	AUG. /03	K.M.
4.	MINOR AMENDMENT ON PHASE 3 AREA AND SLT POND 3	FEB. /10	K.M.
5.	MAJOR AMENDMENT TO ENLARGE LIMIT OF EXTRACTION IN PHASE 2	SEPT. /15.	K.M.
6.	MINOR AMENDMENT TO PERMIT EXTRACTION OF PHASE 1 EAST BOUNDARY ADJACENT TO OTHER LICENSED PROPERTY TO 1.5m ABOVE THE WATER TABLE	SEPT. /17	K.M.
7.	INCREASES THE LIMIT OF EXTRACTION IN THE SOUTHEAST CORNER OF THE NORTH LICENCE, REDUCES THE NORTH LICENCE AREA DUE TO LAND BEING EXPROPRIATED BY THE MTO ALONG HIGHWAY 401, REMOVES RECHARGE TRENCH.	OCT. 2024	K.M.

REVISIONS

NO.	DESCRIPTION	DATE	INIT.
1.	AS PER SUB-CONSULTANTS AND M.N.R.	OCT. /88	J.L.S.
2.	AS PER SUB-CONSULTANTS AND M.N.R.	APR. /89	C.A.O'B.
3.	AS PER SUB-CONSULTANTS AND M.N.R.	MAY /90	C.A.O'B.
4.	UPDATED TO COMPLY WITH THE AGGREGATE RESOURCES ACT.	JUNE/90	L.L.H.
5.	AS PER O.B.M. CONDITIONS + FILL PERMIT APPLICATION	OCT. /90	J.J.M.
6.	AS PER MINISTER CONDITIONS & TRANSFERRED ONTO AUTOCAD	DEC. /91	J.J.M.
7.	TO CONFORM WITH G.R.C.A. FILL PERMIT APPLICATION AND REVISED MONITORING STATION LOCATIONS	AUG. /92	R.E.G.
8.	AS PER M.N.R.	NOV. /92	R.E.G.
9.	BLDG. #3 DELETED, SURFACE WATER STATIONS RE-LOCATED	SEPT. /00	A.G.H.
10.	REGIONAL STORM FLOODLINE AT END OF EXTRACTION ADDED	MAY /01	A.G.H.
12.	EXPAND SP1 & SP3, EXPAND LIMIT OF EXTRACTION OF PHASE 2 BARN AREA.	MAY /05	K.M.
13.	EXTRACT COMMON SETBACK WITH ADJACENT LICENCE (ABOVE WATER)	SEPT. /17	K.M.
14.	REVISIONS TO ADDRESS AGENCY COMMENTS DURING PUBLIC COMMENT PERIOD	SEPT. /17	K.M.

MILL CREEK AGGREGATES

PART OF LOTS 21, 22, 23 AND 24, CONCESSION II
PART OF LOT 24, CONCESSION I
TOWNSHIP OF PUSLINCH, COUNTY OF WELLINGTON

University of Guelph
854 GORDON STREET
GUELPH, ONTARIO
N1G 1Y7

Scale 1:3000
50 0 50 100 150 m

J. KEVIN MITCHELL IS AUTHORIZED BY THE MINISTRY OF NATURAL RESOURCES TO PREPARE SITE PLANS FOR LICENSED PITS AND QUARRIES.

DRAFT

J.H. COHOON ENGINEERING LIMITED
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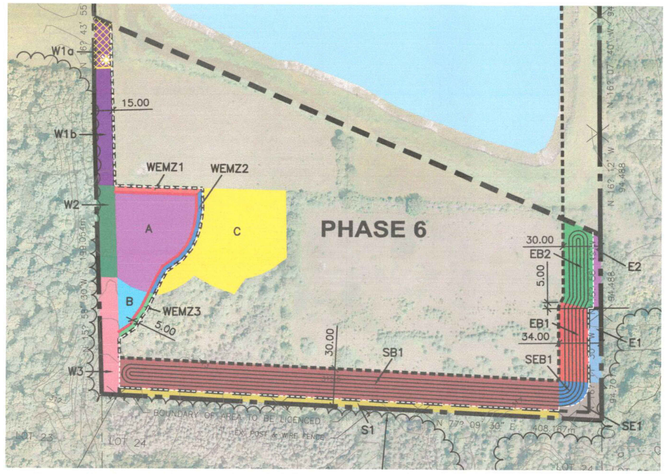
BRANTFORD – ONTARIO , N3T 5L8
TEL. (519) 753-2656
FAX. (519) 753-4263

PROGRESSIVE & FINAL REHABILITATION PLAN SOUTH OF TOWNSHIP ROAD 2

JOB: 11132

Drawing No. 7 OF 8



LEGEND

- A - WOODLAND PROTECTION ZONE A
- B - WOODLAND PROTECTION ZONE B
- C - WOODLAND TO BE REMOVED
- WEMZ1 - WOODLAND EDGE MANAGEMENT ZONE 1
- WEMZ2 - WOODLAND EDGE MANAGEMENT ZONE 2
- WEMZ3 - WOODLAND EDGE MANAGEMENT ZONE 3
- W1a - 15m SETBACK
- W1b - 15m SETBACK
- W2 - 15m SETBACK
- W3 - 15m SETBACK
- S1 - 6m NO TOUCH ZONE
- SB1 - SOUTH BERM AREA
- SEB1 - SOUTHEAST BERM
- SE1 - NO TOUCH ZONE
- E1 - 10m NO TOUCH ZONE
- EB1 - PORTION OF EAST BERM
- E2 - 6m NO TOUCH ZONE
- EB2 - PORTION OF EAST BERM
- BELOW WATER EXTRACTION

Goodban Ecological Consulting Inc.

- LICENSED BOUNDARY
- LIMIT OF EXTRACTION
- WOODLAND PROTECTION ZONE LIMIT
- WOODLAND PROTECTION ZONE
- SILT FENCE LOCATION
- PROPOSED BERM (WITH IRREGULAR CONTOURING)
- SNAKE HIBERNACULUM LOCATION

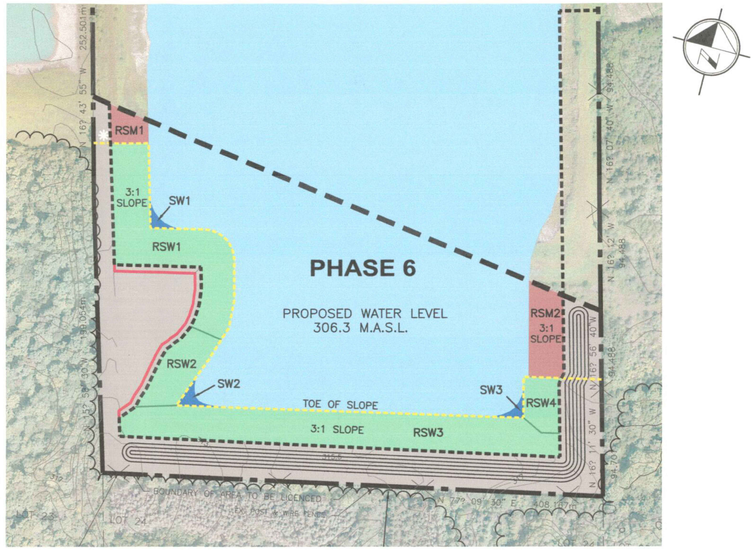
Dufferin Aggregates
a division of CRH Canada Group Inc.
2300 Steeles Ave. W., Suite 400, Concord Ontario, L4K 5X6

FIGURE 3
ECOLOGICAL MANAGEMENT PLAN
MILL CREEK PIT
PART OF LOTS 21, 22, 23 AND 24, CONCESSION II
PART OF LOT 24, CONCESSION I
TOWNSHIP OF PUSLINCH, COUNTY OF WELLINGTON

J.H. COHOON ENGINEERING LIMITED
CONSULTING ENGINEERS
BRANTFORD

SCALE: 1:3000 DATE: MAR. 15/17

0m 50m 100m 150m 200m



LEGEND

- LICENSED BOUNDARY
- LIMIT OF EXTRACTION
- WOODLAND PROTECTION ZONE LIMIT
- FUTURE SIGNIFICANT WOODLAND BOUNDARY
- PROPOSED BERM (WITH IRREGULAR CONTOURING)
- REFER TO FIGURE 3 FOR DETAILS
- RSW - REHAB SIDE SLOPE WOODLAND
- RSM - REHAB SIDE SLOPE MEADOW
- SW - SHORELINE WETLAND
- SNAKE HIBERNACULUM LOCATION
- BELOW WATER EXTRACTION

Goodban Ecological Consulting Inc.

Dufferin Aggregates
a division of CRH Canada Group Inc.
2300 Steeles Ave. W., Suite 400, Concord Ontario, L4K 5X6

FIGURE 4
REHABILITATION PLAN
MILL CREEK PIT
PART OF LOTS 21, 22, 23 AND 24, CONCESSION II
PART OF LOT 24, CONCESSION I
TOWNSHIP OF PUSLINCH, COUNTY OF WELLINGTON

J.H. COHOON ENGINEERING LIMITED
CONSULTING ENGINEERS
BRANTFORD

SCALE: 1:3000 DATE: MAR. 15/17

0m 50m 100m 150m 200m

PRE-EXTRACTION AND SITE PREPARATION – ECOLOGICAL MANAGEMENT REQUIREMENTS

I. WITHIN 3 YEARS OF APPROVAL OF THE MAJOR SITE PLAN AMENDMENT TO PERMIT PHASE 6, THE LICENSEE SHALL CREATE THE FOLLOWING ECOLOGICAL AREAS IN THE LOCATIONS IDENTIFIED ON THIS PAGE IN ACCORDANCE WITH THE ECOLOGICAL MANAGEMENT PLAN AND REHABILITATION PLAN PREPARED BY GOODBAN ECOLOGICAL CONSULTING INC., APRIL 2017:

AREA	FEATURE	DESCRIPTION
W1a	NATURAL REGENERATION AREA	THE LICENSEE SHALL MAINTAIN THIS AREA IN A NATURAL STATE WITH FUTURE CONSTRUCTION OF A SNAKE HIBERNACULUM THAT FEATURES ROOT WADS, LOGS AND ROCK PILES.
W1b	FUTURE TREE PLANTING AREA	THE LICENSEE SHALL PLANT SEEDLINGS OF EASTERN WHITE CEDAR, EASTERN RED CEDAR, WHITE BIRCH, TREMBLING ASPEN AND/OR BIGTOOTH ASPEN.
W2	FOREST MANAGEMENT AREA	THE LICENSEE SHALL MAINTAIN THE EXISTING WOODLAND IN A CONTIGUOUS STATE WITH THE WHITE PINE STAND TO THE EAST. DAMAGED SAPLINGS SHALL BE FLUSH CUT NEAR THE GROUND TO PROMOTE REGROWTH.
W3	FOREST MANAGEMENT AREA	THE LICENSEE SHALL MAINTAIN THE EXISTING WOODLAND AND PLANT EASTERN WHITE CEDAR, EASTERN RED CEDAR AND/OR WHITE BIRCH WITHIN ANY GAPS. DAMAGED SAPLINGS SHALL BE FLUSH CUT NEAR THE GROUND TO PROMOTE REGROWTH AND INVASIVE WOODY SPECIES WILL BE CUT AND TREATED.
WEMZ1	FUTURE TREE PLANTING AREA	THE LICENSEE SHALL PLANT SEEDLINGS OF EASTERN WHITE CEDAR, EASTERN RED CEDAR, WHITE BIRCH, TREMBLING ASPEN AND/OR BIGTOOTH ASPEN. INVASIVE WOODY SPECIES WILL BE CUT AND TREATED.
WEMZ2	FOREST MANAGEMENT AREA	THE LICENSEE SHALL REMOVE LARGE TREES ALONG WOODLAND EDGE AND PLANT EASTERN WHITE CEDAR, EASTERN RED CEDAR AND/OR WHITE BIRCH WITHIN GAPS. INVASIVE WOODY SPECIES WILL BE CUT AND TREATED.
WEMZ3	FOREST MANAGEMENT AREA	THE LICENSEE SHALL PLANT EASTERN WHITE CEDAR, EASTERN RED CEDAR AND/OR WHITE BIRCH. DAMAGED SAPLINGS SHALL BE FLUSH CUT NEAR THE GROUND TO PROMOTE REGROWTH.
A	FOREST MANAGEMENT AREA	THIS WOODLAND SHALL BE MAINTAINED IN A NATURAL STATE.
B	FOREST MANAGEMENT AREA	THIS WOODLAND SHALL BE MAINTAINED IN A NATURAL STATE. DAMAGED SAPLINGS SHALL BE FLUSH CUT NEAR THE GROUND TO PROMOTE REGROWTH.
S1	FUTURE TREE PLANTING AREA	THE LICENSEE SHALL MAINTAIN DESIRABLE WOODY SPECIES AND REMOVE INVASIVE WOODY SPECIES TO BE CUT AND TREATED. GAPS WILL BE PLANTED WITH EASTERN WHITE CEDAR, EASTERN RED CEDAR AND/OR WHITE BIRCH.
SB1	FUTURE TREE PLANTING AREA	NORTH/PIT SIDE OF BERM: THE LICENSEE SHALL PLANT EASTERN WHITE CEDAR, EASTERN RED CEDAR, PIN CHERRY, WHITE BIRCH, TREMBLING ASPEN AND/OR BIGTOOTH ASPEN. SOUTH/NON-PIT SIDE OF BERM: THE LICENSEE SHALL PLANT BASSWOOD, BLACK CHERRY, RED OAK AND/OR WHITE PINE. HABITAT FEATURES SUCH AS ROOT WADS, LOG AND ROCK PILES SHALL BE ADDED, ALONG WITH 5 SHRUB PATCHES AND 10 POLLINATOR STRIPS.
SEB1	FUTURE TREE PLANTING AREA	NORTH WEST/PIT SIDE OF BERM: THE LICENSEE SHALL PLANT EASTERN WHITE CEDAR, EASTERN RED CEDAR, PIN CHERRY, WHITE BIRCH, TREMBLING ASPEN AND/OR BIGTOOTH ASPEN. CREST OF BERM: THE LICENSEE SHALL PLANT BASSWOOD, BLACK CHERRY, RED OAK AND/OR WHITE PINE.

PRE-EXTRACTION AND SITE PREPARATION – ECOLOGICAL MANAGEMENT REQUIREMENTS (CONT'D)

SE1	FUTURE TREE PLANTING AREA	THE LICENSEE SHALL MAINTAIN DESIRABLE WOODY SPECIES AND REMOVE INVASIVE WOODY SPECIES TO BE CUT AND TREATED. GAPS WILL BE PLANTED WITH BASSWOOD, BLACK CHERRY, RED OAK AND/OR WHITE PINE.
E1	FOREST MANAGEMENT AREA	THE LICENSEE SHALL MAINTAIN DESIRABLE WOODY SPECIES AND REMOVE INVASIVE WOODY SPECIES TO BE CUT AND TREATED. GAPS WILL BE PLANTED WITH EASTERN WHITE CEDAR, EASTERN RED CEDAR AND/OR WHITE BIRCH.
E2	FOREST MANAGEMENT AREA	THE LICENSEE SHALL MAINTAIN DESIRABLE WOODY SPECIES AND REMOVE INVASIVE WOODY SPECIES TO BE CUT AND TREATED.
EB1	FUTURE TREE PLANTING AREA	WEST SIDE OF BERM: THE LICENSEE SHALL PLANT BASSWOOD, BLACK CHERRY, RED OAK AND/OR WHITE PINE. EAST SIDE OF BERM: THE LICENSEE SHALL PLANT EASTERN WHITE CEDAR, EASTERN RED CEDAR, PIN CHERRY, WHITE BIRCH, TREMBLING ASPEN AND/OR BIGTOOTH ASPEN. HABITAT FEATURES SUCH AS ROOT WADS, LOG AND ROCK PILES SHALL BE ADDED, ALONG WITH 2 SHRUB PATCHES AND 5 POLLINATOR STRIPS.
EB2	FUTURE NATURAL REGENERATION AREA	THE LICENSEE SHALL PLANT NON-INVASIVE GRASS/LEGUME MIXTURE TO STABILIZE THE SLOPE, INCLUDING MILKWEED. HABITAT FEATURES SUCH AS ROOT WADS, LOG AND ROCK PILES SHALL BE ADDED, ALONG WITH 2 SHRUB PATCHES AND 5 POLLINATOR STRIPS.

II. THE LICENSEE SHALL INSTALL STAKES IN PHASE 6 ALONG THE WESTERN EXTRACTION LIMIT, 6m FROM THE SOUTHERN LICENCE BOUNDARY, AND 6m TO 10m FROM THE EASTERN LICENCE BOUNDARY.

III. PRIOR TO STRIPPING AND BERM CONSTRUCTION, THE LICENSEE SHALL INSTALL LIGHT DUTY SILT FENCING IN PHASE 6 ALONG THE WESTERN EXTRACTION LIMIT, 6m FROM THE SOUTHERN LICENCE BOUNDARY, AND 6m TO 10m FROM THE EASTERN LICENCE BOUNDARY, AS SHOWN ON THIS PLAN.

IV. THE LICENSEE SHALL CONSTRUCT BERMS ALONG THE SOUTH AND EAST BOUNDARY OF PHASE 6 OCCUPYING AN AREA OF APPROXIMATELY 1.2 ha., AS SHOWN ON THIS PLAN, WITH IRREGULAR AND NATURALISTIC CONTOURING. THE BERMS SHALL BE TOP DRESSED WITH A MINIMUM OF 30m OF TOPSOIL AND BE PLANTED IN ACCORDANCE WITH THE PRE-EXTRACTION AND SITE PREPARATION FEATURES NOTED ON THIS PLAN.

V. THE LICENSEE, WITH A QUALIFIED ECOLOGIST, SHALL INSTALL ONE SNAKE HIBERNACULUM IN ACCORDANCE WITH THE LOCATION SHOWN ON THIS PLAN. THE HIBERNACULUM WILL BE A MINIMUM OF 3m x 3m IN AREA, AND BE EXCAVATED TO A DEPTH OF 3.5m BUT SHALL NOT EXCEED THE DEPTH OF 308.2 MASL.

VI. ALL TREE CLEARING SHALL BE COMPLETED BETWEEN NOVEMBER 1 AND APRIL 1 TO AVOID THE BREEDING BIRD SEASON AND ACTIVITY.

VII. TREE PLANTING AREAS SHALL BE PLANTED DURING SPRING AND/OR FALL PLANTING PERIODS WITH APPROXIMATELY 2,500 SEEDLINGS PER HECTARE AND THE SPACING WILL BE APPROXIMATELY 2.0m x 2.0m.

VIII. SHRUB PATCHES SHALL BE PLANTED DURING SPRING AND/OR FALL PLANTING PERIODS AND ARE APPROXIMATELY 10m x 10m IN SIZE AND SPACING/DENSITY WILL BE APPROXIMATELY 1.5m x 1.5m.

IX. TREE AND SHRUB SPECIES AND PERCENTAGES OF SPECIES SHALL BE IN ACCORDANCE WITH THE ECOLOGICAL MANAGEMENT PLAN PREPARED BY GOODBAN ECOLOGICAL CONSULTING INC. IN APRIL 2017.

X. THE LICENSEE SHALL IMPLEMENT THE ADDITIONAL HABITAT REQUIREMENTS FOR EACH AREA IN ACCORDANCE WITH THE ECOLOGICAL MANAGEMENT PLAN PREPARED BY GOODBAN ECOLOGICAL CONSULTING INC. IN APRIL 2017.

PROGRESSIVE & FINAL REHABILITATION – ECOLOGICAL MANAGEMENT REQUIREMENTS

I. PROGRESSIVE REHABILITATION WILL BE COMPLETED WITHIN PHASE 6 AS FINAL EXTRACTION LIMITS AND DEPTHS ARE REACHED. THE FOLLOWING FEATURES WILL BE CREATED AS A RESULT OF THE REHABILITATION IN ACCORDANCE WITH THE ECOLOGICAL MANAGEMENT PLAN AND REHABILITATION PLAN PREPARED BY GOODBAN ECOLOGICAL CONSULTING INC., APRIL 2017:

AREA	FEATURE	DESCRIPTION
RSM1	NATURAL REGENERATION AREA	THE LICENSEE SHALL PLANT NON-INVASIVE GRASS/LEGUME MIXTURE TO STABILIZE THE SLOPE, INCLUDING MILKWEED. HABITAT FEATURES SUCH AS ROOT WADS, LOG AND ROCK PILES SHALL BE ADDED, ALONG WITH 1 SHRUB PATCH AND 3 POLLINATOR STRIPS.
RSM2	NATURAL REGENERATION AREA	THE LICENSEE SHALL PLANT NON-INVASIVE GRASS/LEGUME MIXTURE TO STABILIZE THE SLOPE, INCLUDING MILKWEED. HABITAT FEATURES SUCH AS ROOT WADS, LOG AND ROCK PILES SHALL BE ADDED, ALONG WITH 2 SHRUB PATCHES AND 5 POLLINATOR STRIPS.
RSW1	TREE PLANTING AREA	THE LICENSEE SHALL PLANT EASTERN WHITE CEDAR, EASTERN RED CEDAR, PIN CHERRY, WHITE BIRCH, TREMBLING ASPEN, AND/OR BIGTOOTH ASPEN, ALONG WITH 5 SHRUB PATCHES AND 10 POLLINATOR STRIPS.
RSW2	TREE PLANTING AREA	THE LICENSEE SHALL PLANT BLACK OAK, CHINQUAPIN OAK, RED OAK AND/OR WHITE OAK, ALONG WITH TALLGRASS PRAIRIE PLANT SPECIES.
RSW3	TREE PLANTING AREA	THE LICENSEE SHALL PLANT EASTERN WHITE CEDAR, EASTERN RED CEDAR, PIN CHERRY, WHITE BIRCH, TREMBLING ASPEN, AND/OR BIGTOOTH ASPEN, ALONG WITH 7 SHRUB PATCHES AND 15 POLLINATOR STRIPS.
RSW4	TREE PLANTING AREA	THE LICENSEE SHALL PLANT NON-INVASIVE GRASS/LEGUME MIXTURE TO STABILIZE THE SLOPE, INCLUDING MILKWEED. HABITAT FEATURES SUCH AS ROOT WADS, LOG AND ROCK PILES SHALL BE ADDED, ALONG WITH 3 SHRUB PATCHES AND 5 POLLINATOR STRIPS.
SW1, SW2, SW3	SWALLOW WETLAND AREAS	THE LICENSEE SHALL INSTALL ROOT WADS, LOG AND ROCK PILES ABOVE AND BELOW THE WATER LINE, ALONG WITH SMALL SANDBAR WILLOWS AND OTHER WETLAND SHRUBS TO BE PLANTED ALONG THE SHORELINE. A GRAVEL BAR SHALL BE ESTABLISHED ABOVE THE HIGH WATER LINE.

PROGRESSIVE & FINAL REHABILITATION – ECOLOGICAL MANAGEMENT REQUIREMENTS (CONT'D)

II. THE BACKFILL SIDE SLOPES SHALL BE CONSTRUCTED TO A MINIMUM OF 3:1 WITH AN IRREGULAR SURFACE. HABITAT FEATURES ON THESE SLOPES SHALL BE PLANTED IN ACCORDANCE WITH PROGRESSIVE AND FINAL REHABILITATION FEATURES NOTED ON THIS PLAN.

III. TREE PLANTING AREAS SHALL BE PLANTED DURING SPRING AND/OR FALL PLANTING PERIODS WITH APPROXIMATELY 2,500 SEEDLINGS PER HECTARE AND THE SPACING WILL BE APPROXIMATELY 2.0m x 2.0m.

IV. SHRUB PATCHES SHALL BE PLANTED DURING SPRING AND/OR FALL PLANTING PERIODS AND ARE APPROXIMATELY 10m x 10m IN SIZE AND SPACING/DENSITY WILL BE APPROXIMATELY 1.5m x 1.5m.

V. TREE AND SHRUB SPECIES AND PERCENTAGES OF SPECIES SHALL BE IN ACCORDANCE WITH THE REHABILITATION PLAN PREPARED BY GOODBAN ECOLOGICAL CONSULTING INC. IN APRIL 2017.

VI. THE LICENSEE SHALL IMPLEMENT THE ADDITIONAL HABITAT REQUIREMENTS FOR EACH AREA IN ACCORDANCE WITH THE REHABILITATION PLAN PREPARED BY GOODBAN ECOLOGICAL CONSULTING INC. IN APRIL 2017.

VII. THE LICENSEE SHALL REMOVE ALL LIGHT DUTY SILT FENCING SHOWN ON THIS PLAN ONCE BERMS AND REHABILITATED SLOPES ARE VEGETATED AND STABLE.

VIII. THE PHASE 6 PIT LAKE AREA WILL BE APPROXIMATELY 4.27 ha.

MONITORING AND REPORTING

I. THE LICENSEE SHALL COMPLETE AN ANNUAL ECOLOGICAL MONITORING REPORT TO BE SUBMITTED TO MNRF, COUNTY OF WELLINGTON, TOWNSHIP OF PUSLINCH AND GRCA BY JUNE 30 OF THE FOLLOWING YEAR, DEMONSTRATING THE IMPLEMENTATION OF THE ECOLOGICAL MANAGEMENT PLAN AND REHABILITATION PLAN WITHIN PHASE 6.

II. AS PART OF THE MONITORING REPORT A NETWORK OF 8 FIXED-POINT PHOTO-MONITORING STATIONS WILL BE PERMANENTLY ESTABLISHED TO TAKE PHOTOGRAPHS A MINIMUM OF 3 TIMES PER YEAR.

October 2024 Site Plan Amendments completed by:

PLANNING URBAN DESIGN & LANDSCAPE ARCHITECTURE
MHBC
113 COLLIER STREET, BARRIE ON L4M 1H2
P: 705 728 0045 F: 705 728 2010 | WWW.MHBCPLAN.COM

Legend:

1. REFER TO FIGURES FOR INDIVIDUAL LEGENDS AS SHOWN.

Notes:

1. REFER TO SHEET 6 FOR REHABILITATION DETAILS NORTH OF TOWNSHIP ROAD 2.
2. AREA TO BE REHABILITATED = ~~80.8~~ ~~85.3~~ ha NORTH
   ~~38.8~~ ha SOUTH
   ~~119.6~~ ~~122.1~~ ha TOTAL
3. BUILDINGS MAY REMAIN ON SITE AT DISCRETION OF LICENCE HOLDER.
4. PERIMETER BERMS MAY REMAIN IF MATERIAL NOT NEEDED FOR REHABILITATION.
5. REFER TO "ECOLOGICAL MANAGEMENT PLAN AND REHABILITATION PLAN" BY GOODBAN ECOLOGICAL CONSULTING INC., APRIL 2017.

MINISTRY OF NATURAL RESOURCES AND FORESTRY
GUELPH DISTRICT
SITE PLANS
APPROVED
UNDER THE AGGREGATE RESOURCES ACT
AGGREGATE INSPECTOR
DATE June 19/2019

SITE PLAN AMENDMENTS

NO.	DESCRIPTION	DATE	INIT.
1.	PAGE 8 of 8 ADDED TO REFLECT ECOLOGICAL MANAGEMENT AND REHABILITATION PLAN DETAILS	SEPT. /17	K.M.
2.	UPDATED DRAWINGS 1 TO 7 OF 8	OCT. 2024	K.M.

REVISIONS

NO.	DESCRIPTION	DATE	INIT.
1.	ADDITIONS TO ADDRESS MNRF COMMENTS	MAR. /18	K.M.

MILL CREEK AGGREGATES

PART OF LOTS 21, 22, 23 AND 24, CONCESSION II
PART OF LOT 24, CONCESSION I
TOWNSHIP OF PUSLINCH, COUNTY OF WELLINGTON

University of Guelph

854 GORDON STREET
GUELPH, ONTARIO
N1G 1Y7

Scale 1:3000

50 0 50 100 150 m

J. KEVIN MITCHELL IS AUTHORIZED BY THE MINISTRY OF NATURAL RESOURCES TO PREPARE SITE PLANS FOR PITS AND QUARRIES.

DRAFT

J.H. COHOON ENGINEERING LIMITED
CONSULTING ENGINEERS

440 HARDY ROAD , UNIT #1
BRANTFORD – ONTARIO , N3T 5L8
TEL. (519) 753-2656
FAX. (519) 753-4263

PHASE 6 ECOLOGICAL MANAGEMENT PLAN & REHABILITATION PLAN DETAIL

JOB: 11132

Drawing No. 8 OF 8

3

Attachment 3

MHBC | PLANNING URBAN DESIGN & LANDSCAPE ARCHITECTURE

September 17, 2024

MNR Aggregates Section
Regional Operations Division
300 Water Street
Peterborough, ON K9J 3C7

RE: Mill Creek Pit Site Plan Amendment (Licence No. 5738) – Planning and Land Use Considerations Letter
OUR FILE 9061DX

On behalf of our client, Dufferin Aggregates, a CRH Company ("Dufferin"), please accept this letter as an overview of the planning and land use planning considerations for the Mill Creek Pit Site Plan Amendment, which is licenced by the University of Guelph and operated by Dufferin. The Mill Creek Pit located at Part of Lots 21, 22, 23 and 24, Concession 2 and Part of Lot 24, Concession 1 in the Township of Puslinch, County of Wellington and is currently licenced for above and below the water table extraction.

In accordance with MNR's requirements, this planning and land use considerations letter has been prepared as part of an Aggregate Resources Act ("ARA") Site Plan Amendment request to extend the limit of above/below water extraction within a 2.5 ha area of the Mill Creek Pit licence. The portion of the Mill Creek Pit subject to the Site Plan Amendment and the planning analysis contained herein is outlined in **Figure 1** (attached) and is shown as the "Subject Area".

The Subject Area is zoned Extractive (EXI) with site-specific special provision No. 58 (SP58) in the Township of Puslinch Zoning By-law. See **Figure 2** attached.

Permitted uses within the EXI Zone include "Extractive uses". Extractive uses (which include a "pit") currently exist on site and are a permitted use within the EXI Zone. The Township Zoning By-law defines a "pit" as the following:

> **Pit:** land or land under water where unconsolidated aggregate material is being or has been removed by means of an open excavation to supply material for construction, industrial or manufacturing purposes, and has not been rehabilitated, but shall not include a quarry as defined herein, an excavation incidental to the erection of a building or structure for which a building permit has been granted, or an excavation incidental to the construction of any public works.

The SP58 site specific provision states that, ”No setback shall be required for: Any pitface or excavation on those lands zoned EXI (sp58) when adjacent to an H-4 Zone or adjacent to an A(sp1) Zone, Any building structure, or reduce stockpile on those lands zone EXI(sp58) from an adjacent H-4 Zone and Any berm on those lands zoned EXI (sp58) from an adjacent H-4 Zone or from an adjacent A (sp1) Zone.” Such provisions are not applicable to the Subject Area as there is no adjacent H-4 Zone.

On this basis, above/below water extraction of the Subject Area is a permitted use within the EXI Zone. Furthermore, as shown on **Figures 1 and 2** the lands surrounding the Subject Area are all licenced and zoned to permit extraction and there are no adjacent sensitive receptors.

In conclusion, the site is zoned to permit the Site Plan Amendment and making available as much aggregate as is realistically possible from this site is consistent with provincial policy. Therefore the Site Plan Amendment application represents good planning and wise resource management.

Should you have any questions, please do not hesitate to contact the undersigned.

Yours truly,

MHBC

Brian Zeman, BES, MCIP, RPP
Partner

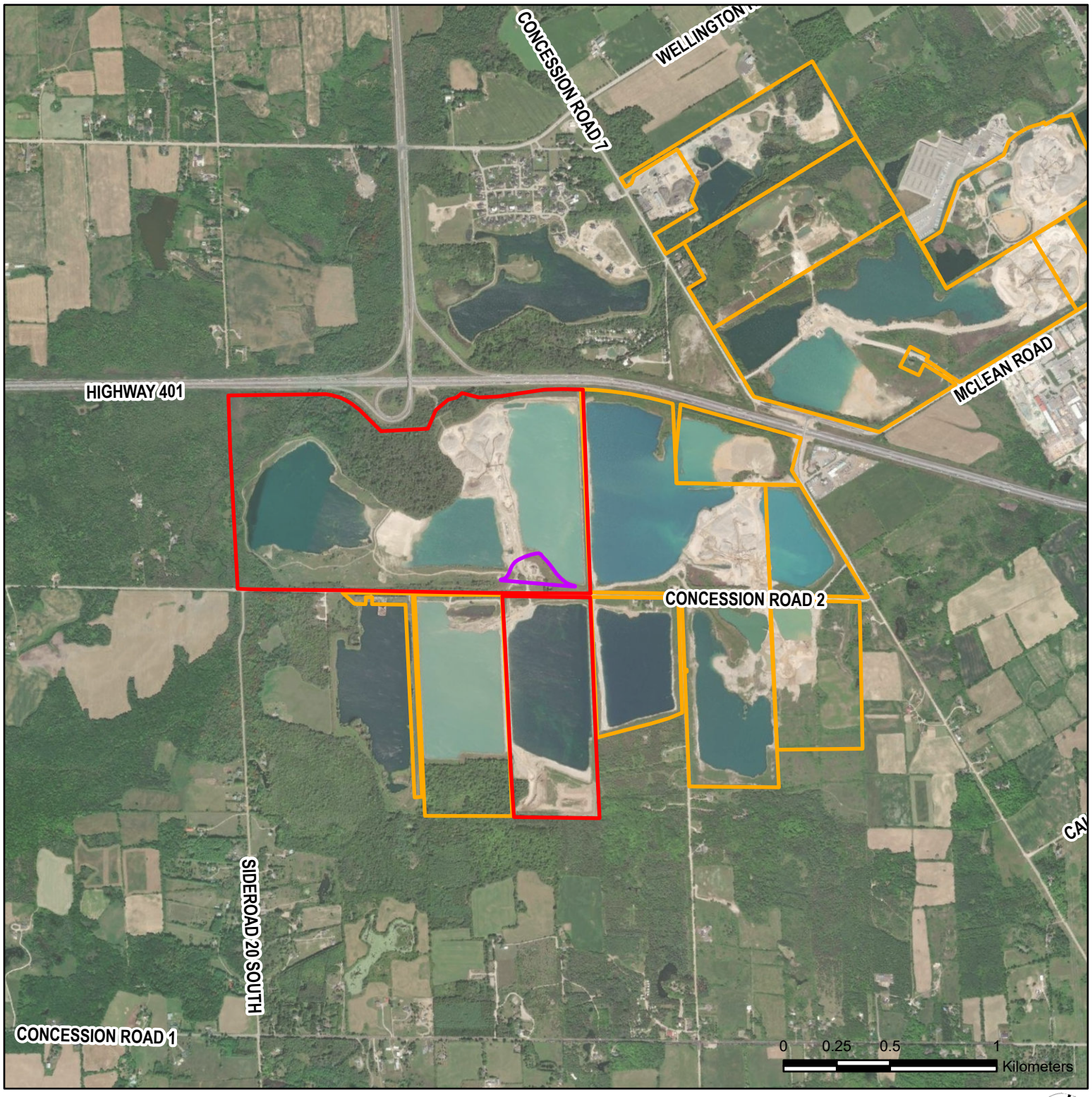
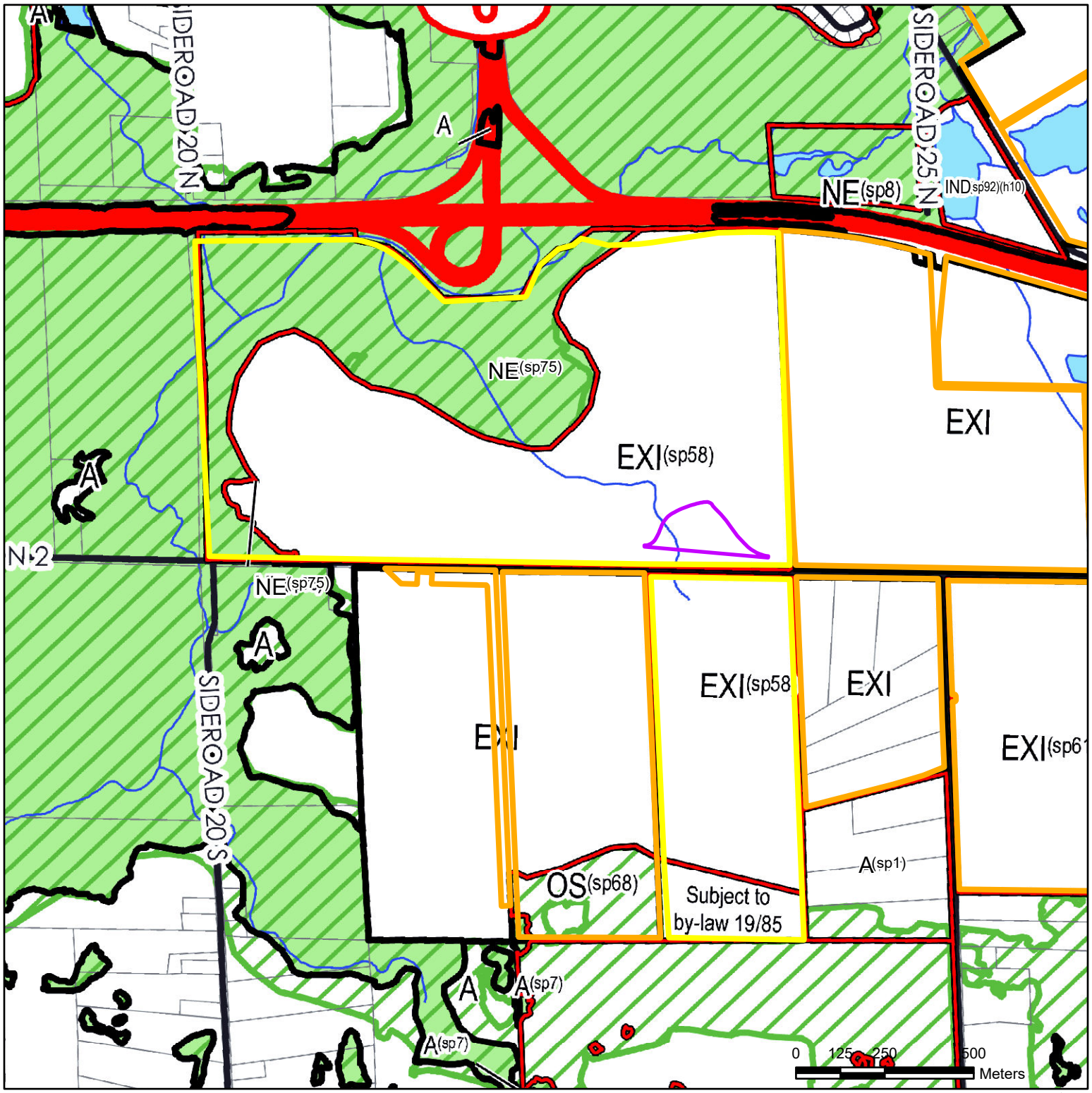


Figure 1 - Site Location

Subject Area

Mill Creek Licence Boundary

Other ARA Licences



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- Subject Area
- Mill Creek Licence Boundary
- Other ARA Licences
- Site Specific Exemption
- Zoning Limits
- Environmental Protection Overlay
- Natural Environment

4

Attachment 4

REPORT

Mill Creek Pit - Proposed Site Plan Amendment

Water Report

Submitted to:

Dufferin Aggregates, A CRH Company

3300 Steeles Avenue West
4th Floor
Concord, ON L4K 5X6

Submitted by:

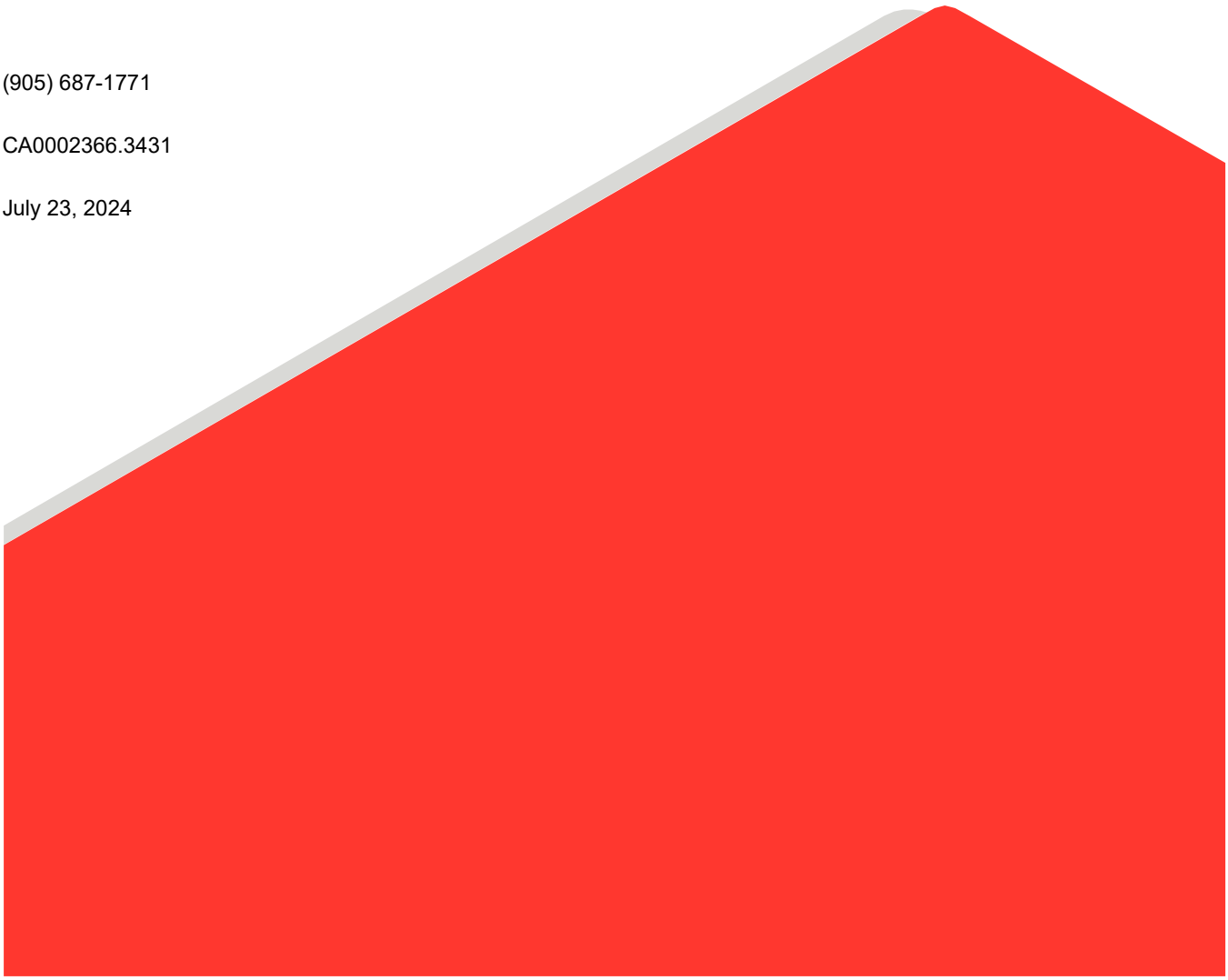
WSP Canada Inc.

55 King Street, Suite 700, St. Catharines, ON L2R 3H5

(905) 687-1771

CA0002366.3431

July 23, 2024



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1.0 INTRODUCTION

1.1 Background

WSP Canada Inc. (WSP) was retained by Dufferin Aggregates, a CRH Company (herein referred to as 'Dufferin') to prepare a water assessment for a proposed Site Plan Amendment for the Mill Creek Pit in the Township of Puslinch, County of Wellington, Ontario. The Licensee for the Mill Creek Pit (Licence 5738) is the University of Guelph and the pit is operated by Dufferin Aggregates.

The Mill Creek Pit is located on the north and south sides of Concession Road 2, between Sideroad 20 South and Sideroad 25 South, in the Township of Puslinch (**Figure 1**). The legal description is Part of Lots 21, 22, 23 and 24, Concession II, Part of Lot 24, Concession I, Township of Puslinch, County of Wellington. The approved extraction at the Mill Creek Pit consists of six phases. Phases 1, 3, 4 and 5 are located on the north side of Concession Road 2, while Phases 2 and 6 are located on the south side. All six phases involve below water extraction. The total area that is licenced covers 188.6 ha and the approved extraction area is 122.1 ha. Adjacent land uses in the vicinity of the Mill Creek Pit are a mix of aggregate extraction, natural heritage, agricultural, rural residential and, immediately to the north, the Highway 401 corridor. The Mill Creek Pit (herein referred to as the 'Site'), is underlain by a substantial outwash deposit, which extends to the northeast and southwest of Highway 401. This deposit forms an important aggregate resource in this area. As shown in Figure 1, several additional aggregate properties have also been developed within the outwash deposit and several below-water pits are present in close proximity to the Site.

The Site is licenced by the Ministry of Natural Resources (MNR) under the Aggregate Resources Act (ARA) as a Class 'A' Pit Below Water for extraction of the aggregate resource from above and below the water table (Licence No. 5738). A copy of the current Aggregate Resource Act (ARA) Site Plans for the Site is attached in **Appendix A**.

Dufferin is applying for an amendment to the ARA Site Plans to extend the limit of below water extraction adjacent to the Phase 1 pond to include a 2.5 ha area (Site Plan Amendment Area) that is currently occupied by a berm. The proposed amendment area is shown on **Figure 2**. Upon Site rehabilitation, the extension of the extraction area will result in an increase to the size of the rehabilitated pit pond with ecological enhancements along the shoreline.

This Water Report was completed by a WSP project team and curriculum vitae are provided in **Appendix B**.

1.2 Evaluation Requirements

The purpose of this Water Report is to identify potential impacts on local groundwater and surface water resources, resulting from below-water extraction within the proposed Site Plan Amendment area. This study has been undertaken to satisfy the requirements for a Site Plan Amendment under the Aggregate Resources of Ontario (MNR, August 2020) and the Clean Water Act (2006) for source water considerations.

Section 1.1.3 of the ARA Standards (MNR, August 2020) outlines the requirements for the Water Assessment for the Site:

> *1.1.3 For applications to lower the depth of extraction of a licence or aggregate permit in an area of the site that does not currently allow extraction below the water table but where extraction below the water table is permitted in other areas of the site, and for applications to expand a licence boundary into an adjacent road*

allowance to extract below the water table, applicants must have a qualified professional prepare a supplement to a water report that has previously been completed for the site that:

(a) identifies whether extracting below water in the area of the site identified in the proposed amendment would have any negative impacts on any water features or resources and their uses located in the zone of influence for extraction below the water table, and

(b) proposes preventative, mitigative or remedial measures to address any negative impacts identified in 1.2.1.

Section 1.6 of the ARA Standards (MNR, August 2020) outlines the requirements for the Source Water Considerations for the Site:

1.6 If the site is in a source protection area under the Clean Water Act, identify activities proposed at the site that are drinking water threats set out in applicable source protection plans, and provide details of how relevant source water protection policies will be followed and associated mitigation measures that will be implemented.

2.0 PHYSICAL SETTING

The physical setting, topography, drainage, geology and hydrogeology of the Site and for the proposed Site Plan Amendment area have been well documented in numerous reports prepared for the Site. The most recent series of reports with the above information and the current monitoring data were prepared by WSP and dated March 27, 2024:

- Mill Creek Aggregates Pit 2023 Coordinated Monitoring Report;
- Mill Creek Aggregates Pit Appendix A of the Coordinated Monitoring Report;
- Mill Creek Aggregates Pit Appendix B of the Coordinated Monitoring Report; and
- Technical Appendix C 2023 Annual Fisheries Report of the Mill Creek Coordinated Monitoring Report.

The proposed Site Plan Amendment area is located within the portion of the Site described on the Site Plans as Phase 1. This area is currently occupied by a berm used to store topsoil and overburden, and an outbuilding from the original farm. The berm and outbuilding will be removed to facilitate extraction.

2.1 Hydrogeology

2.1.1 Site Specific Data

Groundwater and surface water monitoring has been completed at numerous locations across the Site since 1986 as part of a comprehensive monitoring program. Monitoring locations are shown in **Figure 3**. Construction details of the monitoring locations are presented in **Tables D-1 to D-5, Appendix D**.

An extensive database of water level and temperature data has been obtained and reviewed, interpreted and discussed in detail in the annual monitoring reports completed for the Site. As such, a review of all available monitoring data for the Site is not presented in this report, as it is assumed that the reader will have access to the Mill Creek Pit 2023 Coordinated Monitoring Report (WSP, 2024). Select graphs presenting groundwater level and temperature data from monitoring locations located closest to the proposed Site Plan Amendment area are presented in **Figures E-1 to E-11, Appendix E**. Groundwater contour maps generated using data recorded in

August 2023 (representing the 2023 'high' water table conditions) and January 2023 (representing the 2023 'low' water table conditions) are presented on **Figures 5 and 6**. Similar figures have been included in each annual report for the Site since the mid-1990s.

Hydrographs

Manual water level readings at select wells located near the Site Plan Amendment area (BH4, BH11, 92-1/R and 92-13) are presented in **Figures E-1, E-4, E-5 and E-6, Appendix E**. Automated loggers are installed at select locations on-Site, including BH4 and 92-13 (Figure 3). The automated water level data collected at BH4 and 92-13 are presented in **Figures E-2 and E-7**, respectively. A hydrograph presenting the water level in the on-Site ponds is presented in **Figure E-10**.

Generally, water level data from the Site exhibit typical seasonal variation, which is a peak in the spring due to the annual spring melt and precipitation recharge, decreasing through the summer, and an increase in the late fall. The fluctuations in groundwater elevations that have historically been observed on-Site are a direct response to several factors, including seasonal climatic conditions and proximity to open-water ponds.

Given the close proximity of 92-1R and 92 13 to the Phase 1 and Phase 4 ponds, the groundwater levels at these wells are similar to the levels of these ponds, as expected.

Temperature Data

The automated temperature data recorded at BH4 and 92-13 are presented in **Figures E-3 and E-8**, respectively. A thermograph showing the manual pond water temperature data is presented in **Figure E-11**.

BH4 is located approximately 40 m south of silt pond SP3, adjacent to Township Road 2, and outside of the licenced extraction area. As shown in Figure E-3, the seasonal groundwater temperature fluctuation observed at this location exhibits a wave-like pattern, which has been relatively stable since 2011. Thus, an aggregate extraction influence is not interpreted at BH4.

Monitor nest 92-13 is a multi-level monitoring location that is located approximately 20 m to the west (downgradient) of the pond in Phase 1. Given the close proximity of the monitor to the pond, this monitor provides data with respect to the thermal effects resulting from the presence of the pond, wash water pumping, and silt pond water recirculation. It is noted that this monitor will eventually be removed during the extraction in Phase 5. The groundwater temperature fluctuations at this location (Figure E-8) resemble a wave-like pattern, similar to the ambient air temperature. The air temperature exhibits a generally consistent pattern that sees annual winter lows in January/February, increasing to annual highs in the summer (July/August) and then decreasing through the fall back to the winter season. The natural pre-extraction groundwater temperatures show a reasonably similar pattern, with annual lows of 5.7°C to 8.5°C that occur in late spring/early summer, increasing to annual highs of 9.0°C to 10.7°C in the fall, followed by a progressive decrease through the fall and into the winter. The historical data illustrate the pre-extraction (1992 to 1994) natural seasonal variation at the shallow monitor at nest 92-13, followed by the thermal modifications resulting from the progressive development of the Phase 1 pond.

Groundwater Flow

Based on the groundwater contour maps presented in past annual monitoring reports, the interpretation of groundwater flow within the surficial aquifer at the Site has been consistent over the long term, and is consistent during both high and low water table conditions. Profiles of the 2023 high and low water conditions from southeast to northwest across the north property are presented in the cross-section (**Figure 7**). The alignment of cross-section X-X' is shown on Figures 5 and 6.

In reviewing the location of the proposed Site Plan Amendment area relative to the perimeter of the Phase 1/4/5 pond, and the relatively minor increase in the size of the Phase 1/4/5 pond, it is anticipated that the extraction of the Site Plan Amendment area below the water table will not result in a notable modification to the final pond levels or groundwater flow patterns at the Site.

Conditions Beneath Mill Creek

Hydraulic gradient conditions beneath Mill Creek have been determined at five locations by means of shallow drive point piezometer installations. Based on the baseline (pre-extraction) data collected from the Site in 1988, the vertical hydraulic gradient at drive points DP3 and DP4 ranged from 0.03 m to 0.07 m, while the vertical hydraulic gradient at drive points DP1, DP2 and DP5 ranged from 0.21 m to 0.27 m (GLL & JHL, 1988). The average hydraulic gradient calculated using the available monitoring data collected at the drive points between 1988 and 2023 shows similar results. The historical average hydraulic gradient at DP3 and DP4 ranged from 0.05 m to 0.08 m, while the historical average hydraulic gradient at DP1, DP2 and DP5 ranged from 0.20 m to 0.25 m. There are no anticipated impacts to hydraulic gradients beneath Mill Creek as a result of extraction of the Site Plan Amendment area.

Groundwater Influx to Mill Creek

Groundwater influx to Mill Creek is estimated at each drive point location for different flow conditions and the measurement is interpolated for the stream sections between drive points, as presented in the annual monitoring reports. Based on the baseline (pre-extraction) data collected from the Site, the contribution of groundwater discharge to the creek across the Site was estimated to be about 20 L/s to 30 L/s, which represents between 10 to 15% of the summer low flow estimate at the southern property boundary (GLL & JHL, 1988).

In 2023, the average groundwater influx to Mill Creek from the Site was estimated to be 28.3 L/s (WSP, 2024). Groundwater influx values have fluctuated since 2000, but have generally remained similar to, or higher than, the historic range from 1989 to 1999. The higher values of groundwater discharge from 2004 to 2023 compared to the pre-1999 historic average are attributed to the consistently higher water level in the Phase 1 pond since 2004, and in the Phase 3 and Phase 4 ponds in recent years, and the resulting higher groundwater levels across the site. There are no anticipated impacts to groundwater influx to Mill Creek as a result of extraction of the Site Plan Amendment area.

2.2 Groundwater Use

2.2.1 Local Water Wells

A search of the MECP Water Well Record database was undertaken to identify well records located within a 500 m radius of the Site. The results of the search are shown on **Figure 8**, and summarized in **Table F-1, Appendix F**.

A total of fifty-eight (58) water well records plot within the search area. The wells are listed by their location on properties located near the Site (Table F-1). A summary of the results is provided below:

- Nine (9) records pertain to wells which are located and monitored on the Mill Creek Pit property: two bedrock supply wells for the former barn/domestic buildings on-Site (1964 and 1973), and test holes/observation wells installed between 1978 and 2020;

- Seven (7) records pertain to the adjacent CBM Aggregates properties to the east/southeast: three (3) are records of well abandonments in 2012/2015, and four (4) are for monitoring/observation well installations in 2012/2017/2018;
- Six (6) records are listed for the Slovenski Park property located northeast of the Site: three (3) records are for monitoring well installations in 2016, two (2) records are for the installation of an extension onto existing wells in 2017, and one (1) record is a bedrock supply well installation from 1965;
- Four (4) records relate to the former Reid Heritage Homes Pit property located north of the Site: three (3) are for monitoring well installations in 1994 and one (1) is a cluster record for the abandonment of 18 monitoring wells in 2010;
- Two (2) are interpreted to be incorrectly plotted and are actually for wells located more than 500 m from the Site;
- Nine (9) are monitoring wells installed by MTO near the Hanlon interchange in 2019/2020;
- One (1) is a bedrock test well that was installed in 1968 and plots in the middle of an on-Site pond; and,
- Twenty (20) are private domestic or farm supply wells: three (3) are completed in the overburden and seventeen (17) are completed in the bedrock.

A residential water well survey was undertaken in May 2023 in accordance with MECP technical guidance (MECP, 2008). The survey results are presented in **Table F-2, Appendix F** and are summarized below:

- Attempts were made to deliver surveys to thirteen (13) parcels with a municipal address that were identified within the survey area. The door-to-door surveys were conducted on May 23, 2023, with a follow up visit completed on May 25, 2023. Both visits were completed in the late afternoon/evening. If no contact had been established by the second attempt, a pre-stamped return envelope and survey package were left in the mailbox.
- A total of four (4) property owners responded either verbally in person during the door-to-door survey or mailed a completed survey package later. Two (2) property owners verbally declined to participate during the door-to-door survey. The remaining seven (7) surveys were not completed owing to no response from the property owner.
- Of the four (4) property owners who responded to the survey either in person or by mail, three (3) identified a drilled bedrock well was used to provide domestic water supply, and one (1) identified a shallow dug well was used to provide domestic water supply. The shallow dug well was located at the property located at 7145 Township Road 2, which is owned by CBM Aggregates. The shallow well is monitored as part of the Mill Creek Pit monitoring program (“Smith Well”).

2.2.2 Municipal Supply Wells

Urban centres located near the Site are serviced by municipal well fields typically installed within the lower bedrock aquifer; however, there are no well-head protection areas (WHPAs) on Site. Within the study area surrounding the Site, WHPA-D for the Clemens Mill municipal water supply system is mapped to extend within about 765 m from the northwest corner of the Site, at its closest point.

2.2.3 Permits to Take Water

A search of the MECP Permit to Take Water (PTTW) database was undertaken as part of the current study to identify groundwater users within the study area. A total of four (4) PTTWs were identified for properties located within 1 km of the Site, summarized as follows.

- PTTW No. 5557-B93NZ5 is issued to CRH Canada Group Inc. for operations at the Mill Creek Pit. The permit was issued on February 7, 2019, as a renewal of a previous permit. Several former PTTWs that are currently expired or revoked/replaced were located for the Site. The active PTTW allows for a maximum total taking of 17,000,000 L/day from two sources: Phase 1 Pond and Phase 4 Pond or Silt Pond SP4. The purpose of taking from Phase 1 Pond is for aggregate washing, while the purpose of water taking for the Phase 4 Pond or Silt Pond SP4 is to maintain the water level elevation of the Phase 4 Pond or Silt Pond SP4 to an elevation between that of the Phase 1 and Phase 3 ponds.
- PTTW No. 4031-BCGP9H is issued to CBM for aggregate washing at its McNally Pit and is a renewal of a previous PTTW. The Permit allows water to be taken from the source pond at a maximum rate of 16,366 L/min for a maximum total daily taking of 23,568,000 L/day. Water taking is permitted to occur 24 hours per day, 365 days per year.
- PTTW No. 5832-CLQPNV is issued to Capital Paving Inc. for its facility located approximately 750 m north to northeast of the Site. The PTTW was issued in December 2022 as a renewal of a previous PTTW. The Permit allows for groundwater to be taken from four (2) drilled wells. Well A is used to supply the office building at a maximum rate of 140 L/min, up to 14 hours per day, 300 days per year. Well B is an asphalt plant supply well that is permitted to be pumped at a maximum rate of 615 L/min for 14 hours per day, 300 days per year. Well C supplies the concrete plant at a maximum rate of 960 L/min for 14 hours per day, 300 days per year. Finally, Well D is the Shop Well that is permitted to be operated at a maximum rate of 140 L/min for up to 14 hours per day, 300 days per year. The PTTW also allows water to be taken from the dugout pond for aggregate washing uses, at a maximum rate of 14,116 L/min, for up to 20 hours per day, 200 days per year.
- PTTW No. 8417-B5WQLE is issued to St. Marys Cement Inc. (Canada) for water taking from its Aberfoyle Pit property located approximately 650 m northeast of the Site. The PTTW allows water to be taken from the Aberfoyle Main (North) Pit Pond for aggregate washing at a maximum rate of 16,366 L/min for 24 hours per day, 365 days per year.

2.3 Water Quality

Groundwater and surface water sampling (from Phase 1 Pond) has been completed semi-annually for over 30 years. The available field chemical results are presented in **Table G-1**, and the laboratory chemical results are presented in **Tables G-2 and G-3, Appendix G**.

For comparison purposes, groundwater quality was assessed versus the Ontario Drinking Water Quality Standards (ODWQS). Groundwater quality generally complies with the ODWQS for the parameters tested, except for hardness and manganese, which have frequently exceeded their respective ODWQS. Hardness and manganese are not considered to be health-related parameters. The standard for hardness is a guideline, which is established for parameters that need to be controlled to ensure efficient treatment of water supplies. The standard for manganese is an aesthetic objective, which is established for parameters that may impair the taste, odour, or colour of water. Hardness and manganese exceedances have occurred in the groundwater on-Site both

before and after extraction commenced. The elevated concentrations of hardness and manganese are attributed to natural conditions at the Site.

The concentrations of most parameters have fluctuated slightly or have been relatively consistent over the long-term. Exceptions are conductivity, sodium and chloride concentrations, which have exhibited an overall increasing trend on-Site since the mid-1990s. The increasing sodium, chloride and conductivity concentrations may reflect road salting activities along Highway 401 and/or along the Township roads. As these increasing trends are observed at locations both upgradient and downgradient of the property, they are not attributed to operations at the Mill Creek Pit.

Parameter concentrations in the Phase 1 pond are generally similar to values detected at the groundwater monitoring locations. The surface water quality typically complies with the Provincial Water Quality Objectives for the parameters tested, with some occasional exceptions.

2.4 Climate

Temperature and precipitation data recorded between 2014 and 2023 at the GRCA's Shade's Mills Climate Station, located 11 km southwest of the Site, were used in this report. Data from the Shade's Mills Climate Station were unavailable prior to 2014 and, therefore, data from the Waterloo Wellington A Climate Station and/or the Kitchener-Waterloo Climate Station, both operated by Environment and Climate Change Canada (ECCC) and both located approximately 18 km west of the Site, were also used in this report. The 30-year climate normal (1981-2010) and yearly water budget data for 2011 through 2023 are included in **Appendix H**.

As shown in **Table H-1**, the 30-year climate normal (1981-2010) for total annual precipitation for the study area is 916 mm. Using the Thornthwaite Mather methodology, the estimated annual evapotranspiration is 589 mm, yielding an average water surplus of 327 mm/year available for surface water runoff and recharge to the groundwater system. As shown in **Tables H-2 through H-14**, the annual precipitation between 2011 and 2023 ranged from 656 mm to 1,092 mm and averaged 916 mm. Notable wet years include 2017 (1,092 mm), 2018 (1,042 mm), 2019 (1,063 mm) and 2021 (1,020 mm), while 2012 (656 mm) and 2022 (682 mm) were notably drier than normal.

The 30-year (1981-2010) average annual mean temperature for the study area is 7.0°C (Table H-1) and the annual mean temperature between 2011 and 2023 ranged from 6.8°C to 10.1°C (Tables H-2 to H-14). The average annual mean temperature recorded between 2011 and 2023 is 8.6°C, which is appreciably higher than the 30-year average. With the exception of 2011, 2013 and 2014, the annual mean temperature recorded each year since 2011 has been at least 1.0°C higher than the 30-year average.

3.0 SOURCE WATER CONSIDERATIONS

As described in Section 1.2 of this report, the Amendment Standards state that if a site is located in a source protection area under the Clean Water Act, additional information must be included in the ARA amendment application to address any threat to drinking water that is present due to the proposed activities. This information includes identifying activities proposed at the site that are drinking water threats, providing details of how relevant source water protection policies will be followed and associated mitigation measures that will be implemented.

The Mill Creek Pit property is located within the Grand River Source Protection Area. According to the Approved Source Protection Plan (LER SPC, February 2022), there are no municipal supply wells located within 1 km of the Site. The closest wellhead protection area is WHPA-D area for the Clemens Mill municipal water supply system. At its closest point, the WHPA-D area is located 765 m from the northwest corner of the Site. There are no

mapped River and Stream Intake Protection Zones (IPZ) or Issue Contributing Areas (ICA) located on-Site or within 1 km of the Site.

The Clean Water Act identifies twenty-two (22) activities which are prescribed drinking water threats. Some examples of these activities are (i) the establishment, operation or maintenance of a waste disposal site; (ii) the establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage, and (iii) the application of agricultural source material to land. Of the 22 identified activities, two (2) are currently completed on the Site: (i) the handling and storage of fuel, and (ii) the handling and storage of DNAPLs. Fuel (gasoline and diesel) and waste oil are currently stored in above-ground tanks located adjacent to one of the barn buildings within the Site Plan Amendment area. The tanks include a 2,200 L tank for gasoline storage, a 10,000 L tank for diesel storage and a 1,360 L tank for waste oil. As such, the tanks will be removed to complete extraction within the Site Plan Amendment area.

The Grand River Source Protection Plan (LER SPC, 2022) identifies the following policies for addressing these activities:

Policy Number Identifier	Policy Tool and Applicability
15. The Handling and Storage of Fuel	
WC-CW-15.2	Existing – Risk Management Plan (RMP) for: WHPA-A-v.10; WHPA-B-v.10; IPZ-1-v.10 Future – RMP for: WHPA-B-v.10
WC-CW-15.3	Future – Prohibit for: WHPA-A-v.10; IPZ-1-v.10
WC-MC-15.4	Existing/Future ARA: WHPA-A-v.10; WHPA-B-v.10; IPZ-1-v.10
16. The Handling and Storage of a Dense Non-Aqueous Phase Liquid (DNAPL)	
WC-CW-16.1	Existing – Risk Management Plan (RMP) for: WHPA-A/B/C; IPZ-1-v. 10; ICA (TCE)
WC-CW-16.2	Future – Prohibit for: WHPA-A-v.10; IPZ-1-v.10
WC-CW-16.3	Future – RMP for: WHPA-B/C; ICA (TCE)
WC-CW-16.4	Existing/Future Education and Outreach: WHPA-A/B/C; IPZ-1-v.10; ICA (TCE)

As shown in the table above, these policies do not apply at the Site, as the Mill Creek Pit property is not located within the land designated WHPA-A/B/C, IPZ or ICA. Therefore, the current and proposed activities at the Mill Creek Pit comply with the Grand River Source Protection Plan (LER SPC, February 2022) and the Clean Water Act.

Based on the above and the requirements of the Aggregate Resources Act, the following note is recommended for inclusion on the Mill Creek Pit Aggregate Resources Act Site Plans:

The licence boundary is not located within a Wellhead Protection Area or a Surface Water Intake Protection Zone. Therefore, source water protection policies do not apply to this licence.

4.0 IMPACT ASSESSMENT

4.1 Water Budget Discussion

On a macro scale, the water budget within a subwatershed is the sum of water inputs (precipitation) and outputs (evapotranspiration, surface water flow, groundwater recharge and water takings for anthropogenic uses). An imbalance between the inputs and outputs represents a change in water storage within the overall subwatershed. For a subwatershed under steady-state conditions, any new stress will cause the distribution of water outputs to adjust such that the sum of inputs equals the sum of outputs.

Extraction from the proposed Site Plan Amendment area will impact the water budget for the area subject to the amendment only, as the rest of the property will remain unchanged from currently-approved conditions. Under the currently-approved conditions, 65% of the property is approved for aggregate extraction. Evapotranspiration and runoff are reduced to nil within the extracted area, as precipitation which falls onto the disturbed areas will either (i) rapidly infiltrate to the groundwater table, or (ii) be intercepted by the ponds which have been created by below-water extraction. Precipitation which currently falls within the undisturbed/natural areas within the northwestern portion of the Site is subject to evapotranspiration, infiltration and runoff. There are no changes to the water budget for the undisturbed portions of the Site.

Current Conditions Within Site Plan Amendment Area

Within the 2.5 ha Site Plan Amendment area, the land currently contains berms which are constructed along the southwest perimeter of the Phase 1 Pond and the southeast corner of the Phase 4 Pond/Silt Pond 3 (Figure 4), buildings which will be demolished prior to extraction within the proposed Site Plan Amendment area, gravel driveway/working area and grass/landscaped area. Under current conditions, precipitation which falls onto this portion of the Site will either: (i) infiltrate into the ground; (ii) runoff towards the Phase 1 or 4 Ponds; or (iii) runoff to the north roadside ditch along Township Road 2. Topographical contours indicate that water within the roadside ditch south of the Site Plan Amendment area drains westward toward Mill Creek, located approximately 1.5 km to the west.

Based on the 30-year normal water budget for the Waterloo Wellington A climatological station (Table H-1, Appendix H), on average, approximately 327 mm of annual surplus precipitation occurs near the Site. This surplus precipitation will either infiltrate to recharge the water table or runoff. Based on topography, vegetation and slope, the runoff co-efficient for the Site Plan Amendment area was conservatively estimated at 0.2, such that 20% of the surplus water will infiltrate, while the remaining 80% will runoff. Based on the average annual surplus precipitation of 327 mm, this equates to 262 mm/year (6,540 m^3/year) of runoff from the Site Plan Amendment area under current conditions. It is interpreted that approximately 40% of the runoff from the Site Plan Amendment area will drain to the Phase 1 or Phase 4 Ponds and 60% (157 mm/year, or 3,924 m^3/year) of the runoff will enter the roadside ditch.

Operating Conditions

During the operational phase, the removal of sand and gravel in the Site Plan Amendment area will result in a one-time increase in void space in the aquifer which must be back-filled with groundwater and precipitation inputs. The groundwater flow into the pit footprint will increase to compensate for the increase in void space. Due to the intermittent nature of excavation (limited hours per day, limited days per week and seasonal operation), the

drawdown effects at the edge of the pit pond due to aggregate extraction (as water fills void space) is small. No drawdown is perceptible in the existing ponds during below water extraction. The effects of this one-time increase in void space are already occurring during the existing approved extraction at the Site, and, therefore, no additional impacts related to water loss due to void space creation during extraction are expected.

Rehabilitation Conditions

Under the rehabilitated conditions, when the 2.5 ha Site Plan Amendment area is fully extracted, all of the precipitation which falls within that area will be directed to the combined Phase 1/4/5 Pond. As such, extraction of the Site Plan Amendment area will reduce the estimated quantity of runoff that currently enters the roadside ditch (3,924 m^3/year, or 0.12 L/s) to zero. The flow rate recorded in Mill Creek at the downstream end of the Site between 2014 and 2023 has ranged from 77 L/s to 1,922 L/s. As such, runoff from the Site Plan Amendment area represents less than 0.2% of the flow in Mill Creek during low flow conditions. This estimate assumes that all of the runoff that enters the ditch will flow to Mill Creek, which is conservative since some quantity of water from the ditch would infiltrate before reaching Mill Creek. As such, the potential contribution to flow in Mill Creek resulting from runoff from the Site Plan Amendment area is considered negligible.

The final ponds created by extraction at the Site will be subject to water losses due to evaporation. The impacts of evaporation from the currently-approved ponds were assessed through the approvals process for the original pit licence. The removal of overburden material from the Site Plan Amendment area will result in a slight increase (less than 2%) to the size of the final Phase 1/4/5 pond, and corresponding slight increase in the amount of evaporation that occurs from the pond. The small increase in total evaporation that will occur from the enlarged pond is considered negligible in the subwatershed balance.

4.2 Impacts to Mill Creek

The proposed extension within the Site Plan Amendment area is located over 700 m from Mill Creek. Given that extraction to within 100 m of the creek has not resulted in measurable negative impacts to the creek (WSP, 2024), there are no additional impacts anticipated to the creek as a result of the proposed licence extension.

4.3 Impacts to Local Groundwater Users

The majority of the wells identified through the water well record search and residential well survey (Section 2.2.1 of this report) are bedrock wells or test wells installed for monitoring purposes. The exceptions include the following four (4) overburden supply wells:

- Well No. 6702326 plots approximately 400 m east of the Site (Phase 1 Pond) and approximately 500 m from the ‘Site Plan Amendment area. The well plots adjacent to CBM Aggregate’s office for the McNally Pit, which is a former residential dwelling that has been repurposed as an office. Based on the well record, the well was installed in 1962 for house supply and was terminated at a depth of 14.6 m (48 feet) in gravel. The well plots within 100 m from the edge of the pond edge created by aggregate extraction at the McNally Pit. Based on the well depth and static water level listed on the well record, the well has a total available drawdown of 6.7 m.
- Well No. 6704693 plots approximately 330 m east of the southern portion of the Site and approximately 850 m from the Site Plan Amendment area. The well plots adjacent to a residential dwelling located at municipal address 4248 Sideroad 25 S. Based on the well record, the well was installed in 1973 for domestic supply and was terminated at a depth of 25.9 m (85 feet) in grey gravel. Existing ponds created by aggregate extraction at CBM Aggregate properties are situated 150 m east and 200 m north of this well. The well is situated

approximately 360 m from the edge of the Mill Creek Aggregate Pit's Phase 2 Pond. Based on the well depth and static water level listed on the well record, the well has a total available drawdown of 15.2 m.

- Well No. 6708455 plots approximately 350 m west of the Site (430 m from the Phase 3 Pond) and approximately 1,600 m from the Site Plan Amendment area. The well plots adjacent to a residential dwelling located at municipal address 6998 Township Road 2. Based on the well record, the well was installed in 1985 for domestic supply and was terminated at a depth of 8.2 m (27 feet) in brown gravel. Based on the well depth and static water level listed on the well record, the well has a total available drawdown of 6.4 m.
- One shallow well was identified at the property located at 7145 Township Road 2, which is a property owned by CBM Aggregates. A water well record pertaining to the well could not be located; however, the shallow well is monitored as part of the Mill Creek Pit monitoring program (designated "Smith Well").

For each of the four (4) above-noted overburden supply wells, existing below-water aggregate extraction operations have occurred in closer proximity to the well than the proposed extension within the Site Plan Amendment area of the Site and no historical impacts have been attributed to aggregate extraction.

Extraction at the Site takes place only within the overburden unit and does not intersect the bedrock aquifer. Therefore, the current/proposed extraction completed at the Mill Creek Pit will not impact wells completed in the bedrock unit.

As such, there are no additional impacts anticipated to local groundwater users as a result of the proposed Site Plan Amendment. Existing robust monitoring programs are currently in place at the various aggregate pit properties to monitor the groundwater table and ensure that negative impacts are not observed for local groundwater users.

5.0 MITIGATION

5.1 Monitoring Program

There are no recommended changes to the existing monitoring program as a result of the proposed extension of extraction to include the Site Plan Amendment area. The existing monitoring program is comprehensive and has been completed at the Site for almost 40 years. Any impacts to Mill Creek or other local groundwater/surface water resources are adequately monitored by the existing program.

5.2 Trigger Program

The existing monitoring program incorporates a detailed trigger mechanism that includes early warning and interim threshold values for Mill Creek. The early warning and interim threshold values came into effect in June 2001 and are based on maintaining positive seasonal hydraulic head gradients across the water table between specific monitor pairs, such that a positive hydraulic gradient continues to exist from the site toward Mill Creek. The current trigger program will be continued during extraction of the proposed Site Plan Amendment area and no changes are recommended to ensure continued protection of Mill Creek.

6.0 CONCLUSIONS

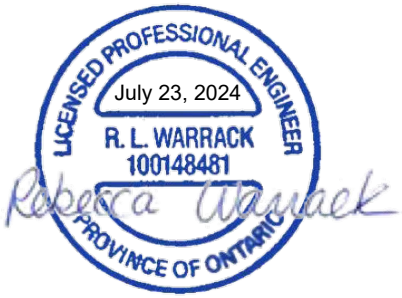
The following conclusions are made based upon the findings of this study:

- Extraction of the proposed Site Plan Amendment area will comply with the Grand River Source Protection Plan (February 2022) and the Clean Water Act;

- In reviewing the location of the proposed Site Plan Amendment area relative to the perimeter of the Phase 1/4/5 pond, and the relatively minor increase in the size of the Phase 1/4/5 pond, it is anticipated that the extraction of the Site Plan Amendment area below the water table will not result in a notable modification to the final pond levels or groundwater flow patterns at the Site; and
- There are no adverse impacts to Mill Creek or local groundwater users anticipated as a result of the proposed Site Plan Amendment.

Signature Page

WSP Canada Inc.



Rebecca Warrack, P.Eng.
Project Engineer

Greg Siiskonen, P.Eng.
Director, Earth & Environment

RW/GS/rc

7.0 REFERENCES

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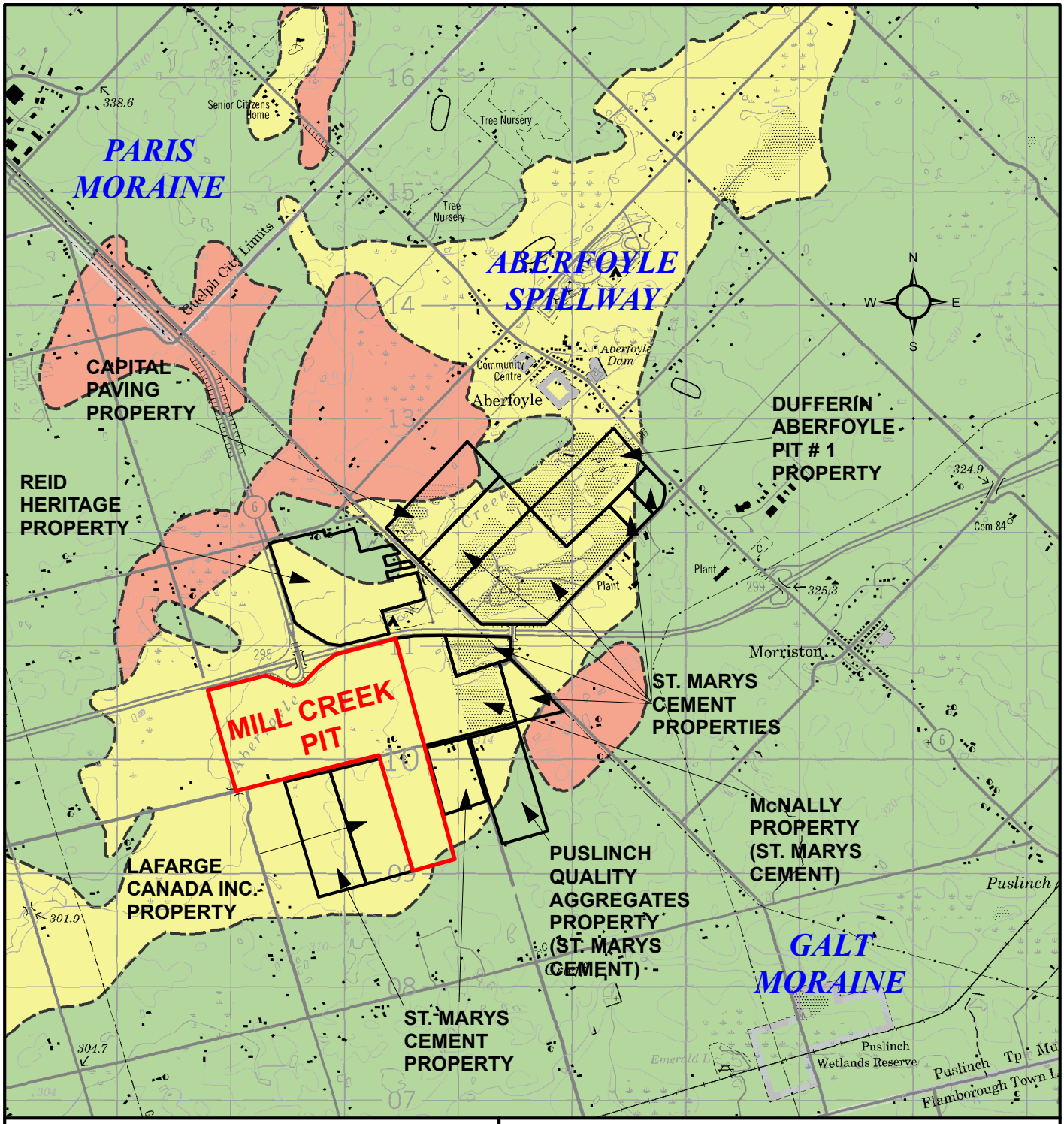
Tables

TABLE 1
MONITOR GROUPINGS
MILL CREEK AGGREGATES PIT

Bedrock	Sand and Gravel			Wetland	Creek
TW16-78	1*	TW16-79	92-33	DP6	DP1
Well 4794	1-R	OW1-84	OW5-84	DP7	DP2
	2*	OW2-84		DP8	DP3
	2-R	OW4-84		DP9	DP4*
	3	92-1*		DP10	DP4R
	4	92-1R		DP11	DP5A**
	5	92-5		DP12	DP5B***
	6	92-8		DP16	DP5C***
	7-I*	92-12		DP113	DP5CR
	7-II*	92-13			DP17*
	11	92-14*			DP17R
	12*	92-15*			DP18
	13	92-15a*			DP19
	14	92-26			DP20
	OW16A-78	92-27			DP21
		92-28			DP22
		92-29			
		92-32			

NOTES:
- * Indicates monitor was decommissioned.
- ** Indicates monitor is no longer accessible.
- *** Indicates monitor was removed by vandals.

Figures



Legend

- SILTY SAND TILL
- ICE-CONTACT STRATIFIED DRIFT SAND, SILT, GRAVEL
- OUTWASH SAND AND GRAVEL

SOURCE:
GENERALIZED AFTER KARROW, 1987.

500 0 1,000 metres

LOCATION AND PHYSICAL SETTING

LEVEL 1 AND 2 WATER REPORT
MILL CREEK PIT - SITE PLAN AMENDMENT

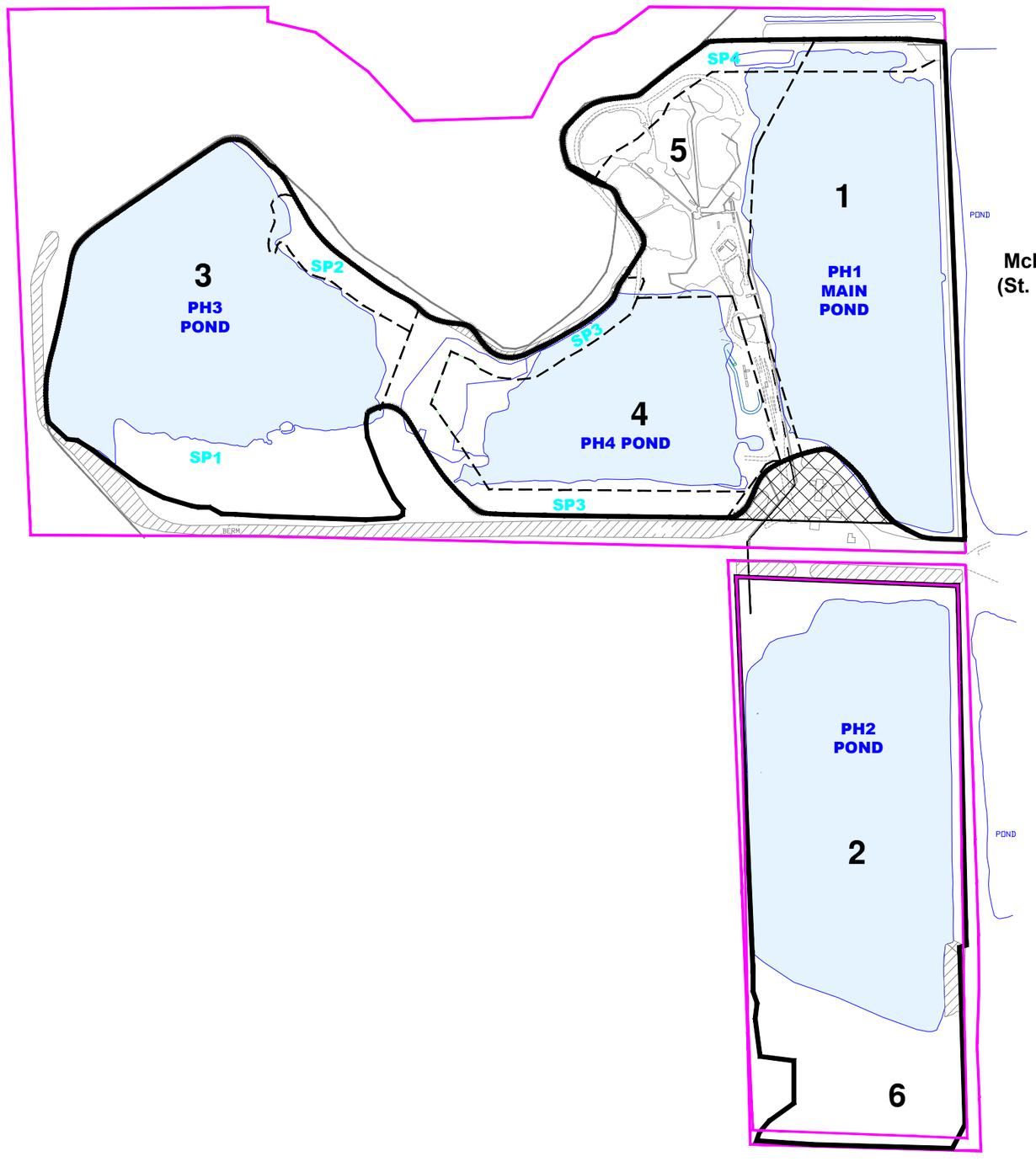
For Dufferin Aggregates

Dufferin Aggregates
A CRH COMPANY

DATE: JULY 2024	SCALE: 1:50000
PROJECT: CA0002366.3431	REF. NO.: CA0002366.3431 F1 2023

wsp

FIGURE 1



McNALLY
(St. Marys Cement)

LEGEND

- BOUNDARY OF LICENSED PROPERTY
- LIMIT OF EXTRACTION PER SITE PLANS
- APPROVED PHASING LIMIT
- 3 — PHASE DESIGNATION
- SP3 — SILT POND DESIGNATION
- BERM
- PROPOSED SITE PLAN AMENDMENT AREA (2.5 HA)

NOTES:

BASE MAPPING BY PLANNING INITIATIVES LTD., DATED AUGUST 1987, DRAWING NUMBERS 1A AND 1B OF 4.

POND BOUNDARIES BASED ON AERIAL PHOTOGRAPHY (DUFFERIN AGGREGATES, NOVEMBER 2020).

SITE PLAN SEQUENCING

LEVEL 1 AND 2 WATER REPORT

MILL CREEK PIT - SITE PLAN AMENDMENT

for Dufferin Aggregates

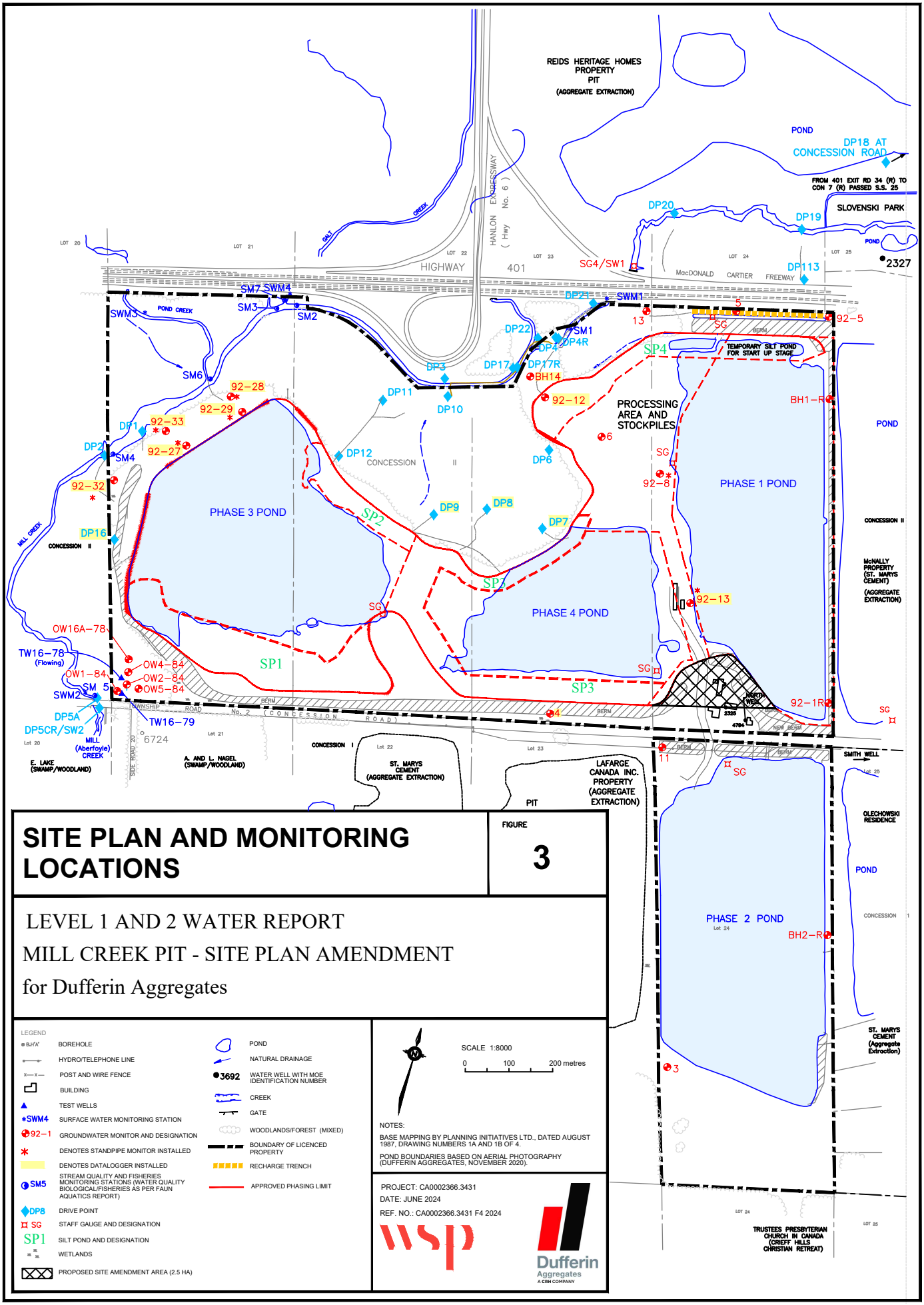
Dufferin Aggregates
A CRH COMPANY

wsp

SCALE: NOT TO SCALE
PROJECT: CA0002366.3431
DATE: JULY 2024
REF. NO.: CA0002366.3431 F2 2024

FIGURE
2

H:\PROJECTS\2011\111-52958 MILL CREEK PIT\CA0002366.3431 - MILL CREEK PIT LICENSE HYDROG BARN AREA\2 - GRAPHICS\CAD FILES FROM ICRC SERVER\CA0002366.3431 F2 2024.DWG



SITE PLAN AND MONITORING LOCATIONS

FIGURE 3

LEVEL 1 AND 2 WATER REPORT

MILL CREEK PIT - SITE PLAN AMENDMENT

for Dufferin Aggregates

LEGEND

- BH/MW — BOREHOLE
- HYDRO/TELEPHONE LINE
- POST AND WIRE FENCE
- BUILDING
- TEST WELLS
- *SWM4 — SURFACE WATER MONITORING STATION
- 92-1 — GROUNDWATER MONITOR AND DESIGNATION
- * — DENOTES STANDPIPE MONITOR INSTALLED
- DENOTES DATALOGGER INSTALLED
- SM5 — STREAM QUALITY AND FISHERIES MONITORING STATIONS (WATER QUALITY BIOLOGICAL/FISHERIES AS PER FAUN AQUATICS REPORT)
- DP8 — DRIVE POINT
- SG — STAFF GAUGE AND DESIGNATION
- SP1 — SILT POND AND DESIGNATION
- WETLANDS
- PROPOSED SITE AMENDMENT AREA (2.5 HA)
- POND
- NATURAL DRAINAGE
- 3692 — WATER WELL WITH MOE IDENTIFICATION NUMBER
- CREEK
- GATE
- WOODLANDS/FOREST (MIXED)
- BOUNDARY OF LICENCED PROPERTY
- RECHARGE TRENCH
- APPROVED PHASING LIMIT

SCALE 1:8000

0 100 200 metres

NOTES:

BASE MAPPING BY PLANNING INITIATIVES LTD., DATED AUGUST 1987, DRAWING NUMBERS 1A AND 1B OF 4.

POND BOUNDARIES BASED ON AERIAL PHOTOGRAPHY (DUFFERIN AGGREGATES, NOVEMBER 2020).

PROJECT: CA0002366.3431

DATE: JUNE 2024

REF. NO.: CA0002366.3431 F4 2024

wsp

Dufferin Aggregates
A CRH COMPANY

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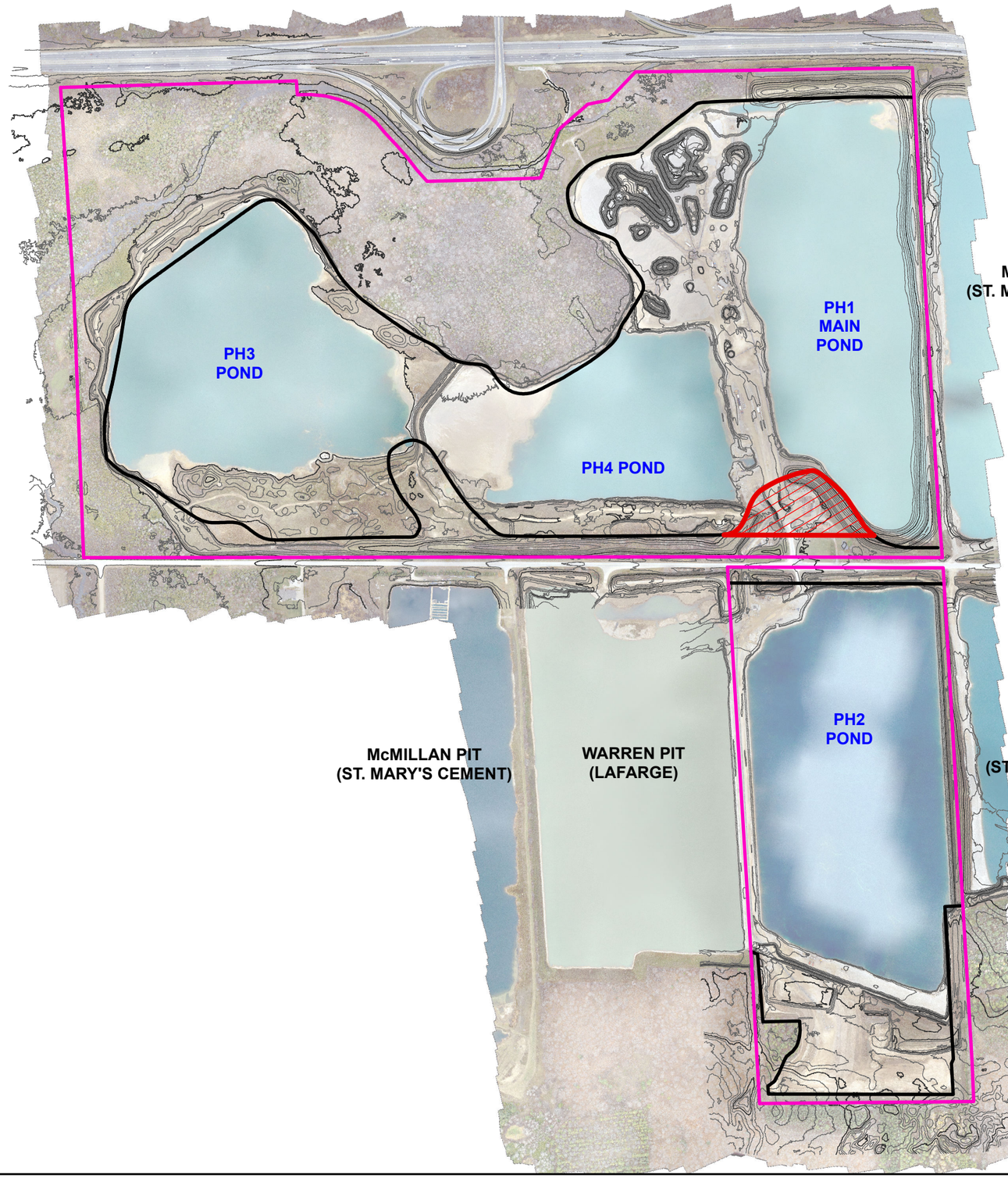


LEGEND

- BOUNDARY OF LICENCED PROPERTY
- LICENCED LIMIT OF EXTRACTION PER SITE PLANS
- PROPOSED SITE PLAN AMENDMENT AREA (2.5 ha)

2020 GROUND SURFACE CONTOURS

- MINOR CONTOUR (1m INTERVAL)
- MAJOR CONTOUR (5m INTERVAL)

0 180 360 m

NOTES:
1. NAD 1983 UTM ZONE 17N
2. 2020 ORTHOIMAGERY PROVIDED BY DUFFERIN AGGREGATES.

SITE TOPOGRAPHY

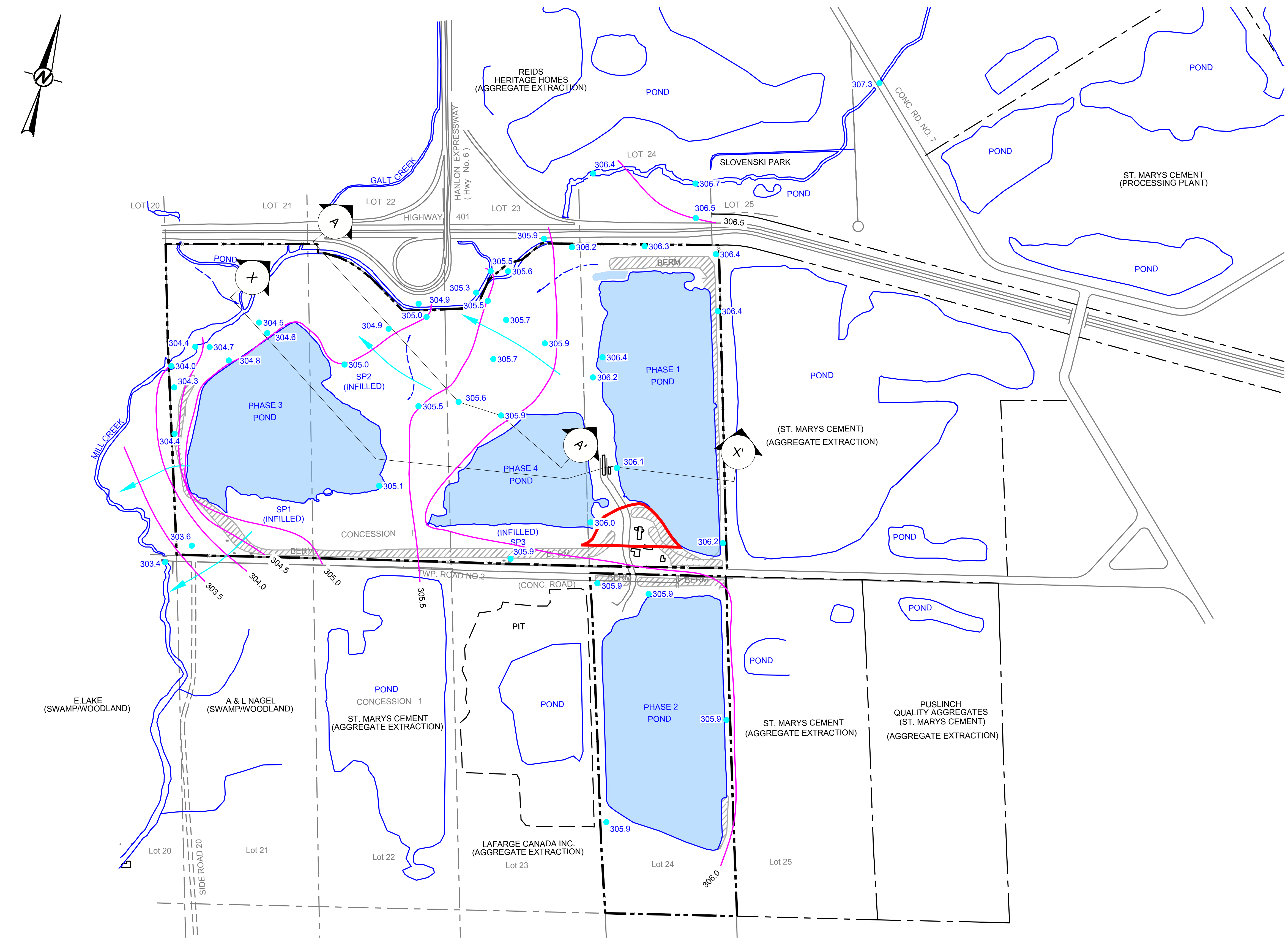
LEVEL 1 AND 2 WATER REPORT
MILL CREEK PIT - SITE PLAN AMENDMENT
For Dufferin Aggregates

DATE: JULY 2024	
PROJECT: CA0002366.3431	
SCALE: 1 : 9,000	
DRAWN BY: JLD	FIGURE No: 4

55 KING STREET, SUITE 600
ST. CATHARINES, ON L7R 3H5
T 905-687-1771 | F 905-687-1773 | www.wsp.com

Dufferin Aggregates
A CRH COMPANY

S:\Projects\2011\111-52958 Mill Creek Pit\CA0002366.3431 - Mill Creek Pit License Hydro\G Barn Area\2 - GRAPHICS\FIGURE 4 AND 8_GIS\CA0002366.3431-F4-SP.mxd



LEGEND

- BOUNDARY OF LICENSED PROPERTY
- 305.6 WATER TABLE ELEVATION (mASL) (AUGUST 8,2023)
- 303.5 INTERPRETED WATER TABLE CONTOUR (mASL)
- INFERRED DIRECTION OF GROUNDWATER FLOW
- GEOLOGIC CROSS SECTION LINE
- PROPOSED SITE PLAN AMENDMENT AREA (2.5 ha)

0 250 500
1:12,500 METRES

CLIENT
DUFFERIN AGGREGATES

PROJECT
LEVEL 1 AND 2 WATER REPORT
MILL CREEK PIT - SITE PLAN AMENDMENT

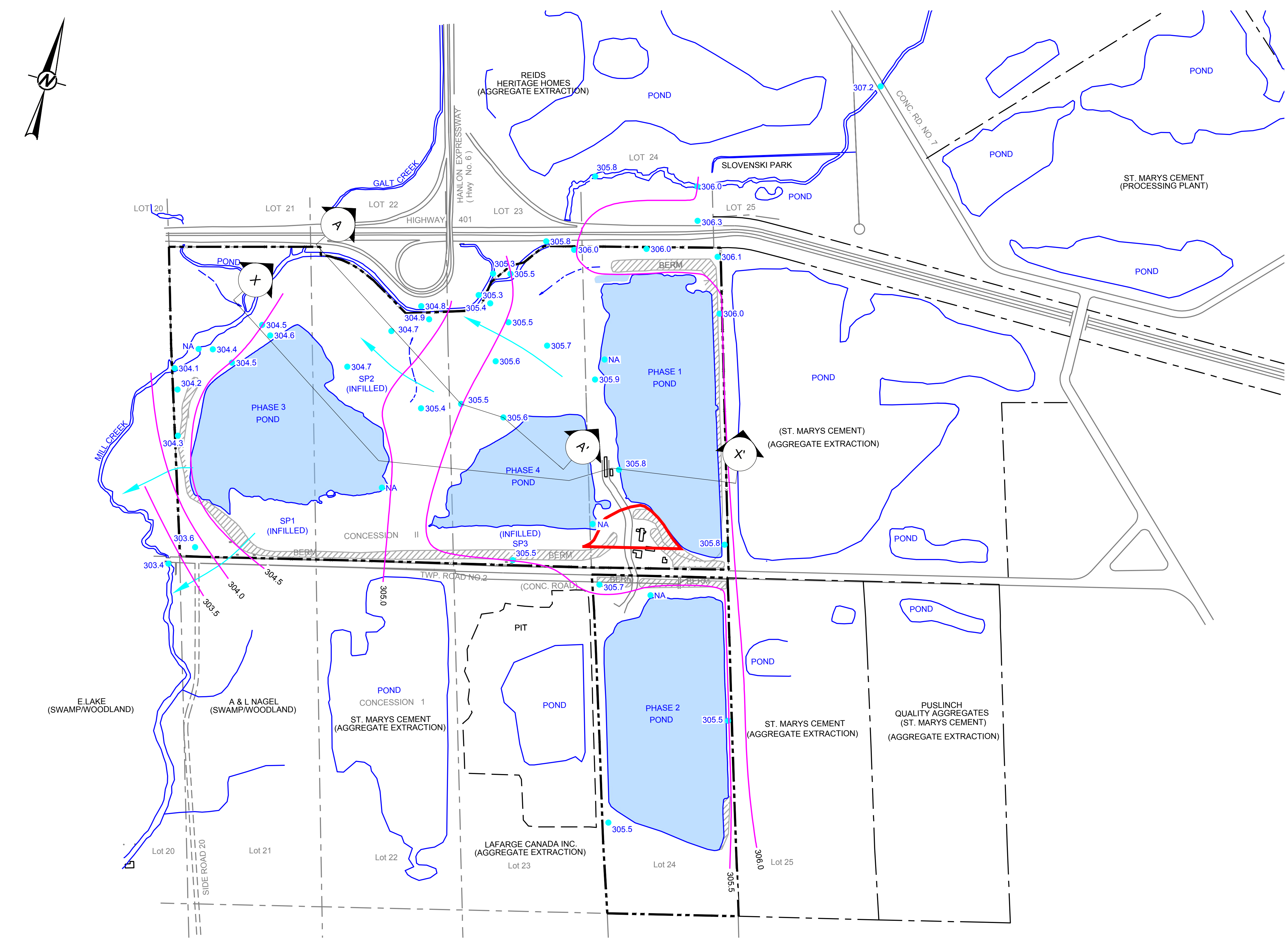
CONSULTANT

wsp

YYYY-MM-DD	2024-03-11
DESIGNED	---
PREPARED	NV
REVIEWED	RW
APPROVED	RW

TITLE
2023 'HIGH FLOW' WATER TABLE CONFIGURATION (AUGUST)

PROJECT NO.	CONTROL	REV.	FIGURE
CA0002366.3431	0002	A	5



LEGEND

- BOUNDARY OF LICENSED PROPERTY
- 305.5 WATER TABLE ELEVATION (mASL) (JANUARY 12,2023)
- 303.5 INTERPRETED WATER TABLE CONTOUR (mASL)
- INFERRED DIRECTION OF GROUNDWATER FLOW
- NA WATER LEVEL IS NOT AVAILABLE DUE TO FROZEN CONDITIONS
- GEOLOGIC CROSS SECTION LINE
- PROPOSED SITE PLAN AMENDMENT AREA (2.5 ha)

CLIENT
DUFFERIN AGGREGATES

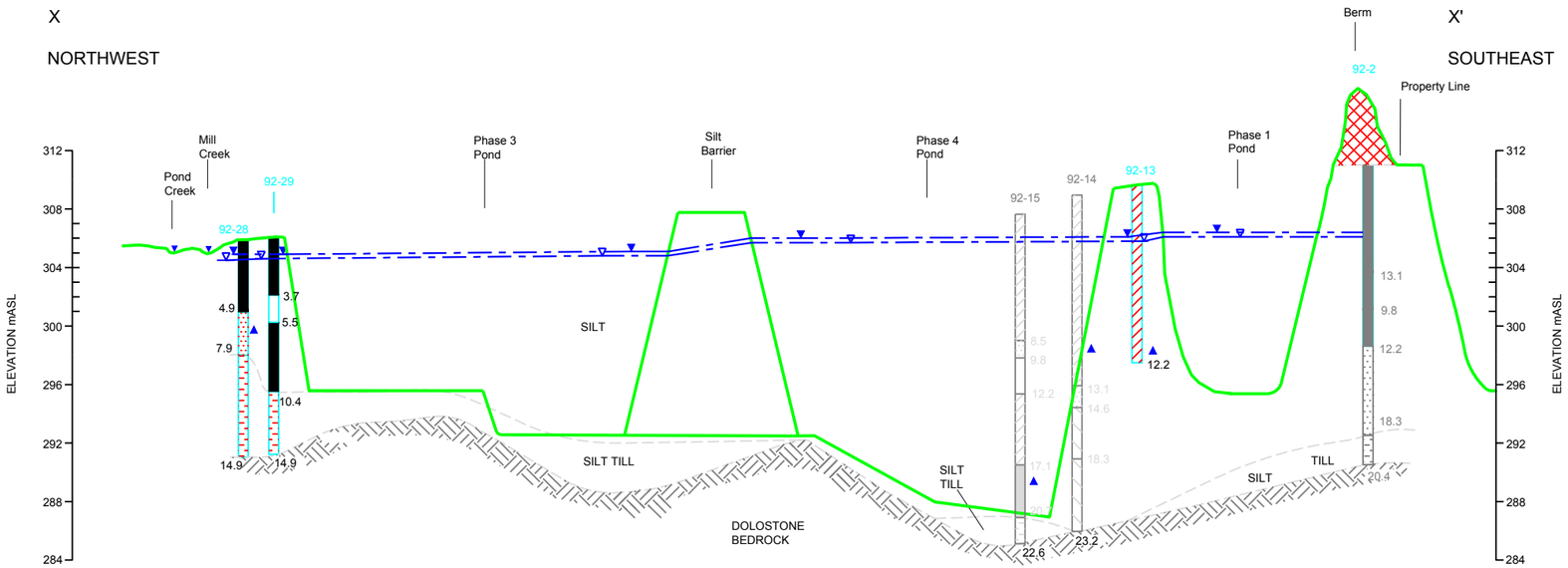
PROJECT
LEVEL 1 AND 2 WATER REPORT
MILL CREEK PIT - SITE PLAN AMENDMENT

CONSULTANT
wsp

YYYY-MM-DD	2024-03-11
DESIGNED	---
PREPARED	NV
REVIEWED	RW
APPROVED	RW

TITLE
2023 'LOW FLOW' WATER TABLE CONFIGURATION (JANUARY)

PROJECT NO.	CONTROL	REV.	FIGURE
CA0002366.3431	0002	A	6



LEGEND

- GRAVEL, SANDY GRAVEL, SAND AND GRAVEL
- GRAVELLY, FINE TO COARSE, SAND
- SAND
- SILT, SILTY FINE SAND, FINE SAND
- SILTY TILL
- ASSUMED BEDROCK

92-28 — BOREHOLE DESIGNATION (GREYED OUT BOREHOLE = DECOMMISSIONED MONITOR)

2023 ``HIGH FLOW" WATER TABLE PROFILE (AUGUST 2023)

2023 ``LOW FLOW" WATER TABLE PROFILE (JANUARY 2023)

5.5 — DEPTH TO CHANGE IN STRATA (m)

GROUNDWATER MONITOR

14.9 — BOTTOM OF BOREHOLE (m)

REFERENCE(S)

1. THE ACTUAL SOIL STRATIFICATION HAS BEEN VERIFIED FROM DATA OBTAINED AT THE BOREHOLE LOCATIONS ONLY.
2. THE INFERRED CONTACTS SHOWN ARE BASED ON GEOLOGICAL EVIDENCE AND THESE MAY VARY FROM THOSE SH0WN BETWEEN BORINGS.

0 1 2

1:40 HORIZONTAL METRES

CLIENT
DUFFERIN AGGREGATES

CONSULTANT
wsp

YYYY-MM-DD	2024-03-11
DESIGNED	---
PREPARED	NV
REVIEWED	RW
APPROVED	RW

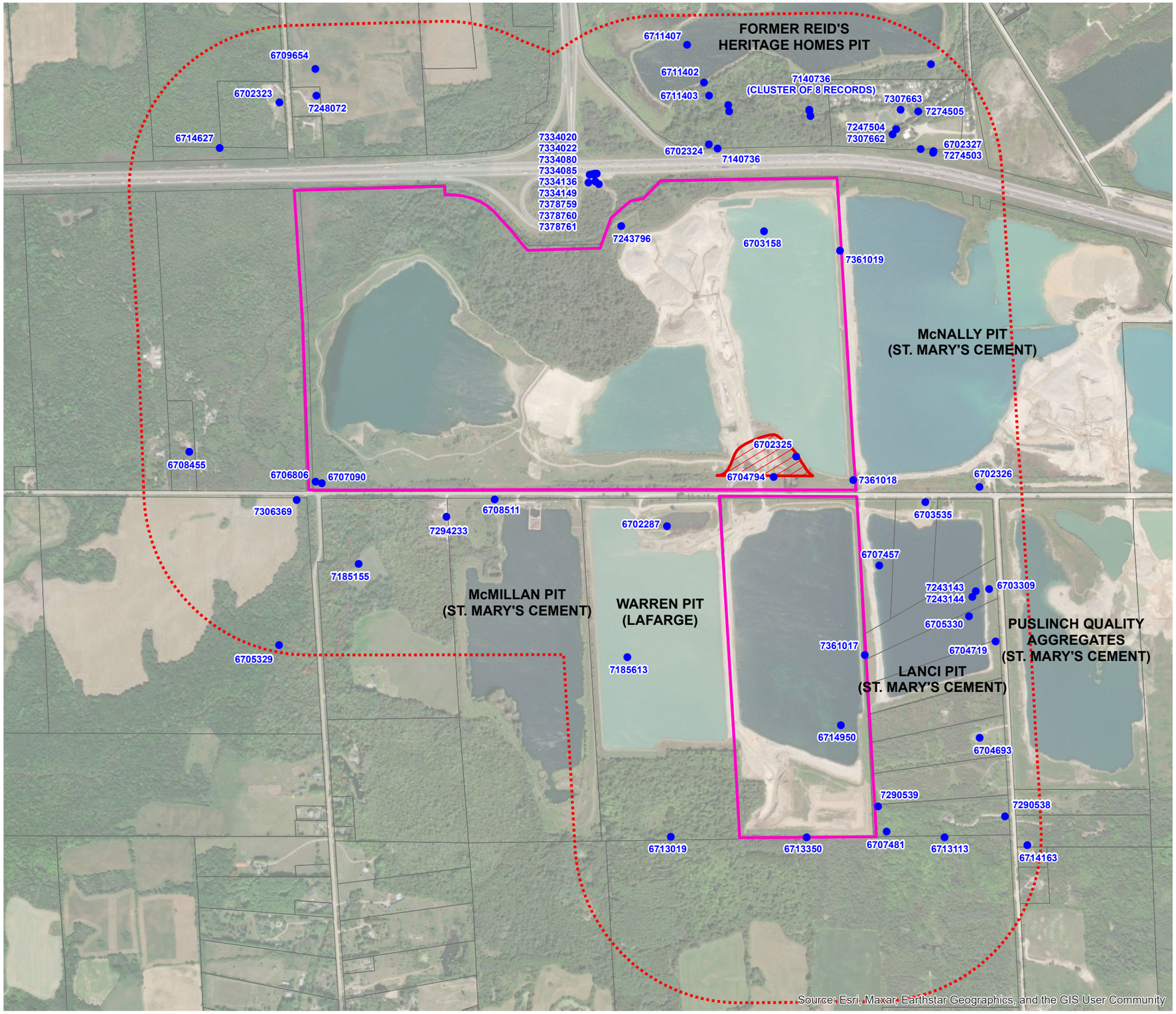
PROJECT
LEVEL 1 AND 2 WATER REPORT
MILL CREEK PIT - SITE PLAN AMENDMENT

TITLE
WATER TABLE PROFILE

PROJECT NO.	CONTROL	REV.	FIGURE
CA0002366.3431	0002	A	7

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

25 mm



LEGEND

- BOUNDARY OF LICENCED PROPERTY
- PROPOSED SITE PLAN AMENDMENT AREA (2.5 ha)
- 500m SEARCH AREA
- PROPERTY BOUNDARIES
- MECP WATER WELL RECORD (AS OF JUNE 2022)

0 240 480 m

NOTES:
1. NAD 1983 UTM ZONE 17N

MECP WATER WELL RECORDS

LEVEL 1 AND 2 WATER REPORT
MILL CREEK PIT - SITE PLAN AMENDMENT
For Dufferin Aggregates

DATE:	JULY 2024
PROJECT:	CA0002366.3431
SCALE:	1 : 12,000
DRAWN BY:	JLD
FIGURE No:	8

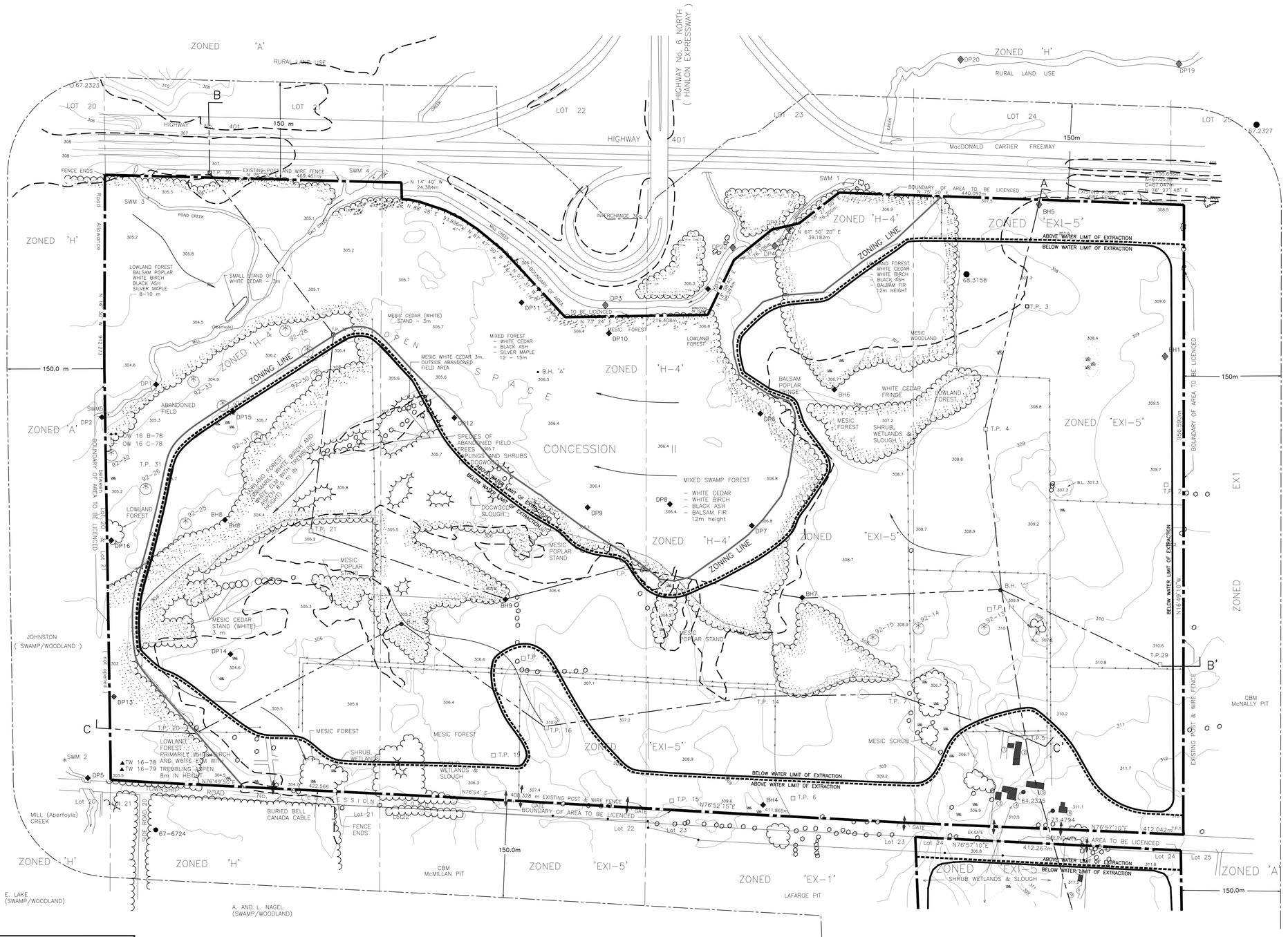
55 KING STREET, SUITE 600
ST. CATHARINES, ON L7R 3H5
T 905-687-1771 | F 905-687-1773 | www.wsp.com

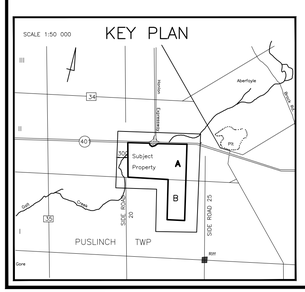
Dufferin Aggregates
A CRH COMPANY

S:\Projects\20111111-52958 Mill Creek Pit\CA0002366.3431 - Mill Creek Pit License Hydro\G Barn Area\2 - GRAPHICS\FIGURE 4 AND 8_GIS\CA0002366.3431-F8-SP.mxd

APPENDIX A

Current Aggregate Resources Act Site Plans





Legend:

- ZONING LINE
- 310 CONTOUR LINE (Meters ASL)
- 314.2 SPOT ELEVATION (Meters ASL)
- T.P.3 TEST PIT
- B.H'A' BOREHOLE
- HYDRO/TELEPHONE LINE
- X — X — EX. POST AND WIRE FENCE
- BUILDING
- TEST WELLS
- BH9 BOREHOLE OBSERVATION MONITOR INSTALLATION
- SWM 4 SURFACE WATER MONITORING STATION
- 92-27 GROUNDWATER MONITORING STATION (TEMPERATURE AND LEVEL)
- WETLANDS
- REGIONAL STORM FLOODLINE
- 65 3692 WATER WELL
- CREEK
- 1.2m FARM-TYPE GATE (TYP.)
- WOODLANDS/FOREST (MIXED)
- OW16B-78 OBSERVATION WELL
- DP5 DRIVE POINT
- ZONED 'H' HAZARD LAND ZONING
- ZONED 'EXI' EXTRACTIVE INDUSTRIAL ZONING
- POND
- DIRECTION OF NATURAL DRAINAGE
- BOUNDARY OF PROPERTY TO BE LICENCED
- EXISTING ENTRANCE/EXIT
- AL LINE OF CROSS SECTION
- ABOVE WATER LIMIT OF EXTRACTION
- BELOW WATER LIMIT OF EXTRACTION

Notes:

1. BOUNDARY INFORMATION FROM A VARIETY OF SOURCES.
2. TOPOGRAPHY INFORMATION WAS OBTAINED FROM NORTHWAY MAPPING CORP., MARCH 1969.
3. ZONING INFORMATION WAS OBTAINED FROM THE TOWNSHIP OF PUSLINCH ZONING BYLAW 19 / 85 AND AMENDED BY OMB ORDER MAY 13, 1991.
4. TOTAL AREA OF SUBJECT LANDS = 188.6 ha.
5. TOTAL AREA TO BE LICENCED = 146.4 ha (NORTH PORTION) + 42.2 ha (SOUTH PORTION) = 188.6 ha (TOTAL)
6. TOTAL AREA TO BE EXTRACTED = 83.3 ha (NORTH PORTION) + 38.8 ha (SOUTH PORTION) = 122.1 ha (TOTAL)
7. THIS SITE PLAN IS PREPARED FOR SUBMISSION TO THE MINISTRY OF NATURAL RESOURCES IN CONJUNCTION WITH AN APPLICATION FOR A CLASS "A" LICENCE UNDER THE AGGREGATE RESOURCES ACT AND REGULATIONS.
8. REFER TO SHEET 2 FOR CROSS SECTIONS.
9. REFER TO SHEET 2 FOR EXISTING FEATURES FOR SUBJECT LANDS LOCATED SOUTH OF TOWNSHIP ROAD 2.
10. REFER TO SHEET 2 FOR WELL INFORMATION AND BUILDING LIST.
11. THE ELEVATION OF THE WATER TABLE VARIES FROM APPROXIMATELY 303.5 mASL TO 306.5 mASL AS DETERMINED BY GENIVAR.
12. GEOLOGIC INFORMATION BASED ON A REPORT ENTITLED GEOLOGICAL RESEARCH RESULTS AND INFORMATION ON AGGREGATE RESOURCES EXTRACTION POTENTIAL BY PEIL, 1981.
13. ORIGINAL SITE PLANS PREPARED BY PLANNING INITIATIVES LTD., AUGUST 1987. SITE PLAN AMENDMENTS IN 2000, 2002, 2003, AND 2010 BY JAGGER HIMS LIMITED / GENIVAR. SITE PLAN AMENDMENTS IN 2015 BY J.H. COHOON ENGINEERING LTD.

SITE PLAN AMENDMENTS

NO.	DESCRIPTION	DATE	INIT.
1.	HOUSEKEEPING ITEMS.	AUG. /03	K.M.
2.	MINOR AMENDMENT ON PHASE 3 AREA AND SILT POND 3	FEB. /10	K.M.
3.	MAJOR AMENDMENT TO ENLARGE LIMIT OF EXTRACTION IN PHASE 2	SEPT. /15	K.M.

REVISIONS

NO.	DESCRIPTION	DATE	INIT.
1.	AS PER SUB-CONSULTANTS AND M.N.R.	OCT. /88	J.L.S.
2.	AS PER SUB-CONSULTANTS AND M.N.R.	APR. /89	C.A.O'B.
3.	AS PER SUB-CONSULTANTS AND M.N.R.	MAY /90	C.A.O'B.
4.	UPDATED TO COMPLY WITH THE AGGREGATE RESOURCES ACT.	JUNE/90	L.L.H.
5.	AS PER O.M.B. CONDITIONS + FILL PERMIT APPLICATION	OCT. /90	J.J.M.
6.	AS PER MINISTER CONDITIONS AND TRANSFERRED ONTO AUTOCAD	DEC. /91	J.J.M.
7.	INCLUDING NEW AND RELOCATED MONITORING STATION LOCATIONS	AUG. /92	R.E.G.
8.	AS PER M.N.R.	NOV. /92	R.E.G.
9.	ADDITIONAL DRIVE POINTS ADDED	NOV. /93	R.E.G.
10.	BLDG #8 DELETED, SURFACE WATER STATIONS RE-POSITIONED	SEPT. /00	A.G.H.
11.	REGIONAL STORM FLOODLINE ADDED	MAY /01	A.G.H.
12.	HOUSEKEEPING ITEMS	AUG. /03	K.M.
13.	EXPAND TOTAL AREA TO BE EXTRACTED	MAY /05	K.M.
14.	ADDED LIMIT OF EXTRACTION ABOVE AND BELOW	SEPT. /17	K.M.

MILL CREEK AGGREGATES

PART OF LOTS 21, 22, 23 AND 24, CONCESSION II
PART OF LOT 24, CONCESSION I
TOWNSHIP OF PUSLINCH, COUNTY OF WELLINGTON

University of Guelph

854 GORDON STREET
GUELPH, ONTARIO
N1G 1Y7

Scale 1:3000

50 0 50 100 150 m

J. KEVIN MITCHELL IS AUTHORIZED BY THE MINISTRY OF NATURAL RESOURCES TO PREPARE & CERTIFY SITE PLANS FOR LICENCE APPLICATIONS.

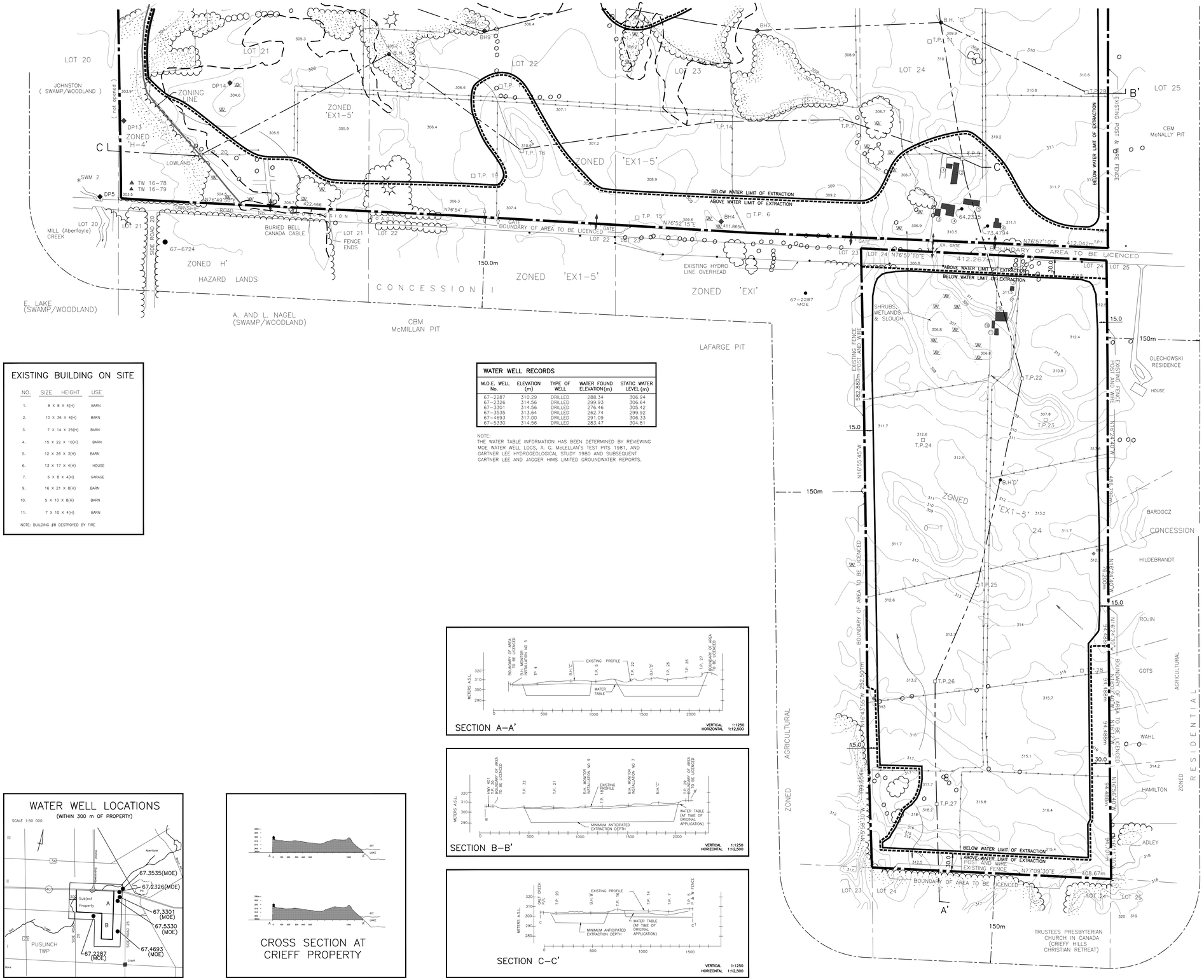
J.H. COHOON ENGINEERING LIMITED
CONSULTING ENGINEERS

440 HARDY ROAD , UNIT #1
BRANTFORD – ONTARIO , N3T 5L8
TEL. (519) 753-2656
FAX. (519) 753-4263

EXISTING FEATURES NORTH OF TOWNSHIP ROAD 2

Drawing No. 1 OF 8

JOB: 11132



EXISTING BUILDING ON SITE

NO.	SIZE	HEIGHT	USE
1.	8 X 8 X	4(H)	BARN
2.	10 X 36 X	4(H)	BARN
3.	7 X 14 X	25(H)	BARN
4.	15 X 22 X	10(H)	BARN
5.	12 X 26 X	3(H)	BARN
6.	13 X 17 X	4(H)	HOUSE
7.	6 X 8 X	4(H)	GARAGE
9.	16 X 21 X	8(H)	BARN
10.	5 X 10 X	8(H)	BARN
11.	7 X 10 X	4(H)	BARN

NOTE: BUILDING #8 DESTROYED BY FIRE

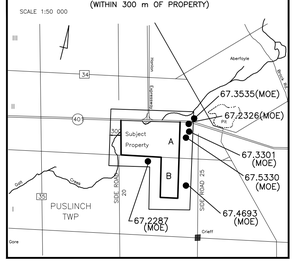
WATER WELL RECORDS

M.O.E. WELL No.	ELEVATION (m)	TYPE OF WELL	WATER FOUND ELEVATION(m)	STATIC WATER LEVEL (m)
67-2287	310.29	DRILLED	288.34	306.94
67-2326	314.56	DRILLED	299.93	306.64
67-3301	314.56	DRILLED	276.46	305.42
67-3535	313.64	DRILLED	262.74	299.92
67-4693	317.00	DRILLED	291.09	306.33
67-5330	314.56	DRILLED	283.47	304.81

NOTE:
THE WATER TABLE INFORMATION HAS BEEN DETERMINED BY REVIEWING MOE WATER WELL LOGS, A. G. McLELLAN'S TEST PITS 1981, AND GARTNER LEE HYDROGEOLOGICAL STUDY 1980 AND SUBSEQUENT GARTNER LEE AND JAGGER HIMS LIMITED GROUNDWATER REPORTS.

WATER WELL LOCATIONS
(WITHIN 300 m OF PROPERTY)

SCALE 1:50 000



CROSS SECTION AT CRIEFF PROPERTY

SECTION A–A'
VERTICAL 1:1250
HORIZONTAL 1:12,500

SECTION B–B'
VERTICAL 1:1250
HORIZONTAL 1:12,500

SECTION C–C'
VERTICAL 1:1250
HORIZONTAL 1:12,500

Legend:

- ZONING LINE
- 310 CONTOUR LINE (Meters ASL)
- 314.2 SPOT ELEVATION (Meters ASL)
- T.P.3 TEST PIT
- B.H'A' BOREHOLE
- HYDRO/TELEPHONE LINE
- X — X — EX. POST AND WIRE FENCE
- BUILDING
- TEST WELLS
- BH9 BOREHOLE OBSERVATION MONITOR INSTALLATION
- SWM 4 SURFACE WATER MONITORING STATION
- 92-27 GROUNDWATER MONITORING STATION (TEMPERATURE AND LEVEL)
- WETLANDS
- REGIONAL STORM FLOODLINE
- 65 3692 WATER WELL
- CREEK
- 1.2m FARM-TYPE GATE (TYP.)
- WOODLANDS/FOREST (MIXED)
- OW16B-78 OBSERVATION WELL
- DP5 DRIVE POINT
- ZONED 'H' HAZARD LAND ZONING
- ZONED 'EXI' EXTRACTIVE INDUSTRIAL ZONING
- POND
- DIRECTION OF NATURAL DRAINAGE
- BOUNDARY OF PROPERTY TO BE LICENCED
- EXISTING ENTRANCE/EXIT
- A L LINE OF CROSS SECTION
- ABOVE WATER LIMIT OF EXTRACTION
- BELOW WATER LIMIT OF EXTRACTION

Notes:

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8. REFER TO SHEET 1 FOR EXISTING FEATURES FOR SUBJECT LANDS LOCATED NORTH OF TOWNSHIP ROAD 2.
9. THE ELEVATION OF THE WATER TABLE VARIES FROM APPROXIMATELY 303.5 mASL TO 306.5 mASL AS DETERMINED BY GENIVAR.
10. ORIGINAL SITE PLANS PREPARED BY PLANNING INITIATIVES LTD., AUGUST 1987. SITE PLAN AMENDMENTS IN 2000, 2002, 2003, AND 2010 BY JAGGER HIMS LIMITED / GENIVAR. SITE PLAN AMENDMENTS IN 2015 BY J.H. COHOON ENGINEERING LTD.

SITE PLAN AMENDMENTS

NO.	DESCRIPTION	DATE	INT.
1.	HOUSEKEEPING ITEMS.	AUG. /03	K.M.
2.	MINOR AMENDMENT ON PHASE 3 AREA AND SILT POND 3	FEB. /10	K.M.
3.	MAJOR AMENDMENT TO ENLARGE LIMIT OF EXTRACTION IN PHASE 2	SEPT. /15	K.M.

REVISIONS

NO.	DESCRIPTION	DATE	INT.
1.	AS PER SUB-CONSULTANTS AND M.N.R.	OCT. /88	J.L.S.
2.	AS PER SUB-CONSULTANTS AND M.N.R.	APR. /89	C.A.O'B.
3.	AS PER SUB-CONSULTANTS AND M.N.R.	MAY /90	C.A.O'B.
4.	UPDATED TO COMPLY WITH THE AGGREGATE RESOURCES ACT.	JUNE/90	L.L.H.
5.	AS PER O.M.B. CONDITIONS + FILL PERMIT APPLICATION	OCT. /90	J.J.M.
6.	AS PER MINISTER CONDITIONS AND TRANSFERRED ONTO AUTOCAD	DEC. /91	J.J.M.
7.	INCLUDING NEW AND RELOCATED MONITORING STATION LOCATIONS	AUG. /92	R.E.G.
8.	AS PER M.N.R.	NOV. /92	R.E.G.
9.	ADDITIONAL DRIVE POINTS ADDED	NOV. /93	R.E.G.
10.	BLDG #8 DELETED, SURFACE WATER STATIONS RE-POSITIONED	SEPT. /00	A.G.H.
11.	REGIONAL STORM FLOODLINE ADDED	MAY /01	A.G.H.
12.	HOUSEKEEPING ITEMS	AUG. /03	K.M.
13.	EXPAND SP1 & SP3, EXPAND LIMIT OF EXTRACTION OF PHASE 2 BARN AREA.	MAY /05	K.M.
14.	REVISIONS TO ADDRESS AGENCY COMMENTS DURING PUBLIC COMMENT PERIOD	SEPT. /17	K.M.

MILL CREEK AGGREGATES

PART OF LOTS 21, 22, 23 AND 24, CONCESSION II
PART OF LOT 24, CONCESSION I
TOWNSHIP OF PUSLINCH, COUNTY OF WELLINGTON

University of Guelph
854 GORDON STREET
GUELPH, ONTARIO
N1G 1Y7

Scale 1:3000
50 0 50 100 150 m

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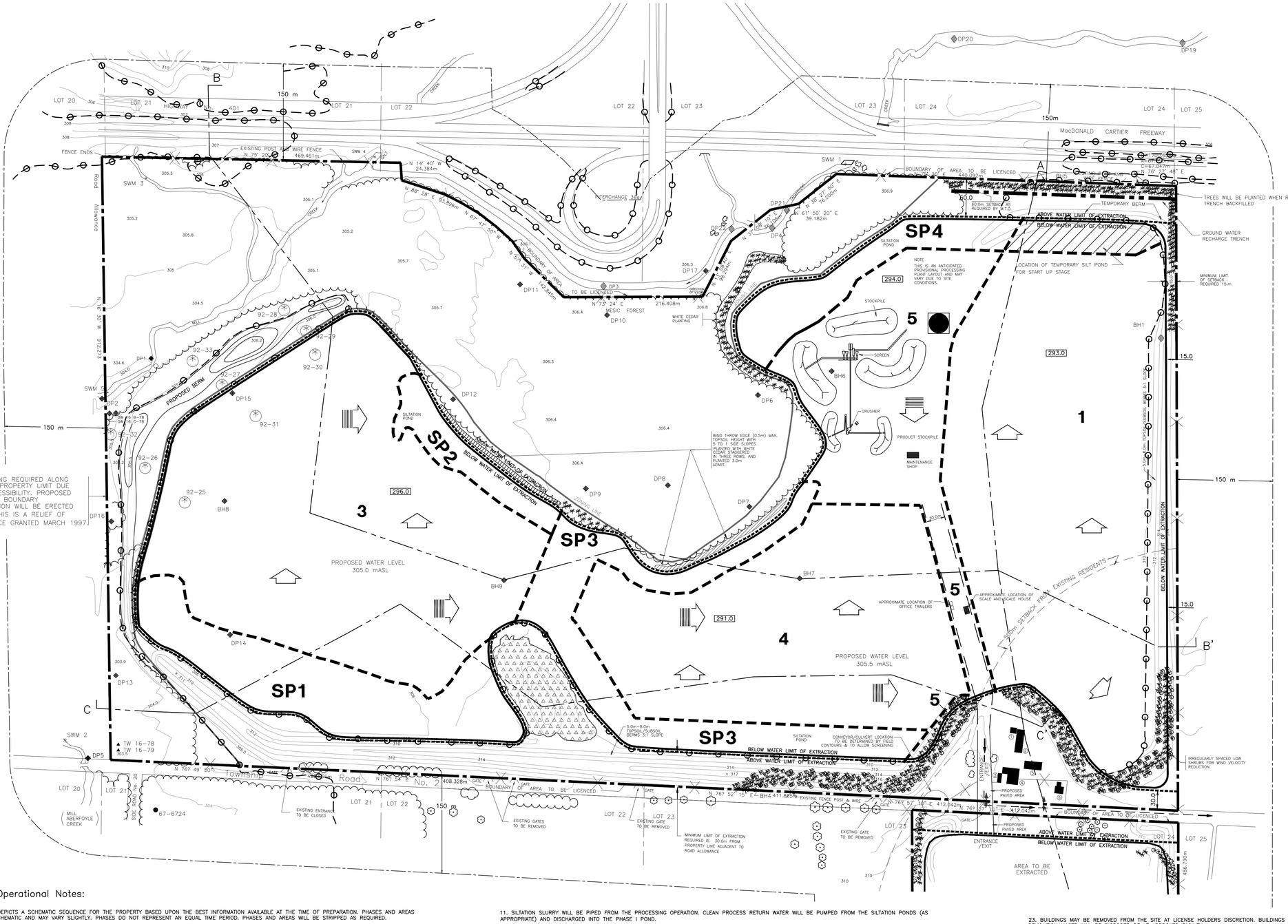
TEL. (519) 753-2656
FAX. (519) 753-4263

EXISTING FEATURES SOUTH OF TOWNSHIP ROAD 2

Drawing No. 2 OF 8

JOB: 11132

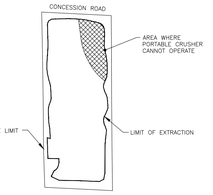


Legend:

- BOUNDARY OF PROPERTY TO BE LICENCED
- 310 PROPOSED CONTOUR (Meters ASL)
- 314.2 SPOT ELEVATION (Meters ASL)
- T.P.3 TEST PIT
- B.H'A' BOREHOLE
- DP5 DRIVE POINT
- FENCE (EX./PROPOSED) POST & WIRE
- BUILDING (EXISTING)
- TEST WELLS
- DW 16 B-78 OBSERVATION WELL
- BH9 BOREHOLE OBSERVATION MONITOR INSTALLATION
- SWM 4 SURFACE WATER MONITORING STATION
- 92-27 GROUNDWATER MONITORING STATION (TEMPERATURE AND LEVEL)
- REGIONAL STORM FLOODLINE AT END OF EXTRACTION
- ZONING LINE
- 293.0 APPROXIMATE FINAL DEPTH OF EXTRACTION
- REFORESTATION
- GATE (EXISTING/PROPOSED)
- MIXED TREED AREA
- WIND THROW EDGE PLANTING BED
- EXISTING TREED AREA
- RECHARGE TRENCH
- PROPOSED BERM
- INTERNAL HAUL ROUTES
- HAUL ROUTE TO MARKET
- PROCESSING PLANT PRODUCT STOCK PILE SCARP AREA AUX. ACTIVITIES
- PHASING LIMIT
- 3 EXTRACTION PHASE
- SP3 SILT POND PHASING
- DIRECTION OF EXTRACTION (ABOVE WATER TABLE)
- DIRECTION OF EXTRACTION (BELOW WATER TABLE)
- A L LINE OF CROSS SECTION
- ABOVE WATER LIMIT OF EXTRACTION
- BELOW WATER LIMIT OF EXTRACTION

Technical Recommendations:

1. A PERIMETER BERM SHALL BE CONSTRUCTED AROUND ALL OPERATIONAL SILT PONDS WITH THE EXCEPTION OF THE PORTION OF SP3 CREATING THE BARRIER BETWEEN PHASES 3 & 4. THE PERIMETER BERM SHALL BE CONSTRUCTED AS FOLLOWS:
   - THE TOP OF THE BERM SHALL HAVE A CREST ELEVATION THAT WILL PROVIDE A MINIMUM 1.25 METRE FREEBOARD THAT WILL ACCOMMODATE SEASONAL FLUCTUATION OF THE SILT POND LEVEL.
   - THE BERM SHALL HAVE AN INNER SLOPE OF NOT GREATER THAN 2H:1V.
   - THE BERM SHALL HAVE AN OUTER SLOPE OF NOT GREATER THAN 3H:1V.
   - THE BERM SHALL BE CONSTRUCTED USING ON SITE GRANULAR MATERIALS.
2. WHEN AGGREGATE WASHING IS OCCURRING AND SILT LADEN WATER IS DISCHARGED TO THE SILT POND, CLEAN WATER WILL BE RECYCLED/PUMPED BACK TO THE MAIN POND AS REQUIRED TO MAINTAIN THE MNR APPROVED OPERATING WATER LEVEL THRESHOLD FOR THE SILT POND.
3. MONITORING AND OPERATION OF THE SITE SHALL BE DONE IN ACCORDANCE WITH THE APPROVED REPORT ENTITLED UPDATED COORDINATED ENVIRONMENTAL MONITORING PROGRAMS FOR MILL CREEK, LICENCE NO. 5738. MONTHLY SUMMARY REPORTS WILL BE SUBMITTED TO THE MINISTRY OF NATURAL RESOURCES, TOWNSHIP OF PUSLINCH AND THE GRAND RIVER CONSERVATION AUTHORITY WITHIN TEN WORKING DAYS OF THE LAST DAY OF EACH MONTH.
4. ALL EQUIPMENT WITHIN PHASE 2 SHALL BE KEPT AS CLOSE AS POSSIBLE TO THE EXTRACTION FACE. A PORTABLE CRUSHER MAY OPERATE WITHIN PHASE 2. THE PORTABLE CRUSHER MAY NOT OPERATE WITHIN 200 METRES OF THE RESIDENCE ADJACENT TO THE NORTHEAST CORNER OF PHASE 2 AS ILLUSTRATED BELOW.



SITE PLAN AMENDMENTS

NO.	DESCRIPTION	DATE	INIT.
1.	REDUCTION OF AREA TO BE EXTRACTED AS A RESULT OF ADDITIONAL WETLAND BUFFER.	JUNE /92	
2.	REMOVAL OF 2.0m BERM TO ADJACENT TO MILL CREEK.	JUNE /92	
3.	CONSOLIDATION OF ENTRANCE / EXIT TO BE LOCATED WEST OF EXISTING BUILDINGS.	JUNE /92	
4.	VARIOUS MINOR AMENDMENTS AS PER MNR MARCH/97 APPROVAL (SILT POND, FENCING, SLURRY PIPE, TREE PLANTING, USE OF GENSETS.)	MAR./97	
5.	REVISIONS TO THE STOCKPILE HEIGHT	SEPT./99	
6.	VARIOUS MINOR AMENDMENTS AS PER MNR APPROVAL SEPT. /00 (SILT PONDS SP1, SP2, GRCA CUT & FILL PERMIT LINE, AMPHITHEATRE, TEMPORARY BERM IN PHASE 1, EXTRACTION PHASE 1)	SEPT. /00	
7.	MINOR AMENDEMENTS AS PER MNR APPROVAL APRIL 2001 (RECHARGE TRENCH IN SET-BACK NORTH OF PHASE 1, EXTRACTION OUTLINE SOUTH END OF PHASE I, AND SP1 / SP2 OUTLINES AND HAUL ROADS IN PHASE 3).	MAY /01	
8.	VARIOUS MINOR AMENDEMENTS AND HOUSEKEEPING.	AUG. /03	
9.	REVISIONS TO GENERAL OPERATION NOTES (ITEM 16) AND TECHNICAL RECOMMENDATION.	JAN. /05	
10.	MINOR AMENDMENT ON PHASE 3 AREA AND SILT POND 3	FEB. /10	K.M.
11.	MAJOR AMENDMENT TO ENLARGE LIMIT OF EXTRACTION IN PHASE 2	SEPT. /15	K.M.
12.	MINOR AMENDMENT TO PERMIT EXTRACTION OF PHASE 1 EAST BOUNDARY ADJACENT TO OTHER LICENSED PROPERTY TO 1.5m ABOVE THE WATER TABLE.	SEPT. /17	K.M.

REVISIONS

NO.	DESCRIPTION	DATE	INIT.
1.	AS PER SUB CONSULTANTS AND MINISTRIES	OCT.26/88	J.L.S.
2.	AS PER SUB CONSULTANTS AND MINISTRIES	APR. /89	A.L.B.
3.	MODIFICATION TO SEQUENCE	SEPT./89	A.B.M.
4.	UPDATED TO CONFORM WITH THE AGGREGATE RESOURCES ACT	JUNE/90	L.L.H.
5.	AS PER O.M.B. CONDITIONS & FILL PERMIT APPLICATION	OCT. /90	J.J.M.
6.	AS PER MINISTERS CONDITIONS & TRANSFERRED ONTO AUTOCAD	DEC. /91	J.J.M.
7.	TO CONFORM WITH G.R.C.A. FILL PERMIT APPLICATION AND REVISED MONITORING STATION LOCATIONS	AUG. /92	R.E.G.
8.	AS PER M.N.R.	NOV. /92	R.E.G.
9.	ADDITIONAL DRIVE POINTS ADDED	NOV. /93	R.E.G.
10.	BLDG. #9 DELETED, SURFACE WATER STATIONS RE-LOCATED	SEPT. /00	A.G.H.
11.	REGIONAL STORM FLOODLINE ADDED	MAY /01	A.G.H.
12.	AS PER M.N.R. COMMENTS	JAN. /04	K.M.
13.	EXPAND SP1 & SP3, EXPAND LIMIT OF EXTRACTION OF PHASE 2 BARN AREA.	MAY /05	K.M.
14.	EXTRACT COMMON SETBACK WITH ADJACENT LICENCE (ABOVE WATER)	SEPT. /17	K.M.

General Operational Notes:

1. THIS PLAN DEPICTS A SCHEMATIC SEQUENCE FOR THE PROPERTY BASED UPON THE BEST INFORMATION AVAILABLE AT THE TIME OF PREPARATION. PHASES AND AREAS ARE SHOWN SCHEMATIC AND MAY VARY SLIGHTLY. PHASES DO NOT REPRESENT AN EQUAL TIME PERIOD. PHASES AND AREAS WILL BE STRIPPED AS REQUIRED.
2. TOPSOIL AND OVERBURDEN SHALL BE STRIPPED AND STORED SEPARATELY.
3. TREE PLANTING WILL BE ONGOING IN THOSE AREAS ILLUSTRATED IN ALL PHASES.
4. THE PROCESSING PLANT SHALL BE LOCATED AS SHOWN. USE OF A PORTABLE PROCESSING PLANT WILL BE ALLOWED ON A PERMANENT BASIS (AS PER LETTER DATED FEB. 15, 2000) SUBJECT TO MEETING MOE GUIDELINES. A PORTABLE CRUSHER MAY ALSO BE LOCATED WITHIN PHASE 2 AND 6 AND WILL OPERATE IN ACCORDANCE WITH THE TECHNICAL RECOMMENDATIONS.
5. AGGREGATE MATERIALS WILL BE REMOVED BY DRY EXTRACTION AND WILL BE FOLLOWED IMMEDIATELY BY WET/DRAGLINE EXTRACTION. DIRECTION OF MINING ABOVE AND BELOW THE WATER TABLE WILL PROCEED AS SHOWN ON THE PHASING DRAWINGS ON SHEET 5. FOR BLENDING PURPOSES, AGGREGATE SOURCES IN MORE THAN ONE PHASE MAY BE REQUIRED.
6. DRY AND WET EXTRACTION WILL PROCEED TOGETHER AS DESCRIBED IN THE NOISE STUDY AND WILL PROCEED AS SHOWN ON THE PHASING DRAWINGS ON SHEET 5.
7. IT IS THE INTENT TO REMOVE ALL COMMERCIAL SAND AND GRAVEL DOWN TO GLACIAL TILL, CLAY OR BEDROCK. THE MAXIMUM DEPTH OF EXTRACTION VARIES FROM ±7.3 m TO ±24.4 m BELOW ORIGINAL GROUND SURFACE.
8. INTERNAL HAUL ROUTES TO THE PROCESSING AREA FROM THE EXTRACTION LOCATIONS WILL BE DEVELOPED AND DISBANDED AS REQUIRED. THE MAIN USE HOWEVER IS EXPECTED TO BE FOR SERVICING PURPOSES SINCE THE USE OF CONVEYOR BELT SYSTEMS IS ANTICIPATED. CONVEYOR BELT SYSTEM TO BE LOCATED TO ACCOMMODATE EXTRACTION IN OPERATIONAL PHASE(S). CONVEYOR BELT SYSTEM MAY REQUIRE MINOR GRADING OR ADJUSTMENT IN BERM LENGTH.
9. INTERNAL HAUL ROUTES WILL BE TREATED FOR DUST AS REQUIRED WITH WATER AND/OR MOE APPROVED DUST SUPPRESSANT.
10. SILTATION PONDS ARE AN ESSENTIAL PART OF: A) ENSURING SUCCESSFUL PROCESSING OF THE RAW AGGREGATE AND B) ENSURING THAT THE DESIRED WATER TABLES AND SUBSURFACE FLOWS ARE GUARANTEED. IN ORDER TO ENSURE THE LATTER, IT IS ESSENTIAL THAT SILT PONDS SP1 AND SP2 ARE UTILIZED TO THEIR FULL PRACTICAL ACCOMMODATION CAPACITY BEFORE UTILIZING THE THIRD SILT POND (SP3). THE SP1 AND SP3 EXTENSIONS WILL BE UTILIZED AFTER THEY HAVE BEEN EXTRACTED.
11. SILTATION SLURRY WILL BE PIPED FROM THE PROCESSING OPERATION. CLEAN PROCESS RETURN WATER WILL BE PUMPED FROM THE SILTATION PONDS (AS APPROPRIATE) AND DISCHARGED INTO THE PHASE I POND.
12. A STABILITY BUFFER ZONE WITH A MINIMUM TOP WIDTH OF 1.5 m (5 FEET) WILL BE PROVIDED BETWEEN ALL SILT PONDS AND EXTRACTION AREAS.
13. THE SHORELINES AND STABILITY BUFFER ZONE OF ALL SILTATION PONDS WILL BE STABILIZED AND VEGETATED IMMEDIATELY UPON CREATION OR AT THE NEXT APPROPRIATE PLANTING SEASON.
14. WITH THE EXCEPTION OF THE DRAINAGE SWALES LOCATED AT THE PERIMETER OF THE EXTRACTION AREA, NO SURFACE WATER SHALL LEAVE THE SITE AS A RESULT OF SILT ALTERATIONS AND/OR OPERATIONS.
15. DURING TIMES WHEN THE PROCESSING PLANT IS OPERATING AND/OR BELOW WATER EXTRACTION IS OCCURRING, WATER LEVELS IN ALL OPERATIONAL SILT PONDS SHALL BE VISUALLY AND PHYSICALLY MONITORED DAILY AND REPORTED TO THE MINISTRY OF NATURAL RESOURCES, THE TOWNSHIP OF PUSLINCH AND THE GRAND RIVER CONSERVATION AUTHORITY MONTHLY. THIS EXCLUDES PERIODS WHEN PONDS ARE FROZEN.
16. DURING TIMES WHEN THE PROCESSING PLANT IS OPERATING AND/OR BELOW WATER TABLE EXTRACTION IS OCCURRING, ALL SILT PONDS SHALL BE OPERATED IN ACCORDANCE WITH THEIR SPECIFIC OPERATIONAL WATER LEVELS.
17. A 1.2 m FENCE SHALL BE ERECTED WHERE SHOWN DURING STARTUP OPERATIONS. ALL UNFENCED BOUNDARIES SHALL BE MARKED WITH PAINTED POSTS, ENTRANCE/EXITS SHALL BE GATED.
18. THE OPERATOR WILL ENSURE THAT ALL PROPOSED BERM GROUND COVERS WILL BE REPLACED DURING THE NEXT APPROPRIATE PLANTING SEASON IF IT DIES. ALL REHABILITATED AREAS WILL BE PREPARED TO ENCOURAGE NATURAL REGENERATION.
19. USE OF PORTABLE GENERATORS WILL BE PERMITTED AS PER RELIEF OF COMPLIANCE GRANTED MARCH 1997.
20. A TEMPORARY GROUNDWATER TRENCH WILL BE CONSTRUCTED IN THE SETBACK NORTH OF PHASE I. FEED WATER WILL BE PUMPED FROM THE POND IN PHASE I. THE USE OF THE RECHARGE TRENCH WILL NOT EXTEND PAST THE END OF PHASE 5 AND WILL BE BACKFILLED PRIOR TO CLOSEOUT OF OPERATIONS AT THE SITE. REFER TO RECHARGE TRENCH PROPOSAL APRIL 30, 2001.
21. SCRAP SHALL BE STORED WITHIN THE PROCESSING PLANT AND STOCKPILING AREA. SCRAP SHALL BE REMOVED ON AN ONGOING BASIS.
22. ANY FUEL STORED ON SITE SHALL BE IN ABOVE GROUND TANKS LOCATED NEAR BUILDING 1 OR AT GENSET LOCATIONS.
23. BUILDINGS MAY BE REMOVED FROM THE SITE AT LICENSE HOLDERS DISCRETION. BUILDINGS DEMOLITION WASTE WILL BE DISPOSED OF AT APPROVED FACILITY.
24. REFER TO SHEET 4 FOR GENERAL OPERATIONAL PLAN FOR SUBJECT LANDS SOUTH OF TOWNSHIP ROAD 2 AND SHEET 5 FOR PHASING SCHEMATICS AND INDIVIDUAL PHASE NOTES.
25. REFER TO SHEET 4 FOR SITE PLAN OVERRIDES.
26. REFER TO SHEET 4 FOR TREE PLANING DETAILS.
27. REFER TO SHEET 5 FOR BERM DETAILS.
28. THE ELEVATION OF THE WATER TABLE VARIES FROM APPROXIMATELY 303.5 mASL TO 306.5 mASL AS DETERMINED BY GENIVAR.
29. THE EQUIPMENT OPERATING ON SITE SHALL INCLUDE BUT NOT BE LIMITED TO THE FOLLOWING: LOADERS, EXCAVATORS, DRAG LINES, PROCESSING EQUIPMENT, SITE MAINTENANCE EQUIPMENT, SITE PREPARATION AND REHABILITATION EQUIPMENT AND TRUCKS. USE OF PORTABLE GENERATORS WILL BE PERMITTED AS PER RELIEF OF COMPLIANCE GRANTED MARCH 1997, SUBJECT TO MEETING MOE NOISE GUIDELINES.
30. SAND, GRAVEL AND LIMESTONE PRODUCTS MAY BE IMPORTED FOR BLENDING OR RESALE. NO CONCRETE OR ASPHALT WILL BE IMPORTED FOR RECYCLING.
31. ANY TREES REMOVED FROM THE SITE SHALL BE USED FOR FIREWOOD OR CHIPPED OR USED FOR REHABILITATION.
33. DURING EXTRACTION OF PHASE 5 & 6, OFFICE TRAILERS, THE SCALE AND SCALE HOUSE MAY BE RELOCATED TO THE AREA OCCUPIED BY THE FORMER HOUSE AND BARN AREA TO PERMIT EXTRACTION IN PHASE 5 BELOW THE WATER TABLE.

MILL CREEK AGGREGATES

PART OF LOTS 21, 22, 23 AND 24, CONCESSION II
PART OF LOT 24, CONCESSION I
TOWNSHIP OF PUSLINCH, COUNTY OF WELLINGTON

University of Guelph

854 GORDON STREET
GUELPH, ONTARIO
N1G 1Y7

Scale 1:3000

50 0 50 100 150 m

J. KEVIN MITCHELL IS AUTHORIZED BY THE MINISTRY OF NATURAL RESOURCES TO PREPARE & CERTIFY SITE PLANS FOR LICENCE APPLICATIONS.

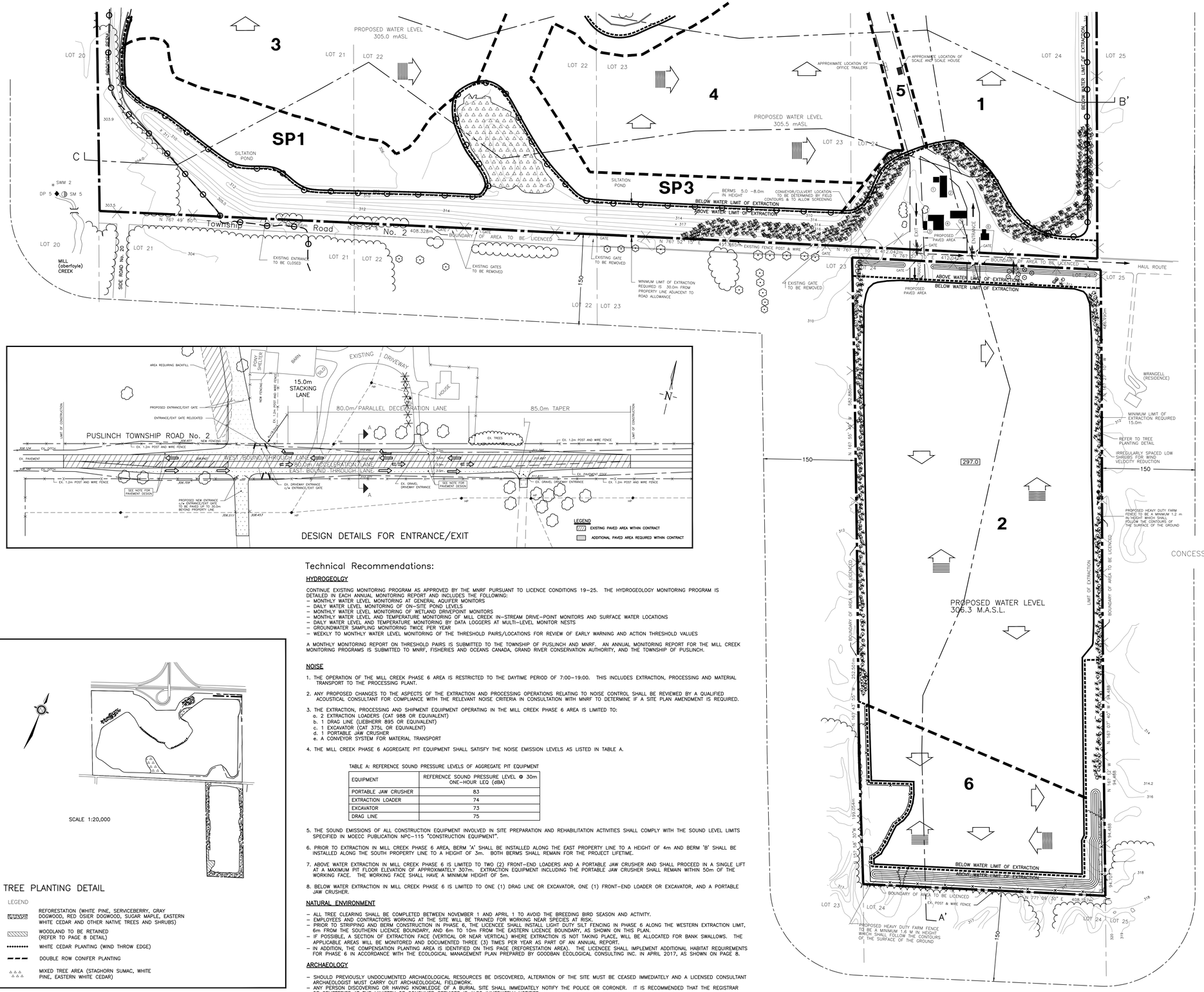
J.H. COHOON ENGINEERING LIMITED
CONSULTING ENGINEERS

440 HARDY ROAD , UNIT #1
BRANTFORD — ONTARIO , N3T 5L8
TEL. (519) 753-2656
FAX. (519) 753-4263

OPERATIONS PLAN NORTH OF TOWNSHIP ROAD 2

Drawing No. 3 OF 8

JOB: 11132



DESIGN DETAILS FOR ENTRANCE/EXIT

TREE PLANTING DETAIL

LEGEND

- REFORESTATION (WHITE PINE, SERVICEBERRY, GRAY DOGWOOD, RED OSIER DOGWOOD, SUGAR MAPLE, EASTERN WHITE CEDAR AND OTHER NATIVE TREES AND SHRUBS)
- WOODLAND TO BE RETAINED (REFER TO PAGE 8 DETAIL)
- WHITE CEDAR PLANTING (WIND THROW EDGE)
- DOUBLE ROW CONIFER PLANTING
- MIXED TREE AREA (STAGHORN SUMAC, WHITE PINE, EASTERN WHITE CEDAR)

Technical Recommendations:

HYDROGEOLOGY

CONTINUE EXISTING MONITORING PROGRAM AS APPROVED BY THE MNRF PURSUANT TO LICENCE CONDITIONS 19–25. THE HYDROGEOLOGY MONITORING PROGRAM IS DETAILED IN EACH ANNUAL MONITORING REPORT AND INCLUDES THE FOLLOWING:

- MONTHLY WATER LEVEL MONITORING AT GENERAL AQUIFER MONITORS
- DAILY WATER LEVEL MONITORING OF ON–SITE POND LEVELS
- MONTHLY WATER LEVEL MONITORING OF WETLAND DRIVEPOINT MONITORS
- MONTHLY WATER LEVEL AND TEMPERATURE MONITORING OF MILL CREEK IN–STREAM DRIVE–POINT MONITORS AND SURFACE WATER LOCATIONS
- DAILY WATER LEVEL AND TEMPERATURE MONITORING BY DATA LOGGERS AT MULTI–LEVEL MONITOR NESTS
- GROUNDWATER SAMPLING MONITORING TWICE PER YEAR
- WEEKLY TO MONTHLY WATER LEVEL MONITORING OF THE THRESHOLD PAIRS/LOCATIONS FOR REVIEW OF EARLY WARNING AND ACTION THRESHOLD VALUES

A MONTHLY MONITORING REPORT ON THRESHOLD PAIRS IS SUBMITTED TO THE TOWNSHIP OF PUSLINCH AND MNRF. AN ANNUAL MONITORING REPORT FOR THE MILL CREEK MONITORING PROGRAMS IS SUBMITTED TO MNRF, FISHERIES AND OCEANS CANADA, GRAND RIVER CONSERVATION AUTHORITY, AND THE TOWNSHIP OF PUSLINCH.

NOISE

1. THE OPERATION OF THE MILL CREEK PHASE 6 AREA IS RESTRICTED TO THE DAYTIME PERIOD OF 7:00–19:00. THIS INCLUDES EXTRACTION, PROCESSING AND MATERIAL TRANSPORT TO THE PROCESSING PLANT.
2. ANY PROPOSED CHANGES TO THE ASPECTS OF THE EXTRACTION AND PROCESSING OPERATIONS RELATING TO NOISE CONTROL SHALL BE REVIEWED BY A QUALIFIED ACOUSTICAL CONSULTANT FOR COMPLIANCE WITH THE RELEVANT NOISE CRITERIA IN CONSULTATION WITH MNRF TO DETERMINE IF A SITE PLAN AMENDMENT IS REQUIRED.
3. THE EXTRACTION, PROCESSING AND SHIPMENT EQUIPMENT OPERATING IN THE MILL CREEK PHASE 6 AREA IS LIMITED TO:
   a. 2 EXTRACTION LOADERS (CAT 988 OR EQUIVALENT)
   b. 1 DRAG LINE (LIEBHERR 895 OR EQUIVALENT)
   c. 1 EXCAVATOR (CAT 375L OR EQUIVALENT)
   d. 1 PORTABLE JAW CRUSHER
   e. A CONVEYOR SYSTEM FOR MATERIAL TRANSPORT
4. THE MILL CREEK PHASE 6 AGGREGATE PIT EQUIPMENT SHALL SATISFY THE NOISE EMISSION LEVELS AS LISTED IN TABLE A.

TABLE A: REFERENCE SOUND PRESSURE LEVELS OF AGGREGATE PIT EQUIPMENT

EQUIPMENT	REFERENCE SOUND PRESSURE LEVEL @ 30m ONE–HOUR LEQ (dBA)
PORTABLE JAW CRUSHER	83
EXTRACTION LOADER	74
EXCAVATOR	73
DRAG LINE	75

5. THE SOUND EMISSIONS OF ALL CONSTRUCTION EQUIPMENT INVOLVED IN SITE PREPARATION AND REHABILITATION ACTIVITIES SHALL COMPLY WITH THE SOUND LEVEL LIMITS SPECIFIED IN MOECC PUBLICATION NPC–115 "CONSTRUCTION EQUIPMENT".
6. PRIOR TO EXTRACTION IN MILL CREEK PHASE 6 AREA, BERM 'A' SHALL BE INSTALLED ALONG THE EAST PROPERTY LINE TO A HEIGHT OF 4m AND BERM 'B' SHALL BE INSTALLED ALONG THE SOUTH PROPERTY LINE TO A HEIGHT OF 3m. BOTH BERMS SHALL REMAIN FOR THE PROJECT LIFETIME.
7. ABOVE WATER EXTRACTION IN MILL CREEK PHASE 6 IS LIMITED TO TWO (2) FRONT–END LOADERS AND A PORTABLE JAW CRUSHER AND SHALL PROCEED IN A SINGLE LIFT AT A MAXIMUM PIT FLOOR ELEVATION OF APPROXIMATELY 307m. EXTRACTION EQUIPMENT INCLUDING THE PORTABLE JAW CRUSHER SHALL REMAIN WITHIN 50m OF THE WORKING FACE. THE WORKING FACE SHALL HAVE A MINIMUM HEIGHT OF 5m.
8. BELOW WATER EXTRACTION IN MILL CREEK PHASE 6 IS LIMITED TO ONE (1) DRAG LINE OR EXCAVATOR, ONE (1) FRONT–END LOADER OR EXCAVATOR, AND A PORTABLE JAW CRUSHER.

NATURAL ENVIRONMENT

- ALL TREE CLEARING SHALL BE COMPLETED BETWEEN NOVEMBER 1 AND APRIL 1 TO AVOID THE BREEDING BIRD SEASON AND ACTIVITY.
- EMPLOYEES AND CONTRACTORS WORKING AT THE SITE WILL BE TRAINED FOR WORKING NEAR SPECIES AT RISK.
- PRIOR TO STRIPPING AND BERM CONSTRUCTION IN PHASE 6, THE LICENCEE SHALL INSTALL LIGHT DUTY SILT FENCING IN PHASE 6 ALONG THE WESTERN EXTRACTION LIMIT, 6m FROM THE SOUTHERN LICENCE BOUNDARY, AND 6m TO 10m FROM THE EASTERN LICENCE BOUNDARY, AS SHOWN ON THIS PLAN.
- IF POSSIBLE, A SECTION OF EXTRACTION FACE (VERTICAL OR NEAR VERTICAL) WHERE EXTRACTION IS NOT TAKING PLACE, WILL BE ALLOCATED FOR BANK SWALLOWS. THE APPLICABLE AREAS WILL BE MONITORED AND DOCUMENTED THREE (3) TIMES PER YEAR AS PART OF AN ANNUAL REPORT.
- IN ADDITION, THE COMPENSATION PLANTING AREA IS IDENTIFIED ON THIS PAGE (REFORESTATION AREA). THE LICENCEE SHALL IMPLEMENT ADDITIONAL HABITAT REQUIREMENTS FOR PHASE 6 IN ACCORDANCE WITH THE ECOLOGICAL MANAGEMENT PLAN PREPARED BY GOODBAN ECOLOGICAL CONSULTING INC. IN APRIL 2017, AS SHOWN ON PAGE 8.

ARCHAEOLOGY

- SHOULD PREVIOUSLY UNDOCUMENTED ARCHAEOLOGICAL RESOURCES BE DISCOVERED, ALTERATION OF THE SITE MUST BE CEASED IMMEDIATELY AND A LICENSED CONSULTANT ARCHAEOLOGIST MUST CARRY OUT ARCHAEOLOGICAL FIELDWORK.
- ANY PERSON DISCOVERING OR HAVING KNOWLEDGE OF A BURIAL SITE SHALL IMMEDIATELY NOTIFY THE POLICE OR CORONER. IT IS RECOMMENDED THAT THE REGISTRAR OF CEMETERIES AT THE MINISTRY OF CONSUMER SERVICES IS ALSO IMMEDIATELY NOTIFIED.

Legend:

- BOUNDARY OF PROPERTY TO BE LICENCED
- 310 PROPOSED CONTOUR (Meters ASL)
- 314.2 SPOT ELEVATION (Meters ASL)
- T.P.3 TEST PIT
- B.H'A' BOREHOLE
- DP5 DRIVE POINT
- FENCE (EX./PROPOSED) POST & WIRE
- BUILDING (EXISTING)
- TEST WELLS
- OW 16 B–76 OBSERVATION WELL
- BH9 BOREHOLE OBSERVATION MONITOR INSTALLATION
- SWM 4 SURFACE WATER MONITORING STATION
- 92–27 GROUNDWATER MONITORING STATION (TEMPERATURE AND LEVEL)
- REGIONAL STORM FLOODLINE AT END OF EXTRACTION
- ZONING LINE
- SILT FENCE
- REFORESTATION
- GATE (EXISTING/PROPOSED)
- MIXED TREED AREA
- WIND THROW EDGE PLANTING BED
- EXISTING TREED AREA
- PROPOSED BERM
- INTERNAL HAUL ROUTES
- HAUL ROUTE TO MARKET
- PHASING LIMIT
- 3 EXTRACTION PHASE
- SP3 SILT POND PHASING
- DIRECTION OF EXTRACTION (ABOVE WATER TABLE)
- DIRECTION OF EXTRACTION (BELOW WATER TABLE)
- 297.0 APPROXIMATE FINAL DEPTH OF EXTRACTION
- A L LINE OF CROSS SECTION
- ABOVE WATER LIMIT OF EXTRACTION
- BELOW WATER LIMIT OF EXTRACTION

Notes:

1. REFER TO SHEET 3 FOR GENERAL OPERATIONAL NOTES.
2. REFER TO SHEET 3 FOR OPERATIONAL PLAN NORTH OF TOWNSHIP ROAD 2.

SITE PLAN OVERRIDE OF OPERATIONAL STANDARDS

NO.	ITEM	SECTION
1.	THE FENCING REQUIREMENTS ALONG THE WEST PROPERTY LINE NORTH OF TOWNSHIP ROAD AND IN THE PORTION OF THE WEST BOUNDARY OF PHASE 2 AND THE ADJACENT LICENCE WHERE THE ACCESS AND CONVEYOR ARE LOCATED SHALL BE ELIMINATED.	5.1
2.	GROUND WATER RECHARGE TRENCH WILL BE CONSTRUCTED IN EXCAVATION SETBACK AREA OF NORTH OF PHASE 1.	5.11
3.	CONVEYOR AND OFF ROAD EQUIPMENT ACCESS MAY BE INSTALLED IN THE EXCAVATION SETBACK AREA.	5.11
4.	AN INTERNAL ACCESS ROAD TO ALLOW OFF–ROAD EQUIPMENT FROM PHASE 2 TO THE ADJACENT LICENSED PIT ALONG THE WEST BOUNDARY OF SETBACK.	5.11
5.	THE EXCAVATION SETBACK AREA AND THE FENCING REQUIREMENT ALONG THE PHASE 2 EAST AND WEST BOUNDARIES WITH THE ADJACENT LICENSED LANDS SHALL BE ELIMINATED UPON SUBMITTING AN AGREEMENT WITH THE APPLICABLE LAND OWNER MNR.	5.1 & 5.11

SITE PLAN AMENDMENTS

NO.	DESCRIPTION	DATE	INIT.
1.	VARIOUS MINOR AMENDMENTS AS PER M.N.R. APPROVAL SEP. /00.	SEPT. /00	
2.	VARIOUS MINOR AMENDMENTS AS PER MNR APPROVAL, APRIL 2001.	MAY /01	
3.	VARIOUS MINOR AMENDMENTS AND HOUSEKEEPING.	AUG. /03	K.M.
4.	MINOR AMENDMENT ON PHASE 3 AREA AND SILT POND 3	FEB. /10	K.M.
5.	MAJOR AMENDMENT TO ENLARGE LIMIT OF EXTRACTION IN PHASE 2	SEPT. /15	K.M.
6.	MINOR AMENDMENT TO PERMIT EXTRACTION OF PHASE 2 EAST AND WEST BOUNDARIES ADJACENT TO OTHER LICENSED PROPERTIES TO 1.5m ABOVE THE WATER TABLE.	MAY /16	K.M.
7.	MINOR AMENDMENT TO PERMIT EXTRACTION OF PHASE 1 EAST BOUNDARY ADJACENT TO OTHER LICENSED PROPERTY TO 1.5m ABOVE THE WATER TABLE.	SEPT. /16	K.M.

REVISIONS

NO.	DESCRIPTION	DATE	INIT.
1.	AS REQUESTED BY SUB CONSULTANTS AND MINISTRIES	OCT. /88	L.L.M.
2.	AS REQUESTED BY SUB CONSULTANTS AND MINISTRIES	APR. /89	A.L.B.
3.	MODIFICATION TO SEQUENCE	SEPT. /89	A.B.M.
4.	UPDATED TO CONFORM WITH THE AGGREGATE RESOURCES ACT	JUNE. /90	L.L.M.
5.	AS PER O.M.B. CONDITIONS & FILL PERMIT APPLICATION	OCT. /90	J.J.M.
6.	TRANSFERRED ON TO AUTOCAD	DEC. /91	J.J.M.
7.	REVISIONS RE: BARRIER WALL	SEPT. /00	A.G.H.
8.	REGIONAL STORM FLOODLINE AT END OF EXTRACTION ADDED	MAY /01	A.G.H.
9.	EXPAND SP1 & SP3, EXPAND LIMIT OF EXTRACTION OF PHASE 2 BARN AREA.	MAY /05	K.M.
10.	EXTRACT COMMON SETBACK WITH ADJACENT LICENSES (ABOVE WATER)	MAY /16	K.M.
11.	EXTRACT COMMON SETBACK WITH ADJACENT LICENSE (ABOVE WATER)	SEPT. /17	K.M.
12.	REVISIONS TO ADDRESS AGENCY COMMENTS DURING PUBLIC COMMENT PERIOD	SEPT. /17	K.M.
13.	ADDITIONS TO ADDRESS MNRF COMMENTS	MAR. /18	K.M.

MILL CREEK AGGREGATES

PART OF LOTS 21, 22, 23 AND 24, CONCESSION II
PART OF LOT 24, CONCESSION I
TOWNSHIP OF PUSLINCH, COUNTY OF WELLINGTON

University of Guelph
854 GORDON STREET
GUELPH, ONTARIO
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Scale 1:3000
50 0 50 100 150 m

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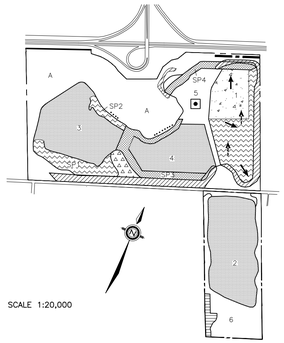
OPERATIONS PLAN SOUTH OF TOWNSHIP ROAD 2

Drawing No. 4 OF 8

JOB: 11132



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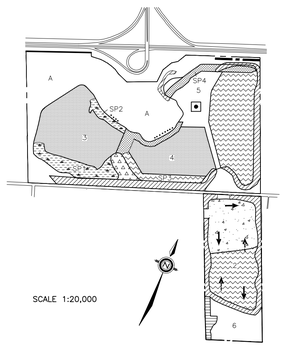
Phase 1

- Topsoil and overburden shall be removed separately and used to construct perimeter berms around Phase 3 and 4 as illustrated.
- A temporary berm will be constructed along Phase I and Highway 401 partially over silt pond SP4 and blended into the existing berm along the east boundary as field conditions permit. The berm will consist of either topsoil or subsoil which will be separated when and where possible and needed. The berm may remain as a permanent structure unless the material is required for rehabilitation purposes or may be removed in order to excavate silt pond SP4.
- Berms shall be seeded with a maintenance free ground cover (perennial rye 20 %, tall fescue 80%)
- In Phase 1, extraction generally is to be from south to north. An exception to this is permitted along the eastern limit of Phase 1 to allow extraction to extend northwards up to silt pond SP4.
- Sub water table resources in areas designated for the operation silt ponds (SP1 and SP2) will be extracted first. Ponds to be excavated in spring or fall. Extraction and temporary use of silt pond SP4 during startup of Phase 1 is permitted.
- Dry excavation in Phase 1 will be in direction as shown. Aggregate materials will be removed by dry excavation and will be followed immediately by wet/dragline extraction.
- Minimum width of siltation pond (SP1 and SP2) adjacent to Phase 3 of northern property will be 40 metres. Actual width will be dependent on depth of resource and sideslope that can be excavated.
- A temporary groundwater recharge trench will be constructed in the setback north of Phase 1. Feed water will be pumped from the pond in Phase 1. The use of the recharge trench will not extend past the end of Phase 5 and it will be backfilled prior to the closeout of operations at the site. Please refer to recharge trench proposal (April 30, 2001) for details and monitoring program requirements.
- Phases 2, 3 and 4 will remain in agricultural use (excluding haul roads and silt ponds).



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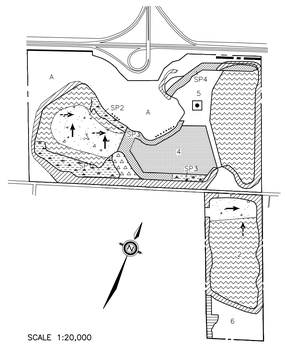
Phase 2

- Silt pond SP3 stripped of topsoil and excavated above and below the water table and siltation pond basin created and available for use as soon as SP1 and SP2 are completed.
- Phase 1 exhausted of its aggregate resources as practical.
- Strip topsoil and overburden separately from Phase 2 and use to complete perimeter berms around Phase 2 as shown.
- Excavation in Phase 2 will occur above and below the water table in the direction shown.
- Tree planting continues.
- Completion of appropriate grading, stabilization and vegetating of shorelines in Phase 2.
- It is the intention of the applicant to transport the aggregate deposits from Phase 2 to the processing plant area by conveyor belt. This will involve the construction of a culvert system under Township Road No. 2. The design and location of the culvert under Concession Road 2 will be subject to the approval of the Township of Puslinch.
- The location of the conveyor system will vary to accommodate extraction. The conveyor installation may require minor grading and berm alterations.
- A temporary haul route across Township Road No. 2 will facilitate the movement of aggregate from Phase 2 to the processing area until the conveyor system is in place. Oversized bank material may also be required to be hauled to the processing area by truck throughout the life of Phase 2.
- Phases 3 and 4 will remain in agricultural use (excluding haul roads and silt ponds).



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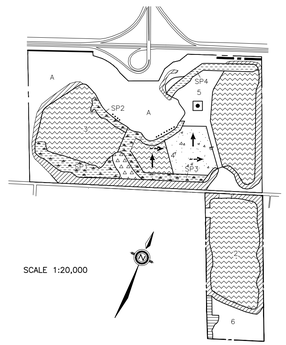
Phase 3

- Topsoil stripping of Phase 3 and initial above water table removal of aggregate.
- Final removal of all available aggregate resource in Phase 2.
- Phase 4 to continue in agricultural use.
- Tree planting continues.
- Completion of appropriate grading, stabilization and vegetating of shorelines in Phase 2.
- Haul roads in Phase 3 can be extracted during Phase 3, in conformance with Rehabilitation Plan, or may remain for extraction during Phase 5.



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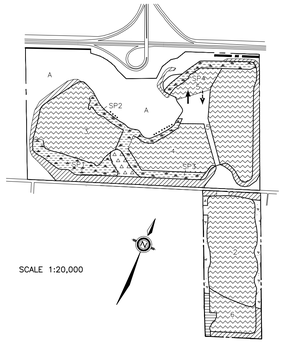
Phase 4

- Silt pond 3 between Phases 3 and 4 shall be filled with silt prior to commencement of extraction in Phase 4.
- Removal of topsoil and above the water table extraction of the sand and gravel.
- Final removal of all available resources in Phase 3.
- Tree planting continues.
- Completion of appropriate grading, stabilization and vegetating of shorelines in Phase 3.
- Removal of redundant haul routes.
- Silt pond 4 north of Phases 1 and 5 will be excavated above and below the water table and siltation pond basin created and available for use as soon as SP3 is completed.



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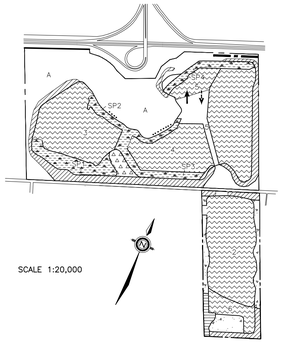
Phase 5

- Final removal of available resources from Phase 4 and resources from redundant haul routes.
- Relocation of mobile processing plant as Phase 5 extracted.
- Stripping and above water table extraction followed by below water table extraction for Phase 5. Material may be hauled off site for processing.



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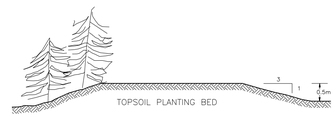
Phase 6

- Prior to extraction commencing in Phase 6, the licensee shall provide MNRF confirmation that Holding Zone H-8 has been lifted.
- Removal of all haul routes except those required for rehabilitation land uses. (eg. island habitat locations)
- Transplanting of final tree stock.
- Completion of appropriate grading, stabilization and vegetating of shorelines.
- Replacing top soils on islands and revegetating them.
- Side slopes of the pit toward the final lakes shall be no steeper than 3:1 except where certain objectives demand a shallower slope. (see Details of Final Rehabilitation on page 7 of 8 and page 8 of 8)
- Excess topsoil and overburden in the berms will be used to create additional promontory(ies).
- Topsoil and overburden removed from Phase 6 and used to rehabilitate sideslopes in Phase 2 and to create acoustic berms
- Commence extraction of Phase 6. Resources may be conveyed to processing plant in Phase 5 or shipped off site. Extraction in Phase 6 may occur at the same time as Phase 5.

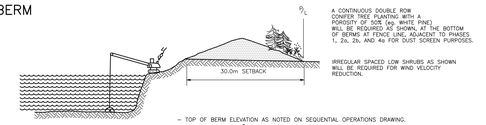
DESIGN OF SPECIAL BERMS

EROSION PROTECTION / WIND THROW EDGE

- BERM TO BE 0.5m IN HEIGHT
- TOP TO BE FLAT FOR PEDESTRIAN ACCESS
- BERM TO BE PLANTED WITH WHITE CEDAR
- BERM TO BE LOCATED WHERE NOTED ON SHEET 2A, AND IN THE TREE PLANTING DETAIL (ON THIS SHEET)



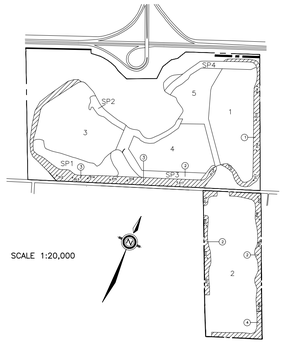
TYPICAL BERM



- TOP OF BERM ELEVATION AS NOTED ON SEQUENTIAL OPERATIONS DRAWING.
- BERM SLOPE 3:1
- SHORELINE TO BE REHABILITATED AS PER SKETCH ON SHEET 3b.

SPECIAL BERM PROVISIONS

(NOISE / EROSION PROTECTION / VISIBILITY SCREENING)



SCALE 1:20,000

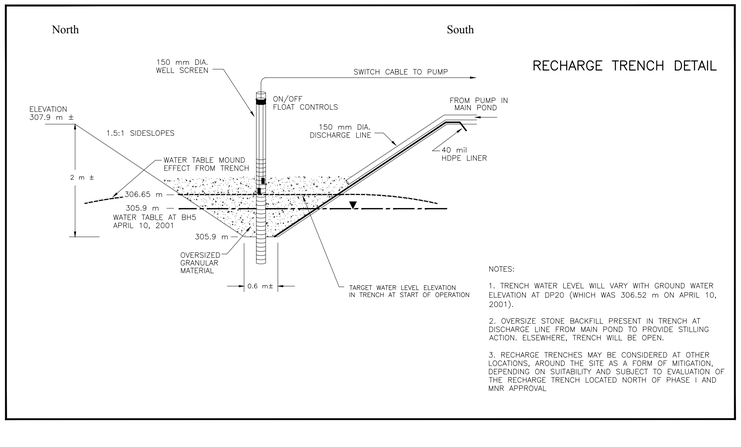
LEGEND

- ① SEQUENTIAL ORDER OF BERM CONSTRUCTION
- *317 FINAL BERM ELEVATIONS
- PERIMETER BERMS

Notes:

Berms will be constructed to the minimum height and dimensions as shown. However, subsequent applications by other Aggregate Producers may render the berm redundant. If this happens application may be made to the Ministry of Natural Resources for a more appropriate design.

Berms will be designed using a ground cover (ie: white clover, (trifolium repens), bird's foot trefoil (lotus corniculatus) and interspersed with a variety of deciduous and coniferous shrubs/trees.



NOTES:

1. TRENCH WATER LEVEL WILL VARY WITH GROUND WATER ELEVATION AT DP20 (WHICH WAS 306.52 m ON APRIL 10, 2001).

2. OVERSIZE STONE BACKFILL PRESENT IN TRENCH AT DISCHARGE LINE FROM MAIN POND TO PROVIDE STILLING ACTION. ELSEWHERE, TRENCH WILL BE OPEN.

3. RECHARGE TRENCHES MAY BE CONSIDERED AT OTHER LOCATIONS, AROUND THE SITE AS A FORM OF MITIGATION, DEPENDING ON SUITABILITY AND SUBJECT TO EVALUATION OF THE RECHARGE TRENCH LOCATED NORTH OF PHASE I AND MNR APPROVAL

Legend:

- EXTRACTION BELOW WATER TABLE
- EXTRACTION ABOVE WATER TABLE
- AWAITING SILT POND
- AWAITING EXTRACTION INTERIM AGRICULTURAL USE
- BERM
- SILT POND BEING PROGRESSIVELY REHABILITATED TO WETLAND AND MEADOW HABITAT
- WOODLAND AREA
- HAUL ROUTE
- A/B NO EXTRACTION –A– ECOLOGICAL –B– REFORESTATION
- PROCESSING PLANT AREA
- WIND THROW EDGE
- X AREA TO BE MONITORED
- TEMPORARY GROUNDWATER RECHARGE TRENCH
- DIRECTION OF EXTRACTION (ABOVE WATER TABLE)
- DIRECTION OF EXTRACTION (BELOW WATER TABLE)

Notes:

1. REFER TO SHEET 3 FOR GENERAL OPERATIONAL NOTES.

2. REFER TO THE FOLLOWING STUDIES AND REPORTS USED IN PREPARING THE OPERATIONAL PLAN:

A) ABERFOYLE PIT TRAFFIC IMPACT STUDY BY UMA ENGINEERING LTD., NOVEMBER 1987.

B) ANTICIPATED FUGITIVE DUST AT THE UNIVERSITY OF GUELPH PROPERTY IN PUSLINCH TOWNSHIP BY ARKTOS LTD., OCTOBER 1987.

C) TERRESTRIAL BIOLOGY IMPACT ASSESSMENT BY PAUL F. G. EAGLES PLANNING LTD, NOVEMBER 1988.

D) MILL CREEK STUDY BY FAUN AQUATICS CANADA LTD., 1987.

E) THE IMPACT AND ABATEMENT OF NOISE FROM A PROPOSED GRAVEL PIT IN THE TOWNSHIP OF PUSLINCH BY J. S. KEELER LTD., 1987, REVISED MAY 10, 1989.

F) WATER RESOURCES STUDY – BASELINE CONDITIONS FOR A PROPOSED SAND AND GRAVEL PIT, UNIVERSITY OF GUELPH BY GARTNER LEE LTD., 1987.

G) POTENTIAL IMPACT ASSESSMENT REPORT AND GROUNDWATER, SURFACE WATER ASPECTS PROPOSED SAND AND GRAVEL PIT, TOWNSHIP OF PUSLINCH BY GARTNER LEE LTD., 1987.

H) SUPPLEMENTAL GROUNDWATER INFORMATION BY JAGGER HIMS LTD., ONGOING FROM 1987 TO 1992.

I) RECHARGE TRENCH PROPOSAL BY JAGGER HIMS LTD., APRIL 30, 2001.

3. THE FOLLOWING REPORTS WERE PREPARED FOR EXTRACTION OF PHASE 6:

A) HYDROGEOLOGICAL ASSESSMENT REPORT BY HIMS GEOENVIROMENTAL LTD., 2015.

B) NOISE IMPACT STUDY BY AERCOUSTICS ENGINEERING LTD., 2015.

C) LEVEL 1 & 2 NATURAL ENVIRONMENT ASSESSMENT BY AECOM, 2015.

D) STAGE 1 ARCHAEOLOGICAL ASSESSMENT BY GOLDER ASSOCIATES LTD., 2015.

E) PLANNING JUSTIFICATION REPORT BY GSP GROUP INC., 2015.

F) ECOLOGICAL MANAGEMENT PLAN AND REHABILITATION PLAN BY GOODBAN ECOLOGICAL CONSULTING INC. 2017

SITE PLAN AMENDMENTS

NO.	DESCRIPTION	DATE	INT.
1.	REDUCTION OF AREA TO BE EXTRACTED AS A RESULT OF ADDITIONAL WETLAND BUFFER	JUNE /92	
2.	REMOVAL OF 2.0m BERM TO ADJACENT TO MILL CREEK	JUNE /92	
3.	CONSOLIDATION OF ENTRANCE / EXIT TO BE LOCATED WEST OF EXISTING BUILDINGS.	JUNE /92	
4.	CONSTRUCTION OF DYKE WALL ADJACENT TO PHASE 3	AUG. /92	
5.	VARIOUS MINOR AMENDMENTS AS PER MNR MARCH/97 APPROVAL (SILT POND, FENCING, SLURRY PIPE, TREE PLANTING, USE OF GENSETS, ETC.)	MARCH/97	
6.	INCLUSION OF BERM ALONG 401	MARCH/99	
7.	VARIOUS MINOR AMENDMENTS AS PER M.N.R. APPROVAL SEPT. /00 (SILT PONDS SP1, SP2, ORCA CUT AND FILL PERMIT LINE, AMPHITHEATRE TEMPORARY BERM IN PHASE 1, EXTRACTION IN PHASE 1, ETC.)	SEPT. /00	
8.	VARIOUS MINOR AMENDMENTS AS PER MNR APPROVAL, MAY /01 (RECHARGE TRENCH, MODIFICATIONS TO EXTRACTION OUTLINE IN PHASE 1 AND SILT PONDS SP1/SP2 IN PHASE 3).	MAY /01	
9.	MINOR AMENDMENT RE TRANSPORT AGGREGATE ACROSS CONCESSION ROAD 2.	OCT. /02	
10.	VARIOUS MINOR AMENDMENTS AND HOUSEKEEPING.	AUG. /03	K.M.
11.	MINOR AMENDMENT ON PHASE 3 AREA AND SILT POND 3	FEB. /10	K.M.
12.	MAJOR AMENDMENT TO ENLARGE LIMIT OF EXTRACTION IN PHASE 2	SEPT. /15	K.M.

REVISIONS

NO.	DESCRIPTION	DATE	INT.
1.	AS PER REQUEST BY SUB. CONSULTANTS AND MINISTRIES	OCT./88	J.L.S.
2.	AS PER STUDY BY SUB. CONSULTANTS AND MINISTRIES	APR./89	A.L.B.
3.	MODIFICATION TO SEQUENCE	SEPT./89	A.B.M.
4.	UPDATED TO CONFORM WITH THE AGGREGATE RESOURCES ACT	JUNE/90	J.J.M.
5.	AS PER O.M.B. CONDITIONS AND FILL PERMIT APPLICATION	OCT./90	J.J.M.
6.	AS PER MINISTER CONDITIONS AND TRANSFERRED ONTO AUTOCAD	DEC./91	J.J.M.
7.	TO CONFORM WITH O.R.C.A. FILL PERMIT APPLICATION AND REVISED MONITORING STATION LOCATIONS	AUG./92	R.E.G.
8.	AS PER M.N.R.	NOV./92	R.E.G.
9.	AS PER APPROVAL BY M.N.R. SEPT. /00	SEPT./00	A.G.H.
10.	AS PER APPROVAL BY MNR, MAY /01.	MAY /01	A.G.H.
11.	AS PER M.N.R. COMMENTS	JAN. /04	K.M.
12.	EXPAND SP1 & SP3, EXPAND LIMIT OF EXTRACTION OF PHASE 2 BARN AREA.	MAY /05	K.M.
13.	REVISED PHASING NOTES AND REVISIONS TO ADDRESS AGENCY COMMENTS DURING PUBLIC COMMENT PERIOD	SEPT. /17	K.M.
14.	REVISIONS TO PHASING NOTES TO ADDRESS COMMENTS	FEB. /19	K.M.

MILL CREEK AGGREGATES

PART OF LOTS 21, 22, 23 AND 24, CONCESSION II
PART OF LOT 24, CONCESSION I
TOWNSHIP OF PUSLINCH, COUNTY OF WELLINGTON

University of Guelph

854 GORDON STREET
GUELPH, ONTARIO
N1G 1Y7

Scale 1:3000

50 0 50 100 150 m

J. KEVIN MITCHELL IS AUTHORIZED BY THE MINISTRY OF NATURAL RESOURCES TO PREPARE & CERTIFY SITE PLANS FOR LICENCE APPLICATIONS:

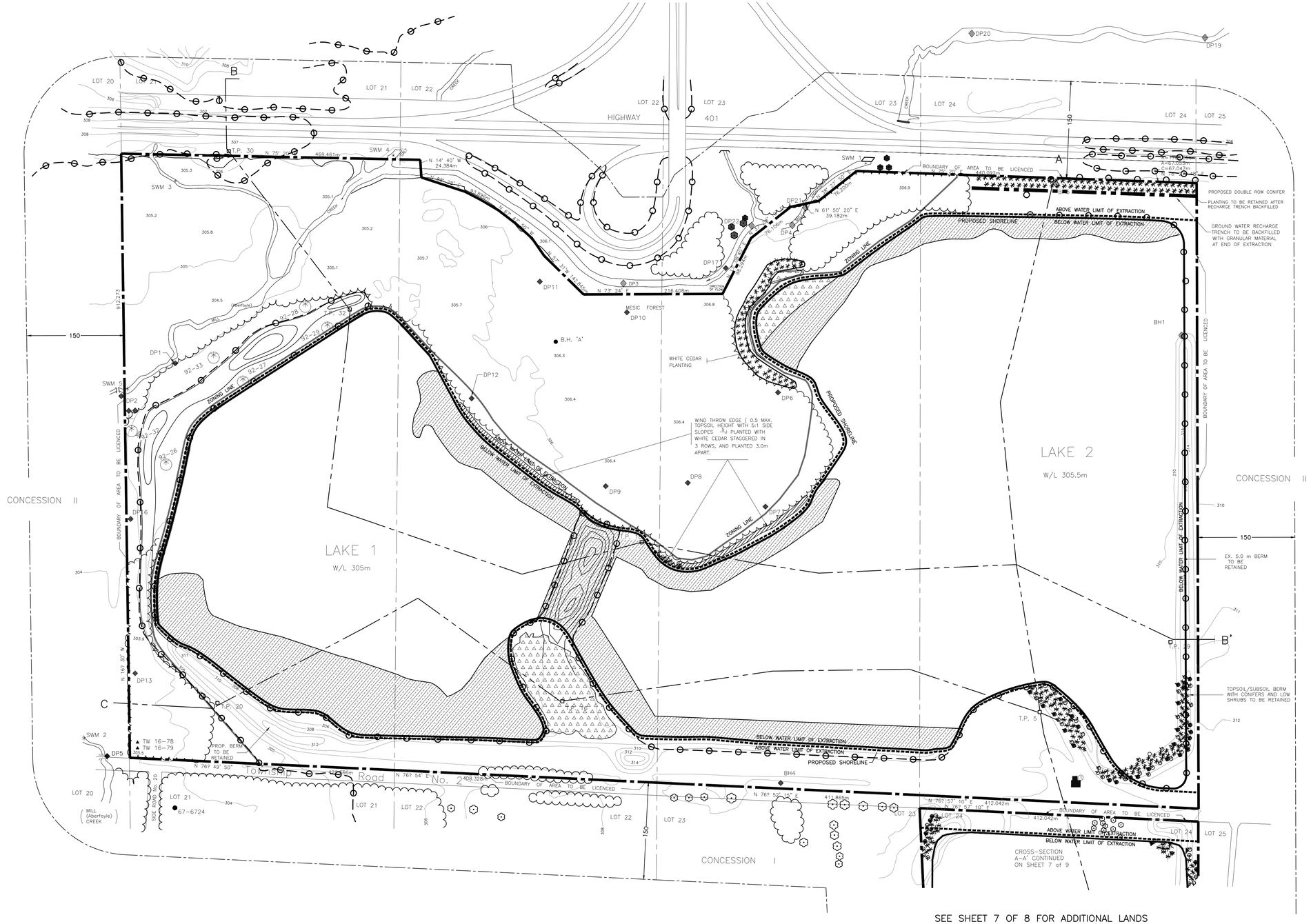
J.H. COHOON ENGINEERING LIMITED
CONSULTING ENGINEERS

440 HARDY ROAD , UNIT #1
BRANTFORD – ONTARIO , N3T 5L8
TEL. (519) 753-2656
FAX. (519) 753-4263

OPERATION PHASING DETAILS

Drawing No. 5 OF 8

JOB: 11132



SEE SHEET 7 OF 8 FOR ADDITIONAL LANDS TO BE LICENCED

Legend:

- ZONING LINE
- 310 PROPOSED CONTOUR (Metres A.S.L.)
- BOUNDARY OF AREA TO BE LICENCED
- EXISTING TREED AREA
- MIXED TREED AREA
- BUILDING (TO BE RETAINED)
- DP5 DRIVE POINT
- REVEGETATED ISLANDS
- OW 16 B-78 OBSERVATION WELL
- 92-27 GROUNDWATER MONITORING STATION (TEMPERATURE AND LEVEL)
- REGIONAL STORM FLOODLINE AT END OF EXTRACTION
- PROPOSED SHORELINE
- RECHARGE TRENCH
- WIND THROW EDGE PLANTING BED
- REFORESTATION
- PROPOSED WETLANDS/MEADOWS HABITAT TO BE CREATED
- T.P.3 TEST PIT
- SWM 4 SURFACE WATER MONITORING STATION
- B.H. 5 BORE HOLE OBSERVATION MONITOR INSTALLATION
- B.H. 'B' BORE HOLE
- FA5 STREAM QUALITY AND FISHERIES MONITORING STATION (Water Quality, Biological/Fisheries as per FaunAquatics Report)
- TW 16-74 TEST WELLS
- ABOVE WATER LIMIT OF EXTRACTION
- BELOW WATER LIMIT OF EXTRACTION

Notes:

1. REFER TO SHEET 7 FOR REHABILITATION DETAILS SOUTH OF TOWNSHIP ROAD 2.
2. AREA TO BE REHABILITATED = 83.3 ha NORTH
   38.8 ha SOUTH
   122.1 ha TOTAL
3. BUILDINGS MAY REMAIN ON SITE AT DISCRETION OF LICENCE HOLDER.
4. REFER TO SHEET 7 FOR REHABILITATION CROSS-SECTIONS.
5. PERIMETER BERMS MAY REMAIN IF MATERIAL NOT REQUIRED FOR REHABILITATION.
6. THE CULVERT UNDER CONCESSION ROAD 2 SHALL BE REMOVED PRIOR TO THE SURRENDER OF THE LICENCE.
7. OFFICE TRAILERS, SCALE AND SCALE HOUSE, ALL PROCESSING EQUIPMENT AND SCRAP SHALL BE REMOVED.

SITE PLAN AMENDMENTS

NO.	DESCRIPTION	DATE	INIT.
1.	VARIOUS MINOR AMENDMENTS AS PER M.N.R. APPROVAL SEP. /00.	SEPT. /00	
2.	SUBMERGED SIDESLOPES 2:1 OR FLATTER.	SEPT. /00	
3.	VARIOUS MINOR AMENDMENTS AS PER MNR APPROVAL APRIL, /01. RECHARGE TRENCH TO BE BACKFILLED	MAY /01	
4.	VARIOUS MINOR AMENDMENTS AND HOUSEKEEPING.	AUG. /03	K.M.
5.	MINOR AMENDMENT ON PHASE 3 AREA AND SILT POND 3	FEB. /10	K.M.
6.	MAJOR AMENDMENT TO ENLARGE LIMIT OF EXTRACTION IN PHASE 2	SEPT. /15	K.M.
7.	MINOR AMENDMENT TO PERMIT EXTRACTION OF PHASE 1 EAST BOUNDARY ADJACENT TO OTHER LICENSED PROPERTY TO 1.5m ABOVE THE WATER TABLE.	SEPT. /17	K.M.

REVISIONS

NO.	DESCRIPTION	DATE	INIT.
1.	AS PER SUB-CONSULTANTS AND M.N.R.	OCT. /88	J.L.S.
2.	AS PER SUB-CONSULTANTS AND M.N.R.	APR. /89	C.A.G'B.
3.	AS PER SUB-CONSULTANTS AND M.N.R.	MAY /90	C.A.G'B.
4.	UPDATED TO COMPLY WITH THE AGGREGATE RESOURCES ACT.	JUNE/90	L.L.H.
5.	AS PER O.B.M. CONDITIONS + FILL PERMIT APPLICATION	OCT. /90	J.J.M.
6.	AS PER MINISTER CONDITIONS & TRANSFERRED ONTO AUTOCAD	DEC. /91	J.J.M.
7.	TO CONFORM WITH G.R.C.A. FILL PERMIT APPLICATION AND REVISED MONITORING STATION LOCATIONS	AUG. /92	R.E.G.
8.	AS PER M.N.R.	NOV. /92	R.E.G.
9.	ADDITIONAL DRIVE POINTS ADDED	NOV. /93	R.E.G.
10.	BLDG. #3 DELETED, SURFACE WATER STATIONS RE-LOCATED	SEPT. /00	A.G.H.
11.	REGIONAL STORM FLOODLINE AT END OF EXTRACTION ADDED.	MAY /01	A.G.H.
12.	EXPAND SP1 & SP3, EXPAND LIMIT OF EXTRACTION OF PHASE 2 BARN AREA.	MAY /05	K.M.
13.	EXTRACT COMMON SETBACK WITH ADJACENT LICENCE (ABOVE WATER)	SEPT. /17	K.M.

MILL CREEK AGGREGATES

PART OF LOTS 21, 22, 23 AND 24, CONCESSION II
PART OF LOT 24, CONCESSION I
TOWNSHIP OF PUSLINCH, COUNTY OF WELLINGTON

University of Guelph
854 GORDON STREET
GUELPH, ONTARIO
N1G 1Y7

Scale 1:3000
50 0 50 100 150 m

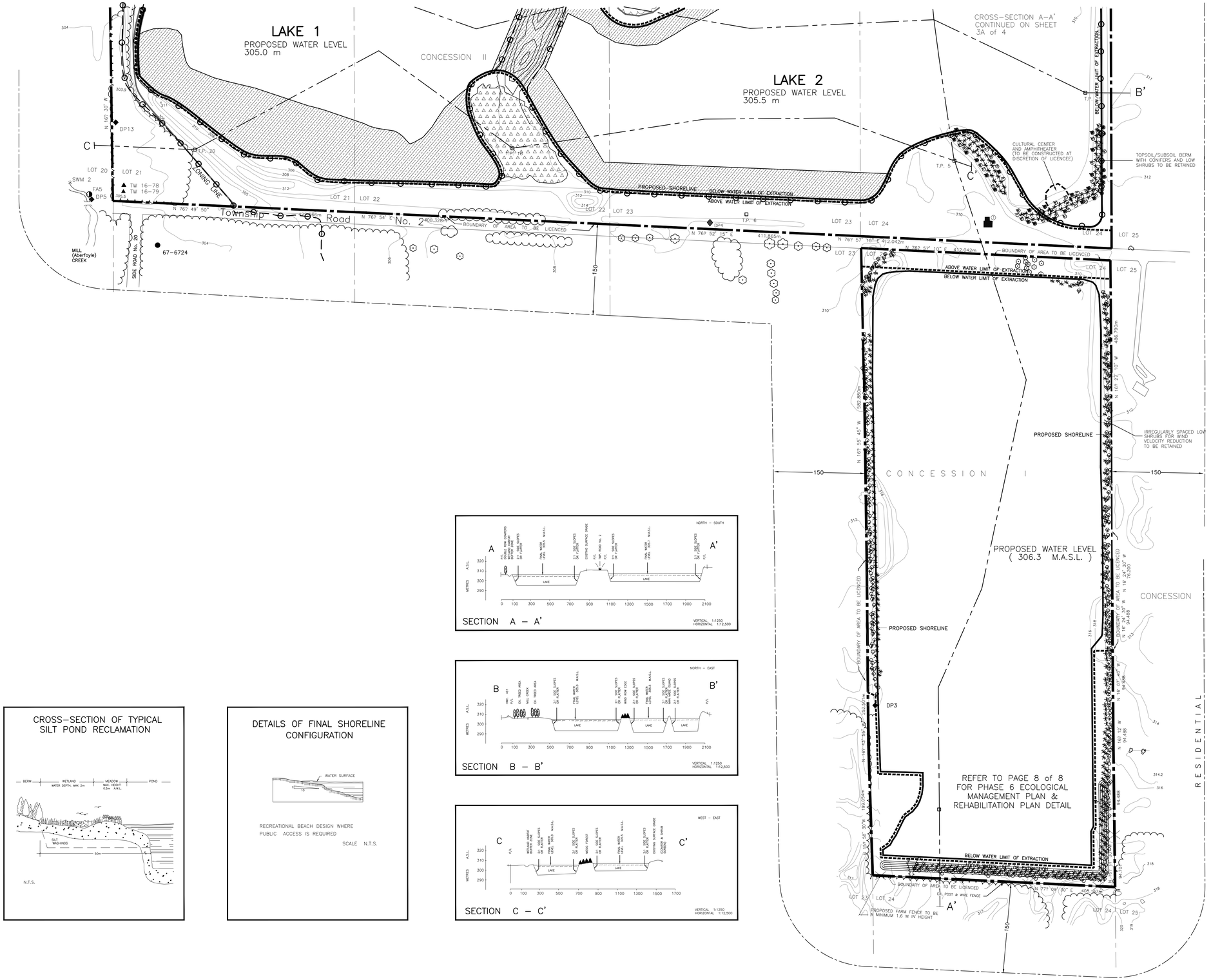
J. KEVIN MITCHELL IS AUTHORIZED BY THE MINISTRY OF NATURAL RESOURCES TO PREPARE & CERTIFY SITE PLANS FOR LICENCE APPLICATIONS.

J.H. COHOON ENGINEERING LIMITED
CONSULTING ENGINEERS
440 HARDY ROAD , UNIT #1
BRANTFORD – ONTARIO , N3T 5L8
TEL. (519) 753-2656
FAX. (519) 753-4263

PROGRESSIVE & FINAL REHABILITATION PLAN NORTH OF TOWNSHIP ROAD 2

Drawing No. 6 OF 8

JOB: 11132



Legend:

- ZONING LINE
- PROPOSED CONTOUR (Metres A.S.L.)
- BOUNDARY OF AREA TO BE LICENCED
- EXISTING TREED AREA
- MIXED TREED AREA
- BUILDING (TO BE RETAINED)
- DP5 DRIVE POINT
- REVEGETATED ISLANDS
- OW 16 B-78 OBSERVATION WELL
- 92-27 GROUNDWATER MONITORING STATION (TEMPERATURE AND LEVEL)
- REGIONAL STORM FLOODLINE AT END OF EXTRACTION
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- TW 16-74 TEST WELLS
- BERM
- ABOVE WATER LIMIT OF EXTRACTION
- BELOW WATER LIMIT OF EXTRACTION

Notes:

1. REFER TO SHEET 6 FOR REHABILITATION DETAILS NORTH OF TOWNSHIP ROAD 2.
2. AREA TO BE REHABILITATED = 83.3 ha NORTH
   38.8 ha SOUTH
   122.1 ha TOTAL
3. BUILDINGS MAY REMAIN ON SITE AT DISCRETION OF LICENCE HOLDER.
4. PERIMETER BERMS MAY REMAIN IF MATERIAL NOT NEEDED FOR REHABILITATION.

CROSS-SECTION OF TYPICAL SILT POND RECLAMATION

DETAILS OF FINAL SHORELINE CONFIGURATION

RECREATIONAL BEACH DESIGN WHERE PUBLIC ACCESS IS REQUIRED

SCALE N.T.S.

SITE PLAN AMENDMENTS

NO.	DESCRIPTION	DATE	INIT.
1.	VARIOUS MINOR AMENDMENTS AS PER M.N.R. APPROVAL SEP. /00.	SEPT. /00	
2.	VARIOUS MINOR AMENDMENTS AS PER MNR APPROVAL APRIL /01.	MAY /01	
3.	VARIOUS MINOR AMENDMENTS AND HOUSEKEEPING.	AUG. /03	K.M.
4.	MINOR AMENDMENT ON PHASE 3 AREA AND SILT POND 3	FEB. /10	K.M.
5.	MAJOR AMENDMENT TO ENLARGE LIMIT OF EXTRACTION IN PHASE 2	SEPT. /15	K.M.
6.	MINOR AMENDMENT TO PERMIT EXTRACTION OF PHASE 1 EAST BOUNDARY ADJACENT TO OTHER LICENSED PROPERTY TO 1.5m ABOVE THE WATER TABLE	SEPT. /17	K.M.

REVISIONS

NO.	DESCRIPTION	DATE	INIT.
1.	AS PER SUB-CONSULTANTS AND M.N.R.	OCT. /88	J.L.S.
2.	AS PER SUB-CONSULTANTS AND M.N.R.	APR. /89	C.A.O'B.
3.	AS PER SUB-CONSULTANTS AND M.N.R.	MAY /90	C.A.O'B.
4.	UPDATED TO COMPLY WITH THE AGGREGATE RESOURCES ACT.	JUNE/90	L.L.H.
5.	AS PER O.B.M. CONDITIONS + FILL PERMIT APPLICATION	OCT. /90	J.J.M.
6.	AS PER MINISTER CONDITIONS & TRANSFERRED ONTO AUTOCAD	DEC. /91	J.J.M.
7.	TO CONFORM WITH G.R.C.A. FILL PERMIT APPLICATION AND REVISED MONITORING STATION LOCATIONS	AUG. /92	R.E.G.
8.	AS PER M.N.R.	NOV. /92	R.E.G.
9.	BLDG. #3 DELETED, SURFACE WATER STATIONS RE-LOCATED	SEPT. /00	A.G.H.
10.	REGIONAL STORM FLOODLINE AT END OF EXTRACTION ADDED	MAY /01	A.G.H.
12.	EXPAND SP1 & SP3, EXPAND LIMIT OF EXTRACTION OF PHASE 2 BARN AREA.	MAY /05	K.M.
13.	EXTRACT COMMON SETBACK WITH ADJACENT LICENCE (ABOVE WATER)	SEPT. /17	K.M.
14.	REVISIONS TO ADDRESS AGENCY COMMENTS DURING PUBLIC COMMENT PERIOD	SEPT. /17	K.M.

MILL CREEK AGGREGATES

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PART OF LOT 24, CONCESSION I
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50 0 50 100 150 m

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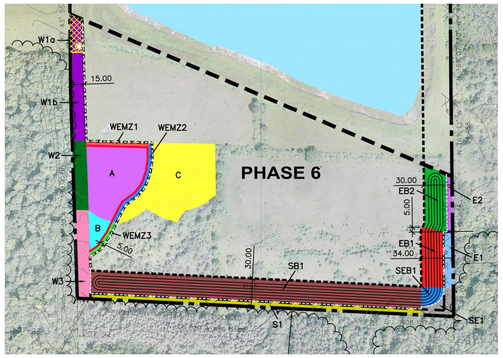
PROGRESSIVE & FINAL REHABILITATION PLAN SOUTH OF TOWNSHIP ROAD 2

Drawing No. 7 OF 8

JOB: 11132



LEGEND

- A - WOODLAND PROTECTION ZONE A
- B - WOODLAND PROTECTION ZONE B
- C - WOODLAND TO BE REMOVED
- WEMZ1 - WOODLAND EDGE MANAGEMENT ZONE 1
- WEMZ2 - WOODLAND EDGE MANAGEMENT ZONE 2
- WEMZ3 - WOODLAND EDGE MANAGEMENT ZONE 3
- W1a - 15m SETBACK
- W1b - 15m SETBACK
- W2 - 15m SETBACK
- W3 - 15m SETBACK
- S1 - 6m NO TOUCH ZONE
- SB1 - SOUTH BERM AREA
- SEB1 - SOUTHEAST BERM
- SE1 - NO TOUCH ZONE
- E1 - 10m NO TOUCH ZONE
- EB1 - PORTION OF EAST BERM
- E2 - 6m NO TOUCH ZONE
- EB2 - PORTION OF EAST BERM
- BELOW WATER EXTRACTION

Goodban Ecological Consulting Inc.

- LICENSED BOUNDARY
- LIMIT OF EXTRACTION
- WOODLAND PROTECTION ZONE LIMIT
- WOODLAND PROTECTION ZONE
- SILT FENCE LOCATION
- PROPOSED BERM (WITH IRREGULAR CONTOURING)
- SNAKE HIBERNACULUM LOCATION

FIGURE 3

ECOLOGICAL MANAGEMENT PLAN
MILL CREEK PIT

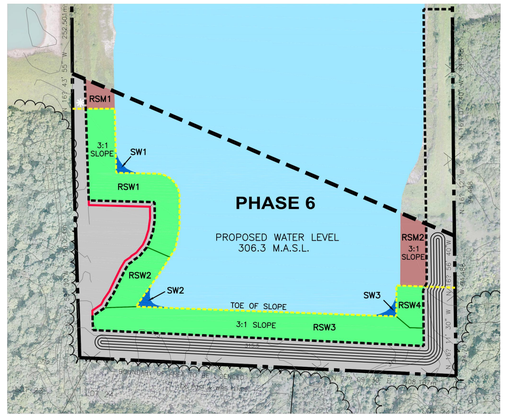
PART OF LOTS 21, 22, 23 AND 24, CONCESSION II
PART OF LOT 24, CONCESSION I
TOWNSHIP OF PUSLINCH, COUNTY OF WELLINGTON

J.H. COHOON ENGINEERING LIMITED
CONSULTING ENGINEERS
BRANTFORD

SCALE: 1:3000 DATE: MAR. 15/17

0m 50m 100m 150m 200m

Dufferin Aggregates
a division of CRH Canada Group Inc.
2300 Steeles Ave. W., Suite 400, Concord Ontario, L4K 5X6



LEGEND

- LICENSED BOUNDARY
- LIMIT OF EXTRACTION
- WOODLAND PROTECTION ZONE LIMIT
- FUTURE SIGNIFICANT WOODLAND BOUNDARY
- PROPOSED BERM (WITH IRREGULAR CONTOURING)
- REFER TO FIGURE 3 FOR DETAILS
- RSW - REHAB SIDE SLOPE WOODLAND
- RSM - REHAB SIDE SLOPE MEADOW
- SW - SHORELINE WETLAND
- SNAKE HIBERNACULUM LOCATION
- BELOW WATER EXTRACTION

Goodban Ecological Consulting Inc.

FIGURE 4

REHABILITATION PLAN
MILL CREEK PIT

PART OF LOTS 21, 22, 23 AND 24, CONCESSION II
PART OF LOT 24, CONCESSION I
TOWNSHIP OF PUSLINCH, COUNTY OF WELLINGTON

J.H. COHOON ENGINEERING LIMITED
CONSULTING ENGINEERS
BRANTFORD

SCALE: 1:3000 DATE: MAR. 15/17

0m 50m 100m 150m 200m

Dufferin Aggregates
a division of CRH Canada Group Inc.
2300 Steeles Ave. W., Suite 400, Concord Ontario, L4K 5X6

Legend:

1. REFER TO FIGURES FOR INDIVIDUAL LEGENDS AS SHOWN.

Notes:

1. REFER TO SHEET 6 FOR REHABILITATION DETAILS NORTH OF TOWNSHIP ROAD 2.
2. AREA TO BE REHABILITATED = 83.3 ha NORTH
   38.8 ha SOUTH
   122.1 ha TOTAL
3. BUILDINGS MAY REMAIN ON SITE AT DISCRETION OF LICENCE HOLDER.
4. PERIMETER BERMS MAY REMAIN IF MATERIAL NOT NEEDED FOR REHABILITATION.
5. REFER TO "ECOLOGICAL MANAGEMENT PLAN AND REHABILITATION PLAN" BY GOODBAN ECOLOGICAL CONSULTING INC., APRIL 2017.

PRE-EXTRACTION AND SITE PREPARATION – ECOLOGICAL MANAGEMENT REQUIREMENTS

I. WITHIN 3 YEARS OF APPROVAL OF THE MAJOR SITE PLAN AMENDMENT TO PERMIT PHASE 6, THE LICENSEE SHALL CREATE THE FOLLOWING ECOLOGICAL AREAS IN THE LOCATIONS IDENTIFIED ON THIS PAGE IN ACCORDANCE WITH THE ECOLOGICAL MANAGEMENT PLAN AND REHABILITATION PLAN PREPARED BY GOODBAN ECOLOGICAL CONSULTING INC., APRIL 2017:

AREA	FEATURE	DESCRIPTION
W1a	NATURAL REGENERATION AREA	THE LICENSEE SHALL MAINTAIN THIS AREA IN A NATURAL STATE WITH FUTURE CONSTRUCTION OF A SNAKE HIBERNACULUM THAT FEATURES ROOT WADS, LOGS AND ROCK PILES.
W1b	FUTURE TREE PLANTING AREA	THE LICENSEE SHALL PLANT SEEDLINGS OF EASTERN WHITE CEDAR, EASTERN RED CEDAR, WHITE BIRCH, TREMBLING ASPEN AND/OR BIGTOOTH ASPEN.
W2	FOREST MANAGEMENT AREA	THE LICENSEE SHALL MAINTAIN THE EXISTING WOODLAND IN A CONTIGUOUS STATE WITH THE WHITE PINE STAND TO THE EAST. DAMAGED SAPLINGS SHALL BE FLUSH CUT NEAR THE GROUND TO PROMOTE REGROWTH.
W3	FOREST MANAGEMENT AREA	THE LICENSEE SHALL MAINTAIN THE EXISTING WOODLAND AND PLANT EASTERN WHITE CEDAR, EASTERN RED CEDAR AND/OR WHITE BIRCH WITHIN ANY GAPS. DAMAGED SAPLINGS SHALL BE FLUSH CUT NEAR THE GROUND TO PROMOTE REGROWTH AND INVASIVE WOODY SPECIES WILL BE CUT AND TREATED.
WEMZ1	FUTURE TREE PLANTING AREA	THE LICENSEE SHALL PLANT SEEDLINGS OF EASTERN WHITE CEDAR, EASTERN RED CEDAR, WHITE BIRCH, TREMBLING ASPEN AND/OR BIGTOOTH ASPEN. INVASIVE WOODY SPECIES WILL BE CUT AND TREATED.
WEMZ2	FOREST MANAGEMENT AREA	THE LICENSEE SHALL REMOVE LARGE TREES ALONG WOODLAND EDGE AND PLANT EASTERN WHITE CEDAR, EASTERN RED CEDAR AND/OR WHITE BIRCH WITHIN GAPS. INVASIVE WOODY SPECIES WILL BE CUT AND TREATED.
WEMZ3	FOREST MANAGEMENT AREA	THE LICENSEE SHALL PLANT EASTERN WHITE CEDAR, EASTERN RED CEDAR AND/OR WHITE BIRCH. DAMAGED SAPLINGS SHALL BE FLUSH CUT NEAR THE GROUND TO PROMOTE REGROWTH.
A	FOREST MANAGEMENT AREA	THIS WOODLAND SHALL BE MAINTAINED IN A NATURAL STATE.
B	FOREST MANAGEMENT AREA	THIS WOODLAND SHALL BE MAINTAINED IN A NATURAL STATE. DAMAGED SAPLINGS SHALL BE FLUSH CUT NEAR THE GROUND TO PROMOTE REGROWTH.
S1	FUTURE TREE PLANTING AREA	THE LICENSEE SHALL MAINTAIN DESIRABLE WOODY SPECIES AND REMOVE INVASIVE WOODY SPECIES TO BE CUT AND TREATED. GAPS WILL BE PLANTED WITH EASTERN WHITE CEDAR, EASTERN RED CEDAR AND/OR WHITE BIRCH.
SB1	FUTURE TREE PLANTING AREA	NORTH/PIT SIDE OF BERM: THE LICENSEE SHALL PLANT EASTERN WHITE CEDAR, EASTERN RED CEDAR, PIN CHERRY, WHITE BIRCH, TREMBLING ASPEN AND/OR BIGTOOTH ASPEN. SOUTH/NON-PIT SIDE OF BERM: THE LICENSEE SHALL PLANT BASSWOOD, BLACK CHERRY, RED OAK AND/OR WHITE PINE. HABITAT FEATURES SUCH AS ROOT WADS, LOG AND ROCK PILES SHALL BE ADDED, ALONG WITH 5 SHRUB PATCHES AND 10 POLLINATOR STRIPS.
SEB1	FUTURE TREE PLANTING AREA	NORTH WEST/PIT SIDE OF BERM: THE LICENSEE SHALL PLANT EASTERN WHITE CEDAR, EASTERN RED CEDAR, PIN CHERRY, WHITE BIRCH, TREMBLING ASPEN AND/OR BIGTOOTH ASPEN. CREST OF BERM: THE LICENSEE SHALL PLANT BASSWOOD, BLACK CHERRY, RED OAK AND/OR WHITE PINE.

PRE-EXTRACTION AND SITE PREPARATION – ECOLOGICAL MANAGEMENT REQUIREMENTS (CONT'D)

SE1	FUTURE TREE PLANTING AREA	THE LICENSEE SHALL MAINTAIN DESIRABLE WOODY SPECIES AND REMOVE INVASIVE WOODY SPECIES TO BE CUT AND TREATED. GAPS WILL BE PLANTED WITH BASSWOOD, BLACK CHERRY, RED OAK AND/OR WHITE PINE.
E1	FOREST MANAGEMENT AREA	THE LICENSEE SHALL MAINTAIN DESIRABLE WOODY SPECIES AND REMOVE INVASIVE WOODY SPECIES TO BE CUT AND TREATED. GAPS WILL BE PLANTED WITH EASTERN WHITE CEDAR, EASTERN RED CEDAR AND/OR WHITE BIRCH.
E2	FOREST MANAGEMENT AREA	THE LICENSEE SHALL MAINTAIN DESIRABLE WOODY SPECIES AND REMOVE INVASIVE WOODY SPECIES TO BE CUT AND TREATED.
EB1	FUTURE TREE PLANTING AREA	WEST SIDE OF BERM: THE LICENSEE SHALL PLANT BASSWOOD, BLACK CHERRY, RED OAK AND/OR WHITE PINE. EAST SIDE OF BERM: THE LICENSEE SHALL PLANT EASTERN WHITE CEDAR, EASTERN RED CEDAR, PIN CHERRY, WHITE BIRCH, TREMBLING ASPEN AND/OR BIGTOOTH ASPEN. HABITAT FEATURES SUCH AS ROOT WADS, LOG AND ROCK PILES SHALL BE ADDED, ALONG WITH 2 SHRUB PATCHES AND 5 POLLINATOR STRIPS.
EB2	FUTURE NATURAL REGENERATION AREA	THE LICENSEE SHALL PLANT NON-INVASIVE GRASS/LEGUME MIXTURE TO STABILIZE THE SLOPE, INCLUDING MILKWEED. HABITAT FEATURES SUCH AS ROOT WADS, LOG AND ROCK PILES SHALL BE ADDED, ALONG WITH 2 SHRUB PATCHES AND 5 POLLINATOR STRIPS.

II. THE LICENSEE SHALL INSTALL STAKES IN PHASE 6 ALONG THE WESTERN EXTRACTION LIMIT, 6m FROM THE SOUTHERN LICENCE BOUNDARY, AND 6m TO 10m FROM THE EASTERN LICENCE BOUNDARY.

III. PRIOR TO STRIPPING AND BERM CONSTRUCTION, THE LICENSEE SHALL INSTALL LIGHT DUTY SILT FENCING IN PHASE 6 ALONG THE WESTERN EXTRACTION LIMIT, 6m FROM THE SOUTHERN LICENCE BOUNDARY, AND 6m TO 10m FROM THE EASTERN LICENCE BOUNDARY, AS SHOWN ON THIS PLAN.

IV. THE LICENSEE SHALL CONSTRUCT BERMS ALONG THE SOUTH AND EAST BOUNDARY OF PHASE 6 OCCUPYING AN AREA OF APPROXIMATELY 1.2 ha., AS SHOWN ON THIS PLAN, WITH IRREGULAR AND NATURALISTIC CONTOURING. THE BERMS SHALL BE TOP DRESSED WITH A MINIMUM OF 30m OF TOPSOIL AND BE PLANTED IN ACCORDANCE WITH THE PRE-EXTRACTION AND SITE PREPARATION FEATURES NOTED ON THIS PLAN.

V. THE LICENSEE, WITH A QUALIFIED ECOLOGIST, SHALL INSTALL ONE SNAKE HIBERNACULUM IN ACCORDANCE WITH THE LOCATION SHOWN ON THIS PLAN. THE HIBERNACULUM WILL BE A MINIMUM OF 3m x 3m IN AREA, AND BE EXCAVATED TO A DEPTH OF 3.5m BUT SHALL NOT EXCEED THE DEPTH OF 308.2 MASL.

VI. ALL TREE CLEARING SHALL BE COMPLETED BETWEEN NOVEMBER 1 AND APRIL 1 TO AVOID THE BREEDING BIRD SEASON AND ACTIVITY.

VII. TREE PLANTING AREAS SHALL BE PLANTED DURING SPRING AND/OR FALL PLANTING PERIODS WITH APPROXIMATELY 2,500 SEEDLINGS PER HECTARE AND THE SPACING WILL BE APPROXIMATELY 2.0m x 2.0m.

VIII. SHRUB PATCHES SHALL BE PLANTED DURING SPRING AND/OR FALL PLANTING PERIODS AND ARE APPROXIMATELY 10m x 10m IN SIZE AND SPACING/DENSITY WILL BE APPROXIMATELY 1.5m x 1.5m.

IX. TREE AND SHRUB SPECIES AND PERCENTAGES OF SPECIES SHALL BE IN ACCORDANCE WITH THE ECOLOGICAL MANAGEMENT PLAN PREPARED BY GOODBAN ECOLOGICAL CONSULTING INC. IN APRIL 2017.

X. THE LICENSEE SHALL IMPLEMENT THE ADDITIONAL HABITAT REQUIREMENTS FOR EACH AREA IN ACCORDANCE WITH THE ECOLOGICAL MANAGEMENT PLAN PREPARED BY GOODBAN ECOLOGICAL CONSULTING INC. IN APRIL 2017.

PROGRESSIVE & FINAL REHABILITATION – ECOLOGICAL MANAGEMENT REQUIREMENTS

I. PROGRESSIVE REHABILITATION WILL BE COMPLETED WITHIN PHASE 6 AS FINAL EXTRACTION LIMITS AND DEPTHS ARE REACHED. THE FOLLOWING FEATURES WILL BE CREATED AS A RESULT OF THE REHABILITATION IN ACCORDANCE WITH THE ECOLOGICAL MANAGEMENT PLAN AND REHABILITATION PLAN PREPARED BY GOODBAN ECOLOGICAL CONSULTING INC., APRIL 2017:

AREA	FEATURE	DESCRIPTION
RSM1	NATURAL REGENERATION AREA	THE LICENSEE SHALL PLANT NON-INVASIVE GRASS/LEGUME MIXTURE TO STABILIZE THE SLOPE, INCLUDING MILKWEED. HABITAT FEATURES SUCH AS ROOT WADS, LOG AND ROCK PILES SHALL BE ADDED, ALONG WITH 1 SHRUB PATCH AND 3 POLLINATOR STRIPS.
RSM2	NATURAL REGENERATION AREA	THE LICENSEE SHALL PLANT NON-INVASIVE GRASS/LEGUME MIXTURE TO STABILIZE THE SLOPE, INCLUDING MILKWEED. HABITAT FEATURES SUCH AS ROOT WADS, LOG AND ROCK PILES SHALL BE ADDED, ALONG WITH 2 SHRUB PATCHES AND 5 POLLINATOR STRIPS.
RSW1	TREE PLANTING AREA	THE LICENSEE SHALL PLANT EASTERN WHITE CEDAR, EASTERN RED CEDAR, PIN CHERRY, WHITE BIRCH, TREMBLING ASPEN, AND/OR BIGTOOTH ASPEN, ALONG WITH 5 SHRUB PATCHES AND 10 POLLINATOR STRIPS.
RSW2	TREE PLANTING AREA	THE LICENSEE SHALL PLANT BLACK OAK, CHINQUAPIN OAK, RED OAK AND/OR WHITE OAK, ALONG WITH TALLGRASS PRAIRIE PLANT SPECIES.
RSW3	TREE PLANTING AREA	THE LICENSEE SHALL PLANT EASTERN WHITE CEDAR, EASTERN RED CEDAR, PIN CHERRY, WHITE BIRCH, TREMBLING ASPEN, AND/OR BIGTOOTH ASPEN, ALONG WITH 7 SHRUB PATCHES AND 15 POLLINATOR STRIPS.
RSW4	TREE PLANTING AREA	THE LICENSEE SHALL PLANT NON-INVASIVE GRASS/LEGUME MIXTURE TO STABILIZE THE SLOPE, INCLUDING MILKWEED. HABITAT FEATURES SUCH AS ROOT WADS, LOG AND ROCK PILES SHALL BE ADDED, ALONG WITH 3 SHRUB PATCHES AND 5 POLLINATOR STRIPS.
SW1, SW2, SW3	SWALLOW WETLAND AREAS	THE LICENSEE SHALL INSTALL ROOT WADS, LOG AND ROCK PILES ABOVE AND BELOW THE WATER LINE, ALONG WITH SMALL SANDBAR WILLOWS AND OTHER WETLAND SHRUBS TO BE PLANTED ALONG THE SHORELINE. A GRAVEL BAR SHALL BE ESTABLISHED ABOVE THE HIGH WATER LINE.

PROGRESSIVE & FINAL REHABILITATION – ECOLOGICAL MANAGEMENT REQUIREMENTS (CONT'D)

II. THE BACKFILL SIDE SLOPES SHALL BE CONSTRUCTED TO A MINIMUM OF 3:1 WITH AN IRREGULAR SURFACE. HABITAT FEATURES ON THESE SLOPES SHALL BE PLANTED IN ACCORDANCE WITH PROGRESSIVE AND FINAL REHABILITATION FEATURES NOTED ON THIS PLAN.

III. TREE PLANTING AREAS SHALL BE PLANTED DURING SPRING AND/OR FALL PLANTING PERIODS WITH APPROXIMATELY 2,500 SEEDLINGS PER HECTARE AND THE SPACING WILL BE APPROXIMATELY 2.0m x 2.0m.

IV. SHRUB PATCHES SHALL BE PLANTED DURING SPRING AND/OR FALL PLANTING PERIODS AND ARE APPROXIMATELY 10m x 10m IN SIZE AND SPACING/DENSITY WILL BE APPROXIMATELY 1.5m x 1.5m.

V. TREE AND SHRUB SPECIES AND PERCENTAGES OF SPECIES SHALL BE IN ACCORDANCE WITH THE REHABILITATION PLAN PREPARED BY GOODBAN ECOLOGICAL CONSULTING INC. IN APRIL 2017.

VI. THE LICENSEE SHALL IMPLEMENT THE ADDITIONAL HABITAT REQUIREMENTS FOR EACH AREA IN ACCORDANCE WITH THE REHABILITATION PLAN PREPARED BY GOODBAN ECOLOGICAL CONSULTING INC. IN APRIL 2017.

VII. THE LICENSEE SHALL REMOVE ALL LIGHT DUTY SILT FENCING SHOWN ON THIS PLAN ONCE BERMS AND REHABILITATED SLOPES ARE VEGETATED AND STABLE.

VIII. THE PHASE 6 PIT LAKE AREA WILL BE APPROXIMATELY 4.27 ha.

MONITORING AND REPORTING

I. THE LICENSEE SHALL COMPLETE AN ANNUAL ECOLOGICAL MONITORING REPORT TO BE SUBMITTED TO MNRF, COUNTY OF WELLINGTON, TOWNSHIP OF PUSLINCH AND GRCA BY JUNE 30 OF THE FOLLOWING YEAR, DEMONSTRATING THE IMPLEMENTATION OF THE ECOLOGICAL MANAGEMENT PLAN AND REHABILITATION PLAN WITHIN PHASE 6.

II. AS PART OF THE MONITORING REPORT A NETWORK OF 8 FIXED-POINT PHOTO-MONITORING STATIONS WILL BE PERMANENTLY ESTABLISHED TO TAKE PHOTOGRAPHS A MINIMUM OF 3 TIMES PER YEAR.

SITE PLAN AMENDMENTS

NO.	DESCRIPTION	DATE	INIT.
1.	PAGE 8 of 8 ADDED TO REFLECT ECOLOGICAL MANAGEMENT AND REHABILITATION PLAN DETAILS	SEPT. /17	K.M.

REVISIONS

NO.	DESCRIPTION	DATE	INIT.
1.	ADDITIONS TO ADDRESS MNRF COMMENTS	MAR. /18	K.M.

MILL CREEK AGGREGATES

PART OF LOTS 21, 22, 23 AND 24, CONCESSION II
PART OF LOT 24, CONCESSION I
TOWNSHIP OF PUSLINCH, COUNTY OF WELLINGTON

University of Guelph

854 GORDON STREET
GUELPH, ONTARIO
N1G 1Y7

Scale 1:3000

50 0 50 100 150 m

J. KEVIN MITCHELL IS AUTHORIZED BY THE MINISTRY OF NATURAL RESOURCES TO PREPARE & CERTIFY SITE PLANS FOR LICENCE APPLICATIONS.

J.H. COHOON ENGINEERING LIMITED
CONSULTING ENGINEERS

440 HARDY ROAD , UNIT #1
BRANTFORD – ONTARIO , N3T 5L8
TEL. (519) 753-2656
FAX. (519) 753-4263

PHASE 6 ECOLOGICAL MANAGEMENT PLAN & REHABILITATION PLAN DETAIL

Drawing No. 8 OF 8

JOB: 11132

APPENDIX B

Curriculum Vitae

GREG R. SIISKONEN, P.Eng.

Director, Environment – Southwest Ontario

AREAS OF PRACTICE

Waste Management

Aggregate Resources

Environmental Site Assessments & Remediation

PROFILE

Greg Siiskonen's engineering career has been focused on hydrogeological consulting in the fields of landfill compliance monitoring, aggregate resources, and environmental site assessment and remediation. Mr. Siiskonen has managed and provided senior peer review on projects throughout southern and central Ontario which have included hydrogeologic and hydrologic assessments; drilling and monitoring program design; field investigations and monitoring programs; groundwater, surface water, and landfill gas monitoring; data management, analysis, and interpretation; technical reporting; and client and regulatory liaison.

Since 2019, Mr. Siiskonen has been the Director for the Environment Group in Southwest Ontario.

EDUCATION

Bachelor of Science (Eng.), Geological Engineering, Geo-Environmental Option, Queen's University, Kingston, ON	2004

PROFESSIONAL DEVELOPMENT

8-Hour OSHA HAZWOPER Refresher	2015
Critical Thinking in Aquifer Test Interpretation, S.S. Papadopoulus & Associates	2009
Maxxam Annual Spring Technical Workshop	2007
Project Management Bootcamp, PSMJ Resources Inc.	2007
24-Hour OSHA HAZWOPER	2007
Aquifer Test Analysis Course, Waterloo Hydrogeologic	2006
Brownfields Knowledge Workshop	2006
Solidification/Stabilization Technical Seminar	2006
Managing Multiple Priorities & Projects	2006
Phase I Environmental Site Assessment Course, Associated Environmental Site Assessors of Canada Inc. (AESAC)	2004
O.Reg. 153 Stakeholder Workshop	2004
Surface Miner Common Core Modules (Knowledge Component)	2004

PROFESSIONAL ASSOCIATIONS

Professional Engineers Ontario	PEO

CAREER

Director, Environment – Southwest Ontario, WSP	2019 - Present
Operations Manager, Environment, WSP	2012 - 2018
Project Engineer, Environment, GENIVAR (now named WSP)	2009 - 2012
Project Manager, Jagger Hims Limited (GENIVAR Acquisition)	2004 - 2009

PROFESSIONAL EXPERIENCE

Aggregate Resources

- Dufferin Aggregates
  - Mill Creek Aggregates Pit, Puslinch, ON (2013-ongoing): Management of an extensive compliance monitoring program for an operating sand and gravel pit located adjacent to a cold water stream. Hydrogeological and hydrological monitoring is completed, the results are analyzed, and an annual monitoring report is prepared.
  - Erin Pit, Erin, ON (2013): Hydrogeological assessment and preparation of a compliance monitoring report for an active aggregates pit.
- Quarry Application and Agricultural Irrigation Investigation, Melancthon Township, ON (2008-2013): For the purposes of input toward a dolostone quarry and long-term Permit To Take Water applications, the overburden, bedrock, groundwater, and surface water conditions were characterized across the 54 km^2 study area. Coordinated the drilling and installation of over 130 monitoring wells screened in overburden, dolostone, and shale, totalling over 3,400 m in depth. Extensive hydraulic testing was completed, including packer, slug, step, and pumping tests. Oversaw and assisted in the completion of several tracer tests during a detailed Karst investigation. A computer model was constructed to predict the effects of a quarry on the complex local groundwater system. Managed a routine monitoring program, which included the collection of water samples at approximately 60 monitoring wells, 40 domestic wells, and 50 surface water stations. Responsible for managing field teams and multiple contractors, and liaising with laboratory staff and the client team. Gave several presentations to the community and spoke one-on-one with residents, explaining the results of water level and water quality monitoring of individual domestic wells. Attended numerous meetings and site visits with such regulatory agencies as the MECP, MNRF, and local conservation authority, as well as peer reviewers. Client: The Highland Companies.
- Walker Brothers Quarry, Niagara Falls, ON (2013-ongoing): An annual compliance monitoring report is prepared for an active quarry located adjacent to one active and two closed landfill sites on the Niagara Escarpment. Routine hydrogeological and hydrological monitoring data are managed and analyzed. Monitoring data from all four sites are considered when characterizing and assessing the hydrogeologic setting. Client: Walker Environmental Group.
- Sand and Gravel Pit, Brock Township, ON (2006): Provided project management for a test pitting program to characterize the subsurface soil across the site. An estimate of the quantity and quality of aggregate material remaining at the active sand and gravel pit was then calculated and a technical report was prepared. Client: Confidential.

Waste Management

- Regional Municipality of Niagara
  - Humberstone Landfill Site, Welland, ON (2013-ongoing): Management and senior peer review of the annual compliance monitoring program for this active landfill site. Coordination of the completion of routine hydrogeological and hydrological monitoring, landfill gas monitoring, completion of data management and analysis, and preparation of the annual compliance monitoring report. Management of bedrock topography delineation study and drilling program which included the completion of ground conductivity (EM31), GPR, resistivity, seismic refraction geophysical surveys, and the drilling of multiple boreholes to confirm the depth to bedrock. Statistical analyses were completed to determine if statistically significant differences exist for parameter concentrations in the leachate, background, and downgradient groundwater quality; and as part of a normality assessment related to background groundwater quality.
  - Glenridge Quarry Naturalization Site, St. Catharines, ON (2013-2016, 2018-ongoing): Management and senior peer review of the annual compliance monitoring program for this closed landfill site. Coordination of the completion of routine hydrogeological, hydrological, and landfill gas monitoring, completion of data management and analysis, and preparation of the annual compliance monitoring report. Completed a seep repair program which included the installation of several gravel chimneys, prepared a monitoring program optimization assessment, and investigated the passive gas venting system.
  - Centre Street Landfill Site, Pelham, ON (2013-ongoing): Senior peer review of the annual compliance monitoring program for this closed landfill site. An isotope testing program, groundwater quality risk evaluation, and monitoring program optimization assessment were completed.
  - Various Closed Landfill Sites, Niagara Region, ON (2013-ongoing): Senior peer review/reporting for hydrogeologic and hydrologic assessments, and annual compliance monitoring reports (Caistor Road, Winger Road, Line 5, Quarry Road, and Mountain Road Landfills).
- Walker Environmental Group
  - East, South, and West Landfill Sites, City of Niagara Falls, ON (2013-ongoing): Compliance monitoring reports are prepared for one operating, and two closed, landfill sites located in one continuous footprint on the Niagara Escarpment. Routine hydrogeological, hydrological, and landfill gas monitoring data are managed and analyzed. An adjacent active quarry is also monitored, and monitoring data from all four sites are considered when characterizing and assessing the hydrogeologic setting. Managed the completion of multiple drilling programs, which included the decommissioning and installation of several monitoring wells screened in dolostone and shale.
  - Closed Rice Road Landfill Site, Thorold, ON (2013-ongoing): An annual compliance monitoring report is prepared for this closed landfill site, which includes hydrogeological, hydrological, and biological assessments, as well as an assessment of the functionality of the on-site wetland treatment system. Annual slope monitoring program was also completed.
- Rotary Park Landfill Site, St. Catharines, ON (2013-ongoing): Management and senior peer review for a compliance monitoring program at a closed landfill site in an overburden setting, including hydrogeological, hydrological, and landfill gas monitoring, seep inspections, data management and assessment, and the preparation of an annual monitoring report. Management of a geotechnical investigation, which

included the drilling of several boreholes. Management of the decommissioning and replacement of a deep monitoring well and installation of a gas probe. Client: City of St. Catharines.

- Timmins Area Sludge Disposal Sites, Timmins, ON (2005-ongoing): Management and senior peer review for the routine compliance groundwater and surface water monitoring at two sewage sludge disposal sites. Hydrogeological investigations were completed to determine the size of contaminant attenuation zone required at each site. Closure plans and financial assurance evaluations were also completed. Client: Waste Management of Canada Corporation.
- South Glengarry Area Septage Disposal Site, South Glengarry, ON (2017-ongoing): Senior peer review for an annual compliance monitoring report for an active septage disposal site, including hydrogeologic and hydrologic assessments. Client: Confidential.
- Conceptual Design and Operation Plan for Waste Disposal System, Copper mine in northern British Columbia (2012-2013): Completed a waste characterization study to determine the optimal waste disposal method for a mine camp. Prepared a conceptual design and operation plan for the selected disposal method, incineration. Outlined each aspect of the waste disposal program, including location, design, regulatory approvals, wildlife control, and operation. Client: Confidential.
- County of Simcoe
  - Various closed landfills sites (2019-ongoing): Senior peer review for annual compliance monitoring reports.
  - Closed Collingwood Incinerator and Ash Disposal Site, Collingwood, ON (2007-2012): Provided project management for semi-annual groundwater monitoring, surface water monitoring, and site inspections at the closed landfill site for MOE Certificate of Approval compliance purposes. Several additional monitoring wells were installed to delineate the extent of impacted groundwater. A closure plan was completed, and closure activities were supervised.
  - Former Township of Adjala Landfill Site, Adjala-Tosorontio, ON (2005-2009): Provided project management for semi-annual groundwater and surface water monitoring as a requirement of the MOE Certificate of Approval for the site. Guideline B-7 analyses were completed to determine the impact of the landfill site on adjacent properties. The installation of several monitoring wells was completed, and a Leachate Management Plan was prepared to address the presence of impacted groundwater at the site.
  - Landfill Site Investigation, Simcoe County, ON (2005): Provided field services and technical support for a hydrogeologic study and groundwater and surface water monitoring program to determine the feasibility of constructing a landfill site. An extensive drilling program was completed and included detailed soil characterization.

Environmental Site Assessments & Remediation

- Industrial Property, Georgina, ON (2005-2008): Provided project management for a Phase I and II Environmental Site Assessment (ESA) in which soil and groundwater contaminated with petroleum hydrocarbons and metals were identified. Contaminated soil was remediated during the Phase III component. The groundwater contamination was delineated and monitored after the installation of several monitoring wells. Client: Confidential.
- Vacant Property, Whitchurch-Stouffville, ON (2005-2008): Provided project management for a Phase I and II ESA, which included the installation of a network

of monitoring wells and soil and groundwater analysis. PCE contamination was identified in the on-site groundwater and a delineation program was completed to determine the source and extent of contamination. Client: Confidential.

- Automotive Garage, Bradford, ON (2007): Provided project management for a Phase II ESA, in which petroleum hydrocarbon contamination was discovered in the soil below the floor of the automotive garage. Additional boreholes allowed for the delineation of the contamination and the soil was remediated during Phase III of the project. Client: Confidential.
- Designated Substances Audit, Various Sites, ON (2007): Provided project management for a Designated Substances Audit at twelve properties in Southern Ontario. Samples of building materials were collected and analyzed for the presence of asbestos and lead, and remedial recommendations were provided to the client. Client: Ministry of Transportation.
- Vacant Properties, Brock Township, ON (2007): As project manager, a Phase I ESA was completed at two vacant properties and included the completion of consultation and documentation records. Client: Lake Simcoe Region Conservation Authority.
- Former Gas Station Keswick, ON (2007): Provided project management for a Phase I and II ESA, during which several monitoring wells were installed on the property in the area of former fuel tanks and pumps. Petroleum hydrocarbon contaminated soil was encountered on the property and delineated during a test pit program. Client: Confidential.
- Industrial Property, Toronto, ON (2007): Provided project management for a Phase I and II ESA which revealed the presence of an underground storage tank (UST) on the property. Soil and groundwater samples were collected during the Phase II drilling program. Soil contaminated with petroleum hydrocarbons was discovered adjacent to the UST upon the supervision of its removal. The soil was remediated during Phase III of the ESA. Client: Confidential.
- Gas Station, Orangeville, ON (2007): Project manager for a subsurface investigation which was designed and then completed across the property. Soil and groundwater samples were collected during the drilling program, and petroleum hydrocarbon contaminated groundwater was discovered adjacent to the underground fuel storage tanks. Client: Confidential.
- Residential Property, Newmarket, ON (2006): Provided project management for a Phase II ESA, during which PCE contamination was discovered in the subsurface soil. The contamination was delineated and then remediated during Phase III of the project. Groundwater sampling confirmed that the contamination was restricted to the soil. Client: Confidential.
- Contaminant Investigation, Bruce Peninsula, ON (2006): As project manager, soil and groundwater contaminated with petroleum hydrocarbons was discovered during the completion of an initial Phase II ESA drilling program. A delineation program was then completed, which included the installation of additional monitoring wells. Client: Ministry of Transportation.

REBECCA L. WARRACK, P.Eng.

PROJECT ENGINEER

AREAS OF PRACTICE

Waste Management

Groundwater Resources

Aggregate Resources

Environmental Site Assessments & Site Remediation

PROFILE

Ms. Rebecca Warrack is a graduate of the Co-op Environmental Engineering Program at the University of Guelph. Her university training included groundwater and storm water management, air and water quality treatment, waste management and urban water systems designs. Since joining our firm in 2009, Ms. Warrack has expanded her practical experience through extensive field work, technical analysis, data interpretation and report preparation for numerous projects in waste management, environmental site assessments, aggregate resources and geotechnical engineering.

EDUCATION

B.Eng, Environmental Engineering, Co-op, University of Guelph 2009

PROFESSIONAL ASSOCIATIONS

Professional Engineers Ontario PEO

CAREER

Project Engineer, WSP 2014 – Present

Project Manager, GENIVAR (now named WSP) 2009 – 2013

PROFESSIONAL EXPERIENCE

Aggregate Resources

- Level 1 and 2 Water Report, Uxbridge, ON (2023): Completed a Level 1 and 2 Water Report and Maximum Predicted Water Table Report for an existing below-water sand and gravel pit located on the Oak Ridges Moraine. The study was completed to support an application for an amendment to the site licence to allow a larger extent of below-water extraction. Tasks included completion of a site visit, inspection/measurement of groundwater levels and review of publicly-available hydrogeological data and reports for the Oak Ridges Moraine area. Client: Sunrock Canada Construction Materials ULC.
- Level 2 Hydrogeological Study, Uxbridge, ON (2019): Completed a Level 2 Hydrogeological Study for an existing sand and gravel pit located on the Oak Ridges Moraine. The study was completed to support an application for an amendment to the site licence to allow below-water extraction. The deeper extraction will allow for a more efficient use of the aggregate resource within the Site boundary. Tasks included completion of a site visit, inspection/measurement of groundwater levels and review of publicly-available hydrogeological data and reports for the Oak Ridges Moraine area. Client: 1302824 Ontario Inc.
- Babicz Pit and Hunt Pit, Brant, ON (2020-ongoing): Completed the annual monitoring reports required by the aggregate licences for these two active pits owned and operated by the County of Brant. Groundwater level and quality data was collected by the County and provided to WSP for analysis and reporting. Additional tasks included budgeting, invoicing and client communications. Client: County of Brant.
- Bedrock Exploration Program, Meaford, ON (2020-2022): Coordinated a bedrock borehole drilling program at a property adjacent to an active bedrock quarry for input into possible purchase of the property. The purpose of the boreholes was to evaluate

the approximate quantity of bedrock resource available on the possible expansion property. Samples of the bedrock were submitted for laboratory testing to determine the quality of the rock for aggregate production. Tasks included coordination of field program, budgeting and reporting. Client: Walker Aggregates Inc.

- Hydrogeological Study and Approvals, Oro-Medonte, ON (2018-2021): Completed a Hydrogeological Study for an active aggregate pit situated on the Oro Kame Moraine Complex, in support of an application to amend the Aggregate Resources Act licence to allow an aggregate wash plant to be operated on the Site. In addition, an application for a Permit to Take Water and Environmental Compliance Approval to permit the operation of the wash plant was prepared and submitted. Specific tasks included the coordination of the installation of a new pumping well, the completion of a 72-hour pumping test on the well, the implementation of a long-term groundwater monitoring program at both on-Site wells and off-Site privately-owned wells, completion of a water well survey of off-Site groundwater users, collection of groundwater samples from private wells and coordination of the installation of on-Site monitoring wells. Client: Walker Aggregates Inc.
- Mill Creek Pit Groundwater and Surface Water Monitoring Programs, Puslinch, ON (2019-ongoing): Coordination and review of monitoring data collected at this active gravel pit. The compliance monitoring program includes monthly site visits to measure groundwater levels and temperatures, download automated pressure transducers, measure surface water flows and temperatures, and groundwater quality sampling. Tasks included coordination of field activities, data review for trigger compliance, monthly calls with client to review data, data collation and preparation of annual surface water and hydrogeology reports. Client: Dufferin Aggregates, a Division of CRH Canada Inc.
- Aggregate Licensing Applications, North Bay, ON (2008-2013): Aggregate licensing applications were prepared for the Bourassa Pit & Quarry, March Pit & Quarry, Stanley Pit and Bomarc Pit which included completing the license application forms, obtaining zoning and ownership information for the properties and preparing full detailed site plans. The approvals were granted in 2013. Client: Pioneer Construction.

Waste Management

- Various County of Simcoe Landfill Sites, Compliance Monitoring and Reporting (2020-ongoing): Completed senior peer review of various annual/biennial compliance monitoring reports including Alliston Landfill Site #1, Nottawasaga Landfill Site #10, Sunnidale Landfill Site #12, Bradford West Gwillimbury Site #16, MPT Landfill Site #39 and Tay Stump Dump Site #64.
- Regional Municipality of Niagara
  - Niagara Road 12 Landfill Site, Monitoring Program, Grimsby, ON (2009-2015, 2018-ongoing): Completed the project management role for the annual monitoring program at this active landfill site located in a bedrock setting. Tasks include managing field staff to complete required groundwater, surface water and leachate collection system sampling events, collating and analyzing data and preparing annual monitoring reports. Project management tasks also include managing the project budget, invoicing and client communication.
  - Glenridge Quarry Naturalization Site, Monitoring Program, St. Catharines, ON (2018-ongoing): Completed the project management role for the annual monitoring program at this site located along the Niagara Escarpment. This closed landfill was constructed in a former rock quarry. Tasks include managing field staff to complete required groundwater, surface water and leachate collection system sampling events and combustible gas monitoring events,

collating and analyzing data and preparing annual monitoring reports. Project management tasks also include managing the project budget, invoicing and client communication. In 2019 to 2020, also completed an Environmental Monitoring Program Optimization Program which included a detailed review of existing monitoring locations and the hydrostratigraphic units at the Site and proposed extensive revisions to the monitoring program, including revised trigger locations and criteria. In 2020, managed and oversaw a project to drill and install 8 new combustible gas probes to investigate combustible gas bypass of the Passive Gas Venting System, as well as a review of available data to suggest possible gas migration pathways.

- Mountain Road Landfill, Monitoring Program, Niagara Falls, ON (2019-ongoing): Completed the project management role for the annual monitoring program at this closed landfill site located on the Niagara Escarpment. Managed field staff to complete required groundwater, surface water, combustible gas, Passive Gas Venting System and leachate monitoring programs. Completed data collation, analysis and reporting, project budgeting, invoicing and client communication.
- Centre Street Landfill, Monitoring Program, Pelham, ON (2012-ongoing): Completed the project management role for the annual monitoring program at this closed landfill site located in the Fonthill Kame. Managed field staff to complete required groundwater sampling events, collated and analyzed data and prepared annual monitoring report. Additional tasks have included coordination of supplemental environmental isotope sampling events and preparation of a detailed technical response to MECP review comments (2018). In 2020, completed a review of the existing monitoring program and a statistical analysis of available groundwater monitoring results to prepare written recommendations to optimize the monitoring program.
- Park Road Landfill, Monitoring Program, Grimsby, ON (2009-2015, 2018-ongoing): Tasks completed for this landfill in a bedrock setting have included groundwater and surface water sampling, coordination of field activities, data collation and preparation of annual monitoring reports. Completed the project management role for the annual monitoring program since 2018, including managing the project budget, invoicing and client communication.
- Station Road Landfill, Monitoring Program, Wainfleet, ON (2009-2015, 2018-2019): Tasks completed for this landfill in a bedrock setting have included groundwater and surface water sampling, monitoring well drilling and decommissioning, in-situ hydraulic conductivity testing, data collation and preparation of annual monitoring reports. Completed the project management role for the 2014, 2018 and 2019 annual monitoring program, including managing the project budget, invoicing and client communication.
- Elm Street Landfill, Monitoring Program, Port Colborne, ON (2018-ongoing): Tasks completed for this landfill in a bedrock setting have coordination of field staff to complete groundwater, surface water and leachate collection system sampling, data collation and preparation of annual monitoring reports. Completed the project management role for the annual monitoring program since 2018, including managing the project budget, invoicing and client communication. Additional tasks completed in 2020 included preparation of a report providing recommended revisions to the groundwater trigger mechanism.
- Winger Road Landfill, Monitoring Program, Fort Erie, ON (2014-2015): Completed the project management role for the annual monitoring program at this closed landfill site located in an overburden setting. Managed field staff to

complete required groundwater sampling events, collated and analyzed data and prepared annual monitoring report.

- Caistor Road Landfill, Monitoring Program, West Lincoln, ON (2012-2015): Completed the project management role for the annual monitoring program at this closed landfill site located in an overburden setting. Managed field staff and assisted to complete required surface water and groundwater sampling events, collated and analyzed data and prepared annual monitoring report. Also coordinated an overburden well drilling and installation program.

- Biggars Lane Landfill Site, Brant, ON (2020-ongoing): Managed the annual monitoring and reporting program for the active Biggars Lane Landfill site, including coordination of groundwater, surface water and combustible gas monitoring, data collation/analysis and annual reporting. In 2020, also contributed to an assessment of leachate management to address ongoing leachate ponding issues at the Site. Client: The County of Brant
- Paris Landfill Site, Brant, ON (2020-ongoing): Coordinated combustible gas monitoring at the Paris Landfill Site and completed data collation/analysis and annual reporting for the closed Paris Landfill Site. Groundwater and surface water monitoring at the Paris Landfill is completed by the County and data is provided to WSP for review and reporting. Client: The County of Brant
- Glanbrook Landfill Site, Hamilton, ON (2020-ongoing): Completed an investigation of elevated boron concentrations observed at a bedrock monitoring well at this active landfill site. The elevated boron concentrations had periodically exceeded the trigger criterion established for the bedrock wells. The investigation included a site visit to document the well condition, a review of available groundwater quality data from the Site and a review of the landfill design/construction. The investigation concluded that the source of elevated boron in the bedrock was naturally occurring and was not due to leachate impacts. The second phase of the project is to develop a revised trigger mechanism for the bedrock wells at the Site to better reflect natural conditions. This work is ongoing. Client: City of Hamilton.
- Rotary Park Landfill, Monitoring Program, St. Catharines, ON (2009-2017): Field tasks for this closed landfill have included surface water, leachate and groundwater sampling and monitoring, as well as combustible gas monitoring. Office duties included data collation and analysis, as well as the preparation of the annual monitoring reports and project management. Client: The City of St. Catharines.
- East, South and West Landfill Sites, Thorold, ON (2013-ongoing): Assisted in data management, analysis and annual monitoring report preparation for two active and one closed landfill site in Thorold. Additional tasks have included preparation of responses to MECP review comments and completion of a review of the groundwater monitoring program at the West Landfill to recommend an optimized program. Client: Walker Environmental Group.

Groundwater Resources

- Airport, St. George, Mt. Pleasant and Paris Drinking Water Systems, Brant, ON (2020-ongoing): Completed project coordination, management and reporting for the Permit to Take Water and/or Municipal Drinking Water Licence annual monitoring and reporting programs for these 4 active groundwater supplied drinking water systems operated by the County of Brant. Raw drinking water quality sampling and monitoring of pumping rates/groundwater levels was completed by the County and the results were provided to WSP for analysis and reporting. Additional tasks included the coordination of field staff to complete monthly water level measurements, automated pressure transducer installation and downloads and stream flow measurements to supplement the data obtained by the County. Data collected

by WSP and the County was compiled, reviewed and analyzed to complete annual hydrogeological monitoring reports to comply with the site's Permit to Take Water, Municipal Drinking Water License and/or due diligence requirements required by the County. Also completed project management, budgeting, invoicing and client communication.

- Proposed Greenhouse, Ancaster, ON (2017-2020): A hydrogeological investigation was conducted for a proposed greenhouse facility which will utilize a private bedrock groundwater well for irrigation water supply. An application for an Environmental Compliance Approval (ECA) from the Ministry of the Environment, Conservation and Parks was prepared for discharge of reverse-osmosis system effluent into a surface water receiver. The ECA application included the collection of several background groundwater and surface water samples and using the data to prepare an assimilative capacity study for the proposed discharge. Additional tasks for this project has included coordination and client communication regarding various engineering-related studies/designs (traffic, noise, dust, odour, sewage system, etc.). Client: The Green Organic Dutchman Ltd.
- Permit-To-Take-Water Monitoring and Environmental Compliance Approval Reporting, Niagara Region, ON (2009-2018): Annual compliance reporting is conducted for several quarries in the Niagara Region, for submission to the Ministry of the Environment and Climate Change. Reports typically include the compilation of daily pumping records and water level data for the previous calendar year, for compliance with the Site's Permit-To-Take-Water and Environmental Compliance Approvals. Maintenance and installation of automated flowmeters and loggers is also conducted. Clients: Port Colborne Quarries & the Waterford Group.
- Permit-To-Take-Water Monitoring and Reporting, Fonthill, ON (2009-2018): Environmental monitoring and reporting is conducted for a golf course located on the Fonthill Kame geologic feature. The golf course has a Permit-to-Take-Water which allows it to draw groundwater from a deep bedrock pumping well, store the water in a lined-pond and use the water from the pond for irrigation. Specific tasks have involved preparation of the hydrogeological study to support the Permit-to-Take-Water application and renewal applications, install groundwater monitoring wells and multi-level piezometers, instrument monitors and surface water stations with automated monitoring equipment, download and interpret surface water and hydrogeological data and prepare annual monitoring reports in compliance with the Permit-to-Take-Water.

Environmental Site Assessments and Site Remediation

- Groundwater Contamination Investigation at Asphalt Plant, Orillia, ON (2019-ongoing): Coordinated a drilling program to install groundwater wells around a former aggregate pit which was rehabilitated as a pond. Completed low-flow groundwater sampling to delineate the extent of a narrow plume of trichloroethylene moving in the groundwater and originating at the adjacent asphalt plant. Completed data analysis and reporting of investigation results. Additional work included a bathymetry survey of the pond and sediment and surface water sampling. Remedial options were also explored and recommended. Client: Confidential.
- Phase One and Phase Two Environmental Site Assessments, St. Catharines, ON (2014-2015): Completed a Phase One Environmental Site Assessment at a City of St. Catharines parks and recreations yard, which contained garage and office buildings, underground fuel storage tanks, fill and debris storage and equipment/vehicle storage. The Phase One Environmental Site Assessment recommended further investigation and a Phase Two Environmental Site Assessment was completed which involved installing ten monitoring wells and advancing several boreholes at the Site and submitting soil and groundwater samples to investigate the areas of potential

environmental concern identified in the Phase One Environmental Site Assessment. The work was completed in compliance with the Ontario Regulation 153/04 as amended, to support the future filing of a Record of Site Condition. Client: City of St. Catharines

- Phase One and Phase Two Environmental Site Assessments, New Hamburg, ON (2016-2017): Completed a Phase One Environmental Site Assessment at a felt manufacturing factory located in New Hamburg. The Phase One Environmental Site Assessment recommended further investigation and a Phase Two Environmental Site Assessment was completed which involved installing four monitoring wells at the Site and submitting soil and groundwater samples to investigation the areas of potential environmental concern identified in the Phase One Environmental Site Assessment. Client: Confidential.
- Groundwater Investigation, Niagara Region, ON (2018): Completed a groundwater investigation to delineate and provide recommendations regarding a potential contamination of groundwater at an asphalt plant property located in the Niagara Region. The asphalt plant is located within a licenced quarry property and the contamination has been identified within the groundwater in the bedrock. The project involved the installation of several bedrock monitoring wells and the collection of representative samples using low-flow sampling techniques. The well installation, sample collection and sample results were presented in a report, which provided recommendations for remediation and future work. Client: Confidential.

APPENDIX C

Borehole Logs

BOREHOLE NO. 92-13

PROJECT NAME MILL CREEK AGGREGATES PROPERTY — **PROJECT NO.** 88020.02

CLIENT DUFFERIN AGGREGATES — **DATE** FEBRUARY 10, 1992

BOREHOLE TYPE BECKER HAMMER DRILL (I.D. 102 mm) — **GEOLOGIST** JSK

GROUND ELEVATION 309.5 mASL — **ENGINEER** AGH

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE: TYPE	SAMPLE: 'N' VALUE	SAMPLE: % WATER	SAMPLE: % RECOVERY	SAMPLE: ROD (%)	CONE PENETRATION: "N" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 (Wp — WL)	REMARKS
0	GRAVELLY MEDIUM TO COARSE SAND: Moist from 0.0 m to 4.9 m, saturated from 4.9 m to 12.2 m.		■ @ 5.0 m ■ @ 7.7 m ■ @ 10.3 m								TEXTURAL DESCRIPTIONS FROM FIELD EXAMINATION ONLY – TO BE CONFIRMED BY LABORATORY ANALYSIS TRANSDUCER # 4972 @ 5.0 m TRANSDUCER # 4980 @ 7.7 m TRANSDUCER # 2 @ 10.3 m DATA LOGGER # 7226
12.2	Borehole terminated at 12.2 m in sand.										

Jacobs Hnos Limited

BOREHOLE NO. 92-14

PROJECT NAME MILL CREEK AGGREGATES PROPERTY — **PROJECT NO.** 88020.02

CLIENT DUFFERIN AGGREGATES — **DATE** FEBRUARY 10, 1992

BOREHOLE TYPE BECKER HAMMER DRILL (I.D. 102 mm) — **GEOLOGIST** JSK

GROUND ELEVATION 308.8 mASL — **ENGINEER** AGH

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE: TYPE	SAMPLE: 'N' VALUE	SAMPLE: % WATER	SAMPLE: % RECOVERY	SAMPLE: ROD (%)	CONE PENETRATION 'N' VALUE / SHEAR STRENGTH	WATER CONTENT %	REMARKS
0	GRAVELLY MEDIUM TO COARSE SAND: Trace fine sand, trace silt, moist from 0.0 m to 4.6 m, saturated from 4.6 m to 13.1 m.		■								TEXTURAL DESCRIPTIONS FROM FIELD EXAMINATION ONLY – TO BE CONFIRMED BY LABORATORY ANALYSIS
5											TRANSDUCER # 4965 @ 4.5 m
			■								TRANSDUCER # 4745 @ 7.0 m
			■								TRANSDUCER # 4523 @ 10.7 m
13.1											
14.6	SILTY GRAVELLY FINE TO COARSE SAND: Saturated.										
15	SILT: WTPL										
18.3											
20	FINE SAND: Saturated.										
23.2											DATA LOGGER # 7040
25	Borehole terminated at 23.2 m on assumed bedrock.										
30											
35											
40											
45											
50											

BOREHOLE NO. 92-15

PROJECT NAME MILL CREEK AGGREGATES PROPERTY — **PROJECT NO.** 88020.02

CLIENT DUFFERIN AGGREGATES — **DATE** FEBRUARY 10, 1992

BOREHOLE TYPE BECKER HAMMER DRILL (I.D. 102 mm) — **GEOLOGIST** JSK

GROUND ELEVATION 308.4 mASL — **ENGINEER** AGH

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE: TYPE	SAMPLE: 'N' VALUE	SAMPLE: % WATER	SAMPLE: % RECOVERY	SAMPLE: RQD (%)	CONE PENETRATION 'N' VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 (Wp — WL)	REMARKS
0	GRAVELLY MEDIUM TO COARSE SAND: Some fine sand, trace silt, moist from 0.0 m to 4.9 m, saturated from 4.9 m to 8.5 m.		■								TEXTURAL DESCRIPTIONS FROM FIELD EXAMINATION ONLY – TO BE CONFIRMED BY LABORATORY ANALYSIS TRANSDUCER # 4934 @ 3.0 m
8.5											
9.8	COARSE SAND: Some medium sand, trace fine gravel, saturated.										
12.2	SANDY FINE TO MEDIUM GRAVEL: Saturated.		■								TRANSDUCER # 4626 @ 10.9 m
17.1	GRAVELLY MEDIUM TO COARSE SAND: Some silt, saturated.										
20.7	SANDY GRAVEL: Trace silt, saturated.		■								TRANSDUCER # 4524 @ 18.4 m
22.6	SILT TILL: Saturated.										
	Borehole terminated at 22.6 m on assumed bedrock.										DATA LOGGER # 7017

BOREHOLE NO. 92-27

PROJECT NAME MILL CREEK AGGREGATES PROPERTY **PROJECT NO.** 88020.02

CLIENT DUFFERIN AGGREGATES **DATE** FEBRUARY 12, 1992

BOREHOLE TYPE BECKER HAMMER DRILL (I.D. 102 mm) **GEOLOGIST** JSK

GROUND ELEVATION 305.1 mASL **ENGINEER** AGH

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE: TYPE	SAMPLE: 'N' VALUE	SAMPLE: % WATER	SAMPLE: % RECOVERY	SAMPLE: ROD (%)	CONE PENETRATION "N" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 (Wp — WL)	REMARKS
0											
	GRAVELLY SAND: Moist, saturated below 1.5 m.		■								TEXTURAL DESCRIPTIONS FROM FIELD EXAMINATION ONLY – TO BE CONFIRMED BY LABORATORY ANALYSIS
	2.4										
	SILTY FINE TO MEDIUM SAND: Trace fine gravel, saturated.										TRANSDUCER # 4970 @ 2.4 m
	4.3										
5	SANDY FINE GRAVEL: Saturated.										
	5.5		■								TRANSDUCER # 4749 @ 5.9 m
	SILTY FINE SAND: Saturated.										
	9.4		■								TRANSDUCER # 4532 @ 9.2 m
10	SILT TILL: Trace cobbles, moist.										
	14.9										
15	Borehole terminated at 14.9 m on assumed bedrock.										DATA LOGGER # 7225
20											
25											
30											
35											
40											
45											
50											

Jacobs Hird Limited

BOREHOLE NO. 92-31

PROJECT NAME MILL CREEK AGGREGATES PROPERTY **PROJECT NO.** 88020.02

CLIENT DUFFERIN AGGREGATES **DATE** FEBRUARY 12, 1992

BOREHOLE TYPE BECKER HAMMER DRILL (I.D. 102 mm) **GEOLOGIST** JSK

GROUND ELEVATION 305.0 mASL **ENGINEER** AGH

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE: TYPE	SAMPLE: 'N' VALUE	SAMPLE: % WATER	SAMPLE: % RECOVERY	SAMPLE: ROD (%)	CONE PENETRATION "N" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 (Wp, WL)	REMARKS
0	GRAVELLY SAND: Trace silt, moist from 0.0 m to 1.8 m, saturated from 1.8 m to 7.0 m.		■								TEXTURAL DESCRIPTIONS FROM FIELD EXAMINATION ONLY – TO BE CONFIRMED BY LABORATORY ANALYSIS
7.0	SILT TILL: Moist.		■								TRANSDUCER # 4966 @ 3.2 m
13.1	Borehole terminated at 13.1 m on assumed bedrock.		■								TRANSDUCER # 4747 @ 7.0 m TRANSDUCER # 3 @ 9.1 m DATA LOGGER # 7230

Jacobs Hub Limited

BOREHOLE NO. 92-33

PROJECT NAME MILL CREEK AGGREGATES PROPERTY — **PROJECT NO.** 88020.02

CLIENT DUFFERIN AGGREGATES — **DATE** FEBRUARY 14, 1992

BOREHOLE TYPE BECKER HAMMER DRILL (I.D. 102 mm) — **GEOLOGIST** JSK

GROUND ELEVATION 305.5 mASL — **ENGINEER** AGH

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE: TYPE	SAMPLE: 'N' VALUE	SAMPLE: % WATER	SAMPLE: % RECOVERY	SAMPLE: RQD (%)	CONE PENETRATION: "N" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 (Wp, WL)	REMARKS
0	GRAVELLY MEDIUM TO COARSE SAND: Some fine sand, trace silt, moist from 0.0 m to 1.5 m, saturated from 1.5 m to 7.3 m.		■								TEXTURAL DESCRIPTIONS FROM FIELD EXAMINATION ONLY – TO BE CONFIRMED BY LABORATORY ANALYSIS TRANSDUCER # 4971 @ 2.7 m
7.3	SILT TILL: Trace cobbles, moist.		■								TRANSDUCER # 4750 @ 7.0 m
14.9	Borehole terminated at 14.9 m on assumed bedrock.		■								TRANSDUCER # 4637 @ 11.2 m DATA LOGGER # 7241

Jacobs Hill Limited

BOREHOLE NO. 1

PROJECT NAME Hydrogeological Investigation for University of Guelph

CLIENT University of Guelph — DATE Nov. 13, 1986

BOREHOLE TYPE 108 mm I.D. Hollow Stem Augers — GEOLOGIST S.R.B

GROUND ELEVATION 308.90 m.a.s.l. — PROJECT NO. 86-153

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS AND NUMBER	SAMPLE NO.	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	PENETRATION RESISTANCE BLOWS/0.3m	WATER CONTENT % / COMMENT
.2	TOPSOIL: Black silty, moist			1	AS				
.6	MIXED: Topsoil and silty sand, some organics, moist.								
1				2	AS				
	GRAVEL AND SAND: medium to coarse gravel, moist. Blue grey subangular cobble with some sand between 1.5 m - 1.8 m, moist. Saturated below 1.8 m								▽ 1.8
2									
3									
4				3	AS				
5									
5.5									
	Borehole terminated at 5.5 m in sand and gravel		I						
6									
7									
8									
9									
10									

WATER CONTENT: Wp ——— WL

A.S. = Auger Sample

Gartner Lee Limited

BOREHOLE NO. 2

PROJECT NAME Hydrogeological Investigation for University of Guelph

CLIENT University of Guelph DATE Dec. 16, 1986

BOREHOLE TYPE 171 mm O.D. Mud Rotary GEOLOGIST S.R.B.

GROUND ELEVATION 312.70m.a.s.l. PROJECT NO. 86-153

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS AND NUMBER	SAMPLE NO.	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	PENETRATION RESISTANCE BLOWS/0.3m	WATER CONTENT % / COMMENT
.2	TOPSOIL: Black silty, moist								
	COBBLES WITH SAND: Brown silty, fine, moist with some boulders. Saturated below ± 7.2 m			1	WS				
				2	WS				
				3	WS				
				4	WS				▽ 5.8
			II	5	WS				
9.1	SAND WITH BOULDERS: Brown coarse silty sand with boulders. Saturated			6	WS				

NOTE:
-Pipe broken at 8.2 m during installation
-monitor functional

W.S. = Wash Sample

I

Gartner Lee Limited

BOREHOLE NO. 2

PROJECT NAME Hydrogeological Investigation for University of Guelph

CLIENT University of Guelph DATE Dec 16, 1986

BOREHOLE TYPE 171 mm O.D. Mud Rotary GEOLOGIST S.R.B.

GROUND ELEVATION 312.70 m a.s.l. PROJECT NO. 86-153

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS AND NUMBER	SAMPLE NO.	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	PENETRATION RESISTANCE BLOWS/0.3m	WATER CONTENT % / COMMENT
	(con't)								
	SAND WITH BOULDERS: Brown coarse silty sand with boulders. Saturated								
11									
12				7	WS				Wp — Wl
13									
14.0 14									
	Borehole terminated in sand and gravel		I Both monitors in same bore-hole						

W.S. = Wash Sample

Gartner Lee Limited

BOREHOLE NO. 3

PROJECT NAME Hydrogeological Investigation for University of Guelph

CLIENT University of Guelph DATE Dec. 16, 1986

BOREHOLE TYPE 171 mm O.D. Mud Rotary GEOLOGIST S.R.B.

GROUND ELEVATION 314.05 m.a.s.l. PROJECT NO. 86-153

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS AND NUMBER	SAMPLE NO.	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	PENETRATION RESISTANCE BLOWS/0.3m	WATER CONTENT % / COMMENT
.2	TOPSOIL: Blackish brown, silty moist.								
1	GRAVEL AND SAND: Brown coarse silty sand with cobbles, some boulders, moist. Saturated below ± 7.7 m								
2									
3				1	WS				
4									
5									
6				2	WS				
7									
8				3	WS				▽ 7.7
9			II	4	WS				
10									

WP ——— WL

W. S. = Wash Sample

BOREHOLE NO. 3

PROJECT NAME Hydrogeological Investigation for University of Guelph

CLIENT University of Guelph DATE Dec. 16, 1986

BOREHOLE TYPE 171 mm O.D. Mud Rotary GEOLOGIST S.R.B.

GROUND ELEVATION 314.05 m.a.s.l. PROJECT NO. 86-153

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS AND NUMBER	SAMPLE NO.	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	PENETRATION RESISTANCE BLOWS/0.3m	WATER CONTENT % / COMMENT
10.0	GRAVEL AND SAND: Brown coarse silty sand with cobbles, some boulders, moist. Saturated below ± 7.7 m uniform throughout.		I Both monitors in same bore-hole	5	WS				Wp — Wl; CAVE
14.0	Borehole terminated in sand and gravel								

W. S. = Wash Sample

Gartner Lee Limited

BOREHOLE NO. 4

PROJECT NAME Hydrogeological Investigation for University of Guelph

CLIENT University of Guelph DATE Nov. 14, 1986

BOREHOLE TYPE 108 mm I.D. Hollowstem Augers GEOLOGIST S.R.B.

GROUND ELEVATION 308.22 m.a.s.l. PROJECT NO. 86-153

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS AND NUMBER	SAMPLE NO.	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	PENETRATION RESISTANCE BLOWS/0.3m	WATER CONTENT % / COMMENT
.2	TOPSOIL: Black, silty, moist.								
	GRAVEL AND SAND: Brown silty sand with grey medium subangular gravel and cobbles. Saturated below ±1.5 m.			1	SS				▽ 1.7
				2	SS				
									CAVE
4.6	Borehole terminated in sand and gravel								

S.S. = Split Spoon

To Be Added To Reports

BOREHOLE NO. 5

PROJECT NAME Hydrogeological Investigation for University of Guelph

CLIENT University of Guelph DATE Nov. 13, 1986

BOREHOLE TYPE 108 mm I.D. Hollow Stem Augers GEOLOGIST S.R.B.

GROUND ELEVATION 307.61 m.a.s.l. PROJECT NO. 86-153

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS AND NUMBER	SAMPLE NO.	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	PENETRATION RESISTANCE BLOWS/0.3m	WATER CONTENT % / COMMENT
.2	TOPSOIL: Black silty, moist								
.6	MIXED: Topsoil and silty sand, some organics, moist.			1	AS				▽ 1.2
	GRAVEL AND SAND: Saturated below ±1.5 m.			2	AS				
				3	AS				
4.6	Borehole terminated in sand and gravel								CAVE

A.S. = Auger Sample

Gartner Lee Limited

BOREHOLE NO. 6

PROJECT NAME Hydrogeological Investigation for University of Guelph

CLIENT University of Guelph — DATE Nov. 14, 1986

BOREHOLE TYPE 108 mm I.D. Hollow Stem Augers — GEOLOGIST S.R.B.

GROUND ELEVATION 307.01 m.a.s.l. — PROJECT NO. 86-153

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS AND NUMBER	SAMPLE NO.	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	PENETRATION RESISTANCE BLOWS/0.3m	WATER CONTENT % / COMMENT
.3	TOPSOIL: Black, silty, moist.								Wp — Wl
	SAND AND GRAVEL: Saturated below ±1.5 m.			1	AS				▽ .5
1.5	GRAVELLY SAND: Light brown fine grained silty sand with medium gravel. Saturated.			2	AS				
3.0	SANDY COBBLES: Grey subangular cobbles. Some light sand. Saturated			3	AS				CAVE ↓
4.6	Borehole terminated at ± 4.6 m in sand and cobbles								

A.S. = Auger Sample

Gartner Lee Limited

BOREHOLE NO. 7

PROJECT NAME Hydrogeological Investigation for Guelph

CLIENT University of Guelph DATE Nov. 14, 1986

BOREHOLE TYPE 108 mm I.D. Hollow Stem Augers GEOLOGIST S.R.B.

GROUND ELEVATION 307.43 m.a.s.l. PROJECT NO. 86-153

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS AND NUMBER	SAMPLE NO.	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	PENETRATION RESISTANCE BLOWS/0.3m	WATER CONTENT % / COMMENT
.2	TOPSOIL: Black silty, moist								
	SAND AND GRAVEL: Brown silty sand with some medium gravel, wet. Gravel pocket between 2.1-2.3 m Saturated below ±1.5 m			1	AS				▽ .8
				2	AS				
				3	AS				Cave Borehole 7-II terminated at 4.6 m in sand
			II						
				4	AS				
				5	AS				
7.6	SAND AND GRAVEL Light brown sand with some medium to coarse subangular gravel, saturated.			6	AS				

A.S. = Auger Sample

Gartner Lee Limited

BOREHOLE NO. 7 (continued)

PROJECT NAME Hydrogeological Investigation for University of Guelph

CLIENT University of Guelph — DATE Nov. 14, 1986

BOREHOLE TYPE 108 mm I.D. Hollow Stem Augers — GEOLOGIST S.R.B.

GROUND ELEVATION 307.43 m.a.s.l. — PROJECT NO. 86-153

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS AND NUMBER	SAMPLE NO.	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	PENETRATION RESISTANCE BLOWS/0.3m	WATER CONTENT % / COMMENT
11	SAND AND GRAVEL: Light brown sand with some medium gravel, wet. Gravel pocket between 2.1-2.3 m Saturated below ±1.5 m			7	AS				Wp — Wl
12				8	AS				
13									
				9	AS				
14									
15			I	10	AS				Cave
16									
16.8				11	AS				
17	Borehole 7-I terminated at ±16.8 m in sand and gravel Monitors I and II in separate boreholes								

A.S. = Auger Sample

Gartner Lee Limited

BOREHOLE NO. 8

PROJECT NAME Hydrogeological Investigation for University of Guelph

CLIENT University of Guelph DATE Nov.18, 1986

BOREHOLE TYPE 108 mm I.D. Hollow Stem Augers GEOLOGIST S.R.B.

GROUND ELEVATION 304.78 m.a.s.l. PROJECT NO. 86-153

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS AND NUMBER	SAMPLE NO.	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	PENETRATION RESISTANCE BLOWS/0.3m	WATER CONTENT % / COMMENT
.2	TOPSOIL: Black silty, moist								Wp — Wl
	SAND AND GRAVEL: Brown silty sand with grey fine to medium gravel. Some black sandy organics. Saturated below ± 1.2 m			1	AS				▽ .3
3.0				2	AS				
	COARSE SAND AND GRAVEL: Brownish grey coarse sand with fine gravel, saturated.								Cave
4.6				3	AS				
	Borehole terminated at ±4.6 m in sand.								

A.S.= Auger Sample

BOREHOLE NO. 9

PROJECT NAME Hydrogeological Investigation for University of Guelph

CLIENT University of Guelph DATE Dec. 15, 1986

BOREHOLE TYPE 171 mm O.D. Mud Rotary GEOLOGIST S.R.B.

GROUND ELEVATION 306.75 m.a.s.l. PROJECT NO. 86-153

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS AND NUMBER	SAMPLE NO.	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	PENETRATION RESISTANCE BLOWS/0.3m	WATER CONTENT % / COMMENT
.2	TOPSOIL: Black silty moist								
1	GRAVELLY SAND: Brown to grey coarse sand with medium gravel getting coarse below ±6 m. Saturated below ±1.2 m			1	WS				▽ 1.0
2				2	WS				
3				3	WS				
4			II						Borehole 9-II terminated at ±4.1 m in gravelly sand.
5				4	WS				
6									
7				5	WS				
8									
9				6	WS				
10									

W. S. = Wash Sample

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BOREHOLE NO. 9

PROJECT NAME Hydrogeological Investigation for University of Guelph

CLIENT University of Guelph DATE Dec. 15, 1986

BOREHOLE TYPE 171 mm O.D. Mud Rotary GEOLOGIST S.R.B.

GROUND ELEVATION 306.75 m.a.s.l. PROJECT NO. 86-153

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS AND NUMBER	SAMPLE NO.	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	PENETRATION RESISTANCE BLOWS/0.3m	WATER CONTENT % / COMMENT
	GRAVELLY SAND: Brown to grey coarse sand with medium gravel			7	WS				
	Saturated below ±1.2 m								
12.2				8	WS				
	SILT TILL: Sandy, stony								
				9	WS				
			I	10	WS				Cave
17.				II	WS				
	Borehole 9-I terminated at ±17.1 m on assumed limestone bedrock. Monitors I and II in separate boreholes.								

W.S. = Wash Sample

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TW16-78

4(a)

Job Name: Cambridge Groundwater Exploration Program
Client: Regional Municipality of Waterloo
Borehole Type: Rotary/Cable Tool: 6"Ø
Location: University of Guelph Site

Borehole No. TW 16
Date Completed 09/05/78
Geologist/Engineer W.E.C.
Elev. Ground 1000 ± ft. A.S.L.

Profile			Sample			Penetration Test Blows/Foot.	Piezometer or Standpipe Installation
Ft. / M	Description	Stratigraphy	Number	Type	Blows/Foot	20 40 60 80	
0.0	Ground Surface						MP
1.5	COBBLES AND GRAVEL (Fill)						Sanitary Well Seal
0.5 / 5.0	COBBLES AND GRAVEL, with silt and minor clay, brown						
1.5	GRAVEL, coarse, with some cobbles and silty sand, minor clay, brown		1	W			6½" I.D. Steel Well Casing, 0.180" Wall
15.0			2	W			
4.6	SAND AND GRAVEL, coarse, with some silt and trace clay		3	W			
			4	W			
			5	W			Cavings
38.0							
11.6	SAND, fine to coarse, silty with some gravel, brown		6	B			
			7	B			
48.0							
14.6	SAND AND GRAVEL, silty, with clay, grey		8	B			
55.0			9	B			
16.8	SILT, clayey, with some gravel (Silt-Till)						
60.0			10	B			
18.3	Hole continued on Page 2						

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TW16-78

4(a) cont'd

Job Name: Cambridge Groundwater Exploration Program
Client: Regional Municipality of Waterloo
Borehole Type: _____
Location: _____

Borehole No. TW 16 (Continued)
Date Completed _____
Geologist/Engineer _____
Elev. Ground _____

Profile			Sample			Penetration Test Blows/Foot	Piezometer or Standpipe Installation
Ft. / M	Description	Stratigraphy	Number	Type	Blows/Foot	20 40 60 80	
60.0							
18.3 / 65.0	As above (Silt-Till)		11	B			6¼" I.D. Casing
19.8 / 68.0	GRAVEL, silty, with clay and rock fragments						
20.7 / 78.0	DOLOSTONE, fine, dense, hard, medium to dark brown (Guelph Formation)		12	W			6½" Ø Drive Shoe
			13	W			
23.8 / 90.0	DOLOSTONE, Fine, dense, moderately hard, slightly argillaceous, dark brown (Lockport Formation)						6"Ø Open Hole
27.4 / 101.0	DOLOSTONE, fine, dense, moderately soft, more argillaceous, dark brown (Lockport Formation)		14	W			
30.8 / 106.0	DOLOSTONE, as above but with shaley portions, dark brown to black (Lockport Formation)		15	W			
32.9	End of Hole.						

Note: Water level measured 09/05/78 at 2' above ground. Flow approximately 5 to 7 IGPM over MP. MP is 1.0' above ground.

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TW16-79

4(b)

Job Name: Cambridge Groundwater Exploration Program
Client: Regional Municipality of Waterloo
Borehole Type: Cable Tool; 6"Ø
Location: University of Guelph Site, Twp of Puslinch

Borehole No. TW 16/79
Date Completed 09/14/79
Geologist/Engineer W.E.C.
Elev. Ground 1000± ft. A.S.L.

Profile Ft. / M	Description	Stratigraphy	Sample Number	Sample Type	Sample Blows/Foot	Penetration Test Blows/Foot (20 40 60 80)	Piezometer or Standpipe Installation
0.0	Ground surface						
2.0	COBBLES AND GRAVEL (Fill)						
0.6	SAND AND GRAVEL, with some silt and clay, brown		1				
15.0							
4.3	SAND, fine to coarse, with gravel and some clay, brown		2				
25.0							
7.6	SAND, fine, silty with minor gravel, brown		3				
30.0							
9.1	SAND, very fine to fine, uniform, with some silt and clay, olive-brown		4				
48.0			5				
14.6	End of Hole Note: Water level measured 09/13/79 at 3.6' BMP. MP is 1.5' above ground						

Piezometer or Standpipe Installation:
- Sanitary well seal
- 6¼" I.D. Steel Well Casing 0.188" Wall
- Fig. 'K' Packer
- 6¼"Ø Drive shoe
- 5 3/4" O.D Lead Pipe
- 5 3/4" O.D #50 Slot Stainless Steel Well Screen
- 5 3/4" O.D Tail Pipe (Sump)

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OW1-84

4(c)

CLIENT Regional Municipality of Waterloo FILE NO. 379-831

PROJECT Master Water Supply Study LOCATION Puslinch Township

GEOLOGIST/ENGINEER LDH/WDB DATE COMPLETED Sept. 24,1985

DESCRIPTION	DEPTH metres	DEPTH feet	SAMPLE no.	SAMPLE type	SAMPLE "N"	WELL DETAIL	REMARKS BLOWS PER FOOT
COBBLES & GRAVEL, fill						Protective steel pipe with cap	
SILT & ORGANICS, saturated, brown	1	5				Concrete seal	
	2					Peltonite seal w/l Sept.27/84	
SILT, brown with medium fine sand, some gravel, saturated	3	10				Native backfill	
	4					50mm Ø PVC casing	
SAND & GRAVEL, medium-coarse, saturated	5	15					
	6	20					
	7	25					
	8					50mm Ø, Sched.40 10 slot, PVC well screen	
	9	30					
	10						
END OF HOLE	11	35					
	12	40					
	13						

REMARKS: BLOWS PER FOOT — 10 20 30 40 50 60 70 80 90

GS- GRAB SAMPLE SS- SPLIT SPOON ST- SHELBY TUBE "N" BLOWS PER FOOT WATER LEVEL ▽

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OW2-84 | 4 (d)

CLIENT Regional Municipality of Waterloo FILE NO. 379-831

PROJECT Master Water Supply Study LOCATION Puslinch Township

GEOLOGIST/ENGINEER LDH/WDB DATE COMPLETED Sept. 24,1985

DESCRIPTION	DEPTH metres	DEPTH feet	SAMPLE no.	SAMPLE type	SAMPLE "N"	WELL DETAIL	REMARKS BLOWS PER FOOT 10 20 30 40 50 60 70 80 90
SILT & ORGANICS, some gravel, saturated	1	5				Protective steel pipe with cap; Concrete seal; Peltonite seal w/1 Sept.27/84	
	2						
SILT, with some medium-coarse sand, some gravel, saturated	3	10				Native backfill	
	4	15				50mm Ø PVC casing	
	5						
SAND & GRAVEL, medium-coarse, saturated	6	20					
	7	25					
	8						
	9	30				50mm Ø, Sched. 40 10 slot, PVC well screen	
END OF HOLE	10	35					
	11						
	12	40					
	13						

GS- GRAB SAMPLE SS- SPLIT SPOON ST- SHELBY TUBE "N" BLOWS PER FOOT WATER LEVEL ▽

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OW3-84 | 4(e)

CLIENT Regional Municipality of Waterloo FILE NO. 379-831

PROJECT Master Water Supply Study LOCATION Puslinch Township

GEOLOGIST/ENGINEER LDH/WDB DATE COMPLETED Sept. 25, 1985

DESCRIPTION	DEPTH metres	DEPTH feet	SAMPLE no.	SAMPLE type	SAMPLE "N"	WELL DETAIL	REMARKS
							BLOWS PER FOOT 10 20 30 40 50 60 70 80 90
						▽	w/l Sept.27/84
SILT & ORGANICS, saturated	1	5				Protective steel pipe with cap; Concrete seal; Peltonite seal	
SILT, with gravel, saturated	2					Native backfill	
SAND & GRAVEL, medium-coarse sand, saturated, well rounded gravel	3	10				50mm Ø PVC casing	
	4	15					
	5						
	6	20					
	7	25					
	8						
	9	30				50mm Ø, Sched.40 10 slot, PVC well screen	
END OF HOLE	10						
		35					
	11						
	12	40					
	13						

GS- GRAB SAMPLE SS - SPLIT SPOON ST - SHELBY TUBE "N" BLOWS PER FOOT WATER LEVEL ▽

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OW4-84

4(f)

CLIENT Regional Municipality of Waterloo FILE NO. 379-831

PROJECT Master Water Supply Study LOCATION Puslinch Township

GEOLOGIST/ENGINEER LDH/WDB DATE COMPLETED Sept. 25, 1985

DESCRIPTION	DEPTH metres	DEPTH feet	SAMPLE no.	SAMPLE type	SAMPLE "N"	WELL DETAIL	REMARKS BLOWS PER FOOT 10 20 30 40 50 60 70 80 90
							w/l Sept.27/84
ORGANICS & SILT, saturated						Protective steel pipe with cap	
SAND & GRAVEL, somed silt saturated	1	5				Concrete seal	
	2					Peltonite seal	
SAND & GRAVEL, medium-coarse, saturated	3	10				Native backfill	
	4					50mm Ø PVC casing	
	5	15					
	6	20					
	7						
	8	25					
	9	30				50mm Ø, Sched.40 10 slot, PVC well screen	
END OF HOLE	10						
	11	35					
	12	40					
	13						

GS- GRAB SAMPLE SS- SPLIT SPOON ST- SHELBY TUBE "N" BLOWS PER FOOT WATER LEVEL ▽

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OW5-84

4(g)

CLIENT Regional Municipality of Waterloo FILE NO. 379-831

PROJECT Master Water Supply Study LOCATION Puslinch Township

GEOLOGIST/ENGINEER LDH/WDB DATE COMPLETED Sept. 25, 1985

DESCRIPTION	DEPTH metres	DEPTH feet	SAMPLE no.	SAMPLE type	SAMPLE "N"	WELL DETAIL	REMARKS BLOWS PER FOOT
							10 20 30 40 50 60 70 80 90
							w/l Sept.27/84
SILT & ORGANICS, saturated							Protective steel pipe with cap
SAND & GRAVEL, saturated, clean, well-rounded gravel, medium-coarse sand	1	5					Concrete seal
	2						Peltonite seal
	3	10					Native backfill
	4						50mm Ø PVC casing
	5	15					
	6	20					
	7						
	8	25					
	9	30					50mm Ø, Sched.40 10 slot, PVC well screen
END OF HOLE	10						
	11	35					
	12	40					
	13						

GS- GRAB SAMPLE SS - SPLIT SPOON ST - SHELBY TUBE "N" BLOWS PER FOOT WATER LEVEL ▽

WL-040281

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OW16a-78

4(h)

Job Name: Cambridge Groundwater Exploration Program
Client: Regional Municipality of Waterloo
Borehole Type: Power Augered, 7"Ø
Location: University of Guelph Site - Hwy 401

Borehole No. TH 16a
Date Completed 08/24/78
Geologist/Engineer W.E.C.
Elev. Ground 1000± ft. A.S.L.

Profile			Sample			Penetration Test Blows/Foot	Piezometer or Standpipe Installation
Ft. / M	Description	Stratigraphy	Number	Type	Blows/Foot	20 40 60 80	
	Ground Surface						MP
0.0 / 3.0	ORGANICS, silty (Marsh Soil)	TOPSOIL					Bentonite
0.9 / 10.0	COBBLES AND GRAVEL, with sandy silt, minor clay, brown		1	SS	32		14"Ø Plastic Pipe
3.0 / 15.0	SAND, medium to coarse, uniform, with gravel and minor silt		2	SS	54		
4.6 / 24.0	GRAVEL, medium to coarse, with silty sand and some cobbles		3	SS	150		
			4	SS	101		#10 Slot Point
7.3 / 43.0	SAND, fine to coarse, uniform, with minor silt and gravel, brown		5	SS	63		
			6	SS	62		
			7	W	43		Caving
			8	W	8		
43.1 / 48.0	SAND, very fine to fine, with silt layering, brown		9	SS	16		
44.6 / 56.5	SILT, with sand and coarse gravel grading to denser clayey silt with depth (Silt-Till)		10	SS	14		
			11	SS	9		
57.2	End of Hole. Note: Water level measured 08/25/78 at 4.5' BMP. MP is 3.0' above ground.						

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OW16b-78

4(i)

Job Name: Cambridge Groundwater Exploration Program
Client: Regional Municipality of Waterloo
Borehole Type: Power Augered, 7" Ø
Location: University of Guelph Site - Hwy 401

Borehole No. TH 16b
Date Completed 09/25/78
Geologist/Engineer W.E.C.
Elev. Ground 1005 ± Ft. A.S.L.

Profile			Sample			Penetration Test Blows/Foot	Piezometer or Standpipe Installation
Ft. / M	Description	Stratigraphy	Number	Type	Blows/Foot	20 40 60 80	
	Ground Surface						MP
0.0	GRAVEL, coarse with cobbles and sandy silt and minor clay, brown		1	SS	50		Bentonite
7.0							1½" Ø Plastic Pipe
2.1	SAND, coarse, with fine gravel and minor silt, trace clay, grey-brown		2	SS	15		
			3	SS	20		
			4	SS	27		
23.0							
7.0	SAND AND GRAVEL, coarse, with silt		5	SS	21		
26.5							
8.1	SAND, medium to coarse, with fine gravel		6	SS	21		#10 Slot Point
34.0							
36.0	SILT, with fine sand and granular pebbles, till		7	SS	75		
11.0	SAND AND GRAVEL with silt and		8	W			
39.0	minor clay						
11.9	SILT, with sand and fine gravel, pebbles, grey-brown, becoming more dense with depth (Silt-Till)		9	SS	20		Caving
			10	SS	12		
51.0			11	SS	75		
15.5	End of Hole. Note: Water level measured 03/25/78 at approx. 5' BMP. MP is 2.5' above ground.						

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OW16c-78

4(j)

Job Name: Cambridge Groundwater Exploration Program
Client: Regional Municipality of Waterloo
Borehole Type: Power Augered, 7" Ø
Location: University of Guelph Site - Hwy 401

Borehole No. TH 16c
Date Completed 08/25/78
Geologist/Engineer W.E.C.
Elev. Ground 1005 ± ft. A.S.L.

Profile			Sample			Penetration Test Blows/Foot	Piezometer or Standpipe Installation
Ft. / M	Description	Stratigraphy	Number	Type	Blows/Foot	20 40 60 80	
	Ground Surface						MP
0.0	GRAVEL, coarse, with cobbles, sandy silt, and minor clay, brown						Bentonite
7.0							1½"Ø Plastic Pipe
2.1	SAND, coarse with fine gravel and minor silt, trace clay, grey-brown						Saw-Cut Slots
15.0							
4.6	End of Hole.						

Note: Water level measured 08/25/78 at approx. 5' BMP.
MP is 2.5' above ground.

PROJECT 80-110 WATER WELL DATA TABLE 4/7 SHEET 7

well no	name (owner) location	collar elev.	date	well dia.	water found	static level	pump level	pump rate	specific capacity	well use	well log
3158	Prov. Planning Association Con 2, Lot 24 University	1016 309.7 m	11/68	10" 0.25m	65 19.9m	5 1.5m	40 12.2	1000 75.8	28.6 7.1	DO	0-1 Topsoil 1-14 Gravel 14-17 Medium sandy gravel 17-25 Gravel 25-37 Gravelly medium sand 37-46 Medium sandy gravel 46-58 Clayey medium sand 58-70 Brown limestone 70-95 Black limestone 95-104 Brown limestone
4794	University of Guelph Con 2, Lot 24	1020	8/73	5"	65 90	5	10	20	4.00	DO	0-1 Topsoil 1-30 Brown clayey sandy stones 30-56 Brown clayey sandy gr 56-100 Brown rock
2325	K. Martin Con 2, Lot 24 Prof Happy u. of G.	1022	1/64	6"	72	20	40	20	1.00	ST/DO	0-40 Stony gravel 40-59 Medium sandy clay 59-75 Limestone
2326	W. Burrows Con 2, Lot 25	1032	5/62	6"	48	26	35	16	1.78	DO	0-25 Gravelly stones 25-45 Medium sandy gravel 45-48 Gravel
5488	D. Visser Con 2, Lot 25	1015	4/75	5"	95	23	30	15	2.14	DO	0-25 Brown clayey stones 25-50 Brown claycy sandy gravel 50-74 Brown clayey sandy hardpan 74-106 Brown rock
3315	J. Rankel Con 3, Lot 15	1062	10/68	6"	105	36	80	15	0.34	DO	0-5 Predug 5-80 Clayey stones 80-95 Clayey medium sand 95-100 Medium sandy gravel 100-105 Gravel

WATER WELL RECORDS FOR UNIVERSITY PROPERTY

Well #	Well Log (m)	
3158	0.0-0.3	Topsoil
Lot 24 Conc. 2	0.3-4.3	Gravel
	4.3-5.2	Medium sandy gravel
	5.2-7.6	Gravel
	7.6-11.3	Gravelly medium sand
	11.3-14.0	Medium sandy gravel
	14.0-17.7	Clayey medium sand TILL ?
	17.7-21.3	Brown Limestone
	21.3-29.0	Black Limestone
	29.0-31.7	Brown Limestone

0.25 m diameter well drilled in 1968. Test pumped at 76 L/S, water level drewdown by 10.7 m.

4794	0.0-0.3	Topsoil
Lot 24 Conc. 2	0.3-9.1	Brown clayey sandy stones TILL ?
	9.1-17.1	Brown clayey sandy gravel TILL ?
	17.1-30.5	Brown rock

0.13 m diameter well drilled in 1973. Test pumped at 1.5 L/S, water level drewdown by 1.52 m.

2325	0.0-12.2	Stoney gravel
Lot 24 Conc. 2	12.2-18.0	Medium sandy clay TILL ?
	18.0-22.9	Limestone

0.15 m diameter well drilled in 1964. Test pumped at 1.5 L/S, water level drewdown by 6.1 m.

BOREHOLE NO. 92-1

PROJECT NAME MILL CREEK AGGREGATE PROPERTY — **PROJECT NO.** 91269.00

CLIENT DUFFERIN AGGREGATES — **DATE** FEBRUARY 7, 1992

BOREHOLE TYPE BECKER HAMMER DRILL (I.D. 102 mm) — **GEOLOGIST** JSK

GROUND ELEVATION NOT SURVEYED 312.2 m a.s.l. — **ENGINEER** AJC/AGH

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE ROD (%)	CONE PENETRATION "N" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 / W_P W_L	REMARKS
0											
	SAND AND GRAVEL: Trace silt, moist.										TEXTURAL DESCRIPTIONS FROM FIELD EXAMINATION ONLY – TO BE CONFIRMED BY LABORATORY ANALYSIS
4.9											
	SANDY GRAVEL: Saturated below 6.1 m.										
7.3											
8.5	GRAVELLY COARSE SAND: Some medium sand, saturated.										
10.4	SANDY FINE TO MEDIUM GRAVEL: Saturated.										
	GRAVELLY MEDIUM TO COARSE SAND: Interbedded gravel zones near bottom, trace silt, saturated.										
18.0											
18.6	SILT TILL: Moist.										
	Borehole terminated at 18.6 m on assumed bedrock.										

Jagger Hims Limited

BOREHOLE NO. 92-2

PROJECT NAME MILL CREEK AGGREGATE PROPERTY — **PROJECT NO.** 91269.00

CLIENT DUFFERIN AGGREGATES — **DATE** FEBRUARY 7, 1992

BOREHOLE TYPE BECKER HAMMER DRILL (I.D. 102 mm) — **GEOLOGIST** KBA

GROUND ELEVATION NOT SURVEYED 310.2m a.s.l. — **ENGINEER** AJC/AGH

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE ROD (%)	CONE PENETRATION "N" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 / Wp WL	REMARKS
0	GRAVELLY MEDIUM TO COARSE SAND: Moist from 0.0 m to 4.6 m, saturated from 4.6 m to 7.3 m. 2										TEXTURAL DESCRIPTIONS FROM FIELD EXAMINATION ONLY – TO BE CONFIRMED BY LABORATORY ANALYSIS
7.3	SANDY FINE TO MEDIUM GRAVEL: Saturated.										NO MONITOR INSTALLED
9.8	COARSE SAND AND FINE GRAVEL: Saturated.										— Rust staining
12.2	MEDIUM TO COARSE SAND: Some fine gravel, saturated. 6										
18.3	SANDY SILT TILL: Broken angular rock fragments, saturated.										
20.4	Borehole terminated at 20.4 m on assumed bedrock.										

Jagger Hims Limited

BOREHOLE NO. 92-3

PROJECT NAME MILL CREEK AGGREGATE PROPERTY — **PROJECT NO.** 91269.00

CLIENT DUFFERIN AGGREGATES — **DATE** FEBRUARY 7, 1992

BOREHOLE TYPE BECKER HAMMER DRILL (I.D. 102 mm) — **GEOLOGIST** KBA

GROUND ELEVATION NOT SURVEYED 309.2m a.s.l. — **ENGINEER** AJC/AGH

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE: TYPE	SAMPLE: 'N' VALUE	SAMPLE: % WATER	SAMPLE: % RECOVERY	SAMPLE: ROD (%)	CONE PENETRATION "N" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 (Wp, WL)	REMARKS
0	MEDIUM TO COARSE SAND: Some gravel, moist from 0.0 m to 4.6 m, saturated from 4.6 m to 9.8 m.		NO MONITOR INSTALLED								TEXTURAL DESCRIPTIONS FROM FIELD EXAMINATION ONLY – TO BE CONFIRMED BY LABORATORY ANALYSIS
9.8	GRAVELLY COARSE SAND: Some medium sand, saturated.										Rust staining
13.1											
13.7	SILT: WTPL										
14.6	MEDIUM SAND: Saturated.										
15.2	SILT TILL: Angular rock fragments, saturated.										
	Borehole terminated at 15.2 m on assumed bedrock.										

Jagger Hims Limited

BOREHOLE NO. 92-4

PROJECT NAME MILL CREEK AGGREGATE PROPERTY — **PROJECT NO.** 91269.00

CLIENT DUFFERIN AGGREGATES — **DATE** FEBRUARY 7, 1992

BOREHOLE TYPE BECKER HAMMER DRILL (I.D. 102 mm) — **GEOLOGIST** KBA

GROUND ELEVATION NOT SURVEYED 308.9m a.s.l. — **ENGINEER** AJC/AGH

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE ROD (%)	CONE PENETRATION "N" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 (Wp, WL)	REMARKS
0	GRAVELLY COARSE SAND: Some medium sand, moist from 0.0 m to 4.3 m, saturated from 4.3 m to 7.3 m.										TEXTURAL DESCRIPTIONS FROM FIELD EXAMINATION ONLY – TO BE CONFIRMED BY LABORATORY ANALYSIS
5											NO MONITOR INSTALLED
7.3	MEDIUM TO COARSE SAND: Some fine to medium gravel, saturated.										– Rust staining
10											
14.0											
15	15.2 SANDY SILT TILL: Saturated.										
	Borehole terminated at 15.2 m on assumed bedrock.										
20											
25											
30											
35											
40											
45											
50											

BOREHOLE NO. 92-5

PROJECT NAME MILL CREEK AGGREGATES PROPERTY — **PROJECT NO.** 91269.00

CLIENT DUFFERIN AGGREGATES — **DATE** FEBRUARY 7, 1992

BOREHOLE TYPE BECKER HAMMER DRILL (I.D. 102 mm) — **GEOLOGIST** KBA

GROUND ELEVATION NOT SURVEYED 308.3m a.s.l. — **ENGINEER** AJC/AGH

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE: TYPE	SAMPLE: 'N' VALUE	SAMPLE: % WATER	SAMPLE: % RECOVERY	SAMPLE: ROD (%)	CONE PENETRATION "N" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 (Wp, WL)	REMARKS
0											
	MEDIUM TO COARSE SAND AND FINE GRAVEL: Trace medium gravel, moist from 0.0 m to 3.0 m, saturated from 3.0 m to 9.1 m.										TEXTURAL DESCRIPTIONS FROM FIELD EXAMINATION ONLY - TO BE CONFIRMED BY LABORATORY ANALYSIS
5											
9.1											
10	SILT TILL: WTPL										
14.9											
15	Borehole terminated at 14.9 m on assumed bedrock.										
20											
25											
30											
35											
40											
45											
50											

BOREHOLE NO. 92-6

PROJECT NAME MILL CREEK AGGREGATE PROPERTY — **PROJECT NO.** 91269.00

CLIENT DUFFERIN AGGREGATES — **DATE** FEBRUARY 7, 1992

BOREHOLE TYPE BECKER HAMMER DRILL (I.D. 102 mm) — **GEOLOGIST** KBA

GROUND ELEVATION NOT SURVEYED 307.3 m a.s.l. — **ENGINEER** AJC/AGH

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE ROD (%)	CONE PENETRATION "N" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 / Wp Wl	REMARKS
0											TEXTURAL DESCRIPTIONS FROM FIELD EXAMINATION ONLY – TO BE CONFIRMED BY LABORATORY ANALYSIS
	COARSE SAND AND FINE GRAVEL: Some medium sand, trace medium gravel, moist. 1										
2.4											
5	MEDIUM TO COARSE SAND: Some fine gravel, saturated below 2.4 m. 2										NO MONITOR INSTALLED
7.3											
10	MEDIUM TO COARSE SAND AND FINE GRAVEL: Trace medium gravel, saturated.										
10.7											
12.2	MEDIUM SAND: Saturated. 5										
14.0	SANDY SILT TILL: Angular rock fragments, saturated.										
15	Borehole terminated at 14.0 m on assumed bedrock.										
20											
25											
30											
35											
40											
45											
50											

R

BOREHOLE NO. 92-7

PROJECT NAME MILL CREEK AGGREGATE PROPERTY

PROJECT NO. 91269.00

CLIENT DUFFERIN AGGREGATES

DATE FEBRUARY 8, 1992

BOREHOLE TYPE BECKER HAMMER DRILL (I.D. 102 mm)

GEOLOGIST KBA

GROUND ELEVATION NOT SURVEYED 309.8m a.s.l.

ENGINEER AJC/AGH

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE: TYPE	SAMPLE: 'N' VALUE	SAMPLE: % WATER	SAMPLE: % RECOVERY	SAMPLE: RQD (%)	CONE PENETRATION "N" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 / Wp WL	REMARKS
0	MEDIUM TO COARSE SAND: Some fine gravel, trace fine sand, trace medium gravel, moist from 0.0 m to 4.6 m, saturated from 4.6 m to 9.8 m. 2										TEXTURAL DESCRIPTIONS FROM FIELD EXAMINATION ONLY – TO BE CONFIRMED BY LABORATORY ANALYSIS NO MONITOR INSTALLED – Rust staining – Rust staining
9.8	GRAVELLY MEDIUM TO COARSE SAND: Saturated.										
14.6	FINE TO COARSE SAND: Some fine gravel, trace silt, saturated.										
18.6	SILT TILL: Angular rock fragments, saturated.										
21.0	Borehole terminated at 21.0 m on assumed bedrock.										

Depth scale: 0, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50

BOREHOLE NO. 92-8

PROJECT NAME MILL CREEK AGGREGATE PROPERTY — **PROJECT NO.** 91269.00

CLIENT DUFFERIN AGGREGATES — **DATE** FEBRUARY 8, 1992

BOREHOLE TYPE BECKER HAMMER DRILL (I.D. 102 mm) — **GEOLOGIST** KBA

GROUND ELEVATION NOT SURVEYED 308.1m a.s.l. — **ENGINEER** AJC/AGH

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE: TYPE	SAMPLE: 'N' VALUE	SAMPLE: % WATER	SAMPLE: % RECOVERY	SAMPLE: RQD (%)	CONE PENETRATION "N" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 (Wp, WL)	REMARKS
0	MEDIUM TO COARSE SAND: Some fine gravel, trace fine sand, moist from 0.0 m to 4.0 m, saturated below 4.0 m. 3, 5.										TEXTURAL DESCRIPTIONS FROM FIELD EXAMINATION ONLY - TO BE CONFIRMED BY LABORATORY ANALYSIS
14.0	SILT TILL: Angular rock fragments, saturated, WTPL										
21.0	Borehole terminated at 21.0 m on assumed bedrock.										

BOREHOLE NO. 92-9

PROJECT NAME MILL CREEK AGGREGATE PROPERTY — **PROJECT NO.** 91269.00

CLIENT DUFFERIN AGGREGATES — **DATE** FEBRUARY 8, 1992

BOREHOLE TYPE BECKER HAMMER DRILL (I.D. 102 mm) — **GEOLOGIST** KBA

GROUND ELEVATION NOT SURVEYED 308.4m a.s.l. — **ENGINEER** AJC/AGH

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE: TYPE	SAMPLE: 'N' VALUE	SAMPLE: % WATER	SAMPLE: % RECOVERY	SAMPLE: ROD (%)	CONE PENETRATION "N" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 (W_P – W_L)	REMARKS
0	MEDIUM TO COARSE SAND: Some fine gravel, moist from 0.0 m to 4.6 m, saturated from 4.6 m to 12.8 m. 2 4.										TEXTURAL DESCRIPTIONS FROM FIELD EXAMINATION ONLY – TO BE CONFIRMED BY LABORATORY ANALYSIS NO MONITOR INSTALLED
12.8	SILT TILL: WTPL										
14.9	Borehole terminated at 14.9 m on assumed bedrock.										

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BOREHOLE NO. 92-10

PROJECT NAME MILL CREEK AGGREGATE PROPERTY — **PROJECT NO.** 91269.00

CLIENT DUFFERIN AGGREGATES — **DATE** FEBRUARY 8, 1992

BOREHOLE TYPE BECKER HAMMER DRILL (I.D. 102 mm) — **GEOLOGIST** KBA

GROUND ELEVATION NOT SURVEYED 309.4m a.s.l. — **ENGINEER** AJC/AGH

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE: TYPE	SAMPLE: 'N' VALUE	SAMPLE: % WATER	SAMPLE: % RECOVERY	SAMPLE: RQD (%)	CONE PENETRATION "N" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 (W_P – W_L)	REMARKS
0											TEXTURAL DESCRIPTIONS FROM FIELD EXAMINATION ONLY – TO BE CONFIRMED BY LABORATORY ANALYSIS
	FINE TO COARSE SAND: Some fine gravel, trace medium gravel, moist to 4.9 m, saturated from 4.9 m to 7.3 m. 2		NO MONITOR INSTALLED								
5											
7.3											
10	MEDIUM TO COARSE SAND AND FINE GRAVEL: Saturated.										
9.8											
	MEDIUM TO COARSE SAND: Trace fine gravel, saturated. 5										Rust staining
15											
15.8											
	SILT TILL: Some fine sand, saturated.										
20											
19.8											
	Borehole terminated at 19.8 m on assumed bedrock.										
25											
30											
35											
40											
45											
50											

BOREHOLE NO. 92-11

PROJECT NAME MILL CREEK AGGREGATE PROPERTY — **PROJECT NO.** 91269.00

CLIENT DUFFERIN AGGREGATES — **DATE** FEBRUARY 8, 1992

BOREHOLE TYPE BECKER HAMMER DRILL (I.D. 102 mm) — **GEOLOGIST** KBA

GROUND ELEVATION NOT SURVEYED 308.5m a.s.l. — **ENGINEER** AJC/AGH

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE RQD (%)	CONE PENETRATION "N" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 (Wp, WL)	REMARKS
0											TEXTURAL DESCRIPTIONS FROM FIELD EXAMINATION ONLY – TO BE CONFIRMED BY LABORATORY ANALYSIS
	FINE TO COARSE SAND: Some fine gravel, moist from 0.0 m to 4.6 m, saturated from 4.6 m to 7.3 m. 2										NO MONITOR INSTALLED
7.3											
	MEDIUM TO COARSE SAND: Trace fine gravel, saturated. 5										
14.6											
	FINE TO MEDIUM SAND: Saturated. 7										
17.1											
18.0	SANDY SILT TILL: Saturated.										
	Borehole terminated at 18.0 m on assumed bedrock.										

BOREHOLE NO. 92-12

PROJECT NAME MILL CREEK PROPERTY — **PROJECT NO.** 91269.00

CLIENT DUFFERIN AGGREGATES — **DATE** FEB. 8, /92

BOREHOLE TYPE BECKER HAMMER DRILL (I.D. 102 mm) — **GEOLOGIST** KBA

GROUND ELEVATION NOT SURVEYED 307.2m asl. — **ENGINEER** AJC/AGH

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE ROD (%)	CONE PENETRATION "N" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 / Wp Wl	REMARKS
0											
2.4	GRAVELLY FINE TO COARSE SAND: Moist. 1										TEXTURAL DESCRIPTIONS FROM FIELD EXAMINATION ONLY – TO BE CONFIRMED BY LABORATORY ANALYSIS
4.9	FINE TO COARSE SAND: Trace fine gravel, saturated. 2										NO MONITOR INSTALLED
8.2	GRAVELLY MEDIUM TO COARSE SAND: Saturated. 3										
13.1	SANDY SILT TILL: Angular rock fragments.										
	Borehole terminated at 13.1 m on assumed bedrock.										

5 10 15 20 25 30 35 40 45 50

BOREHOLE NO. 92-13

PROJECT NAME MILL CREEK AGGREGATE PROPERTY — **PROJECT NO.** 91269.00

CLIENT DUFFERIN AGGREGATES — **DATE** FEBRUARY 10, 1992

BOREHOLE TYPE BECKER HAMMER DRILL (I.D. 102 mm) — **GEOLOGIST** JSK

GROUND ELEVATION NOT SURVEYED 309.5m a.s.l. — **ENGINEER** AJC/AGH

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE RQD (%)	CONE PENETRATION "N" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 / Wp WL	REMARKS
0	GRAVELLY MEDIUM TO COARSE SAND: Moist from 0.0 m to 4.9 m, saturated from 4.9 m to 12.2 m. 2 4										TEXTURAL DESCRIPTIONS FROM FIELD EXAMINATION ONLY – TO BE CONFIRMED BY LABORATORY ANALYSIS
12.2	Borehole terminated at 12.2 m in sand.										

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BOREHOLE NO. 92-14

PROJECT NAME MILL CREEK AGGREGATE PROPERTY — **PROJECT NO.** 91269.00

CLIENT DUFFERIN AGGREGATES — **DATE** FEBRUARY 10, 1992

BOREHOLE TYPE BECKER HAMMER DRILL (I.D. 102 mm) — **GEOLOGIST** JSK

GROUND ELEVATION NOT SURVEYED 308.8m a.s.l. — **ENGINEER** AJC/AGH

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE RQD (%)	CONE PENETRATION "N" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 / Wp WL	REMARKS
0	GRAVELLY MEDIUM TO COARSE SAND: Trace fine sand, trace silt, moist from 0.0 m to 4.6 m, saturated from 4.6 m to 13.1 m. 2										TEXTURAL DESCRIPTIONS FROM FIELD EXAMINATION ONLY – TO BE CONFIRMED BY LABORATORY ANALYSIS
13.1											
14.6	SILTY GRAVELLY FINE TO COARSE SAND: Saturated. 6										
	SILT: WTPL										
18.3											
20	FINE SAND: Saturated.										
23.2											
25	Borehole terminated at 23.2 m on assumed bedrock.										

Jagger Hims Limited

BOREHOLE NO. 92-15

PROJECT NAME MILL CREEK AGGREGATE PROPERTY — **PROJECT NO.** 91269.00

CLIENT DUFFERIN AGGREGATES — **DATE** FEBRUARY 10, 1992

BOREHOLE TYPE BECKER HAMMER DRILL (I.D. 102 mm) — **GEOLOGIST** JSK

GROUND ELEVATION NOT SURVEYED 308.4m a.s.l. — **ENGINEER** AJC/AGH

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE: TYPE	SAMPLE: 'N' VALUE	SAMPLE: % WATER	SAMPLE: % RECOVERY	SAMPLE: RQD (%)	CONE PENETRATION "N" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 (Wp — Wl)	REMARKS
0	GRAVELLY MEDIUM TO COARSE SAND: Some fine sand, trace silt, moist from 0.0 m to 4.9 m, saturated from 4.9 m to 8.5 m.										TEXTURAL DESCRIPTIONS FROM FIELD EXAMINATION ONLY – TO BE CONFIRMED BY LABORATORY ANALYSIS
8.5	COARSE SAND: Some medium sand, trace fine gravel, saturated.										
9.8	SANDY FINE TO MEDIUM GRAVEL: Saturated.										
12.2	GRAVELLY MEDIUM TO COARSE SAND: Some silt, saturated.										
17.1	SANDY GRAVEL: Trace silt, saturated.										
20.7	SILT TILL: Saturated.										
22.6	Borehole terminated at 22.6 m on assumed bedrock.										

BOREHOLE NO. 92-16

PROJECT NAME MILL CREEK PROPERTY — **PROJECT NO.** 91269.00

CLIENT DUFFERIN AGGREGATES — **DATE** FEB. 10, /92

BOREHOLE TYPE BECKER HAMMER DRILL (I.D. 102 mm) — **GEOLOGIST** JSK

GROUND ELEVATION NOT SURVEYED 308.3m a.s.l. — **ENGINEER** AJC/AGH

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE ROD (%)	CONE PENETRATION 'N' VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 / Wp Wl	REMARKS
0											TEXTURAL DESCRIPTIONS FROM FIELD EXAMINATION ONLY – TO BE CONFIRMED BY LABORATORY ANALYSIS
	GRAVELLY FINE TO COARSE SAND: Trace silt, moist from 0.0 m to 4.6 m, saturated from 4.6 m to 7.3 m.										NO MONITOR INSTALLED
7.3	SANDY GRAVEL: Saturated.										
9.8	GRAVELLY MEDIUM TO COARSE SAND: Saturated.										
12.2	SAND AND GRAVEL: Layered, saturated.										
14.6	SILT: WTPL										
16.8	FINE SAND: Saturated.										
19.5	SANDY SILT TILL: Saturated.										
21.9	Borehole terminated at 21.9 m on assumed bedrock.										

BOREHOLE NO. 92-17

PROJECT NAME MILL CREEK AGGREGATE PROPERTY — **PROJECT NO.** 91269.00

CLIENT DUFFERIN AGGREGATES — **DATE** FEBRUARY 10, 1992

BOREHOLE TYPE BECKER HAMMER DRILL (I.D. 102 mm) — **GEOLOGIST** JSK

GROUND ELEVATION NOT SURVEYED 308.8 m a.s.l. — **ENGINEER** AJC/AGH

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE ROD (%)	CONE PENETRATION "N" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 / W_P W_L	REMARKS
0	GRAVELLY MEDIUM TO COARSE SAND: Trace silt, moist from 0.0 m to 4.9 m, saturated from 4.9 m to 7.3 m.										TEXTURAL DESCRIPTIONS FROM FIELD EXAMINATION ONLY – TO BE CONFIRMED BY LABORATORY ANALYSIS
7.3	FINE GRAVEL AND MEDIUM TO COARSE SAND: Saturated.										NO MONITOR INSTALLED
11.0	GRAVELLY MEDIUM TO COARSE SAND: Some silt, saturated.										
12.8	SILTY FINE SAND: Some coarse gravel, saturated.										
16.5	Borehole terminated at 16.5 m on assumed bedrock.										

BOREHOLE NO. 92-18

PROJECT NAME MILL CREEK AGGREGATE PROPERTY — **PROJECT NO.** 91269.00

CLIENT DUFFERIN AGGREGATES — **DATE** FEBRUARY 11, 1992

BOREHOLE TYPE BECKER HAMMER DRILL (I.D. 102 mm) — **GEOLOGIST** JSK

GROUND ELEVATION NOT SURVEYED 308.0 m asl. — **ENGINEER** AJC/AGH

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE ROD (%)	CONE PENETRATION "N" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 / Wp Wl	REMARKS
0											TEXTURAL DESCRIPTIONS FROM FIELD EXAMINATION ONLY – TO BE CONFIRMED BY LABORATORY ANALYSIS
2.4	GRAVELLY FINE TO COARSE SAND: Trace silt, moist.										
5	SILT TILL: Some fine to medium sand, some fine gravel, very dense material, moist.										NO MONITOR INSTALLED
10											
14.3											
15	Borehole terminated at 14.3 m on assumed bedrock.										
20											
25											
30											
35											
40											
45											
50											

BOREHOLE NO. 92-19

PROJECT NAME MILL CREEK AGGREGATE PROPERTY — **PROJECT NO.** 91269.00

CLIENT DUFFERIN AGGREGATES — **DATE** FEBRUARY 11, 1992

BOREHOLE TYPE BECKER HAMMER DRILL (I.D. 102 mm) — **GEOLOGIST** JSK

GROUND ELEVATION NOT SURVEYED 306.2 m a.s.l. — **ENGINEER** AJC/AGH

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE RQD (%)	CONE PENETRATION "N" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 / Wp Wl	REMARKS
0											TEXTURAL DESCRIPTIONS FROM FIELD EXAMINATION ONLY – TO BE CONFIRMED BY LABORATORY ANALYSIS
2.4	SAND AND GRAVEL: Moist.										
5	MEDIUM TO COARSE SAND: Some gravel, saturated.										NO MONITOR INSTALLED
7.3											
10	SILT: WTPL										
9.8											
11.9	SILTY FINE SAND: Saturated.										
12.5	SILT: WTPL										
13.7	SANDY GRAVEL: Saturated.										
15	SILT TILL: Moist.										
16.2											
20	Borehole terminated at 16.2 m on assumed bedrock.										
25											
30											
35											
40											
45											
50											

BOREHOLE NO. 92-20

PROJECT NAME MILL CREEK AGGREGATE PROPERTY — **PROJECT NO.** 91269.00

CLIENT DUFFERIN AGGREGATES — **DATE** FEBRUARY 11, 1992

BOREHOLE TYPE BECKER HAMMER DRILL (I.D. 102 mm) — **GEOLOGIST** JSK

GROUND ELEVATION NOT SURVEYED 307.4m a.s.l. — **ENGINEER** AJC/AGH

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE: TYPE	SAMPLE: 'N' VALUE	SAMPLE: % WATER	SAMPLE: % RECOVERY	SAMPLE: RQD (%)	CONE PENETRATION: "N" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 / Wp Wl	REMARKS
0											TEXTURAL DESCRIPTIONS FROM FIELD EXAMINATION ONLY – TO BE CONFIRMED BY LABORATORY ANALYSIS
2.7	SANDY GRAVEL: Moist, saturated below 2.1 m.										
5	GRAVELLY MEDIUM TO COARSE SAND: Saturated.										NO MONITOR INSTALLED
7.9											
10	SANDY GRAVEL: Some silt below 9.1 m, saturated.										
13.7											
15	Borehole terminated at 13.7 m on assumed bedrock.										
20											
25											
30											
35											
40											
45											
50											

BOREHOLE NO. 92-21

PROJECT NAME MILL CREEK AGGREGATE PROPERTY — **PROJECT NO.** 91269.00

CLIENT DUFFERIN AGGREGATES — **DATE** FEBRUARY 11, 1992

BOREHOLE TYPE BECKER HAMMER DRILL (I.D. 102 mm) — **GEOLOGIST** JSK

GROUND ELEVATION NOT SURVEYED — **ENGINEER** AJC/AGH

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE RQD (%)	CONE PENETRATION "N" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 / Wp Wl	REMARKS
0	SANDY FINE TO MEDIUM GRAVEL: Moist from 0.0 m to 2.4 m, saturated from 2.4 m to 5.5 m.										TEXTURAL DESCRIPTIONS FROM FIELD EXAMINATION ONLY – TO BE CONFIRMED BY LABORATORY ANALYSIS
5											NO MONITOR INSTALLED
5.5	GRAVELLY MEDIUM TO COARSE SAND: Saturated.										
7.9	SILT TILL: Trace cobbles, very dense material, moist.										
10											
15											
17.1	Borehole terminated at 17.1 m on assumed bedrock.										
20											
25											
30											
35											
40											
45											
50											

BOREHOLE NO. 92-22

PROJECT NAME MILL CREEK AGGREGATE PROPERTY — **PROJECT NO.** 91269.00

CLIENT DUFFERIN AGGREGATES — **DATE** FEBRUARY 11, 1992

BOREHOLE TYPE BECKER HAMMER DRILL (I.D. 102 mm) — **GEOLOGIST** JSK

GROUND ELEVATION NOT SURVEYED 305.2m a.s.l. — **ENGINEER** AJC/AGH

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE: TYPE	SAMPLE: 'N' VALUE	SAMPLE: % WATER	SAMPLE: % RECOVERY	SAMPLE: RQD (%)	CONE PENETRATION "N" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 / Wp Wl	REMARKS
0	GRAVELLY MEDIUM TO COARSE SAND: Moist from 0.0 m to 2.1 m, saturated from 2.1 m to 7.3 m.										TEXTURAL DESCRIPTIONS FROM FIELD EXAMINATION ONLY – TO BE CONFIRMED BY LABORATORY ANALYSIS NO MONITOR INSTALLED
7.3	SANDY GRAVEL: Saturated.										
10.4	SILT TILL: Saturated.										
15.2	Borehole terminated at 15.2 m on assumed bedrock.										

BOREHOLE NO. 92-23

PROJECT NAME MILL CREEK PROPERTY — **PROJECT NO.** 91269.00

CLIENT DUFFERIN AGGREGATES — **DATE** FEB. 11, /92

BOREHOLE TYPE BECKER HAMMER DRILL (I.D. 102 mm) — **GEOLOGIST** JSK

GROUND ELEVATION NOT SURVEYED 305.0 m a.s.l. — **ENGINEER** AJC/AGH

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE ROD (%)	CONE PENETRATION "N" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 (Wp — WL)	REMARKS
0											TEXTURAL DESCRIPTIONS FROM FIELD EXAMINATION ONLY – TO BE CONFIRMED BY LABORATORY ANALYSIS
4.9	MEDIUM TO COARSE SAND: Some gravel, moist from 0.0 m to 2.4 m, saturated from 2.4 m to 4.9 m. 1										NO MONITOR INSTALLED
12.2	GRAVELLY FINE TO COARSE SAND: Trace silt, trace cobbles, saturated. 4										
14.6	FINE TO MEDIUM SAND: Some gravel, trace silt, saturated. 6										
17.4	SILT TILL: Moist.										
	Borehole terminated at 17.4 m on assumed bedrock.										

5 10 15 20 25 30 35 40 45 50

BOREHOLE NO. 92-24

PROJECT NAME MILL CREEK AGGREGATE PROPERTY — **PROJECT NO.** 91269.00

CLIENT DUFFERIN AGGREGATES — **DATE** FEBRUARY 11, 1992

BOREHOLE TYPE BECKER HAMMER DRILL (I.D. 102 mm) — **GEOLOGIST** JSK

GROUND ELEVATION NOT SURVEYED 305.9 m a.s.l. — **ENGINEER** AJC/AGH

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE RQD (%)	CONE PENETRATION "N" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 / W_P W_L	REMARKS
0											TEXTURAL DESCRIPTIONS FROM FIELD EXAMINATION ONLY – TO BE CONFIRMED BY LABORATORY ANALYSIS
2.4	GRAVELLY SAND: Moist, becoming saturated at 2.1 m. 1										NO MONITOR INSTALLED
4.9	FINE TO COARSE SAND: Some gravel, saturated. 2										
8.2	GRAVELLY MEDIUM TO COARSE SAND: Saturated. 3										
14.6	SILT TILL: Saturated.										
	Borehole terminated at 14.6 m on assumed bedrock.										

5 10 15 20 25 30 35 40 45 50

BOREHOLE NO. 92-25

PROJECT NAME MILL CREEK AGGREGATE PROPERTY — **PROJECT NO.** 91269.00

CLIENT DUFFERIN AGGREGATES — **DATE** FEBRUARY 11, 1992

BOREHOLE TYPE BECKER HAMMER DRILL (I.D. 102 mm) — **GEOLOGIST** JSK

GROUND ELEVATION NOT SURVEYED 304.6 m a.s.l. — **ENGINEER** AJC/AGH

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE ROD (%)	CONE PENETRATION "N" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 / Wp Wl	REMARKS
0											TEXTURAL DESCRIPTIONS FROM FIELD EXAMINATION ONLY – TO BE CONFIRMED BY LABORATORY ANALYSIS
2.4	SAND AND GRAVEL: Moist from 0.0 m to 0.2 m, saturated from 0.2 to 2.4 m. 1										~~NO MONITOR INSTALLED~~
7.3	GRAVELLY MEDIUM TO COARSE SAND: Saturated. 2										
12.2	SILT: WTPL										
14.3	SILT TILL: Some gravel, moist.										
	Borehole terminated at 14.3 m on assumed bedrock.										

5 10 15 20 25 30 35 40 45 50

BOREHOLE NO. 92-26

PROJECT NAME MILL CREEK AGGREGATE PROPERTY — **PROJECT NO.** 91269.00

CLIENT DUFFERIN AGGREGATES — **DATE** FEBRUARY 12, 1992

BOREHOLE TYPE BECKER HAMMER DRILL (I.D. 102 mm) — **GEOLOGIST** JSK

GROUND ELEVATION NOT SURVEYED 305.4m a.s.l. — **ENGINEER** AJC/AGH

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE ROD (%)	CONE PENETRATION "N" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 (Wp — WL)	REMARKS
0	GRAVELLY FINE TO COARSE SAND: Trace silt, saturated.										TEXTURAL DESCRIPTIONS FROM FIELD EXAMINATION ONLY – TO BE CONFIRMED BY LABORATORY ANALYSIS
9.8	SILT TILL: Some sand, saturated.										
13.4	GRAVELLY SAND: Saturated.										
14.6	SILT TILL: Moist.										
15.2	Borehole terminated at 15.2 m on assumed bedrock.										

JAGGER HIMS LIMITED

BOREHOLE NO. 92-27

PROJECT NAME MILL CREEK AGGREGATE PROPERTY — **PROJECT NO.** 91269.00

CLIENT DUFFERIN AGGREGATES — **DATE** FEBRUARY 12, 1992

BOREHOLE TYPE BECKER HAMMER DRILL (I.D. 102 mm) — **GEOLOGIST** JSK

GROUND ELEVATION NOT SURVEYED 305.1 m a.s.l. — **ENGINEER** AJC/AGH

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE: TYPE	SAMPLE: 'N' VALUE	SAMPLE: % WATER	SAMPLE: % RECOVERY	SAMPLE: ROD (%)	CONE PENETRATION "N" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 / W_P W_L	REMARKS
0											
2.4	GRAVELLY SAND: Moist, saturated below 1.5 m.										TEXTURAL DESCRIPTIONS FROM FIELD EXAMINATION ONLY – TO BE CONFIRMED BY LABORATORY ANALYSIS
4.3	SILTY FINE TO MEDIUM SAND: Trace fine gravel, saturated.										
5.5	SANDY FINE GRAVEL: Saturated.										
9.4	SILTY FINE SAND: Saturated.										
14.9	SILT TILL: Trace cobbles, moist.										
	Borehole terminated at 14.9 m on assumed bedrock.										

BOREHOLE NO. 92-28

PROJECT NAME MILL CREEK AGGREGATE PROPERTY — **PROJECT NO.** 91269.00

CLIENT DUFFERIN AGGREGATES — **DATE** FEBRUARY 12, 1992

BOREHOLE TYPE BECKER HAMMER DRILL (I.D. 102 mm) — **GEOLOGIST** JSK

GROUND ELEVATION NOT SURVEYED 305.8m a.s.l. — **ENGINEER** AJC/AGH

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE ROD (%)	CONE PENETRATION "N" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 / W_P W_L	REMARKS
0											
4.9	GRAVELLY SAND: Some silt, moist from 0.0 m to 1.8 m, saturated from 1.8 m to 4.9 m.										TEXTURAL DESCRIPTIONS FROM FIELD EXAMINATION ONLY – TO BE CONFIRMED BY LABORATORY ANALYSIS
7.9	FINE TO MEDIUM SAND: Trace silt, saturated.										
14.9	SILT TILL: Moist.										
	Borehole terminated at 14.9 m on assumed bedrock.										

Jagger Hims Limited

BOREHOLE NO. 92-29

PROJECT NAME MILL CREEK AGGREGATE PROPERTY — **PROJECT NO.** 91269.00

CLIENT DUFFERIN AGGREGATES — **DATE** FEBRUARY 12, 1992

BOREHOLE TYPE BECKER HAMMER DRILL (I.D. 102 mm) — **GEOLOGIST** JSK

GROUND ELEVATION NOT SURVEYED 306.1 m a.s.l. — **ENGINEER** AJC/AGH

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE RQD (%)	CONE PENETRATION "N" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 / Wp Wl	REMARKS
0											
2.4	GRAVELLY MEDIUM TO COARSE SAND: Trace silt, moist, saturated below 1.8 m. 1										TEXTURAL DESCRIPTIONS FROM FIELD EXAMINATION ONLY – TO BE CONFIRMED BY LABORATORY ANALYSIS
3.7	SANDY FINE TO MEDIUM GRAVEL: Saturated.										
5											
5.5	GRAVELLY MEDIUM TO COARSE SAND: Saturated. 2										
	SILTY SAND: Some gravel, saturated. 4										
10											
10.4	SILT TILL: Some sand, moist.										
15											
14.9	Borehole terminated at 14.9 m on assumed bedrock.										
20											
25											
30											
35											
40											
45											
50											

BOREHOLE NO. 92-30

PROJECT NAME MILL CREEK AGGREGATE PROPERTY — **PROJECT NO.** 91269.00

CLIENT DUFFERIN AGGREGATES — **DATE** FEBRUARY 12, 1992

BOREHOLE TYPE BECKER HAMMER DRILL (I.D. 102 mm) — **GEOLOGIST** JSK

GROUND ELEVATION NOT SURVEYED 306.1m a.s.l. — **ENGINEER** AJC/AGH

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE RQD (%)	CONE PENETRATION "N" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 / W_P W_L	REMARKS
0	GRAVELLY MEDIUM TO COARSE SAND: Trace silt, moist from 0.0 m to 1.8 m, saturated from 1.8 m to 10.4 m.										TEXTURAL DESCRIPTIONS FROM FIELD EXAMINATION ONLY – TO BE CONFIRMED BY LABORATORY ANALYSIS
10.4	SILT TILL: Trace cobbles, saturated.										
13.4	Borehole terminated at 13.4 m on assumed bedrock.										

JAGGER HIMS LIMITED

BOREHOLE NO. 92-31

PROJECT NAME MILL CREEK AGGREGATE PROPERTY — **PROJECT NO.** 91269.00

CLIENT DUFFERIN AGGREGATES — **DATE** FEBRUARY 12, 1992

BOREHOLE TYPE BECKER HAMMER DRILL (I.D. 102 mm) — **GEOLOGIST** JSK

GROUND ELEVATION NOT SURVEYED 305.0 m a.s.l. — **ENGINEER** AJC/AGH

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE RQD (%)	CONE PENETRATION "N" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 (Wp, WL)	REMARKS
0	GRAVELLY SAND: Trace silt, moist from 0.0 m to 1.8 m, saturated from 1.8 m to 7.0 m.										TEXTURAL DESCRIPTIONS FROM FIELD EXAMINATION ONLY – TO BE CONFIRMED BY LABORATORY ANALYSIS
7.0	SILT TILL: Moist.										
13.1	Borehole terminated at 13.1 m on assumed bedrock.										

Jagger Hims Limited

BOREHOLE NO. 92-32

PROJECT NAME MILL CREEK AGGREGATE PROPERTY — **PROJECT NO.** 91269.00

CLIENT DUFFERIN AGGREGATES — **DATE** FEBRUARY 14, 1992

BOREHOLE TYPE BECKER HAMMER DRILL (I.D. 102 mm) — **GEOLOGIST** JSK

GROUND ELEVATION NOT SURVEYED 304.9m a.s.l. — **ENGINEER** AJC/AGH

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE ROD (%)	CONE PENETRATION "N" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 (Wp, WL)	REMARKS
0											
3.0	SAND AND GRAVEL: Trace silt, moist from 0.0 m to 1.8 m, saturated from 1.8 m to 3.0 m. 1										TEXTURAL DESCRIPTIONS FROM FIELD EXAMINATION ONLY – TO BE CONFIRMED BY LABORATORY ANALYSIS
7.0	MEDIUM TO COARSE SAND: Some gravel, trace fine sand, trace silt, saturated. 2										
9.8	SILTY FINE SAND: Trace gravel, saturated.										
16.8	SILT TILL: Trace cobbles, moist.										
	Borehole terminated at 16.8 m on assumed bedrock.										

BOREHOLE NO. 92-33

PROJECT NAME MILL CREEK AGGREGATE PROPERTY — **PROJECT NO.** 91269.00

CLIENT DUFFERIN AGGREGATES — **DATE** FEBRUARY 14, 1992

BOREHOLE TYPE BECKER HAMMER DRILL (I.D. 102 mm) — **GEOLOGIST** JSK

GROUND ELEVATION NOT SURVEYED 305.5 m a.s.l. — **ENGINEER** AJC/AGH

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE: TYPE	SAMPLE: 'N' VALUE	SAMPLE: % WATER	SAMPLE: % RECOVERY	SAMPLE: ROD (%)	CONE PENETRATION: "N" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30: W_P W_L	REMARKS
0	GRAVELLY MEDIUM TO COARSE SAND: Some fine sand, trace silt, moist from 0.0 m to 1.5 m, saturated from 1.5 m to 7.3 m.										TEXTURAL DESCRIPTIONS FROM FIELD EXAMINATION ONLY – TO BE CONFIRMED BY LABORATORY ANALYSIS
7.3	SILT TILL: Trace cobbles, moist.										
14.9	Borehole terminated at 14.9 m on assumed bedrock.										

Jagger Hims Limited

BOREHOLE NO. 92-34

PROJECT NAME MILL CREEK AGGREGATE PROPERTY — **PROJECT NO.** 91269.00

CLIENT DUFFERIN AGGREGATES — **DATE** FEBRUARY 12, 1992

BOREHOLE TYPE BECKER HAMMER DRILL (I.D. 102 mm) — **GEOLOGIST** JSK

GROUND ELEVATION NOT SURVEYED 311.4 m a.s.l. — **ENGINEER** AJC/AGH

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE RQD (%)	CONE PENETRATION "N" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 / Wp Wl	REMARKS
0											TEXTURAL DESCRIPTIONS FROM FIELD EXAMINATION ONLY – TO BE CONFIRMED BY LABORATORY ANALYSIS
4.9	SAND AND GRAVEL: Some cobbles, trace silt, moist. 1										NO MONITOR INSTALLED
13.4	SANDY GRAVEL: Trace silt, moist from 4.9 m to 6.1 m, saturated from 6.1 m to 13.4 m. 4 5										
18.3	GRAVELLY MEDIUM TO COARSE SAND: Trace silt, saturated.										
22.9	SILT TILL: Moist.										
	Borehole terminated at 22.9 m on assumed bedrock.										

Jagger Hims Limited

BOREHOLE NO. 92-35

PROJECT NAME MILL CREEK AGGREGATE PROPERTY — **PROJECT NO.** 91269.00

CLIENT DUFFERIN AGGREGATES — **DATE** FEBRUARY 13, 1992

BOREHOLE TYPE BECKER HAMMER DRILL (I.D. 102 mm) — **GEOLOGIST** JSK

GROUND ELEVATION NOT SURVEYED 312.3m a.s.l. — **ENGINEER** AJC/AGH

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE RQD (%)	CONE PENETRATION "N" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 / Wp Wl	REMARKS
0											TEXTURAL DESCRIPTIONS FROM FIELD EXAMINATION ONLY – TO BE CONFIRMED BY LABORATORY ANALYSIS
2.4	SANDY GRAVEL: Trace silt, moist.										
4.9	GRAVELLY SAND: Some silt, moist.										NO MONITOR INSTALLED
12.2	SAND AND GRAVEL: Some silt, some cobbles, moist from 4.9 m to 7.3 m, saturated from 7.3 m to 12.2 m.										
20.7	GRAVELLY SAND: Some silt, saturated.										
22.3	SILT TILL: Saturated.										
	Borehole terminated at 22.3 m on assumed bedrock.										

JAGGER HIMS LIMITED

BOREHOLE NO. 92-36

PROJECT NAME MILL CREEK AGGREGATE PROPERTY — **PROJECT NO.** 91269.00

CLIENT DUFFERIN AGGREGATES — **DATE** FEBRUARY 13, 1992

BOREHOLE TYPE BECKER HAMMER DRILL (I.D. 102 mm) — **GEOLOGIST** JSK

GROUND ELEVATION NOT SURVEYED 313.2m a.s.l. — **ENGINEER** AJC/AGH

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE RQD (%)	CONE PENETRATION "N" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 (Wp — WL)	REMARKS
0	GRAVELLY SAND: Some silt, moist. 2										TEXTURAL DESCRIPTIONS FROM FIELD EXAMINATION ONLY – TO BE CONFIRMED BY LABORATORY ANALYSIS
5											NO MONITOR INSTALLED
6.7											
7.9	MEDIUM SAND: Moist.										
10	SAND AND GRAVEL: Interbedded, trace silt, saturated. 4, 5										– Rust staining
15											
19.5											
20	FINE TO MEDIUM SAND: Trace coarse sand, trace gravel, trace silt, saturated.										
24.4											
25	SILT TILL: Moist.										
26.8											
30	Borehole terminated at 26.8 m on assumed bedrock.										
35											
40											
45											
50											

BOREHOLE NO. DP19

PROJECT NAME: Mill Creek Aggregates Property, Twp of Puslinch **PROJECT NO.:** 88020.01

CLIENT: Dufferin Aggregates **DATE:** May 12, 1993

BOREHOLE TYPE: 32 mm Dia. Drive Point in Hand Auger Hole **GEOLOGIST:** FB/DG

GROUND ELEVATION: 306.6 mASL Top Of Creek Bed **REVIEWER:** AH

ELEVATION (mASL)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE RQD (%)	CONE PENETRATION "N" VALUE / SHEAR STRENGTH	WATER CONTENT % Wp WL	REMARKS
1.0	SAND AND GRAVEL: GREY, MEDIUM TO COARSE SAND AND GRAVEL; SOME SILT AND FINE SAND, GRAVEL BECOMING FINER WITH DEPTH, TRACE OF SHELL FRAGMENTS AT TOP, SATURATED.		I								DRIVE POINT 32 mm DIA. INTAKE, #80 GAUGE SIZE, FROM 1.85 m TO 2.33 m BELOW TOP OF CREEK BED. (GALVANIZED PIPE AND SCREEN)
305.3	HAND AUGER HOLE TERMINATED AT 1.27 m DUE TO AUGER REFUSAL.										
2.0											
3.0											

Jacobs Hill Limited

BOREHOLE NO. DP20

PROJECT NAME: Mill Creek Aggregates Property, Twp of Puslinch
PROJECT NO.: 88020.01
CLIENT: Dufferin Aggregates
DATE: May 12, 1993
BOREHOLE TYPE: 32 mm Dia. Drive Point in Hand Auger Hole
GEOLOGIST: FB/DG
GROUND ELEVATION: 306.3 mASL Top Of Creek Bed
REVIEWER: AH

ELEVATION (mASL)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE RQD (%)	CONE PENETRATION "N" VALUE / SHEAR STRENGTH	WATER CONTENT % (W_P – W_L)	REMARKS
305.9	SAND AND GRAVEL: GREY, FINE TO MEDIUM SAND AND GRAVEL, SOME SILT AND FINE SAND, SATURATED										DRIVE POINT 32 mm DIA. INTAKE, #80 GAUGE SIZE, FROM 1.93 m TO 2.41 m BELOW TOP OF CREEK BED. (GALVANIZED PIPE AND SCREEN)
1.0											
	HAND AUGER HOLE TERMINATED AT 0.92 m DUE TO AUGER REFUSAL.										
2.0											
3.0											

JACOBS HIBB LIMITED

BOREHOLE NO. DP21

PROJECT NAME: Mill Creek Aggregates Property, Twp of Puslinch
PROJECT NO.: 88020.01
CLIENT: Dufferin Aggregates
DATE: May 13, 1993
BOREHOLE TYPE: 32 mm Dia. Drive Point in Hand Auger Hole
GEOLOGIST: FB/DG
GROUND ELEVATION: 305.4 mASL Top Of Creek Bed
REVIEWER: AH

ELEVATION (mASL)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE RQD (%)	CONE PENETRATION "N" VALUE / SHEAR STRENGTH	WATER CONTENT % Wp WL	REMARKS
304.6	SAND AND GRAVEL: GREY, FINE TO MEDIUM SAND AND FINE TO MEDIUM GRAVEL, SOME COURSE SAND, TRACE TO SOME SILT, TRACE OF SHELL FRAGMENTS AT TOP, SATURATED		I								DRIVE POINT 32 mm DIA. INTAKE, #80 GAUGE SIZE, FROM 1.83 m TO 2.31 m BELOW TOP OF CREEK BED. (GALVANIZED PIPE AND SCREEN)
1.0	HAND AUGER HOLE TERMINATED AT 0.78 m DUE TO AUGER REFUSAL.										
2.0											
3.0											

BOREHOLE NO. DP22

PROJECT NAME: Mill Creek Aggregates Property, Twp of Puslinch
PROJECT NO.: 88020.01
CLIENT: Dufferin Aggregates
DATE: May 13, 1993
BOREHOLE TYPE: 32 mm Dia. Drive Point in Hand Auger Hole
GEOLOGIST: FB/DG
GROUND ELEVATION: 304.9 mASL Top Of Creek Bed
REVIEWER: AH

ELEVATION (mASL)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE ROD (%)	CONE PENETRATION "N" VALUE / SHEAR STRENGTH	WATER CONTENT % (W_P – W_L)	REMARKS
1.0	SAND AND GRAVEL: GREY, SAND AND GRAVEL, SOME SILT, TRACE OF CLAY, BECOMING FINE TO MEDIUM SAND AT VERY BOTTOM , SATURATED										DRIVE POINT 32 mm DIA. INTAKE, #80 GAUGE SIZE, FROM 1.98 m TO 2.46 m BELOW TOP OF CREEK BED. (GALVANIZED PIPE AND SCREEN)
303.8	HAND AUGER HOLE TERMINATED AT 1.10 m DUE TO AUGER REFUSAL.										
2.0											
3.0											

APPENDIX D

Monitoring Location Details

TABLE D-1
GROUNDWATER MONITOR DETAILS
MILL CREEK AGGREGATES PIT

BOREHOLE NO.	MONITOR NO.	MONITOR TYPE	MONITOR DIAMETER (mm)	MONITOR ELEVATION (T.O.P.) (mASL)	SCREENED INTERVAL ELEVATION (mASL)	FILTER PACK ELEVATION (mASL)	SEAL ELEVATION (mASL)	BACKFILL ELEVATION (mASL)
1		S	51	309.86	303.4 - 304.9		307.9 - 308.8	303.4 - 307.9
1-R		S	51	311.25	304.13 - 307.18	303.82 - 307.48	307.48 - 310.83	310.83 - 311.44
2A		S	51	313.41	297.08 - 300.82		309.61 - 312.66	296.76 - 309.61
2-R		S	51	315.19	304.46 - 307.51	304.26 - 307.92	307.92 - 313.71	313.71 - 314.32
3A		S	51	315.62	296.38 - 300.12		311.66 - 314.82	296.06 - 311.66
4		S	51	308.85	304.2 - 305.8		307.3 - 308.2	304.2 - 307.3
5		S	51	309.19	303.5 - 305.0		307.0 - 307.9	303.5 - 307.0
6		S	51	308.34	303.5 - 305.1		306.2 - 307.1	303.5 - 306.2
7	I	P	51	308.46	292.4 - 294.0		294.4 - 295.2	292.4 - 294.4
							306.5 - 307.4	295.2 - 306.5
7	II	S	51	308.4	303.0 - 304.5		306.5 - 307.4	303.0 - 306.5
11		S	51	310.09	300.28 - 306.38		308.58 - 309.28	300.18 - 308.58
12		S	51	311.61	301.23 - 307.43		310.43 - 311.13	300.43 - 310.43
13		S	51	307.59	299.26 - 305.77		306.17 - 306.87	306.17 - 299.26
14		S	51	308.14	302.84 - 304.36		304.67 - 307.41	
CBM1		S	51	312.85				
CBM2		S	51	310.83				
CBM3		S	51	312.17				
TW16-78		P	152	304.0	271.3 - 282.1 [1]		Cased from 282.1 - 303.6	
TW16-79		P	146	304.2	295.1 - 296.5 [2]		Cased from 296.5 - 303.7	
OW1-84		S	51	304.8	294.9 - 295.8		303.5 - 303.8	294.9 - 303.5
OW2-84		S	51	304.8	295.4 - 295.9		303.6 - 303.9	295.4 - 303.6
OW4-84		S	51	304.6	294.6 - 295.7		303.4 - 303.7	294.6 - 303.4
OW5-84		S	51	304.41	294.8 - 295.6		303.3 - 303.6	294.8 - 303.3
OW16A-78		S	38	304.5	295.5 - 296.7		302.6 - 303.5	295.5 - 302.6
92-1		S	51	313.0	303.0 - 306.0			303.0 - 312.2
92-1R		S	51	314.62	303.48 - 306.53	303.03 - 307.29	307.29 - 313.08	313.08 - 313.69
92-5		S	51	308.20	300.0 - 303.0			300.0 - 308.0
92-8		S	51	309.65	300.3 - 303.3			300.3 - 308.1
92-12		S	51	308.41	303.05 - 304.57			303.05 - 307.26
92-13		S [3]	76	310.0	297.8 - 309.5			297.8 - 309.5
92-14		S [3]	76	309.8	297.6 - 308.8			297.6 - 308.8
92-15		S [3]	76	309.1	289.7 - 308.4			289.7 - 308.4
92-15a		S	51	309.27	296.90 - 297.66			296.90 - 308.55
92-26		S [3]	76	306.3	295.9 - 305.4			295.9 - 305.4
92-27		S [3]	76	305.9	292.9 - 305.1			292.9 - 305.1
92-28		S [3]	76	306.6	299.3 - 305.8			299.3 - 305.8
92-29		S [3]	76	306.9	297.1 - 306.1			297.1 - 306.1
92-32		S [3]	76	305.4	290.1 - 304.9			290.1 - 304.9
92-33		S [3]	76	306.2	291.0 - 305.5			291.0 - 305.5

NOTES:
- P - Piezometer
- S - Standpipe
- mASL - Metres above sea level
- T.O.P. - Top of pipe
- (1) - Open hole
- (2) - Well Screen in an open hole
- (3) - Equipped with multi-level transducers
- * - Bedrock well; well completion details not available

TABLE D-2
MULTI-LEVEL MONITOR DETAILS
MILL CREEK AGGREGATES PIT

BOREHOLE NO.	MONITOR NO.	GROUND ELEVATION (mASL)	MONITOR ELEVATION (T.O.P.) (mASL)	PROBE DESIGNATION	PROBE ELEVATION (mASL)
92-13	I	309.5	310.0	Deep	299.3
	II			Intermediate	301.8
	III			Shallow	304.5
92-15	I	308.4	309.1	Deep	290.0
92-15 a	II		309.3	Intermediate	297.7
92-15	III		309.1	Shallow	305.4
92-26	I	305.48	306.36	Deep	296.30
	II		306.36	Intermediate	299.46
	III		306.30	Shallow	302.39
92-27	I	305.1	305.9	Deep	295.9
	II			Intermediate	299.2
	III			Shallow	302.7
92-28	I	305.83	306.73	Deep	301.81
	II		306.72	Intermediate	302.70
	III		306.60	Shallow	303.45
92-29	I	306.05	306.97	Deep	297.53
	II		306.97	Intermediate	300.61
	III		306.90	Shallow	303.10
92-32	I	304.93	305.58	Deep	290.90
	II		305.58	Intermediate	296.02
	III		305.40	Shallow	301.42
92-33	I	305.5	306.2	Deep	294.4
	II			Intermediate	298.5
	III			Shallow	303.5 / 298.5
	III			Shallow (A)	303.3

NOTES:
- Each probe is a combination water level pressure transducer and temperature thermistor.
- mASL - Metres above sea level
- T.O.P. - Top of pipe

TABLE D-3
DRIVE POINT MONITOR DETAILS
MILL CREEK AGGREGATES PIT

MONITOR	DRIVE POINT DIAMETER (mm)	GROUND ELEVATION (m ASL)	TOP OF PIPE ELEVATION (m ASL)	SCREENED INTERVAL ELEVATION (m ASL)	MID-POINT OF SCREEN BELOW GRADE (m)
DP1	32	303.55 [1]	304.86	301.86 - 302.46	1.39
DP2A	32	303.15 [1]	304.52	301.05 - 301.55	1.85
DP3	32	304.46 [1]	305.68	302.49 - 303.39	1.52
DP4	32	305.23 [1]	306.81	303.80 - 304.40	1.13
DP4R	32	305.29 [1]	306.46	304.53 - 304.83	0.61
DP5A	32	302.56 [1]	303.59	301.60 - 302.00	0.76
DP5B	32	302.43 [1]	303.50	301.51 - 301.91	0.72
DP5C	32	302.67 [1]	304.11	301.81 - 302.42	0.57
DP5CR	32	302.66 [1]	303.71	301.77 - 302.07	0.76
DP6	32	306.2	306.82	304.5 - 305.1	1.4
DP7	32	306.3	307.63	303.7 - 304.3	2.1
DP8	32	306.1	307.2	301.9 - 302.5	3.9
DP9	32	305.9	306.8	304.6 - 305.2	1.0
DP10	32	306.0	307.4	303.7 - 304.3	1.9
DP11	32	305.6	306.8	304.5 - 305.6	0.6
DP12	32	305.6	306.7	303.8 - 305.2	1.1
DP16	32	304.1	305.0	302.4 - 303.3	1.3
DP17	32	305.04 [1]	306.26	303.69 - 304.59	0.90
DP17R	32	305.07 [1]	306.38	304.45 - 304.80	0.45
DP18	32	307.07 [1]	307.74	306.04 - 306.64	0.73
DP19	32	306.33 [1]	307.53	303.93 - 304.43	2.15
DP20	32	306.02 [1]	307.14	303.64 - 304.04	2.18
DP21	32	305.47 [1]	306.77	303.98 - 304.48	1.24
DP22	32	304.89 [1]	306.01	302.41 - 302.91	2.23

NOTES:
- mASL - Metres above sea level
- (1) - Elevation of creek bed
- DP5B replaced DP5A when resident denied access to creek
- DP5C replaced DP5B when DP5B was removed by unauthorized personnel
- DP5D added to monitoring program
- DP5C and DP5D were removed by unauthorized personnel
- DP5CR added to monitoring program to replace DP5C
- DP17R replaced DP17 due to corrosion
- DP4R replaced DP4 due to corrosion

TABLE D-4
SURFACE WATER MONITOR DETAILS
MILL CREEK AGGREGATES PIT

MONITOR	TOP OF MONITOR ELEVATION (mASL)	MONITOR TYPE
SW1	306.65	1 metre staffing gauge
SW2	303.71	Drive Point
RT	307.44	2 metre staffing gauge in recharge trench
P1	306.85	1 metre staffing gauge in Phase 1 pond
P2	306.26	1 metre staffing gauge in Phase 2 pond
P3	305.23	1 metre staffing gauge in Phase 3 pond
P4	306.61	1 metre staffing gauge in Phase 4 pond

NOTE:
- SW1 resurveyed on May 16, 2013
- SW2 is measured from the top of DP5CR
- P1, P2, P3 and P4 surveyed on April 1, 2022

TABLE D-5
REID HERITAGE DRIVE POINT MONITOR DETAILS
MILL CREEK AGGREGATES PIT

MONITOR	TOP OF MONITOR ELEVATION (mASL)	GRADE ELEVATION (mASL)	MONITOR LENGTH (m)	BOTTOM OF MONITOR ELEVATION (mASL)	MONITOR TYPE
DP113	307.87	307.08	4.08	303.84	near creek drive point

APPENDIX E

Monitoring Results

FIGURE E-1
GROUNDWATER HYDROGRAPH (MANUAL) - BOREHOLE BH4
MILL CREEK AGGREGATES PIT

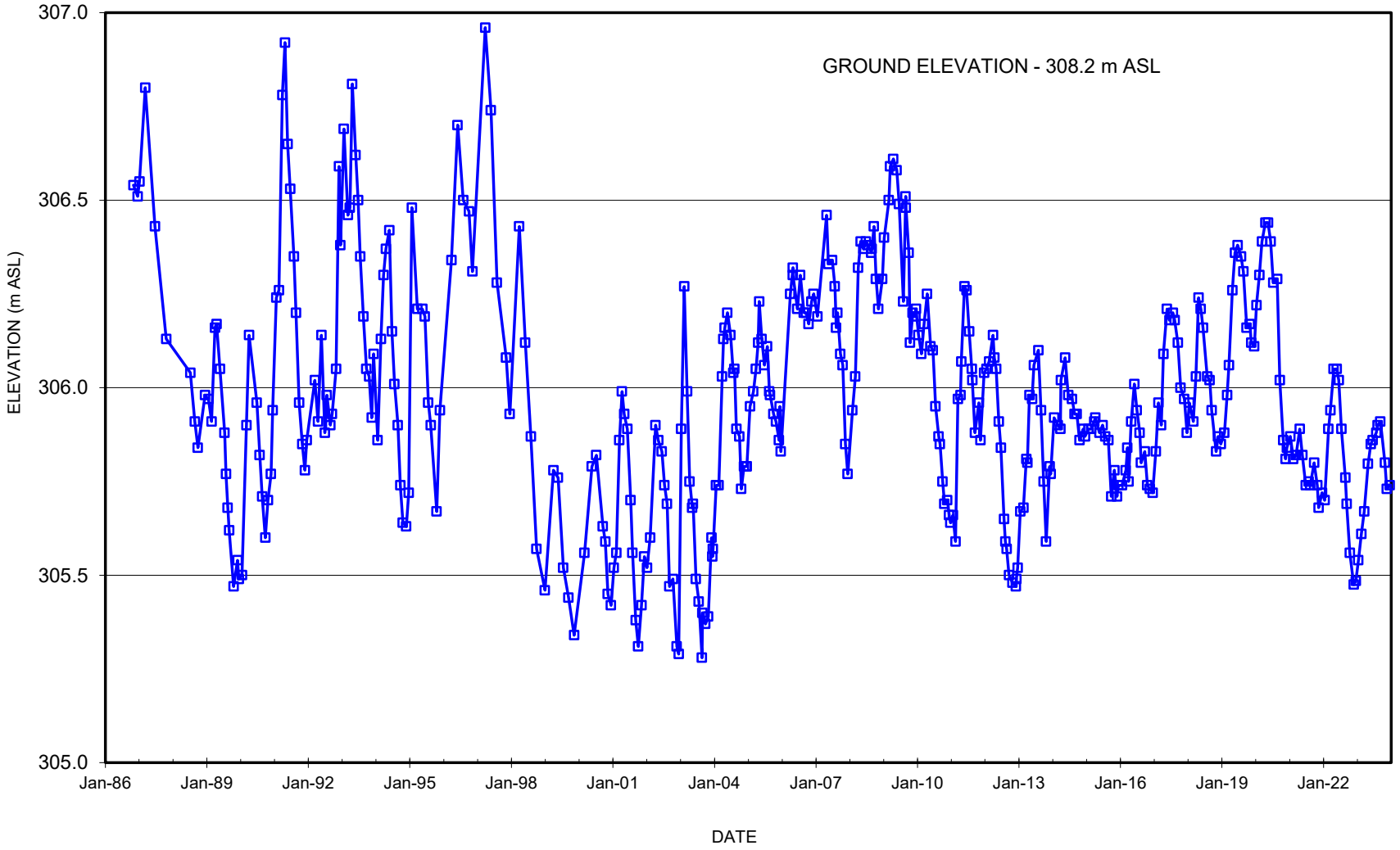


FIGURE E-2
GROUNDWATER HYDROGRAPH (LOGGER) - MONITOR BH4
MILL CREEK AGGREGATES PIT

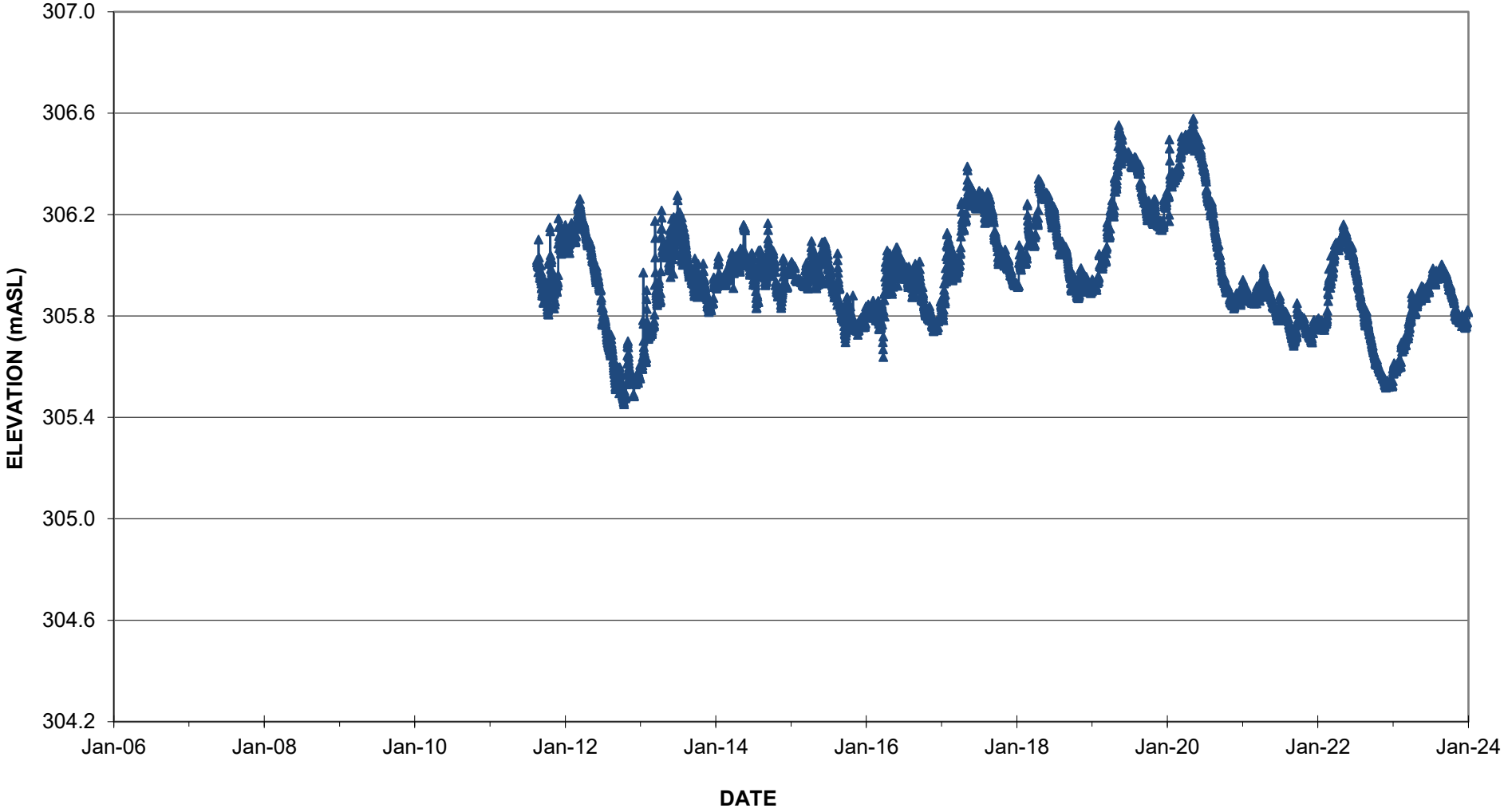


FIGURE E-3
GROUNDWATER THERMOGRAPH - MONITOR BH4
MILL CREEK AGGREGATES PIT

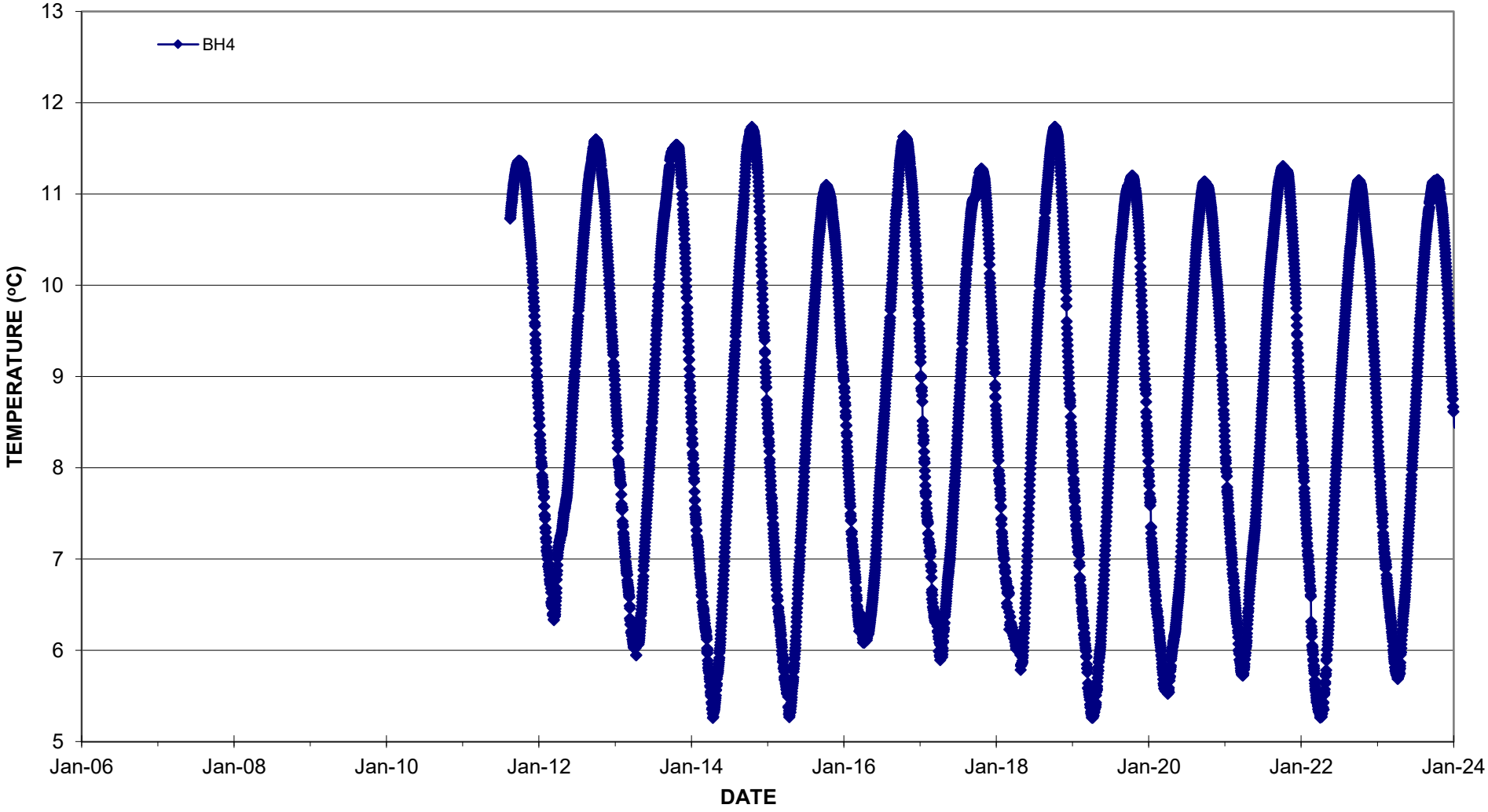


FIGURE E-4
GROUNDWATER HYDROGRAPH - BH11
MILL CREEK AGGREGATES PIT

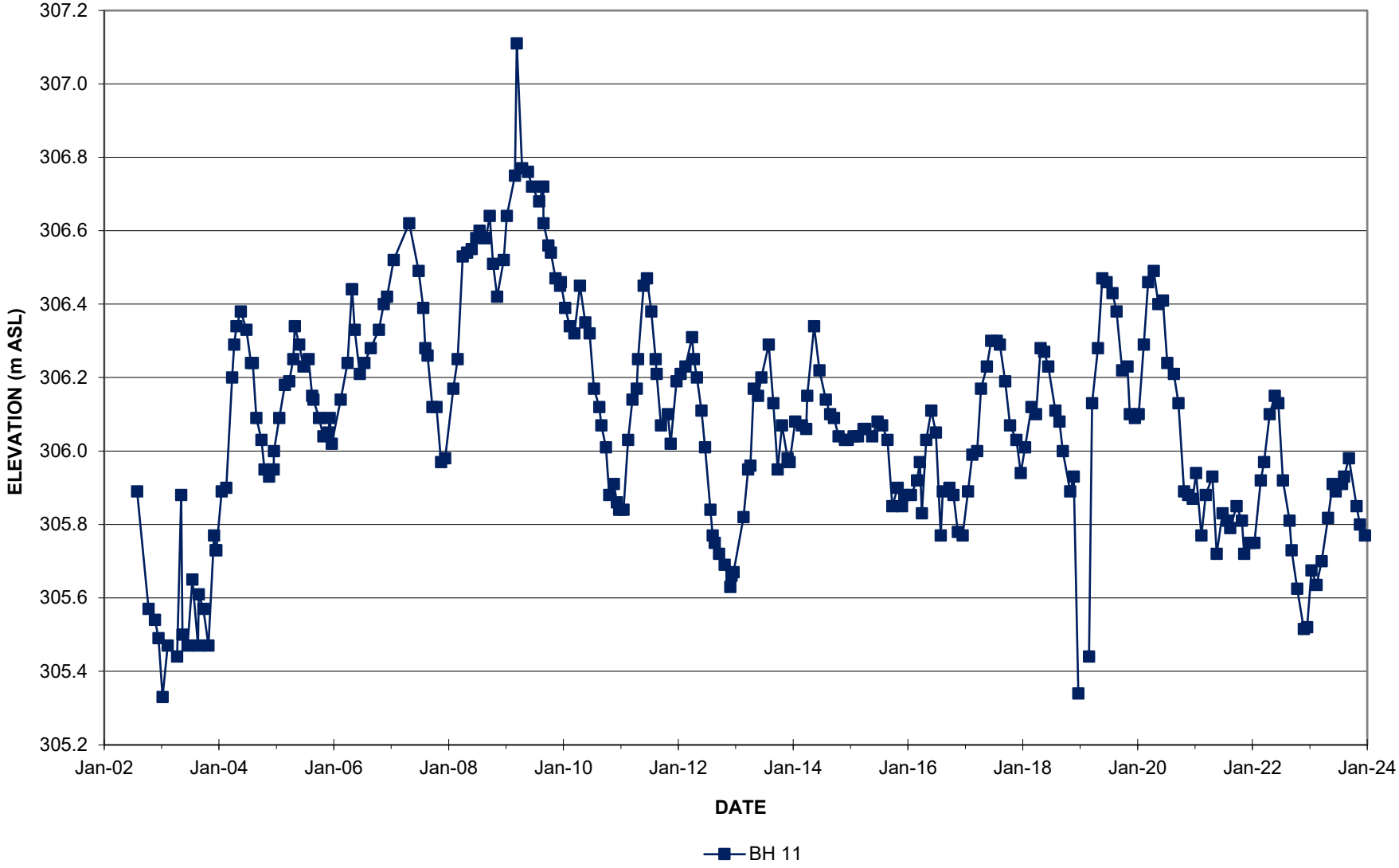


FIGURE E-5
GROUNDWATER HYDROGRAPH - BOREHOLE 92-1/92-1R
MILL CREEK AGGREGATES PIT

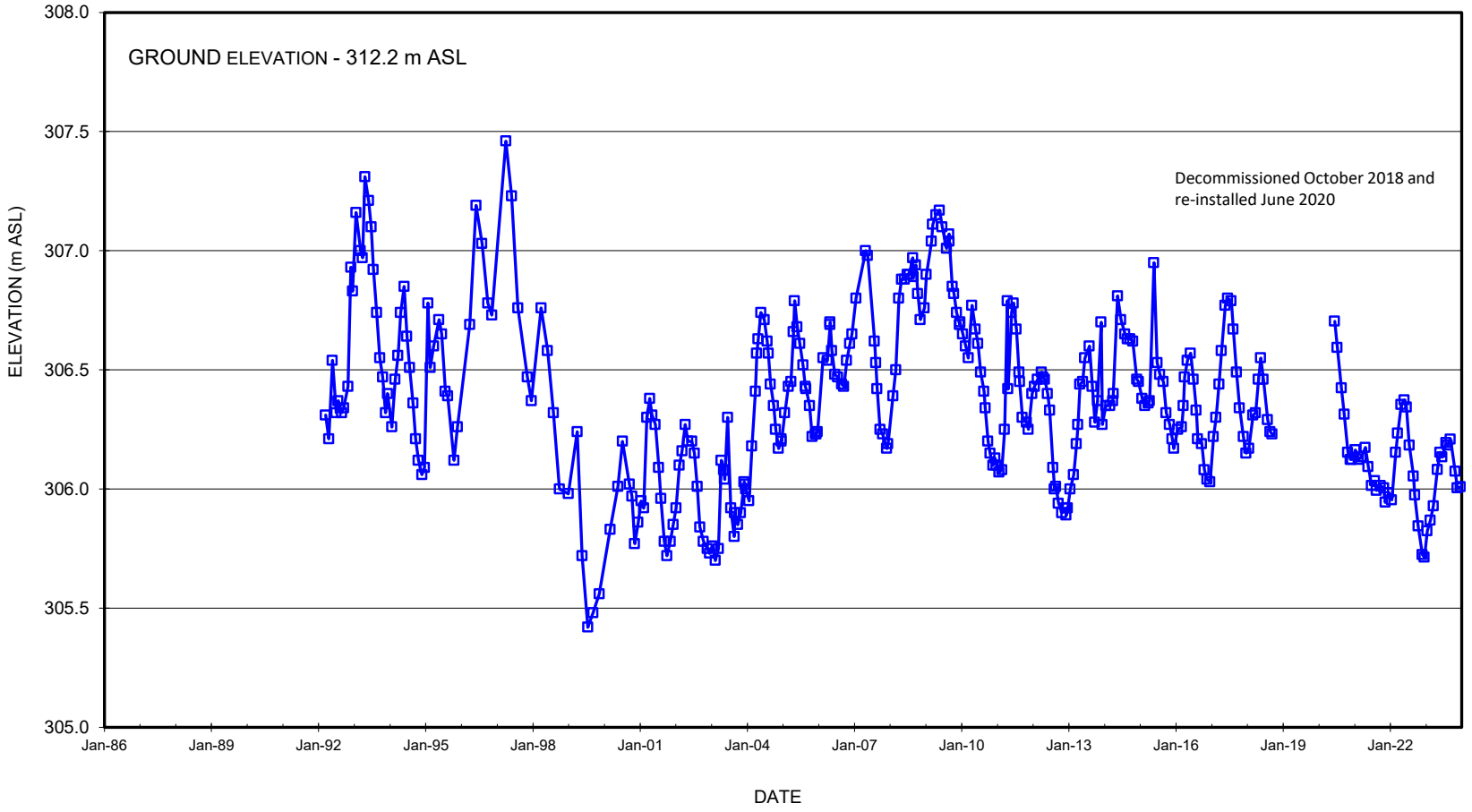


FIGURE E-6
GROUNDWATER HYDROGRAPH (MANUAL) - BOREHOLE 92-13
MILL CREEK AGGREGATES PIT

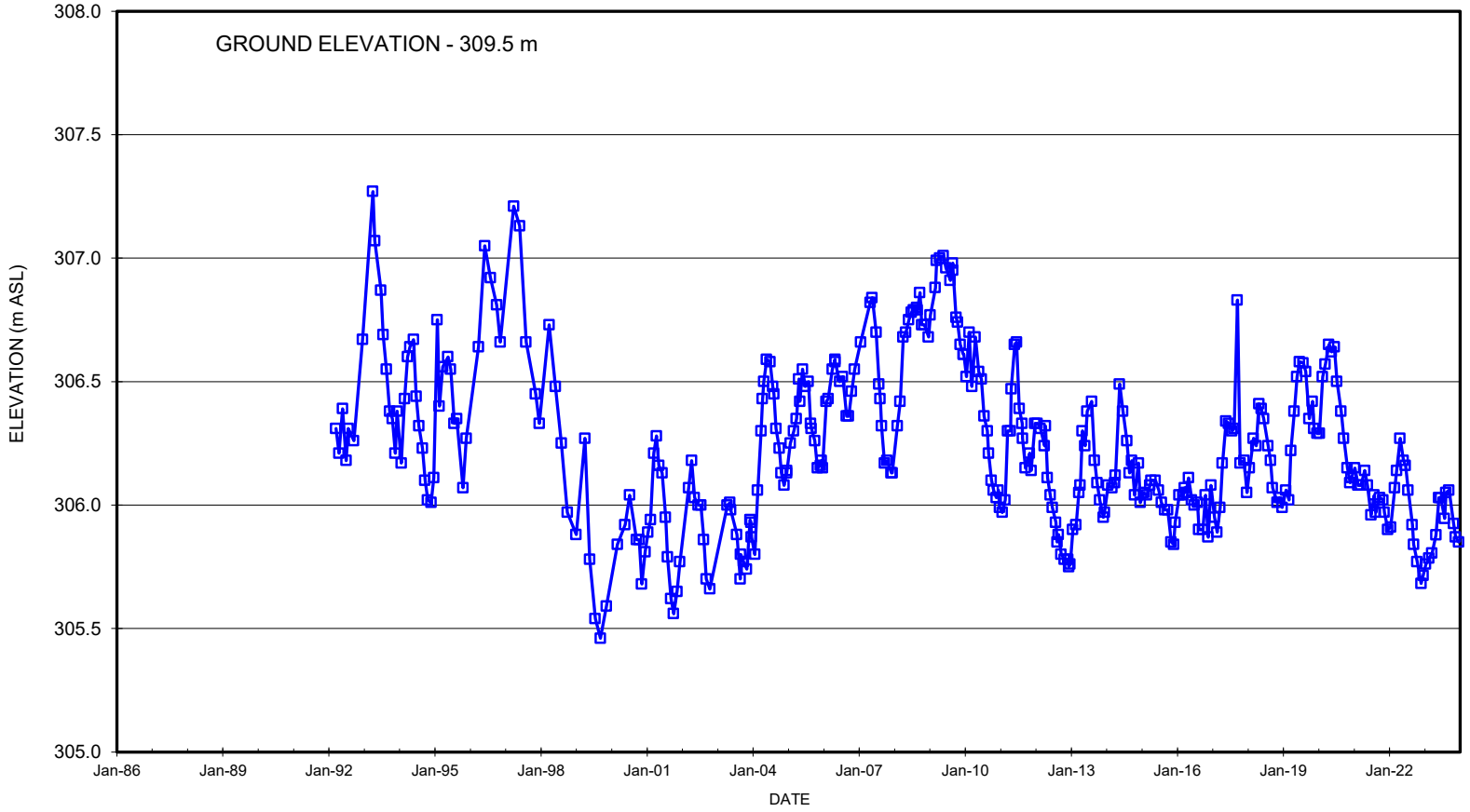


FIGURE E-7
GROUNDWATER HYDROGRAPH (LOGGER) - MULTI-LEVEL MONITOR 92-13
MILL CREEK AGGREGATES PITS

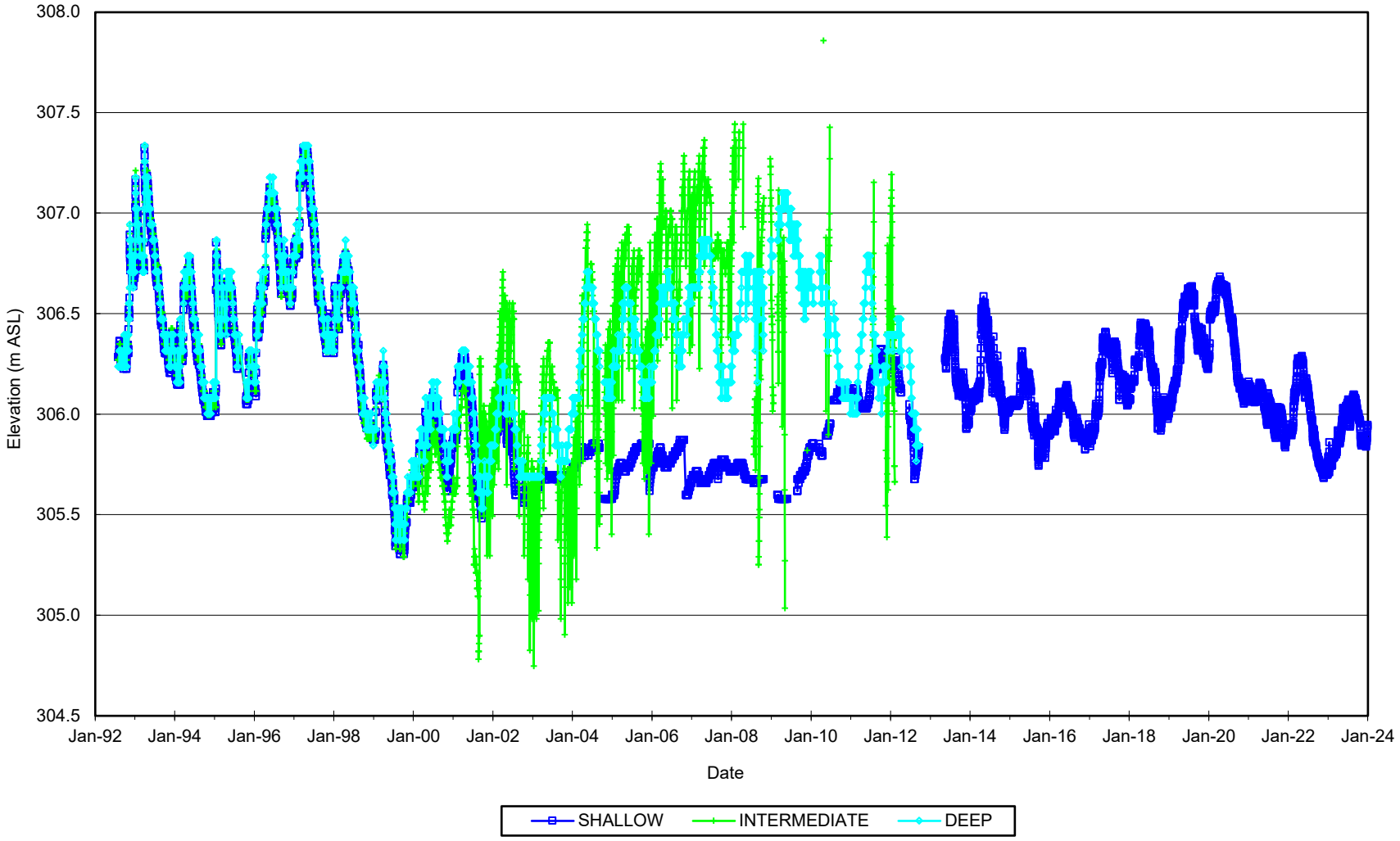


FIGURE E-8
GROUNDWATER THERMOGRAPH - MULTI-LEVEL MONITOR 92-13
MILL CREEK AGGREGATES PIT

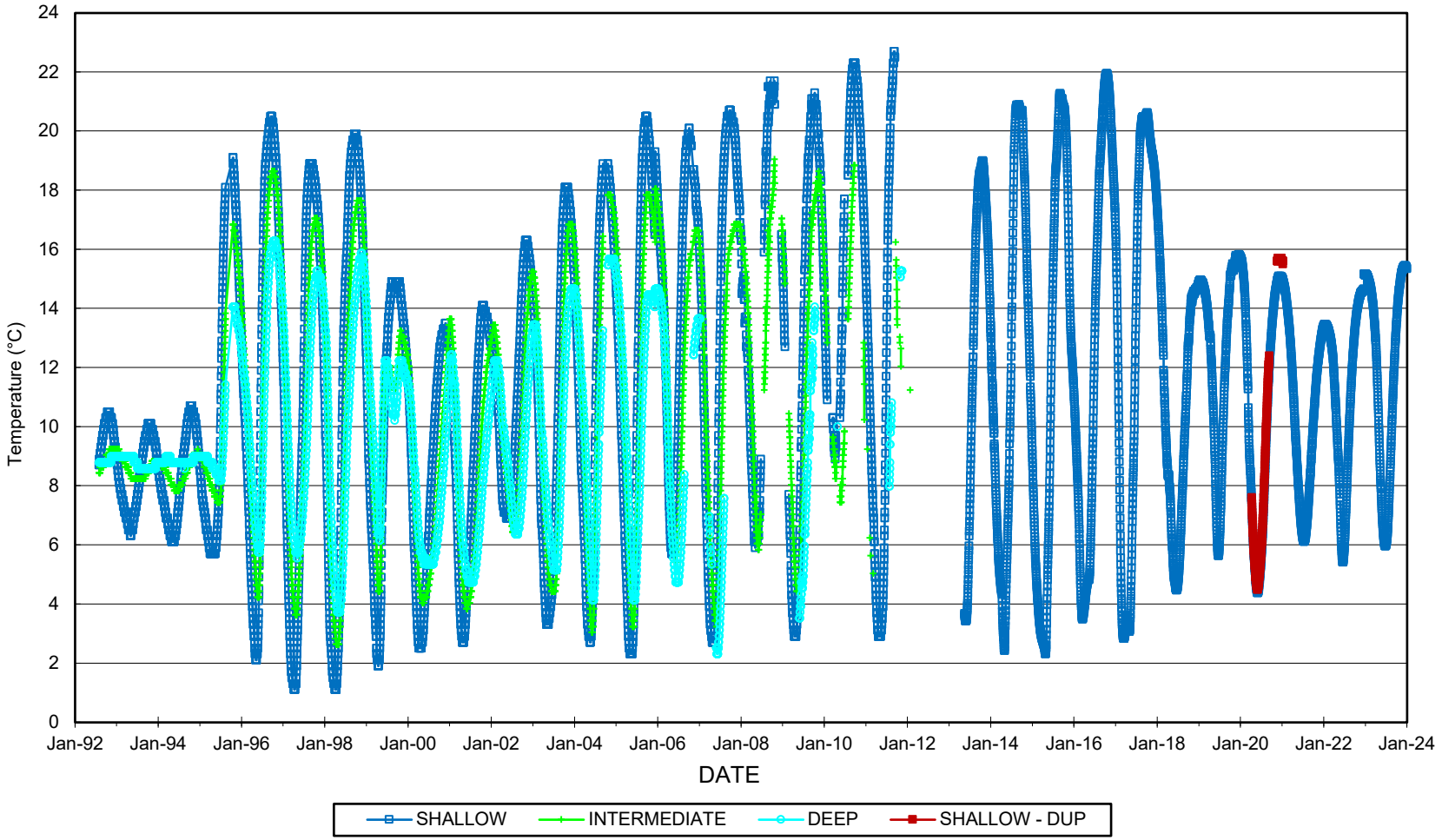


FIGURE E-9
GROUNDWATER HYDROGRAPH - NORTH FARMHOUSE WELL (MOE WELL 4794)
MILL CREEK AGGREGATES PIT

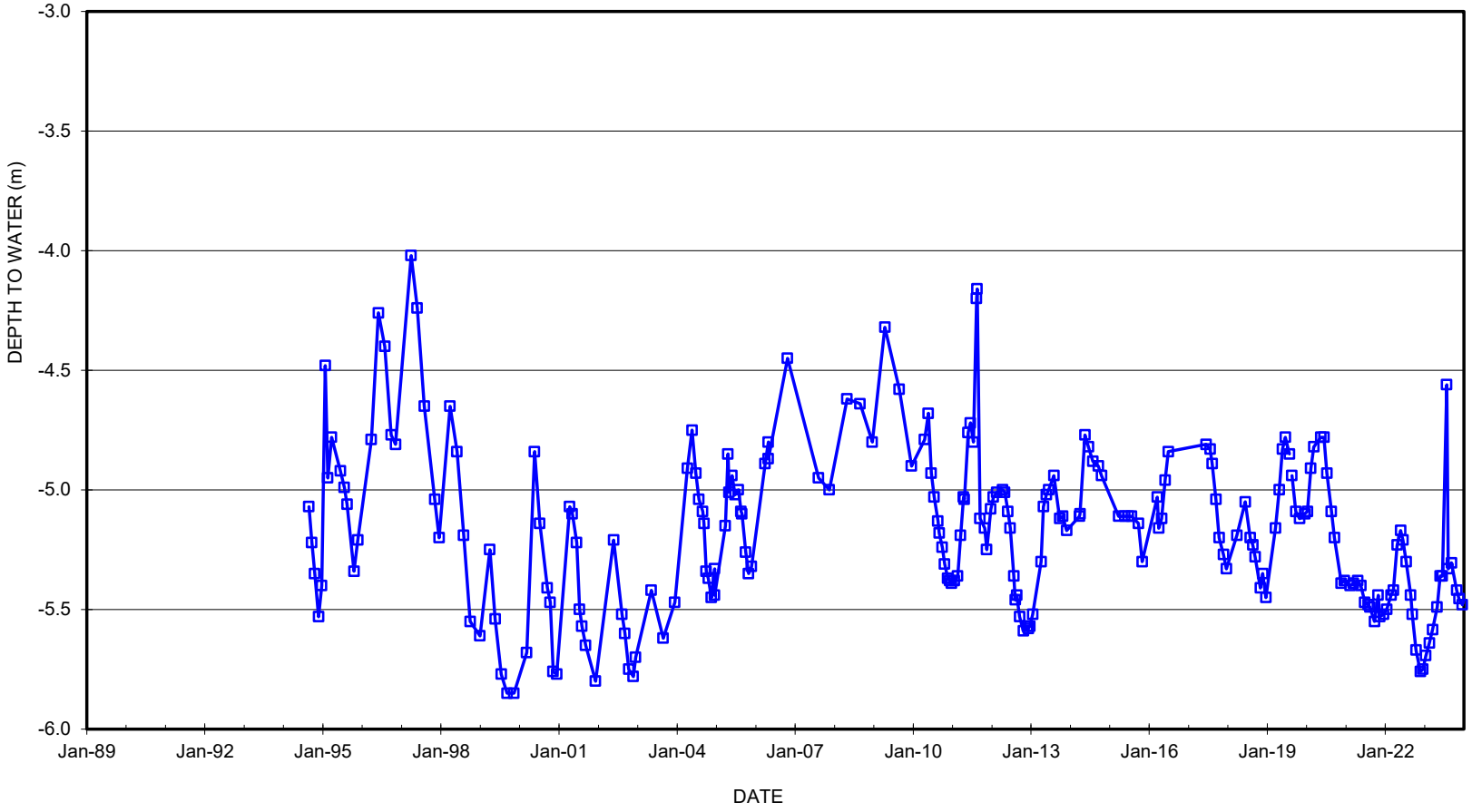


FIGURE E-10
POND HYDROGRAPH
MILL CREEK AGGREGATES PIT

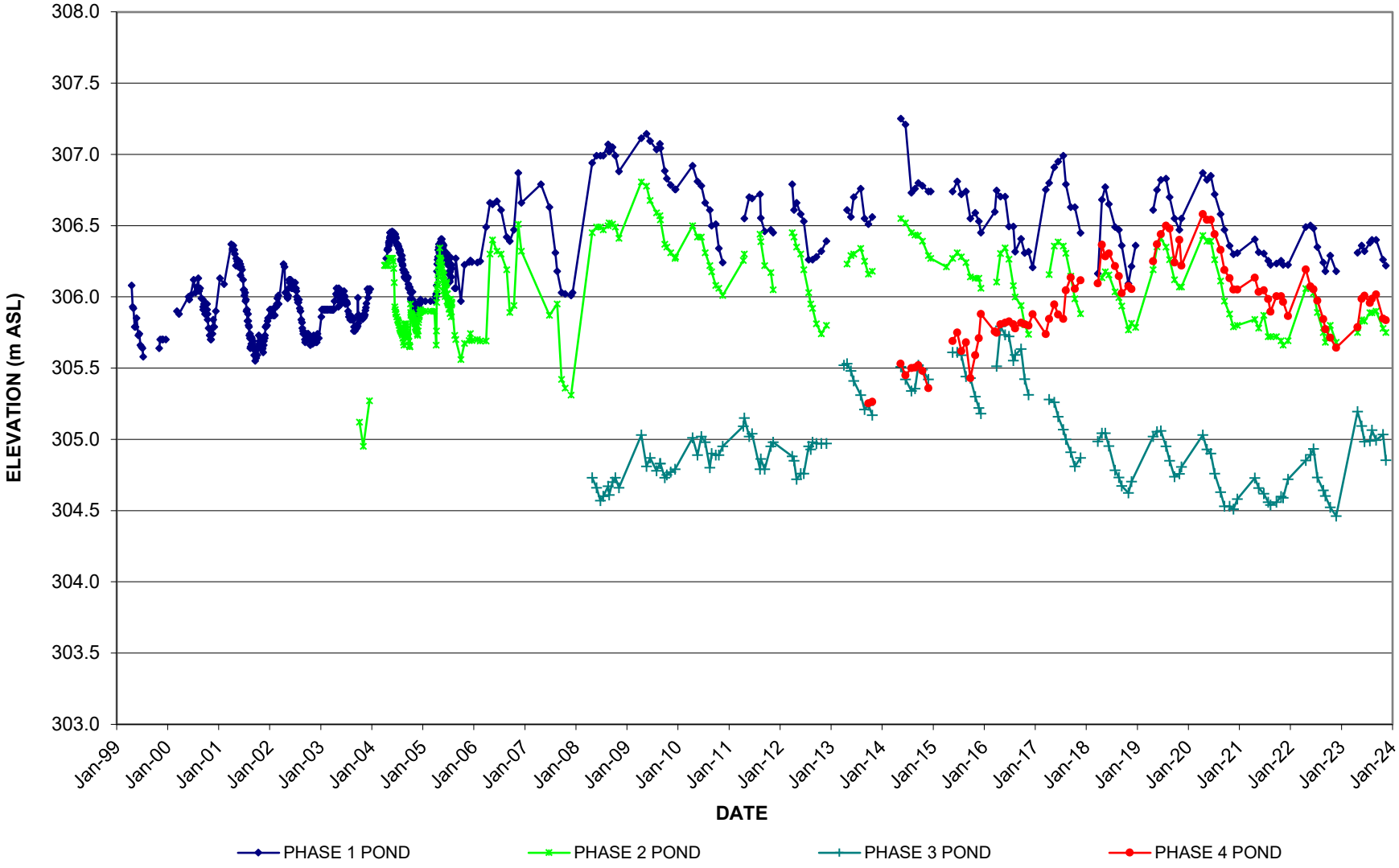
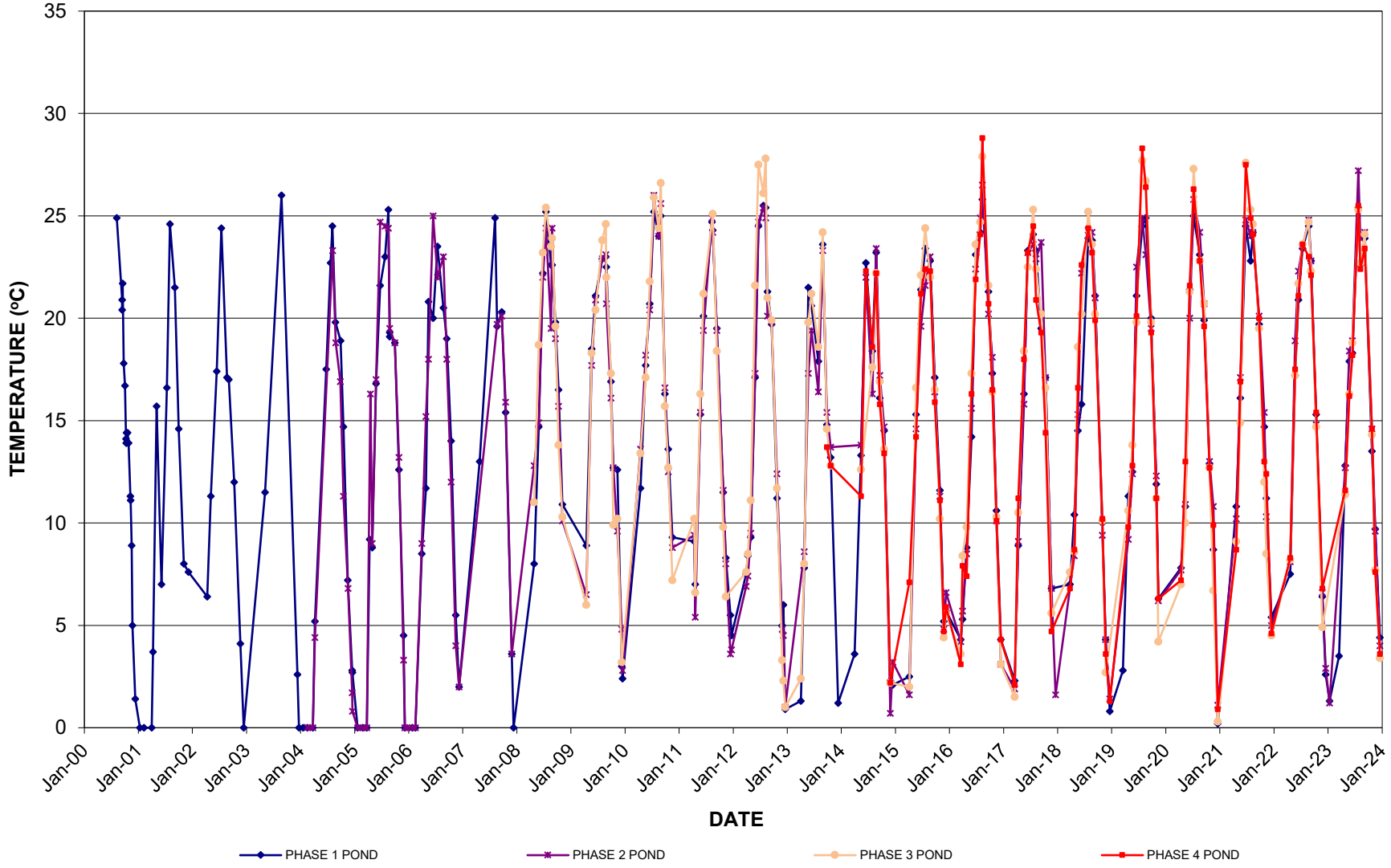


FIGURE E-11
POND THERMOGRAPH
MILL CREEK AGGREGATES PIT



APPENDIX F

Water Well Records and Water Well Survey

TABLE F-1
MECP WATER WELL RECORD DATABASE SEARCH SUMMARY
MILL CREEK AGGREGATES PIT

MOE Well No.	Note	Overburden/ Bedrock	Month/ Year Completed	Easting/ Northing	Well Depth (m)	Static Water Level (m)	Final Status	Water Use	Screen Depth (m)	Casing Material	Casing Diameter (inch)	Soil Description/Depth (feet)
CRH Canada / Dufferin Aggregates / University of Guelph (Mill Creek Aggregates Pit)												
6702325	Old Farm Well On-Site	Bedrock	Jan-64	17 567471 4810184 W	22.9	6.1		House and Barn		Steel	6	STNS GRVL 0040 MSND CLAY 0059 LMSN 0075
6704794	"North Well"	Bedrock	Aug-73	17 567419 4810108 W	30.5	1.5	Water Supply	Domestic	Open Hole 17.4 - 30.5	Steel	5	LOAM 0001 BRWN CLAY SAND STNS 0015 BRWN CLAY SAND STNS 0030 BRWN CLAY SAND GRVL 0056 BRWN ROCK 0075 BRWN ROCK 0100
6706806	"TW16A-78"	Bedrock	Sep-78	17 566074 4809763 W	32.3	Flowing	Test Hole	Municipal	Open Hole 21.6 - 32.3	Steel	6	LOAM 0001 BRWN CLAY SAND STNS 0030 BRWN CLAY SAND GRVL 0055 GREY CLAY SAND STNS 0060 GREY CLAY SAND GRVL 0068 BRWN STNS MGRD 0106
6707090	"TW16-79"	Overburden	Sep-79	17 566094 4809763 W	14.6	0	Test Hole	Municipal	7.0 - 8.5	Steel	6	BRWN CLAY SAND STNS 0015 BRWN CLAY GRVL 0025 BRWN SAND GRVL WBRG 0030 BRWN CLAY FSND 0048
6714950 (Z12600) A012549		Overburden	May-04	17 567796 4809424 W	21.5		Test Hole/ Monitoring	Not Used	12.0 - 15.9	PVC	2	BRWN STNS MSND 0015 GRVL MSND 0025 CSND FSND 0039 MSND FSND 0052 FSND 0071 LMSN
7243796 (Z212036) A174331	"BH14"	Overburden	Jun-15	17 566790 4810736 W	4.6		Monitoring	Monitoring	3.0 - 4.6	PVC	2	BRWN SAND SILT 0007 GREY SAND GRVL 0015
7361017 (Z332030) A292750	"BH2-R"	Overburden	Jun-20	17 567816 4809648 W	10.0		Test Hole/ Monitoring	Observation/ Monitoring	3.3 - 10.0	PVC	2	BRWN SAND GRVL STNS 0025
7361018 (Z332031) A292749	"BH92-1R"	Overburden	Jun-20	17 567656 4810155 W	10.4		Test Hole/ Monitoring	Observation/ Monitoring	7.3 - 10.4	PVC	2	BRWN SAND GRVL STNS 0034
7361019 (Z332032) A292747	"BH1-R"	Overburden	Jun-20	17 567452 4810821 W	7.5		Monitoring	Monitoring	4.4 - 7.5	PVC	2	BRWN SAND SILT GRVL 0015 BRWN CSND GRVL STNS 0025
CBM Aggregates												
7185155 (Z131683) A093901		Overburden	Jul-12	17 566260 4809553 W	10.7		Test Hole	Test Hole	6.1 - 10.7	PVC	2	BRWN GRVL SAND HARD 0027 BRWN SAND GRVL HARD 0035
7185613 (Z153630) A	Decommissioned 150 mm steel cased well		Jul-12	17 567118 4809472 W	27.1							
7243143 (Z167977) A	4" Potable Water Well Decomission		May-15	17 568097 4809917 W				Not Used				
7243144 (Z199098) A	Monitoring Well Decommission		Apr-15	17 568091 4809898 W				Domestic			3	
7290538 (Z244200) A073365		Bedrock	Jun-17	17 568345 4809275 W	15.8		Test Hole/ Monitoring	Observation/ Monitoring	12.8 - 15.8	PVC	2	BRWN LOAM SAND GRVL 0001 BRWN SAND GRVL SILT 0038 BRWN SAND GRVL ---- 0076 BRWN SILT SAND GRVL 0082 BRWN ROCK FCRD 0092
7290539 (Z244195) A038576		Bedrock	Jun-17	17 567964 4809212 W	17.7		Test Hole/ Monitoring	Observation/ Monitoring	11.9 - 16.5	PVC	2	BRWN LOAM SAND GRVL 0001 BRWN GRVL SAND ---- 0020 BRWN SAND GRVL ---- 0034 BRWN SAND GRVL WBRG 0079 GREY ROCK FCRD 0083
7306369 (Z244178) A224751		Overburden	Jan-18	17 566032 4809696 W	14.9		Observation/ Monitoring	Monitoring	9.0 - 12.0	PVC	2	BRWN SAND GRVL WBRG 0003 BRWN SAND GRVL 0012 BRWN SAND GRVL WBRG 0015

TABLE F-1
MECP WATER WELL RECORD DATABASE SEARCH SUMMARY
MILL CREEK AGGREGATES PIT

MOE Well No.	Note	Overburden/ Bedrock	Month/ Year Completed	Easting/ Northing	Well Depth (m)	Static Water Level (m)	Final Status	Water Use	Screen Depth (m)	Casing Material	Casing Diameter (inch)	Soil Description/Depth (feet)
Slovenski Park												
6702327		Bedrock	May-65	17 567655 4811176 W	27.7	0.6		Park & Camp Site	Open Hole 15.8 - 27.7		5	GRVL STNS 0020 FSND CLAY 0052 BRWN LMSN 0091
7274503 (Z236911) A216812		Overburden	Sep-16	17 567656 4811182 W	6.0		Observation/ Monitoring	Monitoring	3.0 - 6.0	PVC	38	BRWN SAND GRVL DNSE 0006
7274504 (Z236913) A216813		Overburden	Sep-16	17 567523 4811202 W	4.1		Observation/ Monitoring	Monitoring	1.0 - 4.1	PVC	1.5	BRWN SAND GRVL 0013
7274505 (Z236912) A216814		Overburden	Sep-16	17 567582 4811287 W	4.2		Observation/ Monitoring	Monitoring	1.2 - 4.2	PVC	1.5	BRWN SAND GRVL 0014
7307662 (Z269500) A	49' deep well, added 6' x 5" extension with cap		Oct-17	17 567530 4811219 W								
7307663 (Z269499)	70' deep well, added 4' x 6" extension with cap		Oct-17	17 567529 4811280 W								
Reid Heritage Homes Pit												
6711402 (144449)		Overburden	May-94	17 566930 4811218 W	10.4		Observation	Not Used	4.6 - 7.6	PVC	2	GREY SAND GRVL LOOS 0027 GREY SAND LOOS 0032 BRWN CLAY LOOS 0034
6711403 (144448)		Overburden	May-94	17 566954 4811184 W	12.5	0.6	Observation	Not Used	4.0 - 7.0	PVC	2	GREY SAND GRVL LOOS 0020 GREY SAND LOOS 0030 BRWN CLAY LOOS 0041
6711407 (144450)		Overburden	May-94	17 566853 4811317 W	8.2		Observation	Not Used	1.5 - 4.6	PVC	2	BRWN SAND GRVL DNSE 0007 GREY GRVL SAND LOOS 0015 GREY SAND GRVL LOOS 0025 BRWN TILL LOOS 0027
7140736 (M06475) A	Abandonment Record of 18 monitoring wells		Jan-10	17 566747 4811812 W								
Incorrectly Plotted (>500 m from Site)												
6713350 (210259)	Plots along south edge of Site	Bedrock	May-00	17 567776 4809071 L	55.8	8.8	Water Supply	Domestic	Open Hole 27.4 - 55.8	Steel	6	LOAM 0002 BRWN CLAY STNS 0015 BRWN CLAY SAND GRVL 0040 BRWN GRVL SAND 0070 BRWN CLAY SAND GRVL 0090 BRWN LMSN 0183
6714627 (260754)		Bedrock	Sep-03	17 565552 4810676 L	18.3	3.0	Water Supply	Domestic	Open Hole 14.3 - 18.3	Steel	6	BRWN CLAY GRVL 0025 GREY CLAY GRVL 0045 BRWN ROCK FCRD 0060
MTO /Fuels Transport												
7334020 (6XSTEWLO) A267195		Overburden	Apr-19	17 566672 4810868 W	3.0		Monitoring	Monitoring	1.5 - 3.0	PVC	2	BRWN SILT SILT LOOS 0010
7334022 (6ZUAR6MS) A267194		Overburden	Apr-19	17 566680 4810873 W	3.4		Monitoring	Monitoring	1.8 - 3.4	PVC	2	BRWN SILT SAND LOOS 0011
7334080 (IE2NHQQF) A267192		Overburden	Apr-19	17 566674 4810871 W	3.7		Monitoring	Monitoring	2.1 - 3.7	PVC	2	BRWN SILT LOOS 0012

TABLE F-1
MECP WATER WELL RECORD DATABASE SEARCH SUMMARY
MILL CREEK AGGREGATES PIT

MOE Well No.	Note	Overburden/ Bedrock	Month/ Year Completed	Easting/ Northing	Well Depth (m)	Static Water Level (m)	Final Status	Water Use	Screen Depth (m)	Casing Material	Casing Diameter (inch)	Soil Description/Depth (feet)
MTO /Fuels Transport (Continued)												
7334085 (JBW7UODC) A267197		Overburden	Apr-19	17 566668 4810868 W	3.4		Monitoring	Monitoring	1.8 - 3.4	PVC	2	BRWN SILT SAND LOOS 0011
7334136 (LHVQ2QTK) A267193		Overburden	Apr-19	17 566660 4810865 W	3.4		Monitoring	Monitoring	1.8 - 3.4	PVC	2	BRWN SILT SAND LOOS 0011
7334149 (OWUCQQ65) A267196		Overburden	Apr-19	17 566671 4810868 W	3.7		Monitoring	Monitoring	2.1 - 3.7	PVC	2	BRWN SILT SAND LOOS 0012
7378759 (ANLFR2ZM) A212848		Overburden	May-20	17 566662 4810840 W	3.0		Monitoring	Monitoring	2.1 - 3.0	PVC	2	
7378760 (HP3I8IQT) A291995		Overburden	May-20	17 566682 4810848 W	3.0		Monitoring	Monitoring	2.1 - 3.7	PVC	2	
7378761 (C853W66C) A291994		Overburden	May-20	17 566694 4810844 W	3.7		Monitoring	Monitoring	2.1 - 3.7	PVC	2	BRWN SILT LOOS 0012
Private Wells (Overburden)												
6702326		Overburden	May-62	17 568032 4810227 W	14.6	7.9		Domestic		Steel	6	GRVL STNS 0025 MSND GRVL 0045 GRVL 0048
6704693		Overburden	Jun-73	17 568214 4809488 W	25.9	10.7	Water Supply	Domestic		Steel	6	GREY STNS GRVL 0030 GREY GRVL CLAY 0078 BRWN GRVL SAND 0083 GREY GRVL 0085
6708455		Overburden	Sep-85	17 565681 4809761 W	8.2	1.8	Water Supply	Domestic		Steel	6	BLCK LOAM 0002 BRWN SAND STNS LOOS 0025 BRWN CGVL LOOS 0027
Private Wells (Bedrock)												
6702287		Bedrock	Jan-64	17 567141 4809885 W	22.9	11.0		Barn	Open Hole 16.5 - 22.9		6	PRDG 0012 MSND GRVL CLAY 0054 LMSN 0075
6702323		Bedrock	Feb-63	17 565694 4810854 W	35.1	2.4		Domestic / Livestock	Open Hole 22.9 - 35.1	Steel	5	LOAM 0001 GRVL 0050 BRWN CLAY FSND 0070 HPAN STNS 0075 BRWN LMSN 0112 BLCK LMSN 0115
6702324	Plots along QEW	Bedrock	Mar-58	17 566989 4811039 W	25.9	3.7		Farm			4	PRDG 0017 CLAY MSND 0056 SILT MSND 0058 BRWN LMSN 0070 GREY LMSN 0080 BRWN LMSN 0085
6703158	Plots onsite (middle of pond)	Bedrock	Nov-68	17 567214 4810823 W	31.7	1.5		Test			10	LOAM 0001 GRVL 0014 MSND GRVL 0017 GRVL 0025 GRVL MSND 0037 MSND GRVL 0046 CLAY MSND 0058 BRWN LMSN 0070 BLCK LMSN 0095 BRWN LMSN 0104
6703309		Bedrock	Jan-69	17 568134 4809933 W	39.6	9.1		Domestic	Open Hole 25.1 - 39.6		4	LOAM 0001 BRWN CLAY STNS 0045 GRVL 0060 BRWN CLAY GRVL 0078 BRWN LMSN 0130
6703535		Bedrock	Aug-69	17 567884 4810143 W	52.4	13.7	Water Supply	Domestic & Stock	Open Hole 22.3 - 52.4	Steel	4	GRVL MSND 0069 BRWN LMSN 0098 BLCK ROCK 0130 GREY LMSN 0172
6704719		Bedrock	Jul-73	17 568191 4809783 W	40.2	8.5	Water Supply	Domestic	Open Hole 26.5 - 40.2	Steel	4	GRVL BLDR 0073 BRWN LMSN 0107 BRWN ROCK 0130 BLCK ROCK 0132
6705329		Bedrock	Oct-74	17 566084 4809257 W	40.2	14.0	Water Supply	Domestic	Open Hole 29.6 - 40.2	Steel	5	BRWN CLAY STNS 0025 BRWN CLAY GRVL 0035 BRWN HPAN GRVL 0045 BRWN CLAY SAND GRVL 0095 BRWN ROCK 0132
6705330		Bedrock	Oct-74	17 568095 4809837 W	31.1	9.8	Water Supply	Domestic	Open Hole 28.0 - 31.1	Steel	5	LOAM 0001 BRWN CLAY STNS 0020 BRWN CLAY GRVL 0055 BRWN SAND GRVL 0080 BRWN CLAY GRVL 0090 BRWN ROCK 0102

TABLE F-1
MECP WATER WELL RECORD DATABASE SEARCH SUMMARY
MILL CREEK AGGREGATES PIT

MOE Well No.	Note	Overburden/ Bedrock	Month/ Year Completed	Easting/ Northing	Well Depth (m)	Static Water Level (m)	Final Status	Water Use	Screen Depth (m)	Casing Material	Casing Diameter (inch)	Soil Description/Depth (feet)
Private Wells (Bedrock Continued)												
6707457		Bedrock	May-81	17 567794 4809923 W	26.5	7.0	Water Supply	Domestic	Open Hole 22.9 - 26.5	Steel	5	LOAM 0001 BRWN CLAY STNS 0020 BRWN CLAY SAND GRVL 0055 HPAN GRVL 0065 BRWN CLAY SAND GRVL 0073 BRWN STNS 0087
6707481		Bedrock	Jul-81	17 568007 4809145 W	16.8	11.9	Water Supply	Domestic	Open Hole 6.1 - 16.8	Steel	6	BRWN SAND GRVL LOOS 0019 GREY LMSN HARD 0055
6708511 (NA)		Bedrock	Jun-86	17 566614 4809841 W	13.4		Water Supply	Commercial	10.7 - 11.6	Steel	6	BRWN GRVL STNS HARD 0004 GREY SAND GRVL SOFT 0038 GREY SAND SOFT 0041 GREY SAND GRVL SOFT 0042 BRWN LMSN HARD 0044
6709654 (54557)		Bedrock	Feb-89	17 565776 4810979 W	25.3	6.1	Water Supply	Domestic	Open Hole 15.8 - 25.3	Steel	6	BRWN CLAY STNS 0010 GREY CLAY SAND GRVL 0051 BRWN ROCK 0083
6713019 (204394)		Bedrock	Jul-99	17 567376 4808974 L	27.4	10.7	Water Supply	Domestic	Open Hole 22.9 - 27.4	Steel	6	BRWN CLAY SNDY 0015 BRWN CLAY SNDY GRVL 0030 BRWN GRVL SAND 0075 GREY LMSN 0090
6713113 (210273)		Bedrock	Sep-99	17 568182 4809170 L	31.1	9.4	Water Supply	Domestic	Open Hole 28.3 - 31.1	Steel	6	LOAM 0001 BRWN CLAY STNS 0015 BRWN CLAY SAND GRVL 0050 BRWN SAND CLAY 0080 BRWN CLAY SAND GRVL 0087 BRWN LMSN ROCK 0093 BRWN LMSN 0102
6714163 (247284)		Bedrock	Jun-02	17 568432 4809206 W	36.9	20.4	Water Supply	Domestic		Steel	6	BRWN CLAY STNS BLDR 0060 GREY SILT GRVL 0080 GREY CLAY SILT 0120 WHIT LMSN 0121
7248072 (Z211067) A184420		Bedrock	Aug-15	17 565799 4810900 W	50.0	11.4	Water Supply	Domestic	Open Hole 18.3 - 50.0	Steel	6.25	BLCK LOAM 0002 BRWN SAND 0010 BRWN CLAY 0018 BRWN GRVL SAND 0025 BRWN CLAY BLDR 0060 GREY LMSN 0164
7294233 (Z266388) A213730		Bedrock	Aug-17	17 566485 4809754 W	25.3	10.0	Water Supply	Public Supply	Open Hole 19.5 - 25.3	Steel	6	GREY SAND GRVL 0052 BRWN GRVL CLAY 0060 LMSN 0083

TABLE F-2
DOOR TO DOOR WATER WELL SURVEY RESULTS
MILL CREEK AGGREGATES PIT

Municipal Address	2023 Water Well Survey Notes
7053 Township Road 2	Property has one (1) drilled well that was installed in 2018 by Hanlon Well Drilling (Tag #A213730). Well is installed with 6" diameter steel casing, extending above grade. Water is sulfurous, hard and high in iron; treatment includes iron filter and softener. Well is used for domestic uses (4 persons) and lawn/garden watering. No issues with well. Static WL measured at 2.71 m below top of casing. Well No. 7294233 (A213730) plots on property (bedrock well).
4247 Sideroad 20	Property has one (1) drilled well that was installed in 2005 by Hanlon Well Drilling (no tag). Well is installed with 6" diameter steel casing, extending above grade. Approx. 80 feet deep. Well is used for domestic uses (4 persons) and lawn/garden watering. No issues with well. Static WL measured at 2.20 m below top of casing. Well No. 6715410 (bedrock) plots on property and was drilled in 2005.
4395 Sideroad 20 N	Survey left; no response received. Well No. 7248072 plots on property.
4397 Sideroad 20 N	Resident declined to participate. No well records plot on property.
4400 Sideroad 20N	Survey left; no response received. Well No. 6702323 plots on property.
4453 Sideroad 20 N	Property has one (1) drilled water well with a casing that is below ground. Water quality is described as hard and is used for domestic uses (2 persons) and lawn/garden. In 2012, issues were encountered and the main line from well to the house was replaced, and a new fileter and UV system were installed. Currently experiencing issues with contamination and a new UV and filter are required. Well No. 6709654 (bedrock) plots on property. Buildings located > 500 m from Site.
6990 Township Road 2	Survey left; no response received. Well No. 6709322 plots on property.
7002 Township Road 2	Survey left; no response received. No well records plot on property.
6998 Township Road 2	Resident declined to participate. Well No. 6708455 plots on property.
6947 Township Road 2	Survey left; no response received. Buildings located > 500 m from Site.
7061 Wellington Road 34	Survey left; no response received. No well records plot on property. Buildings located > 500 m from Site.
7139 Township Road 2	Survey left; no response received. Well No. 6703535 (bedrock) plots on property.
7145 Township Road 2	CBM owned property with one (1) water supply well located in a well pit. Well is 6" steel pipe within a cobble stone wall pit. Water is sulfurous and hard and is boiled before drinking. Water is used to supply domestic uses for 2 persons. Experienced an issue with contamination approximately 4 years ago (during dry period). Well is already monitored as part of the Mill Creek Aggregates Pit monitoring program ("Smith Well"). No well records plot on property.

APPENDIX G

Groundwater Chemistry

TABLE G-1
WATER CHEMISTRY - FIELD MEASUREMENTS
MILL CREEK AGGREGATES PIT

LOCATION	DATE	TEMPERATURE (°C)	pH (as units)	CONDUCTIVITY (µS/cm)
BH1-I	December, 1992	9.0	7.4	800
	April, 1993	6.0	7.4	590
	December, 1993	9.6	7.7	455
	April, 1994	3.6	7.7	522
	December, 1994	12.0	7.3	NA
	May, 1995	9.3	7.8	570
	November, 1995	11.0	7.8	600
	November, 1996	11.5	7.4	610
	November, 1997	12.0	7.2	NA
	November, 1998	17.6	8.0	625
	November, 1999	12.9	7.9	600
	November, 2000	10.6	7.7	610
	March, 2001	5.1	7.9	NA
	November, 2001	12.5	7.5	618
	April, 2002	12.0	7.2	660
	November, 2002	13.0	7.2	590
	April, 2003	10.7	7.6	643
	November, 2003	11.1	7.2	716
	March, 2004	8.0	7.3	699
	November, 2004	13.6	7.8	655
	March, 2005	5.9	8.0	708
	December, 2005	11.8	7.8	596
	March,2006	4.2	7.9	681
	November, 2006	14.5	7.8	585
	April, 2007	16.4	7.7	511
	November, 2007	11.9	8.0	639
	April, 2008	11.4	7.8	610
	December,2008	11.9	7.2	649
	April, 2009	10.2	8.9	514
	November,2009	14.3	7.8	725
	April, 2010	NA	NA	NA
	November, 2010	13.6	7.6	724
	March, 2011	11.7	8.0	661
	November, 2011	15.1	8.0	663
	April, 2012	12.2	7.8	644
	December, 2012	11.0	8.1	725
	April, 2013	11.9	8.2	705
	December, 2013	9.1	7.7	712
	April, 2014	11.0	8.3	799
	December, 2014	12.5	7.8	820
	April, 2015	9.9	8.2	792
	December, 2015	12.7	7.7	1111 *
	March, 2016	11.9	7.8	776
	November, 2016	14.3	8.0	803
	March, 2017	12.4	8.1	800
	November, 2017	13.2	7.4	730
	March, 2018	11.9	8.0	750
	November, 2018	11.5	7.8	1072
	March, 2019	11.0	7.9	1085
BH1r	November, 2020	12.4	8.4	1020
	March, 2021	2.5	7.4	860
	November, 2021	15.3	8.0	1103
	March, 2022	3.8	8.0	1020
	November, 2022	11.6	8.1	969
	March, 2023	2.5	8.1	908
	November, 2023	13.6	8.0	1005
BH92-5	November, 2019	10.1	7.7	1642
	March, 2020	8.8	8.1	984

LOCATION	DATE	TEMPERATURE (°C)	pH (as units)	CONDUCTIVITY (µS/cm)
BH92-8	December, 1992	9.2	7.3	775
	April, 1993	7.0	7.4	700
	December, 1993	9.1	7.6	466
	April, 1994	6.5	7.4	545
	December, 1994	10.0	7.2	NA
	May, 1995	8.3	7.7	600
	November, 1995	8.0	7.8	640
	November, 1996	9.0	7.3	692
	November, 1997	9.5	7.2	NA
	November, 1998	10.9	7.8	620
	November, 1999	13.3	7.8	700
	November, 2000	11.0	8.2	680
	March, 2001	5.0	8.0	NA
	November, 2001	12.5	7.5	670
	April, 2002	7.9	7.2	610
	November, 2002	12.0	7.2	775
	April, 2003	7.6	7.5	706
	November, 2003	11.5	7.4	770
	March, 2004	7.0	7.3	752
	November, 2004	12.0	8.2	725
	January, 2008	8.5	7.5	498
	April, 2008	7.7	7.9	560
	December, 2008	9.8	7.5	508
	April, 2009	8.3	8.2	450
	November, 2009	10.3	8.2	204
	April, 2010	8.8	7.8	289
	November, 2010	10.6	8.2	292
	March, 2011	9.5	8.0	470
	November, 2011	14.4	8.1	447
	April, 2012	8.2	7.4	657
	December, 2012	12.4	7.8	718
	April, 2013	10.0	8.3	710
	December, 2013	10.0	7.5	713
	April, 2014	8.5	8.1	831
	December, 2014	13.6	7.1	804
	April, 2015	7.4	8.1	805
	December, 2015	13.8	6.7	1036 *
	March, 2016	7.4	6.8	750
	November, 2016	16.3	7.6	800
	March, 2017	9.0	8.0	740
	April, 2017	8.7	8.1	740
	November, 2017	16.1	7.4	650
	March, 2018	10.7	8.1	660
	November 2018	13.1	7.7	959
	March, 2019	8.4	8.1	1048
	November, 2019	12.6	8.0	1003
	March, 2020	9.1	7.4	804
	November, 2020	12.6	8.0	900
	March, 2021	9.6	8.2	780
	November, 2021	14.4	8.3	986
	March, 2022	9.4	7.8	978
	November, 2022	13.3	7.8	918
	March, 2023	9.3	7.8	842
	November, 2023	13.7	7.7	957
BH6	March, 2005	5.0	7.9	762
	November, 2005	11.0	7.9	466
	March, 2006	4.1	7.9	475
	November, 2006	12.9	7.9	466
	April, 2007	13.1	8.0	430

Notes: NA = Reading not available.
' * ' denotes suspected instrument error.

TABLE G-1
WATER CHEMISTRY - FIELD MEASUREMENTS
MILL CREEK AGGREGATES PIT

LOCATION	DATE	TEMPERATURE (°C)	pH (as units)	CONDUCTIVITY (µS/cm)
BH8-I	December, 1992	5.8	8.2	710
	April, 1993	4.5	7.4	550
	December, 1993	5.7	7.4	423
	April, 1994	4.2	7.2	467
	December, 1994	8.0	7.2	NA
	May, 1995	7.3	7.5	450
	November, 1995	7.0	7.6	500
	November, 1996	9.0	7.4	634
	November, 1997	7.5	7.2	NA
	November, 1998	9.4	7.9	460
	November, 1999	10.7	7.5	500
	November, 2000	10.0	7.2	480
	March, 2001	5.1	8.1	NA
	November, 2001	10.0	7.5	560
	April, 2002	6.2	7.3	530
	November, 2002	9.0	7.2	590
	April, 2003	4.5	7.8	553
	November, 2003	9.9	7.2	700
	March, 2004	4.0	7.2	665
	November, 2004	10.8	7.6	598
	March,2005	5.9	7.8	571
	November, 2005	10.8	7.6	616
	March, 2006	4.0	7.7	553
	November, 2006	12.4	8.0	491
	April, 2007	11.5	7.7	515
	November, 2007	11.7	8.1	509
	April, 2008	7.1	7.8	465
	December, 2008	6.9	7.2	610
	April, 2009	7.7	8.7	439
	November, 2009	9.9	7.7	668
	April, 2010	9.1	7.2	634
	November, 2010	9.6	7.2	665
	March, 2011	7.0	8.5	658
BH32-III	November, 2011	10.1	7.5	739
	April, 2012	9.7	7.1	791
	December, 2012	7.5	8.2	935
	April, 2013	8.4	7.6	886
	December, 2013	8.5	7.9	741
	April, 2014	7.1	7.3	987
	December, 2014	5.9	7.7	962
	April, 2015	5.8	7.5	983
	December, 2015	8.5	7.4	1148 *
	March, 2016	5.4	7.8	840
	November, 2016	10.8	7.9	840
	March, 2017	5.2	7.4	1050
	April, 2017	5.3	7.5	1000
	November, 2017	10.7	7.2	680
	March, 2018	6.1	8.3	720
	November, 2018	9.5	7.0	610
	March, 2019	5.3	8.4	931
	November, 2019	10.3	7.7	921
	March, 2020	5.2	8.0	864
	November, 2020	10.9	8.0	848
	March, 2021	8.7	7.9	800
	November, 2021	11.8	7.9	944
	March, 2022	6.2	7.2	1074
	November, 2022	10.5	7.4	814
	March, 2023	5.7	7.0	798
	November, 2023	11.1	7.8	725

LOCATION	DATE	TEMPERATURE (°C)	pH (as units)	CONDUCTIVITY (µS/cm)
PHASE 1 POND	December, 2000	1.4	6.4	320
	April, 2001	3.8	8.5	NA
	November, 2001	10.0	7.8	673
	April, 2002	7.2	7.2	590
	November, 2002	6.0	7.4	540
	April, 2003	9.8	7.9	648
	November, 2003	9.4	8.1	620
	March, 2004	2.7	7.9	179
	November, 2004	10.9	8.4	677
	April, 2005	10.9	7.9	298
	November, 2005	9.3	8.5	677
	April, 2006	9.0	7.9	350
	November, 2006	10	8.1	545
	April, 2007	13.4	8.4	475
	November, 2007	9.9	8.3	605
	April, 2008	12.4	7.0	582
	December, 2008	0.7	7.2	586
	April, 2009	8.9	8.4	497
	November, 2009	8.3	8.4	703
	April, 2010	11.1	7.9	638
	November, 2010	5.3	8.3	670
	April, 2011	9.1	8.8	621
	November, 2011	9.9	8.6	652
	April, 2012	8.0	8.4	626
	December, 2012	6.0	8.3	672
	April, 2013	1.3	7.6	131
	December, 2013	1.2	7.5	930
	April, 2014	3.6	8.4	773
	December, 2014	2.1	8.2	853
	April, 2015	2.5	9.2	325
	December, 2015	5.7	7.7	1078 *
	March, 2016	5.3	7.9	686
	November, 2016	10.6	8.0	1090 *
	March, 2017	2.3	8.5	710
	November, 2017	6.7	7.6	640
	March, 2018	6.8	8.4	650
	November, 2018	4.3	8.2	981
	March, 2019	2.8	8.5	925
	November, 2019	6.1	7.5	1008
	March, 2020	1.6	7.9	711
	November, 2020	8.7	7.9	940
	March, 2021	4.3	7.6	700
	November, 2021	11.2	8.2	916
	March, 2022	4.8	7.9	903
	November, 2022	6.1	8.5	930
	March, 2023	3.5	8.0	868
	November, 2023	8.6	8.4	960

Notes: NA = Reading not available.
' * ' denotes suspected instrument error.

TABLE G-2
GROUNDWATER CHEMICAL RESULTS
MILL CREEK AGGREGATES PIT

PARAMETER	UNITS	ODWQS	BH1-I												
Date			16-Dec-92	20-Apr-93	13-Dec-93	20-Apr-94	21-Dec-94	16-May-95	22-Nov-95	7-Nov-96	26-Nov-97	18-Nov-98	9-Nov-99	8-Nov-00	13-Mar-01
Sodium	mg/L	200 [2]	27.6	20.2	29.1	36.9	35.6	37	38.5	39.4	43	49.5	47.8	46.1	45.4
Potassium	mg/L		2.8	2.1	2.2	1.4	2.1	1.6	2	1.6	1.7	2.2	2	2	1
Calcium	mg/L		72.6	73.8	68.2	64.6	69.3	57.5	58	55.7	50.1	48.4	51.8	49.4	48.1
Magnesium	mg/L		30.2	29	26.9	27.9	25.2	20.7	22.6	20.1	23	23.8	25.7	26	25.6
Alkalinity (as CaCO3)	mg/L	30-500 [3]	231	222	215	172	165	156	160	126	145	137	149	171	143
Sulphate	mg/L	500 [2]	42	40	47	57	61	54	54	46	45	49	45	47.7	47.9
Chloride	mg/L	250 [2]	59.1	49.4	53	69.3	74.3	76.1	74.3	67.8	93.4	91.6	90	101	99.4
Orthophosphate (as P)	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.1	<0.3	<0.3	<0.3
Nitrate and Nitrite (as N)	mg/L	10 [1]	7.2	9.4	7	0.56	0.34	0.53	0.17	0.33	0.48	0.44	0.3	0.6	0.4
Ammonia (as N)	mg/L		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.04	0.08	<0.03
Iron	mg/L	0.3 [2]	0.5	0.49	0.13	2.07	1.61	0.03	0.03	<0.02	<0.02	0.06	0.07	<0.01	<0.01
Manganese	mg/L	0.05 [2]	0.19	0.04	<0.01	0.35	0.26	<0.01	<0.01	<0.01	<0.01	<0.01	0.008	<0.005	<0.005
Copper	mg/L	1 [2]	0.01	<0.01	<0.01	0.01	<0.01	0.02	0.01	<0.01	<0.01	<0.01	<0.003	<0.003	<0.003
Zinc	mg/L	5 [2]	0.18	0.19	0.06	0.15	0.19	0.02	0.02	0.01	<0.01	<0.01	0.012	0.018	0.015
Conductivity	µS/cm		825	762	831	675	711	634	688	537	620	641	680	633	646
pH	Units	6.5-8.5 [3]	7.4	7.7	7.9	7.7	7.7	7.4	7.5	7.8	8.2	8.1	7.95	7.84	7.91
Dissolved Organic Carbon	mg/L	5[2]	1.2	<0.5	<0.5	0.6	0.6	<0.5	<0.5	<0.5	0.8	0.6	0.6	1.6	<0.2
Hardness (as CaCO3)	mg/L	80-100 [3]	306	304	281	276	277	229	238	222	220	219	235	230	226
Bicarbonate (as CaCO3)	mg/L		230	221	213	171	164	156	160	125	143	135	148	170	142
Carbonate (as CaCO3)	mg/L		0.54	1.04	1.59	1	1	<1.00	0.5	<1.00	2	2	1	1	1
Total Dissolved Solids	mg/L	500 [2]	411	395	392	366	NA	NA	NA	312	349	354	357	381	359
Cation Sum	meq/L		7.38	7	6.94	7.16	7.13	6.1	6.39	6.19	6.3	6.58	6.82	6.65	6.52
Anion Sum	meq/L		7.67	7.34	7.27	6.62	6.69	6.43	6.43	5.4	6.49	6.38	6.48	7.3	6.69
Ion Balance	%		1.95	2.33	2.34	3.92	3.23	2.59	0.33	6.8	1.48	1.56	2.61	4.65	1.25
Total Oil and Grease	mg/L		<1	<1	<1	<1	<1	<1	<1					<1	<1

PARAMETER	UNITS	ODWQS	BH1-I												
Date			6-Nov-01	12-Apr-02	20-Nov-02	23-Apr-03	6-Nov-03	10-Mar-04	5-Nov-04	18-Mar-05	7-Dec-05	3-Mar-06	6-Nov-06	30-Apr-07	15-Nov-07
Sodium	mg/L	200 [2]	51.8	47.1	50.5	50.5	51.2	49	54.7	56.6	54	63.2	63.6	65	69.8
Potassium	mg/L		2	2	1	2	2	1	1	2	2.4	2	2	1.8	2
Calcium	mg/L		52.2	53	47.8	51.9	45.9	47.3	47	47	41	58.8	47	47	46.2
Magnesium	mg/L		27.8	28	27.3	27.8	26.6	27.6	27.6	27.5	26	36.1	27.8	31	28.6
Alkalinity (as CaCO3)	mg/L	30-500 [3]	172	179	153	160	169	163	145	140	123	145	171	147	156
Sulphate	mg/L	500 [2]	45.9	48.7	48.4	45.7	37.1	44.4	42.9	44.7	35	53	43	47	42
Chloride	mg/L	250 [2]	89.7	93.3	99.9	95.2	102	99.6	107	118	94	115	132	120	120
Orthophosphate (as P)	mg/L		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.189	<0.01	<0.01	<0.01	0.03
Nitrate and Nitrite (as N)	mg/L	10 [1]	0.5	0.5	0.5	0.7	<0.2	1	0.6	0.5	2.9	0.4	0.3	0.4	0.3
Ammonia (as N)	mg/L		0.04	<0.03	<0.03	<0.03	4.23	<0.03	0.03	<0.03	<0.05	<0.05	0.22	0.08	0.14
Iron	mg/L	0.3 [2]	<0.01	<0.01	0.02	0.02	0.12	0.07	0.17	<0.01	<0.05	0.54	<0.02	0.14	0.14
Manganese	mg/L	0.05 [2]	0.01	<0.005	0.011	0.005	0.112	0.039	0.031	<0.005	<0.002	<0.01	<0.01	0.02	0.03
Copper	mg/L	1 [2]	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.003	<0.02	<0.02	0.002	<0.02
Zinc	mg/L	5 [2]	0.015	0.016	0.013	0.081	<0.005	0.29	0.034	0.017	0.025	0.01	<0.01	0.058	0.03
Conductivity	µS/cm		669	699	660	646	680	656	678	713	571	734	779	751	766
pH	Units	6.5-8.5 [3]	7.74	7.98	8.07	7.93	7.51	8	7.99	7.95	8.1	8.1	8.2	8.2	8.2
Dissolved Organic Carbon	mg/L	5[2]	0.4	0.8	0.6	0.4	10	0.8	1.2	0.8	0.8	0.4	1	0.5	0.5
Hardness (as CaCO3)	mg/L	80-100 [3]	245	247	232	244	224	232	231	231	210	300	230	250	230
Bicarbonate (as CaCO3)	mg/L		171	177	151	159	168	161	144	139	121	143	168	144	154
Carbonate (as CaCO3)	mg/L		<1	2	2	1	<1	2	1	1	1	2	3	2	2
Total Dissolved Solids	mg/L	500 [2]	380	386	373	376	376	375	374	386	326	415	419	405	408
Cation Sum	meq/L		7.21	7.05	6.86	7.12	7.06	6.8	7.03	7.14	6.6	8.72	7.47	7.84	7.77
Anion Sum	meq/L		6.96	7.26	6.92	6.89	7.03	7.06	6.85	7.09	6.02	7.26	8.05	7.26	7.41
Ion Balance	%		1.78	1.46	0.43	1.68	0.22	1.92	1.31	0.3	4.63	9.13	3.78	3.83	2.41
Total Oil and Grease	mg/L		1	<1	<1	<1	22	<1	1	<1	<0.5	<0.5	<0.5	<0.5	1.2

NOTES: · ODWQS Ontario Drinking Water Quality Standards (2006) · (1) Maximum Acceptable Concentration · (2) Aesthetic Objective · (3) Operational Guideline
· * Concentration considered anomalous

TABLE G-2
GROUNDWATER CHEMICAL RESULTS
MILL CREEK AGGREGATES PIT

PARAMETER	UNITS	ODWQS	BH1-I												
Date			29-Apr-08	17-Dec-08	15-Apr-09	25-Nov-09	16-Apr-10	29-Nov-10	29-Mar-11	16-Nov-11	10-Apr-12	6-Dec-12	4-Apr-13	10-Dec-13	1-Apr-14
Sodium	mg/L	200 [2]	64.3	58.1	59.1	62.1	62.4	51	63.4	60	58.9	62.6	61.2	63	60
Potassium	mg/L		2	<1	2	2	2	2.1	2	2.5	1	2	2	2	2
Calcium	mg/L		46.5	41.2	42.3	44	45.2	38.9	46.1	43	44.5	46.5	46.3	45	43
Magnesium	mg/L		28.6	25.6	27.4	29.1	29.7	24.2	29	28	26.6	30.4	31.4	32	30
Alkalinity (as CaCO3)	mg/L	30-500 [3]	99	159	147	153	148	144	143	137	130	160	160	150	160
Sulphate	mg/L	500 [2]	91	39	39	35	37	32	38	35	38	37	38	37	36
Chloride	mg/L	250 [2]	120	120	120	110	130	110	130	120	120	120	130	130	140
Orthophosphate (as P)	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate and Nitrite (as N)	mg/L	10 [1]	0.4	0.4	0.5	0.3	0.4	0.3	0.2	0.2	<0.1	0.2	0.16	0.1	<0.1
Ammonia (as N)	mg/L		<0.05	0.09	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.072
Iron	mg/L	0.3 [2]	<0.02	<0.02	<0.02	<0.02	<0.02	0.027	<0.02	<0.1	<0.02	<0.02	<0.02	0.04	<0.02
Manganese	mg/L	0.05 [2]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.002	<0.01	<0.01	<0.01	<0.01	<0.01
Copper	mg/L	1 [2]	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.001	<0.02	<0.02	<0.02	<0.02	<0.02
Zinc	mg/L	5 [2]	<0.01	0.01	0.01	0.02	0.01	0.012	0.01	0.014	<0.01	0.01	0.01	0.02	0.02
Conductivity	µS/cm		779	771	724	731	770	716	756	740	690	780	770	770	770
pH	Units	6.5-8.5 [3]	7.8	8	7.9	7.9	8.1	8.09	8.05	8.02	8	7.58	8.11	8.06	7.93
Dissolved Organic Carbon	mg/L	5[2]	0.6	0.4	0.5	0.8	0.5	0.8	0.5	0.7	0.36	0.37	0.41	0.36	0.37
Hardness (as CaCO3)	mg/L	80-100 [3]	230	210	220	230	230	200	230	220	220	240	240	250	230
Bicarbonate (as CaCO3)	mg/L		98	157	146	152	146	142	141	135	130	160	150	150	150
Carbonate (as CaCO3)	mg/L		<1	2	1	1	2	2	1	1	1.2	<1	1.9	1.6	1.2
Total Dissolved Solids	mg/L	500 [2]	421	380	381	380	401	353	398	374	369	400	406	400	400
Cation Sum	meq/L		7.53	6.7	6.98	7.35	7.46	6.21	7.5	7.08	7	7.61	7.62	7.7	7.28
Anion Sum	meq/L		7.37	7.28	7.12	6.94	7.45	6.77	7.33	6.85	6.73	7.39	7.55	7.26	7.67
Ion Balance	%		1.12	4.16	0.99	2.85	0.07	4.33	1.18	1.67	1.97	1.47	0.45	2.9	2.62
Total Oil and Grease	mg/L		<0.5	<0.5	<0.5	1.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

PARAMETER	UNITS	ODWQS	BH1-I										BH1-R		
Date			15-Dec-14	6-Apr-15	10-Dec-15	30-Mar-16	14-Nov-16	17-Mar-17	21-Nov-17	26-Mar-18	21-Nov-18	19-Mar-19	19-Nov-20	10-Mar-21	10-Nov-21
Sodium	mg/L	200 [2]	61	65	66	70	75	70	76	73	80	82	95	110	86
Potassium	mg/L		2	2	3	2	3	2.6	2.9	2.7	2.5	2.8	2.6	3.0	2.4
Calcium	mg/L		41	41	44	44	45	42	43	42	42	45	40	48	40
Magnesium	mg/L		30	28	32	32	32	32	32	31	33	32	32	34	29
Alkalinity (as CaCO3)	mg/L	30-500 [3]	140	130	150	150	160	160	160	160	170	140	130	140	130
Sulphate	mg/L	500 [2]	36	36	37	38	36	35	32	35	31	36	35	37	36
Chloride	mg/L	250 [2]	120	150	130	140	140	140	140	150	160	160	180	180	180
Orthophosphate (as P)	mg/L		<0.01	<0.01	<0.01	<0.010	<0.010	<0.010	0.011	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Nitrate and Nitrite (as N)	mg/L	10 [1]	0.17	<0.1	<0.1	0.21	<0.10	<0.10	0.17	<0.10	<0.10	0.16	0.11	0.16	0.10
Ammonia (as N)	mg/L		0.058	<0.05	<0.05	<0.050	<0.050	<0.050	<0.050	<0.050	0.12	<0.050	0.056	<0.050	0.19
Iron	mg/L	0.3 [2]	<0.02	0.05	<0.02	<0.02	<0.02	<0.1	<0.1	<0.10	<0.10	<0.1	<0.1	<0.1	0.200
Manganese	mg/L	0.05 [2]	<0.01	<0.01	0.02	<0.01	<0.01	<0.002	0.0069	<0.002	<0.002	<0.002	<0.0020	<0.0020	0.030
Copper	mg/L	1 [2]	<0.02	<0.02	<0.02	<0.02	<0.02	0.0017	<0.001	<0.001	0.0036	0.0015	<0.00090	<0.00090	0.0010
Zinc	mg/L	5 [2]	0.01	0.01	0.01	0.02	0.01	0.011	<0.010	0.011	0.013	0.025	<0.0050	0.0052	0.029
Conductivity	µS/cm		750	800	830	830	860	880	890	900	920	900	940	980	910
pH	Units	6.5-8.5 [3]	7.87	7.81	8.13	8.04	8.12	8.08	8.07	8.01	8.13	7.90	8.09	8.16	7.89
Dissolved Organic Carbon	mg/L	5[2]	0.64	0.42	0.6	0.52	0.99	0.65	0.74	<0.50	0.67	<0.50	0.47	0.74	<0.40
Hardness (as CaCO3)	mg/L	80-100 [3]	230	220	240	240	250	230	240	230	240	240	230	260	220
Bicarbonate (as CaCO3)	mg/L		140	130	150	150	160	160	160	160	160	140	130	140	130
Carbonate (as CaCO3)	mg/L		<1.0	<1.0	1.9	1.5	2.0	1.8	1.8	1.5	2.1	1.0	1.5	1.9	<1.0
Total Dissolved Solids	mg/L	500 [2]	380	400	410	420	430	456	445	395	485	455	520	490	435
Cation Sum	meq/L		7.24	7.23	7.76	7.88	8.25	7.78	8.17	7.93	8.37	8.54	8.8	9.87	8.21
Anion Sum	meq/L		7.11	7.53	7.59	7.63	7.99	7.87	7.93	8.16	8.52	7.97	8.43	8.68	8.33
Ion Balance	%		0.93	2.06	1.11	1.63	1.65	0.540	1.50	1.42	0.88	3.49	2.12	6.43	0.72
Total Oil and Grease	mg/L		0.5	1	<0.5	<0.50	<0.50	0.60	0.70	<0.50	0.80	<0.50	<0.50	<0.50	0.60

NOTES: · ODWQS Ontario Drinking Water Quality Standards (2006) · (1) Maximum Acceptable Concentration · (2) Aesthetic Objective · (3) Operational Guideline
· * Concentration considered anomalous

TABLE G-2
GROUNDWATER CHEMICAL RESULTS
MILL CREEK AGGREGATES PIT

PARAMETER	UNITS	ODWQS	BH1-R				BH92-5		BH6				
Date			17-Mar-22	25-Nov-22	15-Mar-23	17-Nov-23	13-Nov-19	09-Mar-20	18-Mar-05	11-Nov-05	3-Mar-06	6-Nov-06	30-Apr-07
Sodium	mg/L	200 [2]	91	100	110	110	150	88	44	48.9	46.1	23	38
Potassium	mg/L		2.5	2.5	2.8	2.7	2.1	2.1	2	3	2	2	1.8
Calcium	mg/L		44	46	50	46	86	64	72.4	64.2	88.2	43.3	65
Magnesium	mg/L		30	33	34	33	34	37	26.9	41	32.9	17.9	28
Alkalinity (as CaCO3)	mg/L	30-500 [3]	140	140	150	140	260	250	145	135	163	122	154
Sulphate	mg/L	500 [2]	31	36	34	34	33	32	97.1	79	86	49	82
Chloride	mg/L	250 [2]	160	190	190	200	260	140	105	128	90	63	71
Orthophosphate (as P)	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.3	<0.005	<0.01	<0.01	<0.01
Nitrate and Nitrite (as N)	mg/L	10 [1]	0.16	<0.10	0.12	0.12	<0.10	<0.10	<0.2	0.3	<0.1	0.11	<0.1
Ammonia (as N)	mg/L		0.24	0.22	<0.050	<0.050	<0.050	<0.050	0.37	<0.05	<0.05	0.25	0.16
Iron	mg/L	0.3 [2]	0.14	<0.10	<0.10	<0.100	0.32	0.18	0.05	<0.02	0.02	<0.02	<0.05
Manganese	mg/L	0.05 [2]	0.022	<0.0020	0.0026	<0.0020	0.12	0.094	0.174	<0.01	0.04	<0.01	<0.002
Copper	mg/L	1 [2]	0.0056	<0.00090	<0.00090	<0.00090	0.001	<0.001	0.006	<0.02	<0.02	<0.02	<0.001
Zinc	mg/L	5 [2]	0.026	0.0053	<0.0050	<0.0050	0.13	0.11	0.066	0.16	0.78	<0.01	0.43
Conductivity	µS/cm		900	990	1000	1000	1400	1000	785	841	763	511	680
pH	Units	6.5-8.5 [3]	8.13	8.19	8.18	8.20	8.04	7.86	7.76	8.09	8.1	8.2	8.2
Dissolved Organic Carbon	mg/L	5[2]	0.75	0.64	0.69	1.0	0.59	0.55	5	1.1	0.9	2.2	1.5
Hardness (as CaCO3)	mg/L	80-100 [3]	230	250	270	250	350	310	292	330	360	180	280
Bicarbonate (as CaCO3)	mg/L		140	140	140	140	260	250	144	134	161	120	152
Carbonate (as CaCO3)	mg/L		1.7	2.0	2.0	2.0	2.7	1.7	<1	2	2	2	2
Total Dissolved Solids	mg/L	500 [2]	430	455	485	515	710	540	439	445	442	272	383
Cation Sum	meq/L		8.72	9.66	10	9.76	13.9	10.1	7.82	8.78	9.16	4.71	7.29
Anion Sum	meq/L		8.05	8.91	8.86	9.04	13.3	9.68	7.88	7.98	7.56	5.22	6.79
Ion Balance	%		4.02	4.02	6.26	3.88	2.30	2.09	0.4	4.78	9.56	5.19	3.58
Total Oil and Grease	mg/L		1.0	<0.50	<0.50	1.2	0.80	<0.50	1	1.3	<0.5	1.3	<0.5

PARAMETER	UNITS	ODWQS	BH8-I												
Date			16-Dec-92	20-Apr-93	13-Dec-93	20-Apr-94	21-Dec-94	16-May-95	22-Nov-95	7-Nov-96	26-Nov-97	18-Nov-98	9-Nov-99	8-Nov-00	13-Mar-01
Sodium	mg/L	200 [2]	4.1	2.1	2.3	1.6	1.9	2.7	2.2	1.9	1.5	2.0	2.9	4.4	3.6
Potassium	mg/L		2.7	1.2	1.4	1.2	0.9	0.8	0.6	0.7	<0.5	<1	<1	<1	<1
Calcium	mg/L		89.9	77.6	83.9	208	103	85.6	87.5	91.5	85.8	78.4	98.8	79.1	86.4
Magnesium	mg/L		31.7	26.0	32.1	31.0	33.4	26.5	29.5	28.9	29.2	26.1	32.9	28.4	29.6
Alkalinity (as CaCO3)	mg/L	30-500 [3]	305	261	292	575	288	266	270	290	277	262	320	270	280
Sulphate	mg/L	500 [2]	69	50	67	40	66	44	50	39	49	23	43	43.2	36
Chloride	mg/L	250 [2]	7.6	7.0	5.5	2.3	4.1	5.5	5.0	4.2	4.5	4.4	7.4	18.7	14.2
Orthophosphate (as P)	mg/L		<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.1	<0.3	<0.3	<0.3
Nitrate and Nitrite (as N)	mg/L	10 [1]	<0.05	<0.05	<0.05	<0.05	<0.05	0.07	<0.05	<0.05	<0.05	<0.5	<0.2	0.3	<0.2
Ammonia (as N)	mg/L		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.08	0.06	<0.05	0.03	0.31	<0.03
Iron	mg/L	0.3 [2]	4.10	4.45	1.27	16.0	2.67	0.14	0.56	0.57	0.61	0.56	0.64	<0.01	<0.01
Manganese	mg/L	0.05 [2]	0.88	1.04	0.36	1.04	0.42	0.20	0.23	0.24	0.25	0.16	0.247	0.176	0.329
Copper	mg/L	1 [2]	0.01	<0.01	<0.01	0.09	<0.01	<0.01	0.03	<0.01	<0.01	<0.01	<0.003	<0.003	<0.003
Zinc	mg/L	5 [2]	2.30	2.63	1.08	1.36	0.88	0.24	<0.01	<0.01	<0.01	0.02	0.006	0.649	0.094
Conductivity	µS/cm		800	634	743	1230	723	670	647	572	581	508	669	553	595
pH	Units	6.5-8.5 [3]	7.1	7.4	7.6	7.4	7.4	7.3	7.7	7.2	7.6	8.1	7.56	7.59	7.7
Dissolved Organic Carbon	mg/L	5 [2]	6.0	2.9	4.7	2.3	4.5	2.6	2.8	3.0	4.4	1.5	3.2	3.4	2.9
Hardness (as CaCO3)	mg/L	80-100 [3]	355	301	342	647	395	323	340	347	334	303	382	315	338
Bicarbonate (as CaCO3)	mg/L		305	260	291	574	287	265	269	290	276	259	319	269	279
Carbonate (as CaCO3)	mg/L		0.36	0.61	1.09	1	1	<1	1.3	<1	1	3	1	<1	1
Total Dissolved Solids	mg/L	500 [2]	393	325	372	633	NA	NA	NA	345	342	299	384	343	343
Cation Sum	meq/L		7.34	6.13	6.96	13.0	7.99	6.49	6.42	7.05	6.76	6.18	7.79	6.51	6.92
Anion Sum	meq/L		7.75	6.46	7.39	12.4	7.25	6.40	6.58	6.72	6.69	5.83	7.50	6.85	6.75
Ion Balance	%		2.70	2.57	2.96	2.49	4.89	0.77	1.23	2.36	0.54	2.85	1.88	2.52	1.27
Total Oil and Grease	mg/L		3.9	<1	<1	<1	<1	<1	<1					1	<1

NOTES: · ODWQS Ontario Drinking Water Quality Standards (2006) · (1) Maximum Acceptable Concentration · (2) Aesthetic Objective · (3) Operational Guideline
· * Concentration considered anomalous

TABLE G-2
GROUNDWATER CHEMICAL RESULTS
MILL CREEK AGGREGATES PIT

PARAMETER	UNITS	ODWQS	BH8-I												
Date			6-Nov-01	12-Apr-02	20-Nov-02	23-Apr-03	6-Nov-03	10-Mar-04	5-Nov-04	18-Mar-05	11-Nov-05	3-Mar-06	6-Nov-06	30-Apr-07	15-Nov-07
Sodium	mg/L	200 [2]	3.8	4.4	4.9	4.0	4.3	4.9	2.6	2.2	3.5	2.8	2.7	6.4	3.8
Potassium	mg/L		<1	1	<1	<1	1	<1	<1	1	<1	<1	<1	1.2	1
Calcium	mg/L		87.6	87.5	99.9	98.6	97.7	97.7	86.7	83.6	88.1	92.7	69.8	89	*265
Magnesium	mg/L		31.4	29.8	35.2	32.0	33.9	34.4	29.9	28.2	30.3	31.5	22.1	32	*70.3
Alkalinity (as CaCO3)	mg/L	30-500 [3]	280	292	272	254	254	300	213	233	224	233	228	261	266
Sulphate	mg/L	500 [2]	48.7	36.8	91.4	83.4	102	64.0	99.1	78	93	50	57	76	36
Chloride	mg/L	250 [2]	26.3	20.5	25.9	21.5	21.6	18.4	17.9	10.4	13	4	4	12	11
Orthophosphate (as P)	mg/L		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.012	0.06	<0.01	<0.01	<0.01
Nitrate and Nitrite (as N)	mg/L	10 [1]	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1
Ammonia (as N)	mg/L		0.16	0.77	<0.03	<0.03	0.05	<0.03	0.04	0.04	<0.05	<0.05	0.2	0.12	0.08
Iron	mg/L	0.3 [2]	0.35	0.57	0.52	0.58	0.52	0.66	0.43	0.47	0.49	0.57	0.33	<0.05	*5.82
Manganese	mg/L	0.05 [2]	0.212	0.229	0.247	0.236	0.249	0.258	0.211	0.201	0.20	0.19	0.17	0.16	*0.71
Copper	mg/L	1 [2]	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.02	<0.02	<0.02	<0.001	*0.04
Zinc	mg/L	5 [2]	<0.005	0.007	<0.005	0.140	0.008	<0.005	<0.005	<0.005	<0.01	<0.01	<0.01	0.47	*1.64
Conductivity	µS/cm		623	614	670	609	683	645	594	600	519	506	507	632	574
pH	Units	6.5-8.5 [3]	7.75	7.36	7.86	7.60	7.79	7.69	8.12	7.6	8.21	8	8.2	8.3	8.1
Dissolved Organic Carbon	mg/L	5 [2]	1.2	23.9	1.6	2.0	2.5	3.2	2.1	2.5	2.3	1.8	2.1	2	2
Hardness (as CaCO3)	mg/L	80-100 [3]	348	341	395	378	384	385	340	325	340	360	270	350	*950
Bicarbonate (as CaCO3)	mg/L		278	291	270	253	253	299	210	232	221	231	224	257	263
Carbonate (as CaCO3)	mg/L		1	<1	2	<1	1	1	3	<1	3	2	3	4	3
Total Dissolved Solids	mg/L	500 [2]	371	361	427	397	418	404	370	347	363	321	293	378	562
Cation Sum	meq/L		7.13	7.10	8.12	7.75	7.89	7.94	6.92	6.62	7.06	7.36	5.45	7.38	19.6
Anion Sum	meq/L		7.35	7.18	8.07	7.42	7.81	7.85	6.83	6.58	6.77	5.81	5.85	7.13	6.37
Ion Balance	%		1.52	0.60	0.29	2.14	0.48	0.55	0.71	0.34	2.08	11.8	3.57	1.74	*51
Total Oil and Grease	mg/L		16	4	<1	<1	<1	<1	<1	<1	0.6	<0.5	<0.5	<0.5	<0.5

PARAMETER	UNITS	ODWQS	BH8-I							BH92-32-III					
Date			29-Apr-08	17-Dec-08	15-Apr-09	25-Nov-09	16-Apr-10	29-Nov-10	29-Mar-11	16-Nov-11	10-Apr-12	6-Dec-12	4-Apr-13	10-Dec-13	1-Apr-14
Sodium	mg/L	200 [2]	6.6	4.1	5	27.3	29.1	42.6	33.9	28.0	39.4	39.2	40.6	43.0	40
Potassium	mg/L		2	<1	<1	1	<1	1.1	<1	0.86	1	<1	<1	<1	<1
Calcium	mg/L		83.5	71.9	88.1	70.2	74.4	76.3	76.3	88.0	99.2	113	110	97	92
Magnesium	mg/L		27.2	24.2	30.8	24.0	24.3	25.7	25.5	33.0	34.9	42.8	41.8	39	38
Alkalinity (as CaCO3)	mg/L	30-500 [3]	249	271	253	157	140	166	173	253	250	320	270	280	310
Sulphate	mg/L	500 [2]	56	40	59	82	99	60	67	50	79	78	91	81	76
Chloride	mg/L	250 [2]	13	6.0	26	65	76	95	79	82	97	88	93	97	89
Orthophosphate (as P)	mg/L		<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate and Nitrite (as N)	mg/L	10 [1]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.18	<0.1	<0.1
Ammonia (as N)	mg/L		<0.05	0.1	<0.05	<0.05	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	0.072	<0.05	0.089
Iron	mg/L	0.3 [2]	0.39	0.39	0.52	0.32	0.42	0.45	1.44	<0.1	<0.02	0.04	<0.02	0.2	0.04
Manganese	mg/L	0.05 [2]	0.2	0.2	0.25	0.21	0.22	0.26	0.52	0.16	0.03	0.06	0.05	0.15	0.22
Copper	mg/L	1 [2]	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.001	<0.02	<0.02	<0.02	<0.02	<0.02
Zinc	mg/L	5 [2]	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	0.098	0.130	0.150	0.190	0.140	0.140
Conductivity	µS/cm		592	579	631	685	694	759	717	823	850	1000	970	980	980
pH	Units	6.5-8.5 [3]	8.20	7.90	7.7	7.8	8.0	8.0	7.91	7.94	7.84	7.88	7.99	7.78	7.63
Dissolved Organic Carbon	mg/L	5 [2]	3.9	1.4	2.3	1.6	1.4	1.5	2.7	2.1	1.2	1.4	1.3	1.2	1.3
Hardness (as CaCO3)	mg/L	80-100 [3]	320	280	350	270	290	300	300	360	390	460	450	400	390
Bicarbonate (as CaCO3)	mg/L		246	269	252	156	139	164	172	251	250	320	260	280	310
Carbonate (as CaCO3)	mg/L		3	2	1	<1	1	2	1	2	2	2	2	2	1
Total Dissolved Solids	mg/L	500 [2]	343	314	366	369	391	406	392	439	505	562	543	530	530
Cation Sum	meq/L		6.76	5.78	7.17	6.71	7.00	7.82	7.43	8.36	9.57	10.9	10.7	9.9	9.5
Anion Sum	meq/L		6.51	6.41	7	6.67	6.99	7.25	7.10	8.40	9.34	10.6	9.85	10.0	10.3
Ion Balance	%		1.88	5.22	1.19	0.26	0.07	3.79	2.28	0.24	1.22	1.45	4.03	0.57	4.36
Total Oil and Grease	mg/L		<0.5	<0.5	<0.5	1.4	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.5	<0.5	<0.5

NOTES: · ODWQS Ontario Drinking Water Quality Standards (2006) · (1) Maximum Acceptable Concentration · (2) Aesthetic Objective · (3) Operational Guideline
· * Concentration considered anomalous

TABLE G-2
GROUNDWATER CHEMICAL RESULTS
MILL CREEK AGGREGATES PIT

PARAMETER	UNITS	ODWQS	BH92-32-III												
Date			15-Dec-14	6-Apr-15	10-Dec-15	30-Mar-16	14-Nov-16	17-Mar-17	4-Apr-17	21-Nov-17	26-Mar-18	21-Nov-18	19-Mar-19	13-Nov-19	09-Mar-20
Sodium	mg/L	200 [2]	42	43	41	33	42	28	24	38	34	34	34	32	28
Potassium	mg/L		<1	<1	1	<1	<1	0.90	0.94	0.87	0.76	0.98	0.78	1.0	0.92
Calcium	mg/L		87	100	77	100	82	130	120	78	80	94	92	80	92
Magnesium	mg/L		35	40	31	41	31	57	55	31	33	38	37	34	44
Alkalinity (as CaCO3)	mg/L	30-500 [3]	240	320	220	360	210	430	430	220	260	330	300	240	340
Sulphate	mg/L	500 [2]	81	66	64	50	68	150	120	62	77	50	56	46	58
Chloride	mg/L	250 [2]	99	85	88	62	100	46	39	90	68	74	40	75	48
Orthophosphate (as P)	mg/L		<0.01	0.028	<0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Nitrate and Nitrite (as N)	mg/L	10 [1]	<0.1	<0.1	<0.1	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Ammonia (as N)	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.052	<0.050	0.19	0.066	<0.050	0.082
Iron	mg/L	0.3 [2]	0.05	0.15	0.06	0.04	0.04	0.15	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.1
Manganese	mg/L	0.05 [2]	0.45	0.63	0.48	0.91	0.51	0.93	0.96	0.60	0.60	0.70	0.69	0.62	0.83
Copper	mg/L	1 [2]	<0.02	<0.02	<0.02	<0.02	<0.02	0.0019	<0.001	0.0012	0.0015	<0.001	0.0081	<0.001	0.0012
Zinc	mg/L	5 [2]	0.14	0.180	0.070	0.19	0.06	0.18	0.19	0.063	0.079	0.084	0.092	0.061	0.10
Conductivity	µS/cm		910	970	850	930	830	1200	1100	820	830	890	810	770	890
pH	Units	6.5-8.5 [3]	7.84	7.66	7.93	7.86	8.04	7.70	7.79	7.85	7.84	7.87	7.78	7.98	7.62
Dissolved Organic Carbon	mg/L	5 [2]	1.4	1.7	1.5	2.3	1.6	2.7	2.7	1.3	1.6	1.5	1.7	1.1	1.9
Hardness (as CaCO3)	mg/L	80-100 [3]	360	420	320	430	330	560	540	320	340	390	380	340	410
Bicarbonate (as CaCO3)	mg/L		240	320	220	360	210	430	430	220	250	320	300	230	340
Carbonate (as CaCO3)	mg/L		2	1.4	1.8	2.4	2.2	2.0	2.5	1.5	1.6	2.3	1.7	2.1	1.3
Total Dissolved Solids	mg/L	500 [2]	490	530	440	510	460	692	666	430	395	510	435	390	510
Cation Sum	meq/L		9.04	10.2	8.2	10	8.46	12.5	11.8	8.09	8.21	9.38	8.7	8.25	9.43
Anion Sum	meq/L		9.31	10.1	8.3	9.98	8.53	13.1	12.2	8.27	8.64	9.63	8.38	7.77	9.37
Ion Balance	%		1.51	0.59	0.24	0.19	0.380	2.42	1.62	1.14	2.59	1.28	1.89	2.99	0.32
Total Oil and Grease	mg/L		0.80	1	<0.5	<0.50	<0.50	1.4	<0.50	0.50	<0.50	<0.50	<0.50	1.0	<0.50

PARAMETER	UNITS	ODWQS	BH92-32-III						
Date			19-Nov-20	10-Mar-21	10-Nov-21	17-Mar-22	25-Nov-22	15-Mar-23	17-Nov-23
Sodium	mg/L	200 [2]	29	27	25	21	33	31	37
Potassium	mg/L		1.4	1.3	1.4	1.1	1.4	1.5	1.3
Calcium	mg/L		96	110	96	110	96	110	66
Magnesium	mg/L		40	43	33	41	36	43	27
Alkalinity (as CaCO3)	mg/L	30-500 [3]	310	340	330	400	290	320	180
Sulphate	mg/L	500 [2]	48	46	43	40	34	37	38
Chloride	mg/L	250 [2]	71	57	60	40	80	70	81
Orthophosphate (as P)	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Nitrate and Nitrite (as N)	mg/L	10 [1]	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Ammonia (as N)	mg/L		0.068	<0.050	0.054	0.24	0.18	<0.050	<0.050
Iron	mg/L	0.3 [2]	<0.1	<0.1	<0.100	<0.1	<0.10	<0.10	<0.100
Manganese	mg/L	0.05 [2]	0.64	0.67	0.66	0.78	0.63	0.61	0.56
Copper	mg/L	1 [2]	0.0023	0.001	<0.00090	0.001	0.0011	<0.00090	<0.00090
Zinc	mg/L	5 [2]	0.11	0.11	0.095	0.13	0.071	0.088	0.028
Conductivity	µS/cm		850	910	840	890	830	880	710
pH	Units	6.5-8.5 [3]	7.99	7.78	7.63	7.86	7.83	7.82	8.03
Dissolved Organic Carbon	mg/L	5 [2]	1.1	1.5	1.5	2.3	1.4	2.0	1.2
Hardness (as CaCO3)	mg/L	80-100 [3]	400	460	380	450	390	440	280
Bicarbonate (as CaCO3)	mg/L		300	340	330	390	290	310	180
Carbonate (as CaCO3)	mg/L		2.8	1.9	1.3	2.7	1.8	2.0	1.9
Total Dissolved Solids	mg/L	500 [2]	475	465	420	470	370	455	350
Cation Sum	meq/L		9.4	10.5	8.65	10.0	9.27	10.2	7.19
Anion Sum	meq/L		9.1	9.37	9.22	9.86	8.73	9.08	6.78
Ion Balance	%		1.63	5.47	3.22	0.81	3.00	5.67	3.00
Total Oil and Grease	mg/L		0.6	<0.50	0.60	<0.50	0.7	<0.50	1.2

NOTES: · ODWQS Ontario Drinking Water Quality Standards (2006) · (1) Maximum Acceptable Concentration · (2) Aesthetic Objective · (3) Operational Guideline
· * Concentration considered anomalous

TABLE G-2
GROUNDWATER CHEMICAL RESULTS
MILL CREEK AGGREGATES PIT

PARAMETER	UNITS	ODWQS	BH92-8												
Date			16-Dec-92	20-Apr-93	13-Dec-93	20-Apr-94	21-Dec-94	16-May-95	22-Nov-95	7-Nov-96	26-Nov-97	18-Nov-98	9-Nov-99	8-Nov-00	13-Mar-01
Sodium	mg/L	200 [2]	27.4	26.3	27.3	29.7	27.5	27.8	29.9	28.4	33.2	34.4	43	36.6	36.9
Potassium	mg/L		2.7	2.2	2.3	2.0	2.0	1.8	2.0	1.9	0.8	2.1	2	2	2
Calcium	mg/L		71.9	73.1	74.1	50.0	84.5	74.6	75.1	77	69.9	73.2	93.6	99.2	80.8
Magnesium	mg/L		28.0	27.1	29.3	47.3	30.6	26.1	29.1	27.5	26.4	26.0	33.5	35.8	29.4
Alkalinity (as CaCO3)	mg/L	30-500 [3]	244	234	231	219	219	222	208	196	194	192	175	192	198
Sulphate	mg/L	500 [2]	47	52	67	59	73	57	60	59	58	60	129	179	81.5
Chloride	mg/L	250 [2]	44.7	51.0	48.3	80.0	50.5	57.5	59.6	64.4	75.9	65.8	95	91.5	83.8
Orthophosphate (as P)	mg/L		0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.1	<0.3	<0.3	<0.3
Nitrate and Nitrite (as N)	mg/L	10 [1]	2.20	1.44	1.45	0.99	0.42	0.26	<0.05	0.69	0.09	<0.5	<0.2	0.6	<0.2
Ammonia (as N)	mg/L		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.12	<0.05	<0.05	0.03	0.10	<0.03
Iron	mg/L	0.3 [2]	7.45	1.15	1.87	9.53	1.61	0.89	<0.02	0.13	0.03	0.5	0.05	<0.01	<0.01
Manganese	mg/L	0.05 [2]	1.45	0.57	0.60	0.44	0.22	0.03	0.05	0.04	0.04	0.05	0.018	<0.005	0.026
Copper	mg/L	1 [2]	0.14	0.05	0.05	0.05	<0.01	<0.01	0.03	<0.01	<0.01	<0.01	<0.003	<0.003	<0.003
Zinc	mg/L	5 [2]	6.12	1.37	1.83	1.67	1.12	0.53	0.39	0.43	0.42	0.22	0.249	0.299	0.43
Conductivity	µS/cm		780	805	823	840	814	724	760	639	663	669	889	829	735
pH	Units	6.5-8.5 [3]	7.4	7.5	8.1	7.5	7.5	8.0	7.7	7.4	8.1	7.9	7.86	7.71	7.88
Dissolved Organic Carbon	mg/L	5 [2]	1.5	2.6	<0.5	1.6	1.0	<0.5	<0.5	<0.5	1.1	1.2	3.5	1.6	1.0
Hardness (as CaCO3)	mg/L	80-100 [3]	295	294	306	320	337	294	307	305	283	290	372	395	323
Bicarbonate (as CaCO3)	mg/L		243	233	228	218	218	220	207	195	192	191	174	191	197
Carbonate (as CaCO3)	mg/L		0.57	0.69	2.7	1	1	2	1	<1	2	1	1	<1	1
Total Dissolved Solids	mg/L	500 [2]	384	384	399	409	NA	NA	NA	385	386	384	506	567	439
Cation Sum	meq/L		7.15	7.08	7.36	7.73	7.98	6.97	7.13	7.40	7.13	7.34	9.34	9.54	8.10
Anion Sum	meq/L		7.28	7.30	7.48	7.93	7.35	7.27	7.09	7.02	7.23	6.94	8.86	10.20	8.02
Ion Balance	%		0.85	1.56	0.83	1.30	4.11	2.04	0.26	2.60	0.68	2.85	2.64	3.26	0.52
Total Oil and Grease	mg/L		<1	<1	<1	<1	<1	<1	<1					<1	<1

PARAMETER	UNITS	ODWQS	BH92-8												
Date			6-Nov-01	12-Apr-02	20-Nov-02	23-Apr-03	6-Nov-03	10-Mar-04	5-Nov-04	23-Jan-08	29-Apr-08	17-Dec-08	15-Apr-09	25-Nov-09	16-Apr-10
Sodium	mg/L	200 [2]	31.8	33.6	38.1	36.5	42.9	52.0	15.1	38.5	50.9	11.6	42.3	7.7	17
Potassium	mg/L		3	3	1	1	2	2	2	3	2	<1	1	1.0	1.0
Calcium	mg/L		85.1	95.8	99.6	85.4	79.1	72.1	37.6	48.9	56.9	26.7	50.9	20.9	32.0
Magnesium	mg/L		29.8	33.4	34.8	30.2	27.0	25.7	10.9	19.3	24	7.19	20.4	6.4	12.9
Alkalinity (as CaCO3)	mg/L	30-500 [3]	198	200	180	180	166	160	91	126	143	81	135	84	104
Sulphate	mg/L	500 [2]	112	126	175	116	96.6	83.4	26.4	52	50	17	44	13	25
Chloride	mg/L	250 [2]	69.1	77.7	70.4	83.1	100	104	29.2	89	100	25.0	98	16	37
Orthophosphate (as P)	mg/L		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.01	0.02	<0.01	<0.01	<0.01	<0.01
Nitrate and Nitrite (as N)	mg/L	10 [1]	<0.2	0.5	<0.2	<0.2	<0.2	<0.2	0.6	0.1	0.2	0.5	<0.1	0.3	0.3
Ammonia (as N)	mg/L		<0.03	<0.03	<0.03	<0.03	0.11	<0.03	0.03	0.09	0.5	0.15	<0.05	0.17	0.13
Iron	mg/L	0.3 [2]	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	0.03	0.04	0.03	<0.02	<0.02	<0.02
Manganese	mg/L	0.05 [2]	<0.005	0.019	0.035	0.064	0.095	0.053	<0.005	0.09	0.1	<0.01	0.03	0.02	0.02
Copper	mg/L	1 [2]	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Zinc	mg/L	5 [2]	0.115	0.359	0.475	0.494	0.353	0.310	0.025	<0.01	0.03	<0.01	0.03	<0.01	0.01
Conductivity	µS/cm		752	812	826	730	757	727	303	637	708	290	642	238	375
pH	Units	6.5-8.5 [3]	7.80	7.88	7.88	7.83	7.94	7.94	8.18	8.1	8.20	8.00	7.7	7.9	8.2
Dissolved Organic Carbon	mg/L	5 [2]	1.8	2.0	1.2	0.9	2.7	1.3	2.5	2.3	8.0	0.7	0.5	1.1	0.6
Hardness (as CaCO3)	mg/L	80-100 [3]	335	377	392	338	309	286	139	200	240	96	210	79	130
Bicarbonate (as CaCO3)	mg/L		197	199	179	179	165	159	90	125	141	80	134	83	130
Carbonate (as CaCO3)	mg/L		1	1	1	1	1	1	1	2	2	<1	<1	<1	1
Total Dissolved Solids	mg/L	500 [2]	454	497	533	466	453	441	181	331	377	141	340	120	191
Cation Sum	meq/L		8.15	9.06	9.53	8.37	8.10	8.02	3.48	5.77	7.12	2.44	6.09	1.96	3.44
Anion Sum	meq/L		8.24	8.85	9.23	8.36	8.15	7.87	3.24	6.14	6.79	2.73	6.37	2.44	3.67
Ion Balance	%		0.56	1.21	1.6	0.11	0.31	0.97	3.61	3.11	2.36		2.25		3.29
Total Oil and Grease	mg/L		<1	1	<1	<1	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	1.4	0.6

NOTES: · ODWQS Ontario Drinking Water Quality Standards (2006) · (1) Maximum Acceptable Concentration · (2) Aesthetic Objective · (3) Operational Guideline
· * Concentration considered anomalous

TABLE G-2
GROUNDWATER CHEMICAL RESULTS
MILL CREEK AGGREGATES PIT

PARAMETER	UNITS	ODWQS	BH92-8												
Date			29-Nov-10	10-Apr-12	29-Mar-11	16-Nov-11	06-Dec-12	04-Apr-13	10-Dec-13	01-Apr-14	15-Dec-14	06-Apr-15	10-Dec-15	30-Mar-16	14-Nov-16
Sodium	mg/L	200 [2]	4.3	52.9	39.1	31	51.2	52.9	51	49	48	51	51	52	56
Potassium	mg/L		1.5	2	2.0	2.5	3	2	3	2	3	2	3	2	3
Calcium	mg/L		26.2	54.6	45.9	46.0	52.8	54.9	54	55	52	58	53	57	56
Magnesium	mg/L		6.3	28.4	19.8	18.0	28.8	31.5	31	32	29	31	30	31	30
Alkalinity (as CaCO3)	mg/L	30-500 [3]	73	150	124	126	150	140	150	140	140	140	140	140	150
Sulphate	mg/L	500 [2]	14	52	39	37	58	75	68	79	75	80	64	77	64
Chloride	mg/L	250 [2]	18	110	79	67	110	120	110	120	110	110	110	110	130
Orthophosphate (as P)	mg/L		0.02	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.066	<0.01	<0.010	<0.010
Nitrate and Nitrite (as N)	mg/L	10 [1]	0.4	<0.1	0.2	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.10	<0.10
Ammonia (as N)	mg/L		0.10	<0.05	0.15	0.32	0.19	0.16	0.07	0.15	0.1	<0.050	<0.05	<0.050	<0.050
Iron	mg/L	0.3 [2]	<0.02	<0.02	<0.02	<0.1	0.25	0.17	0.11	0.11	0.04	0.05	0.04	<0.02	0.03
Manganese	mg/L	0.05 [2]	<0.01	0.10	0.06	0.11	0.13	0.15	0.16	0.16	0.16	0.15	0.16	0.14	0.16
Copper	mg/L	1 [2]	<0.02	<0.02	<0.02	<0.001	<0.02	<0.02	0.03	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Zinc	mg/L	5 [2]	<0.01	<0.01	0.01	0.012	0.01	0.02	0.02	0.02	0.03	0.03	0.04	0.04	0.04
Conductivity	µS/cm		234	710	579	538	780	780	800	800	780	800	780	800	800
pH	Units	6.5-8.5 [3]	8.1	8.01	8.1	8.1	7.5	8.15	8.01	7.92	7.95	7.77	8.08	7.97	8.10
Dissolved Organic Carbon	mg/L	5 [2]	0.7	0.72	0.7	1.0	0.9	0.66	0.55	0.37	0.7	0.66	0.62	0.62	0.85
Hardness (as CaCO3)	mg/L	80-100 [3]	92	250	200	190	250	270	260	270	250	270	260	270	260
Bicarbonate (as CaCO3)	mg/L		72	150	123	125	150	140	140	140	140	140	140	130	150
Carbonate (as CaCO3)	mg/L		<1	2	1	1	<1	1.9	1.4	1.1	1.2	<1	1.6	1.2	1.8
Total Dissolved Solids	mg/L	500 [2]	119	394	303	282	397	422	410	420	410	430	400	420	430
Cation Sum	meq/L		2.06	7.42	5.68	5.21	7.32	7.71	7.55	7.55	7.17	7.72	7.39	7.71	7.76
Anion Sum	meq/L		2.30	7.18	5.53	5.19	7.27	7.64	7.51	7.78	7.52	7.76	7.3	7.49	7.94
Ion Balance	%			1.61	1.29	0.210	0.33	0.46	0.29	1.5	2.4	0.28	0.60	1.41	1.09
Total Oil and Grease	mg/L		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.7	1.2	<0.5	<0.50	<0.50

PARAMETER	UNITS	ODWQS	BH92-8												
Date			17-Mar-17	04-Apr-17	Apr-17 (dup)	21-Nov-17	Nov-17 (dup)	26-Mar-18	Mar-18 (dup)	21-Nov-18	Nov-18 (dup)	19-Mar-19	Mar-19 (dup)	13-Nov-19	Nov-19 (dup)
Sodium	mg/L	200 [2]	51			53		52		55		56		62	
Potassium	mg/L		2.4			2.8		2.5		2.6		2.4		3.1	
Calcium	mg/L		54			52		49		50		51		54	
Magnesium	mg/L		31			31		30		31		31		34	
Alkalinity (as CaCO3)	mg/L	30-500 [3]	140			160		150		150		150		150	
Sulphate	mg/L	500 [2]	63			56		57		77		50		54	
Chloride	mg/L	250 [2]	120			130		120		130		120		140	
Orthophosphate (as P)	mg/L		<0.010			<0.010		<0.010		<0.010		<0.010		<0.010	
Nitrate and Nitrite (as N)	mg/L	10 [1]	<0.10			<0.10		<0.10		<0.10		<0.10		<0.10	
Ammonia (as N)	mg/L		<0.050			0.051		0.054		0.19		0.079		<0.050	
Iron	mg/L	0.3 [2]	0.19			0.11		<0.10		<0.10		<0.10		<0.10	
Manganese	mg/L	0.05 [2]	0.14			0.15		0.12		0.16		0.12		0.17	
Copper	mg/L	1 [2]	0.044			<0.001		0.0013		0.0044		<0.001		0.0017	
Zinc	mg/L	5 [2]	0.079			0.023		0.023		0.022		0.026		0.045	
Conductivity	µS/cm		810			810		800		810		810		830	
pH	Units	6.5-8.5 [3]	8.02			8.02		8.01		8.06		8.02		8.14	
Dissolved Organic Carbon	mg/L	5 [2]	0.78			0.67		0.56		0.81		<0.50		<0.50	
Hardness (as CaCO3)	mg/L	80-100 [3]	260			260		250		250		250		280	
Bicarbonate (as CaCO3)	mg/L		140			160		150		150		150		150	
Carbonate (as CaCO3)	mg/L		1.4			1.5		1.4		1.6		1.5		1.9	
Total Dissolved Solids	mg/L	500 [2]	418			395		350		480		415		410	
Cation Sum	meq/L		7.56			7.52		7.26		7.51		7.58		8.31	
Anion Sum	meq/L		7.62			7.84		7.66		8.31		7.57		7.97	
Ion Balance	%		0.36			2.10		2.64		5.06		0.06		2.08	
Total Oil and Grease	mg/L		2.1*	1.0	<0.50	<0.50	0.80	<0.50	<0.50	0.70	0.90	<0.50	<0.50	0.90	0.80

NOTES: · ODWQS Ontario Drinking Water Quality Standards (2006) · (1) Maximum Acceptable Concentration · (2) Aesthetic Objective · (3) Operational Guideline
· * Concentration considered anomalous

TABLE G-2
GROUNDWATER CHEMICAL RESULTS
MILL CREEK AGGREGATES PIT

PARAMETER	UNITS	ODWQS	BH92-8												
Date			09-Mar-20	Mar-20 (dup)	16-Apr-20	19-Nov-20	Nov-20 (dup)	10-Mar-21	Mar-21 (dup)	10-Nov-21	Nov-21 (dup)	17-Mar-22	Mar-22 (dup)	25-Nov-22	Nov-22 (dup)
Sodium	mg/L	200 [2]	60			66		72		64		71		82	
Potassium	mg/L		2.6			3.1		2.8		2.6		2.5		3.0	
Calcium	mg/L		49			53		55		52		52		53	
Magnesium	mg/L		33			34		36		32		33		35	
Alkalinity (as CaCO3)	mg/L	30-500 [3]	150			150		160		150		160		160	
Sulphate	mg/L	500 [2]	50			56		44		54		44		40	
Chloride	mg/L	250 [2]	140			130		130		150		150		160	
Orthophosphate (as P)	mg/L		<0.010			<0.010		<0.010		<0.010		<0.010		0.013	
Nitrate and Nitrite (as N)	mg/L	10 [1]	<0.10			<0.10		<0.10		<0.10		<0.10		<0.10	
Ammonia (as N)	mg/L		<0.050			<0.050		<0.050		<0.050		0.22		<0.050	
Iron	mg/L	0.3 [2]	<0.1			<0.1		<0.1		<0.100		<0.1		<0.10	
Manganese	mg/L	0.05 [2]	0.14			0.13		0.1		0.210		0.12		0.20	
Copper	mg/L	1 [2]	<0.001			<0.00090		0.0011		<0.00090		<0.00090		<0.00090	
Zinc	mg/L	5 [2]	0.04			0.049		0.037		0.040		0.039		0.043	
Conductivity	µS/cm		830			850		880		880		910		940	
pH	Units	6.5-8.5 [3]	8.02			8.09		8.07		7.97		8.02		8.08	
Dissolved Organic Carbon	mg/L	5 [2]	0.53			0.47		0.51		<0.40		0.67		0.56	
Hardness (as CaCO3)	mg/L	80-100 [3]	260			270		280		260		270		280	
Bicarbonate (as CaCO3)	mg/L		150			150		160		150		160		160	
Carbonate (as CaCO3)	mg/L		1.4			1.7		1.7		1.3		1.6		1.8	
Total Dissolved Solids	mg/L	500 [2]	430			475		450		435		415		415	
Cation Sum	meq/L		7.8			8.42		8.88		8.11		8.52		9.17	
Anion Sum	meq/L		7.86			7.89		7.78		8.34		8.35		8.58	
Ion Balance	%		0.38			3.26		6.63		1.41		1.02		3.36	
Total Oil and Grease	mg/L		<0.50	2.9*	<0.50	<0.50	<0.5	<0.50	<0.50	0.5	0.6	0.8	1.5	0.9	<0.50

PARAMETER	UNITS	ODWQS	BH92-8			
Date			15-Mar-23	Mar-23 (dup)	17-Nov-23	Nov-23 (dup)
Sodium	mg/L	200 [2]	88		58	
Potassium	mg/L		2.9		3.3	
Calcium	mg/L		55		66	
Magnesium	mg/L		37		46	
Alkalinity (as CaCO3)	mg/L	30-500 [3]	160		210	
Sulphate	mg/L	500 [2]	46		46	
Chloride	mg/L	250 [2]	160		150	
Orthophosphate (as P)	mg/L		<0.010		<0.010	
Nitrate and Nitrite (as N)	mg/L	10 [1]	<0.10		<0.10	
Ammonia (as N)	mg/L		<0.050		<0.050	
Iron	mg/L	0.3 [2]	<0.10		<0.100	
Manganese	mg/L	0.05 [2]	0.13		0.26	
Copper	mg/L	1 [2]	0.0015		<0.00090	
Zinc	mg/L	5 [2]	0.045		0.078	
Conductivity	µS/cm		940		990	
pH	Units	6.5-8.5 [3]	8.13		8.08	
Dissolved Organic Carbon	mg/L	5 [2]	0.51		0.50	
Hardness (as CaCO3)	mg/L	80-100 [3]	290		350	
Bicarbonate (as CaCO3)	mg/L		160		200	
Carbonate (as CaCO3)	mg/L		2		2.3	
Total Dissolved Solids	mg/L	500 [2]	475		495	
Cation Sum	meq/L		9.71		9.68	
Anion Sum	meq/L		8.57		9.23	
Ion Balance	%		6.23		2.39	
Total Oil and Grease	mg/L		<0.50	<0.50	2.0	<0.50

NOTES:
- ODWQS Ontario Drinking Water Quality Standards (2006)
- (1) Maximum Acceptable Concentration
- (2) Aesthetic Objective
- (3) Operational Guideline
- * Concentration considered anomalous

TABLE G-3
PHASE 1 POND CHEMICAL RESULTS
MILL CREEK AGGREGATES PIT

PARAMETER	UNITS	PWQO												
Date			14-Dec-00	10-Apr-01	06-Nov-01	12-Apr-02	20-Nov-02	23-Apr-03	06-Nov-03	10-Mar-04	05-Nov-04	18-Apr-05	11-Nov-05	27-Apr-06	06-Nov-06
Sodium	mg/L		48.1	42.4	48	46.1	50.8	51.2	50.6	11.1	50.6	46.8	53.8	49.9	52
Potassium	mg/L		3	2	2	2	2	2	2	<1	2	2	2	2	2
Calcium	mg/L		51.3	45.6	53.1	55.4	51.9	52.5	46.1	14.7	52.0	43.9	45.1	46.1	43
Magnesium	mg/L		27.3	22.7	25.9	25.4	28.9	28.5	28.9	5.96	32.8	28.1	32	30.2	30
Alkalinity (as CaCO3)	mg/L		146	126	150	158	136	139	129	41	137	140	127	147	140
Sulphate	mg/L		62	58.4	68.9	64.5	69.5	67.4	71.2	16.2	68.4	59.7	55	42	57
Chloride	mg/L		97.8	83.5	97	91.7	99.7	98.1	105	23.3	105	105	105	107	114
Orthophosphate (as P)	mg/L		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.005	0.01	<0.01
Nitrate and Nitrite (as N)	mg/L		0.3	<0.2	<0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.1	0.1	<0.1
Ammonia (as N)	mg/L		<0.05	<0.03	<0.03	0.04	<0.03	<0.03	0.04	0.13	<0.03	<0.03	<0.05	<0.05	0.08
Un-ionized Ammonia	mg/L	0.02	<0.05	<0.03	<0.03	0.001	<0.0009	<0.001	0.002	0.001	<0.001	<0.001	<0.001	<0.001	0.003
Iron	mg/L	0.3	0.01	0.04	0.32	0.48	0.04	0.08	0.05	0.18	0.41	0.04	0.04	0.07	0.02
Manganese	mg/L		<0.005	0.007	0.021	0.025	0.009	0.006	0.006	0.009	0.047	0.005	<0.01	0.01	<0.01
Copper	mg/L	0.005	<0.003	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.02	<0.02	<0.02
Zinc	mg/L	0.03	0.009	0.006	0.038	0.105	0.018	0.021	0.01	0.019	0.033	0.01	<0.01	0.02	<0.01
Colour	TCU		<3	<3	18	31	<3	<3	4	16	22	<2			
Turbidity	NTU		0.6	0.9	10.2	18.6	3.6	3	0.9	5.9	25	2			
Conductivity	µS/cm		651	571	713	692	683	653	683	185	686	707	606	724	723
pH	Units	6.5-8.5	8.1	8.04	8.13	8.24	8.28	8.25	8.31	7.79	8.35	8.4	8.31	8.3	8.3
Dissolved Organic Carbon	mg/L		0.9	0.7	0.5	0.9	1	0.8	1.1	0.7	1.1	0.9	1.4	1.4	1.8
Hardness (as CaCO3)	mg/L		240	207	239	243	249	249	234	61.2	265	225	240	240	220
Bicarbonate (as CaCO3)	mg/L		144	125	148	155	134	137	126	41	134	137	125	144	138
Carbonate (as CaCO3)	mg/L		2	1	2	3	2	2	2	<1	3	3	2	3	3
Total Dissolved Solids	mg/L		382	333	389	385	389	387	384	99	396	372	370	366	378
Cation Sum	meq/L		6.96	6.03	6.91	6.90	7.23	7.24	6.94	1.73	7.56	6.59	7.29	7.02	6.68
Anion Sum	meq/L		6.99	6.09	7.17	7.11	7	6.97	7.04	1.84	7.15	7.02	6.66	6.83	7.21
% Difference	%		0.2	0.53	1.83	1.46	1.6	1.92	0.76	3.00	2.81	3.2	4.47	1.42	3.85
Animal/Vegetable Oil	mg/L		<1	<1	<1	<1	<1								<0.5
Mineral Oil	mg/L				<1	<1	<1								<0.5
Total Oil and Grease	mg/L		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0.8	<0.5	<0.5
Reactive Silica	mg/L		3.9	3.3	4.1	3.8	3.8	3.1	1.6	1.3	1.1	0.8			

NOTE: PWQO - Provincial Water Quality Objectives (February 1999)

TABLE G-3
PHASE 1 POND CHEMICAL RESULTS
MILL CREEK AGGREGATES PIT

PARAMETER	UNITS	PWQO												
Date			30-Apr-07	15-Nov-07	29-Apr-08	17-Dec-08	15-Apr-09	25-Nov-09	16-Apr-10	29-Nov-10	13-Apr-11	16-Nov-11	10-Apr-12	06-Dec-12	04-Apr-13
Sodium	mg/L		53	55	59	42	54.3	57	54	57	60	54	57	56	9.6*
Potassium	mg/L		2.4	2.6	2.5	2.0	2	2.4	2.2	2.6	2.6	2.5	2.5	2.5	<1*
Calcium	mg/L		45	44	46	52	43.9	44.7	44	46	49	45	46	50	9.88*
Magnesium	mg/L		31	32	34	26	29.6	29.7	29	33	33	30	31	31	4.48*
Alkalinity (as CaCO3)	mg/L		142	130	141	185	150	140	141	134	137	134	140	150	28
Sulphate	mg/L		81	64	46	40	45	46	46	48	47	54	52	58	8
Chloride	mg/L		110	120	110	83	110	110	120	110	120	110	110	110	19
Orthophosphate (as P)	mg/L		<0.01	0.02	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.013
Nitrate and Nitrite (as N)	mg/L		<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Ammonia (as N)	mg/L		0.07	<0.05	<0.05	0.09	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.14
Un-ionized Ammonia	mg/L	0.02	0.004	<0.001	<0.0001	0.0001	<0.0001	<0.0001	0.0004	0.0006		0.001	<0.001	<0.001	<0.001
Iron	mg/L	0.3	<0.05	<0.1	<0.1	<0.02	0.04	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.05*
Manganese	mg/L		0.005	0.007	0.004	<0.01	<0.01	<0.002	0.004	0.005	0.005	0.003	0.0045	0.0047	<0.01*
Copper	mg/L	0.005	0.005	0.001	<0.001	<0.02	<0.02	<0.001	0.001	0.002	0.001	0.001	0.0022	0.0012	<0.02*
Zinc	mg/L	0.03	0.01	0.013	0.01	<0.01	0.01	0.006	0.005	0.010	0.008	0.012	0.012	0.0091	<0.01*
Turbidity	NTU		1.9	2.5	1.2	2.1					1.1	1.3	0.9	1.6	
Conductivity	µS/cm		722	749	723	692	718	736	724	730	725	741	680	780	140
pH	Units	6.5-8.5	8.3	8.1	8.3	8.0	7.8	8.2	8.2	8.3	8.2	8.3	8.2	7.84	7.27
Dissolved Organic Carbon	mg/L						1.4	1.4		1.5					0.31
Total Organic Carbon	mg/L														
Hardness (as CaCO3)	mg/L		230	220	220	240	230	230	220	240	220	230	230	250	43
Bicarbonate (as CaCO3)	mg/L		139	130	138	183	149	138	139	131	134	131	130	150	28
Carbonate (as CaCO3)	mg/L		2	2	3	2	<1	2	2	3	2	2	2	<1.0	<1.0
Total Dissolved Solids	mg/L			389	362	357	379	373	377	377	372		372	404	68.0
Cation Sum	meq/L						7.05	7.09		7.32					1.30
Anion Sum	meq/L						7.11	6.88		6.86					1.27
% Difference	%						0.46	1.5		3.29					
Animal/Vegetable Oil	mg/L		<0.5				<0.5	1.6		<0.5					
Mineral Oil	mg/L		<0.5				<0.5	<0.5		<0.5	<0.5				
Total Oil and Grease	mg/L		<0.5	<0.5	<0.5	<0.5	<0.5	1.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.70

NOTE: PWQO - Provincial Water Quality Objectives (February 1999) * Dissolved concentration

TABLE G-3
PHASE 1 POND CHEMICAL RESULTS
MILL CREEK AGGREGATES PIT

PARAMETER	UNITS	PWQO												
Date			10-Dec-13	01-Apr-14	15-Dec-14	06-Apr-15	10-Dec-15	30-Mar-16	14-Nov-16	17-Mar-17	21-Nov-17	26-Mar-18	21-Nov-18	19-Mar-19	13-Nov-19
Sodium	mg/L		55	12	53	1.8	52	58	56	49	56	56	62	55	67
Potassium	mg/L		2.6	0.95	2.7	<0.2	3	3	3	2.6	2.6	2.8	2.8	2.4	3.0
Calcium	mg/L		55	26	53	3.1	46	52	42	45	42	41	40	36	51
Magnesium	mg/L		34	12	32	1.1	32	34	32	31	33	33	35	28	36
Alkalinity (as CaCO3)	mg/L		140	64	140	6.5	130	140	130	140	130	140	140	120	140
Sulphate	mg/L		66	12	64	1	62	60	60	60	50	49	43	39	39
Chloride	mg/L		120	22	110	4	110	110	130	120	130	120	140	130	130
Orthophosphate (as P)	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Nitrate and Nitrite (as N)	mg/L		<0.1	0.48	<0.1	<0.1	<0.1	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.11	0.11
Ammonia (as N)	mg/L		<0.05	0.33	0.056	0.088	<0.05	<0.050	<0.050	<0.050	<0.050	<0.050	0.073	0.062	<0.050
Un-ionized Ammonia	mg/L	0.02	<0.001	0.009	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.002	<0.001
Iron	mg/L	0.3	<0.1	0.75	<0.1	0.17	<0.1	<0.1	<0.1	<0.1	<0.1	<0.10	0.41	<0.10	0.2
Manganese	mg/L		0.011	0.042	0.002	0.011	0.003	0.0087	0.0029	0.0097	0.0029	0.0064	0.047	0.0064	0.013
Copper	mg/L	0.005	0.0012	0.0034	0.0011	0.0017	0.0010	0.0011	0.0012	<0.1	<0.001	<0.001	0.0022	<0.0010	0.0026
Zinc	mg/L	0.03	0.032	0.042	0.009	0.026	0.005	0.014	0.0051	0.017	0.0053	0.011	0.048	0.011	0.087
Turbidity	NTU		3.3	23	0.5	0.7	0.5	1.6	0.7	0.7	0.5	0.9	6.3	0.7	3.2
Conductivity	µS/cm		780	220	760	29	760	770	760	780	780	770	790	730	810
pH	Units	6.5-8.5	8.24	7.82	8.09	6.71	8.26	8.17	8.26	8.19	8.26	8.1	8.04	8.16	8.30
Dissolved Organic Carbon	mg/L														
Total Organic Carbon	mg/L		1.3	2.2	1.4	0.28	1.2	1.1	1.4	0.98	1.2	1.1	1.1	1.1	1.2
Hardness (as CaCO3)	mg/L		250	84	260	8.7	260	270	240	240	250	250	260	210	280
Bicarbonate (as CaCO3)	mg/L		140	64	140	6.5	130	140	130	140	130	140	130	120	130
Carbonate (as CaCO3)	mg/L		2.3	<1.0	1.6	<1.0	2.2	1.9	2.2	2.0	2.3	1.6	1.4	1.7	2.5
Total Dissolved Solids	mg/L		400	120	400	14	400	400	400	398	370	360	430	345	395
Cation Sum	meq/L														
Anion Sum	meq/L														
% Difference	%														
Animal/Vegetable Oil	mg/L														
Mineral Oil	mg/L														
Total Oil and Grease	mg/L		<0.5	<0.5	<0.5	0.80	<0.5	<0.50	<0.50	0.90	0.80	<0.50	0.60	<0.50	0.50

NOTE: PWQO - Provincial Water Quality Objectives (February 1999)

TABLE G-3
PHASE 1 POND CHEMICAL RESULTS
MILL CREEK AGGREGATES PIT

PARAMETER	UNITS	PWQO										
Date			09-Mar-20	19-Nov-20	10-Mar-21	10-Nov-21	17-Mar-22	25-Nov-22	16-Dec-22	16-Dec-22 (dup)	15-Mar-23	17-Nov-23	17-Nov-23 (dup)
Sodium	mg/L		13	73	71	75	76	91			89	95	
Potassium	mg/L		0.7	3.2	3.0	3.4	3.1	3.6			3.7	3.5	
Calcium	mg/L		12	44	40	39	40	42			41	42	
Magnesium	mg/L		5	35	33	35	33	38			38	36	
Alkalinity (as CaCO3)	mg/L		36	140	130	130	100	140			140	130	
Sulphate	mg/L		6.9	40	41	42	32	38			44	41	
Chloride	mg/L		30	140	140	150	120	170			170	180	
Orthophosphate (as P)	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010			<0.010	<0.010	
Nitrate and Nitrite (as N)	mg/L		0.15	<0.10	<0.10	<0.10	0.14	<0.10			<0.10	<0.10	
Ammonia (as N)	mg/L		0.18	<0.050	<0.050	<0.050	0.062	<0.050			<0.050	<0.050	
Un-ionized Ammonia	mg/L	0.02	0.001	<0.001	<0.001	<0.002	<0.001	<0.002			<0.001	<0.002	
Iron	mg/L	0.3	0.17	0.66	0.18	0.11	0.12	0.15			<0.1	0.24	
Manganese	mg/L		0.018	0.045	0.015	0.0098	0.013	0.019			0.0073	0.019	
Copper	mg/L	0.005	0.0011	0.0035	0.0014	<0.00090	0.0010	0.0017			0.0013	0.0012	
Zinc	mg/L	0.03	0.026	0.066	0.024	0.016	0.021	0.053			0.028	0.0062	
Turbidity	NTU		3.4	13	3.9	6.2	9.6	3.1			0.5	2.5	
Conductivity	µS/cm		190	870	850	870	690	950			960	960	
pH	Units	6.5-8.5	7.83	8.27	8.30	8.21	8.12	8.32			8.12	8.31	
Dissolved Organic Carbon	mg/L												
Total Organic Carbon	mg/L		1.2	1.0	1.1	0.77	0.86	0.86			1.0	1.0	
Hardness (as CaCO3)	mg/L		46	240	230	240	190	250			250	250	
Bicarbonate (as CaCO3)	mg/L		36	140	130	130	100	140			140	130	
Carbonate (as CaCO3)	mg/L		<1.0	2.4	2.4	2.0	1.3	2.7			1.7	2.5	
Total Dissolved Solids	mg/L		60	495	395	475	360	400			445	470	
Cation Sum	meq/L												
Anion Sum	meq/L												
% Difference	%												
Animal/Vegetable Oil	mg/L												
Mineral Oil	mg/L												
Total Oil and Grease	mg/L		<0.50	<0.50	<0.50	<0.50	<0.50	2.6	<0.50	<0.50	<0.50	1.0	0.60

NOTE: PWQO - Provincial Water Quality Objectives (February 1999)

APPENDIX H

Climate Data

TABLE H-1
30 YEAR CLIMATE NORMAL (1981 - 2010) - WATERLOO WELLINGTON A CLIMATE STATION
MILL CREEK AGGREGATES PIT

Month	Mean Temperature °C	I	E mm	Daylight Factor	E Adj. mm	Total Precipitation mm	WHC mm	Surplus mm	Deficit mm
January	-6.5	0.0	0.0	0.8	0.0	65.2	100.0	65.2	0.0
February	-5.5	0.0	0.0	0.8	0.0	54.9	100.0	54.9	0.0
March	-1.0	0.0	0.0	1.0	0.0	61.0	100.0	61.0	0.0
April	6.2	1.4	29.4	1.1	33.0	74.5	100.0	41.5	0.0
May	12.5	4.0	61.4	1.3	78.0	82.3	100.0	4.3	0.0
June	17.6	6.7	87.9	1.3	112.5	82.4	69.9	0.0	0.0
July	20.0	8.1	100.5	1.3	130.7	98.6	37.8	0.0	0.0
August	18.9	7.4	94.7	1.2	113.7	83.9	8.1	0.0	0.0
September	14.5	5.0	71.7	1.0	74.6	87.8	21.3	0.0	0.0
October	8.2	2.1	39.5	1.0	37.5	67.4	51.2	0.0	0.0
November	2.5	0.4	11.4	0.8	9.2	87.1	100.0	29.1	0.0
December	-3.3	0.0	0.0	0.8	0.0	71.2	100.0	71.2	0.0
Total	**7.0**	**35.1**			**589.1**	**916.3**		**327.2**	**0.0**
					Net Water Surplus	**327.2**	**mm**		

TABLE H-2
2011 WATER BUDGET - KITCHENER/WATERLOO CLIMATE STATION
MILL CREEK AGGREGATES PIT

Month	Mean Temperature °C	I	E mm	Daylight Factor	E Adj. mm	Total Precipitation mm	WHC mm	Surplus mm	Deficit mm
January	-8.6	0.0	0.0	0.8	0.0	21.1	100.0	21.1	0.0
February	-6.6	0.0	0.0	0.8	0.0	30.1	100.0	30.1	0.0
March	-2.2	0.0	0.0	1.0	0.0	80.8	100.0	80.8	0.0
April	6.1	1.3	26.5	1.1	29.7	60.0	100.0	30.3	0.0
May	13.5	4.5	64.1	1.3	81.5	160.0	100.0	78.5	0.0
June	17.1	6.4	83.4	1.3	106.7	66.0	59.3	0.0	0.0
July	22.2	9.5	111.3	1.3	144.7	19.5	0.0	0.0	65.9
August	19.7	7.9	97.4	1.2	116.8	64.2	0.0	0.0	52.6
September	15.4	5.5	74.5	1.0	77.4	101.5	24.1	0.0	0.0
October	9.0	2.4	41.0	1.0	38.9	124.7	100.0	9.8	0.0
November	5.3	1.1	22.7	0.8	18.4	110.6	100.0	92.2	0.0
December	-0.5	0.0	0.0	0.8	0.0	84.1	100.0	84.1	0.0
Total	**7.5**	**38.6**			**614.2**	**922.6**		**426.9**	**118.6**
					Net Water Surplus	**308.4**	**mm**		

Notes:
- calculations based on Thornthwaite Mather Method
- °C calculated mean of daily temperatures for the month, in degrees Celcius
- I denotes Heat Index
- E denotes Evapotranspiration
- WHC denotes Water Holding Capacity
- A value of 100 mm was used for the water holding capacity of the soils
- Climate normal data from the Environment Canada Waterloo Wellington A climatological station located at latitude 43°27'00"N, longitude 80°23'00"W
- 2011 temperature and precipitation data from the Environment Canada Kitchener-Waterloo climatological station located at latitude 43°27'39"N, longitude 80°22'43'

TABLE H-3
2012 WATER BUDGET - KITCHENER/WATERLOO CLIMATE STATION
MILL CREEK AGGREGATES PIT

Month	Mean Temperature °C	I	E mm	Daylight Factor	E Adj. mm	Total Precipitation mm	WHC mm	Surplus mm	Deficit mm
January	-3.2	0.0	0.0	0.8	0.0	41.9	100.0	41.9	0.0
February	-1.8	0.0	0.0	0.8	0.0	22.9	100.0	22.9	0.0
March	6.1	1.3	25.9	1.0	26.5	29.6	100.0	3.1	0.0
April	5.8	1.3	24.8	1.1	27.7	29.3	100.0	1.6	0.0
May	15.1	5.3	72.2	1.3	91.7	11.3	19.6	0.0	0.0
June	18.6	7.3	91.0	1.3	116.5	111.1	14.2	0.0	0.0
July	22.0	9.4	109.7	1.3	142.6	31.9	0.0	0.0	96.5
August	19.3	7.7	94.6	1.2	113.5	58.7	0.0	0.0	54.8
September	14.4	4.9	68.0	1.0	70.8	101.2	30.4	0.0	0.0
October	9.0	2.4	40.3	1.0	38.3	140.0	100.0	32.2	0.0
November	1.9	0.2	7.0	0.8	5.7	13.7	100.0	8.0	0.0
December	-0.2	0.0	0.0	0.8	0.0	63.9	100.0	63.9	0.0
Total	**8.9**	**39.9**			**633.3**	**655.5**		**173.5**	**151.4**
					Net Water Surplus	**22.2**	**mm**		

TABLE H-4
2013 WATER BUDGET - KITCHENER/WATERLOO CLIMATE STATION
MILL CREEK AGGREGATES PIT

Month	Mean Temperature °C	I	E mm	Daylight Factor	E Adj. mm	Total Precipitation mm	WHC mm	Surplus mm	Deficit mm
January	-4.0	0.0	0.0	0.8	0.0	77.9	100.0	77.9	0.0
February	-6.9	0.0	0.0	0.8	0.0	47.8	100.0	47.8	0.0
March	-1.7	0.0	0.0	1.0	0.0	26.1	100.0	26.1	0.0
April	5.3	1.1	24.8	1.1	27.8	99.2	100.0	71.4	0.0
May *	13.7	4.6	67.6	1.3	85.8	68.7	82.9	0.0	0.0
June *	17.4	6.6	87.0	1.3	111.3	121.7	93.2	0.0	0.0
July *	20.4	8.3	102.3	1.3	133.0	137.6	97.8	0.0	0.0
August *	18.3	7.1	91.5	1.2	109.8	52.4	40.4	0.0	0.0
September *	14.3	4.9	70.5	1.0	73.3	71.0	38.1	0.0	0.0
October *	9.5	2.6	45.8	1.0	43.5	128.4	100.0	23.0	0.0
November	0.7	0.1	3.2	0.8	2.6	32.9	100.0	30.3	0.0
December	-5.5	0.0	0.0	0.8	0.0	50.0	100.0	50.0	0.0
Total	**6.8**	**35.3**			**587.1**	**913.7**		**326.6**	**0.0**
					Net Water Surplus	**326.6**	**mm**		

Notes:
- calculations based on Thornthwaite Mather Method
- °C calculated mean of daily temperatures for the month, in degrees Celcius
- I denotes Heat Index
- E denotes Evapotranspiration
- WHC denotes Water Holding Capacity
- A value of 100 mm was used for the water holding capacity of the soils
- Temperature and precipitation data from the Environment Canada Kitchener-Waterloo climatological station located at latitude 43°27'39"N, longitude 80°22'43"W

TABLE H-5
2014 WATER BUDGET - SHADE'S MLLS CLIMATE STATION
MILL CREEK AGGREGATES PIT

Month	Mean Temperature °C	I	E mm	Daylight Factor	E Adj. mm	Total Precipitation mm	WHC mm	Surplus mm	Deficit mm
January	-9.5	0.0	0.0	0.8	0.0	90.7	100.0	90.7	0.0
February	-9.8	0.0	0.0	0.8	0.0	70.5	100.0	70.5	0.0
March	-5.9	0.0	0.0	1.0	0.0	45.0	100.0	45.0	0.0
April	6.2	1.4	26.2	1.1	29.4	87.2	100.0	57.8	0.0
May *	14.3	4.9	67.3	1.3	85.5	79.1	93.6	0.0	0.0
June *	20.7	8.5	102.2	1.3	130.8	51.6	14.4	0.0	0.0
July *	20.4	8.4	100.5	1.3	130.7	127.9	11.6	0.0	0.0
August *	20.0	8.1	98.3	1.2	118.0	25.2	0.0	0.0	81.1
September *	16.5	6.1	79.1	1.0	82.3	144.2	61.9	0.0	0.0
October *	10.3	3.0	46.5	1.0	44.2	71.8	89.5	0.0	0.0
November	1.0	0.1	3.4	0.8	2.7	78.2	100.0	65.0	0.0
December	-0.4	0.0	0.0	0.8	0.0	27.3	100.0	27.3	0.0
Total	**7.0**	**40.4**			**623.5**	**898.7**		**356.3**	**81.1**
					Net Water Surplus	**275.2**	**mm**		

TABLE H-6
2015 WATER BUDGET - SHADE'S MLLS CLIMATE STATION
MILL CREEK AGGREGATES PIT

Month	Mean Temperature °C	I	E mm	Daylight Factor	E Adj. mm	Total Precipitation mm	WHC mm	Surplus mm	Deficit mm
January	-8.6	0.0	0.0	0.8	0.0	35.0	100.0	35.0	0.0
February	-14.2	0.0	0.0	0.8	0.0	56.3	100.0	56.3	0.0
March	-3.3	0.0	0.0	1.0	0.0	14.0	100.0	14.0	0.0
April	6.7	1.6	25.9	1.1	29.0	98.9	100.0	69.9	0.0
May	17.1	6.4	79.8	1.3	101.3	69.4	68.1	0.0	0.0
June	18.4	7.2	87.1	1.3	111.5	160.3	100.0	16.8	0.0
July	21.5	9.0	105.0	1.3	136.5	69.7	33.2	0.0	0.0
August	20.5	8.4	99.2	1.2	119.0	85.0	0.0	0.0	0.9
September	19.7	7.9	94.6	1.0	98.4	72.6	0.0	0.0	25.8
October	9.7	2.7	40.4	1.0	38.4	84.0	45.6	0.0	0.0
November	6.5	1.5	25.0	0.8	20.2	54.4	79.8	0.0	0.0
December	3.5	0.6	11.9	0.8	9.3	59.2	100.0	29.7	0.0
Total	**8.1**	**45.3**			**663.7**	**858.8**		**221.7**	**26.6**
					Net Water Surplus	**195.1**	**mm**		

Notes:
- calculations based on Thornthwaite Mather Method
- °C calculated mean of daily temperatures for the month, in degrees Celcius
- I denotes Heat Index
- E denotes Evapotranspiration
- WHC denotes Water Holding Capacity
- A value of 100 mm was used for the water holding capacity of the soils
- Temperature and precipitation data from the Grand River Conservation Authority Shade's Mills climatological station located at latitude 43°23'00"N, longitude 80°17'00"W

TABLE H-7
2016 WATER BUDGET - SHADE'S MLLS CLIMATE STATION
MILL CREEK AGGREGATES PIT

Month	Mean Temperature °C	I	E mm	Daylight Factor	E Adj. mm	Total Precipitation mm	WHC mm	Surplus mm	Deficit mm
January	-4.5	0.0	0.0	0.8	0.0	44.8	100.0	44.8	0.0
February	-3.0	0.0	0.0	0.8	0.0	52.4	100.0	52.4	0.0
March	2.4	0.3	6.9	1.0	7.1	99.5	100.0	92.4	0.0
April	4.7	0.9	15.8	1.1	17.7	90.8	100.0	73.1	0.0
May	14.9	5.2	66.2	1.3	84.0	31.8	47.8	0.0	0.0
June	19.7	7.9	93.5	1.3	119.7	42.2	0.0	0.0	29.7
July	23.4	10.3	115.7	1.3	150.4	93.0	0.0	0.0	57.4
August	23.8	10.5	118.2	1.2	141.8	183.3	41.5	0.0	0.0
September	19.1	7.6	90.0	1.0	93.6	68.8	16.7	0.0	0.0
October	11.8	3.7	49.6	1.0	47.1	45.8	15.4	0.0	0.0
November	6.3	1.4	22.8	0.8	18.5	67.6	64.6	0.0	0.0
December	-2.0	0.0	0.0	0.8	0.0	113.5	100.0	78.1	0.0
Total	**9.7**	**47.8**			**679.9**	**933.5**		**340.7**	**87.1**
					Net Water Surplus	**253.6**	**mm**		

TABLE H-8
2017 WATER BUDGET - SHADE'S MLLS CLIMATE STATION
MILL CREEK AGGREGATES PIT

Month	Mean Temperature °C	I	E mm	Daylight Factor	E Adj. mm	Total Precipitation mm	WHC mm	Surplus mm	Deficit mm
January	-2.2	0.0	0.0	0.8	0.0	110.2	100.0	110.2	0.0
February	-0.3	0.0	0.0	0.8	0.0	77.1	100.0	77.1	0.0
March	-0.3	0.0	0.0	1.0	0.0	93.4	100.0	93.4	0.0
April	9.3	2.6	39.2	1.1	43.9	120.3	100.0	76.4	0.0
May	12.5	4.0	55.6	1.3	70.6	137.1	100.0	66.5	0.0
June	19.5	7.8	94.0	1.3	120.3	78.9	58.6	0.0	0.0
July	21.6	9.1	106.1	1.3	137.9	92.6	13.3	0.0	0.0
August	20.4	8.4	99.1	1.2	119.0	138.0	32.3	0.0	0.0
September	18.8	7.4	90.0	1.0	93.6	25.5	0.0	0.0	35.8
October	13.1	4.3	58.8	1.0	55.8	76.6	20.8	0.0	0.0
November	3.0	0.5	10.3	0.8	8.4	88.7	100.0	1.1	0.0
December	-4.7	0.0	0.0	0.8	0.0	53.4	100.0	53.4	0.0
Total	**9.2**	**44.0**			**649.6**	**1091.8**		**478.0**	**35.8**
					Net Water Surplus	**442.2**	**mm**		

Notes:
- calculations based on Thornthwaite Mather Method
- °C calculated mean of daily temperatures for the month, in degrees Celcius
- I denotes Heat Index
- E denotes Evapotranspiration
- WHC denotes Water Holding Capacity
- A value of 100 mm was used for the water holding capacity of the soils
- Temperature and precipitation data from the Grand River Conservation Authority Shade's Mills climatological station located at latitude 43°23'00"N, longitude 80°17'00"W
- Missing data was infilled with data from the Grand River Conservation Authority's Guelph Lake climatological station

TABLE H-9
2018 WATER BUDGET - SHADE'S MLLS CLIMATE STATION
MILL CREEK AGGREGATES PIT

Month	Mean Temperature °C	I	E mm	Daylight Factor	E Adj. mm	Total Precipitation mm	WHC mm	Surplus mm	Deficit mm
January	-6.9	0.0	0.0	0.8	0.0	87.4	100.0	87.4	0.0
February	-2.5	0.0	0.0	0.8	0.0	81.5	100.0	81.5	0.0
March	-0.5	0.0	0.0	1.0	0.0	32.5	100.0	32.5	0.0
April	3.0	0.5	8.7	1.1	9.7	139.7	100.0	130.0	0.0
May	17.9	6.9	82.4	1.3	104.6	57.3	52.7	0.0	0.0
June	24.4	11.0	121.7	1.3	155.7	86.5	0.0	0.0	16.5
July	23.4	10.3	115.4	1.3	150.0	71.1	0.0	0.0	78.9
August	23.3	10.2	114.8	1.2	137.8	165.5	27.7	0.0	0.0
September	19.4	7.7	91.1	1.0	94.8	51.1	0.0	0.0	15.9
October	9.3	2.6	36.1	1.0	34.3	92.9	58.6	0.0	0.0
November	1.5	0.2	3.6	0.8	2.9	121.4	100.0	77.1	0.0
December	-0.5	0.0	0.0	0.8	0.0	55.3	100.0	55.3	0.0
Total	**9.3**	**49.2**			**689.9**	**1042.2**		**463.8**	**111.4**
					Net Water Surplus	**352.3**	**mm**		

TABLE H-10
2019 WATER BUDGET - SHADE'S MLLS CLIMATE STATION
MILL CREEK AGGREGATES PIT

Month	Mean Temperature °C	I	E mm	Daylight Factor	E Adj. mm	Total Precipitation mm	WHC mm	Surplus mm	Deficit mm
January	-6.7	0.0	0.0	0.8	0.0	74.7	100.0	74.7	0.0
February	-4.8	0.0	0.0	0.8	0.0	66.4	100.0	66.4	0.0
March	-1.5	0.0	0.0	1.0	0.0	73.4	100.0	73.4	0.0
April	5.9	1.3	23.9	1.1	26.7	99.3	100.0	72.6	0.0
May	12.8	4.1	58.3	1.3	74.0	123.3	100.0	49.3	0.0
June	18.8	7.4	90.8	1.3	116.3	79.8	63.5	0.0	0.0
July	23.7	10.5	118.7	1.3	154.3	143.0	52.2	0.0	0.0
August	21.3	8.9	104.9	1.2	125.9	64.6	0.0	0.0	9.1
September	17.8	6.8	85.3	1.0	88.7	79.5	0.0	0.0	9.2
October	10.6	3.1	46.9	1.0	44.6	141.1	96.5	0.0	0.0
November	0.9	0.1	2.7	0.8	2.2	62.4	100.0	56.7	0.0
December	-0.9	0.0	0.0	0.8	0.0	55.6	100.0	55.6	0.0
Total	**8.2**	**42.2**			**632.7**	**1063.1**		**448.7**	**18.3**
					Net Water Surplus	**430.4**	**mm**		

Notes:
- calculations based on Thornthwaite Mather Method
- °C calculated mean of daily temperatures for the month, in degrees Celcius
- I denotes Heat Index
- E denotes Evapotranspiration
- WHC denotes Water Holding Capacity
- A value of 100 mm was used for the water holding capacity of the soils
- Temperature and precipitation data from the Grand River Conservation Authority Shade's Mills climatological station located at latitude 43°23'00"N, longitude 80°17'00"W
- Missing data was infilled with data from the Grand River Conservation Authority's Guelph Lake climatological station

TABLE H-11
2020 WATER BUDGET - SHADE'S MLLS CLIMATE STATION
MILL CREEK AGGREGATES PIT

Month	Mean Temperature °C	I	E mm	Daylight Factor	E Adj. mm	Total Precipitation mm	WHC mm	Surplus mm	Deficit mm
January	-1.4	0.0	0.0	0.8	0.0	130.9	100.0	130.9	0.0
February	-3.6	0.0	0.0	0.8	0.0	38.6	100.0	38.6	0.0
March	2.4	0.3	7.7	1.0	7.9	83.4	100.0	75.5	0.0
April	5.8	1.3	22.0	1.1	24.7	43.3	100.0	18.6	0.0
May	12.7	4.1	56.1	1.3	71.3	52.7	81.4	0.0	0.0
June	20.5	8.4	99.4	1.3	127.2	61.7	15.9	0.0	0.0
July	25.0	11.4	125.9	1.3	163.7	58.9	0.0	0.0	88.9
August	22.2	9.5	109.3	1.2	131.2	72.6	0.0	0.0	58.6
September	16.1	5.8	74.5	1.0	77.5	46.4	0.0	0.0	31.1
October	9.3	2.6	38.7	1.0	36.8	91.4	54.6	0.0	0.0
November	6.4	1.5	24.8	0.8	20.1	57.7	92.2	0.0	0.0
December	-0.6	0.0	0.0	0.8	0.0	110.0	100.0	102.2	0.0
Total	**9.6**	**44.8**			**660.3**	**847.6**		**365.9**	**178.6**
					Net Water Surplus	**187.3**	**mm**		

TABLE H-12
2021 WATER BUDGET - SHADE'S MLLS CLIMATE STATION
MILL CREEK AGGREGATES PIT

Month	Mean Temperature °C	I	E mm	Daylight Factor	E Adj. mm	Total Precipitation mm	WHC mm	Surplus mm	Deficit mm
January	-2.7	0.0	0.0	0.8	0.0	32.6	100.0	32.6	0.0
February	-6.1	0.0	0.0	0.8	0.0	54.2	100.0	54.2	0.0
March	3.4	0.6	10.3	1.0	10.5	53.4	100.0	42.9	0.0
April	8.9	2.4	34.4	1.1	38.5	64.9	100.0	26.4	0.0
May	14.1	4.8	61.4	1.3	78.0	33.0	55.0	0.0	0.0
June	22.1	9.5	107.8	1.3	137.9	132.2	49.2	0.0	0.0
July	21.3	8.9	102.9	1.3	133.8	95.3	10.7	0.0	0.0
August	23.8	10.6	118.2	1.2	141.8	83.5	0.0	0.0	47.6
September	17.5	6.6	80.2	1.0	83.4	222.7	100.0	39.3	0.0
October	13.9	4.7	60.4	1.0	57.4	129.7	100.0	72.3	0.0
November	3.6	0.6	11.0	0.8	8.9	46.1	100.0	37.2	0.0
December	0.9	0.1	2.0	0.8	1.6	72.4	100.0	70.8	0.0
Total	**10.1**	**48.7**			**691.9**	**1020.0**		**375.7**	**47.6**
					Net Water Surplus	**328.1**	**mm**		

Notes:
- calculations based on Thornthwaite Mather Method
- °C calculated mean of daily temperatures for the month, in degrees Celcius
- I denotes Heat Index
- E denotes Evapotranspiration
- WHC denotes Water Holding Capacity
- A value of 100 mm was used for the water holding capacity of the soils
- Temperature and precipitation data from the Grand River Conservation Authority Shade's Mills climatological station located at latitude 43°23'00"N, longitude 80°17'00"W
- Missing data was infilled with data from the Grand River Conservation Authority's Guelph Lake climatological station

TABLE H-13
2022 WATER BUDGET - SHADE'S MLLS CLIMATE STATION
MILL CREEK AGGREGATES PIT

Month	Mean Temperature °C	I	E mm	Daylight Factor	E Adj. mm	Total Precipitation mm	WHC mm	Surplus mm	Deficit mm
January	-8.4	0.0	0.0	0.8	0.0	36.6	100.0	36.6	0.0
February	-5.4	0.0	0.0	0.8	0.0	109.7	100.0	109.7	0.0
March	1.0	0.1	2.6	1.0	2.7	64.4	100.0	61.7	0.0
April	6.9	1.6	26.7	1.1	29.9	36.6	100.0	6.7	0.0
May	16.1	5.8	74.0	1.3	94.0	55.1	61.1	0.0	0.0
June	19.8	8.0	95.2	1.3	121.9	57.2	0.0	0.0	3.6
July	22.7	9.8	112.1	1.3	145.7	33.0	0.0	0.0	112.7
August	22.3	9.6	109.8	1.2	131.8	87.2	0.0	0.0	44.6
September	17.8	6.8	83.8	1.0	87.1	28.2	0.0	0.0	58.9
October	10.0	2.8	41.6	1.0	39.5	52.5	13.0	0.0	0.0
November	4.7	0.9	16.9	0.8	13.7	39.7	39.0	0.0	0.0
December	-0.9	0.0	0.0	0.8	0.0	82.1	100.0	21.1	0.0
Total	**8.9**	**45.5**			**666.3**	**682.3**		**235.8**	**219.8**
					Net Water Surplus	**16.0**	**mm**		

TABLE H-14
2023 WATER BUDGET - SHADE'S MLLS CLIMATE STATION
MILL CREEK AGGREGATES PIT

Month	Mean Temperature °C	I	E mm	Daylight Factor	E Adj. mm	Total Precipitation mm	WHC mm	Surplus mm	Deficit mm
January	-2.3	0.0	0.0	0.8	0.0	71.2	100.0	71.2	0.0
February	-2.8	0.0	0.0	0.8	0.0	45.2	100.0	45.2	0.0
March	-0.6	0.0	0.0	1.0	0.0	121.3	100.0	121.3	0.0
April	7.8	1.9	36.4	1.1	40.8	87.2	100.0	46.4	0.0
May	12.2	3.9	59.1	1.3	75.1	55.6	80.5	0.0	0.0
June	17.4	6.6	86.4	1.3	110.6	81.1	51.0	0.0	0.0
July	19.5	7.8	97.3	1.3	126.4	203.2	100.0	27.8	0.0
August	17.8	6.8	88.5	1.2	106.1	116.5	100.0	10.4	0.0
September	16.2	5.9	80.0	1.0	83.2	22.1	38.9	0.0	0.0
October	10.2	2.9	48.5	1.0	46.1	61.0	53.8	0.0	0.0
November	2.2	0.3	9.3	0.8	7.6	42.7	89.0	0.0	0.0
December	1.8	0.2	7.7	0.8	6.0	75.9	100.0	58.9	0.0
Total	**8.3**	**36.4**			**601.8**	**983.0**		**381.2**	**0.0**
					Net Water Surplus	**381.2**	**mm**		

Notes:
- calculations based on Thornthwaite Mather Method
- °C calculated mean of daily temperatures for the month, in degrees Celcius
- I denotes Heat Index
- E denotes Evapotranspiration
- WHC denotes Water Holding Capacity
- A value of 100 mm was used for the water holding capacity of the soils
- Precipitation data from the Grand River Conservation Authority Shade's Mills climatological station located at latitude 43°23'00"N, longitude 80°17'00"W
- 2022 Temperature data from the Grand River Conservation Authority Shade's Mills climatological station located at latitude 43°23'00"N, longitude 80°17'00"W
- 2023 Temperature data from the Environment and Climate Change Canada Kitchener/Waterloo climatological station located at latitude 43°27'39"N, longitude 80°2

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Attachment 5

Natural Environment Technical Report (NETR)

Proposed Site Plan Amendment (SPA)
Mill Creek Pit
Dufferin Aggregates
Township of Puslinch

August 2024

Submitted to:

Dufferin Aggregates
A Division of CRH Canada Group Inc.
2300 Steeles Avenue West, 4th Floor
Concord Ontario L4K 5X6

Prepared by:

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MILL CREEK PIT SITE PLAN AMENDMENT
NATURAL ENVIRONMENT TECHNICAL REPORT

GOODBAN ECOLOGICAL CONSULTING INC. (GEC)

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Attachment B Representative Site Photographs (2022)

Attachment C Vascular Plant List (2022)

Attachment D Significant Wildlife Habitat – Screening and Assessment

1.0 INTRODUCTION

1.1 Background

Goodban Ecological Consulting Inc. (GEC) was retained by Dufferin Aggregates to prepare a Natural Environment Technical Report (NETR) for a proposed Site Plan Amendment (SPA) for the Mill Creek Pit in the Township of Puslinch, County of Wellington, Ontario. The Licensee for the Mill Creek Pit (Licence 5738) is the University of Guelph and the pit is operated by Dufferin Aggregates.

The Mill Creek Pit is located on the north and south sides of Concession Road 2, between Sideroad 20 South and Sideroad 25 South, in the Township of Puslinch (**Figure 1**). The legal description is Part of Lots 21, 22, 23 and 24, Concession II, Part of Lot 24, Concession I, Township of Puslinch, County of Wellington. The Mill Creek Pit has Phases 1 through 6. Phases 1, 3, 4 and 5 are located on the north side of Concession Road 2, while Phases 2 and 6 are located on the south side. All six phases involve below water extraction. The total area that is licenced covers 188.6 ha. The extraction area is 122.1 ha in total. Adjacent land uses in the vicinity are a mix of aggregate extraction, natural heritage, agricultural, rural residential and, immediately to the north, the Highway 401 corridor.

Phase 5 is intended to be the final phase of extraction at the Mill Creek Pit. Phase 5 encompasses the plant area and the access from Concession Road 2. The proposed Site Plan Amendment (SPA) will add 2.5 ha to the extraction area of Phase 5. Following the decommissioning and removal of the plant equipment, aggregate material will be trucked to Dufferin's nearby Aberfoyle Pit 1 for processing. The entire SPA area was previously disturbed as part of pit operations; it includes part of the access from Concession Road 2, a yard area with small shop buildings, part of a conveyor route and berms.

The Ministry of Natural Resources (MNR) has requested that a Natural Environment Technical Report (NETR) be prepared for the proposed Site Plan Amendment.

1.2 Natural Environment Technical Report Requirements under the Aggregate Resources Act (ARA)

Under the *Aggregate Resources Act* there is a requirement to complete a Natural Environment Report to identify any of the following natural heritage features and areas that exist on the site and within 120 metres of the site:

a) significant wetlands;
b) other coastal wetlands in Ecoregions 5E, 6E and 7E;
c) fish habitat;
d) significant woodlands and significant valleylands in Ecoregions 6E and 7E (excluding islands in Lake Huron and the St. Mary's River);
e) habitat of endangered species and threatened species;
f) significant wildlife habitat;
g) significant areas of natural and scientific interest; and,
h) Within the area of one or more provincial plan(s), any key natural heritage features not included in (a) through (g).

The Aggregate Resources of Ontario: Technical Reports and Information Standards issued under O. Reg. 466/20 sets the standards for how the technical reports must be prepared. The standards provide the following guidance in preparing the Natural Environment Report:

> *"Where any of the above features or areas have been identified, the report must identify and evaluate any negative impacts on the natural features or areas, including their ecological functions, and identify any proposed preventative, mitigative or remedial measures. The report must also identify if the site or any of the features, included in (a) through (g), are located within a natural heritage system that has been identified by a municipality in ecoregions 6E and 7E or by the province as part of a provincial plan."*

1.3 Organization of this Report

This Natural Environment Technical Report (NETR) is organized under the following headings:

- 2.0 Natural Heritage Screening
- 3.0 Study Approach and Methods
- 4.0 Existing Conditions
- 5.0 Description of the Proposed Extraction and Operations
- 6.0 Natural Environment Technical Recommendations (Operations & Rehabilitation)
- 7.0 Summary and Conclusions
- 8.0 Literature Cited

2.0 NATURAL HERITAGE SCREENING

2.1 Natural Heritage Screening Methods

The study area is defined as the proposed licensed area and the surrounding 120 m (adjacent lands), as shown on **Figure 2**. The Natural Heritage Screening involved a review of available background information and ecological field surveys completed during 2022. The details (methods, dates, etc.) of the field surveys are provided below in **Section 3.0** and the findings of the field surveys are provided in **Sections 4.3** and **4.4**.

Background information sources included the following:

- Schedules from the County of Wellington and Township of Puslinch Official Plans.
- Lands Information Ontario (LIO) and GRCA online mapping.
- Natural Heritage Information Centre (NHIC) database.

2.2 Significant Wetlands and Significant Coastal Wetlands

A review of Land Information Ontario (LIO) and GRCA online natural heritage mapping indicates that there are no Significant Wetlands within the Mill Creek Pit SPA study area.

The site is distant from the shorelines of the Great Lakes and, as such, there are no Significant Coastal Wetlands present.

2.3 Habitat of Endangered Species and Threatened Species

The site is located within 1km square 17NJ6710. The NHIC database lists records of Bobolink (Threatened) and Eastern Meadowlark (Threatened) for this 1km square. Both are grassland bird species. Potential habitat for these species is quite marginal and limited to the grassed berms which are only around 45 m wide. Neither species was observed during the 2022 breeding bird surveys and they are considered absent from the SPA study area.

The NHIC database includes records of Bobolink (*Dolichonyx oryzivorus*) and Eastern Meadowlark (*Sturnella magna*); both species are listed as Threatened in Ontario. The habitats within the SPA study area are generally unsuitable for these two grassland species. The 'old field' areas are mainly grassed berms that are small and narrow (only 45 m wide), and other areas contain too many trees. Both species are conspicuous and readily detected if present; they were not observed on May 28, June 10, and July 14, 2022 and considered absent from the SPA study area.

There are no Endangered or Threatened species, or their habitats, within the SPA study area.

2.4 Fish Habitat

The study area includes portions of pit lakes associated with Phases 1 and 4. Both pit lakes are actively used for pit operations and they are isolated features with no direct connection to any nearby watercourses. Isolated pit lakes are not considered to be fish habitat, as defined by the federal Department of Fisheries and Oceans (DFO).

2.5 Significant Woodlands

No Significant Woodlands have been identified within the study area. The only woodland feature within the Natural Environment Study Area is the narrow strip of Dry-Fresh Trembling Aspen Deciduous Forest (FOD3-1) mapped on **Figure 3**. This feature is too small (0.21 ha) and narrow (25 m wide) to be considered a Significant Woodland. The nearest Significant Woodland is associated with Mill Creek, approximately 400 m to the northwest of the proposed SPA area at the closest point.

2.6 Significant Valleylands

No Significant Valleylands have been identified within the study area. There are no valley features within the study area.

2.7 Significant Wildlife Habitat (SWH)

Based on a review of background information and the findings of the 2022 field surveys, no Significant Wildlife Habitat (SWH) was identified by GEC within the Mill Creek Pit SPA study area. The SWH screening completed by GEC is provided in **Attachment D**.

2.8 Significant Areas of Natural and Scientific Interest

Significant Areas of Natural and Scientific Interest (ANSI) are defined in the PPS (2020) as an area identified as provincially significant by the Ontario Ministry of Natural Resources using evaluation procedures established by the province, as amended from time to time.

GEC reviewed Land Information Ontario (LIO) mapping and determined that there are no Significant Areas of Natural and Scientific Interest (ANSI) within the study area.

2.9 Growth Plan 2017 - Additional Key Natural Heritage Features

The SPA area is located within the Growth Plan. As outlined in Section 1.2 of this report, the NETR must consider any key natural heritage features of the Growth Plan not already addressed in Section 2.2 to 2.8 of this report. This includes the following key natural heritage features: non-significant wetlands, sand barrens, savannahs, tallgrass prairies and alvars. There are no sand barrens, savannahs, tallgrass prairies or alvars within the SPA study area.

The term “non-significant wetlands” is interpreted by GEC to mean *wetlands that were evaluated under the Ontario Wetland Evaluation System (OWES) that are not provincially significant.* There are no “non-significant wetlands” identified within the SPA study area.

The *Ontario Wetland Evaluation System* or *OWES* (MNRF 2022), states the following on page 9:

> *“In general, wetlands smaller than 2 ha (5 acres) are not evaluated. However very small wetlands can provide habitat for wildlife or serve other ecological, hydrological, hydrogeological or social functions. A wetland smaller than 2 ha can be evaluated (and undergo a full wetland evaluation) provided that the rationale for doing so is included in the Wetland Evaluation Data and Scoring Record (WEDSR).”*

OWES (MNRF 2022), page 41:

> *“The minimum size of a wetland type for mapping purposes is typically 0.5 hectares. This minimum mapping size can be smaller when highlighting a specialized community. Some examples include: a small kettle wetland within an open water central pond ringed by emergent marsh, a small floating fen at the edge of a swamp or marsh, and a tiny bog located within a fen or swamp.”*

There is a very small (0.1 ha) feature identified in this NETR as a Mineral Meadow Marsh Ecosite (European Common Reed) (Unit MAM2). This feature is highly disturbed and dominated by invasive wetland species such as European Common Reed (*Phragmites australis* ssp. *australis* +), Reed Canary Grass (*Phalaris arundinacea*) and Purple Loosestrife (*Lythrum*

salicaria +). No significant wetland features or functions were identified by GEC and, in GEC's opinion, there is no rationale for evaluating Unit MAM2 under the OWES. As noted above, there are no "non-significant wetlands" within the SPA study area. It is noted that the principal of GEC, Mr. Anthony Goodban, has been certified to evaluate wetlands in Ontario using the OWES since 1994.

Unit MAM2 will not be directly or indirectly negatively affected as a result of the proposed Site Plan Amendment.

2.10 Natural Heritage Screening: Conclusions and Recommendations

As described above in **Section 1.2**, the ARA requires that a Natural Environment Technical Report (NETR) must identify which, if any, of the 8 types of natural heritage features and areas listed exist within the proposed SPA area (the "site") and within 120 metres of the site.

Of the potential natural heritage features that are listed above in **Section 1.2**, none were found to occur within the SPA study area. With respect to any key natural heritage features of the Growth Plan not already addressed in Section 2.2 to 2.8 of this report, such as non-significant wetlands, sand barrens, savannahs, tallgrass prairies and alvars, none were found to occur within the SPA study area.

Natural environment technical recommendations are provided in **Section 6.0**.

3.0 STUDY APPROACH AND METHODS

This section describes the methods used to conduct the details surveys of vegetation, flora and wildlife and outlines the resulting natural environment input provided to the proposed extraction footprint, operational plan, ecological management plan and rehabilitation plan.

3.1 Vegetation and Flora

Surveys of vegetation and flora were completed in 2022. The dates and details of the various site visits are provided in **Table 1**.

Vegetation communities were classified and mapped following Lee et al.'s (1998) *Ecological Land Classification for Southern Ontario: A First Approximation* and the updated *Vegetation Type List* (Lee 2008).

Vascular plant species status was assessed for Ontario (Oldham and Brinker 2009) and MNR 'old' Central Region (MNR 1989).

3.2 Wildlife

The wildlife groups that were inventoried included selected orders of invertebrates, amphibians, reptiles, birds, and mammals. The dates and details of the various site visits are provided in **Table 1**.

Invertebrates

The invertebrate groups that were studied included odonates and butterflies. The invertebrate inventory was completed primarily by documenting all species observed while conducting other surveys.

Amphibians

No suitable breeding habitat for amphibians was identified within the SPA study area. Searches for amphibians were undertaken while conducting other surveys.

Reptiles - Snakes

No reptiles that are species of conservation concern are known to occur in the general area or would be expected within the study area. Consequently, no detailed studies on reptiles were undertaken, such as snake-board surveys. Snakes were searched for while conducting other aspects of the inventories. Snake emergence surveys were completed on May 6 and 28, 2022, around potential hibernaculum sites (e.g., foundations).

Reptiles - Turtles

The shorelines of the Phase 1 and Phase 4 pit lakes and nearby areas were surveyed for signs of turtle nesting activity on May 28 and June 10, 2022.

Birds

Birds were the most intensively studied group of wildlife, with an emphasis on the bird breeding season. Breeding bird surveys were conducted during the 2022 breeding season. Survey details (dates, times, weather, etc.) are provided in **Table 1**.

Breeding bird surveys were completed on May 28 and July 14, 2022. The second survey was completed just after the end of the typical breeding bird survey period (July 10), due to COVID-19 infections within the project team. Considering the species observed within the SPA study area, the timing of the second survey did not materially affect the results.

A wandering transect approach was utilized for the surveys, with the intent of documenting singing birds which may not have been recording using fixed point counts in an active gravel pit with the pit entrance bisecting the SPA study area. The wandering transects followed during the 2022 breeding bird surveys are shown on **Figure 4**.

Mammals

Mammals were searched for during each ecological survey visit. Presence of mammal species was determined through direct observations and signs such as tracks, burrows, nests, and scats.

4.0 EXISTING CONDITIONS

4.1 Landscape Setting

4.1.1 Terrain Setting

The regional till moraines are classified as part of the Horseshoe Moraines physiographic region, and in particular the Paris and Galt moraines (Chapman and Putnam 1984). The Paris and Galt moraine region stretches a distance of approximately 130 kilometres (km) from Caledon to Lake Erie, are upwards of 11 km in width, and have relief of upwards of 30 m.

The regional physiography and distribution of unconsolidated sediments, including sand and gravel deposits, are largely the result of glacial activity that took place in the late Wisconsinan substage of the Pleistocene Epoch, which ended approximately 10,000 years ago (OGS 1998). Glacial activity in this area has created subsurface conditions that can be very variable over short distances. The most prominent glacial features in the area are till moraines and spillways.

The subject property is located in Ecodistrict 6E-1, which is part of the larger Ecoregion 6E or Mixedwood Plains Region. Ecodistrict 6E-1 has been more recently called the Stratford Ecodistrict by Wester et al. (2018), who describe its location, extent and forest vegetation as follows:

> *Located in the central portion of southwestern Ontario, Ecodistrict 6E-1 encompasses 926,054 ha (14.7% of the ecoregion, 0.9% of the province). The boundary extends from near the community of Zurich in the west to the community of Acton in the east. The u-shaped ecodistrict includes the communities of Ingersoll in the south and Grand Valley and the Maitland River in the north. The undulating topography ranges in elevation from 214 m above sea level along the Maitland River to 532 m above sea level east of the community of Grand Valley.*
>
> *Key features:*
>
> - *Cropland and pasture occur over three-quarters of the ecodistrict.*
> - *Morainal deposits can be found over much of the area.*
> - *Glacial features include the Guelph drumlin field and several north-south trending moraines.*
>
> *The Stratford Ecodistrict is associated with the Eastern Temperate Deciduous Forest Vegetation Zone (Baldwin et al. 2018) and the Huron-Ontario Section (L.1) of the Great Lakes-St. Lawrence Forest Region. The southern and southwestern portions are included in the Niagara Section (D.1) (Rowe 1972). The ecodistrict has been predominately converted to pasture and cropland. Approximately one-fifth of the area is represented by natural or naturalized areas including forests, fen complexes, and marshes. Deciduous forests dominated by sugar maple, American beech, white ash, and oak species occur on dry to fresh sites, and yellow birch, red maple, silver maple, and ash species are found on wetter environments. Less common associates can include American elm,*

eastern hop-hornbeam, black maple, large-toothed aspen, butternut, and black cherry.

North of Concession Road 2, the northwest corner of the licenced area is crossed by Mill Creek and by two tributary creeks, Galt Creek and Pond Creek. Various reaches of Mill Creek are documented as supporting naturally sustaining Brown Trout and Brook Trout populations. Brown Trout spawning is documented as occurring in the section of Mill Creek on the pit property. There is also a substantial area of wetland adjacent to Mill Creek and the tributary streams, which is part of the larger Galt Creek Swamp, an area that is identified as a Provincially Significant Wetland by the MNRF. Mill Creek and its tributaries, as well as the Galt Creek Swamp, are all separated from the proposed Site Plan Amendment area by existing pit lakes.

4.1.2 Site Setting

A series of representative site photographs taken by GEC in 2022 are provided in **Attachment B**. The photographs illustrate the disturbed nature of the Natural Environment Study Area for the proposed SPA. It should be noted that the entire proposed extraction area within the SPA is highly disturbed. **Photos 1** to **3** show photos of the former farmhouse near Concession Road 2 that will be retained. **Photos 4** and **5** show views of the shop building and yard, located in an area that will mostly be extracted. **Photos 6** is a view looking towards the site entrance at Concession Road 2. **Photos 7** and **8** show the section of the conveyor located immediately on the north side of Concession Road 2. **Photos 9** and **10** show views of the weigh scales, tarping area, and processing areas, along with the pit lakes associated with Phases 1 and 4.

4.2 Aquatic Habitat

As noted above in **Section 2.4**, the study area includes portions of pit lakes associated with Phases 1 and 4. Both pit lakes are actively used for pit operations and they are isolated features with no direct connection to any nearby watercourses.

4.3 Terrestrial Habitat

4.3.1 Vegetation Communities

Almost the entire site SPA study area has been disturbed by previous agricultural uses and, more recently, by pit operations. There is an old farmhouse near Concession Road 2 that will be retained (see **Photos 1** to **3**); it has manicured lawns and ornamental tree plantings. The study area also includes the pit access road, tarping station, conveyor, yard areas, shop buildings and an old silo (see **Photos 4** to **10**).

Detailed descriptions of the vegetation communities (ELC Units) identified within the SPA study area are provided in **Table 2**. Vegetation community polygons are mapped on **Figure 3**. A series of representative site photographs taken by GEC in 2022 are presented in **Attachment B**. Photo references are provided in **Table 2**. Non-native plant species are denoted with a plus sign in parentheses (+). All of the community types described below are common and widespread in southern Ontario.

Since the entire SPA study area is disturbed in nature, the vegetation communities are all early successional types such as patches of Trembling Aspen (FOD3-1), shrub thickets dominated by poplar saplings and Common Buckthorn (+), old field areas that include pit berms that were seeded in the past (CUM1-1), hedgerow features (CUH), a small European Common Reed (+) meadow marsh pocket and pit lakes.

4.3.2 Plant Species

A checklist of the vascular plants recorded during the field surveys completed by GEC is provided in **Attachment C**. A total of 170 vascular plant taxa have been recorded to date. One hundred and one (101) taxa, 59.4% of the recorded flora, are considered non-native and introduced to southern Ontario. This is a relatively high proportion of non-native plant species and this is a reflection of the disturbed nature of the study area.

No vascular plant species considered rare or significant in Ontario (Oldham and Brinker 2009), or MNR 'old' Central Region (Riley 1989), were recorded within the study area.

4.4 Wildlife

The list of wildlife species that were observed is presented in **Table 3** (general wildlife), **Table 4** (birds within SPA study area) and **Table 5** (birds within SPA area). The lists include the common and scientific names of each species that was observed. In the text of the report, scientific names are included for only those wildlife species that were not observed during the study.

A total of 50 wildlife species were observed, including 3 odonate, 3 butterfly, 1 amphibian, 1 reptile, 34 bird, and 8 mammal species.

Invertebrates

A total of 6 invertebrate species were seen, limited to a few common odonates and butterflies.

Amphibians

The only amphibian observed during the 2022 field surveys was an American Toad on the grounds of the former farm residence.

Reptiles

The Eastern Gartersnake was the only reptile observed. It was seen on the Phase 1 berm (Unit CUM1-1a). This is the most abundant snake species in the province.

Birds

A total of 34 bird species were observed (**Table 4**), including 12 within the proposed extraction area (**Table 5**). The disturbed nature of the study area, limited vegetation diversity and the active pit operations has resulted in the relatively low number of breeding bird species. The upland bird community was dominated mainly by Song Sparrow, American Goldfinch and Red-

winged Blackbird. Across the entire SPA study area, the most common species were Canada Goose, Song Sparrow, Red-winged Blackbird and Mourning Dove.

Killdeer and Spotted Sandpiper were observed along the pit lake shorelines and in sparsely vegetated, gravelly areas. The Phase 1 pit lake had Canada Geese and Mallard loafing on it. Small numbers of swallows (Barn Swallow, Northern Rough-winged Swallow and Tree Swallow) were observed foraging over the Phase 1 pit lake. A single Caspian Tern was also observed foraging over the lake.

Barn Swallow is listed as Special Concern in Ontario. This species was observed foraging over the Phase 1 pit lake and around the yard buildings on July 14, 2022. Barn Swallows were also observed on May 6, 2022. The structures located within the SPA study area were checked for signs of Barn Swallow nests but none were observed. Barn Swallow is discussed further in **Attachment D** (Significant Wildlife Habitat).

Mammals

The 8 species of mammals that were observed within the study area are all very common to abundant in Ontario, with an S-rank of S5 (see **Table 3**).

5.0 DESCRIPTON OF THE PROPOSED EXTRACTION AND OPERATIONS

Phase 5 is intended to be the final phase of extraction at the Mill Creek Pit. Phase 5 encompasses the plant area and the access from Concession Road 2. The proposed Site Plan Amendment (SPA) will add 2.5 ha to the extraction area of Phase 5. Following the decommissioning and removal of the plant equipment, aggregate material will be trucked to Dufferin's nearby Aberfoyle Pit 1 for processing.

6.0 NATURAL ENVIRONMENT TECHNICAL RECOMMENDATIONS (Operations and Rehabilitation)

The following Natural Environment Technical Recommendations for the Site Plan Amendment (SPA) area are intended to minimize potential negative effects.

- **Timing of Tree-clearing and Stripping Operations**

Tree-clearing should be timed to avoid the bird breeding season (April 1 to August 26) and active period for bats (April 1 to October 31).

Stripping of topsoil should be timed to avoid the bird breeding season (April 1 to August 26). It is recommended that the operator schedule the stripping of topsoil and ground vegetation to avoid this period, to avoid potentially contravening the *Migratory Birds Convention Act* and/or the *Fish and Wildlife Conservation Act*. Stripping of overburden and/or removal of berms may occur during the bird breeding season, provided that the topsoil and ground vegetation has already been removed.

Recommended Site Plan Note:

> Tree-clearing shall not occur during the active period for bats and the bird breeding season, i.e., no tree-clearing between April 1 and October 31.
>
> Stripping of topsoil and ground vegetation shall not occur during the bird breeding season, i.e., no topsoil and ground vegetation stripping between April 1 and August 26. Stripping of overburden and/or removal of berms may occur during the bird breeding season, provided that the topsoil and ground vegetation has already been removed.

- **Building Demolition/Removal**

Any structures to be removed within the SPA area should be checked again for signs of Barn Swallow nesting activity. If Barn Swallow nests are detected then the rules in Part III of Ontario Regulation 830/21 should be followed. Building demolition should be avoided during the period between April 1 and August 26 if active Barn Swallow nests are found, and a nesting structure should be created and/or enhanced.

Recommended Site Plan Note:

> Prior to Buildings 1, 2 and 5 as shown on Drawing 3 of 8 being removed, a Qualified Professional shall search these structures for signs of Barn Swallow nesting activity if removal is to occur between April 1 and August 20. If active Barn Swallow nests are detected then building removal should be deferred until the nest(s) are no longer active.

- **Rehabilitation**

Any trees to be removed from the SPA area should be used to create habitat features along the new shoreline that will result from the below water extraction. Logs, stumps, and root wads can be keyed into the new shoreline and shallow water areas. Tree tops and branches can be cut up and placed as brush piles in shallow water. Oversize material should also be placed along the new shoreline and shallow water areas. The creation of these habitat features will potentially provide cover and basking sites for turtles and snakes, cover and nursery areas for fish, etc. To the extent feasible, the shoreline should be irregular in shape.

Recommended Site Plan Note:

> Stumps, root wads, logs and branches resulting from any tree removals within the Phase 5B area shall be used as part of the Rehabilitation Plan. Oversized material (e.g., boulders) shall also be used as part of the Rehabilitation Plan. Logs, stumps, and root wads shall be keyed into the new shoreline and shallow water areas. Tree tops and branches shall be cut up and placed as brush piles in shallow water, such that they are mostly/totally submerged. Oversize material shall also be placed along the new shoreline and shallow water areas.

7.0 SUMMARY AND CONCLUSIONS

Phase 5 is intended to be the final phase of extraction at the Mill Creek Pit. Phase 5 encompasses the plant area and the access from Concession Road 2. The proposed Site Plan Amendment (SPA) will add 2.5 ha to the extraction area of Phase 5. The entire SPA area was previously disturbed as part of pit operations; it includes part of the access from Concession Road 2, a yard area with small shop buildings, part of a conveyor route and berms.

The Ministry of Natural Resources (MNR) requested that a Natural Environment Technical Report (NETR) be prepared for the proposed Site Plan Amendment. Of the potential natural heritage features that are listed above in **Section 1.2**, none were found to occur within the SPA study area. With respect to any key natural heritage features of the Growth Plan not already addressed in Section 2.2 to 2.8 of this report, such as non-significant wetlands, sand barrens, savannahs, tallgrass prairies and alvars, none were found to occur within the SPA study area.

The proposed SPA will increase the size of the Phase 1 and Phase 4 pit lakes by almost 2.5 ha and the new shorelines created will be enhanced through the installation of habitat features such as stumps, root wads, logs, brush piles and boulders.

Respectfully submitted,

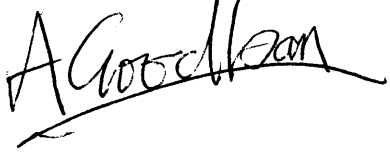

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Figure # 1

Location

Mill Creek Pit
Part of Lot 24, Concession 1
Part of Lots 21 to 24, Concession 2
Township of Puslinch
County of Wellington

Legend

- Area Subject to Site Plan Amendment (2.5 ha)
- Natural Environment Study Area
- Mill Creek Licence Boundary
- Mill Creek Limit of Extraction
- Other Aggregate Resource Act Licences

Date: August 2024

Sources

Land Information Ontario
Contains information licensed under the
Open Government Licence - Ontario

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Meters (1:15,000)

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Goodban Ecological Consulting Inc.

Figure # 2
Site View

Mill Creek Pit

Part of Lot 24, Concession 1
Part of Lots 21 to 24, Concession 2
Township of Puslinch
County of Wellington

Legend

- Mill Creek Licence Boundary - Licence # 5738
- Mill Creek Limit of Extraction - Above Water
- Mill Creek Limit of Extraction - Below Water
- Proposed Area to be Extracted - 2.5 ha
- Natural Environment Study Area

Date: August 2024

Sources: Aerial photography from Microsoft Bing, date unknown.

Scale - 1:2000

0 30 60 Meters

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Figure # 3

Vegetation Communities (ELC Units)

Mill Creek Pit

Part of Lot 24, Concession 1
Part of Lots 21 to 24, Concession 2
Township of Puslinch
County of Wellington

Legend

- Mill Creek Licence Boundary - Licence # 5738
- Mill Creek Limit of Extraction - Above Water
- Mill Creek Limit of Extraction - Below Water
- Proposed Area to be Extracted - 2.5 ha
- Natural Environment Study Area
- Vegetation Community Boundary

Vegetation Communities (ELC Units)

FOD3-1	Dry-Fresh Poplar Deciduous Forest Type
CUM1-1	Dry-Moist Old Field Meadow Type
CUT1	Mineral Cultural Thicket Ecosite
MAM2	Mineral Meadow Marsh Ecosite (European Common Reed)
OAO	Open Aquatic
CUHa*	Hedgerow (Crack Willow)
CUHb*	Hedgerow (Lilac)
CUHc*	Hedgerow (Lilac)
HBG*	Heritage Building & Manicured Grounds (Lawns & Ornamental Trees)
MAN*	Manicured Areas (Lawns)

*Not in Ecological Land Classification for Southern Ontario: A First Approximation (Lee et al. 1998)

Date	August 2024
Sources	Aerial photography from Microsoft Bing, date unknown.
Scale - 1:2000	0 30 60 Meters

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Figure # 4

Wildlife Survey Transects

Mill Creek Pit

Part of Lot 24, Concession 1
Part of Lots 21 to 24, Concession 2
Township of Puslinch
County of Wellington

Legend

- Mill Creek Licence Boundary - Licence # 5738
- Mill Creek Limit of Extraction - Above Water
- Mill Creek Limit of Extraction - Below Water
- Proposed Area to be Extracted - 2.5 ha
- Natural Environment Study Area
- Breeding Bird Survey Transects

Date	August 2024
Sources	Aerial photography from Microsoft Bing, date unknown.

Scale - 1:2000

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Table 1: 2022 Ecological Survey Details
Proposed Site Plan Amendment (SPA) – Mill Creek Pit
Goodban Ecological Consulting Inc. (GEC)

Date	Surveyors[1]	Time	Purpose	Weather Conditions[2]	Notes
2022/05/06	AG	0940-1320	• Spring Vegetation and Flora • Snake Emergence Survey • General Wildlife	T = 12°C-15°C, BWS = 3, CC = 50	Multi-purpose visit.
2022/05/28	AG, TH	0855-1055 (TH) 0815-1420 (AG)	• Breeding Bird Survey • Snake Emergence • Turtle Nesting Survey • General Wildlife	T = 14°C, BWS = 2, CC = 70	1st breeding bird survey. Multi-purpose visit.
2022/06/10	AG	0800-1340	• Turtle Nesting Survey • Late Spring Vegetation and Flora	T = 18°C, BWS = 3, CC = 100	Multi-purpose visit.
2022/07/14	AG, TH	0755-0935 (TH) 0755-1325 (AG)	• Breeding Bird Survey • General Wildlife • Summer Vegetation and Flora	T = 17°C, BWS = 2, CC = 50	2nd breeding bird survey. Multi-purpose visit.
2022/09/20	AG	1005-1340	• Fall Vegetation and Flora • General Wildlife		Multi-purpose visit.

TABLE 1 NOTES:

[1]**Surveyors**

AG – Anthony Goodban (Goodban Ecological Consulting Inc.)
TH – Tyler Hoar (Ornithologist and Wildlife Biologist)

[2]**Weather Conditions** (Information provided for weather-dependent wildlife surveys)

T - Temperature (°C)
BWS - Beaufort Wind Scale (0 to 12)
CC - Cloud Cover (%)

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TABLE 2: VEGETATION COMMUNITIES (ELC UNITS)
Mill Creek Pit SPA, Township of Puslinch

ELC Code[1]	Community Type[1]	Dominant Species	Tree Size Class[2] (cm DBH)	Cover Code[3]	Soils / Drainage	Photo Numbers[4]	General Description
FOD3-1	Dry-Fresh Poplar Deciduous Forest Type	Trembling Aspen >> Bigtooth Aspen / Common Buckthorn (+)	<10 10-25	>60%	Disturbed soils / well drained	11	Small early successional patch of young Trembling Aspen, with some Bigtooth Aspen and Common Buckthorn (+).
CUM1-1a	Dry-Moist Old Field Meadow Type	Smooth Brome (*Bromus inermis* +) >> Kentucky Bluegrass (*Poa pratensis* +) – Tall Goldenrod (*Solidago altissima*) / Common Buckthorn (+) – Tartarian Honeysuckle (*Lonicera tatarica* +) > Glossy Buckthorn (*Frangula alnus* +) – Shrub Willows (*Salix* spp.)	n/a	<10%	Disturbed soils / well drained	10, 14, 15, 16, 17	Large grassed berm located between Phase 1 pit lake and Concession Road 2. Smooth Brome (+) strongly dominates the groundcover. Scattered shrubs; most are non-native/invasive.
CUM1-1b	Dry-Moist Old Field Meadow Type	Smooth Brome (*Bromus inermis* +) >> Kentucky Bluegrass (*Poa pratensis* +) – Tall Goldenrod (*Solidago altissima*) / Common Buckthorn (+) – Tartarian Honeysuckle (*Lonicera tatarica* +)	n/a	<10%	Disturbed soils / well drained	7, 8	Smaller grassed berm; located immediately west of conveyor just north of Concession Road 2.
CUM1-1c	Dry-Moist Old Field Meadow Type	Smooth Brome (*Bromus inermis* +) >> Kentucky Bluegrass (*Poa pratensis* +) – Tall Goldenrod (*Solidago altissima*) / Trembling Aspen (*Populus tremuloides*) / Common Buckthorn (+)	n/a	10-25%	Disturbed soils / well drained	13	Old field patch that has formed on disturbed pit soils. Unit is located on south side of access road beside the Phase 4 pit lake. Scattered woody regeneration.
CUT1a	Mineral Cultural Thicket Ecosite	Trembling Aspen (*Populus tremuloides*) saplings - Common Buckthorn (*Rhamnus cathartica* +)	<10	26-60%	Disturbed soils / well drained	12	Narrow regenerating strip of Trembling Aspen and Common Buckthorn (+) that has formed on disturbed pit soils. Unit is located on north side of access road beside the Phase 4 pit lake.
CUHa*	Hedgerow	Black Willow (*Salix nigra*) / Common Buckthorn (*Rhamnus cathartica* +)	25-50	n/a	Disturbed soils / well drained	6	Small cluster of willows in yard area. Trees were originally growing on a ditch line in farmland.
CUHb*	Hedgerow	Lilac (*Syringa vulgaris* +) >> Common Buckthorn (*Rhamnus cathartica* +) / Black Walnut (*Juglans nigra*) – Sugar Maple (*Acer saccharum*)	10-25	n/a	Burford loam / well drained	-	Roadside shrubby hedgerow dominated by Lilac (+), which is a relic of cultivation. A few Black Walnut and Sugar Maple are also present.
CUHc*	Hedgerow	Apple (*Malus pumila* +) - Common Buckthorn (*Rhamnus cathartica* +) / White Elm (*Ulmus americana*)	<10	n/a	Burford loam / well drained	-	Roadside shrubby hedgerow dominated by Apple (+) and Common Buckthorn (+).

TABLE 2: VEGETATION COMMUNITIES (ELC UNITS)
Mill Creek Pit SPA, Township of Puslinch

ELC Code[1]	Community Type[1]	Dominant Species	Tree Size Class[2] (cm DBH)	Cover Code[3]	Soils / Drainage	Photo Numbers[4]	General Description
MAM2	Mineral Meadow Marsh Ecosite (European Common Reed)	European Common Reed (*Phragmites australis* ssp *australis* +) >> Reed Canary Grass (*Phalaris arundinacea*) > Purple Loosestrife (*Lythrum salicaria* +)	n/a	n/a	Silt / poorly drained	-	Small (0.08 ha) enclosed depression on former ditch line in disturbed area, now surrounded by fill and partially revegetated. This feature is a dense patch of European Common Reed (+) and Reed Canary Grass that has formed on former silt pond substrate.
OAO	Open Water	Stonewort (*Chara* sp.) in shallow margins	n/a	n/a	Gravel / subaqueous	10, 14, 15, 16, 18	Phase 1 and Phase 4 pit lakes. Deep water with very limited submergent and emergent vegetation; limited to some Stonewort growth in the shallower margins.

Table 1 - Notes:

[1]ELC codes and community types are based on Lee et al. (1998).

Lee, H.T., W.D. Bakowsky, J.L. Riley, J. Bowles, M. Puddister, P. Uhlig and S. McMurray. 1998. Ecological Land Classification for Southern Ontario: First Approximation and Its Application. Ontario Ministry of Natural Resources, Southcentral Science Section, Science Development and Transfer Branch. SCSS Field Guide FG-02. 225 pp.

*Not included in Lee et al. (1998).

[2]Tree Size Class: <10 cm dbh; 10-24 cm dbh; 25-50 cm dbh; >50 cm

[3]Cover Code: 0 = none; 1 = 0-10%; 2 = 11-25%; 3 = 26-60%; 4 = >60%

[4]See **Attachment C** for representative site photographs.

TABLE 3:
LIST OF INCIDENTAL WILDLIFE SPECIES OBSERVED IN 2022
MILL CREEK PIT SITE PLAN AMENDMENT (SPA) & ENVIRONS

Common Name	Scientific Name	S-Rank
Odonates		
Black Saddlebags	*Tramea lacerta*	S4
Bluet sp.	*Enallagma* sp.	
Common Green Darner	*Anax junius*	S5
Meadowhawk sp.	*Sympetrum* sp.	
Twelve-Spotted Skimmer	*Libellula pulchella*	S5
Butterflies		
Azure sp.		
Cabbage White	*Pieris rapae*	SNA
Common Ringlet	*Coenonympha tullia*	S5
Common Sulphur	*Colias philodice*	S5
Amphibians		
American Toad	*Anaxyrus americanus*	S5
Reptiles		
Eastern Gartersnake	*Thamnophis sirtalis*	S5
Mammals		
Eastern Chipmunk	*Tamias striatus*	S5
Eastern Cottontail	*Sylvilagus floridanus*	S5
Gray Squirrel	*Sciurus carolinensis*	S5
Red Squirrel	*Tamiasciurus hudsonicus*	S5
Meadow Vole	*Microtus pennsylvanicus*	S5
Coyote	*Canis latrans*	S5
Raccoon	*Procyon lotor*	S5
White-tailed Deer	*Odocoileus virginianus*	S5

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TABLE 4:
BIRD SPECIES OBSERVED ON PIT AND ROADSIDE TRANSECTS IN 2022

Common Name	Scientific Name	S-Rank	Transects	05/28	07/14
American Goldfinch	Spinus tristis	S5B	Pit	1	3
American Goldfinch	Spinus tristis	S5B	Roadside		3
American Redstart	Setophaga ruticilla	S5B	Roadside	1	1
American Robin	Turdus migratorius	S5B	Pit		2
American Robin	Turdus migratorius	S5B	Roadside	3	2
Baltimore Oriole	Icterus galbula	S4B	Pit	1	
Barn Swallow	Hirundo rustica	S5B	Roadside		1
Belted Kingfisher	Megaceryle alcyon	S4B	Pit	1	
Blue Jay	Cyanocitta cristata	S5	Pit	1	
Brown-headed Cowbird	Molothrus ater	S4B	Pit		2
Brown-headed Cowbird	Molothrus ater	S4B	Roadside	1	5
Canada Goose	Branta canadensis	S5	Pit	41	14
Caspian Tern	Sterna caspia	S3B, S5M	Pit		1
Caspian Tern	Sterna caspia	S3B, S5M	Roadside	1	1
Cedar Waxwing	Bombycilla cedrorum	S5B	Pit		1
Cedar Waxwing	Bombycilla cedrorum	S5B	Roadside	3	7
Common Grackle	Quiscalus quiscula	S5B	Pit	3	
Common Grackle	Quiscalus quiscula	S5B	Roadside	4	4
Common Yellowthroat	Geothlypis trichas	S5B	Pit	2	1
Eastern Kingbird	Tyrannus tyrannus	S4B	Pit		2
European Starling	Sturnus vulgaris	SNA	Pit		2
Gray Catbird	Dumetella carolinensis	S4B	Roadside	2	1
Great Blue Heron	Ardea herodias	S5	Roadside	1	4
Great Crested Flycatcher	Myiarchus crinitus	S4B	Roadside	1	
Indigo Bunting	Passerina cyanea	S4B	Roadside	1	
Killdeer	Charadrius vociferus	S5B, S5N	Pit	1	
Killdeer	Charadrius vociferus	S5B, S5N	Roadside	1	1
Mallard	Anas platyrhynchos	S5	Pit	8	
Mourning Dove	Zenaida macroura	S5	Pit		1
Mourning Dove	Zenaida macroura	S5	Roadside	7	15
Northern Cardinal	Cardinalis cardinalis	S5	Roadside	1	
Northern Flicker	Colaptes auratus	S4B	Pit		1
Northern Flicker	Colaptes auratus	S4B	Roadside	2	3
Northern Rough-winged Swallow	Stelgidopteryx serripennis	S4B	Pit		1
Northern Rough-winged Swallow	Stelgidopteryx serripennis	S4B	Roadside		2
Red-winged Blackbird	Agelaius phoeniceus	S5	Pit	5	1

TABLE 4:
BIRD SPECIES OBSERVED ON PIT AND ROADSIDE TRANSECTS IN 2022

Common Name	Scientific Name	S-Rank	Transects	05/28	07/14
Red-winged Blackbird	Agelaius phoeniceus	S5	Roadside	8	7
Ring-billed Gull	Larus delawarensis	S5B, S4N	Pit		1
Ring-billed Gull	Larus delawarensis	S5B, S4N	Roadside		1
Rock Pigeon	Columba livia	SNA	Pit		1
Song Sparrow	Melospiza melodia	S5B	Pit	6	15
Song Sparrow	Melospiza melodia	S5B	Roadside	6	5
Spotted Sandpiper	Actitis macularius	S5	Pit	6	1
Tree Swallow	Tachycineta bicolor	S4B	Roadside		2
Warbling Vireo	Vireo gilvus	S5B	Pit	2	3
Warbling Vireo	Vireo gilvus	S5B	Roadside	4	
Willow Flycatcher	Empidonax traillii	S5B	Pit		1
Yellow Warbler	Setophaga petechia	S5B	Pit	3	1
Yellow Warbler	Setophaga petechia	S5B	Roadside	3	2

TABLE 5:
BIRD SPECIES OBSERVED IN 2022
WITHIN SITE PLAN AMENDMENT (SPA) AREA

Species	Scientific Name	May 28, 2022	July 14, 2022
American Goldfinch	Spinus tristis	1	4
Barn Swallow	Hirundo rustica		3
Canada Goose	Branta canadensis		2
Eastern Kingbird	Tyrannus tyrannus		2
Killdeer	Charadrius vociferus	1	
Northern Rough-winged Swallow	Stelgidopteryx serripennis		1
Red-winged Blackbird	Agelaius phoeniceus	7	
Rock Pigeon	Columba livia		1
Song Sparrow	Melospiza melodia	4	7
Spotted Sandpiper	Actitis macularius	1	
Willow Flycatcher	Empidonax traillii		1
Yellow Warbler	Setophaga petechia	2	

ATTACHMENT A:

Résumé of Anthony G. Goodban, B.Sc., M.E.S.(Pl.), MCIP, RPP

Consulting Ecologist and Natural Heritage Planner
Goodban Ecological Consulting Inc. (GEC)

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Goodban Ecological Consulting Inc.

ANTHONY G. GOODBAN, B.Sc., M.E.S.(Pl.), MCIP, RPP

Consulting Services in Field Botany, Ecology and Natural Heritage Planning

EDUCATION

1995 M.E.S.(Planning), Environmental Planning, York University, North York, Ontario

1992 Honours B.Sc., Ecology, University of Guelph, Guelph, Ontario

PROFESSIONAL ASSOCIATIONS

Ontario Professional Planners Institute - Full Member
Canadian Institute of Planners - Full Member

PROFESSIONAL TRAINING

2017 Completed the 3-day *Ontario Reptile & Amphibian Field Survey Course* presented by Blazing Star Environmental, NRSI, Ontario Ministry of Natural Resources and Forestry (MNRF). The course was held on Beausoleil Island in Georgian Bay.

2014 Completed the 2-day RX-100 *Low Complexity Prescribed Burn (LCPB) Worker Course* provided by Tallgrass Ontario in Bloomingdale, Ontario.

2013 Completed the Trees Ontario 2-day *Ontario Tree Seed Collector Training Course* in Angus, Ontario.

2013 Completed the Ministry of Natural Resources and Forestry (MNRF) Butternut Health Assessment "Refresher" Training at the Royal Botanical Gardens (RBG), Burlington, Ontario.

2009 Completed the MNRF *Butternut Health Assessment Workshop* at the Royal Botanical Gardens, Burlington, Ontario.

2008 Completed the MNRF 5-day training course in the use of the *Ecological Land Classification System for Southern Ontario* (ELC) at Ball's Falls Conservation Area, Jordan, Ontario.

1994 Completed the MNRF 5-day training course in the use of the *Ontario Wetlands Evaluation System: Southern Manual* (Third Edition) in Tweed, Ontario.

PROFESSIONAL EXPERIENCE

1999-Present	Consulting Ecologist and Natural Heritage Planner, Goodban Ecological Consulting Inc.
1992-1998	Ecologist and Natural Heritage Planner, Ecoplans Limited
1991-1992	Botanist and Ecologist, Hamilton-Wentworth Natural Areas Inventory Project
1990	Field Botanist, Hamilton Region Conservation Authority and Hamilton Naturalists' Club

PROFILE

Mr. Anthony Goodban's academic background is in botany, ecology and environmental planning at the undergraduate and graduate level and he has 33 years of field and professional experience. He has expert knowledge of the vegetation and flora of southern Ontario, being especially familiar with the flora of the Hamilton and Halton Region. Mr. Goodban has been the principal of Goodban Ecological Consulting Inc. since 1999 and he works either as an independent consultant or as a subconsultant to other firms. Past and present clients include other consulting firms, aggregate companies, developers, municipalities, conservation authorities, provincial ministries, institutions, naturalist clubs and private citizens. Mr. Goodban has worked on a broad variety of projects involving species at risk, including many different plant and wildlife species. He often undertakes detailed field ecological field surveys for a wide range of projects, including Official Plan updates, aggregate applications, land development projects, park planning exercises, natural areas inventories, restoration and monitoring projects. Mr. Goodban has worked on many wetland projects, including wetland evaluations, boundary delineations, impact assessments and monitoring programs. He provides project input relating to planning matters such as the natural heritage components of the Provincial Policy Statement, Greenbelt Plan and the Endangered Species Act, and has prepared numerous environmental impact statements for a wide variety of development proposals. Mr. Goodban prepared and updated the Flora of Hamilton, in association with the Hamilton Conservation Authority. He has expertise dealing with rare vegetation communities, including alvars and prairies, and has written several papers and reports on prairie and savanna vegetation in the Hamilton and Halton areas. He is certified to complete wetland evaluations under the *Ontario Wetland Evaluation System: Southern Manual (3rd Edition)* and to use the *Ecological Land Classification System for Southern Ontario* (ELC). Mr. Goodban has appeared as an expert witness before the Ontario Municipal Board and the Joint Board.

PROJECT EXPERIENCE

Species at Risk (SAR)

- Mr. Goodban has worked on many projects involving Threatened and Endangered Species in recent years. Projects dealing with wildlife species include Jefferson Salamander, Butler's Gartersnake, Eastern Foxsnake, Gray Ratsnake, Bank Swallow, Barn Swallow, Bobolink, Chimney Swift, Eastern Meadowlark, SAR bats and Mottled Duskywing. Projects dealing with plant species include American Chestnut, American Columbo, American Ginseng, Butternut and Flowering Dogwood.

- Mr. Goodban has completed a series of detailed studies of the Endangered Jefferson Salamander and its habitats. Work has included detailed monitoring of six breeding pools from 2004 to the present (including frog call surveys, egg mass surveys, fixed-point photography, water temperature, vegetation, etc), egg mass surveys of 30+ breeding pools in Halton, Hamilton, Peel, Waterloo and Wellington, spring migration studies with drift fencing and pitfall traps, larval surveys in breeding pools, etc. In 2014, Mr. Goodban began monitoring almost 1 km of drift fence and 60+ pitfall traps set up to capture salamanders migrating to breeding pools in the early spring.

- Mr. Goodban is a certified Ontario Butternut Health Assessor (BHA) who has completed many Butternut Health Assessments in recent years. In 2014 he assessed 27 Butternut trees on the Oro Moraine, of which 6 were retainable (Category 2) trees, and 6 Butternut trees on the Niagara Escarpment in Halton Hills which were all non-retainable (Category 1). Mr. Goodban has also overseen compensatory Butternut planting programs required by *Endangered Species Act* Stewardship Agreements and through the registry process allowed under O.Reg 242/08 and O.Reg 830/21.

Resource Management - Watersheds and Natural Heritage System Planning

- Responsible for the development of Natural Heritage Systems for the Sixteen Mile Creek watershed, Township of Oro-Medonte and North Oakville.

Resource Management – Wetlands, ANSI's and ESA's

- Responsible for numerous wetland evaluations and impact assessments for a range of development proposals across Ontario, including such wetlands as: Dorchester Swamp, Strasburg Creek Wetland Complex, Forks of the Credit Wetland Complex, Creditview Swamp, Victoria Point Wetland Complex and Halton Escarpment Wetland Complex. Many of these projects required the preparation of environmental impact studies/assessments, often including the detailed review and integration of water resources (hydrogeology, hydrology, stormwater engineering) and ecological (wetlands, fisheries) data.

- Main environmental consultant to the City of Orillia during an OMB hearing that focused on the issue of large-scale development within a Provincially Significant Wetland (Victoria Point Bog).

- Main environmental consultant to local residents in the Town of Essex during a 2002 OMB hearing that examined an 18-hole golf course proposal within a Provincially Significant Wetland (Marshfield Woods).

- Participant in evaluations and impact assessments for development proposals adjacent to Environmentally Sensitive Areas (ESAs) across southern Ontario, including: Sixteen Mile Creek Valley (ESA 16) and Hilton Falls Complex (ESA 25) in Halton Region, Doon Pinnacle Hill (ESPA 35) in Waterloo Region, Major Spink Area (ESA No. 97) in Durham Region and Hayesland Complex (ESA No. 28) in Hamilton.

Transportation Projects

- Participated in the preparation of a number of highway Environmental Assessments, including: the Bradford Bypass, the Leslie Street Extension in Toronto, the Parry Sound and Mactier sections of Highway 69 and Highway 7 from Kitchener to Guelph.

- Participant in Class Environmental Assessments for sensitive river, wetland and valley crossings, including: the northerly and southerly crossings of Twelve Mile Creek in Oakville, the Mountainview Road crossing of Silver Creek in Georgetown and Sixth Line crossing of Sixteen Mile Creek in Milton.

Aggregates

- Participant in multi-disciplinary studies in support of sand and gravel pit license applications, including Dufferin Aggregates Cedar Creek, Alps and Chudyk Pits, and Cambridge Aggregates Ayr Pit, in North Dumfries. Responsible for several MTO wayside permit applications (one quarry and three pits) in eastern Ontario.

- Participant in multi-disciplinary studies in support of limestone/dolostone quarry license applications, including the Tomlinson Brothers quarry in Stittsville, Holmenin quarry near Buckhorn, Dufferin Aggregates' Milton Quarry and Acton Quarry Extensions and James Dick Construction Limited's proposed Rockfort Quarry in Caledon.

- Responsible for the development and implementation of wetland vegetation monitoring programs adjacent to aggregate operations, as components of adaptive management plans (AMP).

- Consulting Botanist/Ecologist to aggregate companies for biodiversity plans, enhancement plans and rehabilitation plans at a number of pits and quarries in southern Ontario.

Vegetation and Flora - Inventory, Management and Monitoring

- Responsible for completing detailed botanical inventories of numerous sites in southern Ontario, including Bronte Creek Provincial Park (Halton), the Red Hill Valley (Hamilton-Wentworth) and the Dundas Valley (Hamilton-Wentworth).

- Consulting botanist and ecologist to Natural Areas Inventory Projects in southern Ontario, including Hamilton (2001-2002; 2010-2014), Halton (2003-2004) and Niagara (2006-2008).

- Developed vegetation management plans and strategies for a number of significant natural areas and communities, including:

    - Ontario Hydro's right-of-way at Bronte Creek Provincial Park (Oakville)
    - prairie and other vegetation at Bronte Creek Provincial Park (Oakville)
    - prairie and oak woodland vegetation at Spencer Gorge Wilderness Area (Dundas/Flamborough)
    - prairie vegetation at the Ancaster Prairie (Ancaster)

- rare species and significant communities in the Albion Falls - Buttermilk Falls portion of the Red Hill Valley (Hamilton)

RELATED EXPERIENCE AND COMMUNITY INVOLVEMENT

1995 to present

Mr. Goodban is the first author of a research paper on the historical and present extent and floristic composition of prairie and savanna vegetation in the vicinity of Hamilton, Ontario, prepared with the assistance of two other authors (W.D. Bakowsky and B.D. Bricker). This paper was presented at the 23rd Natural Areas, 15th North American Prairie, and Indiana Dunes Ecosystems Conferences held at St. Charles, Illinois, on October 26, 1996. It was published in the Proceedings of the 15th North American Prairie Conference (1999). Mr. Goodban is currently undertaking further research on prairie, savanna and oak woodland vegetation in the western Lake Ontario region of Ontario. He has authored several papers and studies on the prairie and oak woodland vegetation at Bronte Creek Provincial Park.

1995 to 1999

Mr. Goodban was a participant in the **International Alvar Conservation Initiative** or **'Alvar Working Group'**. This was a collaborative project aimed at documenting and protecting alvar sites in the Great Lakes basin. Participants from across eastern North America examined sites in Michigan, New York, Ohio and Ontario. Mr. Goodban's masters level research on alvar vegetation on the Flamborough Plain was integrated into this broader study. He prepared the text for a 24-page full color brochure and poster for the Federation of Ontario Naturalists, as one of the products generated by the Alvar Working Group, entitled *Great Lakes Alvars*. Mr. Goodban has studied alvar vegetation in all of the main alvar regions in Ontario. He has also visited alvar sites in New York and Ohio.

1991 to present

Mr. Goodban has led numerous naturalist and field botanist field trips in southern Ontario on behalf of the Field Botanists of Ontario. He has given presentations on rare vegetation communities (e.g., prairies, alvars) at conferences, meetings and naturalist club events.

1991 to present

Mr. Goodban has worked in collaboration with the Hamilton Region Conservation Authority to document the flora of the City of Hamilton. The first edition of *The Vascular Plant Flora of the Regional Municipality of Hamilton-Wentworth, Ontario,* was produced in 1995. Mr. Goodban prepared a Second Edition of the Flora in 2003 and a Third Edition in 2014, documenting more than 1400 vascular plant taxa in the City of Hamilton.

1995 to 2000

Member of the Regional Municipality of Hamilton-Wentworth's **ENVIRONMENTALLY SIGNIFICANT AREA IMPACT EVALUATION GROUP** (ESAIEG). ESAIEG considers development proposals located within or adjacent to Environmentally Significant Areas (ESAs) and provides advice to planning staff.

1991 to 1995

Member of the Regional Municipality of Halton's **ECOLOGICAL AND ENVIRONMENTAL ADVISORY COMMITTEE** (EEAC). The basic function of EEAC is to provide technical advice, through the Planning and Development Department, to staff and Council on all environmental matters affecting Halton.

SELECTED PUBLICATIONS AND REPORTS

Goodban, A.G. 2014. The Vascular Plants of Hamilton, Ontario. pp. 1 to 91, In: Schwetz, N. (ed.), Hamilton Natural Areas Inventory Project 3rd Edition, Nature Counts 2, Species Checklist Document. Hamilton Conservation Authority, Ancaster, Ontario.

Goodban, A.G. 2014. The Vegetation Communities of Hamilton, Ontario. pp. 92 to 111, In: Schwetz, N. (ed.), Hamilton Natural Areas Inventory Project 3rd Edition, Nature Counts 2, Species Checklist Document. Hamilton Conservation Authority, Ancaster, Ontario.

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Goodban, A.G. 2003. The Vascular Plants of Hamilton, Ontario. pp. 1-1 to 1-99, In: Dwyer, J.K., Nature Counts Project, Hamilton Natural Areas Inventory 2003, Volume 1 – Species Checklists. Hamilton Naturalists' Club, Hamilton, Ontario.

Goodban, A.G. 2003. The Vegetation Communities of Hamilton, Ontario. pp. 2-1 to 2-22, In: Dwyer, J.K., Nature Counts Project, Hamilton Natural Areas Inventory 2003, Volume 1 – Species Checklists. Hamilton Naturalists' Club, Hamilton, Ontario.

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Goodban, A.G. *In prep.* A life science inventory and assessment of Bronte Creek Provincial Park (North Section). Bronte Creek Provincial Park, Burlington, Ontario Parks.

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Goodban, A.G., W.D. Bakowsky and B.D. Bricker. 1999. The historical and present extent and floristic composition of prairie and savanna vegetation in the vicinity of Hamilton, Ontario. pp. 87-103. In: Proceedings of the 15th North American Prairie Conference. *Edited by* C. Warwick. Natural Areas Association, Bend, Oregon.

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Goodban, A.G. 1997. A survey of the rare vascular plant flora of the Albion Falls - Buttermilk Falls area in the City of Hamilton, Ontario. Hamilton Region Conservation Authority, Ancaster, Ontario. 14 pp. + appendix + map.

Goodban, A.G. 1996. The vegetation and flora of the Red Hill Valley and environs. pp. 17-66. In: Biological Inventory of the Red Hill Valley, Hamilton Naturalists' Club (eds.), Hamilton, Ontario.

Goodban, A.G. 1995. Alvar Vegetation on the Flamborough Plain: Ecological Features, Planning Considerations and Conservation Recommendations. Major Paper. Faculty of Environmental Studies, York University, North York, Ontario. 88 pp. + appendices.

Goodban, A.G. 1994. *Carex virescens* (Cyperaceae) new to the Regional Municipality of Hamilton-Wentworth. Field Botanists of Ontario Newsletter 7(1): 11-12.

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Attachment B:

Representative site photographs taken by GEC on May 28 and July 14, 2022.

Mill Creek Pit – Site Plan Amendment (SPA)
Dufferin Aggregates

Goodban Ecological Consulting Inc. (GEC)

July 2024

Photo 1: View of the former farm residence located near Concession Road 2. GEC 2022-05-28

Photo 2: The former farm residence is a heritage building that will be retained. Ornamental trees and shrubs are located on the grounds and the lawns are mown regularly. GEC 2022-05-28

Photo 3: View looking southwest from atop the Phase 1 berm, looking towards the rear of the former farm residence. GEC 2022-05-28

Photo 4: View looking west from atop the Phase 1 berm, looking towards the shop buildings. The shop buildings are located within the proposed SPA extraction area. GEC 2022-05-28

Photo 5: View showing the front yard and shop area near Concession Road 2. The area where the shop buildings are located is proposed for extraction under the SPA. GEC 2022-07-14

Photo 6: View looking south towards the pit entrance at Concession Road 2. To the right is a conveyor that runs underneath the access road. GEC 2022-07-14

Photo 7: Conveyor on the north side of Concession Road 2. This conveyor has moved aggregate material from Phases 2 and 6 of the Mill Creek Pit and the adjacent McMillan Pit to the Mill Creek processing plant. This portion of the berm and yard are outside of the proposed SPA extraction area. GEC 2022-05-28

Photo 8: Second view of the conveyor. The berm is grassed and contains scattered trees and shrubs (mapped as Unit CUM1-1b on Figure 5. This portion of the berm and the yard in the foreground is within the proposed SPA extraction area. GEC 2022-05-28

Photo 9: View looking northwest from atop the Phase 1 berm. The weigh scales to the right are in the existing approved extraction area. The land in the foreground and the tarping station (yellow/white structure) are in the proposed SPA extraction area. GEC 2022-05-28

Photo 10: View looking north northwest from atop the Phase 1 berm towards the processing plant and Phase 1 lake. The land in the foreground is part of the proposed SPA extraction area. Unit CUM1-1a. GEC 2022-05-28

Photo 11: View looking south towards Concession Road 2, showing a young patch of Trembling Aspen (*Populus tremuloides*) (Unit FOD3-1). GEC 2022-05-28

Photo 12: Wind-dispersed early successional tree and shrub species (e.g., Trembling Aspen) are gradually colonizing the open, disturbed areas within the study area. Unit CUT1a. GEC 2022-05-28

Photo 13: View of a small patch of “old field” vegetation (Unit CUM1-1c). Note that these disturbed areas are gradually being colonized by wind-dispersed early successional tree species such as Trembling Aspen. GEC 2022-05-28

Photo 14: View looking east showing the Phase 1 berm (Unit CUM1-1a) and Phase 1 lake. GEC 2022-07-14

Photo 15: View looking east southeast along the Phase 1 berm (Unit CUM1-1a). The shrubs are mainly invasive species such as Tartarian Honeysuckle (*Lonicera tatarica* +), Common Buckthorn (*Rhamnus cathartica* +) and Glossy Buckthorn (*Frangula alnus* +). GEC 2022-05-28

Photo 16: View looking west northwest along the Phase 1 berm (Unit CUM1-1a). The groundcovers are a mix of cool season grasses such as Smooth Brome (*Bromus inermis* +) and Kentucky Blue Grass (*Poa pratensis* +), clovers (*Trifolium pratense* +, *T. repens* +) and Tall Goldenrod (*Solidago altissima*). GEC 2022-05-28

Photo 17: Closer to the haul road and tarping station, there are small patches within Unit CUM1-1a with shallow/no topsoil. The main plant species are Blueweed (*Echium vulgare* +), Canada Blue Grass (*Poa compressa* +), Poverty Oat Grass (*Danthonia spicata*) and hawkweeds (*Hieracium* spp. +). GEC 2022-07-14

Photo 18: At the toe of the Phase 1 berm slope, the shoreline of the Phase 1 pit lake faces north and northeast, and it is quite steep. It is generally unsuitable as turtle nesting habitat due to these characteristics. GEC 2022-05-28

Attachment C: 2022 Vascular Plant Checklist
Mill Creek Pit SPA Study Area

Floristic surveys were completed on May 6 and 28, June 10, July 14 and September 20, 2022. A total of 170 vascular plant taxa have been recorded to date. One hundred and one (101) taxa, 59.4% of the recorded flora, are considered non-native and introduced to southern Ontario. No rare or significant vascular plant species were recorded.

Vascular Plant Checklist Notes:

CC – Coefficient of Conservatism (Oldham et al. 1995)
CW – Coefficient of Wetness (Oldham et al. 1995)

2022 Vascular Plant Checklist – Mill Creek Pit SPA Study Area					
Scientific Name	**Common Name**	**S-Rank**	**Exotic Status**	**CC**	**CW**
Acer negundo	Manitoba Maple	S5		0	0
Acer platanoides	Norway Maple	SNA	SE5		5
Acer saccharum	Sugar Maple	S5		4	3
Achillea borealis	Woolly Yarrow	S5		0	3
Aesculus hippocastanum	Horse Chestnut	SNA	SE2		5
Agrostis gigantea	Redtop	SNA	SE5		-3
Agrostis stolonifera	Creeping Bentgrass	SNA	SE5		-3
Alliaria petiolata	Garlic Mustard	SNA	SE5		0
Asparagus officinalis	Garden Asparagus	SNA	SE5		3
Betula papyrifera	Paper Birch	S5		2	3
Betula pendula	Weeping Birch	SNA	SE4		0
Bromus inermis	Smooth Brome	SNA	SE5		5
Carex bebbii	Bebb's Sedge	S5		3	-5
Carex blanda	Woodland Sedge	S5		3	0
Carex granularis	Limestone Meadow Sedge	S5		3	-3
Carex hystericina	Porcupine Sedge	S5		5	-5
Carex spicata	Spiked Sedge	SNA	SE5		3
Centaurea jacea	Brown Knapweed	SNA	SE5		5
Centaurea stoebe	Spotted Knapweed	SNA	SE5		5
Cerastium fontanum ssp. *vulgare*	Common Mouse-ear Chickweed	SNA	SE5		3
Chelidonium majus	Greater Celandine	SNA	SE5		5
Chenopodium album	Common Lamb's-quarters	SNA	SE5		3
Cirsium arvense	Canada Thistle	SNA	SE5		3
Cirsium vulgare	Bull Thistle	SNA	SE5		3
Clematis virginiana	Virginia Clematis	S5		3	0
Convallaria majalis	European Lily-of-the-valley	SNA	SE5		5
Cornus racemosa	Grey Dogwood	S5		2	0
Cornus sericea	Red-osier Dogwood	S5		2	-3
Crataegus monogyna	English Hawthorn	SNA	SE4		3
Crataegus punctata	Dotted Hawthorn	S5		4	5

2022 Vascular Plant Checklist – Mill Creek Pit SPA Study Area					
Scientific Name	**Common Name**	**S-Rank**	**Exotic Status**	**CC**	**CW**
Cyperus esculentus	Perennial Yellow Flatsedge	S5		1	-3
Dactylis glomerata	Orchard Grass	SNA	SE5		3
Daucus carota	Wild Carrot	SNA	SE5		5
Dianthus armeria	Deptford Pink	SNA	SE5		5
Digitaria sanguinalis	Hairy Crabgrass	SNA	SE5		3
Dipsacus fullonum	Common Teasel	SNA	SE5		3
Echinochloa crus-galli	Large Barnyard Grass	SNA	SE5		-3
Echium vulgare	Common Viper's Bugloss	SNA	SE5		5
Elaeagnus angustifolia	Russian Olive	SNA	SE3		3
Elaeagnus umbellata	Autumn Olive	SNA	SE3		3
Eleocharis erythropoda	Red-stemmed Spikerush	S5		4	-5
Eleocharis obtusa	Blunt Spikerush	S5		5	-5
Elymus repens	Quackgrass	SNA	SE5		3
Epilobium hirsutum	Hairy Willowherb	SNA	SE5		-3
Epipactis helleborine	Broad-leaved Helleborine	SNA	SE5		3
Equisetum arvense	Field Horsetail	S5		0	0
Equisetum hyemale	Common Scouring-rush	S5		2	0
Eragrostis cilianensis	Stinkgrass	SNA	SE5		3
Erigeron annuus	Annual Fleabane	S5		0	3
Erigeron philadelphicus	Philadelphia Fleabane	S5		1	-3
Erysimum cheiranthoides	Wormseed Wallflower	S5?			3
Euphorbia cyparissias	Cypress Spurge	SNA	SE5		5
Euthamia graminifolia	Grass-leaved Goldenrod	S5		2	0
Festuca rubra	Red Fescue	S5			3
Fragaria virginiana	Wild Strawberry	S5		2	3
Frangula alnus	Glossy Buckthorn	SNA	SE5		0
Fraxinus americana	White Ash	S4		4	3
Galium mollugo	Smooth Bedstraw	SNA	SE5		5
Galium verum	Yellow Bedstraw	SNA	SE4		5
Geum urbanum	Wood Avens	SNA	SE3		5
Hesperis matronalis	Dame's Rocket	SNA	SE5		3
Hordeum jubatum	Foxtail Barley	S5?		0	0
Inula helenium	Elecampane	SNA	SE5		3
Juglans nigra	Black Walnut	S4?		5	3
Juncus dudleyi	Dudley's Rush	S5		1	-3
Juncus nodosus	Knotted Rush	S5		5	-5
Juncus torreyi	Torrey's Rush	S5		3	-3
Juniperus virginiana	Eastern Red Cedar	S5		4	3
Lamium amplexicaule	Common Dead-nettle	SNA	SE3		5
Lapsana communis	Common Nipplewort	SNA	SE5		3
Lathyrus latifolius	Everlasting Pea	SNA	SE4		5
Lepidium campestre	Field Peppergrass	SNA	SE5		5
Lepidium ruderale	Roadside Peppergrass	SNA	SE3		5
Leucanthemum vulgare	Oxeye Daisy	SNA	SE5		5

2022 Vascular Plant Checklist – Mill Creek Pit SPA Study Area					
Scientific Name	**Common Name**	**S-Rank**	**Exotic Status**	**CC**	**CW**
Ligustrum vulgare	European Privet	SNA	SE5		3
Lithospermum officinale	European Gromwell	SNA	SE5		5
Lonicera morrowii	Morrow's Honeysuckle	SNA	SE3		3
Lonicera tatarica	Tatarian Honeysuckle	SNA	SE5		3
Lythrum salicaria	Purple Loosestrife	SNA	SE5		-5
Malus pumila	Common Apple	SNA	SE4		5
Medicago lupulina	Black Medick	SNA	SE5		3
Medicago sativa ssp. *sativa*	Alfalfa	SNA	SE5		5
Melilotus albus	White Sweet-clover	SNA	SE5		3
Melissa officinalis	Lemon Balm	SNA	SE1		5
Monarda fistulosa	Wild Bergamot	S5		6	3
Oenothera biennis	Common Evening-primrose	S5		0	3
Oxalis stricta	Upright Yellow Wood-sorrel	SNA	SE5		3
Panicum capillare	Common Panicgrass	S5		0	0
Parthenocissus vitacea	Thicket Creeper	S5		4	3
Phalaris arundinacea	Reed Canary Grass	S5		0	-3
Phleum pratense	Common Timothy	SNA	SE5		3
Phragmites australis ssp. *australis*	European Common Reed	SNA	SE5		-3
Picea abies	Norway Spruce	SNA	SE3		5
Pilosella aurantiaca	Orange Hawkweed	SNA	SE5		5
Pilosella piloselloides	Tall Hawkweed	SNA	SE5		5
Plantago lanceolata	English Plantain	SNA	SE5		3
Plantago major	Common Plantain	SNA	SE5		3
Poa annua	Annual Bluegrass	SNA	SE5		3
Poa compressa	Canada Bluegrass	SNA	SE5		3
Poa pratensis	Kentucky Bluegrass	S5		0	3
Populus balsamifera	Balsam Poplar	S5		4	-3
Populus grandidentata	Large-toothed Aspen	S5		5	5
Populus tremuloides	Trembling Aspen	S5		2	0
Populus x *canadensis*	(Populus deltoides X Populus nigra)	SNA			
Potentilla argentea	Silvery Cinquefoil	SNA	SE5		3
Potentilla recta	Sulphur Cinquefoil	SNA	SE5		5
Prunella vulgaris ssp. *lanceolata*	Lance-leaved Self-heal	S5		0	0
Prunus pumila	Sand Cherry	S4		8	5
Prunus virginiana	Chokecherry	S5		2	3
Puccinellia distans	Spreading Alkaligrass	SNA	SE5		-3
Ranunculus acris	Common Buttercup	SNA	SE5		0
Rhamnus cathartica	European Buckthorn	SNA	SE5		0
Rhus typhina	Staghorn Sumac	S5		1	3
Robinia pseudoacacia	Black Locust	SNA	SE5		3
Rosa blanda	Smooth Rose	S5		3	3
Rosa multiflora	Multiflora Rose	SNA	SE5		3
Rubus allegheniensis	Allegheny Blackberry	S5		2	3

2022 Vascular Plant Checklist – Mill Creek Pit SPA Study Area					
Scientific Name	**Common Name**	**S-Rank**	**Exotic Status**	**CC**	**CW**
Rubus idaeus ssp. *strigosus*	North American Red Raspberry	S5		2	3
Rudbeckia hirta	Black-eyed Susan	S5		0	3
Rumex acetosella	Sheep Sorrel	SNA	SE5		3
Rumex crispus	Curled Dock	SNA	SE5		0
Salix alba	White Willow	SNA	SE4		-3
Salix bebbiana	Bebb's Willow	S5		4	-3
Salix discolor	Pussy Willow	S5		3	-3
Salix eriocephala	Cottony Willow	S5		4	-3
Salix interior	Sandbar Willow	S5		1	-3
Salix nigra	Black Willow	S4		6	-5
Salix petiolaris	Meadow Willow	S5		3	-3
Salix purpurea	Purple Willow	SNA	SE4		-3
Salix x *fragilis*	(Salix alba X Salix euxina)	SNA			
Saponaria officinalis	Bouncing-bet	SNA	SE5		3
Scirpus atrovirens	Dark-green Bulrush	S5		3	-5
Securigera varia	Purple Crown-vetch	SNA	SE5		5
Senecio vulgaris	Common Ragwort	SNA	SE5		5
Setaria pumila	Yellow Foxtail	SNA	SE5		0
Setaria viridis	Green Foxtail	SNA	SE5		5
Silene vulgaris	Bladder Campion	SNA	SE5		5
Sinapis arvensis	Corn Mustard	SNA	SE5		5
Solanum dulcamara	Bittersweet Nightshade	SNA	SE5		0
Solidago altissima	Tall Goldenrod	S5		1	3
Solidago canadensis	Canada Goldenrod	S5		1	3
Solidago nemoralis	Grey-stemmed Goldenrod	S5		2	5
Sonchus oleraceus	Common Sow-thistle	SNA	SE5		3
Sorbus aucuparia	European Mountain-ash	SNA	SE4		5
Sporobolus neglectus	Small Dropseed	S4		1	3
Symphyotrichum ericoides	White Heath Aster	S5		4	3
Symphyotrichum lanceolatum	Panicled Aster	S5		3	-3
Symphyotrichum novae-angliae	New England Aster	S5		2	-3
Symphyotrichum pilosum	Old Field Aster	S5			3
Syringa vulgaris	Common Lilac	SNA	SE5		5
Tanacetum vulgare	Common Tansy	SNA	SE5		5
Taraxacum officinale	Common Dandelion	SNA	SE5		3
Thlaspi arvense	Field Pennycress	SNA	SE5		5
Torilis japonica	Erect Hedge-parsley	SNA	SE4		3
Toxicodendron radicans var. *radicans*	Eastern Poison Ivy	S5		2	0
Tragopogon dubius	Yellow Goatsbeard	SNA	SE5		5
Trifolium arvense	Rabbit's-foot Clover	SNA	SE4		5
Trifolium pratense	Red Clover	SNA	SE5		3
Trifolium repens	White Clover	SNA	SE5		3

2022 Vascular Plant Checklist – Mill Creek Pit SPA Study Area					
Scientific Name	**Common Name**	**S-Rank**	**Exotic Status**	**CC**	**CW**
Tussilago farfara	Coltsfoot	SNA	SE5		3
Typha angustifolia	Narrow-leaved Cattail	SNA	SE5		-5
Ulmus americana	White Elm	S5		3	-3
Ulmus pumila	Siberian Elm	SNA	SE3		3
Verbascum thapsus	Common Mullein	SNA	SE5		5
Verbena urticifolia	White Vervain	S5		4	0
Veronica arvensis	Corn Speedwell	SNA	SE5		5
Veronica officinalis	Common Speedwell	SNA	SE5		5
Viburnum lentago	Nannyberry	S5		4	0
Vicia cracca	Tufted Vetch	SNA	SE5		5
Vitis riparia	Riverbank Grape	S5		0	0

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ATTACHMENT D: SIGNIFICANT WILDLIFE HABITAT (SWH) SCREENING AND ASSESSMENT

Attachment D – Table of Contents

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SIGNIFICANT WILDLIFE HABITAT (SWH) – SCREENING AND ASSESSMENT

D.1 Introduction

For the purposes of this study, GEC has relied upon the SWHTG to determine what constitutes Significant Wildlife Habitat (SWH) and this is consistent with the recommendations in the NHRM (MNR 2010). There are also several significant problems with the SWHECS that provide additional rationale for not using it. Nevertheless, GEC has considered the SWHECS when appropriate and references to them are provided in this attachment to the Natural Environment Technical Report.

The NHRM and the SWHTG identify four main types of Significant Wildlife Habitat: seasonal concentrations of animals; rare and specialized habitats for wildlife; habitats of species of conservation concern; and animal movement corridors. These are discussed below in relation to the semi-natural features within the Mill Creek SPA study area.

D.2 Seasonal Concentrations of Animals

The SWHTG identifies 14 types of seasonal concentrations of animals that may be considered Significant Wildlife Habitat. They are as follows:

- winter deer yards;
- moose late winter habitat;
- colonial bird nesting sites;
- waterfowl stopover and staging areas;
- waterfowl nesting areas;
- shorebird migratory stopover areas;
- landbird migratory stopover areas;
- raptor winter feeding and roosting areas;
- Wild Turkey winter range;
- Turkey Vulture summer roosting areas;
- reptile hibernacula;
- bat hibernacula;
- bullfrog concentration areas; and,
- migratory butterfly stopover areas.

None of these types of seasonal concentrations of animals occur within the study area. There are no identified winter deer yards in the area; moose do not occur at this latitude; colonial bird nesting areas apply only to herons, gulls, terns, and swallow species whose nesting habitat is not found within the study area; the pit lakes are set within an active gravel pit and not particularly suitable for waterfowl stopover and nesting; shorebird, landbird, and butterfly migratory stopover areas are typically associated with areas within 5 km of the shores of the Great Lakes; the study area is unsuitable as raptor winter feeding and roosting areas because it does not support small rodent populations; winter range for Wild Turkeys typically includes conifers and seeps, habitat that is lacking in the study area; Turkey Vulture roosting sites are absent in the study area; there appear to be no suitable reptile hibernacula; there is no suitable habitat for bat hibernacula; and the bullfrog is absent within the study area.

D.3 Rare and Specialized Habitats

D.3.1 Rare Habitats

Rare habitats are those vegetation communities that are considered rare in Ontario. Generally, these are communities that have been ascribed an S-rank of S1 to S3 by the NHIC. There are no cliffs and talus slopes, sand barrens, alvars, tallgrass prairies or savannahs within the study area. No vegetation communities with S-ranks of S1 to S3 by Bakowsky (1996) and/or the NHIC were identified within the study area.

The vegetation communities that occur within the study area are common and widespread in southern Ontario, having developed in areas of extensive previous disturbance associated with the opening up and operation of the Mill Creek Pit.

D.3.2 Specialized Habitats

The SWHTG defines 14 specialized habitats that may be considered Significant Wildlife Habitat. They are as follows:

- habitat for area-sensitive species;
- forests providing a high diversity of habitats;
- old-growth or mature forest stands;
- foraging areas with abundant mast;
- amphibian woodland breeding ponds;
- turtle nesting habitat;
- specialized raptor nesting habitat;
- moose calving areas;
- moose aquatic feeding areas;
- mineral licks;
- mink, otter, marten, and fisher denning sites;
- highly diverse areas;
- cliffs; and
- seeps and springs.

Certain of these categories of specialized habitat can be eliminated from occurring within the study area without further discussion. These include amphibian woodland breeding ponds; turtle nesting habitat; moose calving and aquatic feeding areas; mineral licks; mink, otter, marten, and fisher denning sites; cliffs; and seeps and springs.

Three of the specialized habitats relate to the quality of forest cover: forests providing a high diversity of habitats, old-growth or mature forest stands, and foraging areas with abundant mast. None of these forest habitats occur within the SPA study area. Similarly, there is no suitable habitat for woodland-breeding area-sensitive species within the study area.

Specialized raptor nesting habitat refers to nesting by those hawk and owl species that both nest and forage within forest habitat. These include the three accipiters, and the Red-shouldered Hawk (*Buteo lineatus*), Broad-winged Hawk (*Buteo platypterus*), Barred Owl (*Strix varia*), and Northern Saw-whet Owl (*Aegolius acadicus*). None of these species occur within the

study area and the forested habitat is limited to a small early successional stand of Trembling Aspen (*Populus tremuloides*).

Highly diverse area is another rather subjective category of significant wildlife habitat that is not considered significant in the SWHECS. The study area does not qualify as a highly diverse area because the entire study area has been disturbed by pit-related activities and the habitats are limited to grassed berms and early successional patches of Trembling Aspen, small shrub thickets, "old field" patches and pit lakes. These types of habitats are relatively common in the vicinity, occurring in/around the various active gravel pits south of Highway 401.

D.4 Species of Conservation Concern

Habitats of Species of Conservation Concern include wildlife species that are listed as Special Concern or rare, that are declining, or are featured species. Habitats of Species of Conservation Concern do not include Endangered or Threatened species as identified by the Ontario *Endangered Species Act (2007)*.

Three groups of wildlife may be considered species of conservation concern:

- species that have a significant proportion of their population in Ontario and that are rare in the planning area;
- species that are exhibiting a statistically significant decline in Ontario; and
- species that are rare or designated significant at some level.

Species with a Significant Proportion of their Global Population in Ontario

There are numerous species in Ontario that have limited representation outside of the province. Habitat for these species may be considered significant wildlife habitat if the species is also rare or significantly declining within the planning area.

None of the species observed during this study have a significant proportion of their global population in Ontario.

Species Declining Significantly in Ontario

Generally, good data are currently available only for birds. The NHIC has taken into account some of these declines in recent revisions to the S-ranks that it has ascribed various species. Some of the declining species have recently had their S-ranks changed from S5 (secure) to S4 (apparently secure) to reflect these declines. None of these bird species were recorded from the SPA study area.

The SWHECS also list certain habitats of species of conservation concern, as outlined below:

- Marsh breeding bird habitat: there are no habitats with shallow water and emergent aquatic vegetation present. There is no suitable breeding habitat for the indicator species listed in the SWHECS and none of these bird species were observed in the study area. The indicator species are listed as follows: American Bittern (*Botaurus lentiginosus*), Virginia Rail (*Rallus limicola*), Sora (*Porzana carolina),* Common Gallinule (*Gallinula galeata*), American Coot (*Fulica americana*), Pied-billed Grebe (*Podilymbus podiceps*), Marsh Wren (*Cistothorus palustris*), Sedge Wren (*Cistothorus platensis*), Common Loon (*Gavia immer*),

Sandhill Crane (*Grus canadensis*), Green Heron (*Butorides virescens*) and Trumpeter Swan (*Cygnus buccinator*).

- Open country bird breeding habitat: the "old field" patches within the SPA study area are pit berms and other disturbed areas that were seeded with a grass-legume seed mix. They are far below the 30 ha size threshold. None of the indicator species listed in the SWHECS were observed in the study area. The indicator species are listed as follows: Upland Sandpiper (*Bartramia longicauda*), Grasshopper Sparrow (*Ammodramus savannarum*), Vesper Sparrow (*Pooecetes gramineus*), Northern Harrier (*Circus hudsonicus)* and Savannah Sparrow (*Passerculus sandwichensis*).

- Shrub/Early successional bird breeding habitat: the "shrub thicket" (Unit CUT1a) within the SPA study area is a narrow strip of Trembling Aspen (*Populus tremuloides*) saplings, Common Buckthorn (*Rhamnus cathartica* +) and Glossy Buckthorn (*Frangula alnus* +) and it is far below the 10-ha size threshold in the SWHECS. The indicator species listed in the SWHECS, e.g., Brown Thrasher (*Toxostoma rufum*) and Clay-coloured Sparrow (*Spizella pallida*), were not observed in the study area.

- Terrestrial Crayfish: the entire site has been disturbed in the past by agricultural uses and pit operations. There is no suitable habitat for terrestrial crayfish within the SPA study area.

<u>Rare or Significant Species</u>

Significance is defined at six levels:

- globally significant (with a G-rank of G1 to G3);
- nationally significant (designated Endangered, Threatened or Special Concern by the Committee on the Status of Endangered Wildlife in Canada);
- provincially significant (with an S-rank of S1 to S3 and S3?, if the latter type of species is being tracked by the OMNRF; species designated Special Concern by the OMNRF);
- regionally significant (within an Ecoregion, or within one of the old OMNR administrative regions);
- locally significant (within an Ecodistrict); and,
- within a planning authority's jurisdiction.

The above is the order of priority that should be given to protection of species of conservation concern.

Of note is the fact that the SWHECS do not consider species that are rare at the global, national, regional, or local levels to qualify as Significant Wildlife habitat. According to the SWHECS, only provincially significant species can qualify as Significant Wildlife Habitat. GEC concurs that globally and nationally significant species that are not provincially significant should not be considered Significant Wildlife Habitat and this is consistent with the NHRM. Consistent with the SWHTG, GEC concurs that regionally and locally significant species may qualify as Significant Wildlife Habitat in some circumstances. The mandate for identifying Significant Wildlife Habitat lies with local planning authorities and not the MNRF. Consequently, municipalities should be able to certain habitats for species that are significant within their jurisdiction as Significant Wildlife Habitat. For this reason, GEC typically does consider locally significant species when assessing Significant Wildlife Habitat, especially if viable populations of such species occur in relatively intact natural habitats.

The discussion on rare or significant species is divided into two sections. The first deals with species that were observed during the inventories and the second discusses species that have been found in the general area, based on records in the NHIC database.

D.4.1 Confirmed Rare or Significant Species

A small number of Barn Swallows (Special Concern) were observed on May 6 and July 14, 2022. They were seen foraging around the yard area and over the Phase 1 pit lake. The structures located within the SPA study area were checked for signs of Barn Swallow nests but none were observed. There is a nesting structure located approximately 580 m west of the proposed SPA area.

The MNRF (2013) had previously defined what constitutes habitat for Barn Swallow in the *General Habitat Description*, when this species was listed as Threatened in Ontario and afforded protection under the *Endangered Species Act (ESA 2007).* Barn Swallow is now listed as Special Concern and not afforded protection under the ESA. Nevertheless, the General Habitat Description was considered. It consists of active nests (Category 1), a 5 m radius around active nests which represents the defended territory area (Category 2), and the area from 5 m to 200 m around the nest which is typically used for foraging (Category 3).

Although the Barn Swallow typically forages within 200 m of its nest, it may occasionally travel considerable distances to forage. This most often occurs during cool, windy weather and it usually seeks water bodies at these times to forage because these habitats are most productive for insects. Under these adverse weather conditions, New York birds foraged as far as 6 km from the nesting colony (Shields 1984).

Within the proposed SPA area, there appears to be no Category 1, 2 or 3 Barn Swallow habitat, since no nests were observed and suitable nesting structures are located more than 200 m away from the SPA area. It is concluded that there is no Significant Wildlife Habitat for Barn Swallow within the SPA study area.

D.4.2 Unconfirmed Rare or Significant Species

This section of the report discusses those species listed by the NHIC as occurring within the general vicinity of the study area, but that were not observed. Records from the following 1km x 1km squares were considered:

- 17NJ6509
- 17NJ6510
- 17NJ6609
- 17NJ6610
- 17NJ6709
- 17NJ6710
- 17NJ6809
- 17NJ6810

1km squares 17NJ6709, 17NJ6710, 17NJ6809 and 17NJ6810 primarily encompass large pit lakes associated with the various active below water gravel pits in the vicinity. 1km squares 17NJ6609 and 17NJ6610 include large pit lakes, as well as large swamp wetlands with watercourses and ponds. Pit lakes are absent from 1km squares 17NJ6509 and 17NJ6510 but these squares do encompass extensive swamp wetlands with watercourses and some ponds.

The entire SPA area and almost all of the study area falls within 1km square 17NJ6710. A very small portion of the study falls within 1km square 17NJ6709.

No globally or nationally significant species have been documented within the general vicinity of the proposed Mill Creek Pit SPA.

Provincially Significant Species

- **Ram's-head Lady's-slipper (*Cypripedium arietinum*) – S3 (Vulnerable)**

Oldham and Brinker (2009) noted the following for *Cypripedium arietinum*:

> *"Moist coniferous swamps, dry, sandy woods, and limestone barrens. Has apparently declined in southern Ontario."*

Wellington County records of Ram's-head Lady's-slipper are more than 30 years old (Oldham and Brinker 2009). No suitable habitat for this vascular plant species is present in the SPA study area.

- **Double-striped Bluet (*Enallagma basidens*) – S3 (Vulnerable)**

Carmichael et al. (2004) describe the Double-striped Bluet as "rare in southwestern Ontario, recent immigrant" and its habitat as "ponds with sparse vegetation."

The Wisconsin Department of Natural Resources website states that the Double-striped Bluet *"…has been found in permanent or semi-permanent lakes, ponds, reservoirs, borrow pits, slow parts of streams or rivers, or spring fed streams. It rarely occurs in bog ponds."* [https://dnr.wi.gov/topic/EndangeredResources/Animals.asp?mode=detail&SpecCode=IIODO71120]

The NHIC records are from 1km squares 17NJ6609, 17NJ6610, 17NJ6709, 17NJ6710, 17NJ6809 and 17NJ6810. These 6 squares encompass all the pit lakes in the vicinity. As noted above, almost all of the SPA study area falls into square 17NJ6710.

The Double-striped Bluet was not observed during the 2022 ecological field surveys. The June and July site visits correspond to the flight season for this species. It is concluded that the SPA study area does not constitute Significant Wildlife Habitat (SWH) for the Double-striped Bluet. It is noted that the pit lakes that potentially provide habitat for this species will not be negatively affected by the proposed SPA.

- **Midland Painted Turtle (Chrysemys picta marginata) – S4 (Apparently Secure), Special Concern (SARA)**
- **Snapping Turtle (Chelydra serpentina) – S4 (Apparently Secure), Special Concern (SARO, SARA)**

The Midland Painted Turtle is listed as Special Concern on the federal SARA list but not on the provincial SARO list. The Snapping Turtle is listed as Special Concern on both the federal SARA list and the provincial SARO list.

The Midland Painted Turtle inhabits a wide variety of waterbodies and wetlands, including ponds, lakes, slow-moving creeks and marshes that have a soft bottom and provide abundant basking sites and aquatic vegetation.

The Snapping Turtle occurs in most waterbodies and wetlands, though it is most frequently observed in slow-moving water with a soft mud or sand bottom and abundant vegetation. This species may inhabit surprisingly small habitats.

Both the Midland Painted Turtle and the Snapping Turtle were listed in the NHIC database for the following 1km x 1km squares:

- 17NJ6509
- 17NJ6510
- 17NJ6609
- 17NJ6610
- 17NJ6709
- 17NJ6710
- 17NJ6810

The two species were not observed in the SPA study area during the 2022 ecological field surveys. The late May and June site visits were time to correspond with the egg-laying period for both species and no signs of turtle nesting activity was observed. The banks of the Phase 1 and Phase 4 pit lakes are, within the study area, quite steep and mostly north-facing, making them less attractive to female turtles looking to lay their eggs. Midland Painted Turtle and Snapping Turtle have both been observed by GEC in the Phase 5 pit lake, which is better suited as turtle habitat having patches of emergent vegetation around the margins, bars and small islands, and being adjacent to Galt Creek Swamp PSW with permanent creek and tributaries.

It is concluded that the SPA study area does not constitute Significant Wildlife Habitat (SWH) for the Midland Painted Turtle and Snapping Turtle. It is noted that the pit lakes that potentially provide habitat for these species will not be negatively affected by the proposed SPA.

D.5 Animal Movement Corridors

The SWHTG defines animal movement corridors as elongated, naturally vegetated parts of the landscape used by animals to move from one habitat to another. To qualify as Significant Wildlife Habitat, these corridors should be a critical link between habitats that are regularly used by wildlife. The SPA study area does not contain any such critical links between habitats.

D.6 Summary of Significant Wildlife Habitat (SWH)

No significant concentrations of animals, rare habitats, habitats of species of conservation concern or animal movement corridors occur within the study area. It is concluded that no Significant Wildlife Habitats occur within the SPA Natural Environment Study Area. This is not surprising, considering the extensive disturbance history within the study area from past agricultural uses and current pit operations.

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