Appendix A DETAILED PLANS FOR THE CONSTRUCTION OF NASHWAAK STREAM BRIDGE REPLACEMENT

SISSON PROJECT: REVISED INFORMATION REQUIREMENTS IN SUPPORT OF THE APPLICATION FOR FISHERIES ACT AUTHORIZATION, AND OFFSETTING PLAN

March 4, 2019

REDUCED PLANS

Use a scale half size of those shown when printed on 11x17 paper (280mm x 432mm)

THE SISSON PARTNERSHIP

SISSON PROJECT LIMITED PARTNERSHIP

DETAIL PLANS FOR THE CONSTRUCTION OF

NASHWAAK RIVER WATER CONTROL STRUCTURE (WCS REPLACEMENT)

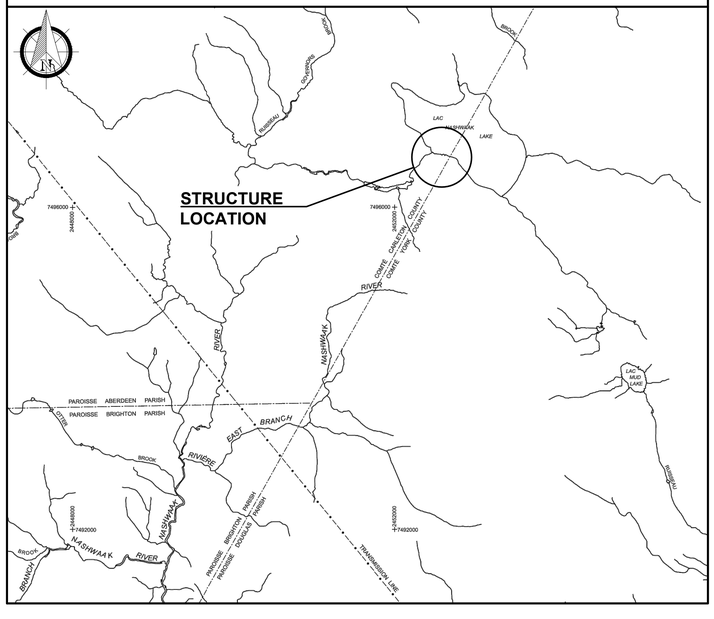
~ Single Lane Steel Stringer Structure ~

Nashwaak Lake Access Road

PRELIMINARY
NOT FOR CONSTRUCTION

Stantec

LOCATION PLAN



DESIGN CRITERIA

- **BRIDGE DESIGN CODE IS CSA-S6-14.**
- **LIVE LOAD IS CL-625-ONT.**
- **BRIDGE BARRIERS ARE TL1 RATED**
- **STRUCTURAL STEEL TO CONFORM TO CAN / CSA G40.21 GRADE 350W**
- **ROAD CLASSIFICATION IS PAR 1.**
- **DRAINAGE AREA = 12.9 Km²**
- **Q100 + 20% (DESIGN FLOW RATE) = 16 m³/sec**
- **ALL DIMENSIONS ARE EXPRESSED IN MILLIMETRES.**
- **ALL STATIONS AND ELEVATIONS ARE EXPRESSED IN METRES.**
- **ELEVATIONS - GEODETIC CGVD2013**

INDEX

DESIGN LOADING

LIVE LOAD
CL-625-ONT TRUCK AND LANE LOADING

DEAD LOAD
RAILING SYSTEM (PER SIDE):
0.89 kN/m
TRANSVERSE NAIL LAMINATED WOOD DECK:
1.14 kPa
STEEL DIAPHRAGMS:
0.40 kPa

WIND LOAD
q ‰ =0.69 kPa (MOST CRITICAL FOR NEW BRUNSWICK)

BARRIER LOAD
BARRIER ANCHORAGE DESIGNED FOR TL-1 LOADS

GENERAL NOTES

1.0 CONSTRUCTION NOTES:

1.1 FOR THE PURPOSE OF CONSTRUCTION DRAWINGS, THE FOLLOWING DEFINITIONS SHALL APPLY.

1.2 ALL SITE WORK SHALL BE COMPLETED AS INDICATED ON DRAWINGS.

1.3 THE CONTRACTOR SHALL VISIT THE SITE AND SHALL FAMILIARIZE THEMSELVES WITH ALL CONDITIONS AFFECTING THE PROPOSED WORK AND SHALL MAKE PROVISIONS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR FAMILIARIZING THEMSELVES WITH ALL CONTRACT DOCUMENTS, FIELD CONDITIONS, DIMENSIONS, AND CONFIRMING THAT THE WORK MAY BE ACCOMPLISHED AS SHOWN PRIOR TO PROCEEDING WITH CONSTRUCTION. ANY DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER PRIOR TO THE COMMENCEMENT OF WORK.

1.4 ALL MATERIALS FURNISHED AND INSTALLED SHALL BE IN STRICT ACCORDANCE WITH ALL APPLICABLE CODES, REGULATIONS, AND ORDINANCES. THE CONTRACTOR SHALL ISSUE ALL APPROPRIATE NOTICES AND COMPLY WITH ALL LAWS, ORDINANCES, RULES, REGULATIONS, AND LAWFUL ORDERS OF ANY PUBLIC AUTHORITY REGARDING THE PERFORMANCE OF WORK.

1.5 ALL WORK CARRIED OUT SHALL COMPLY WITH ALL APPLICABLE MUNICIPAL AND UTILITY COMPANY SPECIFICATIONS AND LOCAL JURISDICTIONAL CODES, ORDINANCES, AND APPLICABLE REGULATIONS.

1.6 UNLESS NOTED OTHERWISE, THE WORK SHALL INCLUDE FURNISHING MATERIALS, APPURTENANCES, AND LABOUR NECESSARY TO COMPLETE ALL INSTALLATIONS AS INDICATED ON DRAWINGS.

1.7 PLANS ARE NOT TO BE SCALED. THESE PLANS ARE INTENDED TO BE A DIAGRAMMATIC OUTLINE ONLY UNLESS OTHERWISE NOTED. DIMENSIONS SHOWN ARE TO FINISH SURFACES UNLESS OTHERWISE NOTED. IT IS CRITICAL TO FIELD VERIFY DIMENSIONS, SHOULD THERE BE ANY QUESTIONS REGARDING THE CONTRACT DOCUMENTS, THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING A CLARIFICATION FROM THE ENGINEER PRIOR TO PROCEEDING WITH THE WORK. DETAILS ARE INTENDED TO SHOW DESIGN INTENT. MODIFICATIONS MAY BE REQUIRED TO SUIT JOB DIMENSIONS OR CONDITIONS AND SUCH MODIFICATIONS SHALL BE INCLUDED AS PART OF WORK AND APPROVED BY THE ENGINEER PRIOR TO PROCEEDING WITH WORK.

1.8 THE CONTRACTOR SHALL INSTALL ALL MATERIALS IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS UNLESS SPECIFICALLY STATED OTHERWISE.

1.9 IF THE SPECIFIED MATERIALS CANNOT BE INSTALLED AS SHOWN ON THESE DRAWINGS, THE CONTRACTOR SHALL PROPOSE AN ALTERNATIVE INSTALLATION SPACE FOR APPROVAL BY THE ENGINEER PRIOR TO PROCEEDING.

1.10 THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE SAFETY OF WORK AREA AND ADJACENT AREAS THAT ARE LIKELY TO BE AFFECTED BY THE WORK UNDER THIS CONTRACT. WORK SHALL CONFORM TO ALL LOCAL SAFETY REGULATIONS.

1.11 THE CONTRACTOR SHALL COORDINATE WORK AND SCHEDULE WORK ACTIVITIES WITH OTHER DISCIPLINES WHERE APPLICABLE.

1.12 CONSTRUCTION SHALL BE DONE IN A WORKMANLIKE MANNER BY COMPETENT EXPERIENCED WORKMAN IN ACCORDANCE WITH APPLICABLE CODES AND THE BEST ACCEPTED PRACTICE.

1.13 CONTRACTOR SHALL NOT COMMENCE WORK WITHOUT THE PRIOR WRITTEN CONSENT OF THE OWNER.

1.14 THE CONTRACTOR SHALL PROTECT EXISTING FEATURES NOT TO BE IMPACTED BY THE WORK. ANY DAMAGED PART SHALL BE REPAIRED AT CONTRACTOR'S EXPENSE TO THE SATISFACTION OF THE ENGINEER.

1.15 PRIOR TO INITIATING WORK, A WATERCOURSE AND WETLAND ALTERATION PERMIT MUST BE OBTAINED FROM NEW BRUNSWICK DEPARTMENT OF ENVIRONMENT.

1.15 THE CONTRACTOR SHALL CONTACT UTILITY LOCATING SERVICES PRIOR TO THE START OF CONSTRUCTION.

1.16 THE CONTRACTOR SHALL COORDINATE AND MAINTAIN ACCESS FOR ALL TRADES, SUBCONTRACTORS, MANUFACTURERS AND THE OWNER TO THE SITE, WHERE APPLICABLE.

1.17 THE CONTRACTOR SHALL BE RESPONSIBLE FOR SECURITY OF THE SITE FOR THE DURATION OF CONSTRUCTION UNTIL JOB COMPLETION.

1.18 THE CONTRACTOR SHALL MAINTAIN IN GOOD CONDITION ONE COMPLETE SET OF PLANS WITH ALL REVISIONS, ADDENDA, AND CHANGE ORDERS ON THE PREMISES AT ALL TIMES.

1.19 THE CONTRACTOR SHALL MINIMIZE DISTURBANCE TO THE EXISTING SITE DURING CONSTRUCTION. EROSION CONTROL MEASURES, IF REQUIRED DURING CONSTRUCTION, SHALL BE IN CONFORMANCE WITH THE PROVINCIAL AND LOCAL JURISDICTION FOR EROSION AND SEDIMENT CONTROL.

1.20 ALL NECESSARY RUBBISH, STUMPS, DEBRIS, STICKS, STONES AND OTHER REFUSE SHALL BE REMOVED FROM SITE AND DISPOSED OF IN A LAWFUL MANNER AND IN ACCORDANCE WITH THE SOIL MANAGEMENT PLAN, WHERE APPLICABLE.

1.21 ALL BROCHURES, INSTALLATION AND ASSEMBLY MANUALS, CATALOGS, SHOP DRAWINGS, AND OTHER DOCUMENTS SHALL BE TURNED OVER TO THE OWNER UPON COMPLETION OF CONSTRUCTION AND PRIOR TO PAYMENT.

1.22 THE CONTRACTOR SHALL SUBMIT A COMPLETE SET OF AS-BUILT REDLINES TO THE OWNER UPON COMPLETION OF PROJECT AND PRIOR TO PAYMENT.

1.23 THE CONTRACTOR SHALL LEAVE PREMISES IN A CLEAN CONDITION.

1.24 THE PROPOSED FACILITY WILL BE UNMANNED AND DOES NOT REQUIRE POTABLE WATER OR SEWER SERVICE AND IS NOT FOR HUMAN HABITAT (NO HANDICAP ACCESS REQUIRED).

1.25 THE CONTRACTOR SHALL PROVIDE TEMPORARY WASHROOM FACILITIES ON SITE.

1.26 THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL PERMITS AND INSPECTIONS REQUIRED FOR CONSTRUCTION. IF CONTRACTOR CANNOT OBTAIN A PERMIT, THEY MUST NOTIFY THE OWNER IMMEDIATELY.

1.27 THE CONTRACTOR SHALL REMOVE ALL TRASH AND DEBRIS FROM THE SITE ON A DAILY BASIS.

1.28 INFORMATION SHOWN ON DRAWINGS WAS OBTAINED FROM SITE VISITS AND/OR DRAWINGS PROVIDED BY THE SITE OWNER. THE CONTRACTOR SHALL NOTIFY THE ENGINEER OF ANY DISCREPANCIES PRIOR TO ORDERING MATERIALS OR PROCEEDING WITH CONSTRUCTION.

1.29 ALL SIGNAGE, BARRICADES AND TRAFFIC CONTROL DEVICES SHALL BE IN ACCORDANCE WITH THE WORK AREA TRAFFIC CONTROL MANUAL FOR NEW BRUNSWICK.

1.30 UNLESS OTHERWISE NOTED, THE CONTRACTOR SHALL FOLLOW THE MATERIALS, SUBMITTALS AND CONSTRUCTION SECTIONS OF THE DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION, JANUARY 2019.

1.31 THE BRIDGE WAS DESIGNED USING CAN/CSA-S6-14, CANADIAN HIGHWAY BRIDGE DESIGN CODE.

1.32 THE FOLLOWING ASSUMPTIONS HAVE BEEN MADE IN THE DESIGN OF THIS BRIDGE:

- STEEL STRINGERS DO NOT ACT COMPOSITELY WITH DECK.
- GUIDE RAIL TO BE BOLTED TO RAIL POST THRU A HOLE DRILLED IN THE GUIDE RAIL (IN THE FIELD) TO SUIT HOLE IN RAIL POST.
- TOP OF BRIDGE STRUCTURE IS NOT HIGHER THAN 10m ABOVE GROUND.
- THE BRIDGE HAS NO SIDEWALK.
- STRUCTURE ASSUMED TO BE STRAIGHT (NOT CURVED OR SKEWED).
- DECK OVERHANG SHALL NOT EXCEED 300mm.

2.0 STRUCTURAL NOTES:

2.1 GENERAL NOTES SHALL BE READ IN CONJUNCTION WITH SPECIFICATIONS AND CONTRACT DOCUMENTS.

2.2 STRUCTURAL DRAWINGS SHALL BE COORDINATED AND READ IN CONJUNCTION WITH THE CIVIL DRAWINGS.

2.3 DO NOT USE DRAWINGS FOR CONSTRUCTION UNLESS MARKED "ISSUED FOR CONSTRUCTION" AND SEALED BY ENGINEER.

2.4 DESIGN, DETAILING AND CONSTRUCTION, SHALL CONFORM TO PROVINCIAL BUILDING CODE, NATIONAL BUILDING CODE, OCCUPATIONAL HEALTH AND SAFETY ACT, LOCAL REGULATIONS AND BYLAWS AND OTHER CODES AND STANDARDS LISTED. LATEST AVAILABLE EDITIONS SHALL BE USED.

2.5 CHECK DIMENSIONS ON STRUCTURAL DRAWINGS AGAINST CIVIL DRAWINGS.

2.6 DIMENSIONS OF EXISTING CONDITIONS ARE PLUS OR MINUS REGARDLESS OF WHETHER SHOWN ON DRAWINGS OR NOT. VERIFY THAT ALL DIMENSIONS AND EXISTING CONDITIONS ARE AS SHOWN ON DRAWINGS. REPORT ANY INCONSISTENCIES AND DOUBTFUL CONDITIONS TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK.

2.7 DRAWINGS SHALL NOT BE SCALED.

2.8 TYPICAL STRUCTURAL DETAILS SHALL BE USED WHERE SPECIFIC DETAILS ARE NOT SHOWN ON STRUCTURAL DRAWINGS.

2.9 NO PROVISION HAS BEEN MADE FOR CONDITIONS OCCURRING DURING CONSTRUCTION. THE CONTRACTOR SHALL PROVIDE ALL NECESSARY BRACING AND SHORING REQUIRED TO SAFEGUARD NEW AND EXISTING STRUCTURES, SERVICES AND UTILITIES, AND FOR THE LOADS AND INSTABILITY OCCURRING DURING CONSTRUCTION. CONTRACTOR SHALL ASSUME FULL RESPONSIBILITY FOR SAID TEMPORARY WORKS.

2.10 DESIGN LOADS, AS INDICATED SHALL NOT BE EXCEEDED DURING CONSTRUCTION.

2.11 DO NOT CUT OPENINGS THROUGH STRUCTURAL ELEMENTS UNLESS APPROVED BY THE ENGINEER.

2.12 ADEQUATE COLD OR HOT WEATHER PROTECTION SHALL BE PROVIDED FOR ALL WORK IN ACCORDANCE WITH STANDARDS SPECIFIED TO ENSURE ADEQUATE QUALITY, DURABILITY AND STRENGTH ARE ACHIEVED.

2.13 DESIGN OF THE ABUTMENTS AND FOUNDATIONS FOR NEW STRINGER BRIDGE SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR AND BASED ON THE DETAILS SHOWN ON THE DRAWINGS AND ON THE GEOTECHNICAL REPORT "SISSON BRIDGE REPLACEMENT" PREPARED BY STANTEC CONSULTING LTD., JANUARY 29, 2019.

2.14 BRIDGE ABUTMENTS SHALL BE BIN-WALL, BY ARMTEC, OR APPROVED EQUAL AND SHALL BE FOUNDED ON SOLID GROUND AT A DEPTH OF NOT LESS THAN 1.5 METRES BELOW THE RIVER CHANNEL ELEVATION TO AVOID SCOUR AND FROST POTENTIAL IMPACTS. HEIGHTS AND WIDTH OF ABUTMENTS TO BE DESIGNED TO ENSURE BRIDGE DECK ELEVATION TO MATCH FINISHED GRADE PROFILE.

STEEL MATERIALS:

2.15 PLATES AND W SHAPES CONFORM TO CAN/CSA G40.21-350W OR ASTM A572, A992 GRADE 50.

2.16 CHANNELS, RODS AND ANGLES SHALL CONFORM TO CAN/CSA G-140.21 GRADE 350W.

2.17 HSS SHALL CONFORM TO CAN/CSA G40 20-350W OR ASTM A500 GRADE C (345 MPa).

2.18 ALL STRUCTURAL STEEL SHALL BE HOT-DIP GALVANIZED UNLESS OTHERWISE NOTED.

2.19 ALL BOLTS TO BE MINIMUM ¾" ø A325 HOT-DIP GALVANIZED UNLESS OTHERWISE NOTED.

WOOD MATERIAL

2.20 COMMON NAILS TO CSA B111-1974 (R2003). 100mm LONG (20d).

2.21 LAG SCREWS FOR BEARING CONNECTION TO ANSI/ASME STANDARD B18.2.1 GALVANIZED.

2.22 SAWN WOOD SPECIES TO CSA 01141-05 (R2009), S-P-F No. 1/No. 2, PRESSURE PRESERVATIVE TREATED IN ACCORDANCE WITH CSA 080 AND THE SPECIFIED REQUIREMENTS OF CSA S6-06, CLAUSE 9.17.

2.23 LUMBER SHALL BE STORED IN A STRAIGHT HORIZONTAL FASHION TO AVOID DAMAGE FROM THE WEATHER OR OTHER ELEMENTS. POSTS, PLATES AND OTHER METAL ITEMS SHALL ALSO BE PROTECTED FROM THE WEATHER.

2.24 PLACE EACH LAMINATE VERTICAL OF WOOD DECK TIGHT AGAINST THE PRECEDING ONE. ENSURE LAMINATE BEARS EVENLY ON ALL SUPPORTS.

2.25 FASTEN EACH LAMINATION TO THE PRECEDING ONE AT INTERVALS NOT EXCEEDING 250mm. DRIVE NAILS ALTERNATELY NEAR THE TOP AND TO 125mm OF THE END OF EACH LAMINATION. THE NAILS SHALL BE LONG ENOUGH TO PASS THROUGH TWO LAMINATES AND AT LEAST HALFWAY THROUGH THE THIRD.

2.26 STAGGER BUTT WOOD DECK JOINTS SO THAT WITHIN ANY BAND OF 1.0m MEASURED ALONG THE LAMINATE, A BUTT JOINT SHALL NOT OCCUR IN MORE THAN ONE LAMINATE OUT OF ANY THREE ADJACENT LAMINATE.

3.0 EXCAVATION, FOUNDATIONS AND BACKFILL:

3.1 ENSURE THAT REQUIREMENTS OUTLINED ARE READ AND UNDERSTOOD PRIOR TO COMMENCING FOUNDATION WORK. THIS INFORMATION IS GIVEN SOLELY AS A GUIDE. NO RESPONSIBILITY IS ACCEPTED BY OWNER OR ENGINEER FOR ITS CORRECTNESS. NOR SHALL ITS ACCURACY OR ANY OMISSIONS AFFECT THE PROVISION OF THIS CONTRACT.

3.2 EXCAVATIONS SHALL BE COMPLETELY DEWATERED DURING CONSTRUCTION TO PREVENT UPLIFT ON THE STRUCTURE OR CONTAMINATION OF THE BACKFILL MATERIALS.

3.3 REMOVE ALL UNSUITABLE FILL AND ORGANIC MATERIAL FROM CONSTRUCTION AREA AND REPLACE WITH MATERIAL APPROVED BY GEOTECHNICAL ENGINEER.

3.4 NATURAL, UNDISTURBED SOIL OR ENGINEERED FILL BEARING SURFACES SHALL BE APPROVED BY GEOTECHNICAL ENGINEER IN WRITING PRIOR TO FOUNDATION CONSTRUCTION TO ENSURE THAT CONDITIONS CORRESPOND TO THOSE ASSUMED IN DESIGN.

3.5 BACKFILL MATERIAL FOR THE ABUTMENTS SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDED SPECIFICATIONS FOR PHYSICAL PROPERTIES, COMPACTION METHOD AND LIFT THICKNESS.

3.6 PRIOR TO CONSTRUCTION, BACKFILL, BORROW AND GRANULAR MATERIALS SHALL BE APPROVED BY GEOTECHNICAL ENGINEER.

3.7 ABUTMENT FOUNDATION AND ROADWAY SUBGRADE SHALL BE PROOF-ROLLED AND OVERSIZE AND SOFT MATERIALS REMOVED PRIOR TO PLACEMENT OF BACKFILL AND GRANULAR MATERIALS.

3.8 TYPICAL STRUCTURAL DETAILS SHALL BE USED WHERE SPECIFIC DETAILS ARE NOT SHOWN ON STRUCTURAL DRAWINGS.

3.9 BEDROCK CONDITION BASED ON BOREHOLE.

3.10 REMOVE BEDROCK TO ACCOUNT FOR MINIMUM THICKNESS.

3.11 ROCK EXCAVATION MAY BE REQUIRED TO REACH THE FINAL DESIGN GRADE OF THE WATERCOURSE CHANNEL. IT MAY BE FEASIBLE TO REMOVE SOME OF THE UPPER WEATHERED ROCK (UP TO AN ESTIMATED DEPTH OF 1m) USING EXCAVATORS AND/OR ROCK BREAKERS, HOWEVER REMOVAL PAST THIS DEPTH MAY REQUIRE DRILLING AND BLASTING. THE CONTRACTOR SELECTED TO COMPLETE THIS WORK SHOULD BE CONSIDERED RESPONSIBLE FOR DETERMINING THE MEANS AND METHODS FOR BEDROCK REMOVAL.

4.0 SHOP DRAWINGS AND SUBMITTALS:

4.1 REVIEW OF SHOP DRAWINGS BY STANTEC CONSULTING LTD. SHALL BE FOR THE PURPOSE OF ASCERTAINING CONFORMANCE WITH THE GENERAL DESIGN CONCEPT. THIS REVIEW DOES NOT IMPLY APPROVAL OF DETAIL DESIGN OR QUANTITIES IN SHOP DRAWINGS AND DOES NOT RELIEVE THE CONTRACTOR OF RESPONSIBILITY FOR ERRORS AND OMISSIONS IN SHOP DRAWINGS OR FOR MAKING THE WORK ACCURATE AND IN COMPLIANCE WITH THE CONTRACT DOCUMENTS AND DRAWINGS.

4.2 SUBMIT AT LEAST ONE COPY OF SHOP DRAWINGS TO ENGINEER FOR REVIEW.

4.3 ALLOW 10 WORKING DAYS FOR REVIEW OF SHOP DRAWINGS.

4.4 REPRODUCTIONS OF STRUCTURAL DRAWINGS SHALL NOT BE ACCEPTED AS SHOP DRAWINGS.

4.5 DO NOT FABRICATE MATERIALS BASED ON REJECTED SHOP DRAWINGS OR PRIOR TO SHOP DRAWING REVIEW.

5.0 INSPECTION AND TESTING:

5.1 THE FOLLOWING ITEMS SHALL BE INSPECTED OR TESTED BY A CSA CERTIFIED INDEPENDENT INSPECTION AND TESTING COMPANY DESIGNATED BY CONTRACTOR AND APPROVED BY THE OWNER. MATERIALS AND WORKMANSHIP NOT CONFORMING TO THE SPECIFICATIONS AND DRAWINGS SHALL BE REJECTED. REPORTS AND TEST RESULTS SHALL BE PROMPTLY SUBMITTED TO THE ENGINEER FOR REVIEW.

SOILS:

5.2 INSPECTIONS OF BEARING SURFACES SHALL BE CONDUCTED BY THE GEOTECHNICAL ENGINEER. FILL MATERIAL AND FOUNDATIONS SHALL NOT BE PLACED WITHOUT THE AUTHORIZATION OF GEOTECHNICAL ENGINEER. COMPACTION TESTS SHALL BE COMPLETED FOR ALL BORROW, BACKFILL AND GRANULAR MATERIALS.

STRUCTURAL STEEL:

5.3 ALL STRUCTURAL STEEL, BOLTED AND WELDED CONNECTIONS TO BE INSPECTED BY THE ENGINEER.

NO.	REVISIONS	DATE
0	ISSUED FOR CONSTRUCTION	FEB.26, 2019

	Compilation	Drawing
Made By:	LMC	LMC
Checked By:	RWP	PJF
Approved By:		

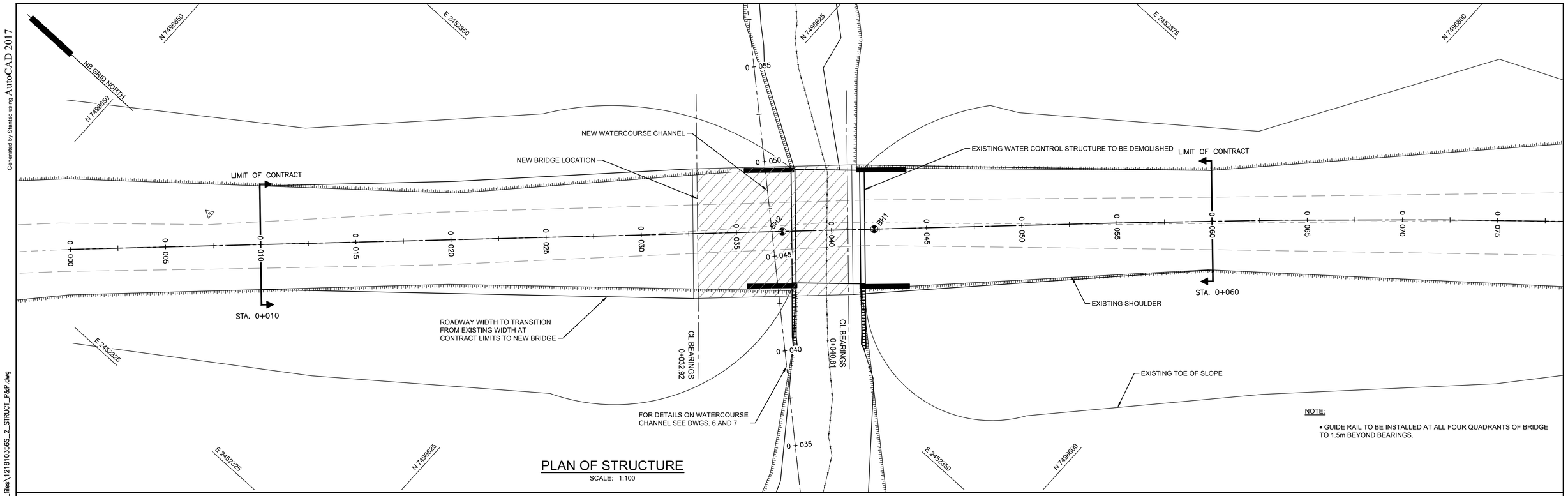
THE SISSON PARTNERSHIP
SISSON PROJECT LIMITED PARTNERSHIP

NASHWAAK RIVER (WCS) REPLACEMENT

DESIGN LOADING & GENERAL NOTES

Stantec Consultant

Date	FEB. 2019
Bridge Design Code	CSA-S6-14
Live Load	CL-625-ONT
DWG.	1 OF 10

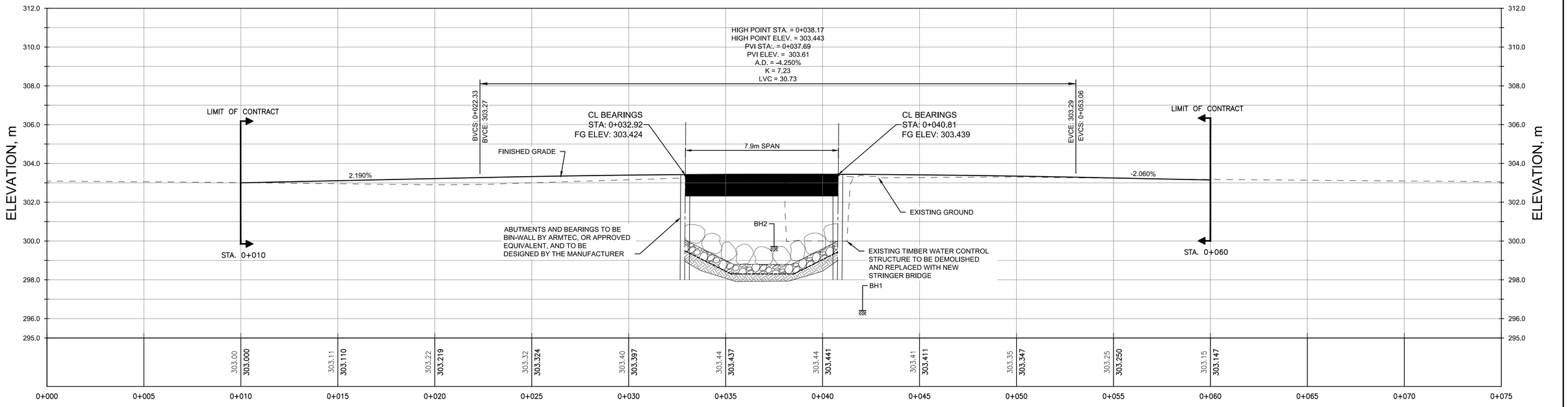


PLAN OF STRUCTURE

SCALE: 1:100

NOTE:

- GUIDE RAIL TO BE INSTALLED AT ALL FOUR QUADRANTS OF BRIDGE TO 1.5m BEYOND BEARINGS.



STRUCTURE CENTERLINE PROFILE

SCALE: 1:100

Stantec
Consultant

NO.	REVISIONS	DATE
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Approved By:		

THE SISSON PARTNERSHIP

SISSON PROJECT LIMITED PARTNERSHIP

NASHWAAK RIVER (WCS) REPLACEMENT

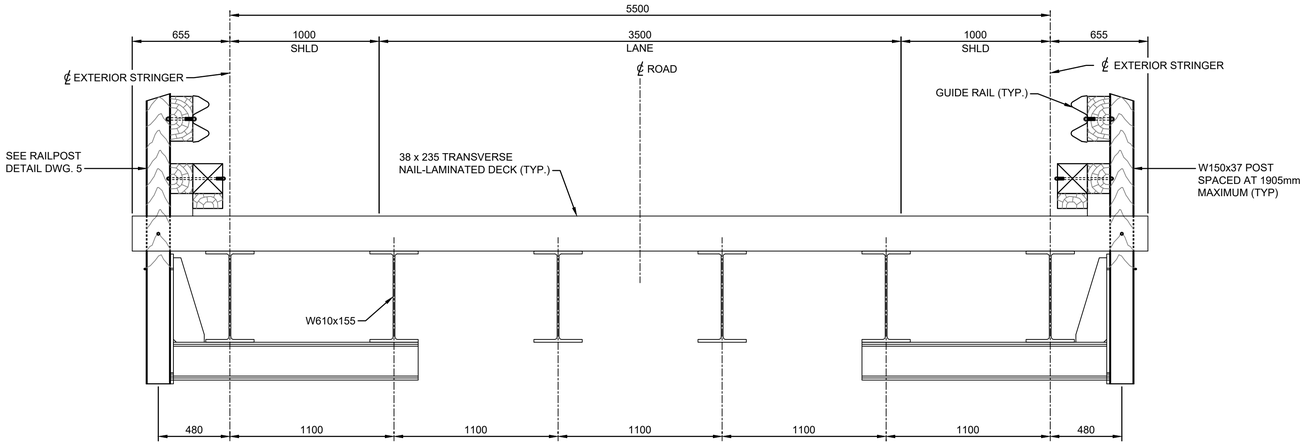
PLAN AND PROFILE

Bridge Design Code CSA-S6-14

Date FEB. 2019

Live Load CL-625-ONT

DWG. 2 OF 10



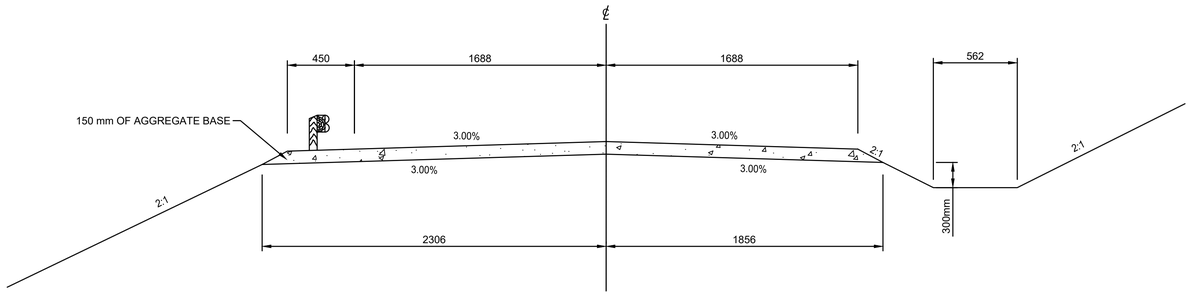
6 STRINGERS - TYPICAL SECTION THRU DECK

SCALE: 1:20

HP AND W STRINGER SELECTION TABLE			
SPAN	STRINGER SPACING 1.10m	DIAPHRAGM SIZE AND SPACING	DIAPHRAGM TYPE
7.9m	W610x155	C310x31 ENDS & MIDSPAN	TYPE B

BRIDGE AND ROADWAY ALIGNMENT GEOMETRY

ID	SEGMENT TYPE	LENGTH (m)	RADIUS (m)	TANGENT OR CHORD AZIMUTH	BEGIN STATION	PI OR A	END STATION	DELTA △
T–7	TANGENT	55.129		136° 27' 09.98"	STA: 0+000.000 E: 2,452,327.881 N: 7,496,646.376		STA: 0+055.129 E: 2,452,365.862 N: 7,496,606.418	
C–1	CURVE	42.328	550.000	138° 39' 26.97"	STA: 0+055.129 E: 2,452,365.862 N: 7,496,606.418	E: 2,452,380.450 N: 7,496,591.071	STA: 0+097.457 E: 2,452,393.815 N: 7,496,574.647	4° 24' 34.0"
T–8	TANGENT	2.393		140° 51' 43.96"	STA: 0+097.457 E: 2,452,393.815 N: 7,496,574.647		STA: 0+099.850 E: 2,452,395.326 N: 7,496,572.791	



PROPERTY ACCESS ROAD STANDARD #1

SCALE: 1:20

WATERCOURSE ALIGNMENT GEOMETRY

ID	SEGMENT TYPE	LENGTH (m)	RADIUS (m)	TANGENT OR CHORD AZIMUTH	BEGIN STATION	PI OR A	END STATION	DELTA △
T–1	TANGENT	21.694		27° 03' 46.67"	STA: 0+000.000 E: 2,452,327.056 N: 7,496,581.959		STA: 0+021.694 E: 2,452,336.926 N: 7,496,601.278	
T–2	TANGENT	49.582		41° 40' 27.51"	STA: 0+021.694 E: 2,452,336.926 N: 7,496,601.278		STA: 0+071.276 E: 2,452,369.893 N: 7,496,638.312	
T–3	TANGENT	5.556		43° 21' 39.52"	STA: 0+071.276 E: 2,452,369.893 N: 7,496,638.312		STA: 0+076.831 E: 2,452,373.707 N: 7,496,642.352	
T–4	TANGENT	3.169		51° 35' 36.84"	STA: 0+076.831 E: 2,452,373.707 N: 7,496,642.352		STA: 0+080.000 E: 2,452,376.190 N: 7,496,644.320	
T–5	TANGENT	3.787		55° 13' 07.38"	STA: 0+080.000 E: 2,452,376.190 N: 7,496,644.320		STA: 0+083.787 E: 2,452,379.300 N: 7,496,646.480	
T–6	TANGENT	2.477		85° 36' 04.66"	STA: 0+083.787 E: 2,452,379.300 N: 7,496,646.480		STA: 0+086.264 E: 2,452,381.770 N: 7,496,646.670	

NO.	REVISIONS	DATE
0	ISSUED FOR CONSTRUCTION	FEB.26, 2019

	Compilation	Drawing
Made By:	LMC	LMC
Checked By:	RWP	PJF
Approved By:		

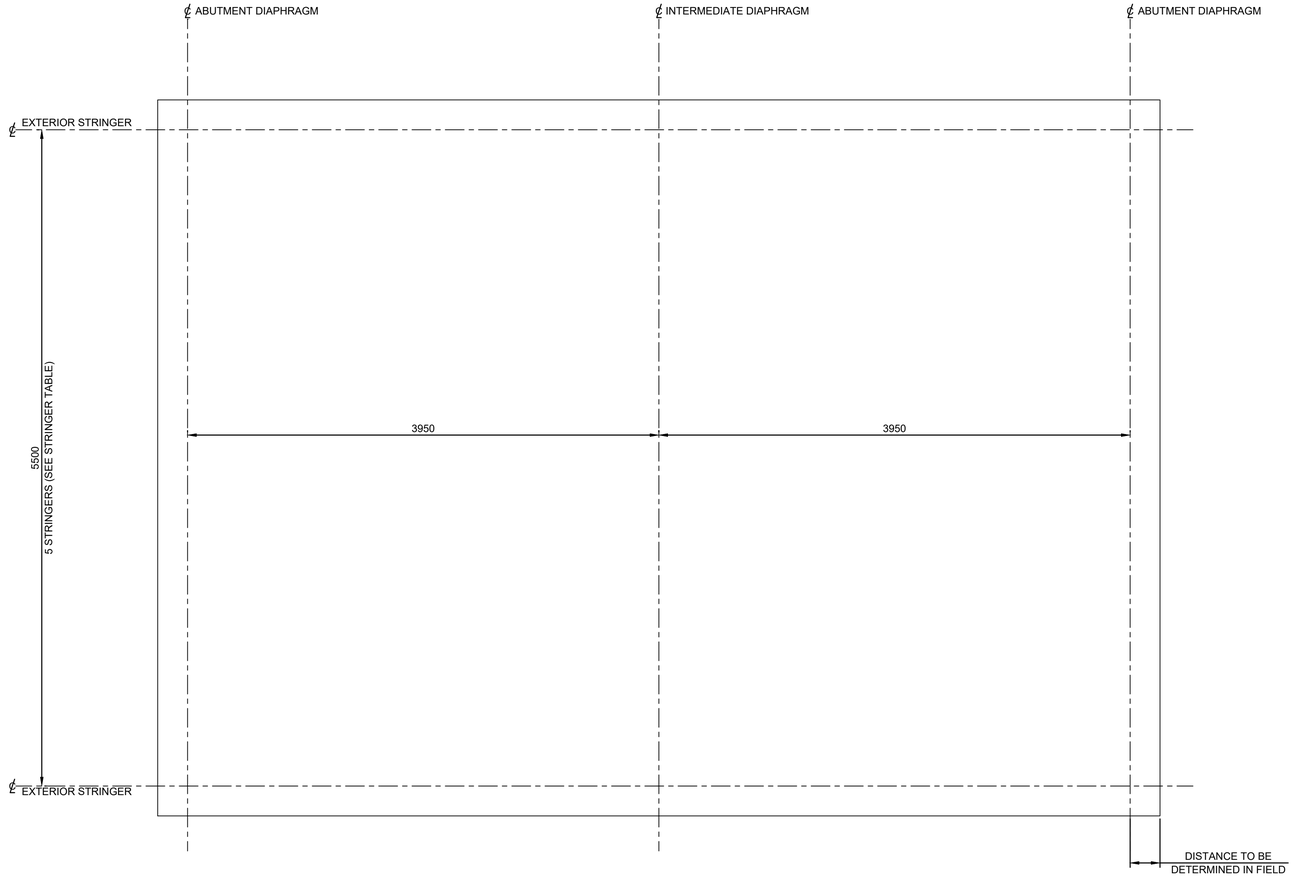
SISSON PROJECT
LIMITED PARTNERSHIP

NASHWAAK RIVER (WCS) REPLACEMENT

TYPICAL SECTIONS
AND TABLES

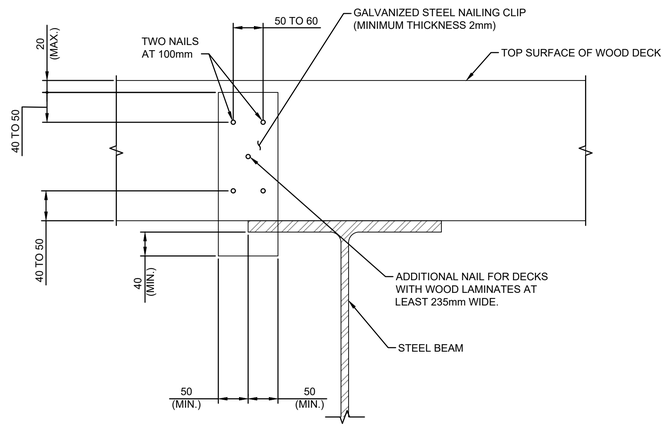
Stantec
Consultant

Bridge Design Code	CSA-S6-14	Date FEB. 2019
		Live Load CL-625-ONT
		DWG. 3 OF 10



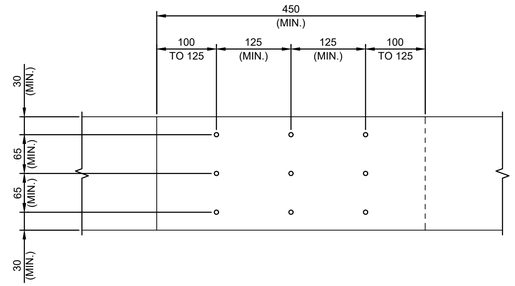
TYPICAL PLAN FOR 7.9m SPAN

SCALE: 1:25



CONNECTION OF NAIL - LAMINATED DECK TO STEEL BEAM

SCALE: 1:5



NAILING PATTERN FOR LAMINATES

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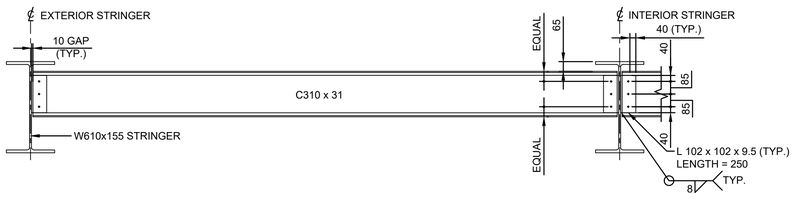
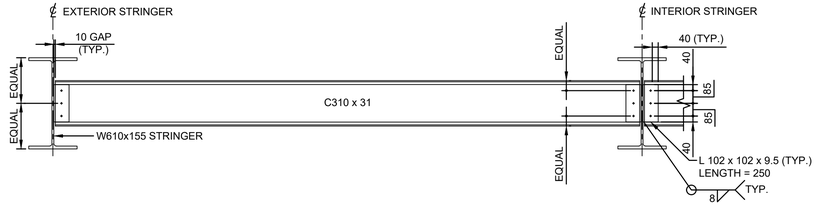


TYPICAL ABUTMENT DIAPHRAGM

SCALE: 1:20



TYPICAL INTERMEDIATE DIAPHRAGM

SCALE: 1:20

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NASHWAAK RIVER (WCS) REPLACEMENT

BRIDGE DETAILS
SHEET 1 OF 2

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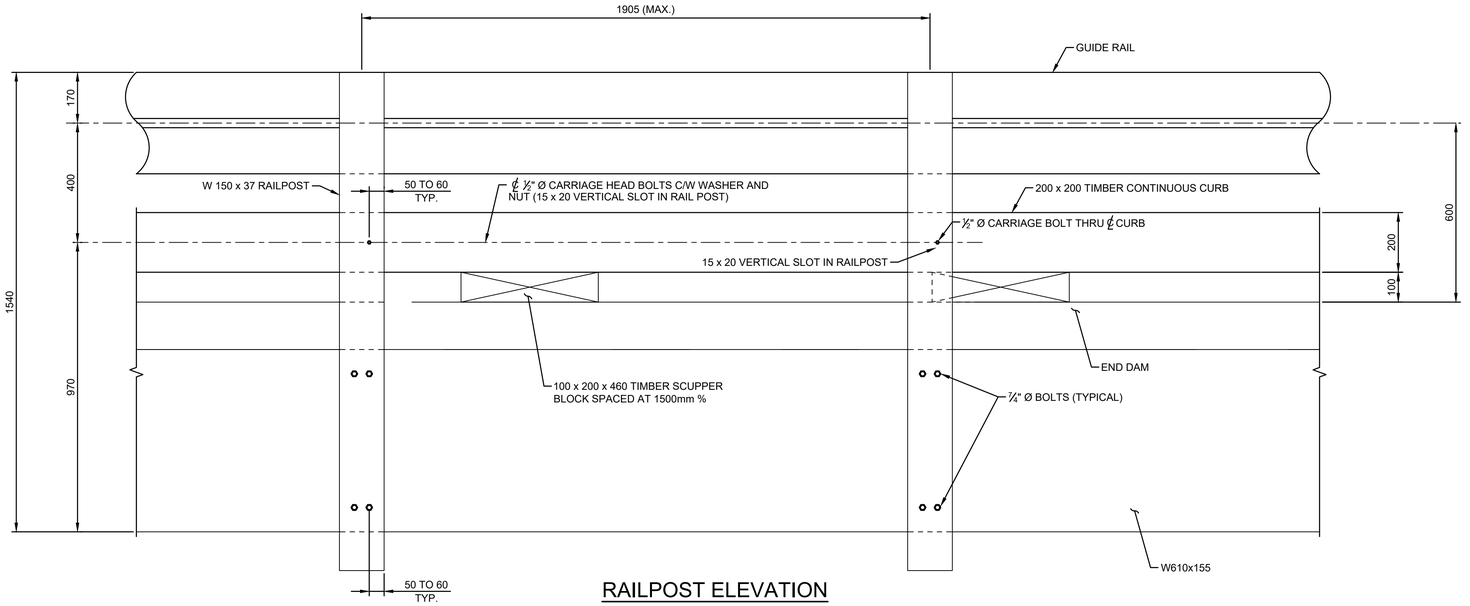
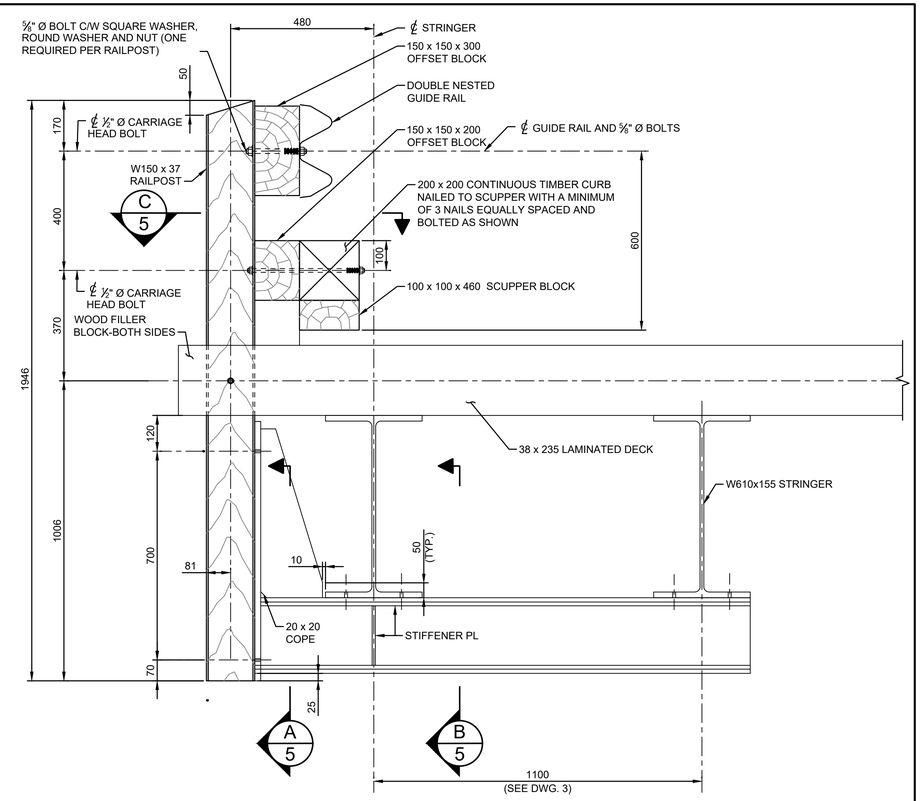


RAILPOST ELEVATION

TNL WOOD DECK
SCALE: 1:10



RAILPOST CONNECTION DETAIL FOR TNL DECK

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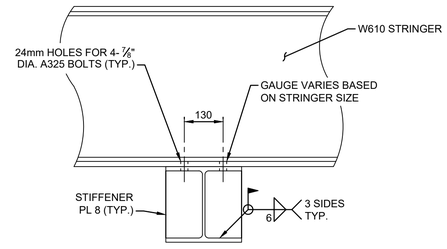
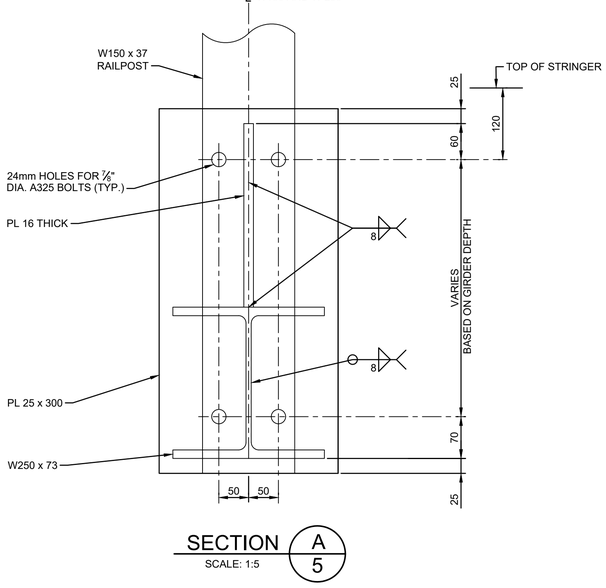


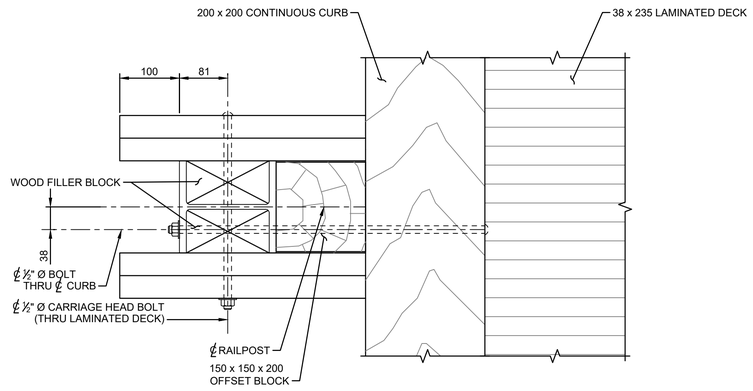
SECTION B 5

SCALE: 1:10



SECTION A 5

SCALE: 1:5



SECTION C 5

SCALE: 1:5

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NASHWAAK RIVER (WCS) REPLACEMENT

BRIDGE DETAILS
SHEET 2 OF 2

Bridge Design Code	CSA-S6-14
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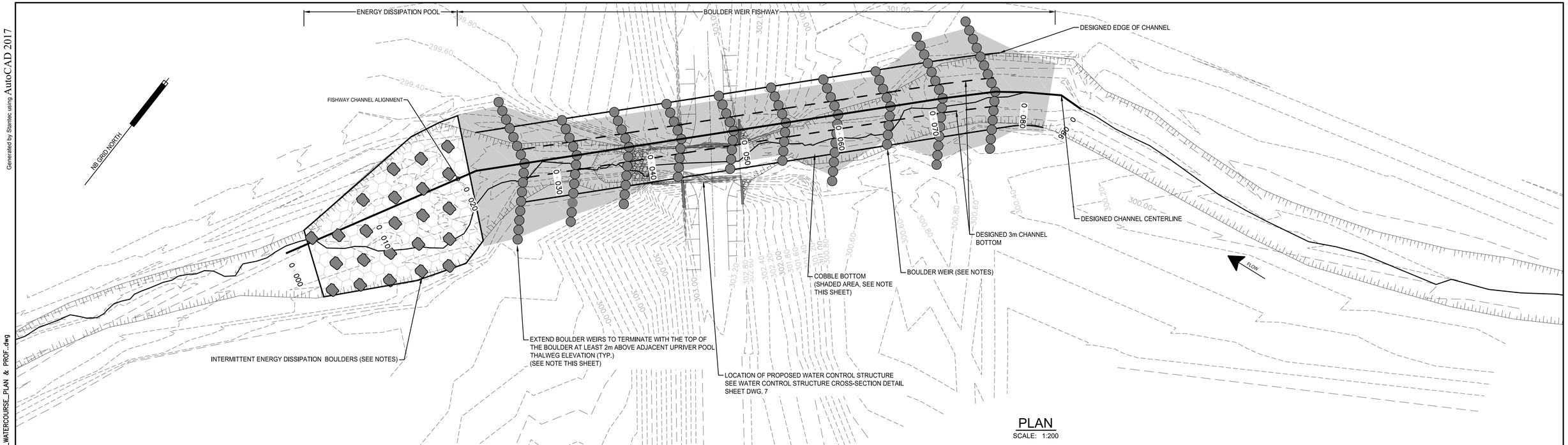
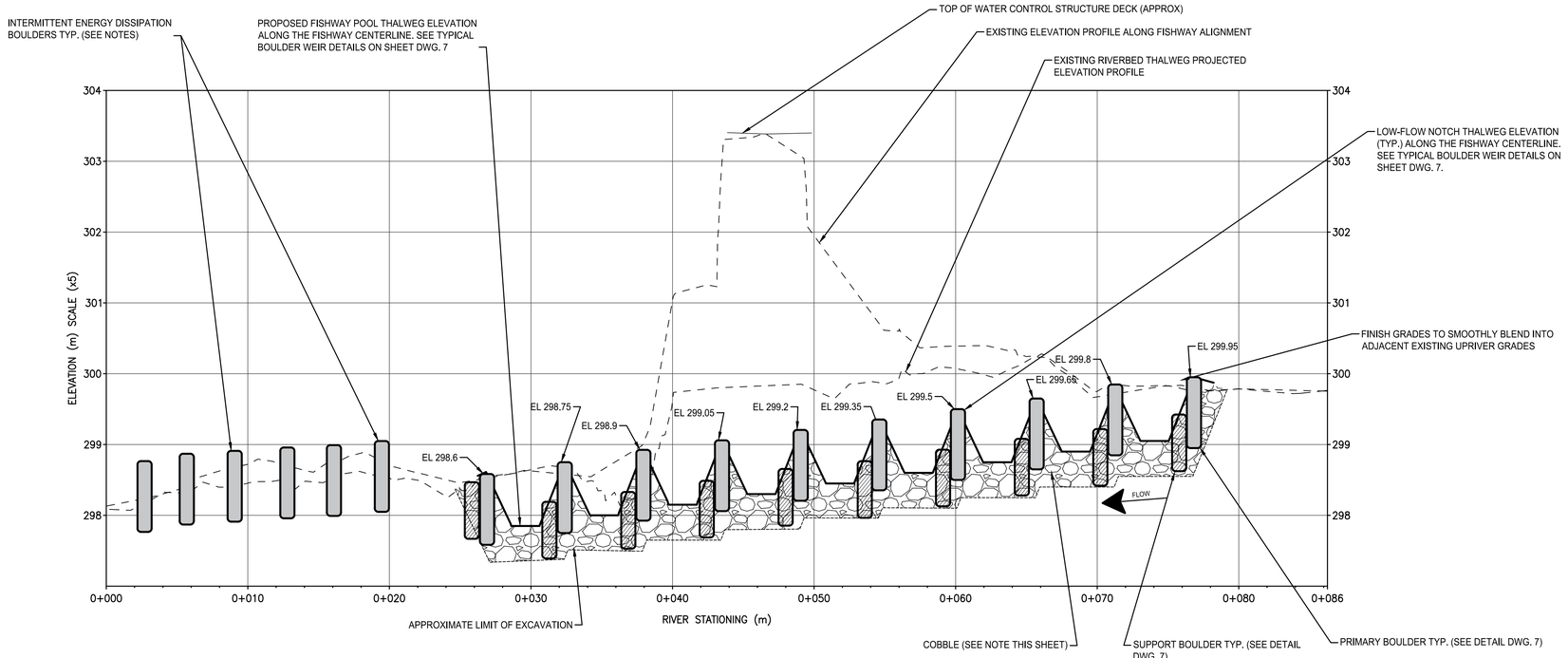


PLAN
SCALE: 1:200



PROFILE
SCALE: 1:200

NOTES:

1. DIRECTIONALS "LEFT" AND "RIGHT" ARE BASED ON AN OBSERVER FACING DOWNRIVER.
2. THE BOULDER WEIR FISHWAY SHALL INCLUDE A DEFINED LOW-FLOW CHANNEL AS GENERALLY DEPICTED IN THE PLANS. SEE SHEET DWG. 10 FOR BOULDER WEIR FISHWAY CROSS-SECTIONS.
3. INTERMITTENT ENERGY DISSIPATION BOULDERS DEPICTED ON THE PLAN ARE FOR GENERAL REPRESENTATION ONLY AND SHALL BE CONSIDERED APPROXIMATE. PLACEMENT OF THE 0.75 TO 1.5m DIAMETER INTERMITTENT BOULDERS WILL BE FIELD LOCATED UNDER ADVISEMENT OF THE ENGINEER.
4. BOULDER WEIR LOCATIONS (10) DEPICTED ON PLAN ARE APPROXIMATE. CONTRACTOR SHALL EXTEND BOULDER WEIRS SO THAT THE TOP OF THE TERMINUS BOULDERS ON BOTH SIDES OF THE CHANNEL ARE AT LEAST 2m ABOVE THE PROPOSED GRADE OF UPRIVER WEIR POOL THALWEG ELEVATION.
5. THE BOULDER WEIR FISHWAY COBBLE MATERIAL SHALL CONSIST OF ANGULAR ROCK RIPRAP WITH A MEDIAN SIZE (D50) OF 0.75m. THE THICKNESS OF INSTALLED COBBLE MATERIAL SHALL BE APPROXIMATELY AS NOTED ON SHEET 7 AND AS DEPICTED ON THE CROSS-SECTIONS ON SHEET DWG. 10.
6. THE VOID SPACES IN THE COBBLE MATERIAL SHALL BE FILLED WITH FINE MATERIAL AND WASHED INTO THE FISHWAY UNDER DIRECTION OF THE ENGINEER.
7. INTERMITTENT ENERGY DISSIPATION BOULDERS WITH MEDIAN AXIS DIAMETERS OF 0.75 TO 1.5 METRE SHALL BE INSTALLED AT A DENSITY OF 1 INTERMITTENT BOULDER PER 12 SQUARE METRES. FINAL BOULDER PLACEMENT WILL BE DIRECTED IN THE FIELD AS GENERALLY DEPICTED.
8. INTERMITTENT ENERGY DISSIPATION BOULDERS WILL BE PLACED WITH APPROXIMATELY 0.5m PROTRUDING ABOVE THE EXISTING GRADE UNDER THE ADVISEMENT OF THE ENGINEER.
9. FINE MATERIAL SHALL BE WASHED-IN USING WATER TO BE PUMPED FROM A TEMPORARY SUMP CONSTRUCTED BY THE CONTRACTOR IN THE SEGREGATED WORK AREA.

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NASHWAAK RIVER (WCS) REPLACEMENT

WATERCOURSE CHANNEL PLAN AND PROFILE

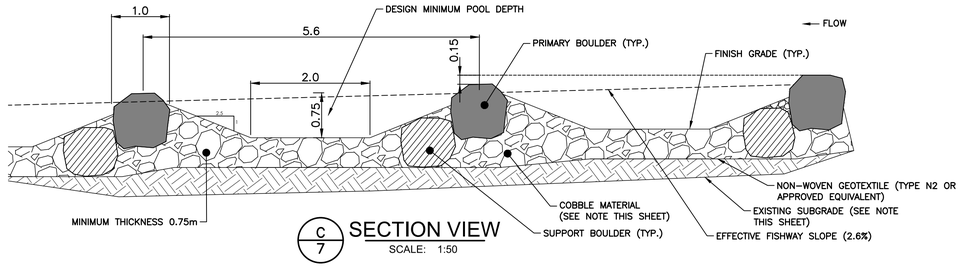
Stantec Consultant

Bridge Design Code CSA-S6-14

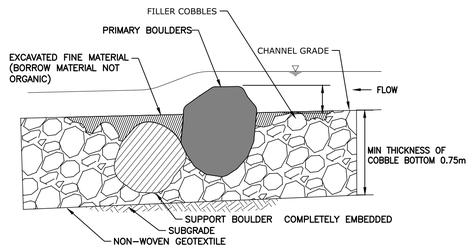
Date FEB. 2019

Live Load CL-625-ONT

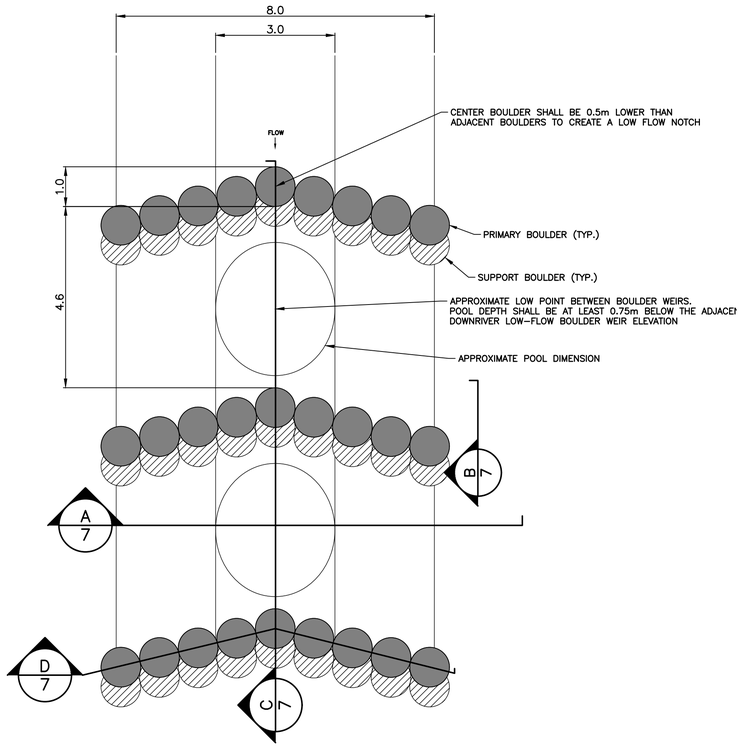
DWG. 6 OF 10



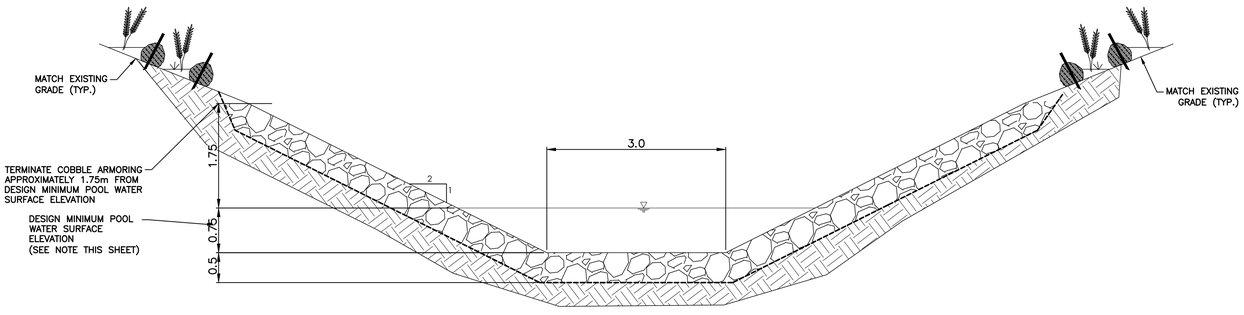
C/7 SECTION VIEW
SCALE: 1:50



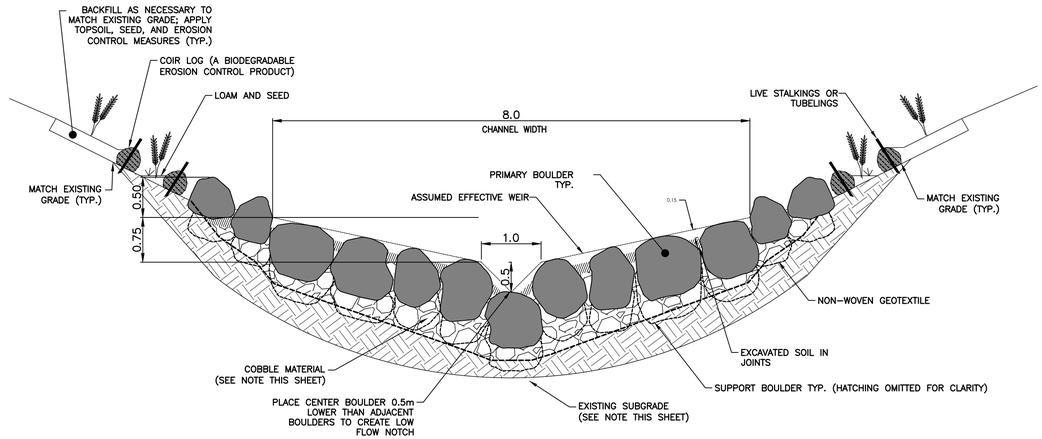
B/7 SECTION VIEW
SCALE: 1:50



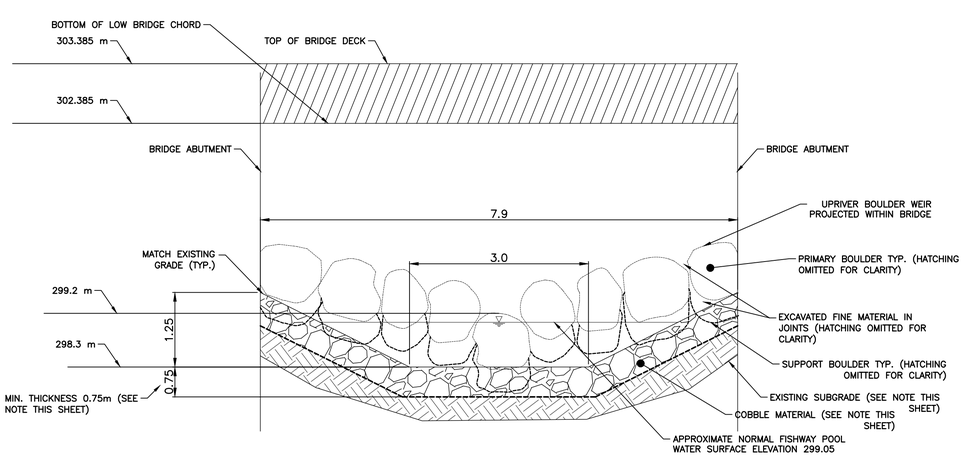
PLAN VIEW
SCALE: 1:75



A/7 SECTION VIEW
SCALE: 1:50



D/7 CROSS SECTION VIEW
SCALE: 1:50



SECTION VIEW (WATER CONTROL STRUCTURE SECTION)
SCALE: 1:50

NOTES:

1. REMOVE BEDROCK TO ELEVATION BELOW SUBGRADE TO ALLOW FOR INSTALLATION OF MINIMUM DEPICTED MATERIAL THICKNESSES.
2. CROSS-SECTIONS AND DIRECTIONALS "LEFT" AND "RIGHT" ARE BASED ON AN OBSERVER FACING DOWNRIVER.
3. THE BOULDER WEIR FISHWAY COBBLE MATERIAL SHALL CONSIST OF ANGULAR ROCK WITH A MEDIAN SIZE (D50) OF 0.5m. THE THICKNESS OF INSTALLED COBBLE MATERIAL TO BE AT LEAST MINIMUM SUFFICIENT TO FULLY EMBED SUPPORT BOULDERS SHALL BE DEPICTED AS SHOWN ON THIS SHEET (TYP. AT ALL BOULDER WEIRS) AND CROSS-SECTIONS SHEET DWG. 10.
4. PRIMARY AND SUPPORT BOULDERS SHALL BE BETWEEN 0.75 TO 1.5m IN DIAMETER ALONG THEIR PRIMARY AXIS.
5. FINE MATERIAL SHALL BE WASHED-IN USING WATER TO BE PUMPED FROM A TEMPORARY SUMP CONSTRUCTED BY THE CONTRACTOR IN THE SEGREGATED WORK AREA.

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THE SISSON PARTNERSHIP
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NASHWAAK RIVER (WCS) REPLACEMENT

WATERCOURSE CHANNEL DETAILS

Stantec Consultant

		Date	FEB. 2019
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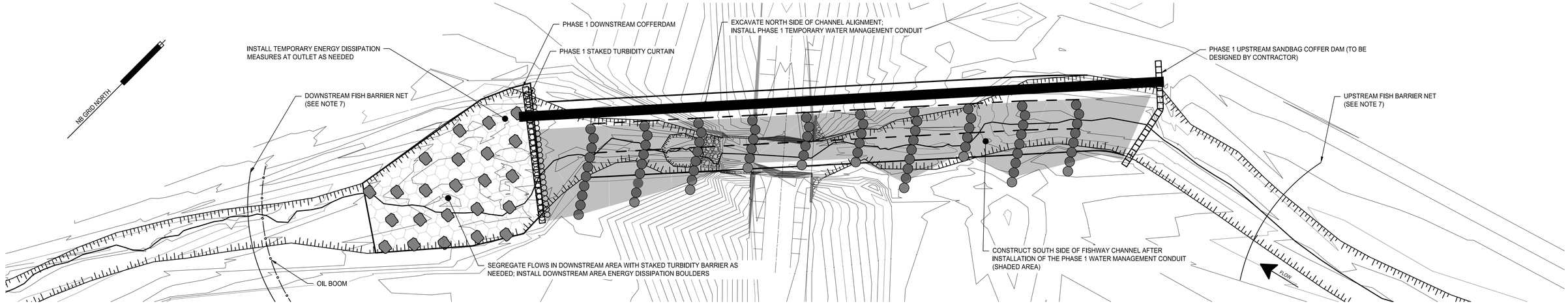
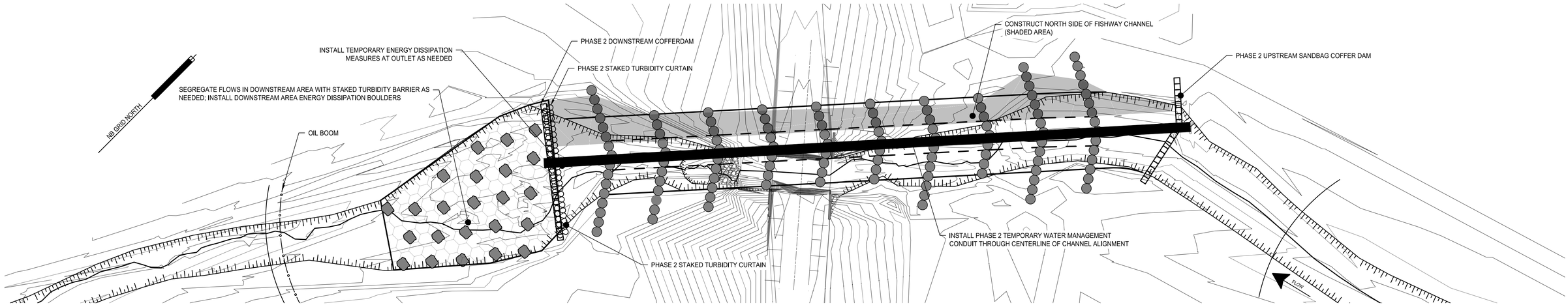


PHASE 1 WATER MANAGEMENT CONCEPT

SCALE 1:200



PHASE 2 WATER MANAGEMENT CONCEPT

SCALE 1:200

GENERAL NOTES

1. CONTRACTOR SHALL BE RESPONSIBLE FOR DESIGN, CONSTRUCTION, AND MAINTENANCE OF WATER MANAGEMENT SYSTEM, INCLUDING THE CAPACITY OF THE WATER MANAGEMENT SYSTEM, COMPLIANCE WITH PROJECT PERMITS AND APPLICABLE REGULATIONS, AND TIMELY EXECUTION OF THE WORK.
2. THE WATER MANAGEMENT PLAN DEPICTED ON THIS SHEET IS PROVIDED AS A GENERAL DEPICTION OF POTENTIALLY SUITABLE MEANS TO PROVIDE FOR WATER MANAGING DURING EXPECTED MEDIAN FLOWS DURING THE SUMMER AND FALL.
3. PRIOR TO INITIATING WORK AT THE SITE, CONTRACTOR SHALL DEVELOP AND SUBMIT TO OWNER AND ENGINEER A MAINTENANCE OF FLOW PLAN PER THE PROJECT SPECIFICATIONS. THE APPROVED MAINTENANCE OF FLOW PLAN SHALL BE IMPLEMENTED AND MAINTAINED THROUGHOUT PROJECT CONSTRUCTION.
4. PRIOR TO COMMENCING IN-WATER WORK, STAKED EROSION CONTROL BARRIERS AND OIL BOOMS (SEE DETAILS THIS SHEET) SHALL BE INSTALLED. OIL BOOMS SHALL BE INSTALLED AND MAINTAINED DOWNSTREAM FROM ALL AREAS WHERE WORK IS PERFORMED IN OR ADJACENT TO NASHWAAK BROOK.
5. PRIOR TO INITIATING EACH PHASE OF WATER MANAGEMENT, OBSERVED AQUATIC ORGANISMS IN AREAS THAT ARE SEGREGATED BY EACH WATER MANAGEMENT PHASE SHALL BE CAREFULLY REMOVED FROM WORK AREA AND PLACED IN THE BROOK DOWNSTREAM FROM THE LIMITS OF WORK.
6. IF DEWATERING IS NECESSARY, INSTALL DEWATERING DISCHARGE TREATMENT SYSTEM (SEE DETAIL THIS SHEET) IN UPLAND LOCATION ADJACENT TO LIMIT OF WORK.
7. FISH RESCUE TO BE CONDUCTED IN THE WORK AREA BY A QUALIFIED FISH SPECIALIST. FISH BARRIER NETS TO BE INSTALLED IN LOW VELOCITY SECTION OF RIVER OUTSIDE OF WORK AREA.
8. TEMPORARY WATER MANAGEMENT IS RESPONSIBILITY OF CONTRACTOR. FLOW STATISTICS FOR DESIGN OF TEMPORARY WATER MANAGEMENT CONDUIT INCLUDE: ITEM #621 FOR TEMPORARY WATER CONTROL - $1m^3$. $Q2 = 3.9m^3$. $Q10 = 7.0m^2/S$.

WATER MANAGEMENT

1. WATER MANAGEMENT INCLUDES DIVERSION OF FLOW THROUGH A CONDUIT INSTALLED ON THE UPSTREAM FACE OF A TEMPORARY COFFER DAM, UPSTREAM OF THE LIMIT OF WORK. CONSTRUCTION WILL OCCUR AS TWO PHASES: PHASE 1 (SOUTH-EAST SIDE) AND PHASE 2 (SOUTH-WEST SIDE).
2. CONSTRUCTION THAT IS ANTICIPATED TO BE PERFORMED IN COORDINATION WITH PHASE 1 WATER MANAGEMENT INCLUDES:
   a. INSTALLATION AND MAINTENANCE OF WATER MANAGEMENT COMPONENTS;
   b. COMPLETION OF CHANNEL EXCAVATION FOR REALIGNMENT THROUGH THE BRIDGE;
   c. DEMOLITION OF THE EXISTING WATER COURSE STRUCTURE ABUTMENTS IN PREPARATION FOR THE NEW BRIDGE AND BOULDER WEIR FISHWAY;
   d. COMPLETION OF CONSTRUCTION OF THE SOUTH-EAST PORTION OF BOULDER WEIR FISHWAY; AND
   e. COMPLETION OF GRADING AND INITIATION OF SITE RESTORATION ON THE SOUTH-EAST (PHASE 1) OR SOUTH-WEST (PHASE 2) PORTION OF THE BOULDER WEIR FISHWAY.
3. THE ANTICIPATED PHASED SEQUENCE OF WORK FOR INCLUDES:
   a. FOLLOWING DEMOLITION OF THE EXISTING BRIDGE DECK AND ABUTMENTS AND THE ADJACENT ROADWAY EMBANKMENTS, EXCAVATE THE AREA OF THE PROPOSED BOULDER WEIR FISHWAY STARTING FROM DOWNSTREAM END AND WORKING UPSTREAM TOWARDS THE UPSTREAM END OF THE LIMIT OF WORK.
   b. INSTALL TEMPORARY WATER MANAGEMENT CONDUIT THROUGH THE EXCAVATION AND BACKFILL AS NEEDED.
   c. INSTALL CONDUIT INLET CLOSURE (SEE DETAIL THIS SHEET) AT UPSTREAM END OF CONDUIT AND TIE INTO ADJACENT TURBIDITY BARRIERS.
   d. INSTALL UPSTREAM SANDBAG COFFER DAM.
   e. BREACH THE REMAINING UPSTREAM EXCAVATION TO PROVIDE HYDRAULIC CONNECTION TO THE BROOK THROUGH THE TEMPORARY WATER MANAGEMENT CONDUIT.
   f. INSTALL STAKED TURBIDITY BARRIERS AND STAKED EROSION CONTROL BARRIERS.
   g. COMPLETE INSTALLATION OF THE PHASE 1 AREAS OF BOULDER WEIR FISHWAY AS DEPICTED IN THE PHASE 1 PLAN WORK AREA. (REPEAT SEQUENCE 3a - f OF WORK FOR PHASE 2.)
4. COMPLETE GRADING, REMOVE WATER MANAGEMENT SYSTEM BEGINNING FROM THE DOWNSTREAM END OF THE WORK AREA AND PROGRESSING UPSTREAM, AND INITIATE SITE RESTORATION.

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NASHWAAK RIVER (WCS) REPLACEMENT

WATER MANAGEMENT PHASING

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Bridge Design Code CSA-S6-14

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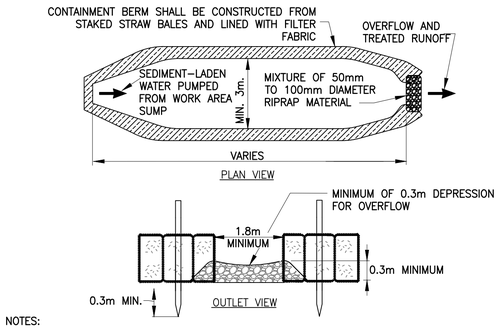
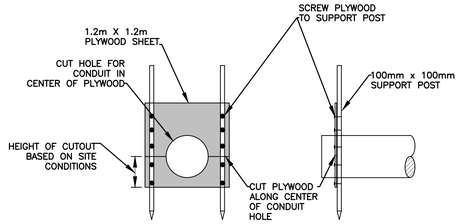


NOTES:

1. SEDIMENT CONTAINMENT SYSTEM SHALL BE LINED WITH MIRAFO 140N®, OR SIMILAR, FILTER FABRIC MATERIAL.
2. CONTRACTOR SHALL SIZE SEDIMENT CONTAINMENT SYSTEM APPROPRIATELY TO ADEQUATELY TREAT VOLUME OF DEWATERING DISCHARGE.
3. CONTRACTOR SHALL INSPECT SEDIMENT CONTAINMENT SYSTEM DAILY AND REPAIR AS NECESSARY TO MAINTAIN SYSTEM PERFORMANCE. ACCUMULATED SEDIMENT SHALL BE REMOVED WHEN STORAGE HEIGHT HAS BEEN REDUCED TO 9 INCHES. REMOVED SEDIMENT SHALL BE DEPOSITED IN AN AREA THAT WILL NOT CONTRIBUTE SEDIMENT TO JURISDICTION AREAS AND CAN BE PERMANENTLY STABILIZED.
4. CONTRACTOR MAY PROPOSE AND IMPLEMENT ALTERNATIVE DEWATERING DISCHARGE TREATMENT SYSTEMS TO MEET ITS DISCHARGE LIMIT OF 15mg/L ABOVE BACKGROUND OR AS DEFINED IN THE WATERCOURSE AND WETLAND ALTERATION PERMIT.

SINGLE CHAMBER SEDIMENT CONTAINMENT SYSTEM (NOT TO SCALE)



NOTES:

1. CONDUIT INLET CLOSURE SIZED BASED ON CONTRACTOR-SELECTED CONDUIT DIMENSIONS.
2. BOTTOM OF PLYWOOD TO BE EMBEDDED IN STREAMBED AND/OR SEALED WITH SANDBAGS.
3. BARRIER SHALL CONNECT TO TURBIDITY BARRIER INSTALLED ON EITHER SIDE OF THE CONDUIT.

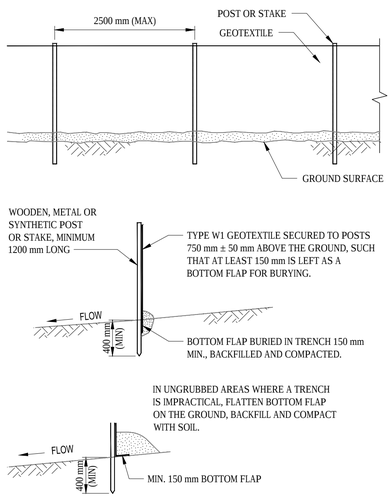
WATER MANAGEMENT CONDUIT INLET CLOSURE (NOT TO SCALE)

GENERAL NOTES

1. THIS PLAN IS TO BE USED AS A GUIDELINE ONLY. ADDITIONAL EROSION AND SEDIMENT CONTROL (ESC) MAY BE DICTATED BY FIELD CONDITIONS, PERMIT CONDITIONS, AND/OR DCC, AND SHALL BE INSTALLED AT THE CONTRACTOR'S EXPENSE.
2. OTHER ESC MEASURES MAY BE PROPOSED BY THE CONTRACTOR FOR APPROVAL. IN ADDITION TO ESC MEASURES SHOWN ON THE PLANS, UTILIZE ESC MEASURES AT THE BASE OF ALL TEMPORARY SOIL STOCKPILES.

EROSION AND SEDIMENT CONTROL (ESC) NOTES

1. INSTALL EROSION AND SEDIMENT CONTROL (ESC) PRIOR TO THE BEGINNING OF CONSTRUCTION (BEFORE THERE IS ANY SOIL DISTURBED ON SITE). ENSURE ESC MEASURES ARE ADEQUATE TO PREVENT EROSION AND TO PREVENT SEDIMENT TRANSPORT OUTSIDE THE LIMITS OF WORK.
2. INSTALL ALL EROSION AND SEDIMENT CONTROL FEATURES AS PER TYPICAL DETAILS ON THIS DRAWING.
3. INSTALL THE SEDIMENT FENCE SHOWN DOWNSTREAM OF THE BERM SPILLWAY FOLLOWING COMPLETION OF POND DEWATERING.
4. INSPECT, MAINTAIN AND REPAIR ALL ESC FEATURES AS NECESSARY TO COMPLY WITH APPLICABLE REGULATIONS, AND PROJECT PERMIT CONDITIONS.
5. STORE ALL MATERIALS NECESSARY TO MAKE REPAIRS TO ALL ESC FEATURES ON SITE. MAINTAIN AND MAKE REPAIRS TO ESC MEASURES IMMEDIATELY FOLLOWING IDENTIFICATION OF DEFICIENCIES AT NO ADDITIONAL COST TO THE OWNER.
6. CLOSE THE ENTRANCE TO THE STAGING AREAS AS PER TYPICAL DETAILS AT THE END OF EACH WORKDAY. THE SEDIMENT FENCE SHALL REMAIN CLOSED, IN-PLACE DURING ALL NON-WORK PERIODS. INSTALL SIPHON TO REMOVE REMAINING PONDED WATER.
7. ECS MEASURES TO REMAIN IN PLACE UNTIL PERMANENT VEGETATION HAS BEEN ESTABLISHED OR THE SITE IS OTHERWISE STABILIZED.



SEDIMENT FENCE

PURPOSE:

A TEMPORARY STRUCTURE DESIGNED TO RETAIN SOIL AND REDUCE RUNOFF VELOCITY. SEDIMENT FENCES ARE ADEQUATE TO TREAT FLOW DEPTHS CONSISTENT WITH OVERLAND OR SHEET FLOW. SEDIMENT FENCE IS NOT APPLICABLE IN AREAS OF CONCENTRATED FLOWS, SUCH AS CHANNELS.

NOTES:

1. FABRIC SHALL BE A WOVEN GEOTEXTILE MEETING TYPE W1 REQUIREMENTS AS SPECIFIED IN ITEM 601 OF THE 2006 NEW BRUNSWICK DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS (FOR INFORMATION ONLY).
2. SEDIMENT FENCE SHOULD EXTEND 3 m BEYOND THE WIDTH OF THE AREA TO BE PROTECTED.
3. WHEN SEDIMENT FENCE APPROACHES A TERMINATION POINT, TURN FENCE UPHILL AND EXTEND ONE FULL PANEL.
4. WHEN JOINING TWO OR MORE SEDIMENT FENCES TOGETHER, JOIN THE TWO END STAKES BY WRAPPING BOTH ENDS AT LEAST ONE AND ONE HALF TURNS AND DRIVING THE JOINED STAKES INTO THE GROUND TOGETHER.
5. THE TRENCH SHOULD BE BACKFILLED WITH COMPACTED NATIVE MATERIAL.
6. CONSTRUCT SEDIMENT FENCES AS FAR AS PRACTICAL FROM THE TOE OF SLOPES. WHERE CONDITIONS REQUIRE THE SEDIMENT FENCE TO BE NEAR THE TOE, MAINTAIN A SETBACK OF AT LEAST 1 m.
7. REMOVE ACCUMULATED SEDIMENT WHEN IT REACHES A DEPTH MORE THAN HALF THE HEIGHT OF THE FENCE. DISPOSE OF THE SEDIMENT IN A MANNER AND LOCATION THAT THE SEDIMENT WILL NOT ENTER A WATERCOURSE OR BE SUBJECT TO IMMEDIATE EROSION.
8. SEDIMENT FENCES TO BE INSPECTED TWICE DAILY, ONCE AT BEGINNING OF WORK DAY AND AGAIN AT END OF WORK DAY. ANY REQUIRED REPAIRS SHALL BE CARRIED OUT BEFORE CONSTRUCTION COMMENCES/FINISHES FOR THAT DAY.

SEDIMENT FENCE DETAIL (NOT TO SCALE)

TEMPORARY EROSION CONTROL STRUCTURE (TECS)

PURPOSE:

A TEMPORARY EROSION CONTROL STRUCTURE WILL BE INSTALLED TO REDUCE THE VELOCITY OF FLOW AND TO CAPTURE SUSPENDED SEDIMENTS DURING POND DEWATERING.

NOTES:

1. PLACE TYPE 1 GEOTEXTILE OVER THE HAY BALES AND BANKS THAT EXTENDS ALONG THE GROUND IN FRONT AND BACK ROW OF HAY BALES, TO BE HELD IN PLACE BY THE RIPRAP.
2. DEPTH, WIDTH, AND SIDE SLOPES OF SEDIMENT PIT MAY VARY WITH SOIL CONDITIONS AS DIRECTED BY THE CONSULTANT. LINE SEDIMENT PIT WITH TYPE 1 GEOTEXTILE.
3. SEDIMENT FILTER BAG, RATHER THAN PIT, CAN BE USED WHERE LARGE AMOUNTS OF SEDIMENT LADEN WATER IS EXPECTED (OPTIONAL). SEDIMENT FILTER BAG SHALL BE SIZED TO PROVIDE ADEQUATE DEWATERING CAPACITY FOR THE CONTRACTOR SPECIFIED FLOWRATE AND CONSTRUCTED OF NBDOT N3 NON-WOVEN GEOTEXTILE.
4. INSPECT STRUCTURE TWICE DAILY, AT BEGINNING AND END OF WORK DAY. ANY REQUIRED REPAIRS SHALL BE CARRIED OUT BEFORE CONSTRUCTION COMMENCES.
5. REMOVE ACCUMULATED SEDIMENT WHEN IT REACHES A DEPTH MORE THAN HALF THE HEIGHT OF HAY BALES. DISPOSE OF THE SEDIMENT IN A MANNER AND LOCATION THAT THE SEDIMENT WILL NOT ENTER A WATERCOURSE OR BE SUBJECT TO IMMEDIATE EROSION.
6. SEDIMENT PIT IS NOT RECOMMENDED TO BE USED WITHIN 30 m OF A WATERCOURSE.

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NASHWAAK RIVER (WCS) REPLACEMENT

EROSION CONTROL DETAILS

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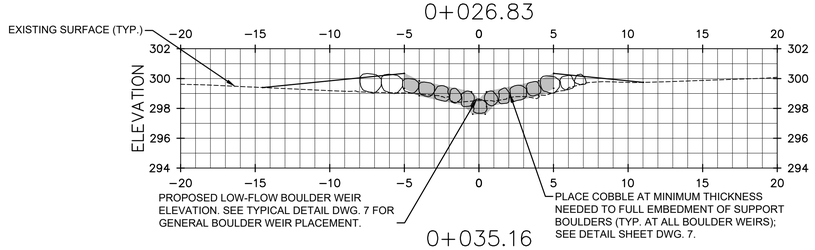
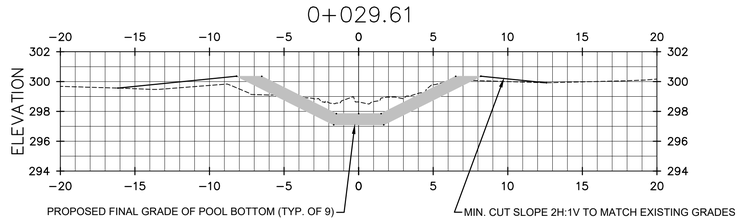
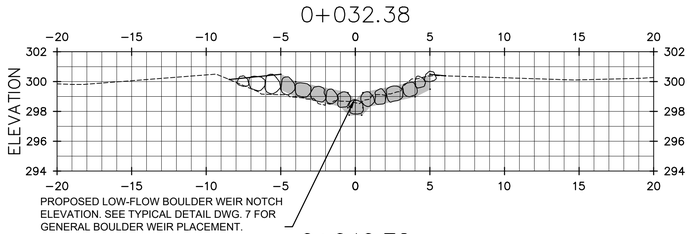
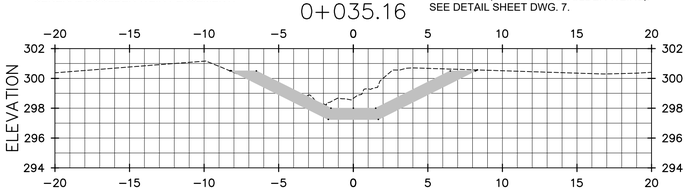
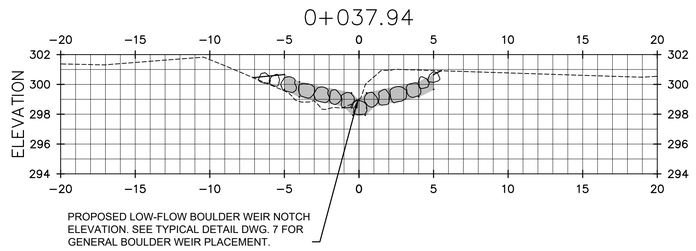
	DWG.	9 OF 10

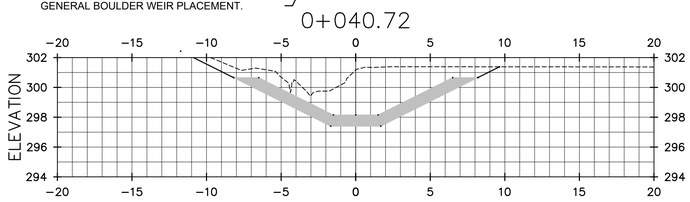


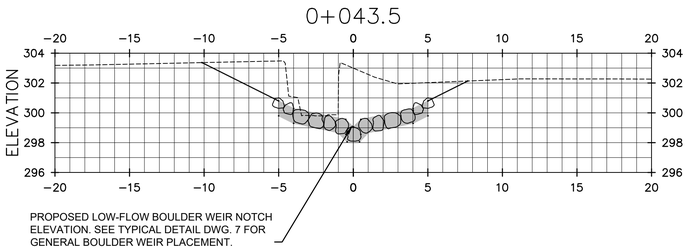


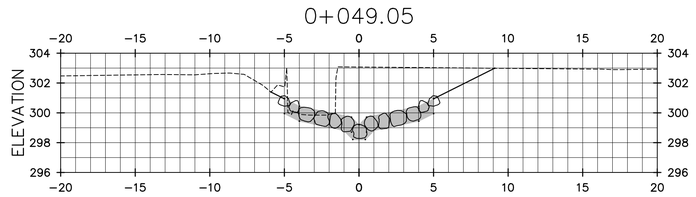


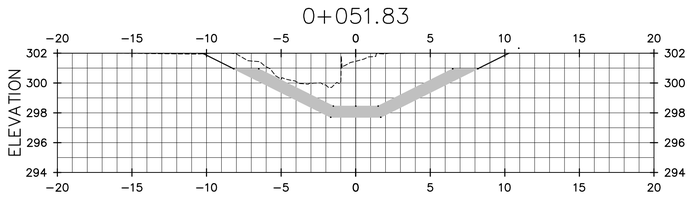


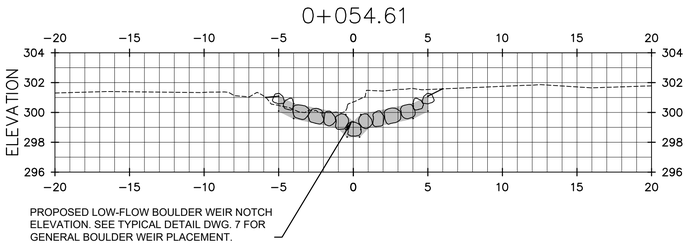


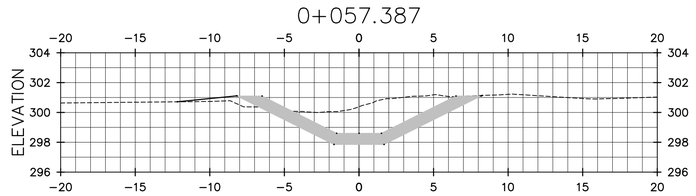


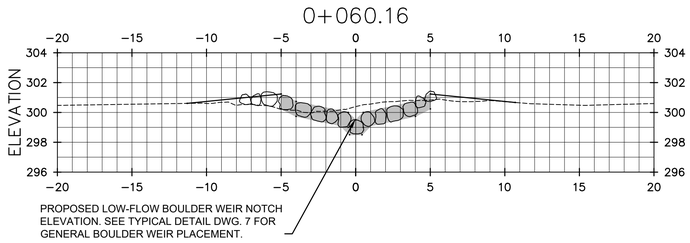


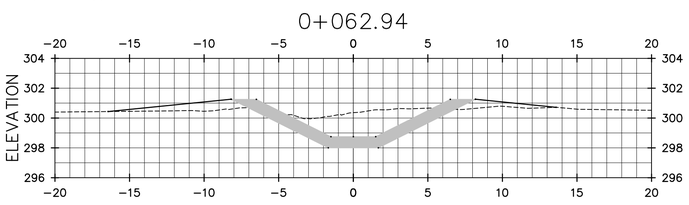


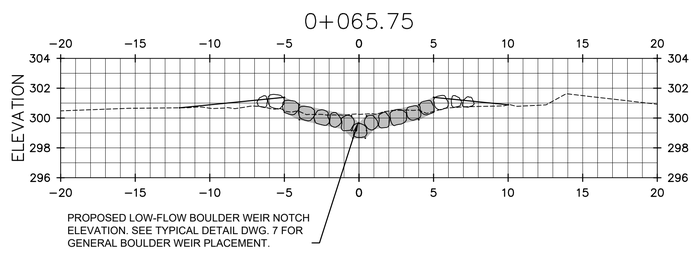


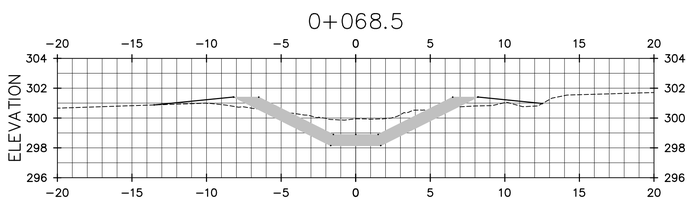


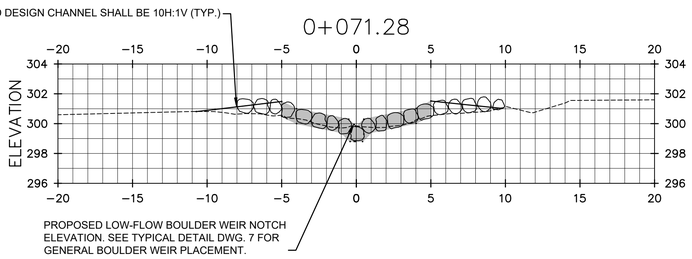


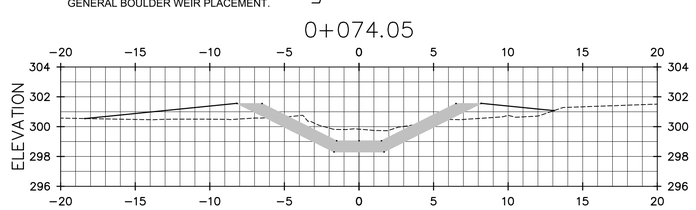


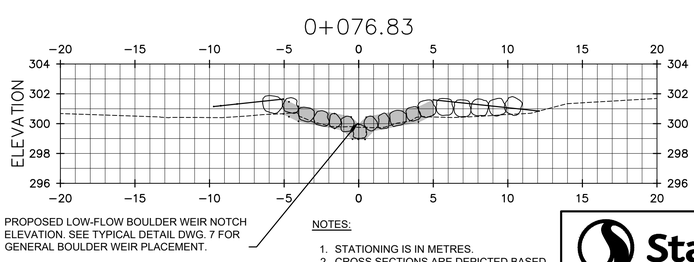












SCALE 1:200

NOTES:

1. STATIONING IS IN METRES.
2. CROSS SECTIONS ARE DEPICTED BASED ON AN OBSERVER FACING DOWNSTREAM.

Stantec
Consultant

NO.	REVISIONS	DATE
-	-	-
-	-	-
0	ISSUED FOR CONSTRUCTION	FEB.26, 2019

	Compilation	Drawing
Made By:	CCP	CCP
Checked By:	RWP	PJF
Approved By:		

THE SISSON PARTNERSHIP

SISSON PROJECT LIMITED PARTNERSHIP

NASHWAAK RIVER (WCS) REPLACEMENT

WATERCOURSE CHANNEL CROSS SECTIONS

		Date	FEB. 2019
Bridge Design Code	CSA-S6-14	Live Load	CL-625-ONT
		DWG.	10 OF 10

Appendix B GEOTECHNICAL INVESTIGATION

SISSON PROJECT: REVISED INFORMATION REQUIREMENTS IN SUPPORT OF THE APPLICATION FOR FISHERIES ACT AUTHORIZATION, AND OFFSETTING PLAN

March 4, 2019

Sisson Bridge Replacement

Geotechnical Investigation

121811420

January 29, 2019

Prepared for:

Sisson Project Limited Partnership

Prepared by:

Stantec Consulting Ltd.
845 Prospect Street
Fredericton, NB, E3B 2T7

Revision	Description	Author		Quality Check		Independent Review	

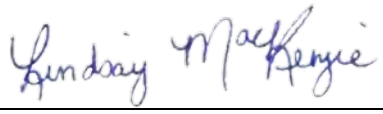
This document entitled Sisson Bridge Replacement was prepared by Stantec Consulting Ltd. (“Stantec”) for the account of Sisson Project Limited Partnership (the “Client”). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec’s professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by 
(signature)

Corey Boland, P.Eng.

Prepared by 
(signature)

Mark Palmer, EIT

Reviewed by 
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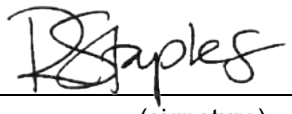
Lindsay MacKenzie, M.Sc.E., P.Eng.

Reviewed by 
(signature)

Rochelle Staples, M.Sc.E., P.Eng.

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LIST OF APPENDICES

1.0 INTRODUCTION

Stantec Consulting Ltd. (Stantec), acting at the request of Sisson Project Limited Partnership, has carried out a geotechnical investigation for the proposed bridge replacement located at the outlet of Nashwaak Lake near Deersdale, New Brunswick. According to preliminary information provided, the proposed structure is to consist of a single lane steel-stringer structure to replace the existing timber bridge. The location of the site is shown on Drawing No. 1 – Site Location Plan, provided in Appendix B. The property is identified by Service New Brunswick Property Identification (PID) Number 10003473.

The scope of the investigation was to assess the subsurface soils and groundwater conditions at the borehole locations for input into the geotechnical design of the foundations and related earthworks for the new bridge abutments.

This report has been prepared specifically and solely for the project described herein. It contains a summary of our findings and includes geotechnical recommendations for design and construction of foundations and related earthworks for the bridge abutments.

2.0 SITE DESCRIPTION

The proposed location for the new bridge structure is at the outlet of the Nashwaak Lake. There is currently a timber bridge at this location. A private access (logging) road provides access to the existing bridge location which runs in an approximate north-south direction to the southwest of the lake. The approaches to the structure have been previously raised with reworked native material. The area is heavily treed along the north and south sides of the stream.

3.0 INVESTIGATION PROCEEDURES

3.1 GEOTECHNICAL INVESTIGATION PROGRAM

The field investigation for the proposed bridge replacement was carried out on November 29, 2018. Two (2) boreholes, identified as BH1 and BH2, were drilled using a track mounted drill rig provided by Logan Geotech Inc. of Moncton, New Brunswick. The boreholes were drilled approximately 0.3 m north (BH1) and south (BH2) from the respective end of the existing bridge structure. The boreholes were drilled to depths of 6.1 m and 9.1 m below the existing ground surface in boreholes BH2 and BH1, respectively. The approximate location of the boreholes is shown on the Borehole Location Plan, Drawing No. 2 included in Appendix B.

The overburden soils at the borehole locations were sampled using Standard Penetration Test (SPT) techniques with a 50 mm OD split-spoon sampler. Standard Penetration Test (SPT) N-values were recorded for each split spoon sample obtained. The procedures followed were based on the standard test method provided in ASTM D1586. The determination of relative density of granular soils, as indicated on the Borehole Records, is based on the results of the Standard Penetration Testing. Bedrock was cored and sampled using HQ diamond coring techniques.

Stantec personnel supervised the drilling activities and recorded the subsurface conditions encountered at the borehole locations. Detailed descriptions of the soils encountered at the test locations and the sampling/testing conducted are described on the Borehole Records provided in Appendix C.

Disturbed soil samples were stored in moisture-tight containers and returned to our Saint John, New Brunswick laboratory for further classification and testing. Bedrock samples were stored in core boxes and returned to our Saint John, New Brunswick laboratory for further classification.

If requested, the soil and bedrock samples will be kept in storage for a period of three months from the date of issuance of the report, otherwise, the samples will be discarded.

3.2 SITE SURVEY

Survey of the area was previously completed by Stantec; however, the borehole locations were not surveyed. Boreholes were located in the field by hand measurements from the existing structure. The approximate borehole locations are shown on the Borehole Location Plan (Drawing No. 2) included in Appendix B. The borehole locations and elevations should only be considered accurate based on the degree of our measuring methods.

3.3 LABORATORY TESTING

Representative soil samples were selected for testing to determine the physical properties of the soils in accordance with ASTM standards. The test program for this project consisted of gradation analysis, moisture content determinations, and Plasticity (Atterberg) Testing.

4.0 SOIL PROFILE

The soil strata encountered at the site are described in detail on the attached Borehole Records. The Symbols and Terms used on Borehole and Test Pit Records provide a brief explanation of the terminology and graphics used by Stantec and are provided in Appendix C.

Soil classification was based on the procedures described in ASTM D2488 (Standard Practice for Description and Identification of Soils, Visual-Manual Procedure) and ASTM D2487 (Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)). In general, the principle strata encountered at the borehole locations are as follows:

- Silty SAND (SM) with gravel (BH1); overlying
- Silty clayey SAND (SC-SM) (BH1); overlying
- Silty SAND (SM) to poorly graded SAND (SP) (BH1);
- Poorly graded SAND (SP-SM) with silt and gravel (BH2); overlying
- GRANITE Bedrock.

4.1 SILTY SAND (SM) WITH GRAVEL

A layer of material classified as silty SAND (SM) with gravel was encountered at the surface of BH1. The layer was found to be brown to grey in color and was 4.0 m thick at the borehole location.

N-values from SPT performed within the layer ranged from 9 to 39 indicating a compactness condition of loose to dense. Laboratory testing results for the material encountered are summarized in Table 4.1.

4.2 SILTY CLAYEY SAND (SC-SM)

A layer of material classified as silty clayey SAND (SC-SM) was encountered below the silty sand with gravel in BH1.

The layer was found to be brown in color and was approximately 1.2 m thick at the borehole location. Trace gravel was encountered throughout this stratum.

One N-value from SPT performed within the layer was measured to be 11 indicating a compactness condition of compact. Laboratory testing results for the material encountered are summarized in Table 4.1.

4.3 SILTY SAND (SM) TO POORLY GRADED SAND (SP)

A layer of silty SAND (SM) to poorly graded SAND (SP) was encountered below the silty clayey sand in BH1. The layer was found to be brown to grey in color and was 1.8 m thick at the borehole location.

N-values from SPT performed within the layer ranged from 23 to 55 indicating a compactness condition of compact to very dense. Laboratory testing results for the material encountered are summarized in Table 4.1.

4.4 POORLY GRADED SAND (SP-SM) WITH SILT AND GRAVEL

A layer of poorly graded SAND (SP-SM) with silt and gravel was encountered at the surface of BH2. The layer was brown to grey in color and was 3.7 m thick at the borehole location.

N-values from SPT performed within the layer ranged from 8 to 14 indicating a compactness condition of loose to compact. Laboratory testing results for the material encountered are summarized in Table 4.1.

Table 4.1 Laboratory Testing Results

BH ID - Sample ID	Depth (m)	Moisture Content (%)	Gravel (%)	Sand (%)	Silt/Clay (%)	Liquid Limit	Plastic Limit	Plasticity Index	Classification
BH1 – SS5	2.7	14.8	32.5	52.0	15.5	N/A	N/A	N/A	Silty SAND (SM) with gravel
BH1 – SS7	4.0	14.8	13.1	50.3	36.6	N/A	N/A	N/A	Silty clayey SAND (SC-SM)
BH1 – SS8	4.9	11.6	N/A	N/A	N/A	21.1	15.9	5.2	Silty clayey SAND (SC-SM)
BH2 – SS3	3.4	17.8	43.3	50.3	6.4	N/A	N/A	N/A	Poorly graded SAND (SP-SM) with silt and gravel

*N/A denotes not applicable

4.5 IGNEOUS BEDROCK: GRANITE

Bedrock was encountered at both borehole locations at depths of 7.0 m and 3.7 m, in boreholes BH1 and BH2 respectively, below the existing ground surface. The bedrock was visually classified as granite and was found to be grey to black in color.

A description of the rock mass quality descriptors is presented in the *Symbols and Terms used on Borehole and Test Pit Records* provided in Appendix C. Rock Quality Designation (RQD) values were determined for the rock core; these values are shown on the Borehole Records provided in Appendix C. The Total Core Recovery (TCR) was observed to be between 50% and 96%. In the absence of full core recovery (1.5m run), some RQD value may be reflective of drilling breaks and may not represent the full rock mass.

Rock Quality Designation (RQD) on recovered core samples was variable throughout the core depth and was found to range from 0% to 96% indicating a very poor to excellent rock quality over the interval sampled. Where encountered, the bedrock was slightly weathered.

For reference, Table 4.2 presents the depth to bedrock below the existing ground surface and the approximate bedrock elevation with respect to geodetic datum.

Table 4.2 Bedrock Depth and Elevation Summary

Borehole ID	Ground Surface Elevation (m)*	Depth to Bedrock (m) below existing ground surface	Bedrock Elevation (m)*
BH1	303.39	7.0	296.4
BH2	303.40	3.7	299.7

*Elevations should only be considered accurate based on the measuring methods used

4.6 GROUNDWATER CONDITIONS

Groundwater was not observed at the borehole locations during drilling; however, Stantec expects the groundwater elevations to be close to the existing stream elevation.

It should be noted that groundwater conditions are expected to fluctuate during periods of heavy precipitation associated with seasonal weather trends, or particular events, tidal cycles, site use, and construction activity.

Dewatering of the area to construct foundations for the proposed structure may be required depending on final design elevations.

5.0 DISCUSSION AND RECOMMENDATIONS

5.1 GENERAL

It is our understanding that a bridge replacement is proposed near the outlet of Nashwaak Lake. According to preliminary information provided, the proposed structure is to consist of a single lane steel-stringer structure. At the time of this report, the foundation loadings are unknown.

BH1 and BH2 were drilled at the approximate locations of the proposed north and south abutments, respectively. The boreholes were drilled approximately 0.3 m north (BH1) and south (BH2) from the respective end of the existing bridge structure as shown on Drawing No. 2 – Borehole Location Plan.

It is assumed that the existing timber bridge will be removed in its entirety, including existing foundations, and will not be re-used for this new bridge structure.

5.2 SITE PREPARATION

5.2.1 Excavation

Safe excavation slopes depend on the soil or rock type and the expected excavation depth. As the final design grades are not known, it is assumed that the foundations for the new bridge structure will be at the approximate grades of the existing bridge structure, minimizing excavation at the site. As such, we anticipate a depth of excavation of less than 2 m for the abutment structures comprising mainly removing up to 2 m of silty sand with gravel or poorly graded sand with silt and gravel.

For preliminary design, excavations in silty sand with gravel or poorly graded sand with silt and gravel should be carried out at 3H:1V. The excavation slopes should be monitored by geotechnical personnel and flattened as and when required.

As a minimum, temporary excavations must be sloped in accordance with the applicable New Brunswick Occupational Health and Safety Guidelines. If an excavation cannot be properly sloped or benched, the contractor should install an engineered shoring system to safely support the temporary excavation.

Temporary slopes should be protected from surface-runoff erosion by means of berms and swales located along the top of the slope and by means of plastic sheeting placed over the slope. Soil stockpiles should not be located within 1.5 times the height of the excavation depth to avoid surcharging the excavation walls.

5.2.2 Structural Fill

Where required, structural fill should consist of an approved inorganic well-graded granular material which is free of deleterious material, such as quarried rock or crushed pit run gravel or other approved inorganic soil. Unless otherwise specified, imported structural fill should consist of clean gravel with a maximum

particle size of 75 millimeters and less than 8% passing the 80 micron sieve, maintained at a suitable moisture content to achieve the specified compaction.

Backfill should be placed in lifts suitable to achieve compaction throughout the entire lift thickness with the compaction equipment provided, typically 300 mm or less. Backfill should be compacted to a minimum of 100 percent standard Proctor in accordance with ASTM standard D698, *Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort.* For light, hand-operated compaction equipment, thinner lifts may be necessary to achieve the specified compaction criteria.

Fill compaction should be verified by means of field testing. In the event of winter construction, fill should be placed and compacted in an unfrozen condition.

5.2.3 Re-Use of Existing Materials

Based on the observed existing material, re-use of existing site materials should be determined by geotechnical personnel at the time of construction.

5.3 FOUNDATIONS

Based on the soil and bedrock conditions encountered, conventional strip/spread footing are feasible for support of the proposed bridge abutments. It is recommended that footings for the new bridge abutments be founded on either the native silty sand/native silty clayey sand/native poorly graded sand with silt and gravel or structural fill overlying native silty sand/native silty clayey sand/native poorly graded sand with silt and gravel.

It is recommended that the footings for the north abutment (BH1) be founded either directly on the native silty sand or silty clayey sand or structural fill overlying the native silty sand/silty clayey sand. For the south abutment (BH2), it is recommended that the footings be founded directly on the native poorly graded sand with silt and gravel or on structural fill overlying the native poorly graded sand with silt and gravel.

At the time of writing, it is assumed that the foundations will not bear directly on bedrock. If the design grades change, we would be pleased to provide recommendations for foundations directly on bedrock.

In accordance with recommendations of the latest National Building Code of Canada (NBC), the following recommendations are provided based on the Limit States Design Approach. We anticipate that the foundation for the bridge abutments will consist of a strip footing. For design purposes, it has been assumed that the minimum width of strip footings will be 1.2 m. If the final design dimensions differ from those assumed in this report, the geotechnical engineer should be contacted to reassess any design assumptions that could impact the performance of the structure.

The geotechnical resistance in terms of bearing capacity, for a strip footing at the ultimate limit state (ULS) is 200 kPa. This value includes a resistance factor of 0.5 and assumes that footings are founded on native silty sand/native silty clayey sand/native poorly graded sand with silt and gravel or structural fill overlying native silty sand/native silty clayey sand/native poorly graded sand with silt and gravel. The serviceability limit state (SLS) for this structure has been assumed to be an allowable total settlement of

20 mm, the geotechnical resistance for the strip footing at this SLS value is 170 kPa. This value is unfactored and assumes that the footings are founded on native silty sand/native silty clayey sand/native poorly graded sand with silt and gravel or structural fill overlying native silty sand/native silty clayey sand/native poorly graded sand with silt and gravel. Differential settlements at this SLS value are expected to be less than approximately 15 mm.

A set back of the foundations from the crest of the permanent slopes is required to maintain the geotechnical resistance discussed herein. The nearest edge of the foundations should be constructed at a minimum of 2.0 m from the crest of the slope.

The base of the footings should be inspected by experienced geotechnical personnel prior to placing concrete to confirm the geotechnical resistances provided.

Foundation surfaces should never be cast on loose, soft, or frozen soil, slough, debris, or surfaces covered by standing water. A qualified geotechnical engineer should observe foundation bearing surfaces prior to concrete placement.

Foundation bearing surfaces should be proof-rolled under direct geotechnical supervision. Loose or soft surfaces identified during the proof-rolling operations should be over-excavated and replaced with structural fill.

5.3.1 Frost Depth

Frost depth in the area of the of Nashwaak Lake can be taken as 1.8 m below the final ground surface. Therefore, for frost protection, footings/underground services should extend a minimum of 1.8 m below the final design grades, or an equivalent amount of insulation be used.

5.4 LATERAL EARTH PRESSURES

The total lateral pressure on retaining structures will consist of the cumulative loading imposed by soil pressure, water pressure (if applicable), and surcharge due to surface or traffic loads. It is recommended that the design of the structure be developed based on an at rest condition against the back of the wall. The walls should be backfilled with well graded granular structural fill as described in sub-section 5.2.2. The geotechnical design parameters summarized in Table 5.1 should be used in the design of permanent retaining structures at the project site. The design parameters presented in Table 8 are applicable for a horizontal backfill condition. These parameters should not be used for sloping backfill.

Imported backfill should consist of an approved clean well graded granular material which is free of organic and deleterious material, such as quarried rock or crushed pit run gravel or other approved inorganic soil.

Table 5.1 Geotechnical Parameters

Parameter	Structural Fill
Total Unit Weight kN/m^3, γ	20 kN/m^3
Buoyant Unit Weight (kN/m^3), γ'	10.2 kN/m^3
Effective angle of Internal Friction, degrees, φ	30°
Coefficient of Earth Pressure, at rest, K_0	0.5
Coefficient of Active Earth Pressure, K_a	0.3
Coefficient of Passive Earth Pressure, K_p	3.0

5.4.1 Seismic Site Class

Based on the soil conditions identified during the geotechnical investigation, the recommended site classification for seismic site response for this site is Class C in accordance with Table 4.1.8.4.-A of the 2015 National Building Code (NBC).

5.5 GENERAL CONSTRUCTION RECOMMENDATIONS

5.5.1 Field Inspection

It is recommended that inspection by experienced geotechnical personnel be carried out during site grading as well as foundation and subgrade preparation to ensure that unsuitable materials are removed; only suitable materials are to be used as structural fill, and materials placed are compacted to the required density.

5.5.2 Construction Dewatering

As the final design grades are not known, it is not known if the groundwater table will be an issue during construction. At a minimum, the contractor should plan for localized dewatering depending on seasonal groundwater levels.

5.5.3 Bearing Surfaces

Foundation surfaces should never be cast on loose, soft, or frozen soil, slough, debris, or surfaces covered by standing water. A qualified geotechnical engineer should observe foundation bearing surfaces prior to concrete placement.

5.5.4 Winter Construction

Should construction be completed during the winter months, care should be taken to ensure that bearing soils remain free of frost penetration prior to, and following, the casting of concrete. The foundation subgrade must be protected from freezing.

Excavations and exposed subgrade should be maintained in a dry and unfrozen condition throughout construction. Soils that become disturbed/ softened during construction should be over-excavated and replaced with structural fill as described herein.

6.0 CLOSURE

Use of this report is subject to the Statement of General Conditions provided in Appendix A. It is the responsibility of Sisson Project Limited Partnership, who is identified as “the Client” within the Statement of General Conditions, and its agents to review the conditions and to notify Stantec Consulting Ltd should any of these not be satisfied. The Statement of General Conditions addresses the following:

- Use of the report.
- Basis of the report.
- Standard of care.
- Interpretation of site conditions.
- Varying or unexpected site conditions.
- Planning, design, or construction.

We trust that the information contained in this report is adequate for your present purposes. If you have questions about the contents of this report, or if we can be of further assistance, please do not hesitate to contact us at your convenience.

Appendix A STATEMENT OF GENERAL CONDITIONS

STATEMENT OF GENERAL CONDITIONS

USE OF THIS REPORT: This report has been prepared for the sole benefit of the Client or its agent and may not be used by any third party without the express written consent of Stantec Consulting Ltd. and the Client. Any use which a third party makes of this report is the responsibility of such third party.

BASIS OF THE REPORT: The information, opinions, and/or recommendations made in this report are in accordance with Stantec Consulting Ltd.'s present understanding of the site specific project as described by the Client. The applicability of these is restricted to the site conditions encountered at the time of the investigation or study. If the proposed site specific project differs or is modified from what is described in this report or if the site conditions are altered, this report is no longer valid unless Stantec Consulting Ltd. is requested by the Client to review and revise the report to reflect the differing or modified project specifics and/or the altered site conditions.

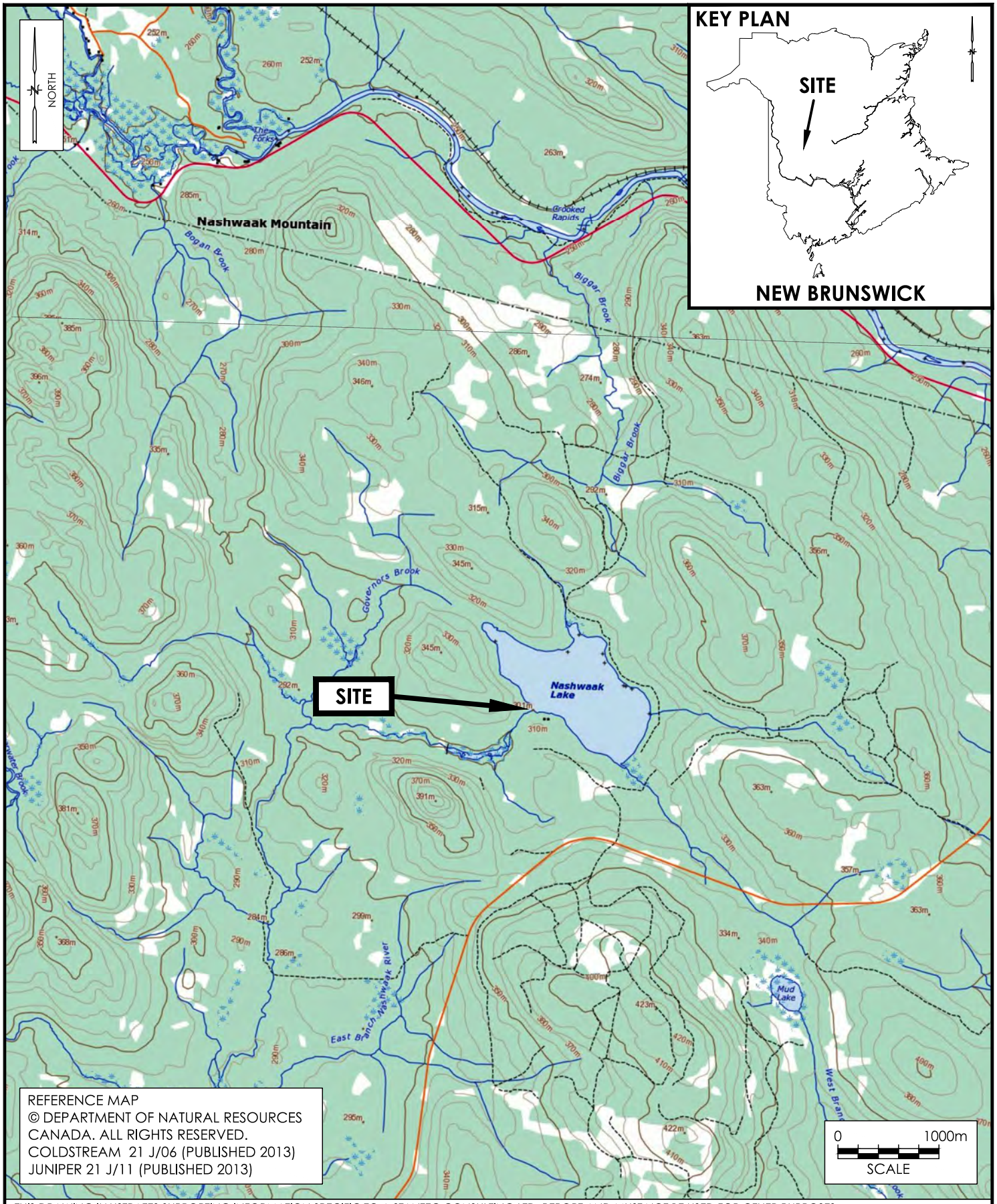
STANDARD OF CARE: Preparation of this report, and all associated work, was carried out in accordance with the normally accepted standard of care in the state or province of execution for the specific professional service provided to the Client. No other warranty is made.

INTERPRETATION OF SITE CONDITIONS: Soil, rock, or other material descriptions, and statements regarding their condition, made in this report are based on site conditions encountered by Stantec Consulting Ltd. at the time of the work and at the specific testing and/or sampling locations. Classifications and statements of condition have been made in accordance with normally accepted practices which are judgmental in nature; no specific description should be considered exact, but rather reflective of the anticipated material behavior. Extrapolation of in situ conditions can only be made to some limited extent beyond the sampling or test points. The extent depends on variability of the soil, rock and groundwater conditions as influenced by geological processes, construction activity, and site use.

VARYING OR UNEXPECTED CONDITIONS: Should any site or subsurface conditions be encountered that are different from those described in this report or encountered at the test locations, Stantec Consulting Ltd. must be notified immediately to assess if the varying or unexpected conditions are substantial and if reassessments of the report conclusions or recommendations are required. Stantec Consulting Ltd. will not be responsible to any party for damages incurred as a result of failing to notify Stantec Consulting Ltd. that differing site or sub-surface conditions are present upon becoming aware of such conditions.

PLANNING, DESIGN, OR CONSTRUCTION: Development or design plans and specifications should be reviewed by Stantec Consulting Ltd., sufficiently ahead of initiating the next project stage (property acquisition, tender, construction, etc), to confirm that this report completely addresses the elaborated project specifics and that the contents of this report have been properly interpreted. Specialty quality assurance services (field observations and testing) during construction are a necessary part of the evaluation of sub-subsurface conditions and site preparation works. Site work relating to the recommendations included in this report should only be carried out in the presence of a qualified geotechnical engineer; Stantec Consulting Ltd. cannot be responsible for site work carried out without being present.

Appendix B DRAWING NO. 1 – SITE LOCATION PLAN DRAWING NO. 2 – BOREHOLE LOCATION PLAN



THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

SITE LOCATION PLAN

SISSON BRIDGE REPLACEMENT

NASHWAAK LAKE OUTLET, NASHWAAK LAKE, NB

Client: SISSON PROJECT LIMITED PARTNERSHIP

Job No.:	121811420
Scale:	1 : 50,000
Date:	22-JAN-2019
Dwn. By:	MDC
App'd By:	MP

Dwg. No.: 1

Stantec

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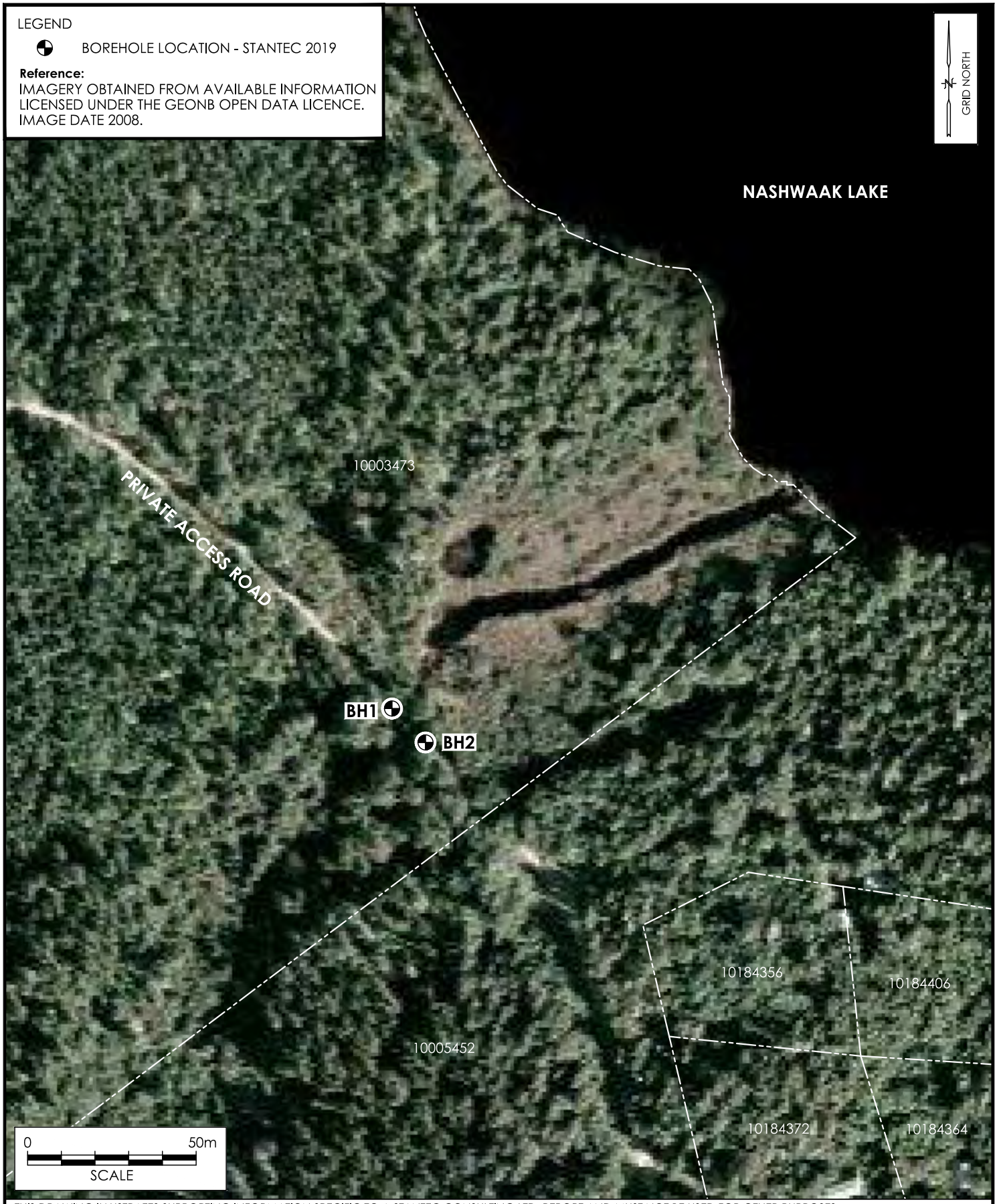

THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

BOREHOLE LOCATION PLAN

SISSON BRIDGE REPLACEMENT

NASHWAAK LAKE OUTLET, NASHWAAK LAKE, NB

Client: SISSON PROJECT LIMITED PARTNERSHIP

Job No.:	121811420
Scale:	1 : 1500
Date:	22-JAN-2019
Dwn. By:	MDC
App'd By:	MP

Dwg. No.: 2

Stantec

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Appendix C SYMBOLS AND TERMS USED ON BOREHOLE AND TEST PIT RECORDS
BOREHOLE RECORDS (BH1 AND BH2)
LABORATORY TESTING RESULTS

SYMBOLS AND TERMS USED ON BOREHOLE AND TEST PIT RECORDS

SOIL DESCRIPTION

Terminology describing common soil genesis:

Rootmat	- vegetation, roots and moss with organic matter and topsoil typically forming a mattress at the ground surface
Topsoil	- mixture of soil and humus capable of supporting vegetative growth
Peat	- mixture of visible and invisible fragments of decayed organic matter
Till	- unstratified glacial deposit which may range from clay to boulders
Fill	- material below the surface identified as placed by humans (excluding buried services)

Terminology describing soil structure:

Desiccated	- having visible signs of weathering by oxidization of clay minerals, shrinkage cracks, etc.
Fissured	- having cracks, and hence a blocky structure
Varved	- composed of regular alternating layers of silt and clay
Stratified	- composed of alternating successions of different soil types, e.g. silt and sand
Layer	- > 75 mm in thickness
Seam	- 2 mm to 75 mm in thickness
Parting	- < 2 mm in thickness

Terminology describing soil types:
The classification of soil types are made on the basis of grain size and plasticity in accordance with the Unified Soil Classification System (USCS) (ASTM D 2487 or D 2488) which excludes particles larger than 75 mm. For particles larger than 75 mm, and for defining percent clay fraction in hydrometer results, definitions proposed by Canadian Foundation Engineering Manual, 4th Edition are used. The USCS provides a group symbol (e.g. SM) and group name (e.g. silty sand) for identification.

Terminology describing cobbles, boulders, and non-matrix materials (organic matter or debris):
Terminology describing materials outside the USCS, (e.g. particles larger than 75 mm, visible organic matter, and construction debris) is based upon the proportion of these materials present:

Trace, or occasional	Less than 10%
Some	10-20%
Frequent	> 20%

Terminology describing compactness of cohesionless soils:
The standard terminology to describe cohesionless soils includes compactness (formerly "relative density"), as determined by the Standard Penetration Test (SPT) N-Value - also known as N-Index. The SPT N-Value is described further on page 3. A relationship between compactness condition and N-Value is shown in the following table.

Compactness Condition	SPT N-Value
Very Loose	<4
Loose	4-10
Compact	10-30
Dense	30-50
Very Dense	>50

Terminology describing consistency of cohesive soils:
The standard terminology to describe cohesive soils includes the consistency, which is based on undrained shear strength as measured by *in situ* vane tests, penetrometer tests, or unconfined compression tests. Consistency may be crudely estimated from SPT N-Value based on the correlation shown in the following table (Terzaghi and Peck, 1967). The correlation to SPT N-Value is used with caution as it is only very approximate.

Consistency	Undrained Shear Strength		Approximate SPT N-Value
	kips/sq.ft.	kPa	
Very Soft	<0.25	<12.5	<2
Soft	0.25 - 0.5	12.5 - 25	2-4
Firm	0.5 - 1.0	25 - 50	4-8
Stiff	1.0 - 2.0	50 – 100	8-15
Very Stiff	2.0 - 4.0	100 - 200	15-30
Hard	>4.0	>200	>30

ROCK DESCRIPTION

Except where specified below, terminology for describing rock is as defined by the International Society for Rock Mechanics (ISRM) 2007 publication "The Complete ISRM Suggested Methods for Rock Characterization, Testing and Monitoring: 1974-2006"

Terminology describing rock quality:

RQD	Rock Mass Quality
0-25	*Very Poor Quality*
25-50	*Poor Quality*
50-75	*Fair Quality*
75-90	*Good Quality*
90-100	*Excellent Quality*

Alternate (Colloquial) Rock Mass Quality	
Very Severely Fractured	*Crushed*
Severely Fractured	*Shattered or Very Blocky*
Fractured	*Blocky*
Moderately Jointed	*Sound*
Intact	*Very Sound*

RQD (Rock Quality Designation) denotes the percentage of intact and sound rock retrieved from a borehole of any orientation. All pieces of intact and sound rock core equal to or greater than 100 mm (4 in.) long are summed and divided by the total length of the core run. RQD is determined in accordance with ASTM D6032.

SCR (Solid Core Recovery) denotes the percentage of solid core (cylindrical) retrieved from a borehole of any orientation. All pieces of solid (cylindrical) core are summed and divided by the total length of the core run (It excludes all portions of core pieces that are not fully cylindrical as well as crushed or rubble zones).

Fracture Index (FI) is defined as the number of naturally occurring fractures within a given length of core. The Fracture Index is reported as a simple count of natural occurring fractures.

Terminology describing rock with respect to discontinuity and bedding spacing:

Spacing (mm)	Discontinuities	Bedding
>6000	*Extremely Wide*	-
2000-6000	*Very Wide*	*Very Thick*
600-2000	*Wide*	*Thick*
200-600	*Moderate*	*Medium*
60-200	*Close*	*Thin*
20-60	*Very Close*	*Very Thin*
<20	*Extremely Close*	*Laminated*
<6	-	*Thinly Laminated*

Terminology describing rock strength:

Strength Classification	Grade	Unconfined Compressive Strength (MPa)
Extremely Weak	R0	<1
Very Weak	R1	1 – 5
Weak	R2	5 – 25
Medium Strong	R3	25 – 50
Strong	R4	50 – 100
Very Strong	R5	100 – 250
Extremely Strong	R6	>250

Terminology describing rock weathering:

Term	Symbol	Description
Fresh	W1	No visible signs of rock weathering. Slight discoloration along major discontinuities
Slightly	W2	Discoloration indicates weathering of rock on discontinuity surfaces. All the rock material may be discolored.
Moderately	W3	Less than half the rock is decomposed and/or disintegrated into soil.
Highly	W4	More than half the rock is decomposed and/or disintegrated into soil.
Completely	W5	All the rock material is decomposed and/or disintegrated into soil. The original mass structure is still largely intact.
Residual Soil	W6	All the rock converted to soil. Structure and fabric destroyed.

STRATA PLOT

Strata plots symbolize the soil or bedrock description. They are combinations of the following basic symbols. The dimensions within the strata symbols are not indicative of the particle size, layer thickness, etc.

Boulders Cobbles Gravel | Sand | Silt | Clay | Organics | Asphalt | Concrete | Fill | Igneous Bedrock | Meta-morphic Bedrock | Sedi-mentary Bedrock

SAMPLE TYPE

SS	Split spoon sample (obtained by performing the Standard Penetration Test)
ST	Shelby tube or thin wall tube
DP	Direct-Push sample (small diameter tube sampler hydraulically advanced)
PS	Piston sample
BS	Bulk sample
HQ, NQ, BQ, etc.	Rock core samples obtained with the use of standard size diamond coring bits.

WATER LEVEL MEASUREMENT

measured in standpipe, piezometer, or well

inferred

RECOVERY

For soil samples, the recovery is recorded as the length of the soil sample recovered. For rock core, recovery is defined as the total cumulative length of all core recovered in the core barrel divided by the length drilled and is recorded as a percentage on a per run basis.

N-VALUE

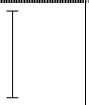
Numbers in this column are the field results of the Standard Penetration Test: the number of blows of a 140 pound (63.5 kg) hammer falling 30 inches (760 mm), required to drive a 2 inch (50.8 mm) O.D. split spoon sampler one foot (300 mm) into the soil. In accordance with ASTM D1586, the N-Value equals the sum of the number of blows (N) required to drive the sampler over the interval of 6 to 18 in. (150 to 450 mm). However, when a 24 in. (610 mm) sampler is used, the number of blows (N) required to drive the sampler over the interval of 12 to 24 in. (300 to 610 mm) may be reported if this value is lower. For split spoon samples where insufficient penetration was achieved and N-Values cannot be presented, the number of blows are reported over sampler penetration in millimetres (e.g. 50/75). Some design methods make use of N-values corrected for various factors such as overburden pressure, energy ratio, borehole diameter, etc. No corrections have been applied to the N-values presented on the log.

DYNAMIC CONE PENETRATION TEST (DCPT)

Dynamic cone penetration tests are performed using a standard 60 degree apex cone connected to 'A' size drill rods with the same standard fall height and weight as the Standard Penetration Test. The DCPT value is the number of blows of the hammer required to drive the cone one foot (300 mm) into the soil. The DCPT is used as a probe to assess soil variability.

OTHER TESTS

S	Sieve analysis
H	Hydrometer analysis
k	Laboratory permeability
γ	Unit weight
G_s	Specific gravity of soil particles
CD	Consolidated drained triaxial
CU	Consolidated undrained triaxial with pore pressure measurements
UU	Unconsolidated undrained triaxial
DS	Direct Shear
C	Consolidation
Q_u	Unconfined compression
I_p	Point Load Index (I_p on Borehole Record equals $I_p(50)$ in which the index is corrected to a reference diameter of 50 mm)

	Single packer permeability test; test interval from depth shown to bottom of borehole
	Double packer permeability test; test interval as indicated
	Falling head permeability test using casing
	Falling head permeability test using well point or piezometer

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BOREHOLE RECORD

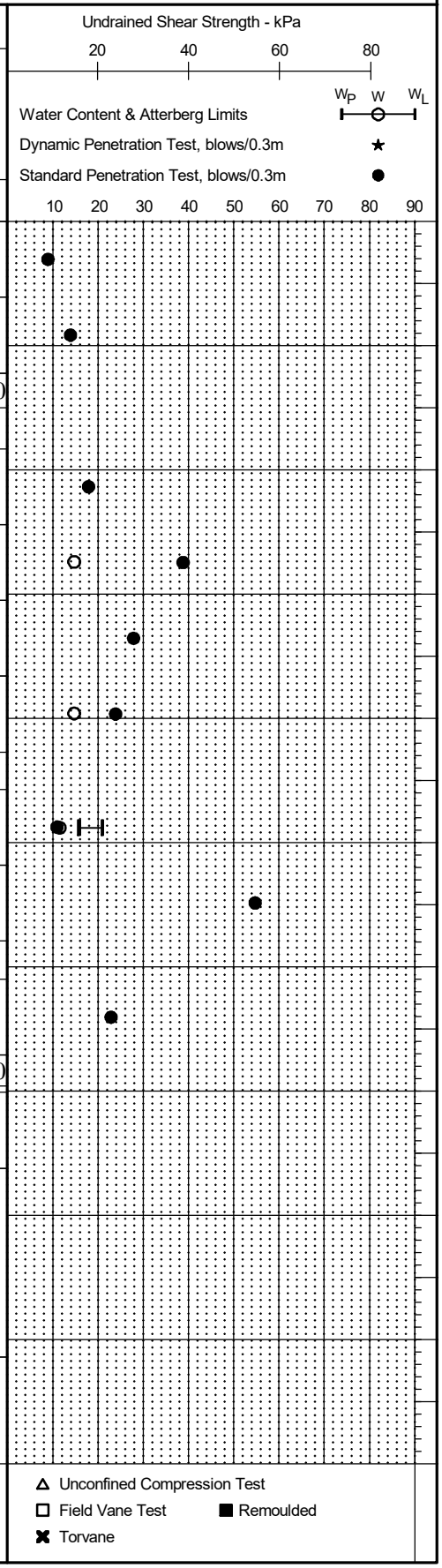
BH1

CLIENT **SISSON PROJECT LIMITED PARTNERSHIP** PROJECT No. **121811420**

LOCATION **Nashwaak Lake Water Control Structure** BH No. **BH1**

DATES: BORING **2018/11/29** WATER LEVEL **Not Observed** DATUM **Geodetic**

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY	SAMPLES N-VALUE OR RQD
	303.39						mm	
0		Loose to dense brown to grey silty SAND (SM) with gravel			SS	1	200	9
1					SS	2	100	14
					SS	3	25	50/130
2		-sand layer at 1.83m			SS	4	100	18
					SS	5	150	39
3					SS	6	200	28
4	299.4				SS	7	360	24
		Compact brown silty clayey SAND (SC-SM) - with trace of gravel						
5	298.2				SS	8	360	11
		Compact to very dense brown to grey silty SAND (SM) to poorly graded SAND (SP)			SS	9	250	55
6					SS	10	200	23
	296.4				SS	11	150	50/100
7		Very poor to excellent quality dark grey to black GRANITE - slightly weathered			HQ	12	96%	96%
8					HQ	13	50%	13%
9	294.3							
		End of Borehole at 9.14 m						
10								



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BOREHOLE RECORD

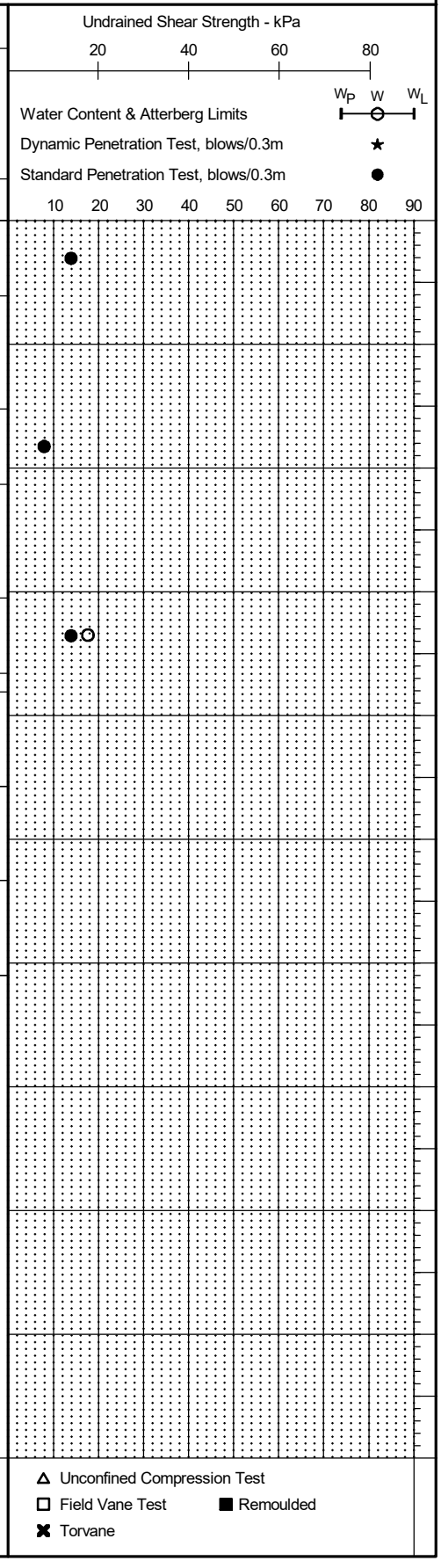
BH2

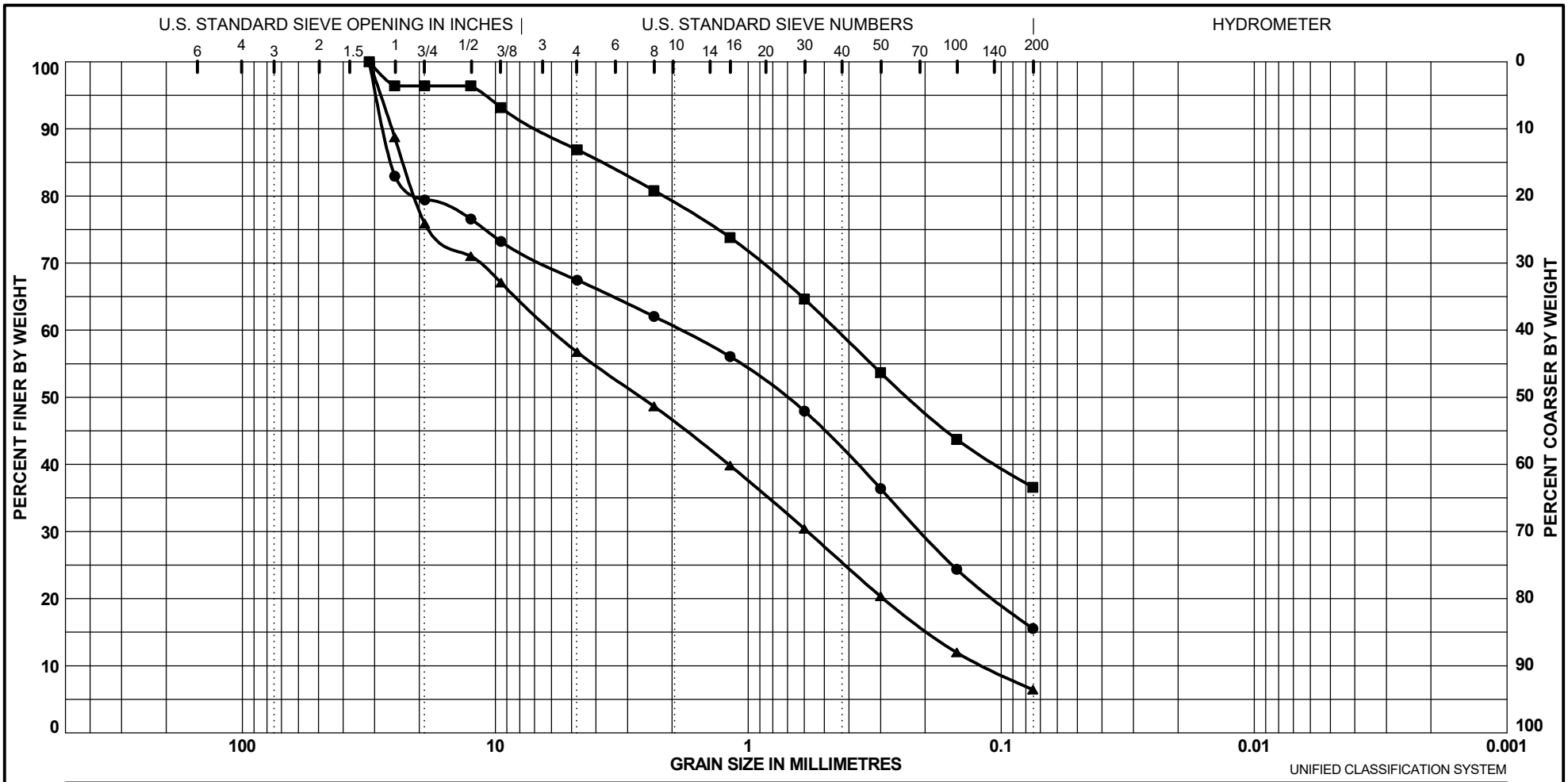
CLIENT **SISSON PROJECT LIMITED PARTNERSHIP** PROJECT No. **121811420**

LOCATION **Nashwaak Lake Water Control Structure** BH No. **BH2**

DATES: BORING **2018/11/29** WATER LEVEL **Not Observed** DATUM **Geodetic**

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY	SAMPLES N-VALUE OR RQD
	303.40						mm	
0		Loose to compact brown to grey poorly graded SAND (SP-SM) with silt and gravel			SS	1	310	14
1								
2					SS	2	150	8
3	299.7				SS	3	180	14
4		Very poor to fair quality grey to black GRANITE - slightly weathered			HQ	4	66%	53%
5					HQ	5	60%	0%
6	297.3				HQ	6	80%	53%
		End of Borehole at 6.10 m						
7								
8								
9								
10								





COBBLES	GRAVEL		SAND			SILT and CLAY	
	coarse	fine	coarse	medium	fine	SILT	CLAY

Source		Depth	Description	W%	W_L	W_P	I_P	%Gravel	%Sand	%Silt	%Clay
●	BH1	2.7	Silty SAND (SM) with gravel	14.8				32.5	52.0	15.5	
■	BH1	4.0	Silty clayey SAND (SC-SM)	14.8				13.1	50.3	36.6	
▲	BH2	3.4	Poorly graded SAND (SP-SM) with silt and gravel	17.8				43.3	50.3	6.4	

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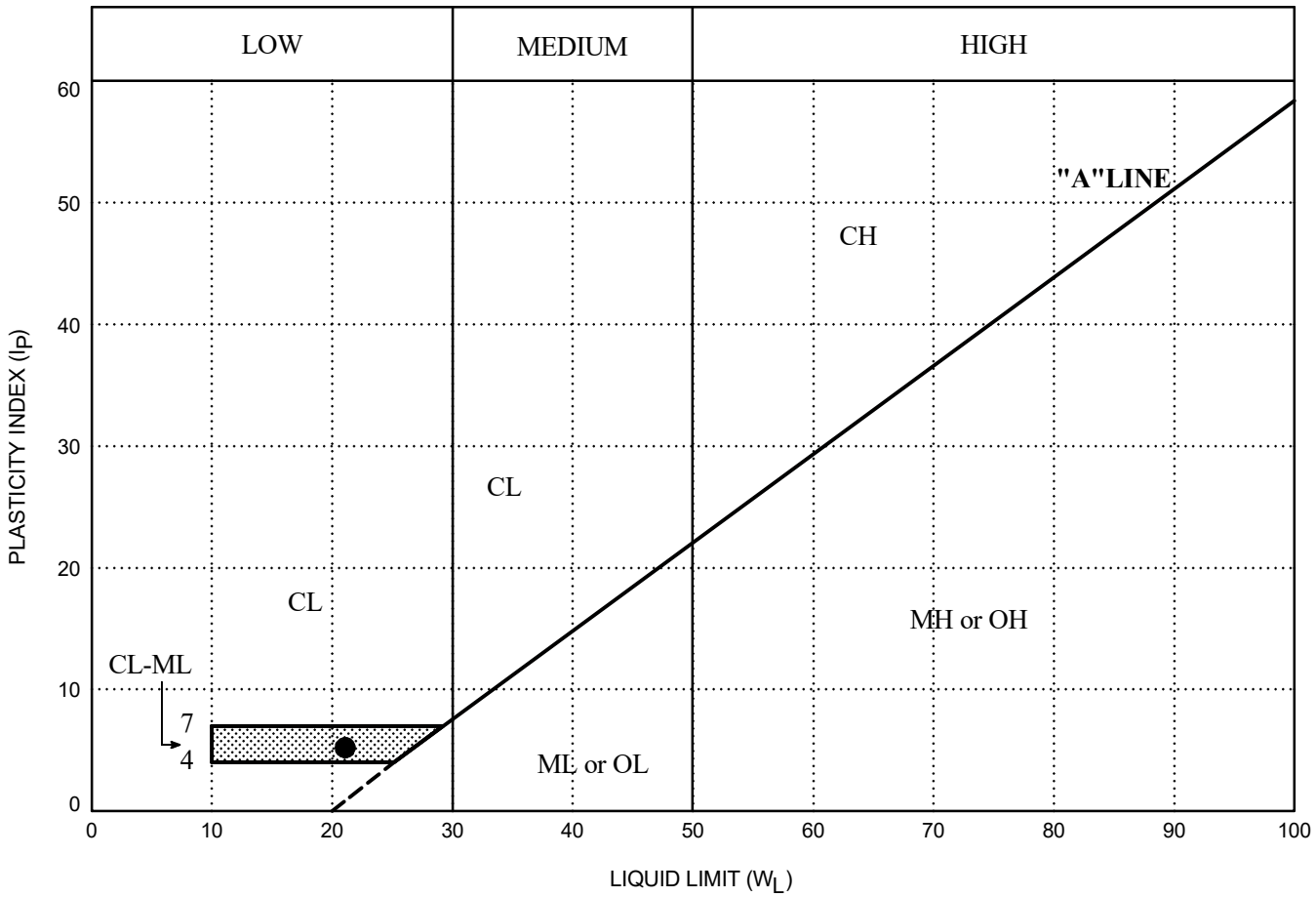
Project: **Nashwaak Lake Water Control Structure**	Location:
Job No.: **121811420**	Notes:
Date: **December 2018**	**GRADATION CURVES**

PLASTICITY CHART



SYM.	SOURCE	DEPTH (m)	LL	PL	PI	W%	DESCRIPTION
●	BH1	4.9	21.1	15.9	5.2	11.6	Silty clayey SAND (SC-SM)

Stantec	Project: **Nashwaak Lake Water Control Structure**	Location:
	Job No.: **121811420**	Notes:
	Date: **December 2018**	**SOIL PLASTICITY**