Government of Yukon Energy, Mines and Resources - Assessment and Abandoned Mines

Clinton Creek Drop Structure No. 4 Repair

Construction Report

18-Dec-15

Advisian is a global advisory firm that provides project and business solutions to clients who develop, operate and maintain physical assets in the infrastructure and resources sectors.

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Dec 18/15

PROJECT NO 307071-01056– CLINTON CREEK DROP STRUCTURE NO. 4 REPAIR: CONSTRUCTION REPORT

Rev	Description	Author	Review	Advisian Approval	Date
A	Issued for Internal Review	S. Clark	J. Gentles	L. Martin	29-Oct-15
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1 Introduction

The Clinton Creek site is a former asbestos mine located 80 km northwest of Dawson City, Yukon (YT), near where the Fortymile River joins the Yukon River. Clinton Creek runs in an easterly direction through the site and receives Wolverine Creek before discharging into the Fortymile River.

The Government of Yukon Energy, Mines and Resources' Assessment and Abandoned Mines (AAM) retained Advisian (WorleyParsons Group) to provide quality assurance/quality control (QA/QC) services for the Gabion Drop Structure No. 4 (DS4) repairs (the works). This project includes the following scope of work:

- Provide an on-site engineer with appropriate expertise to oversee the technical execution of construction and to confirm that all QC items are completed by the contractor as per design specifications and drawings.
- Provide engineering office support during construction.
- Develop and submit a final construction report.
- Develop and submit record drawings.

1.1 Background

The mine operated between 1968 and 1978. Waste rock from the mining operation was placed along the south valley wall of Clinton Creek. Tailings from the milling operation were placed along the west valley wall of Wolverine Creek. Landslides from the waste rock dump and the tailings piles have since blocked Clinton Creek and Wolverine Creek, respectively. Hudgeon Lake has formed as a result of the blockage of Clinton Creek, impounding approximately 10M m^3 of water upstream of the site (Figure A).

Between 2002 and 2004, four gabion drop structures were installed in Clinton Creek, Yukon (YT), at the outlet of Hudgeon Lake to control the flow of water discharging from the lake. In 2010, high flows (estimated return period of approximately 100 to 200 years; WorleyParsons 2014) in Clinton Creek caused damage to existing DS4 (Photo A). AAM, in conjunction with Aboriginal Affairs and Northern Development Canada (AANDC) and Tr'ondëk Hwëch'in First Nation, is currently evaluating long-term remediation options for the Clinton Creek Site; however, until this work can be implemented, short-term measures are required to protect the Clinton Creek channel against erosion that may undermine the stability of the adjacent waste rock and/or cause a rapid release of water from Hudgeon Lake.

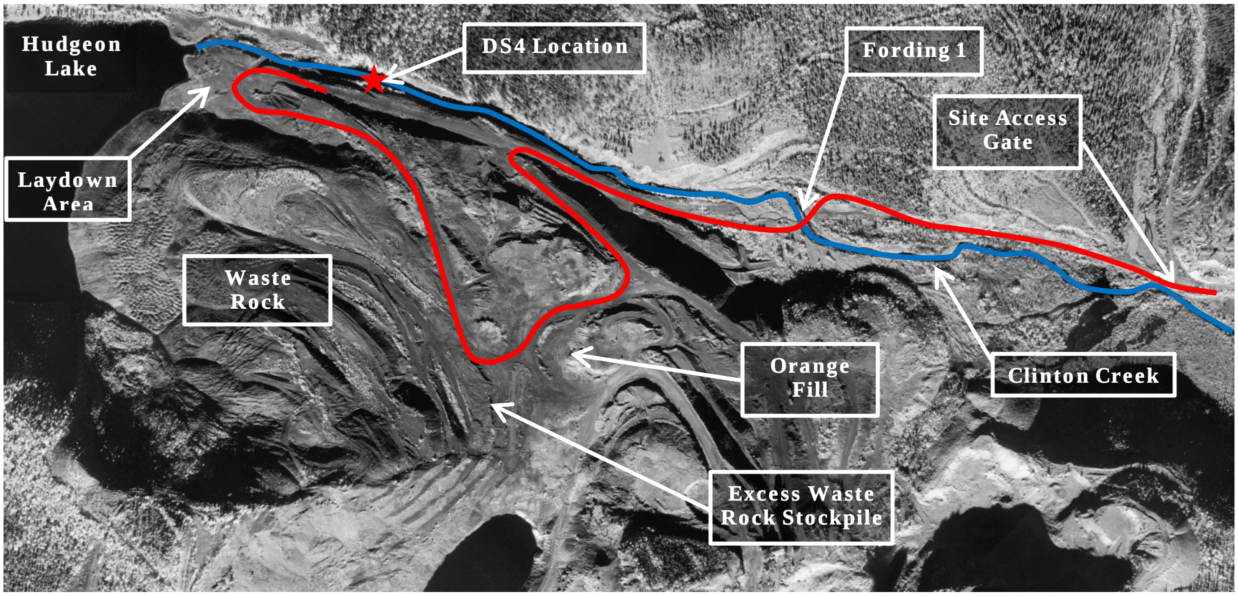

Figure A Clinton Creek Site (aerial photo from 1999)

Photo A Site Overview prior to DS4 Repairs (May 21, 2014, looking west)

1.2 Project Scope

Prior to the repair of DS4, the potentially unstable waste rock slope to the south and east of DS4 (Photo A) was regraded to 2H:1V to allow safe working access to the site.

The repair to DS4 included filling the eroded channel, preparing a new 7 m wide channel, and lining it with articulated concrete block (ACB) mats. The ACB mats were secured to the subgrade using duckbill anchors. A stilling basin for energy dissipation was constructed at the downstream end of the Armorflex channel, before discharge to the existing creek. Transitions to the gabion drop structure and to the existing creek channel were constructed using large diameter rock collected on site.

Engineering record drawings and construction specifications for the DS4 repairs are presented in Appendix 1 and 2, respectively. The completed work is shown in Photo B. The original design report for the DS4 repairs is in Appendix 3.

Photo B Site Overview at Substantial Completion (September 23, 2015, looking northwest)

1.3 Project Team

The project team, including roles and responsibilities, is summarized in Table A.

Table A Project Team

Party	Role	Responsibilities
AAM	Owner	• Owner construction support, oversight and management • Owner construction quality assurance • Contract management • Communication between the contractor and Advisian • General site safety (jointly with General Contractor) • Environmental monitoring
Advisian	Engineer	• Engineering design • Engineering construction monitoring and office support • Construction quality assurance • Producing record drawings and reports
P.S. Sidhu Trucking Ltd.	General Contractor	• Construction scope of work • General site safety (jointly with Owner) • Design, construction, and operation of the creek diversion during period of instream work
CAP Engineering	Subcontractor	• Survey control and earthworks quantity estimates • Soil lab testing • In-situ soil density testing
Armortec (Nilex)	Subcontractor	• Design of Armorflex system (jointly with Engineer) • Supply of Armorflex mats • Quality control of Armorflex mat fabrication and installation (jointly with Engineer)
Belisle Civil Consulting	Subcontractor	• Project management for the General Contractor • Preparing the construction water management plan
Minnow Environmental	Subcontractor	• Preparing the fish salvage plan • Environmental consulting
ELR	Environmental	• Fish salvage prior to instream work

2 Construction Overview

The construction scope of work included the following tasks:

- Construct a temporary construction access road connecting the site to the Clinton Creek Access Road.
- Regrade the waste rock to stabilize the slope on the south side of Clinton Creek, downstream of the damaged gabion structure, at a slope of 2H:1V.
- Temporarily divert flows in Clinton Creek from Hudgeon Lake to a point downstream of the instream work area.
- Fill the eroded channel with on-site material.
- Armour the drop structure chute with Class 60T Armorflex® mats, including gravel bedding, geotextile, microgrid, and ground anchors.
- Construct an instream transition from the upstream channel section (i.e. damaged gabion structure) and downstream channel (i.e. existing unarmoured channel) to the Armorflex® mats using site-sourced rock.
- Complete minor repairs to the other drop structures.

Advisian's field engineer was on-site from August 12 to 15, 2015, and again from August 27 to September 23, 2015 to monitor and document the quality of construction and to manage changes to the original design that resulted from unforeseen site conditions. AAM's site representatives were on-site throughout the duration of the project.

2.1 Construction Schedule

Mobilization for construction began on August 8, 2015. The construction work was divided into five phases, listed in Table B. Demobilization was completed by September 26, 2015.

Table B Construction Phasing

Construction Phase	Start Date	Substantial Completion Date
Mobilization, Construction Camp and Site Access	August 8, 2015	August 20, 2015
Waste Rock Slope Stabilization	August 14, 2015	August 29, 2015
Creek Diversion and Fish Salvage	August 26, 2015	September 3, 2015
Drop Structure Repair	September 3, 2015	September 23, 2015
Provisional Work	September 6, 2015	September 25, 2015
Recommissioning DS4 and Removing Diversion	September 23, 2015	September 25, 2015
Demobilization	September 23, 2015	September 26, 2015

2.2 Material Quantities

Approximate construction material quantities are compared with pre-construction estimated quantities in Table C.

Table C Material Quantities

Item	Unit	Estimated Quantity (pre-construction)	As Constructed Quantity (approximately)
Common excavation	m^3	9,500	9,300 [1]
Channel infill sub-base (general fill)	m^3	1,000	970 [2]
Gravel base (100 mm minus)	m^3	120	160
Large diameter rock (300 mm to 800 mm dia.)	m^3	30	46
Armorflex mats (2.4 m by 4.5 m)	ea.	36	36
Armorflex mats (2.4 m by 5.3 m)	ea.	18	18
Geotextile, non-woven	m^2	900	900
Microgrid, woven	m^2	900	900
Grout, 30 MPa	m^3	10	10
Duckbill 68-DBD ground anchor	ea.	312	306 [3]
20 m rebar	m	100	100

1. Includes excavation for a temporary access road to DS4 from the laydown area, waste rock slope stabilization, channel construction, and over-excavation.
2. Includes waste rock and orange fill material, both of which were used as general fill.
3. Six of the 312 anchors were not installed along northeast edge of Armorflex channel due to the presence of shale bedrock.

2.3 Major Earthworks Equipment

Major earthworks equipment used during the project consisted of the following:

- One Link-Belt 210 Excavator
- One Link-Belt 250 Excavator
- One Link-Belt 460 Excavator
- One CAT 14M Grader
- One CAT D6M Dozer
- One Front-End Loader
- One CAT CS56 Smooth Drum Vibratory Soil Compactor
- Three Terex 30-t Rock Trucks with Tailgate
- Kubota Mini Excavator

3 Mobilization, Construction Camp, and Site Access

The site is accessed by driving west from Dawson City on the Top of the World Highway until Kilometre 59, and driving north 40 km on the Clinton Creek Access Road. The locked gate that controls access to the site is located 9 km past the Fortymile River Bridge. See Figure A for the site layout and access road highlighted in red.

Mobilization began on August 8, 2015 and was completed on August 20, 2015. Mobilization included transporting materials and equipment to site, setting up a construction camp, and access road improvements. Advisian was only on-site between August 12 and 15, 2015 during this phase of work.

3.1 Construction Camp

The construction camp was located on the Clinton Creek Access Road, 1 km past the Fortymile River Bridge. The camp consisted of individual trailers connected to a water tank, sewage tank, and generator, as well as an ATCO trailer containing washrooms, showers, and laundry. Approximately five personnel stayed in the construction camp, while the remaining four to five personnel were provided accommodations with Earl Rolf and Sandra Vaisvil (svaisvil@yahoo.com) at the old Clinton Creek townsite.

3.2 Construction of Fording 1

Fording 1 is located approximately 300 m past the site access gate and crosses Clinton Creek. To allow heavy equipment and trailers to access the site, a causeway was constructed at the fording using on-site fill material. One 1.0 m dia. CSP culvert, four 0.6 m dia. CSP culverts, and a high flow channel were constructed to maintain flows through the crossing, as shown in Photo C. This crossing was designed and constructed by the contractor.

Fish salvage was completed on August 9 to 10, 2015 prior to constructing the causeway. Fish nets were placed in Clinton Creek upstream and downstream of Fording 1 prior to completing the fish salvage. Initially, only two 0.6 m dia. CSP culverts were installed on August 10, 2015. Two additional 0.6 m culverts, one 1.0 m culvert and a high flow channel were added between August 16 and 27, 2015 in response to increasingly high flows in Clinton Creek caused by heavy rainfall.

Photo C **Fording 1, Downstream Side (August 31, 2015, looking northwest)**

4 Waste Rock Slope Stabilization

The waste rock slope to the south and east of DS4 was regraded from an initial slope of approximately 1.4H:1V to a more stable slope of 2H:1V prior to commencing instream work. Regrading the waste rock slope allowed for safer access to the instream work area.

Waste rock excavation began on August 14, 2015 and required 16 days to complete. 8,900 m^3 of waste rock was excavated from the slope. This volume includes access road excavation and some over-excavation by the contractor, both of which are excluded from the excavation payment item. This volume excludes waste rock excavated from the channel (approx. 400 m^3). Waste rock to be used as channel infill (approx. 1000 m^3) was stockpiled along the road entering the laydown area at Universal Transverse Mercator (UTM) coordinates 513,140 mE, 7,147,357 mN. However, this stockpile was later found to be unsuitable fill material. It was left in place since it was not restricting access. Excess waste rock was stockpiled near Porcupine pit, at UTM coordinates 513,305 mE, 7,146,841 mN.

Excavation was carried out by pushing waste rock from the crest of the slope to the toe of the slope using a CAT D6M dozer. Excess waste rock at the toe of the slope was loaded into Terex 30-t rock trucks using a Link-Belt 250 excavator. Access to the excavation area was single-lane with no turnaround, requiring rock trucks to back up approximately 150 m from the construction laydown area to the excavator.

Permafrost was encountered in the lower 2 m to 4 m of the excavated slope. The extent of permafrost on the slope, marked with survey stakes, is shown in Photo D. Groundwater seeped from a 5 m-wide section along the toe of the slope, and appeared to be discharging at the surface of the permafrost. The seepage was initially turbid but was running clear by the following day. The seepage rate was approximately 1 L/s and remained constant throughout the project. Rock and geotextile was placed at the toe of the slope on September 25, 2015 to mitigate erosion. No other work was completed. The presence of permafrost is not expected to significantly affect the stability of the slope or the DS4 repair.

Photo D **Permafrost at Toe of Waste Rock Slope (August 30, 2015, looking east)**

4.1 Health and Safety - Asbestos

Airborne asbestos fibres were a potential concern during the excavation of waste rock. When actively working in the waste rock excavation zone, the workers wore the following asbestos-related PPE:

- Half-face respirator with a P100 filter.
- Tyvek coverall suit, disposed of at the end of each day in garbage bags labelled “hazardous”.

Air sampling was conducted to measure the concentration of asbestos fibers in the air during active construction in the waste rock excavation zone. One excavator operator, one rock truck driver, and one laborer wore Gilian - Gilair 3 air sampling systems when actively working in the excavation zone. The air sampling systems were worn on the belt for up to eight hours.

Air sampling was conducted by the contractor three times during the course of actively working in the excavation zone. The first run of air sampling was conducted at the start of waste rock excavation. Air samples were tested by Wes-HAR Asbestos Analysis and Consulting in Richmond, BC. The average measured airborne-asbestos concentration was 0.009 fibres/cc. The maximum measured concentration was 0.029 fibres/cc. The maximum allowable concentration of airborne asbestos is 5.0 fibres/cc/ 15-minute limit (from Table 10 - Mineral Dusts of the Yukon Occupational Health Regulations). No air samples exceeded this limit.

5 Creek Diversion and Fish Salvage

In order to isolate the instream work area, Clinton Creek was diverted from the outlet of Hudgeon Lake to approximately 50 m downstream of DS4. The diversion was designed by the contractor and completed in accordance with the Water Management Plan (Appendix 8). The fish salvage was completed in coordination with the dewatering of the instream work area and prior to commencing instream work. The fish salvage was carried out in accordance with the Fish Salvage Plan (Appendix 9).

Daily field reports of construction activities during the creek diversion and fish salvage are provided in Appendix 4.

5.1 Creek Diversion

Construction of the creek diversion began on August 26, 2015 and required seven days to complete. The creek was diverted using four 12 in. submersible pumps, each connected to a 10 in. diameter high-density polyethylene (HDPE) pipe. A fifth standby pump was available on-site. The pumps were placed in an intake sump, which was constructed near the outlet of Hudgeon Lake, as shown in Photo E. The intake sump was armoured with riprap and off-spec Armorflex mats (refer to Section 0). Sections of HDPE pipe, each 15 m long, were joined using bolted flanges with rubber gaskets. The length of the finished diversion pipes was approximately 250 m long.

The diversion pipe alignment ran along the south side of the Clinton Creek channel and beneath the access road down to below DS4 as shown on Drawing 1003 in Appendix 1. The access road was approximately 5 m wide and was designed and constructed by the contractor. Some excavation of the waste rock slope, outside the scope of the slope stabilization works, was required. The DR17 HDPE pipes were buried approximately 1 m below the finished road grade. Backfill over the pipes was orange fill material, placed in a 1 m lift and track packed.

The sequencing of the diversion of Clinton Creek was as follows:

1. Construction of the inlet sump and installation of pumps (August 26 to 27, 2015).
2. Construction of the diversion pipe bed and installation of HDPE pipes (August 27 to September 1, 2015).
3. Construction of the diversion pipe outlet erosion protection and connecting the inlet sump to Hudgeon Lake (September 1, 2015).
4. Pumps turned on (September 1, 2015).
5. Dam at Hudgeon Lake outlet installed (September 2, 2015).
6. Fish salvage completed (September 2 to 3, 2015).

The four pumps were powered by two diesel generators. Initially, all four pumps were operating to draw down the Hudgeon Lake water level. Once the lake level was drawn down, the pumps were run intermittently. Most pumps that were not running continued to siphon due to the net elevation drop from inlet to outlet.

There were no delays to the construction schedule as a result of the relatively high flows observed in Clinton Creek in August, 2015 (Section 5.2); however, the diversion pumping capacity was exceeded between approximately August 19 and September 1, 2015. Had heavy rainfall persisted to the end of August or into September, the pumping capacity may not have been sufficient to avoid delays in construction. Further, had the heavy rainfall occurred during instream work, while Hudgeon Lake was dammed off, it would have posed a risk to the DS4 repairs and potentially the other three drop structures. The observed flows were significantly higher than typical flows in Clinton Creek during August (Yukon Government 2005), and as such highlight the inherent uncertainty with regards to predicting flows and the sizing of temporary creek diversion works.

Photo E Pump Intake and Dam at Hudgeon Lake Outlet (September 3, 2015, looking northeast)

The diversion pipes discharged onto an off-specification Armorflex mat at approximately Station 0+70. Large boulders were placed around the discharge, as shown in Photo F, to reduce discharge velocities and protect against erosion of the creek and the waste rock toe.

Photo F **Diversion Pipe Discharge, Erosion Protection (September 1, 2015, looking east)**

5.2 Hudgeon Lake Water Levels and Flow Rates

In order to sustain fish passage and habitat, a minimum flow rate of 0.2 m^3/s in Clinton Creek was required throughout the duration of instream work. Lake water level and discharge measurements were taken intermittently throughout the duration of the project and are presented in Table D. Hudgeon Lake water levels prior to August 27, 2015 were recorded by AAM.

Table D **Hudgeon Lake Water Level and Discharge Measurements**

Date and Time	Hudgeon Lake Staff Gauge Reading (cm)	Hudgeon Lake Water Level (m)	Clinton Creek Flow Rate (m^3/s)	Comment
August 18	6	411.74		Lake discharge only
August 20	18	411.86		
August 22	12	411.80		
August 24	14	411.82		
August 26, 07:00	15	411.83		
August 27, 15:00	28	411.96	3.4	
August 28, 07:00	29	411.97		
August 28, 13:00	28	411.96		
August 29, 09:00	22	411.90	2.8	
August 29, 17:00	20	411.88	2.5	

Date and Time	Hudgeon Lake Staff Gauge Reading (cm)	Hudgeon Lake Water Level (m)	Clinton Creek Flow Rate (m^3/s)	Comment
August 30, 08:00	17	411.85	2.1	
August 30, 16:00	15	411.83	2.0	
August 31, 07:00	12	411.80	1.7	
August 31, 16:30	10.5	411.79	1.6	
September 1, 07:30	9	411.77	1.5	
September 1, 16:30	7.5	411.76	1.3	
September 1, 17:00	7.5	411.76	2.4	Lake discharge + pumping
September 2, 07:30	0	411.68	1.9	
September 2, 13:00	-2	411.66	1.4	
September 2, 17:30	-3	411.65	1.1 [1]	Pumping only
September 3, 07:00	-4	411.64	---	---
September 4, 07:00	-8	411.60	---	---
September 5, 07:00	-12	411.56	---	---
September 6, 07:00	-16	411.52	---	---
September 7, 07:00	-19	411.49	---	---
September 8, 07:00	-19	411.49	0.7 [1]	Siphoning only
September 9, 07:00	-19	411.49	---	---
September 10, 07:00	-20	411.48	---	---
September 11, 07:00	-21	411.47	---	---
September 12, 07:00	-22	411.46	---	---
September 13, 07:00	-24	411.44	---	---
September 14, 07:00	-25	411.43	---	---
September 15, 07:00	-21	411.47	---	---
September 16, 07:00	N/A	N/A	---	---
September 17, 07:00	-20	411.48	---	---
September 18, 07:00	-19	411.49	---	---
September 19, 07:00	-19	411.49	---	---
September 20, 07:00	-19	411.49	---	---
September 21, 07:00	-19	411.49	---	---
September 22, 07:00	-22	411.46	---	---

Date and Time	Hudgeon Lake Staff Gauge Reading (cm)	Hudgeon Lake Water Level (m)	Clinton Creek Flow Rate (m^3/s)	Comment
September 23, 07:00	-21	411.47	---	---
September 23, 17:00	-20	411.48	~0.2	Lake discharge only, measured at DS1 notch

1. Flow rates in Clinton Creek were generally maintained between 0.7 m^3/s (all pumps siphoning) and 1.1 m^3/s (all pumps pumping) between September 2 and 23, 2015. Therefore, flow measurements were not taken regularly during this period.

Hudgeon Lake water levels were monitored at the staff gauge near the construction laydown area. The 0.0 m reading on the staff gauge corresponds to an elevation of 411.68 metres above sea level (masl) (WorleyParsons 2015a).

Hudgeon Lake discharge measurements were taken in Clinton Creek at Fording 1 (Photo G), approximately 800 m downstream of the lake outlet. This location was selected to take advantage of the installed culverts for measuring discharge. All five culverts at Fording 1 operated as inlet controlled throughout the duration of flow measurements. Headwater depths were measured at each culvert and plotted on an inlet-control nomograph for corrugated steel pipes CSPs to estimate total flow rate. Where very high creek flows overtopped the north side of the crossing (see orange fill area in Photo G), a broad-crested weir equation was used to estimate flow.

Photo G Fording 1, Creek Flow Measurements (August 31, 2015, looking northeast)

An approximate rating curve was developed for the Hudgeon Lake outlet assuming weir flow across DS1 controls the lake water level. DS1 is shown in Photo H.

Photo H DS1 Weir Flow at Hudgeon Lake Outlet (September 23, 2015, looking northwest)

5.2.1 Equation No. 1

Equation No. 1 presents a semi-empirical rating curve that divides weir flow into the following components:

1. Low Flow Notch
2. Main Weir
3. Side Slopes

It was assumed that the weir water level was approximately 2 cm below Hudgeon Lake level. Weir coefficients C1, C2, and C3 were calibrated using lake level and discharge measurements. These coefficients are slightly lower than expected, which is typically about 1.45 for broad-crested weirs at low flow (Tracy 1957). This can be explained by the presence of logs and debris in DS1 during the period of discharge measurements.
The coefficients should increase slightly once the debris has been removed.

Equation No. 1 - DS1 Weir Rating Curve

$$Q = C_1 w_1 h_1^{1.5} + C_2 w_2 h_2^{1.5} + C_3 \tan\left(\frac{\theta}{2}\right) h_2^{2.5}$$

$$Calibrated\ Coefficients: C_1 = 1.3, \quad C_2 = 1.4, \quad C_3 = 1.1$$

$$Measured\ weir\ widths: w_1 = 0.8\ m, \quad w_2 = 7.0\ m$$

$$\tan\left(\frac{\theta}{2}\right) = \frac{4H}{1V}$$

$$Weir\ headwater\ h_1 = WL - 411.12 - 0.02\ (\leq 0.40m), \quad h_2 = WL - 411.52 - 0.02$$

A graph of the Hudgeon Lake rating curve (Equation No. 1) is shown in Figure B. Lake level and discharge measurements are plotted on the same graph for reference.

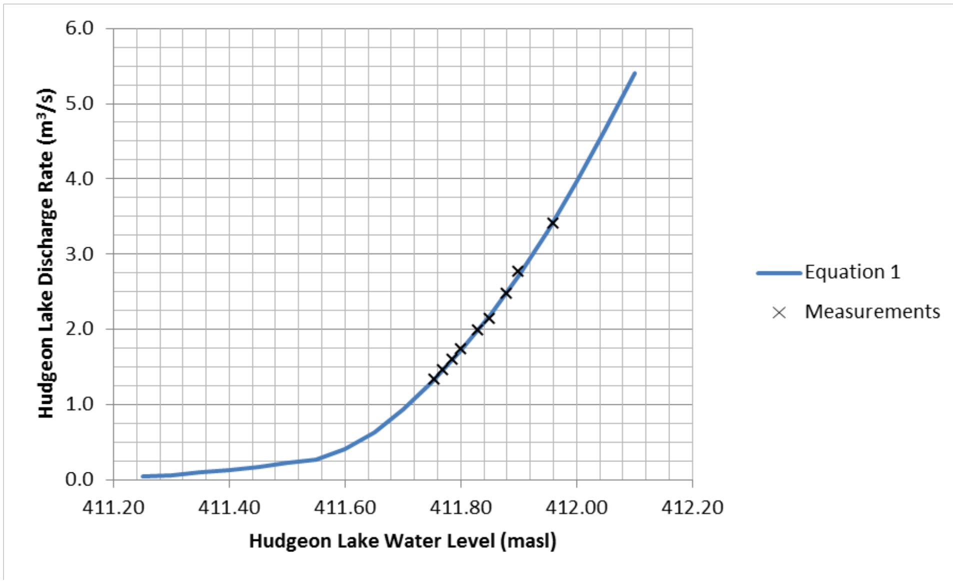

Figure B Estimated Hudgeon Lake Discharge Rating Curve

5.3 Fish Salvage

The fish salvage in the DS4 in-stream work area began on September 2, 2015 and required one-and-a-half days to complete. The dam across Hudgeon Lake outlet was installed over a period of approximately five hours to slowly drop water levels in the work area. A net was placed across Clinton Creek just upstream of the diversion pipe discharge outlet to prevent fish from entering the instream work area once the fish salvage began. Approximately 500 fish were removed from the instream work area. The fish salvage was complete by noon on September 3, 2015.

Photo I **Conducting the Fish Salvage (September 3, 2015, looking northwest)**

6 Drop Structure Repair

Erosion during the flood of 2010 resulted in an approximately 4 m drop in the Clinton Creek channel immediately downstream of DS4, damage to several courses of gabion baskets, and the mobilization of the underlying waste rock material. To mitigate the risk of further channel erosion and of the drop structures washing out entirely, the repair work involved backfilling the creek channel and armouring it with Armorflex mats and large diameter rock. The repair of DS4 can be divided into the following stages:

1. Subgrade Preparation
2. Removal of Damaged Gabions
3. Bulk Earthworks
4. Placement of Geotextile, Gravel Base Layer and Microgrid
5. Installation of Armorflex Mats, Duckbill Anchors, Rebar and Grout
6. Placement of Large Diameter Rock at Inlet and Outlet Transitions

Daily field reports of construction activities during the DS4 repair are presented in Appendix 4.

6.1 Removal of Damaged Gabions

Damaged gabion baskets on the sixth course (i.e. row or layer) from the top of DS4 were removed to create a hydraulically efficient transition to the Armorflex channel.

Photo J DS4 after Removing Damaged Gabion Baskets (September 5, 2015, looking northwest)

6.2 Subgrade Preparation

Subgrade preparation included moving large diameter rocks in the creek channel to areas with deeper fill and excavating unsuitable native material.

Where channel infill was placed over saturated material, a thicker first lift of approximately 0.5 m to 1.0 m was used to avoid disturbing the native material during vibratory compaction. Between Stations 0+50 and 0+65 (approximate) saturated silty material was removed from the south side of the channel to a depth of 0.5 m. The subgrade excavation was backfilled with orange fill (see Section 6.3 for description). Orange fill was compacted to 95% of the control strip maximum dry density, as described in Section 6.3. The north side of the channel in this area consisted of native shale bedrock, which is adequate subgrade material. Photo K shows the approximate extents of subgrade excavation.

Photo K Subgrade Excavation Between 0+50 m and 0+60 m (September 8, 2015, looking west)

At the downstream end of the stilling basin, station 0+59 m, the longitudinal slope of the 0.3 m transition was changed from 1.5H:1V, as originally designed, to approximately 6H:1V. This change was made to facilitate construction and to avoid sharp bends in the Armorflex mats.

6.3 Bulk Earthworks

Bulk earthworks for the repair of DS4 began on September 3, 2015 and, in conjunction with removing damaged gabion baskets and preparing the subgrade, were substantially completed by September 12, 2015. 970 m^3 of fill and 400 m^3 of excavation were required to reach finished subgrade elevations.

The fill was loaded from the stockpile into Terex 30-t rock trucks using a Link-Belt 210 excavator, hauled to DS4, and placed using a CAT D6M dozer and Link-Belt 250 excavator. Fill was compacted using a CAT CS56 smooth drum vibratory soil compactor.

The original design called for the excavated waste rock to be used as fill in the channel, compacted to 93% of the Modified Proctor Maximum Dry Density (MPMDD) specified in Table E; however, when the waste rock was placed it was found to have a moisture content of approximately 24% (Table F) and the minimum specified compaction could not be achieved. Much of the waste rock on-site was found to have higher than optimum moisture content.

There are a combination of factors that may have contributed to the high moisture content of the waste rock, which caused it to be unsuitable as channel infill material. These contributing factors include the following:

- The weather was abnormally wet during excavation and stockpiling of material.
- The waste rock sample that was sent to the lab for proctor tests was taken from the upper slope and found to have an in situ moisture content of 7.0%, near optimum. However, waste rock that was stockpiled as channel infill material was taken from the lower slope, which potentially had higher in situ moisture content.
- The contractor’s stockpile may not have been adequately compacted and graded to ensure proper drainage.
- The waste rock at Clinton Creek may be particularly susceptible to absorbing water.

In order to proceed with filling the channel, a stockpile of orange fill material, located at approximately 513,384 mE and 7,146,928 mN, was used instead of waste rock. The suitability of the orange fill as channel fill material was approved by Advisian. The first lift of waste rock that did not meet density requirements was substantially removed before orange fill was placed.

Orange fill was compacted to 98% of the control strip maximum dry density (MDD). This was completed in accordance with the Alberta Transportation specification ATT-58/96 Density Test, Control Strip Method. To measure a control strip MDD, in-situ density was measured in three locations along a test strip at 4, 6, and 8 passes with a vibratory soil compactor. After 6 passes, the measured dry density began to decrease. The control strip MDD was therefore taken as the median density at 6 passes. The measured control strip MDD was 2113 kg/m^3. The SPMDD was later determined to be 2070 kg/m^3 (not corrected for oversize) as shown in Table E. These two values are comparable, which gives us confidence that the control strip method was an adequate measure of in-situ density.

Photo L **Placing and Compacting Fill - Red line shows approximate extent of subgrade excavation. (September 9, 2015, looking northwest)**

6.3.1 Specifications and Drawings

The channel was regraded to the subgrade elevations and grades specified on Drawing No. 1002 in Appendix 1. General channel infill was placed and compacted in accordance with Specification 31 14 11 - Earthworks and Related Works in Appendix 2 with the following exceptions:

- Item 2.1.1: Orange Fill (see Section 6.3 for description) was added as an alternative to waste rock for channel infill material.
- Item 3.6: For Orange Fill, the compaction requirement of 93% MPMDD was changed to 95% to 98% of Control Strip MPMDD. Control Strip MPMDD was determined in accordance with Alberta Transportation specification ATT-58/96 Density Test, Control Strip Method.

6.3.2 Materials and Testing

Proctor test and sieve analysis results for channel infill materials, waste rock and orange fill, are in Appendix 5 and summarized in Table E. Orange Fill was tested using the Standard Proctor method, which is acceptable for this type of coarse-grained material.

Table E Lab Test Results for Channel Infill Materials

Parameter	Waste Rock	Orange Fill
Test Type	Modified Proctor (ASTM D1557)	Standard Proctor (ASTM D698)
Maximum Dry Density	2,195 kg/m^3	2,070 kg/m^3
Corrected Maximum Dry Density	2,259 kg/m^3	N/A
Control Strip Maximum Dry Density (based on ATT-58-96)	N/A	2,113 kg/m^3
As Received Moisture Content	7.0%	3.3%
Optimum Moisture Content	7.5%	11.0%
Corrected Optimum Moisture Content	8.3%	N/A
Sieve Analysis		
<50 mm	100%	69%
<10 mm	81%	28%
<0.08 mm	20%	4%

Density testing of the fill was completed by the contractor using a nuclear densometer. Density testing results are in Appendix 6, and summarized in Table F.

Table F Field Test Results for Channel Infill Materials

Parameter	Waste Rock	Orange Fill	Subcut (orange fill)
Specified Minimum Compaction	93% of MPMDD	95% to 98% of control strip	N/A
Total No. of In Situ Density Tests	9	55	6
No. of In Situ Density Tests on Recompacted Lifts	9	6	1
No. of In Situ Density Tests on approved Lifts	0	49	5
Average Dry Density[1]	1,474 kg/m³	2,116 kg/m³	2,069 kg/m³
Average Percent Compaction[1]	68.3%	100.1% [2]	97.9% [2]
Average Moisture Content[1]	24.1%	8.5%	7.1%

1. Only results from approved lifts are included, with the exception of waste rock where no lifts were approved. Test results for lifts that required additional compaction are excluded.
2. Percent compaction for orange fill and subcut were calculated by comparing in situ dry density to the control strip maximum dry density, instead of the standard proctor maximum dry density.

6.3.2.1 ARD and Metal Leaching

Acid rock drainage and metal leaching (ARD/ML) lab testing was completed on samples of waste rock and 100 mm minus gravel (stockpile at site entrance; same material as orange fill). These test results are presented in Appendix 10 and summarized in Table G and indicate that both materials are not potentially acid generating (non-PAG). Results from shake flask tests indicate potential CCME exceedances in Selenium and Chromium from waste rock, and Arsenic and Chromium from 100 mm minus gravel. No metals exceeded MMER limits. The orange fill material was not specifically tested for ARD/ML but is composed of the same source material as the 100 mm minus gravel.

Given the current presence of large volumes of waste rock in the former Clinton Creek valley, screening of downstream water samples for potential concentrated elevations of these metals should be considered. However, considering the relatively small quantity of material that was placed in Clinton Creek compared to the current volumes of waste rock in the valley, no significant change to downstream water quality is expected.

Table G Summary of Acid Rock Drainage and Metal Leaching Lab Test Results

Material	Description	NPR [1]	Acid Generating Potential [2]	Shake Flask Metal Exceedances [3] (% of CCME Chronic Limit)
Waste Rock	Serpentinized Utramafic, Graphitic Argillite, and Mudstone/Siltstone	22.0	Non-PAG	Chromium (Cr): 200% of CR(IV) Selenium (Se): 680%
100 mm Minus Gravel	Meta - Sandstone	48.4	Non-PAG	Arsenic (As): 130% Chromium (Cr): 300% of Cr(IV)

1. Neutralization Potential Ratio (NPR) is the ratio of acid neutralizing capacity (modified Sobek method) to acid generating capacity (total sulphur method). This value was averaged over three samples for each material.
2. Potentially acid generating (PAG) material has an NPR less than 1. Non-PAG material has an NPR greater than 2. NPR between 1 and 2 is uncertain.
3. An exceedance was defined as a final dissolved metal concentration that is greater than the Chronic limit under the Canadian Environmental Quality Guidelines for the Protection of Aquatic Life (CCME).

6.4 Geotextile, Gravel Base Layer and Microgrid

Placement of the non-woven geotextile, a gravel base, and woven microgrid began on September 12, 2015 and, in conjunction with placement of Armorflex mats, was completed by September 19, 2015.

The non-woven geotextile was Nilex 4510. The woven microgrid was Stratagrid. The geotextile and microgrid were cut into strips and placed by labourers. Strips were placed across the channel (i.e. perpendicular to the direction of flow). Adjacent strips were overlapped a minimum of 600 mm in the direction of flow (i.e. shingled). Geotextile, gravel and microgrid were placed starting at the downstream end and working upstream.

The gravel base was 100 mm minus crushed rock (100 mm Minus), which was stockpiled by the site entrance. 100 mm minus was loaded from the stockpile into Terex 30-t rock trucks using a Link-Belt 210 excavator, hauled to DS4, and placed using a Link-Belt 250 excavator. The 100 mm minus was compacted using a CAT CS56 smooth drum vibratory soil compactor.

Photo M Placing Geosynthetics, Gravel Base, and Armorflex Mats (September 14, 2015, looking northwest)

6.4.1 Specifications and Drawings

Geosynthetics and a gravel base were placed beneath all Armorflex mats, as shown on Drawing No. 1002 in Appendix 1, and in accordance with Specification 31 36 19 - Armorflex Mats in Appendix 2 with the following exception:

- Item 3.3.3: Geosynthetics were anchored at the upstream and downstream anchor trenches as well as at the top of the channel banks, but not necessarily to the minimum 1.5 m specified. Since all edges of the geotextile and microgrid ended below finished grade, additional anchoring was not necessary.

6.4.2 Materials and Testing

Proctor test and sieve analysis results for the gravel base material, 100 mm minus, are in Appendix 5 and summarized in Table H.

Table H Lab Test Results for Gravel Base Materials

Parameter	100mm Minus
Test Type	Modified Proctor (ASTM D1557)
Maximum Dry Density	2,355 kg/m^3
Corrected Maximum Dry Density	2,475 kg/m^3
Control Strip Maximum Dry Density (based on ATT-58-96)	N/A
As Received Moisture Content	1.5%
Optimum Moisture Content	7.0%
Corrected Optimum Moisture Content	5.2%
Sieve Analysis	
< 50 mm	95%
< 10 mm	52%
< 0.08 mm	6%

Density testing of the gravel base layer was completed by the contractor using a nuclear densometer. Density testing results are presented in Appendix 6, and summarized in Table I. The contractor was unable to achieve the Specified Minimum Compaction of 95% MPMDD in the field, despite near-optimum soil moisture. The high void ratio of the 100 mm minus material was likely not captured in the proctor testing due to the screening of coarse material. The maximum achievable density, approximately 87% of MPMDD, was obtained after approximately four passes with a vibratory soil compactor. Therefore, a minimum of four passes were required throughout the compaction of the gravel base layer, which is acceptable.

Table I Field Test Results for Gravel Base Materials

Parameter	100mm Minus
Specified Minimum Compaction	95% of MPMDD
No. of In Situ Density Tests	10
No. of In Situ Density Tests on Recompacted Lifts	1
No. of In Situ Density Tests on approved Lifts	9
Average Dry Density[1]	2,156 kg/m^3
Average Percent Compaction[1]	87.1%
Average Moisture Content[1]	6.3%

1. Only results from approved lifts are included. Test results for lifts that required additional compaction are excluded.

6.5 Armorflex, Duckbill Anchors, Rebar, and Grout

Placement of Armorflex mats began on September 13, 2015 and, in conjunction with placement of geosynthetics and gravel base material, was completed by September 19, 2015. Installation of duckbill anchors and grouting voids and transitions between mats was completed between September 16 and September 21, 2015. A total of 306 anchors and approximately 10 m^3 of grout were used. An Armortec representative was on-site from September 12 to 15, 2015 to inspect the quality of the Armorflex mats, direct any necessary repairs to damaged mats, approve sub-grade material, and monitor the placement of the first nine mats.

Armorflex mats were brought from the laydown area to DS4 using a front-end loader holding a spreader bar. At DS4, mats were placed with a Link-Belt 460 excavator holding a spreader bar. A minimum of three labourers were required to position the mats flush with adjacent mats. Care was taken to remove large or protruding rocks from gravel bedding before placing each mat. Crowbars were used to shift individual concrete blocks or to “seat” the blocks properly. Due to the tapered block design, mats were oriented such that the thicker edge of each block was positioned downstream. Blocks with the leading (i.e. upstream) edge visibly protruding into the flow were repositioned and, where necessary, grouted in place.

6 m lengths of 20M rebar were placed longitudinally in the channel between adjacent Armorflex mats. The rebar was threaded through the Armorflex cables to help secure adjacent mats. A minimum 0.8 m overlap was provided at rebar lab splices.

The duckbill anchors were installed using a pneumatic jackhammer. Due to the large rocks in the orange fill, anchor holes were pre-drilled to avoid snapping the thin end of the driving rod that attaches to the anchor head. Duckbill anchors were attached to the Armorflex mat cables by looping the anchor around and back through its own cable before driving the anchor-head in. The duckbill anchors were set by prying up on the cable with a steel rod. Where shale bedrock was encountered along the northeast edge of the Armorflex channel, one anchor was installed per mat (Drawing Nos. 1001 and 1004 in Appendix 1) instead of two as originally designed.

The duckbill 68-DBD anchors specified were not suitable for shale bedrock, which caused substantial damage to the anchors and the driving rod during installation. This change will have no significant impact on the performance of the Armorflex channel because these mats are located in the stilling basin section of the channel, which has a higher factor of safety against failure.

The dry grout was mixed with water from Clinton Creek on-site using a portable concrete mixer. The grout was placed using wheelbarrows, tamping rods and finishing trowels. Fresh grout was covered with insulated blankets overnight to protect against freezing.

Photo N Mixing and Placing Grout (September 17, 2015, looking northwest)

6.5.1 Specifications and Drawings

Armorflex mats, anchors and grout were in the locations shown on Drawing No. 1004 in Appendix 1, and in accordance with Specification 31 36 19 - Armorflex Mats in Appendix 2.

6.5.2 Materials and Testing

Armorflex mats were model 60T manufactured by Armortec with dimensions and properties listed in Table J.

Table J Armorflex Mat Properties

Parameter	Value
Concrete Block Class	60T
Open/Closed Cell	Open
Block Length[1]	44.2 cm
Block Width[2]	39.4 cm
Block Height	19 cm
Block Submerged Weight	25 kg
Average 28-day Compressive Strength[3]	34.0 MPa

1. Dimension perpendicular to the direction of flow.
2. Dimension in the direction of flow.
3. Tested in accordance with ASTM D 6684-04. Armortec specifies a minimum compressive strength of 27.6 MPa (4,000 psi) averaged over three units.

The first shipment of Armorflex mats was found to be deficient, with the average block height approximately 16 cm to 17 cm thick. Mats were re-fabricated and shipped to site; however, to avoid delays to the project schedule Armortec shipped the replacement Armorflex mats following a relatively short curing time at their Edmonton plant. While the tested 28-day compressive strength of the Armorflex blocks (Appendix 7) met the minimum specified by Armortec, many of the blocks in the replacement mats had large cracks or spalling.

An Armortec representative was on-site from September 12 to 15, 2015 to inspect the quality of the Armorflex mats and direct any necessary repairs to damaged mats. The Armortec representative stated that the visible cracking and chipping is incidental to typical manufacturing and shipping processes, except where he identified individual concrete blocks to be repaired or replaced. Armortec is not aware of issues with freeze-thaw durability for concrete of similar quality.

The Armortec representative was concerned that the gravel bedding provided was not free draining due to the presence of finer material; however, it is Advisian's opinion that the gravel is free draining and adequate for this application based on the grain size distribution in Table H and in Appendix 5. The gravel bedding was therefore accepted by Advisian.

As per Armortec's direction, cracks were repaired using a primer/water mix and Portland cement. 29 blocks out of the 54 mats (3780 blocks total) were split in half during transport to site. These blocks were replaced with spares by cutting the steel cables and reconnecting them with crimp sleeves. Concrete blocks that were damaged during placement were grouted in place (Photo O).

Photo O **Broken concrete blocks grouted in place (September 21, 2015)**

The rebar was size 20M, fabricated in 6 m lengths. The nominal diameter is 19.5 mm. This rebar is suitable for the purpose of connecting adjacent mats, and is larger than what is required by Armortec.

Duckbill anchors were model 68-DBD equipped with a 1.0 m-long, 3.22 mm-dia. galvanized steel cable. Half-block voids along the edges of the Armorflex mats were located two rows from the end (Drawing No. 1004 in Appendix 1) instead of four rows from the end as originally designed. Based on discussions with Armortec, this change will have no significant impact on the performance of the Armorflex mats.

Quikrete concrete mix with a specified compressive strength of 27.6 MPa (4,000 psi) was used as grout, and the manufacturer's directions were followed during placement. Grout samples were not taken during placement, so actual in situ grout compressive strength is unknown. Considering that the grout should not experience high stress during operation, this is an adequate level of quality control.

6.6 Large Diameter Rock and Inlet Transition

Placement of large diameter rock in the Armorflex channel began on September 21, 2015 and was completed by September 24, 2015. A total of 34 m^3 of large diameter rock was placed at the inlet (west end) and 12 m^3 at the outlet (east end).

Rocks with nominal diameters ranging from approximately 300 mm to 1,000 mm were sourced from waste rock that was excavated during the slope stabilization phase and stockpiled in the laydown area. Non-woven geotextile was placed between large diameter rock and subgrade soils. Rocks were placed using a Link-Belt 210 excavator with a hydraulic thumb. Very large rocks were placed first to avoid individual rocks protruding above the riprap layer.

At the inlet transition, access roads on either side of the channel were built up to direct high flood waters from the gabion drop structure into the Armorflex channel inlet.

Photo P Placing Large Diameter Rock (September 22, 2015, looking northwest)

6.6.1 Specifications and Drawings

Large diameter rock was placed in the locations shown on Drawing No. 1001 and in accordance with Specification 31 37 10 - Large Diameter Rock with the following exception:

- Item 2.3.1.1: An average rock dimension exceeding 800 mm was allowed as long as no individual rocks protrude from the riprap layer, per Item 3.2.4.

As per the drawing notes, additional rock was placed at the inlet transition as directed by the field engineer to provide a better flow path between the gabion channel and the Armorflex channel.

7 Recommissioning DS4 and Demobilization

A final inspection of the DS4 repairs was completed by AAM, Sidhu and Advisian on September 23, 2015. The deficiencies and remaining works were identified during the inspection and were provided to the Contractor. Channel flow was reinstated in the afternoon of September 23, 2015. The deficiencies and remaining work, as well as removal of the creek diversion, took place between September 24 and 25, 2015. Demobilization was complete by September 26, 2015.

7.1 Reinstating Flow

A minimum flow of 0.2 m^3/s through DS4 was required before the pumping diversion could be shut off. A water level in Hudgeon Lake of 411.48 m (-20 cm on the staff gauge) was maintained in order to provide the minimum flow (see Equation 1). The riprap and Armorflex mats in the channel were stable under the approximate 0.2 m^3/s flow. The berm between the DS4 construction area and the diversion pipe discharge location was later removed to reduce ponding at the bottom of the Armorflex channel. As designed some water ponding remained after the berm was removed, as shown in Photo Q.

Photo Q Recommissioned DS4 (September 25, 2015, looking north)

7.2 Demobilization and Site Cleanup

The contractor began demobilization of equipment on September 23, 2015. The creek diversion, including pumps, pipes and Armorflex mats, was removed between September 24 and 25, 2015. Damaged gabion mesh and geotextile, removed from the DS4 site, was buried up against the South Hill. All other equipment and materials were removed from site, which was then cleaned and regraded. A final survey of the site was completed on September 25, 2015.

Large boulders were placed across the access road to DS4 to restrict vehicle access. The construction camp and all signs along the Clinton Creek access road were removed. Demobilization was complete on September 26, 2015.

Waste rock stockpiles along the road entering the laydown area (UTM 513,140 mE, 7,147,357 mN) and near Porcupine Pit (UTM 513,305 mE, 7,146,841 mN) were left in place. Deficient Armorflex mats (170 mm height), extra Armorflex blocks, damaged Armorflex blocks and spare gabion repair materials were also stored at the Porcupine Pit stockpile area. The stockpile areas are shown in Photo R and Photo S.

Photo R Access road waste rock stockpile (September 26, 2015)

Photo S Porcupine Pit stockpile area (September 26, 2015)

8 Provisional Work

Provisional work for the project included:

- Repair of existing Gabion Drop Structure Nos. 1 to 4 (DS1, DS2, DS3, and DS4).
- Constructing a diversion ditch at the crest of the waste rock slope to direct runoff towards the laydown area.
- General maintenance of the Wolverine Creek culverts located near the site access gate.

8.1 Gabion Drop Structure Repair

The existing gabion drop structures were presumably damaged during high flows in Clinton Creek, by weathering of gabion rock, as well as the passage of ice and debris from Hudgeon Lake. Repair of existing gabion drop structures (DS1, DS2, DS3, and DS4) included removal of debris and large vegetation, such as willows and bushes, and repairs to damaged gabion baskets. Gabion basket repair generally included the following steps:

1. Cutting the existing wire mesh (as required).
2. Filling the baskets with rock with average dimensions of approximately 75 mm to 200 mm, sourced from the site entrance stockpile.
3. Stapling and/or sewing a "patch" of polyvinyl chloride (PVC) coated gabion mesh over the damaged area.
4. Stapling and/or sewing an additional strip of PVC-coated gabion mesh over regions with extensive damage (as required).

Gabion baskets to be repaired were identified in the field by AAM's site representative and Advisian's field engineer, based on the following considerations:

- All gabion baskets with existing tears in the wire mesh were repaired.
- Gabion baskets with a single layer of intact wire mesh and missing at least 1 $ft.^3$ of rock (approximate, by visual inspection) were cut and repaired.
- Gabion baskets with two layers of intact wire mesh and missing at least 2 $ft.^3$ of rock were cut and repaired.
- Gabion baskets with larger rocks remaining, or in areas with lower potential for erosion, were lower priority for repair.

Photo T shows gabion baskets cut along downstream edge and filled with rock (light coloured). Photo U shows a finished gabion drop structure after patches and strips of gabion mesh were placed and stapled.

Photo T **Cutting and Filling Gabion Baskets with Rock (September 11, 2015, looking north at DS3)**

Photo U **Finished Gabion Basket Repair (September 20, 2015, looking south at DS2)**

8.2 Diversion Ditch

The purpose of the diversion ditch is to direct runoff away from the stabilized waste rock slope to reduce erosion. The ditch runs along the north side of the existing access road and was constructed using a grader. The ditch is approximately 0.5 m deep and 3 m wide at the top, which is suitable for diverting local road runoff.

Photo V Diversion Ditch along Crest of Waste Rock Slope (September 22, 2015, looking west)

8.3 Wolverine Creek Culverts Maintenance

Two large diameter culverts in Wolverine Creek near the site access gate were partially blocked with woody debris (see Photo W). As part of the 2015 Long-Term Monitoring Plan (WorleyParsons 2015b) site visit, Advisian recommended that the debris be removed. This was completed on September 26.

Photo W **Wolverine Creek West Culvert at Inlet, Prior to Maintenance (September 16, 2015)**

Photo X **Wolverine Creek West Culvert at Inlet, After Maintenance (September 26, 2015)**

9 Summary

Mobilization for the project began on August 8, 2015. Including mobilization and demobilization, the project required 49 days to complete, of which 21 days were spent completing instream works.

Final construction quantities were similar to tendered quantities, with the largest differences in:

- Common excavation was 12% less than the tendered quantity.
- Gravel base was 33% greater than the tendered quantity.
- Large diameter rock was 53% greater than the tendered quantity.

The most significant design change during construction was the decision to use orange fill instead of waste rock excavated from the slope near DS4 due to the high moisture content of the available waste rock.

9.1 Challenges

The following challenges were encountered during the project:

1. Due to the remote location of the project, planning and lead times on material shipments were critical. This affected several items, including the replacement Armorflex mats, additional rolls of microgrid, and replacement steel rods for driving duckbill anchors.
2. There is a short construction season at the Clinton Creek site, with reduced daylight hours as well as frequent snow and freezing conditions possible in September.
3. Access to DS4 is limited by the presence of the waste rock slope on the south side and the valley slope on the north side. Gaining access to the site required a considerable amount of time and effort by the contractor.
4. During the first two weeks of construction, precipitation at the site was abnormally high, resulting in elevated water levels in Hudgeon Lake and, consequently, high flows in Clinton Creek.
5. The availability of material near the site is limited. The waste rock was found to be particularly susceptible to absorbing water and good quality rock is sparse.

9.2 Recommendations for Future Projects

AAM should consider the following recommendations regarding future projects at the site:

1. To control the quality of future construction at the Clinton Creek site, work involving creek diversions or fill placement, or requiring a high level of detail should be completed in July and August.
2. To improve estimates of project cost and schedule, a more thorough assessment of access to the worksite could be completed in the detailed design phase, rather than requiring the contractor to design access.
3. The design pumping capacity provided for this project, approximately 1.2 m^3/s, was adequate despite the relatively high flows in Clinton Creek; however, if heavy rains had persisted or occurred during instream work, they would have presented risks to the construction schedule and to the instream work area respectively (discussion in Section 5.1). This pumping capacity should be considered as a minimum for future projects.
4. If waste rock is proposed as a fill material in future projects then a plan for sourcing, testing and maintaining fill stockpiles should be requested from potential contractors (discussion in Section 6.3)
5. Advisian should conduct a site visit in the spring of 2016 to observe performance of Armorflex channel and note any deficiencies that could be covered by the contractor's one year warranty.

10 References

Tracy, H.J. (1957). Geological Survey Circular 397: Discharge Characteristics of Broad-Crested Weirs. Accessed at: http://pubs.usgs.gov/circ/1957/0397/report.pdf.

WorleyParsons (2014). Clinton Creek Site - Lifecycle Cost Analysis for Remediation Options, Revision 1.

WorleyParsons (2015a). Clinton Creek Long-Term Monitoring Program - 2014 Survey Results, Revision 0.

WorleyParsons (2015b). Clinton Creek Long-Term Monitoring Program - 2015 Survey Results, Revision A.

Yukon Government (2005). Yukon Water Resources Hydrometric Program: Historical Summary 1975 - 2004.

Appendix 1

Record Drawings

NOTES:

GENERAL NOTES

1. DIMENSIONS AND ELEVATIONS ARE IN METRES.
2. ALL COORDINATES ARE IN NAD 83. THE FOLLOWING EXISTING SURVEY CONTROL POINTS WERE USED FOR REFERENCE:

ID	NORTHING (m)	EASTING (m)	ORTHOMETRIC HEIGHT (masl)
No. 2834	7148712.673	513447.724	606.823
No. 2835	7147272.790	513147.057	432.669
No. 1086	7147972.219	513176.710	590.955
No. 1192	7147563.984	512278.758	441.231

3. SITE PLAN, CHANNEL PROFILE, CROSS SECTIONS AND EARTHWORK QUANTITIES ARE BASED ON 2006 ELEVATION DATA FOR THE SITE AS WELL AS 2013 AND 2014 SURVEY OF THE CLINTON CREEK CHANNEL.
4. AS-BUILT SURVEY INFORMATION PROVIDED BY CAP ENGINEERING ON SEPTEMBER 30, 2015.

MATERIALS

5. FILL MATERIAL CONSIST OF ORANGE FILL SOURCED ON SITE
6. ARMORFLEX MATS ARE CLASS 60T
7. 100mm MINUS ANGULAR ROCK
8. LARGE DIAMETER ROCK HAS AN AVERAGE DIMENSION OF BETWEEN 300 AND 1000 mm AND WAS SOURCED ON SITE

APPROXIMATE MATERIAL QUANTITIES

EXCAVATION	9,300 m^3
FILL	970 m^3
100mm MINUS ANGULAR ROCK	160 m^3
CLASS 60T ARMORFLEX MATS (2.4m X 4.5m)	36
CLASS 60T ARMORFLEX MATS (2.4m X 5.3m)	18
NON-WOVEN GEOTEXTILE	900 m^2
WOVEN MICROGRID GEOTEXTILE	900 m^2
LARGE DIAMETER ROCK (300 TO 1000 mm)	46 m^3
30Mpa CONCRETE OR GROUT	10m^3
DUCKBILL 68-DBD GROUND ANCHOR	306
20m REBAR	100m

EXECUTION - GENERAL

9. SURVEY OF EXISTING AND FINISHED GRADES WAS COMPLETED BY THE SURVEYOR / CONTRACTOR FOR THE DETERMINATION OF QUANTITIES AND THE PREPARATION OF AS-BUILT DRAWINGS.

EXECUTION - BULK EARTHWORKS

10. THE UNSTABLE WASTE ROCK SLOPE ON THE SOUTH SIDE OF CLINTON CREEK, DOWNSTREAM OF THE DAMAGED GABION DROP STRUCTURE, WAS CUT BACK TO A 2H:1V SLOPE. THE SLOPE ON THE NORTH SIDE OF CLINTON CREEK WAS FILLED AT A SLOPE OF 50H:1V AND CUT BACK TO A 1H:1V SLOPE.
11. A PORTION OF THE EXCAVATED WASTE ROCK WAS USED TO CONSTRUCT A 5 M WIDE ACCESS ROAD DOWNSTREAM OF THE DAMAGED GABION DROP STRUCTURE. ORANGE FILL SOURCED ON SITE WAS USED TO FILL THE CHANNEL. FINISHED ELEVATIONS AND COMPACTION REQUIREMENTS WAS SPECIFIED ON THE CHANNEL PROFILE AND SECTIONS.
12. REMAINING (I.E. WASTE) EXCAVATED WASTE ROCK WAS STOCKPILED IN TWO LOCATIONS: ONE PILE ALONG THE ROAD JUST SOUTH OF THE STABILIZED WASTE ROCK SLOPE, AND ONE PILE NEAR PORCUPINE PIT.

EXECUTION - CHANNEL CONSTRUCTION

13. DAMAGED GABION BASKETS DOWNSTREAM OF START OF ARMORFLEX MATS WERE REMOVED PRIOR TO CHANNEL INFILLING. ENGINEER CONFIRMED IN THE FIELD WHICH BASKETS WERE REMOVED. BASKETS WERE CUT FLUSH WITH ADJOINING BASKETS AND ROCK MATERIAL AND STOCKPILED ON SITE.
14. NON-WOVEN GEOTEXTILE (NILEX 4510) WAS INSTALLED ON TOP OF THE WASTE ROCK WITH A MINIMUM OVERLAP LENGTH OF 600mm AND KEYED IN AT THE EDGES.
15. 150 mm OF 100mm MINUS ANGULAR ROCK WAS PLACED AND COMPACTED OVER THE ORANGE FILL AS SHOWN ON THE PROFILE (DRAWING 1002).
16. WOVEN MICROGRID (STRATAGRID) WAS INSTALLED ON TOP OF THE ANGULAR ROCK LAYER WITH A MINIMUM OVERLAP LENGTH OF 600mm AND KEYED IN AT THE EDGES A MINIMUM OF 1.5m.
17. CLASS 60T ARMORFLEX MATS WERE INSTALLED ON TOP OF THE ANGULAR ROCK BEDDING IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS AND RECOMMENDATIONS. THE ARMORFLEX MATS ARE PLACED ACROSS THE CHANNEL (I.E., WITH THE LONGEST DIMENSION ALIGNED PERPENDICULAR TO THE DIRECTION OF FLOW) WITH THE 2.4 M X 5.3 M PLACED ACROSS THE CENTER OF THE CHANNEL AND THE TWO 2.4 M X 4.5 M MATS ON MAT EITHER SIDE SLOPES AND A PORTION OF THE CHANNEL BOTTOM.
18. LARGE DIAMETER ROCK WAS SOURCED ON SITE AND USED TO KEY IN THE UPSTREAM AND DOWNSTREAM ENDS OF THE ARMORFLEX AS SHOWN ON DRAWING 1002, PROFILE.
19. DUCKBILL MODEL 68-DBD ANCHORS WERE DRIVEN INTO THE WASTE ROCK A MINIMUM OF 900 mm AT EACH VOID FULL BLOCK AND $\frac{1}{2}$ BLOCK AND 2 AT EVERY MAT TO MAT CONNECTION AND AT MAT ENDS. THE ANCHORS WERE SECURED TO THE REVETMENT CABLE USING FASTENERS PER MANUFACTURER'S RECOMMENDATIONS.
20. 20M OF REBAR WAS THREADED THROUGH THE REVETMENT CABLES, PARALLEL TO THE CHANNEL, TO CONNECT THE MATS AND WAS BACKFILLED WITH 30 MPA CONCRETE.
21. SOME "FIELD ENGINEERING" WAS PROVIDED TO TIE THE PROPOSED CHANNEL INTO THE DAMAGED GABION DROP STRUCTURE UPSTREAM AND THE EXISTING CHANNEL DOWNSTREAM.

AS-BUILT POINT TABLE

POINT #	NORTHING	EASTING	ELEVATION (m)
1	7147390.48	513041.12	403.79
2	7147387.63	513040.31	402.38
3	7147380.68	513038.86	402.44
4	7147377.78	513038.55	403.86
5	7147385.32	513065.76	398.80
6	7147382.62	513065.16	397.38
7	7147375.67	513063.70	397.37
8	7147372.74	513063.17	398.84
9	7147382.74	513079.84	399.04
10	7147379.66	513079.34	397.65
11	7147372.64	513077.94	397.64
12	7147369.53	513077.08	399.19

REV	DATE (DD-MMM-YY)	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	CUSTOMER
7	18-DEC-15	RECORD DRAWING	RL	JH	SJC	JRG	LRM	
6	03-JUL-15	ISSUED FOR CONSTRUCTION	JH	JRG	JRG	AJT	LRM	
5	28-MAY-15	RE-ISSUED FOR TENDER	JRG	JH	JRG	AJT	LRM	
4	24-APR-15	RE-ISSUED FOR TENDER	JRG	JH	JRG	AJT	LRM	
3	20-APR-15	RE-ISSUED FOR TENDER	JRG	JH	JRG	AJT	AJT	
2	10-APR-15	ISSUED FOR TENDER	JH	BJM	JRG	AJT	LRM	
1	31-MAR-14	RE-ISSUED FOR CONSTRUCTION	JH		SC	AJT	LRM	
0	27-MAR-14	ISSUED FOR CONSTRUCTION	JH	BJM	SC	AT	LM	

REF DRAWING No	REFERENCE DRAWING TITLE

D SHEET SCALE SHOWN

OneWay to zero harm

WORLEYPARSONS PROJECT No
307076-06729

ENGINEERING AND PERMIT STAMPS (As Required)

PP: 069

PROFESSIONAL YUKON JACOB GENTLES TERRITORY ENGINEER

Dec 18/15

PROFESSIONAL YUKON LEE MARTIN TERRITORY ENGINEER

Dec 18/15

CUSTOMER

Yukon Government
Department of Energy, Mines and Resources
Assessment and Abandoned Mines

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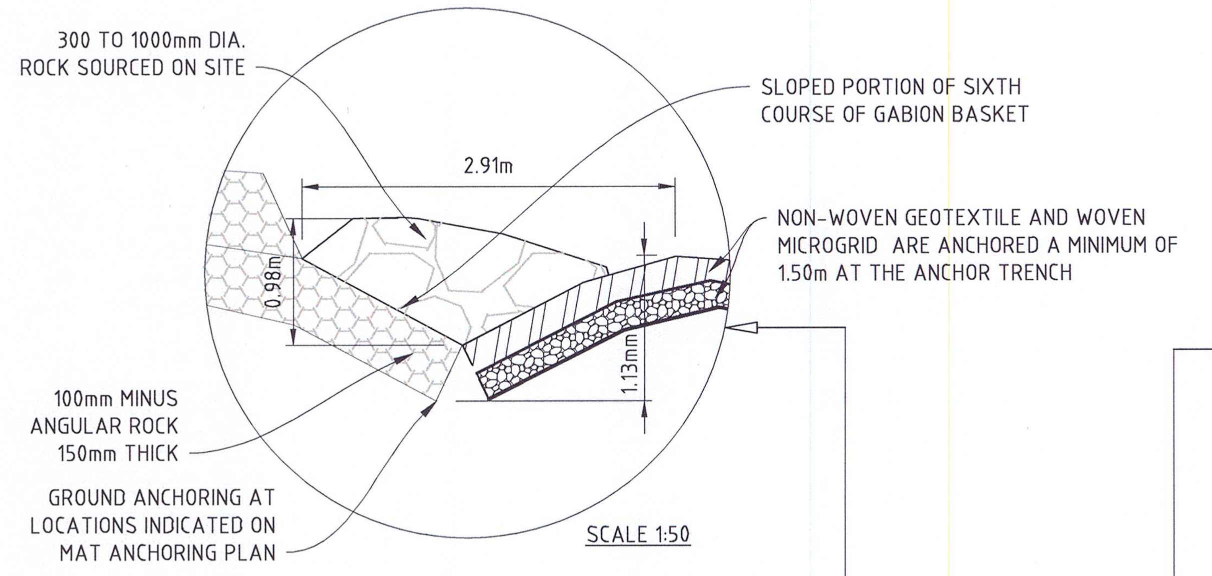
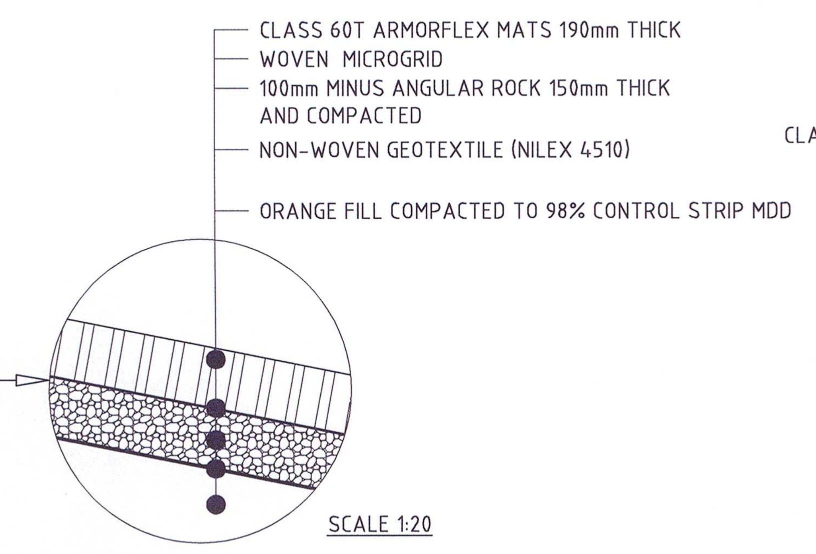
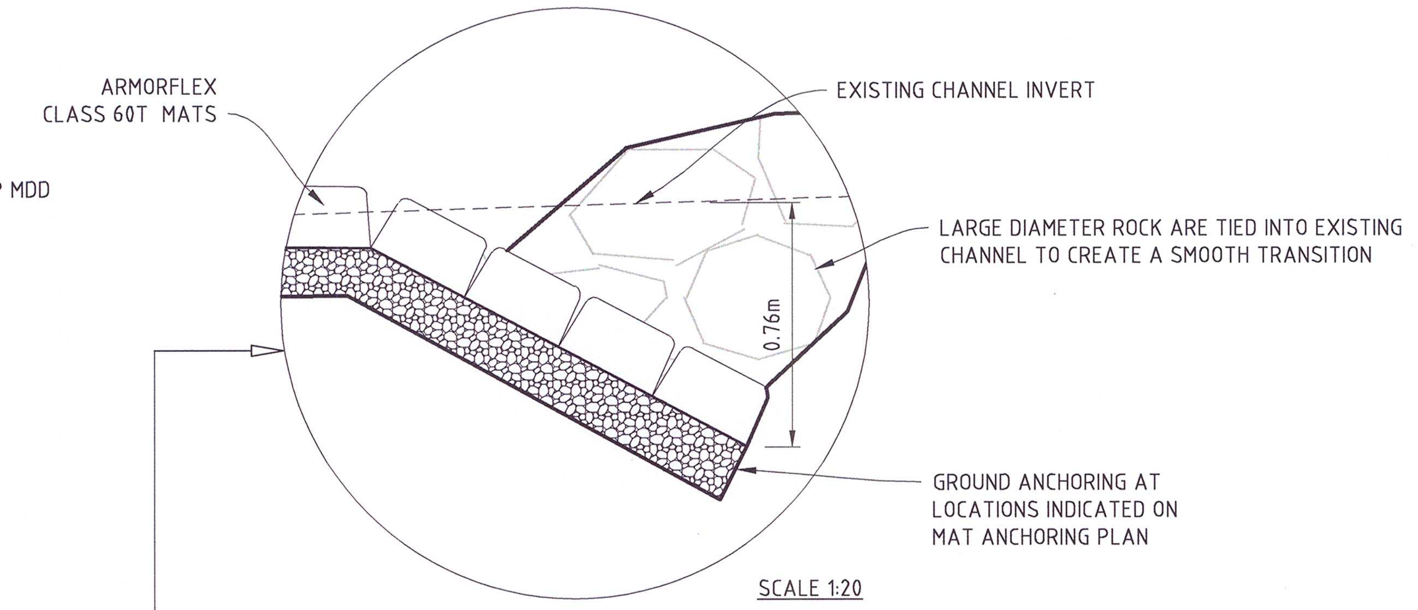
CLINTON CREEK
DROP STRUCTURE 4 REPAIR
PLAN

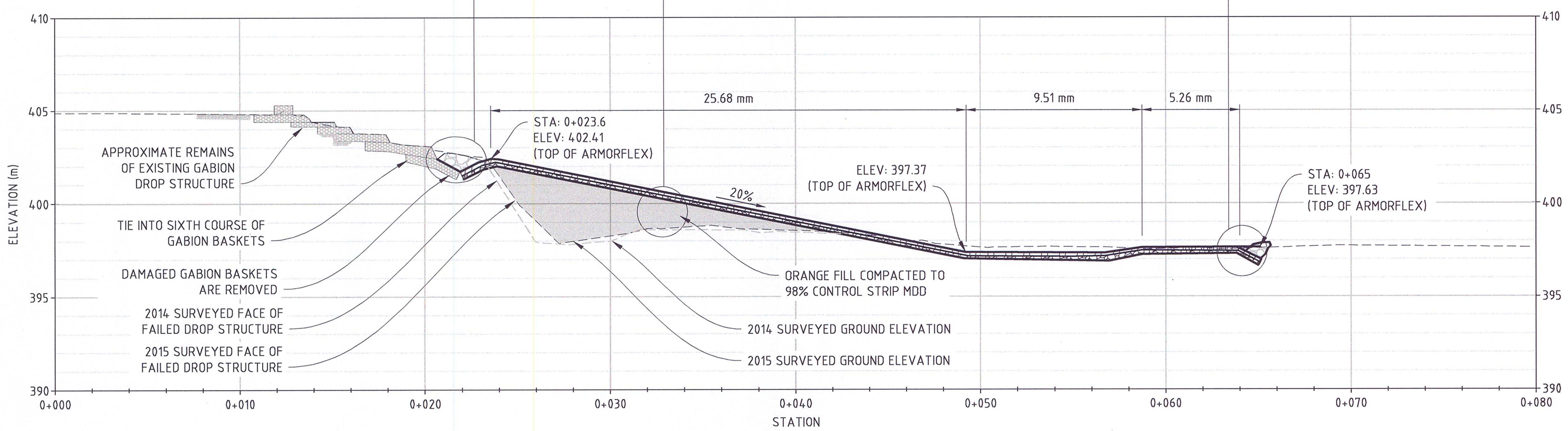
DRG No 307076-06729-00-CI-DGA-1001 REV 7

PLOT DATE & TIME: 18/12/2015 2:54:49 PM USER NAME: ryan.lai LOCATION: U:\YVR\307076\06729_GOY_DS4REPAIR\11_DRAWINGS\01_CIVIL\05_DS4 REPAIR\307076-06729-00-CI-DGA-1001 AND 1002.DWG
SAVE DATE & TIME: 17/12/2015 11:07:52 AM









PROFILE
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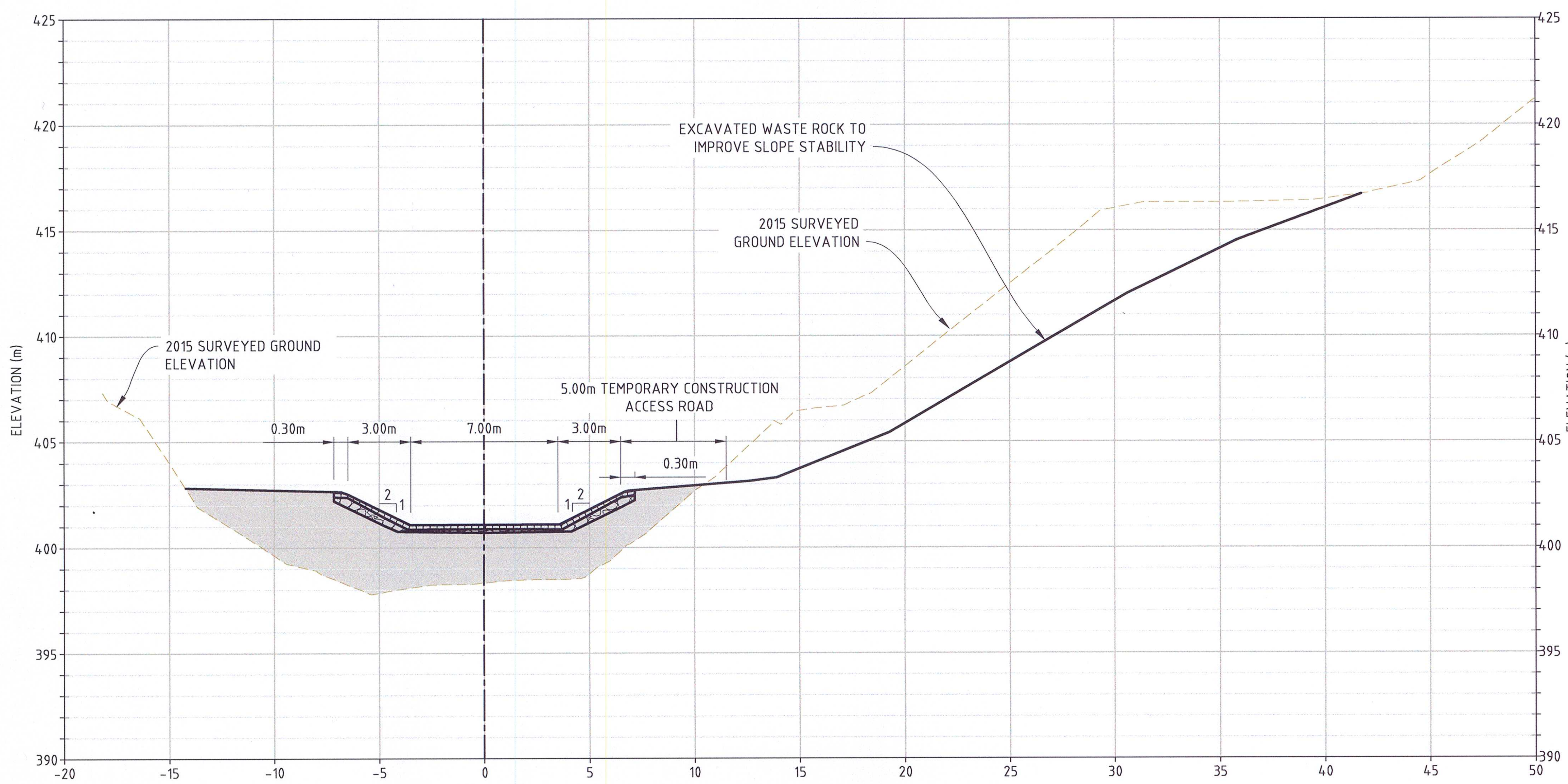

SECTION A-A
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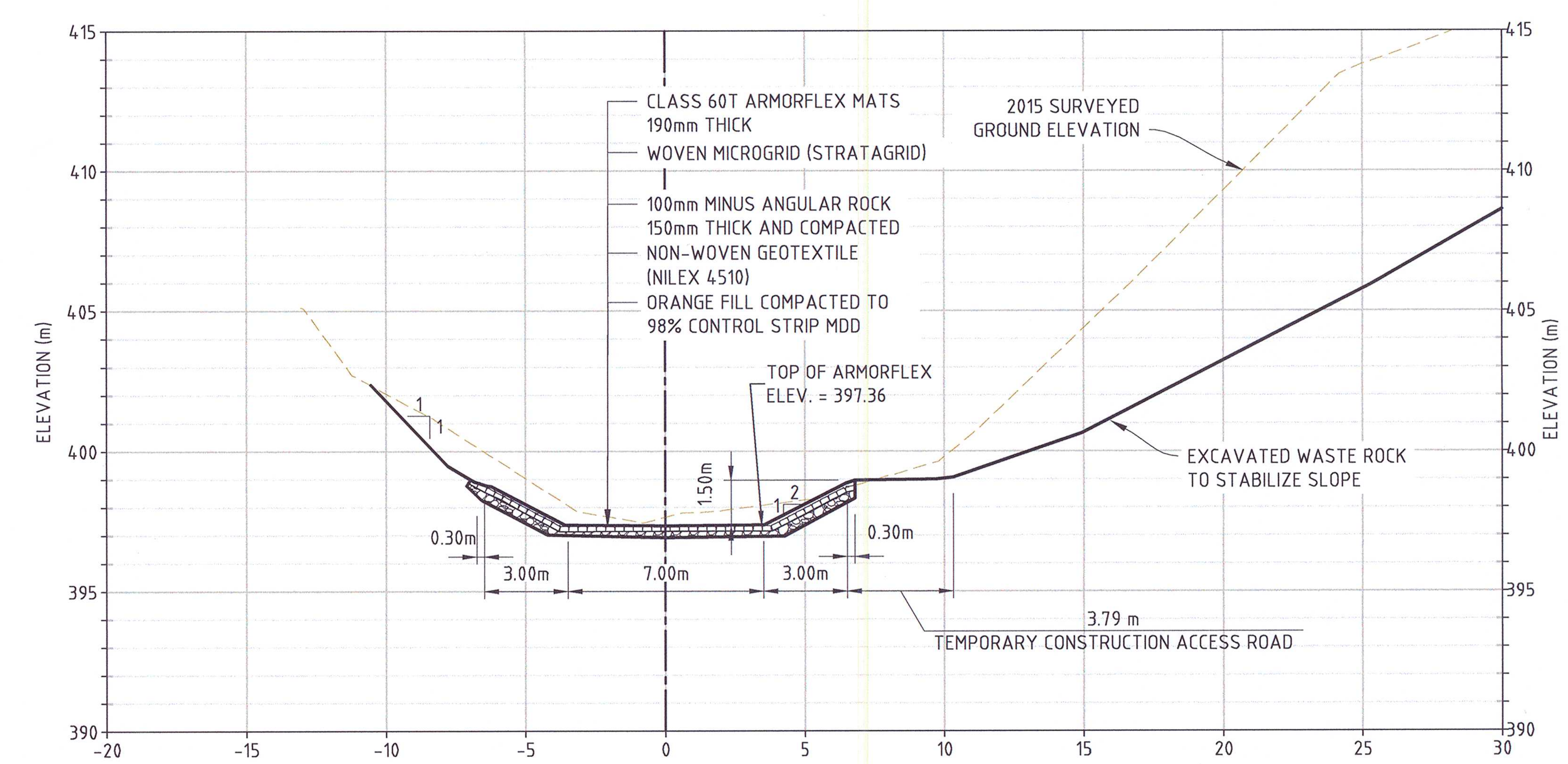

SECTION B-B
1:200

mm 0 500 1000 mm
1:20

mm 0 500 1000 2500 mm
1:50

m 0 5 10 m
1:200

NOTES:

1. FOR GENERAL NOTES, SEE DWG. 1001.
2. DIMENSIONS AND ELEVATIONS ARE IN METRES.

REV	DATE (DD-MMM-YY)	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	CUSTOMER
6	18-DEC-15	RECORD DRAWING	RL	JH	SJC	JRG	LRM	
5	03-JUL-15	ISSUED FOR CONSTRUCTION	JH	JRG	JRG	AJT	LRM	
4	24-APR-15	RE-ISSUED FOR TENDER	JRG	JH	JRG	AJT	LRM	
3	20-APR-15	RE-ISSUED FOR TENDER	JRG	JH	JRG	AJT	AJT	
2	10-APR-15	ISSUED FOR TENDER	JH	BJM	JRG	AJT	LRM	
1	31-MAR-14	RE-ISSUED FOR CONSTRUCTION	JH		SC	AJT	LRM	
0	27-MAR-14	ISSUED FOR CONSTRUCTION	JH	BJM	SC	AT	LM	
A	06-MAR-14	ISSUED FOR CLIENT REVIEW	JH	BJM	SC	AT	LM	

REF DRAWING No | REFERENCE DRAWING TITLE

D SHEET SCALE SHOWN

OneWay to zero harm

WORLEYPARSONS PROJECT No
307076-06729

ENGINEERING AND PERMIT STAMPS (As Required)

PP: 069

PROFESSIONAL ENGINEER YUKON TERRITORY JACOB GENTLES Dec 18/15

PROFESSIONAL ENGINEER YUKON TERRITORY LEE MARTIN Dec 18/15

CUSTOMER

Yukon Government
Department of Energy, Mines and Resources
Assessment and Abandoned Mines

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CLINTON CREEK
DROP STRUCTURE 4 REPAIR
PROFILE AND SECTIONS

DRG No 307076-06729-00-CI-DGA-1002 REV 6

LOCATION: U:\YVR\307076\06729_GOY_DS4REPAIR\11_DRAWINGS\01_CIVIL\05_DS4 REPAIR\307076-06729-00-CI-DGA-1001 AND 1002.DWG
USER NAME: ryan.lai
PLOT DATE & TIME: 18/12/2015 2:55:35 PM
SAVE DATE & TIME: 17/12/2015 11:07:52 AM

NOTES:

1. FOR GENERAL NOTES, SEE DWG. 1001.
2. DIMENSIONS AND ELEVATIONS ARE IN METRES.
3. ACCESS ROAD AND CORRIDOR LOCATIONS ARE APPROXIMATE AND WERE CONFIRMED IN THE FIELD.
4. CONTRACTOR PREPARED A CONSTRUCTION WATER MANAGEMENT PLAN AND WAS SUBMITTED TO THE ENGINEER FOR APPROVAL PRIOR TO STARTING WORK.
5. APPROXIMATE WATER STORAGE CAPACITY IN HUDGEON LAKE IS 6,900m^3/cm INCREASE IN WATER LEVEL.

REV	DATE (DD-MMM-YY)	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	CUSTOMER	REF DRAWING No	REFERENCE DRAWING TITLE
6	18-DEC-15	RECORD DRAWING	RL	JH	SJC	JRG	LRM			
5	03-JUL--15	ISSUED FOR CONSTRUCTION	JH	JRG	JRG	AJT	AJT			
4	08-JUN-15	RE-ISSUED FOR TENDER - REMOVED MATERIAL STOCKPILES	JRG	JH	JRG	AJT	AJT			
3	20-APR-15	RE-ISSUED FOR TENDER	JRG	JH	JRG	AJT	AJT			
2	10-APR-15	ISSUED FOR TENDER	JH	BJM	JRG	AJT	LRM			
1	31-MAR-14	RE-ISSUED FOR CONSTRUCTION	JH		JRG	AJT	LRM			
0	27-MAR-14	ISSUED FOR CONSTRUCTION	JH	BJM	SC	AT	LM			
A	06-MAR-14	ISSUED FOR CLIENT REVIEW	JH	BJM	SC	AT	LM			

D SHEET SCALE SHOWN

OneWay to zero harm

WORLEYPARSONS PROJECT No 307076-06729

ENGINEERING AND PERMIT STAMPS (As Required)

PP: 069

PROFESSIONAL ENGINEER YUKON JACOB GENTLES TERRITORY — Dec 18/15

PROFESSIONAL ENGINEER YUKON LEE MARTIN TERRITORY — Dec 18/15

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Yukon Government
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Assessment and Abandoned Mines

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CLINTON CREEK
DROP STRUCTURE 4 REPAIR
CONSTRUCTION STAGING PLAN

DRG No 307076-06729-00-CI-DGA-1003 REV 6

LOCATION: U:\YVR\307076\06729_GOY_DS4REPAIR\11_DRAWINGS\01_CIVIL\05_DS4 REPAIR\307076-06729-00-CI-DGA-1003.DWG
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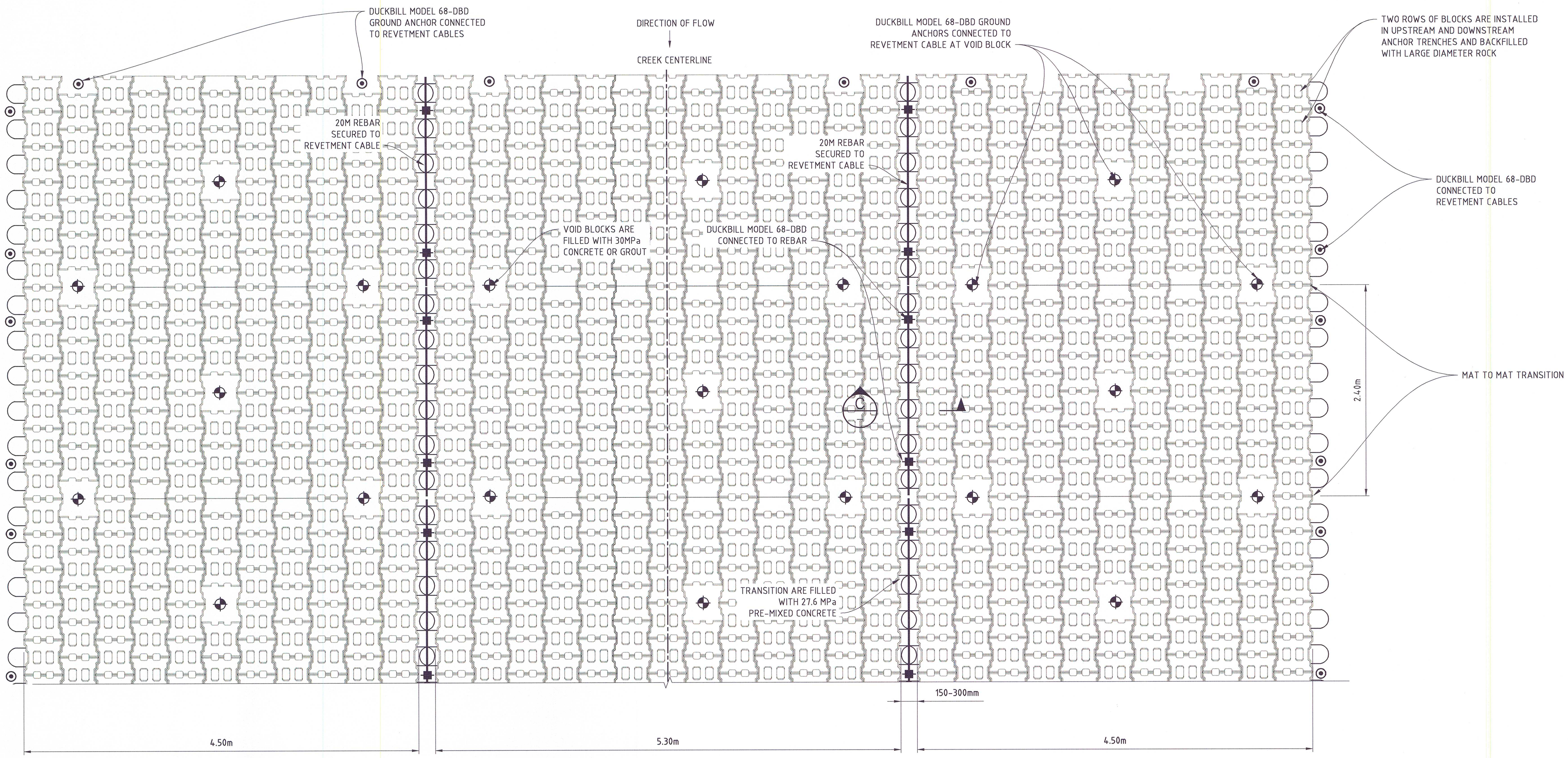
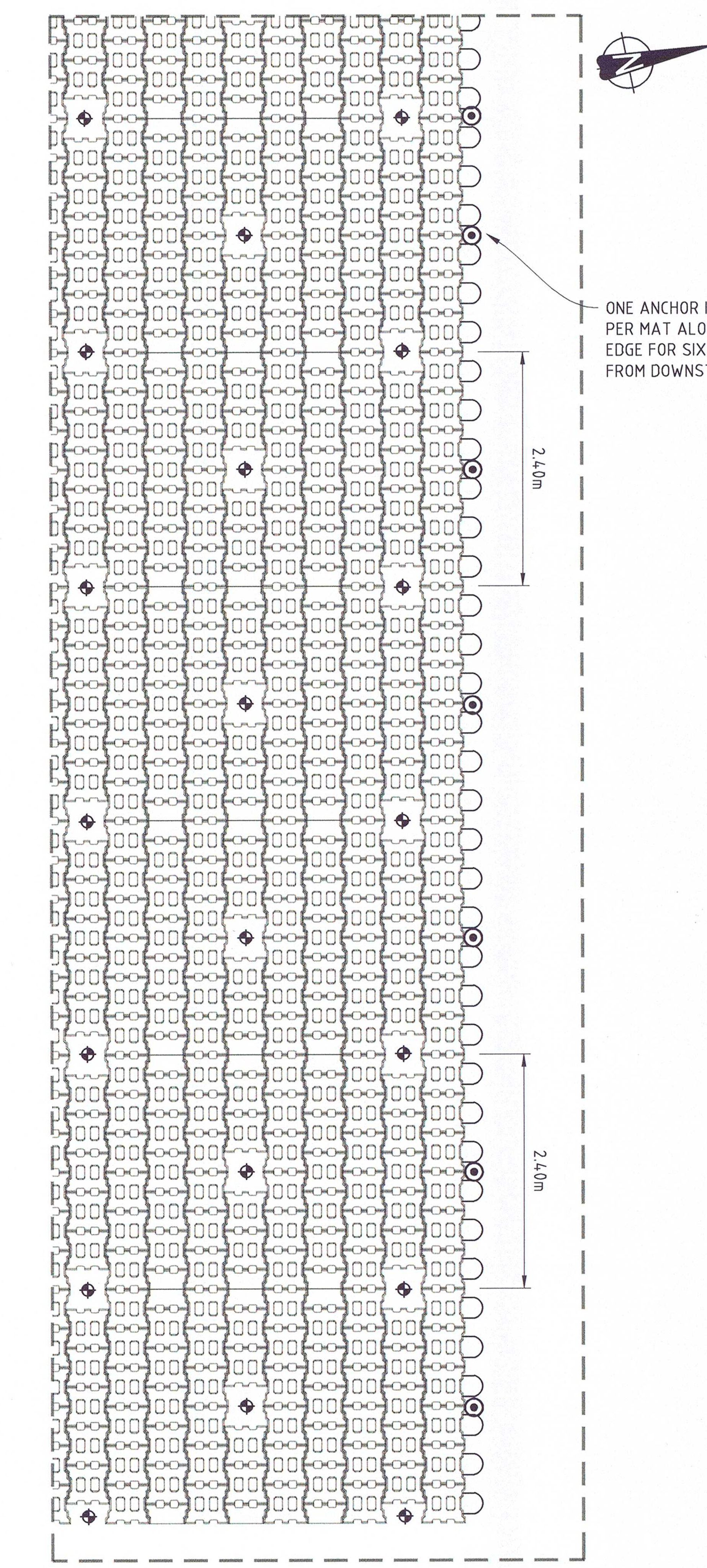


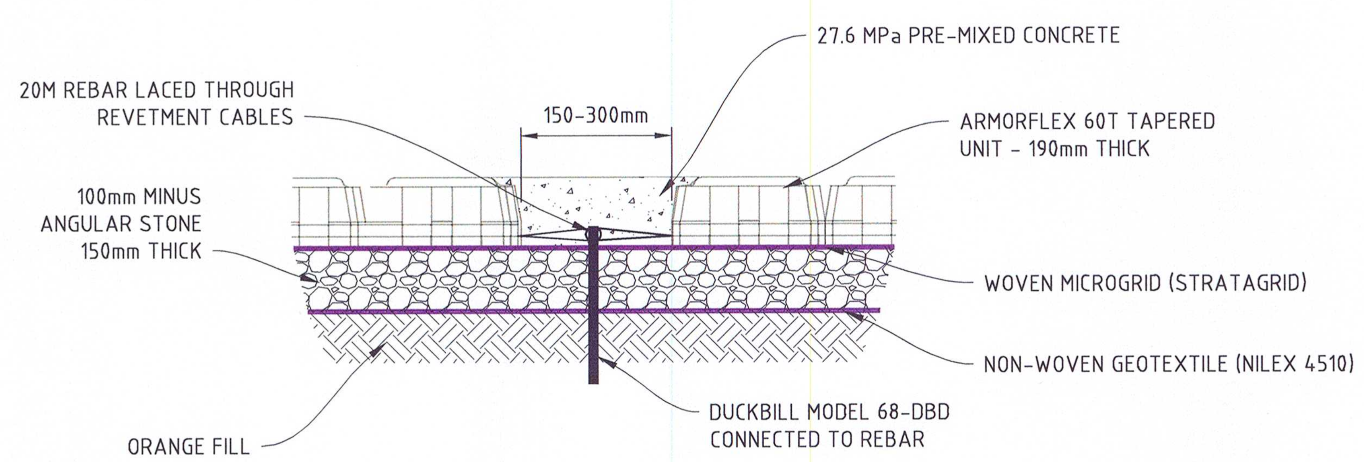
TYPICAL AS-BUILT MAT ANCHORING PLAN

1:30



DETAIL-N.E. CORNER ANCHORING PLAN 1 / 1001

1:50



SECTION C-C'

1:20

LEGEND

- MAT TO MAT TRANSITION GROUND ANCHORS ARE FILLED WITH 27.6 MPa PRE-MIXED CONCRETE
- OUTSIDE EDGE GROUND ANCHORS
- VOID BLOCK GROUND ANCHORS ARE FILLED WITH GROUT OR CONCRETE

mm 0 500 1000 2500 mm
1:50

m 0 0.5 1.0 1.5 m
1:30

NOTES:

1. FOR GENERAL NOTES, SEE DWG. 1001.
2. DIMENSIONS AND ELEVATIONS ARE IN METRES.

REV	DATE (DD-MMM-YY)	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	CUSTOMER	REF DRAWING No	REFERENCE DRAWING TITLE
5	18-DEC-15	RECORD DRAWING	RL	JH	SJC	JRG	LRM			
4	03-JUL-15	ISSUED FOR CONSTRUCTION	JH	JRG	JRG	AJT	LRM			
3	24-APR-15	RE-ISSUED FOR TENDER	JRG	JH	JRG	AJT	LRM			
2	20-APR-15	RE-ISSUED FOR TENDER	JRG	JH	JRG	AJT	AJT			
1	10-APR-15	ISSUED FOR TENDER	JH	JRG	JRG	AJT	LRM			

D SHEET | SCALE SHOWN

OneWay™ to zero harm

WORLEYPARSONS PROJECT No 307076-06729

ENGINEERING AND PERMIT STAMPS (As Required)

PP:069

PROFESSIONAL YUKON JACOB GENTLES TERRITORY ENGINEER
Dec 18/15

PROFESSIONAL YUKON LEE MARTIN TERRITORY ENGINEER
Dec 18/15

CUSTOMER

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Department of Energy, Mines and Resources
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CLINTON CREEK
DROP STRUCTURE 4 REPAIR
MAT ANCHORING PLAN AND DETAIL

DRG No 307076-06729-00-CI-DGA-1004 | REV 5

PLOT DATE & TIME: 18/12/2015 3:00:26 PM
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Appendix 2

Construction Specifications and Addendum

ASSESSMENT AND ABANDONED MINES

Clinton Creek Drop Structure No. 4 Specifications Package

Short-term Repair Works

CONTENTS

Tables within Text

Appendices

1. GENERAL

The Site of the proposed Works is located on Clinton Creek, near the outlet of Hudgeon Lake in the Yukon (YT), near the Alaska border. The Site is approximately 110 km from Dawson City, accessible by the Clinton Creek Access Road off the Top of the World Highway. The Clinton Creek Access Road includes the Fortymile River Bridge near the confluence of the Fortymile and Yukon Rivers. The Top of the World Highway is accessible via a ferry from Dawson City over the open water months. Access to the Site is therefore limited by the ferry schedule.

Between 2002 and 2004, four gabion drop structures were installed in Clinton Creek at the outlet of Hudgeon Lake to control the flow of water discharging from the lake. In 2010, high flows in Clinton Creek caused damage to the drop structures with the worst damage at Drop Structure No. 4 (DS4). Short-term measures (the Work) are required to protect the Clinton Creek channel against erosion that may undermine the stability of the adjacent waste rock and/or cause a rapid release of water from Hudgeon Lake due to further deterioration of the channel.

The proposed Work covered by the Contract Documents includes the following tasks:

1. Construct a temporary construction access road connecting the Site to the Clinton Creek Access Road;
2. Temporarily divert flows in Clinton Creek from Hudgeon Lake to a point downstream of the Site;
3. Regrade the waste rock to stabilize the slope on the south side of Clinton Creek, downstream of the damaged gabion structure, at a slope of 2H to 1V;
4. Fill the eroded channel with excess waste rock from the slope stabilization;
5. Armour the drop structure chute with Class 60T Armorflex® mats, including gravel bedding, geotextile, microgrid, and ground anchors;
6. Construct an in-stream transition from the upstream channel section (i.e., damaged gabion structure) and downstream channel (i.e, existing unarmoured channel) to the Armorflex® mats using site-sourced rock;
7. Complete minor repairs to the other Drop Structures (extent to be confirmed in the field by the Engineer); and
8. Reconstruct the Clinton Creek Access Road as necessary to suit the regraded slope.

2. DEFINITIONS

1. Contractor: The successful bidder selected by AAM to construct the Work.
2. Drawings: Drawing Nos. 307076-06729-00-CI-DGA-1001 to 1004 in addition to any subsequent drawings issued by the Engineer.
3. Engineer: Engineer(s) engaged by AAM to provide clarifications and quality assurance services during the tender period through to the completion of the Work.
4. Owner’s Representative: The person authorized by the Owner to oversee the Work. The Owner’s Representative is responsible for managing the Contract and has authority for oversight of the Work. The Owner’s Representative does not have authority for increases to the Budget or Schedule.
5. Site: Clinton Creek near the outlet of Hudgeon Lake and located on the former Clinton Creek Mine Site located northwest of Dawson City, Yukon.
6. Specifications: The compiled set of individual specifications contained herein.

3. DESCRIPTION OF WORK

3.1 General Work Requirements

3.1.1 The Scope of Work for the regrading of existing waste rock and channel improvements is as shown in the Drawings, which are issued with this document and listed in Section 4, and as described in these Specifications.

3.1.2 Where conflict exists between the Drawings and Specifications, the Contractor shall immediately request clarification from the Engineer.

3.1.3 Revised Drawings may be issued from time to time by the Engineer and such Drawings shall supersede previous versions. All revised Drawings are to be formally approved by the Owner and the Engineer before being implemented.

3.2 Surveying

3.2.1 The Contractor shall engage a qualified Surveyor to complete all survey tasks associated with the Work including, but not limited to: layout, quality assurance, quantity pickup, final as-built surfaces.

3.2.2 Survey of existing and finished grades shall be completed by the Surveyor for the determination of quantities and the preparation of As-Built Drawings as described in Section 03 13 00 - Surveying.

3.3 Construction Access

3.3.1 Prior to mobilization, the Contractor shall submit for approval a Site Access Plan to the Owner including planned access routes, projected vehicle loadings, and work camp details.

3.3.2 Access to the Site shall be via the Fortymile River Bridge. Prior to mobilization, the Contractor shall confirm that the projected vehicle loadings required to transport equipment and materials to the Site shall not damage or otherwise impact the bridge, including the bearing capacity of structural elements and condition of decking material and shall receive a load permit.

3.3.3 An approximate alignment for the temporary construction access road is shown on the Drawings; however, the Contractor shall be responsible for determining a suitable alignment based on conditions encountered in the field, working space requirements, and equipment clearances.

3.3.4 The entrance to the temporary access roads shall be blocked following construction using large site-sourced rock.

3.3.5 Portions of the Clinton Creek Access Road impacted by the regrading of the waste rock slope shall be reinstated using site-sourced, waste rock compacted to 93% modified proctor maximum dry density (MPMDD). The reinstated road shall have a minimum width of 5.0 m and may require benching to maintain a 2H to 1V slope. The Owner shall determine a suitable alignment for the reinstated road based on conditions encountered in the field.

3.4 Construction Water Management

3.4.1 During construction, water management as well as erosion and sediment control shall be the responsibility of the Contractor and shall conform to Section 02 14 00 - Environmental Compliance.

3.4.2 Prior to construction, the Contractor shall submit a Water Management Plan to the Owner for approval. This plan shall describe how discharge from Hudgeon Lake will be controlled and conveyed during construction and shall include historic measured flow rates in Clinton Creek; the elevations, sizes, and capacities of creek diversion infrastructure; and emergency actions to be taken in the event that the diversion is compromised.

3.4.3 The Contractor shall install infrastructure to divert creek flows around the Site including a coffer dam across Clinton Creek at the outlet of Hudgeon Lake and all pumps, generators, hoses, and piping required to maintain the creek diversion during construction.

3.4.4 The Contractor shall monitor flow rates in Clinton Creek and water levels in Hudgeon Lake during construction. These values shall be provided to the Engineer on a daily basis.

3.4.5 The Contractor shall monitor weather forecasts for rainfall predictions to ensure that the water diversion is properly managed.

3.5 Existing Waste Rock Material Regrading

3.5.1 All soil property testing and subgrade preparation shall be completed prior to placement of fill as described in Section 31 14 11 - Earthworks and Related Works.

3.5.2 The existing waste rock slope on the south side of Clinton Creek and downstream of the existing DS4 shall be stabilized by excavating to a 2H to 1V slope as shown on the Drawings.

3.5.3 The extent of the slope stabilization shown on the Drawings is approximate and should be confirmed by way of survey in the field prior to the start of construction.

3.5.4 Waste rock excavated from the south side of Clinton Creek shall be used to fill in the eroded channel and shall be placed in 300 mm thick loose lifts and compacted to at least 93% Modified Proctor Maximum Dry Density (MPMDD) up to the subgrade elevations shown on the Drawings. No vegetative material shall be permitted in the fill. In-situ density and moisture content tests shall be completed for each lift as per Section 31 14 11 - Earthworks and Related Works.

3.6 Drop Structure Chute

3.6.1 Bedding gravel shall meet the 100 mm Minus Bedding Gravel minimum specifications described in Section 31 05 16 - Aggregates and Granular Materials and shall be compacted using a plate tamper to at least 95% Modified Proctor Maximum Dry Density (MPMDD). If possible, the material shall be sourced on-site. The Contractor shall submit unit price for sourced gravel as identified in the addendum that will be issued following the site visit.

3.6.2 Non-woven geotextile (Nilex 4553 or equivalent approved by the Engineer) shall be installed between the waste rock and the bedding gravel. Woven microgrid (STRATAGRID Microgrid or equivalent approved by the Engineer) shall be installed between the bedding layer and the Armorflex® mats.

3.6.3 Drop structure chute armouring material shall be Class 60T Armorflex® Mats installed to the manufacturer's instructions and recommendations. The mats shall be installed at the finished grade elevations shown on the Drawing and tied-in to match field conditions (e.g., the invert elevations of the existing upstream gabion structure and existing channel downstream).

3.6.3 A manufacturer's representative shall be on site prior to the placement of the first Armorflex® mat to inspect the gravel bed preparation and provide instruction on the proper method of installation. The Contractor shall cover the representative's costs associated with the work and any costs resulting from delays in the actual schedule for the start of Armoflex® mat placement. It is the responsibility of the Contractor to ensure that the manufacturer's representative is on site to complete the work without delaying the project schedule.

3.6.4 The upstream and downstream ends of the Armorflex® mat shall be anchored with large diameter rocks to create a smooth transition with the existing gabion structure at an elevation of 402.5 m at the upstream end and 397.6 m at the downstream end (as surveyed in the field in 2013 – elevation to be confirmed in the field by the Surveyor).

3.6.5 The large diameter rocks used to transition between the Armorflex® mat and existing gabion structure and downstream channel shall have an average dimension of between 300 mm and 800 mm and shall be installed as per the specifications described in Section 31 37 10 - Large Diameter Rock.

4. DRAWINGS

4.1.1 All work performed shall be in accordance with the Drawings, which are issued with this document and listed in Table A.

Table A List of Drawings

Drawing No.	Drawing Title
307076-06729-00-CI-DGA-1001 – Rev 6	Plan
307076-06729-00-CI-DGA-1002 – Rev 5	Profile and Sections
307076-06729-00-CI-DGA-1003 – Rev 5	Construction Staging Plan
307076-06729-00-CI-DGA-1004 – Rev 4	Mat Anchoring Plan and Detail

5. SPECIFICATIONS, CODES, AND STANDARDS

5.1 Specifications

5.1.1 All Work performed shall be in accordance with the Specifications, which are issued with this document and listed in Table B.

Table B List of Specifications

Section No.	Section Title
01 11 00	General Instructions
01 40 00	Quality Control
02 02 00	Mobilization and Demobilization
02 03 00	Construction Camp
02 14 00	Environmental Compliance
02 16 00	Product Requirement
03 13 00	Surveying
31 05 16	Aggregates and Granular Materials – Rev.1
31 14 11	Earthworks and Related Works
31 36 19	Armorflex® Mat
31 37 10	Large Diameter Rock

5.2 Governing Codes and Standards

5.2.1 All Work performed shall be in accordance with the Yukon Occupational Health and Safety (OH&S) Act and Regulations.

Appendix 1 Specifications

Table of Contents

1 GENERAL

.1 This section of the specification, and any addenda attached, form a part of the contract documents and shall be read in conjunction with them.

.2 In case of conflict between various sections of the specifications, this section takes precedence over all other sections, and any addenda take precedence over this section.

2 GENERAL INSTRUCTIONS

2.1 Use of Site

.1 When unfavourable conditions exist, as determined by the Contractor in consultation with the Owner or the Owner's Representative, continue operations and Work that shall not be adversely affected by such conditions. Do not construct any portion of the Work under conditions which would adversely affect the quality of the Work or surrounding environment, unless special means or precautions are taken to perform the Work in a proper and satisfactory manner and in compliance with Contract Documents.

.2 The Owner or the Owner's Representative reserves the right to cease operations at any point due to unfavourable conditions and may postpone the Work until suitable conditions exist.

.3 The Contractor shall provide office facilities suitable for supporting construction activities.

.4 The Contractor shall enforce compliance with Site rules (as designated by the Owner) by all Contractor and Subcontractor personnel as well as the Engineer, Owner's representatives, and regulatory agency staff.

.5 Adequate storage facilities for storage of materials, tools, and equipment which could be subject to damage by weather or theft are the responsibility of the Contractor.

.6 The Contractor shall be responsible for all temporary sanitary facilities, including janitorial services, storage, and removal of sewage. All temporary toilets shall be kept in a constant sanitary condition and shall be in compliance with all applicable health or other regulations. Portable enclosed toilets may be used in construction and fabrication areas provided they are regularly attended and maintained. Before completion, all toilet facilities shall be removed.

2.2 Temporary Facilities and Utilities

.1 The Contractor shall be wholly responsible for the supply, installation, provision, maintenance, repair, and final removal of all temporary facilities and utilities necessary for full and complete performance of the Work.

.2 The Contractor is responsible for the cleanliness and safety of all lay-down, storage, temporary facilities, roads, and Work areas.

2.3 Schedule

.1 A tender review meeting may be held with the bidder within 5 working days following tender closure. Two days prior to the tender review meeting, the selected bidder shall provide a work schedule to the Owner.

.2 A work schedule shall show the order and sequence in which the bidder proposes to perform the Work, dates at which the bidder will start the several parts of the Work, and estimated dates of completion of the several parts.

.3 The Contractor shall update the work schedule weekly or more frequently, if requested by the Engineer.

.4 If, in the opinion of the Engineer, the work schedule submitted will not secure the completion of the Work as specified, or is otherwise not in accordance with the specifications, the Engineer may instruct the Contractor to prepare and implement a revised work schedule that is acceptable.

.5 No work shall be undertaken by the Contractor when, in the opinion of the Engineer, the weather is unsuitable or unfavourable for a particular class of work.

.6 The Contractor shall allow sufficient time between phases of construction for the Engineer to complete measurement surveys if required.

.7 The schedule for completion of the work will be finalized upon contract award. The tentative schedule for the work is:

Mobilize on Site	Monday, July 27, 2015
Substantial Completion of the Work	Friday, September 4, 2015
Demobilization and Total Completion	Friday, September 11, 2015

2.4 Mobilization and Start-up

.1 The Contractor shall not mobilize to the Site without the Owner or Owner’s Representative prior written authorization.

.2 The Contractor is to ensure that insurance as required by these Specifications is in full force prior to commencing mobilization to the Site.

.3 The Contractor is to ensure that planned activities are consistent with existing regulatory approvals and that all applicable permits and licenses required to undertake the Work have been obtained.

.4 The Contractor shall submit a Site Access Plan to the Owner or Owner’s Representative for approval prior to mobilization.

.5 The Contractor shall perform planning and scheduling activities as required for the performance of the Work.

.6 The Contractor shall purchase materials and mobilize equipment, supplies, and incidentals to the Site.

.7 The Contractor shall use the identified Site access roads to the designated work areas during mobilization and shall complete improvements to roads if and as required. Any damage to existing Site access roads caused by the Contractor and/or Subcontractors shall be repaired at the Contractor's expense.

.8 If alternative Site access roads are required, the Contractor shall obtain written authorization from the Owner or Owner's Representative prior to accessing the Site or completing improvements to the alternative access roads as required.

.9 The Contractor shall confine equipment, storage of materials and equipment, and the operations of workers to the Site and to land adjacent to the Work and shall not unreasonably encumber the Site with construction equipment or other materials or equipment.

2.5 Examination

.1 Prior to commencement of the Work, the Contractor shall inspect the Site to review and establish the condition of the area of the Work including access roads, existing buildings, wells, trees and other plants, grassed areas, fencing, service poles, wires, roads, survey benchmarks, and monuments on or adjacent to the Site which may be affected by the Work.

.2 The Contractor shall provide ongoing review, inspection, and attendance during performance of the Work to properly document conditions and shall promptly note any existing condition at the Site affected by the Work which may require restoration, repair, or replacement.

.3 The Contractor shall not cover up any of the Work prior to the completion of the appropriate testing and verification as laid out in these Specifications.

.4 The Contractor shall protect existing infrastructure and facilities from damage, which may be affected by the Work, while construction activities are in progress and repair all damage resulting from the Work.

.5 The Contractor shall, prior to the start of construction and/or a new construction task, verify that existing Site conditions and substrate surfaces are acceptable for subsequent Work.

2.6 Restoration

.1 The Contractor shall, except as otherwise specified (in Contract Document and Drawings), restore areas affected by the construction of the Work to match condition of similar adjacent, undisturbed areas.

.2 The Contractor shall ensure that restored areas match prescribed grade and surface drainage characteristics, except as otherwise specified, and ensure a smooth transition from restored surfaces to existing surfaces.

.3 The Contractor shall utilize construction methods and procedures during the performance of the Work which limit, as much as practically possible, disturbance and damage of whatever nature to existing conditions.

2.7 Record Documents

.1 The Contractor shall maintain on Site, one set of the following record documents, which shall be used to record actual revisions to the Work:

.1 Drawings.

.2 Specifications.

.3 Addenda.

.4 Quality Assurance / Quality Control (QA / QC) testing results.

.5 Change Orders and other modifications.

.6 Manufacturers' operating and maintenance instructions.

.7 Copy of approved work schedule.

.8 Copy of approved Environmental Management Plan (EMP).

.9 Copy of approved Site Access Plan.

.10 Copy of an Health and Safety Plan.

.11 Copy of Water Management Plan.

.12 Copy of all permits and licenses obtained to undertake the Work.

.13 List of Hazardous Materials and Data Sheets.

.2 The Contractor shall ensure entries are complete and accurate, enabling future reference.

.3 The Contractor shall provide to the Engineer a hard copy of the Drawings complete with red line mark ups. The red line mark ups shall represent how the Issued for Construction (IFC) Drawings were constructed (i.e., they shall be hand-marked as-builts).

.4 Store record documents separate from documents used for construction.

.5 Record information concurrent with construction progress.

2.8 Waste Disposal

.1 Unused clean granular material (i.e., amended soils, riprap, washed gravel) and unused clean construction materials and excavated soil materials shall be neatly stockpiled on-Site at a location specified by the Owner or the Owner's Representative.

.2 Government based community dump sites may be available to contractors for domestic waste disposal only (not construction generated waste materials).

.1 The Contractor is responsible for obtaining approval from the appropriate dump authority and for payment of fees associated with the use of waste facility sites.

.3 Recyclable waste:

.1 The Contractor is encouraged to recycle any possible waste, such as metal.

.4 Other waste:

.1 All waste disposal shall be in accordance with all acts and regulations governing the disposal, and in accordance with conditions specified by the dump authority.

.2 At completion of work, the Contractor shall provide clearance from the dump authority indicating acceptable completion of the use of the site.

.5 No additional payment will be made for waste recycling or disposal. The Contractor shall include costs associated with recycling or using waste disposal facilities in the unit price items which will require a waste recycling or disposal component.

2.9 Project Meetings

.1 The Owner will schedule a pre-construction meeting to discuss and resolve administrative procedures and responsibilities.

.1 Senior representatives of the Owner, Engineer, Contractor, major Subcontractors, field inspectors, and supervisors will be in attendance.

.2 The Owner may invite representatives of Yukon Occupational Health and Safety, Alcohol and Drug Services, and the RCMP. Responsibilities of the Contractor and Owner will be addressed.

.3 The agenda will include the following:

.1 Appointment of official representatives of participants in the Work.

.2 Schedule of work.

.3 Payments.

.4 Other issues as required.

.2 The Owner may schedule project meetings during the course of the work.

.1 The Engineer, Contractor, and major subcontractors will be in attendance. Other participants may include representatives of First Nations, other Government of Yukon departments, and local interest groups.

.2 Scheduling of meetings, minute taking, and distribution of minutes will be the responsibility of the Owner.

.3 The agenda will include the following:

.1 Review and approval of minutes of previous meeting.

.2 Review of work progress since previous meeting.

.3 Progress schedule, problems, corrective measures and procedures, and revised schedules.

.4 Field observations, problems, conflicts and resolutions.

.5 Safety concerns.

.6 Other issues as required.

2.10 Additional Drawings

.1 The Engineer may furnish additional drawings for clarification. These additional drawings have the same meaning and intent as if they were included with plans referred to in the Contract.

2.11 Layout of Work

.1 The Contractor is responsible for the layout of the work per Section 03 13 00 of this specification.

.2 The Contractor shall supply a competent and fully equipped survey crew to carry out the Work. Unsuitable or unqualified personnel shall be removed from the project and replaced immediately with qualified personnel.

.3 No separate payment will be made for laying out the work. The Contractor shall include costs associated with this work in the appropriate tender pay items.

2.12 Equipment List

.1 Before commencement of the work the Contractor shall provide to the Engineer a list of equipment that could possibly be on site during the project. The equipment list shall detail the Contractor's equipment number, the make, model number, year, serial number, capacity, attachments or any other information needed to establish an Alberta Roadbuilders & Heavy Construction Association Equipment Rental Rate.

2.13 Quality Control

.1 The Contractor shall be responsible for the provision of all quality control services on the project. These shall include all required shop, field and laboratory inspection and testing as shown in the various sections of this specification package, or as otherwise required. The Contractor shall appoint (upon approval of the Engineer), independent, qualified, CSA - certified personnel and CSA - certified testing agencies or firms to undertake this work.

.2 The Contractor shall notify the Engineer one week in advance of sampling or testing so the Engineer can arrange to attend. Failure to notify the Engineer will invalidate the sampling or test results.

.3 No separate payment shall be made for quality control.

2.14 Project Final Inspection

.1 A final inspection for the work done shall be conducted by the Owner and the Engineer at the end of construction. The Contractor shall notify the Owner of the Final Inspection schedule at least 3 weeks in advance. The Contractor’s representative shall be present at the time of Final Inspection. The Contractor shall provide all the tools and access for the Final Inspection. Final Inspection shall be incidental to the work and no separate payment will be paid.

2.15 Minor Repairs to Other Drop Structures

.1 Minor repair to other drop structures will be required. Repairs have been identified for the portion of the drop structures that could visually be inspected. Once the water diversion is implemented, the Owner will confirm all locations to be repaired and the Contractor will provide an estimate to supply the material, equipment and labour to complete the work. The work will be covered under the Provisional Cost Sum.

2.16 Provisional Cost Sum

.1 A Provisional Cost Sum is provided in the Unit Price Table. This sum is to cover the cost of renting Contractor's equipment and for providing labour and materials for undertaking any additional work as directed by the Engineer during the course of the project, which is not paid for under any other item in the contract.

.2 Prior to the start of any such additional work, the Contractor shall submit an estimate to complete the additional work, on a time and materials basis, to the Owner for approval.

2.17 Demobilization

.1 Following completion of the Work, the Contractor shall decommission temporary construction and support facilities, disconnect temporary services and utilities, and remove from the Site.

.2 The Contractor shall dispose of wastes generated during completion of the Work, and sundry items in a manner consistent with applicable laws and in accordance with the conditions stipulated in Clause 2.8 of this Specification.

3 HEALTH AND SAFETY REQUIREMENTS

3.1 General

.1 The Contractor shall implement construction in accordance with the Occupational Health and Safety (OH&S) Act and Regulations of the Yukon.

.2 The Contractor shall, prior to mobilization, provide the Owner with its corporate and site specific Health, Safety, and Environmental (HSE) procedures, and proof of Workers' Compensation Board (WCB) coverage. The plans shall meet the Yukon OH&S Act and Regulation and shall be reviewed and approved by Yukon OH&S and Assessment and Abandonned Mines.

.3 During all activities associated with the Work, health and safety requirements shall be evaluated and appropriate modifications to procedures shall be made, where necessary, by the Contractor and at its expense. The Contractor is responsible for the safety and well-being of its employees, Subcontractors, and all authorized staff on Site.

.4 The Superintendent is responsible for ensuring that all employees, Subcontractor personnel, and other authorized staff comply with health and safety policies while on the Site.

3.2 Asbestos Control

.1 The Site is a former asbestos mine and therefore contains asbestos, including in the waste rock. Special considerations shall be taken by the Contractor in order to address this contaminant. Appropriate asbestos concentration sampling program (e.g. air monitoring – if required) as well as Personal Protective Equipment (PPE) and any other requirement to complete work within a zone containing asbestos shall be implemented and be incidental to the work. A discussion with Yukon OH&S is strongly recommended in order to understand the required mitigations/protections to be executed to complete the Work.

.2 For the duration of the project, the Contractor is required to keep on Site all health and safety related equipment/components for personal and equipment and all other items required under the Asbestos Control section of the Yukon Occupational Health and Safety Act and Regulations for sites containing asbestos.

***** END OF SECTION *****

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1 GENERAL REQUIREMENTS

.1 The Contractor shall be responsible for Quality Control (QC) inspection and testing services carried out by CSA certified testing agencies. The Engineer will carry out Quality Assurance (QA) reviews and testing where necessary.

2 WORK INCLUDED

.1 The QC Work includes but is not necessarily limited to sampling, fabrication, inspection, and testing:

.1 Material properties – soil sampling for gradation and proctor density analyses as well as aggregate sampling for gradation, proctor density, abrasion, and soundness analyses

.2 Survey

.3 Compaction – using a nuclear densometer.

.4 Armoflex® manufacturer's representative during installation

3 APPOINTMENT AND PAYMENT

.1 The Contractor shall appoint and pay for services of qualified inspection and testing agencies, upon approval of the Engineer for the following:

.1 Sampling, inspection and testing listed in paragraph 2.1 above.

.2 Inspection and testing required by laws, ordinances, rules and regulations or orders of public authorities.

.3 Inspection and testing performed exclusively for the Contractor's convenience.

4 MEASUREMENT FOR PAYMENT

.1 No separate payment shall be made for Quality Control. Payment shall be considered incidental to the Work and shall be included under the appropriate items for which quality control is required.

5 EXTRA WORK

.1 Where tests or inspections reveal that a portion(s) of the Work is deficient or not completed in accordance with the Contract requirements or specifications, the Contractor shall address the deficiencies at its own cost, including payment for additional tests or inspections the Engineer may require to verify acceptability of corrected work.

6 CONTRACTOR'S RESPONSIBILITIES

.1 The Contractor shall furnish labour and facilities to:

.1 Provide access to the portion(s) of the Work to be inspected and tested.

.2 Carry out all quality control inspections and tests.

7 TESTING OF MATERIALS

.1 Where materials are specified to be tested, the Contractor shall deliver representative samples in required quantity to the testing agency's laboratory.

8 APPROVAL FOR WORK

.1 The Contractor shall pay costs for uncovering and making good work that is covered before required inspection or testing is completed and approved by the Engineer.

9 TEST RESULTS

.1 Copies of all test results shall be issued to the Engineer.

10 ACCESS FOR TESTING

.1 The Contractor shall provide access for the Engineer to witness sampling and testing and additional QA testing if required.

11 ENGINEER'S RESPONSIBILITIES

.1 The Engineer shall be responsible for Quality Assurance, including witnessing the Contractors QC sampling and testing, reviewing the Contractor's QC test results and arranging for additional QA testing where considered necessary.

***** END OF SECTION *****

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1 DESCRIPTION

.1 Mobilization shall consist of the necessary work and operation including, but not limited to, the movement of personnel; equipment; supplies; and incidentals to the Work, the establishment of offices; camps; temporary access roads, and other facilities necessary to undertake the Work, and expenses incurred for other work and operations which must be performed prior to the commencement of the Work.

.2 Demobilization shall consist of the necessary work to remove from the Site those items that were mobilized, as well as all incidental items that were necessary to set-up or maintain those mobilized items, including deactivation of the temporary access road (i.e. the entrance to the temporary access road shall be blocked using material available on site such that it cannot be accessed by unauthorized vehicles).

2 MEASUREMENT FOR PAYMENT

.1 The Owner shall pay for mobilization at 60 percent of the lump sum price bid for "Mobilization and Demobilization" when the Contractor has delivered its full spread of equipment as listed on its equipment list submitted with its tender or the revised equipment list requested by the Engineer as well as the completion of the temporary access roads.

.2 The Owner shall pay for demobilization up to a maximum of 40 percent of the lump sum price bid for "Mobilization and Demobilization" when the Engineer is satisfied that equipment, camp items and other incidentals have been removed from the Site, the temporary access road has been deactivated, and that the Site has been trimmed and cleaned up.

.3 The Owner shall only pay once for mobilization and demobilization, regardless of the number of times the Contractor mobilizes or demobilizes.

.4 Nothing herein shall be construed to limit or preclude partial payments otherwise provided by the Contract.

***** END OF SECTION *****

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1 DESCRIPTION

.1 The Contractor shall set up, operate and maintain its own camp or provide other suitable accommodation for its staff.

.2 This section specifies requirements of regulatory agencies related to the establishment and removal of construction camps, in the event that a camp is used for accommodation.

2 SITE SELECTION

.1 The use of public campground areas and facilities is not allowed for the construction camp.

3 REQUIREMENTS OF REGULATORY AGENCIES

.1 The camp shall comply with all health regulations and any other regulations which apply for such installations.

.2 The camp shall be located outside of the extents of the former Clinton Creek Mine Site to limit exposure to airborne asbestos and above the Clinton Creek and Forty-Mile floodplains.

.3 The location and layout of the camp shall be submitted to the Engineer for review, including a sketch plan showing the location and orientation of all major camp facilities shall be provided to the Engineer at the tender review meeting. Details of fuel storage methods, solid waste disposal and sewage handling systems must be included. The location of any adjacent water bodies shall be shown.

4 MAINTENANCE

.1 The Contractor shall maintain camps in a neat and tidy condition.

.2 The Contractor shall, upon vacating the camp and service area sites, clean up and leave these areas in a condition satisfactory to the Engineer.

5 MEASUREMENT FOR PAYMENT

.1 The costs associated with this section are considered incidental to the Work and no separate payment will be made.

***** END OF SECTION *****

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1 GENERAL

1.1 Description

.1 This section specifies requirements for planning, providing, inspecting and maintaining environmental compliance.

1.2 Compliance with Laws and Regulations

.1 An Inspector Direction allowing the project to proceed will be issued.The Contractor shall comply with the conditions under the Inspector Direction. Costs associated with compliance with the conditions are considered incidental to the work, and no separate payment will be made.

.2 The Contractor shall conduct its operations in conformity with all Federal, Territorial, and Municipal laws, regulations, licenses, permits and authorizations concerning water, air, natural resources, and the disposal of contaminated or hazardous materials. The Contractor shall be responsible for any penalties which may be assessed by any authority due to the Contractor's failure to comply with the terms of all applicable permit requirements. Costs associated with compliance with environmental laws, regulations, licences, permits and authorizations are considered incidental to the work, and no separate payment will be made.

.3 Any request by the Contractor for authorization of activities or methods not specifically called for by the Contract, Environmental Management Plan (EMP), permit applications or permits issued for the work must be submitted by the Contractor in writing to the Owner.

1.3 Definitions

.1 Environmental Management Plan (EMP): The Contractor’s plan to comply with all applicable environmental laws, regulations, permits, licenses and authorizations. The EMP is developed by the Contractor and describes site specific controls and management for the protection of the environment.

.2 Water Management Plan (WMP): The Contractor’s plan to manage water discharging from Hudgeon Lake.

.3 Mitigating Conditions: conditions resulting from incidents or practices related to the Works which may impact the environment and require corrective actions to manage or remediate.

1.4 Measurement for Payment

.1 Payment by lump sum for Environmental Compliance is to be full compensation for the following:

  .1 Preparation of the EMP and WMP.

  .2 Compliance with the EMP and WMP including the design, construction and maintenance of the water diversion and environmental protection activities, including but not limited to, sediment and erosion control; oil and fuel storage and spill plans; contaminated soil testing, storage, removal or treatment procedures; water and waste water use; equipment servicing and washing areas; water truck loading areas and pumping operations; procedures to test for and take leaking equipment out of service; garbage disposal and litter control; and protection of natural resources and wildlife.

.3 Attendance at environmental briefings, meetings and inspections by the appropriate employees of the Contractor as necessary.

.2 Costs associated with compliance with the Mitigating Conditions are considered incidental to the work, and no separate payment will be made.

.3 Costs associated with compliance with environmental laws, regulations, licenses, permits and authorizations are considered incidental to the work, and no separate payment will be made.

2 EXECUTION

2.1 Environmental Management Plan

.1 The Contractor shall submit an EMP specific to the work. The EMP shall be submitted to the Owner a minimum of 14 calendar days prior to commencement of the work to allow the Owner to evaluate the suitability of the proposed strategy. The Owner will review the EMP and address any concerns with the Contractor.

.2 The EMP shall be project specific. The plan shall include lines of communication and designate field representatives including subcontractors who may be undertaking activities which impact the environment. The procedures shall address the environmental protection issues relevant to the specific construction activities being performed including but not limited to; sediment and erosion control; oil and fuel storage and spill plans; contaminated soil testing, storage, removal or treatment procedures; water and waste water use; equipment servicing and washing areas; water truck loading areas and pumping operations; procedures to test for and take leaking equipment out of service; garbage disposal and litter control; and protection of natural resources and wildlife unique to the project.

.3 The EMP must reflect the requirements of licenses, permits and authorizations issued by regulators for the work. The EMP must demonstrate the Contractor’s commitment to compliance with environmental laws and regulations.

2.2 Environmental Management Plan Review

.1 Unless the Owner approves otherwise, the Contractor shall submit the EMP no less than 14 calendar days prior to the commencement of construction. The Owner will review the EMP within 7 calendar days following the receipt of the EMP.

.2 When necessary the Contractor shall make appropriate changes to the EMP and shall re-submit it to the Owner.

.3 Once there is mutual agreement to the EMP, a finalized copy will be forwarded to the appropriate regulatory agencies by the Owner.

.4 If, during the course of the work, it is determined that the EMP or segments of it, are no longer applicable, the EMP shall be modified by the Contractor, to the mutual satisfaction and acceptance of all parties. All changes to the EMP must be documented and copies of the changes provided to the Owner.

2.3 Environmental Management Plan Implementation

.1 The Contractor shall not commence any work at the work site until the EMP has been approved.

.2 The Contractor shall implement environmental protection measures in accordance with the EMP.

.3 The Contractor shall monitor the work area to ensure that the EMP is effective for all conditions, including inclement weather conditions and during periods of construction or shut down.

.4 The Contractor shall maintain all environmental control and protection devices.

.5 The Contractor shall take appropriate and timely action to correct any deficiencies.

.6 The Contractor shall take appropriate action where it is recognized that an impact to the environment will occur, which may include shutting down the work.

.7 The Contractor shall ensure that staff and subcontractors are trained and empowered to identify, address and report potential environmental problems.

.8 The Contractor shall report all environmental incidents to the proper authorities immediately and provide an incident report within 48 hours of the occurrence to the Owner.

.9 The Contractor shall attend any meetings initiated by the Owner to address any concerns regarding the performance of the EMP.

.10 The Contractor shall ensure that all subcontractors comply with the EMP.

.11 The Contractor shall provide a knowledgeable individual(s) at the work area to maintain the environmental control devices and address any environmental protection issues that arise. The Contractor must identify such individual(s) and their qualifications to the Owner in the EMP.

.12 All requests for a change in authorizations initiated by the Contractor shall be forwarded to the Owner for submission to the appropriate agency.

2.4 Oil and Fuel Best Management Practices

.1 The Contractor shall provide the Owner with details on disposal of used oils, and containment and treatment plan for contaminated soils before construction starts.

.2 The Contractor is responsible for testing, clean up and treatment of all oil/fuel spills and leaks. Clean up is to be undertaken promptly so as to minimize contaminant transport. The Contractor is advised that any soil that is deemed to be potentially contaminated must undergo confirmatory testing by a qualified third party and be transported and treated at an approved facility in accordance with the Yukon Contaminated Sites Regulations.

.3 Particular attention shall be given to ensuring that service areas are designed large enough to service the equipment and designed to contain spills. Particular attention shall be given to ensuring that oil and fuel spills of any volume are reported and cleaned up.

.4 “No Smoking” signs shall be provided by the Contractor and prominently displayed in areas where flammable materials are stored. Additionally, the Contractor shall provide and maintain suitable fire extinguishers in such areas.

.5 The Contractor shall be required to immediately repair any leaking equipment or provide spill pans under any leaking construction equipment until repairs are affected in a timely fashion. Spare pans shall be provided in the proximity of work activity for protection against unplanned spills. The Contractor shall develop this plan to cover all activities including those of their Subcontractors, if any.

.6 The Contractor shall be required to provide spill kits in all work areas and develop a containment plan as part of its job safety analysis.

2.5 Environmental Inspections

.1 Unless the Owner approves otherwise, the Superintendent shall make regular inspections in conjunction with AAM’s field staff on a minimum weekly or as needed basis and at the completion of the Work.

.2 The Contractor shall prepare and submit, within three working days of each inspection a report that includes the date, attendance, scope, observations, incidents of non-compliance, and actions taken as a result of the inspection.

.3 The Contractor shall ensure that the reports are signed by the Contractor’s and AAM’s representatives and that copies of the reports are retained.

2.6 Water Control

.1 The Contractor shall submit a Water Management Plan to the Owner for approval a minimum of 14 calendar days prior to commencement of the work to allow the Engineer to evaluate the suitability of the proposed strategy. The Engineer will review the WMP and address any concerns with the Contractor. This plan shall describe how discharge from Hudgeon Lake will be controlled and conveyed during construction and shall include historic measured flow rates in Clinton Creek; the elevations, sizes, and capacities of creek diversion infrastructure; and emergency actions to be taken in the event that the diversion is compromised.

.2 Runoff from work areas should be negligible at all times. Work should be halted during rainfall events (and all machinery removed from the work area) that have the potential to generate runoff based on observations.

.3 Prior to construction, the Contractor shall measure flow rates in Clinton Creek and water elevations in Hudgeon Lake to establish baseline conditions. A record of these rates shall be provided to the Engineer.

.4 The Contractor shall install and maintain a temporary coffer dam at the outlet of Hudgeon Lake to facilitate the control of discharge from Hudgeon Lake and all infrastructure required to route discharge to a point on Clinton Creek downstream of the Site (e.g., pumps, generators, hoses).

.5 The Contractor shall continue to monitor Hudgeon Lake's water levels and discharge rates throughout construction. A record of these values shall be provided daily to the Engineer.

.6 The Contractor shall supply, assemble, position, operate, and maintain necessary equipment appropriately sized to keep excavations and other work areas free from water. The Contractor shall carefully place rock where water has pooled to prevent further water migration.

.7 Water collected in excavations, temporary sumps, or tanks shall not be released without treatment and approval of Engineer. The Contractor shall manage water as specified and directed by the Owner or the Engineer, and as directed within the EMP.

.8 The Contractor shall perform all necessary de-watering and disposal of groundwater.

.9 If sediment laden runoff is observed (e.g., on low permeability areas such as clay), small berms (i.e., 150 mm height) may be used to isolate the work area from other water bodies.

2.7 <u>Erosion and Sediment Control</u>

.1 The Contractor shall plan and execute construction using methods that minimize erosion and sedimentation, and control surface drainage from cuts, fills, stockpiles, and other work areas.

.2 The Contractor shall develop and/or reinstate access roads, as required, such that disturbance to vegetation is minimized, drainage paths (e.g., using culverts, rock drains, and portable bridges) are maintained, and geotextile / gravel materials are used to stabilize road surfaces as required.

.3 The Contractor shall provide and maintain temporary erosion and sediment control measures that mitigate the migration of sediment off-Site or into sensitive areas on Site. These measures may include but are not limited to water diversions, ditches, berms, rolled erosion control products, sedimentation basins, and silt fencing.

.4 Silt Barrier Fence Placement:

    .1 The Contractor shall place silt barrier fences in a manner that allows for interception of runoff at or close to right angles to flow. In areas where suspended sediment concentration in the surface runoff is severe, the Contractor shall erect two or more silt barrier fences parallel to each other, until required degree of control is achieved.

.2 Installation of the silt barrier fence shall comply with the following requirements:

.1 Fence height to 400 mm.

.2 Position posts in such a manner that fence structure remains taut and placed or driven a minimum of 500 mm into ground. The posts are to always be positioned on downstream side of the barrier fence.

.3 Where a 500 mm depth is impractical or impossible, adequately secure or brace fence posts to prevent overturning of fence due to sediment loading.

.4 Bury excess geotextile at bottom of silt fence a minimum of 150 mm in trench on upstream side, such that no flow can pass under the fence.

.5 Splice subsequent lengths of fence only at support posts by wrapping geotextile completely around each of the two support posts, such that the gap between abutting posts is completely covered by both sections of fabric.

2.8 Dust and Particulate Control

.1 The Contractor shall provide and maintain dust and particulate control measures, such as a water misting system, as required by the Engineer to prevent the generation of dust and particulate for the duration of the Contract.

2.9 Clean-up

.1 At completion of construction phase or as directed by the Engineer, the Contractor shall decommission any water diversions, regrade all ditches, berms and sedimentation basins constructed for the purpose of managing construction runoff and sediment, remove and dispose of any silt fencing and silt accumulations.

2.10 Other Environmental Conditions

.1 The Contractor shall ensure that its personnel, and any Subcontractor personnel performing the work, are fully aware of the requirements to be met with respect to the laws, regulations, permit and licensing conditions which apply to the work being undertaken.

.2 The Contractor shall conduct operations in such a manner that construction equipment does not leave the confines of flagged or designated right-of-way and pit limits without prior approval of the Engineer. Environmentally sensitive area adjacent to right-of-way and pit limits shall be physically avoided.

.3 Heavy construction equipment shall not be operated in streams, wetland or muskeg areas without prior written approval of the Engineer.

.4 The Contractor shall note and avoid any First Nations settlement land or interim protected land selections located in the vicinity of the work.

.5 The Contractor shall be alert to archaeological or paleontological remains and materials which may be uncovered that may be of significance in recording the historic and prehistoric past. When archaeological or paleontological remains are uncovered, the Contractor shall immediately halt operations in the discovery location and shall notify the Owner. The Contractor shall make every effort to preserve archaeological or paleontological remains intact in their original positions in order to preserve the archaeological or paleontological importance of materials in relation to one another and to the enclosing soil. The Contractor shall outline a protocol for the encountering of archaeological or paleontological remains and materials in the EMP.

.6 The Contractor shall not burn any waste oil or solid waste products, unless authorized in writing by an appropriate authority.

2.11 Enforcement

.1 If immediate action is required, the Owner may correct the unsatisfactory condition, and take such other action as the Owner deems necessary to provide environmental compliance.

.2 The Contractor will be responsible for any cost or expense incurred by the Government of the Yukon as a result of taking corrective action. The Contractor will not be relieved from any responsibility because of any act, or failure to act on the part of the Owner

.3 If the Contractor fails to provide environmental compliance or fails to correct forthwith an unsatisfactory condition upon being so advised, the Owner may suspend the work immediately. The Contractor must not resume work until the Owner is satisfied that the situation has been rectified.

***** END OF SECTION *****

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1 DESCRIPTION

.1 New material and equipment shall be used unless otherwise specified.

.2 Within seven days of award, the Contractor shall submit the following information for the proposed supply of materials and equipment:

- .1 Name and address of manufacturer
- .2 Trade name, model and catalogue number
- .3 Performance, descriptive and test data
- .4 Manufacturer's installation or application instructions
- .5 Evidence of arrangements to procure

.3 The Contractor shall use products of one manufacturer for material and equipment of the same type or classification unless otherwise specified.

2 MEASUREMENT FOR PAYMENT

.1 No payment will be made under this section.

3 MANUFACTURER'S INSTRUCTIONS

.1 Unless otherwise specified, the Contractor shall comply with manufacturer's latest printed instructions for materials and installation methods.

.2 The Contractor shall notify the Engineer in writing of any conflict between these specifications and manufacturer's instructions. The Engineer will designate which document is to be followed.

4 DELIVERY AND STORAGE

.1 Packaged material and equipment shall be delivered, stored and maintained with manufacturer's seals and labels intact.

.2 Damage, adulteration and soiling of material and equipment shall be prevented during delivery, handling and storage. The Contractor shall immediately remove rejected material and equipment from site.

.3 The Contractor shall store material and equipment in accordance with suppliers' instructions.

.4 The Contractor shall touch-up damaged factory finished surfaces to the Engineer's satisfaction using primer or enamel to match original and shall not paint over nameplates.

5 SUBSTITUTION AFTER CONTRACT AWARD

.1 No substitution of materials and/or equipment shall be permitted without prior written approval of the Engineer.

.2 Proposals for substitution may only be submitted after Contract Award. Such request must include statements of respective costs of items originally specified and the proposed substitution.

.3 Proposals will be considered by the Engineer if:

  .1 Specified materials are not available; or

  .2 The Engineer determines that the alternative material is equivalent to the specified material; and

  .3 The supply and installation of alternative materials will result in a net savings with a credit applied to the Contract amount.

.4 Should the proposed substitution be accepted either in part or in whole, the Contractor shall assume full responsibility and costs when the substitution affects other portions of the Work. The Contractor shall pay for design or drawing changes required as a result of substitution.

.5 Amounts of all credits arising from approval of the substitutions shall be determined by the Engineer, and the Contract Price shall be reduced accordingly.

.6 The final determination of the suitability of any alternative product is the sole prerogative of the Engineer.

***** END OF SECTION *****

Table of Contents

1 RELATED SECTIONS

.1	Section 01 11 00	General Instructions
.2	Section 31 14 11	Earthwork and Related Work
.3	Section 31 05 16	Aggregates and Granular Materials
.4	Section 31 36 19	Armorflex® Mat
.5	Section 31 37 10	Large Diameter Rock

2 GENERAL INSTRUCTIONS

2.1 Scope of Work

.1 Work to be performed includes surveying of the Work. Surveying is to be executed and completed as directed by these Specifications, and as directed by the Owner / Owner's Representative.

.2 The term "Surveyor" may be used to refer to an individual surveyor, or a surveying company.

.3 The Owner shall supply a map with the location of all control points and a table with UTM NAD83 coordinates of the monuments.

.4 Survey control points have been established at the Site. All other staking and survey control required to complete the Work shall be the responsibility of the Contractor or Surveyor.

.5 The Contractor shall be responsible for maintaining all survey stakes during performance of the Work and shall replace, at its own cost, any stakes damaged or destroyed during construction.

.6 Elevations, lines, and levels, shall be established utilizing recognized engineering survey practices.

.7 Work Suspension:

- .1 Should Work be suspended for any reason, the Surveyor shall complete a detailed survey of the existing condition of the Work at the time of the Work suspension and submit this survey record to the Engineer.

2.2 Scheduling

.1 Prior to the commencement of the Work, the Contractor shall select a Surveyor based on competency and availability for the Work. The Surveyor shall be approved by the Owner or their representative prior to the Work commencing.

.2 It shall be the responsibility of the Contractor to provide the Surveyor with a minimum 24 hours' notice prior to the expected time the Surveyor is required on the Site.

.3 The Surveyor shall be available to the Site at all times, provided the request for services is submitted in a timely manner (i.e., minimum of 24 hours' notice). Should the Surveyor not be available at the requested time, the Surveyor shall provide a competent replacement to the Site so as not to cause a delay to the Work. It is the responsibility of the Surveyor to provide the replacement with relevant information for the Work, including, but not limited to: design Drawings, coordinate system, control point coordinates, Site contacts, data labelling format, and background information related to portions of the Works already completed.

.4 Should the Surveyor receive request for services in less than 24 hours, the Surveyor shall make every attempt to accommodate the request for services. If the Surveyor is not able to provide service on the requested date, and no replacement is found, the Owner / Owner's Representative shall be informed immediately.

2.3 Field Surveying

.1 The Surveyor shall verify locations of survey benchmarks and control points prior to starting the Work and shall promptly notify the Owner or the Engineer of any discrepancies discovered.

.2 The Surveyor shall locate, preserve, and protect survey benchmarks as well as control and reference points as set or as established and shall promptly replace the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

.3 The Surveyor shall maintain a complete and accurate log of control and survey work as it progresses.

3 EXECUTION

3.1 General

.1 Prior to the commencement of the Work, the Surveyor, Contractor, and Owner / Owner's Representative shall develop a list of the minimum expected surveying requirements for the Work.

.2 Prior to the commencement of the Work, the Surveyor, Contractor, and the Owner / Owner's Representative shall develop a list of milestones, which shall require submission of survey data to the Engineer for verification of grades, elevations, and alignment.

.3 All data recorded by the Surveyor shall be neat and orderly such that it is easily transferred, and so the Engineer may interpret the data in a timely manner. The Surveyor may record any number of shots as requested or required by the Engineer, the Contractor, the Owner, or the Owner's Representative; however, these survey points shall not be included with the final (as-built) package of survey points if not required by Clause 3.2 of this Specification.

.4 All discrepancies shall be immediately reported to the Owner or the Owner's Representative. Any portion of the Work that would be affected by the discrepancy shall not be completed until the discrepancy has been clarified and written notification from the Owner or their representative has been received.

3.2 Survey Data Requirements

.1 The following survey data is the minimum required for completion of an as-built package following completion of the Work:

.1 Initial Survey:

.1 An initial survey shall be completed to capture the existing conditions prior to the commencement of the Work. The initial survey shall cover all areas where existing conditions are to be disturbed or constructed upon, including all borrow / stockpile areas. When surveying stockpiles, ensure the material type for the stockpile is properly identified. The purpose of the initial survey shall be to reconcile construction volumes upon completion of the Work, and to verify accuracy of the design survey used by the Engineer.

.2 There are several cross sections that define the regrading of the waste rock pile, these cross sections shall be surveryed at start of project to confirm initial data and again at completion to ensure slope requirements have been met.

.2 Finished Surface of Regraded Waste Rock Slope:

.1 Upon completion of the waste rock regrading including survey / record elevations and geometry.

.3 Subgrade of Channel Infill (Before Bedding Gravel):

.1 Upon completion of the channel infill, but prior to the placement of bedding gravel, including survey / record elevations, grades, and geometry.

.4 Grade of Channel Infill (Before Armouring):

.1 Upon placement of bedding gravel, but prior to placement of Armorflex® mats, including survey / record elevations, grades, and geometry.

.5 Finished Grade of Channel Improvements (After Armouring):

.1 Upon completion of the channel armouring, which includes placement of bedding gravel and Armorflex® mats, including survey / record elevations, grades, and geometry.

.6 Finished Grade of the Large Diameter Rock (300 to 800 mm):

.1 Upon placement of the large diameter rock including survey / record elevations, grades, and geometry.

.2 All data points shall be clearly labelled in a manner similar to the examples provided in Table A. If the Surveyor has a preferred legend for labelling data, the legend shall be approved by the Owner / Owner's Representative prior to use.

Table A Survey Data Labelling Legend

Item Descriptor	**Label**
Initial Survey (Original Grade)	OG
Finished Waste Rock Slope	FWRS
Subgrade of Channel Infill (Before Armoring)	SCI
Grade of Channel Infill (After gravel bedding but prior to Armoflex)	GCI
Finished Grade of Channel Improvements (After Armouring)	FCI
Large Diameter Rock	LDR

.3 Survey data shall be made available to the Engineer to verify grades, elevations, geometry, thicknesses, or any other component of the Work as requested by the Engineer. The Engineer shall be provided with a minimum 48 hours' notice of the incoming information. At a minimum, the following survey data as described within Clause 3.2.1 of this Specification shall be organized and provided to the Engineer at the following milestones:

.1 Initial survey shall be provided to the Engineer following completion of the survey. No confirmation from the Engineer is required prior to continuing with the Work. Should any discrepancies be found from the initial survey, the surveyor and the Owner shall be contacted by the Engineer.

.2 Survey of the channel infill subgrade shall be provided to the Engineer following completion of the survey and prior to placement of bedding gravel. Confirmation of proper grades and elevations shall be provided by the Engineer prior to acceptance of the constructed facilities. Survey elevations shall be within 50mm (2 in.) of the design elevation.

.3 Survey of the channel infill grade shall be provided to the Engineer following completion of the survey and prior to placement of Amorflex® mats. Confirmation of proper grades and elevations shall be provided by the Engineer prior to acceptance of the constructed facilities. Survey elevations shall be within 50 mm (2 in.) of the design elevation.

.4 Survey of the finished channel improvement (after armouring) grade shall be provided to the Engineer following completion of the survey. Confirmation of proper grades and elevations shall be provided by the Engineer prior to acceptance of the constructed facilities. Survey elevations shall be within 50 mm (2 in.) of the design elevation.

.5 Survey of the large diameter rock shall be provided to the Engineer following final placement. Confirmation of proper grades and elevations shall be provided by the

Engineer prior to acceptance of the constructed facilities. Survey elevations shall be within 50 mm (2 in.) of the design elevation.

.6 Survey of the finished repair shall be provided to the Engineer following completion of the Work. Confirmation of proper grades, elevations, and thicknesses shall be provided by the Engineer prior to acceptance of the constructed facilities. Survey elevations shall be within 50 mm (2 in.) of the design elevation.

.7 All survey data collected for the Work shall be submitted to the Engineer within seven days of completion of the Work. The survey data shall be used to develop as-built Drawings of the Work.

4 MEASUREMENT FOR PAYMENT

.1 The costs associated with this section are considered incidental to the Work and no separate payment will be made.

***** END OF SECTION *****

Table of Contents

1 GENERAL

1.1 Scope

.1 This Section describes the general requirements for the following aggregate materials:

.1 100 mm Minus Angular Rock used as Channel Infill Base Material.

1.2 Related Sections

.1	Section 03 13 00	Surveying
.2	Section 31 14 11	Earthwork and Related Work
.3	Section 31 37 10	Large Diameter Rock
.4	Section 31 36 19	Armoflex Mat

1.3 References

.1 American Society for Testing of Materials International (ASTM):

.1 ASTM D422-63 (2007), Standard Test Method for Particle-Size Analysis of Soils

.2 ASTM D1557-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort

.2 Canadian General Standards Board (CGSB):

.1 CAN / CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric

1.4 Submittals

.1 All compaction and in-situ moisture content test results taken during placement of fill shall be submitted to the Engineer within 72 hours.

1.5 Quality Control

.1 Inspection and testing of materials shall be carried out by a qualified independent agency approved by the Engineer. Cost of testing, including transportation of samples, shall be considered incidental to the Work of this section.

2 PRODUCTS

2.1 All Aggregates

.1 Aggregate Quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, or other substances that would act in deleterious manner for use intended.

.2 Coarse aggregates shall be crushed rock, unless approved otherwise by the Engineer.

.3 Recycled materials including, but not limited to, asphaltic concrete, concrete, and glass are not permitted.

.4 Coarse aggregates shall be sourced from one of the stockpiles located at the Site described in Section 2.2 and confirmed by the Engineer.

2.2 Site Availability

.1 Several aggregate stockpiles have been identified at or near the Site; both immediately outside the entrance gate beside the Clinton Creek Road, and near the outlet of Hudgeon Lake. Based on initial sampling and sieve analysis of aggregate near the surface, this material is suitable for use as 100 mm Minus Angular Rock Gradation. The Contractor should note that several piles of this material are stockpiled and sorted by size. Only stockpiles of 100 mm are considered acceptable for use as 100 mm Minus Angular Rock. The piles to be used are to be confirmed by the Engineer prior to the Work starting.

2.3 100 mm Minus Angular Rock

.1 Unless otherwise approved by the Engineer, the 100 mm Minus Angular Rock used as Channel Infill Base shall have a gradation as shown in Table A.

Table A 100 mm Minus Angular Rock Gradation

Sieve Designation (mm)	Percent Passing
100	100
75	90 to 100
50	60 to 100
25	35 to 80
10	0 to 50
1.25	0 to 25
0.080	0 to 10

2.4 Source Quality Control

.1 Acceptance of material at the source does not preclude future rejection if it fails to conform to requirements specified, lacks uniformity, or if its field performance is found to be unsatisfactory.

3 EXECUTION

3.1 Processing

.1 Aggregates shall be processed uniformly using methods that prevent contamination, segregation, and degradation.

.2 Aggregates shall be blended, if required, to obtain gradation requirements, percentage of crushed particles, or particle shapes, as specified. Use approved methods and equipment.

.3 Aggregates shall be washed, if required to meet Specifications using only approved equipment.

.4 When operating in stratified deposits excavation equipment and methods that produce uniform, homogeneous aggregate shall be used.

3.2 Handling

.1 The Contractor shall handle and transport aggregates to avoid segregation, contamination, and degradation.

3.3 Stockpiling

.1 The Contractor shall stockpile aggregates on Site in locations as indicated on the Contractor's EMP unless directed otherwise by the Owner.

.2 During winter operations, the Contractor shall prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.

3.4 Cleaning

.1 The Contractor shall leave aggregate stockpile site in tidy, well-drained condition, free of standing surface water.

.2 The Contractor shall leave any unused aggregates in neat compact stockpiles as directed by the Owner.

3.5 Placement

.1 The Contractor shall not commence placing granular bedding until the channel infill subgrade has been inspected and approved by the Engineer.

.2 The Contractor shall remove any stones greater than 100 mm in diameter.

.3 The Contractor shall place granular bedding to the thickness, extents, and grade lines shown on the Contract Drawings.

.4 The Contractor shall begin spreading of granular bedding on a centreline or on the high side of a one-way slope.

.5 The Contractor shall place the material using methods that do not lead to segregation or degradation of aggregate.

.6 The Contractor shall place material to full width in uniform layers.

.7 The Contractor shall shape each layer to a smooth contour and compact to the specified density before placing the next layer.

3.6 Compaction

.1 All granular bedding requires approval by the Engineer prior to placement, and shall be placed and compacted under the direct supervision of the Engineer.

.2 Granular bedding areas shall be constructed to elevations shown in Contract Drawings by placing and compacting fill material in successive, approximately horizontal layers. The compacted granular bedding shall be free from lenses, pockets, voids, and other imperfections.

.3 The Contractor shall compact each layer to at least 95% of the Modified Proctor Maximum Dry Density.

.4 The Contractor shall be responsible for selecting equipment and methods of attaining the minimum level of compaction specified in this Specification; however, equipment and methods that will not damage the underlying geotextile shall be selected.

.5 If the moisture existing in the soil is insufficient for compacting to the specified density, the Contractor may elect to add water. If excess water is added, the soil shall be dried or removed at the Contractor's expense.

.6 The Contractor shall maintain embankment surfaces until the next course of material is placed or until project or that portion thereof is accepted.

3.7 Finish Tolerances

.1 The Contractor shall finish all areas to the final lines and grades shown on the Drawings.

.2 The Contractor shall ensure finished surface is uniformly compacted, smooth and free from any irregularities.

.3 The Contractor shall remove any loose rock material encountered in cut slopes and fill resulting in cavities.

3.8 Tests and Inspections

.1 The soil testing summarized in Table C is the minimum required during placement and compaction of granular bedding.

Table C Minimum Laboratory, Field Testing, and Field Measurements Required During Placement and Compaction of Granular Bedding Material

Test	ASTM Test Method	Testing Frequency	Standard
In Situ Density and Moisture Content (Nuclear)	D6938-10	One test per 25 m linear metres per lift	$\geq$ 95% of MPMDD -2 to +3% of OMC
Water Content (Oven)	D2216-10	One test per change in soil type (to compare with in situ results)	---

Test	**ASTM Test Method**	**Testing Frequency**	**Standard**
Laboratory Determination of Modified Proctor Density (MPD) and Optimum Moisture Content (OMC)	D1557-12	One test per week of construction and when borrow sources are changed	---
Construction Procedures Observation	---	Continuous	---
Number of Passes of Compaction Equipment	Observation / Minimum of Four	Continuous	---
Grade and Uniformity	Survey Controls	As necessary (tolerance ±50 mm)	---

4 MEASUREMENT FOR PAYMENT

.1 The Contractor’s unit price per cubic metre of 100 mm Minus Angular Rock, used as Channel Infill Base material (Schedule of Values - Item 4), shall include all costs associated with the placement of the material including, but not limited to: placement of non-woven geotextile, , loading, hauling, placing, grading, addition of water, compacting, and completion of the quality control procedures discussed herein.

.2 No separate payment for overhaul. Include all costs for hauling in the cubic metre unit price for this item.

.3 No payment for overbuild of the Channel Infill Base material beyond neat lines shown on cross section.

.4 Payment for blending of materials to achieve specified gradation will be considered incidental to the costs of processing, and no separate payment will be made.

.5 Payment for this item shall be based on the volume measured between the Subgrade of Channel Infill (SCI) and Grade of Channel Infill (GCI) surveyed surfaces.

***** END OF SECTION *****

Table of Contents

1 GENERAL

1.1 Scope

.1 This Section describes the general requirements for excavation, subgrade preparation, placement and compaction of fill, and soil testing.

1.2 Related Sections

.1 Section 03 13 00 Surveying

.2 Section 02 14 00 Environmental Compliance

.3 Section 31 05 16 Aggregates and Granular Materials

.4 Section 31 37 10 Large Diameter Rock

1.3 References

.1 American Society for Testing and Materials (ASTM):

- .1 ASTM D422-63 (2007), Standard Test Method for Particle-Size Analysis of Soils
- .2 ASTM D1557-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort
- .3 ASTM D2488-09a, Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)

.2 Canadian General Standards Board (CGSB):

- .1 CAN / CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric

1.4 Submittals

.1 The Contractor shall submit a construction equipment list for major equipment to be used in this section prior to start of Work.

.2 Submit full details of proposed sources of fill materials and provide results of tests for soil properties, including grading analysis for each material proposed for use, to the Engineer for review at least 1 week prior to commencing work.

.3 All compaction and in-situ moisture content test results taken during placement of fill shall be submitted to the Engineer within 72 hours.

1.5 Protection

.1 The Contractor shall protect excavations from freezing.

.2 The Contractor shall keep excavations clean and free of standing water and loose soil.

.3 Additional protection of excavation and backfilling locations may be required during freezing conditions, such as but not limited to an insulation blanket (i.e., an insulating layer of soil).

1.6 Construction in Freezing Conditions

.1 If requested, the Contractor shall submit in writing to the Engineer a detailed construction procedure for excavation and placement of fill material in freezing conditions. These procedures shall be reviewed and approved by the Engineer prior to start of Work.

1.7 Quality Control

.1 Inspection and testing of materials shall be carried out by a qualified independent agency approved by the Engineer. Cost of testing, including transportation of samples, shall be considered incidental to the Work of this section.

2 MATERIALS

2.1 General

.1 Channel infill material, to be used as channel infill sub-base, shall be taken from excess material from waste rock regrading.

.2 Bedding gravel material shall conform to the gradation presented in Section 2.3 of specification 31 05 16 and, if possible, selected from on-Site excavations or borrow sources.

.3 Large diameter rock shall have an average diameter of 300 mm to 800 mm and shall be selected from on-Site borrow sources.

.4 All fill material shall be substantially free of organics, frozen soil, and rocks larger than 150 mm in diameter.

.5 All fill material shall be approved for use by the Engineer.

2.2 Tests and Inspections

.1 The soil tests summarized in Table A shall be completed by the Contractor prior to commencing fill placement and are prerequisite to the Engineer's approval of fill material.

Table A Minimum Testing of Fill Material

Property	ASTM Standard	Test Frequency	Standard
Grain Size Distribution	D422-63(2007)	One test per 4,000 m^3 or with each change in material (minimum two tests)	None specified
Laboratory Determination of Modified Proctor Density (MPD) and Optimum Moisture Content (OMC)	D1557-12	One test per 4,000 m^3 or with each change in material (minimum two tests)	None specified

Property	ASTM Standard	Test Frequency	Standard
Changes in Borrow Materials - Visual Classification	Observation / D2488-09a	Continuous	---

3 EXECUTION

3.1 General

.1 The Contractor shall not begin placement of fill until the material has been approved for use by the Engineer.

3.2 Excavation

.1 The Contractor shall excavate to lines and grades shown on Contract Drawings unless the Engineer adjusts grades during excavation to suit ground conditions and shall generally, leave a firm and even surface of undisturbed soil true to required subgrade elevations.

.2 The Contractor shall stockpile all surplus and waste excavated materials near the work area in a location(s) specified by the Owner.

.3 If subgrade is unacceptable, additional excavation may be authorized by the Owner or the Engineer and paid for as extra Work. Excavations made below the depths, lines, and grades shown on the Drawings without the Engineer’s written authorization shall be backfilled with an appropriate soil material at the Contractor’s expense. Backfill material shall be approved by the Engineer.

.4 The Contractor shall remove all topsoil, organic matter, debris, and frozen, wet or soft material encountered at subgrade level.

.5 Payment for over-excavation and replacement of unsuitable material as requested by the Engineer shall be made in accordance with the appropriate unit rates.

3.3 Placement

.1 The Contractor shall not commence placing fill material until the subgrade has been inspected and approved by the Engineer.

.2 The Contractor shall place fill materials to the thickness, extents, and grade lines shown on the Contract Drawings.

.3 The Contractor shall begin spreading of fill material on a centreline or on the high side of a one-way slope.

.4 The Contractor shall place using methods that do not lead to segregation or degradation of aggregate.

.5 The Contractor shall place material to full width in uniform layers no thicker than 300 mm, uncompacted.

.6 The Contractor shall shape each layer to a smooth contour and compact to the specified density before placing the next layer.

3.4 Compaction

.1 All fill requires approval by the Engineer prior to placement, and shall be placed and compacted under the direct supervision of the Engineer.

.2 Fill areas shall be constructed to elevations shown in Contract Drawings by placing and compacting fill material in successive, approximately horizontal layers. The compacted fill shall be free from lenses, pockets, voids, and other imperfections.

.3 The depth of each layer shall not exceed 300 mm uncompacted.

.4 The Contractor shall compact each layer to at least 93% of the Modified Proctor Maximum Dry Density.

.5 The Contractor shall be responsible for selecting equipment and methods of attaining the minimum level of compaction specified in this Specification.

.6 If the moisture existing in the soil is insufficient for compacting to the specified density, the Contractor may elect to add water. If excess water is added, the soil shall be dried or removed at the Contractor's expense.

.7 The Contractor shall maintain embankment surfaces until the next course of material is placed or until project or that portion thereof is accepted.

3.5 Finish Tolerances

.1 The Contractor shall finish all areas to the final lines and grades shown on the Drawings.

.2 The Contractor shall ensure finished surface is uniformly compacted, smooth and free from any irregularities.

.3 The Contractor shall ensure positive drainage across all filled and excavated areas.

.4 The Contractor shall remove any loose rock material encountered in cut slopes and fill resulting in cavities.

3.6 Tests and Inspections

.1 The soil testing summarized in Table B is the minimum required during placement and compaction of fill material.

Table B Minimum Laboratory, Field Testing, and Field Measurements Required During Placement and Compaction of Fill Material

Test	ASTM Test Method	Testing Frequency	Standard
In Situ Density and Moisture Content (Nuclear)	D6938-10	One test per 25 m linear metres per lift	≥ 93% of MPMDD -2 to +3% of OMC
Water Content (Oven)	D2216-10	One test per change in soil type (to compare with in situ results)	---
Laboratory Determination of Modified Proctor Density (MPD) and Optimum Moisture Content (OMC)	D1557-12	One test per week of construction, when general fill is noted to be visually different than preceding fill and when borrow sources are changed	---
Construction Procedures Observation	---	Continuous	---
Number of Passes of Compaction Equipment	Observation / Minimum of Four	Continuous	---
Grade and Uniformity	Survey Controls	As necessary (tolerance ±50 mm)	---

4 MEASUREMENT FOR PAYMENT

.1 The Contractor’s unit price per cubic metre of Common Excavation of Waste Rock (Schedule of Value - Item 2) shall include all costs associated with the excavation of the waste rock slope and stockpiling of excess material (i.e., material not used to infill the channel).

.2 Payment for Common Excavation of Waste Rock shall be based on the volume measured between the Original Grade (OG) and the Finished Waste Rock Slope (FWRS) surveyed surfaces less the volume of waste rock used as Channel Infill Subbase.

.3 The Contractor’s unit price per cubic metre of Channel Infill Sub-base (Schedule of Value - Item 3) shall include all costs associated with the placement of the material including, but not limited to: processing (if required), stockpiling, loading, hauling, placing, grading, addition of water, compacting, and completion of the quality control procedures described herein.

.4 Payment for Channel Infill Sub-base shall be based on the volume measured between the OG and the Subgrade of Channel Infill (SCI) surveyed surfaces.

***** END OF SECTION *****

Table of Contents

1 GENERAL

1.1 Scope

.1 This Section covers the materials and installation of Armorflex® Class 60T mats including geosynthetics, ground anchors, rebar, and grout.

.2 Installation of Armorflex® mats shall be as shown on the Drawings and in accordance with these specifications.

1.2 Related Sections

.1 Section 03 13 00 Surveying

.2 Section 31 05 16 Aggregates and Granular Materials

.3 Section 31 14 11 Earthwork and Related Work

1.3 References

.1 Cementitious Materials – Materials shall conform to the following applicable CSA specifications:

.1 Portland Cements, Blended Cements and Hydrated Lime – Specification CAN/CSA A3000-13, for Cementing Materials Compendium.

.2 Hydrated Lime Types – Specification CAN/CSA A3000.

.3 Pozzolans – Specification CAN/CSA A23.1-09.

.2 Aggregates shall conform to the following ASTM specifications, except that grading requirements shall not necessarily apply:

.1 Normal Weight – Specification CAN/CSA A23.1.

.3 Geosynthetics shall conform to the following ASTM specifications,:

.1 Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus – Specification ASTM D4355-07.

.2 Standard Practice for Determining the Specification Conformance of Geosynthetics – Specification ASTM D4759-11.

.3 Standard Test Method for Evaluating the Unconfined Tension Creep and Creep Rupture Behavior of Geosynthetics – Specification ASTM D5262-07 (2012).

.4 Standard Test Methods for Trapezoid Tearing Strength of Geotextiles – Specification ASTM D4533-11.

.5 Standard Test Method for Grab Breaking Load and Elongation of Geotextiles – Specification ASTM D4632-08 (2013) e1.

.6 Standard Test Method for Determining Apparent Opening Size of a Geotextile – Specification ASTM D4751-12.

.7 Standard Test Method for the Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50 mm Probe – Specification ASTM D6241-04 (2009).

.8 Standard Test Methods for Water Permeability of Geotextiles by Permittivity – Specification ASTM D4491-99a (2013).

.9 Standard Test Method for Determining Tensile Properties of Geogrids by the Single or Multi-Rib Tensile Method – Specification ASTM D6637-11.

.10 Standard Test Method for Evaluating the Unconfined Tension Creep and Creep Rupture Behavior of Geosynthetics – Specification ASTM D5262-07 (2012).

2 PRODUCTS

2.1 Armorflex Mats

.1 All Armorflex Class 60T units shall be prefabricated as an assembly of concrete blocks, with specific hydraulic capacities, laced with revetment cables.

.2 Individual units in the system shall be staggered and interlocked for enhanced stability.

.3 All units shall be sound and free of defects that would interfere with either the proper placement of the unit or impair the performance of the system. Surface cracks incidental to the usual methods of manufacture, or surface chipping resulting from customary methods of handling in shipment and delivery, shall not be deemed grounds for rejection.

.4 Cracks exceeding 0.635 cm (0.25 inches) in width and/or 2.54 cm (1.0 inches) in depth shall be deemed grounds for rejection.

.5 Chipping resulting in a weight loss exceeding 10% of the average weight of a concrete unit shall be deemed grounds for rejection.

.6 Blocks rejected at the Site shall be repaired with structural grout or replaced at the expense of the Contractor.

2.2 Geosynthetics

.1 Non-woven geotextile shall be Nilex 4553 or equivalent approved by the Engineer.

.2 Microgrid shall be Stratagrid bi-axial knitted Microgrid or equivalent approved by the Engineer.

2.3 Ground Anchors

.1 Ground anchors shall be Duckbill Model 68-DBD units.

2.4 Grout or Concrete

.1 Mat to mat transitions and void blocks shall be filled with 30 Mpa non-shrink grout or concrete.

2.5 Rebar

.1 Rebar shall consist of 20M, grade 400 bars.

3 EXECUTION

3.1 Foundation Preparation

.1 Granular bedding shall be constructed to the elevations, grades, and geometry shown on the Contract Drawings and to the tolerances specified in the Specifications. The gravel bedding shall be approved by the Engineer and the Manufacturer’s representative prior to placement of the Armorflex® mats.

.2 The gravel bedding shall be graded to a smooth plane surface to ensure that intimate contact is achieved between the slope face and the Armorflex® mats. All slope deformities (e.g., roots, grade stakes, and stones) which project normal to the local slope face must be re-graded or removed. No holes, pockmarks, slope board teeth marks, footprints, or other voids greater than 2.5 cm (1.0 inches) in depth normal to the local slope face shall be permitted. No grooves or depressions greater than 1.25 cm (0.5 inches) in depth normal to the local slope face with a dimension exceeding 30 cm (1.0 feet) in any direction shall be permitted. Where such areas are evident, they shall be brought to grade by placing compacted homogeneous material. The slope and slope face shall be uniformly compacted, and the depth of layers, homogeneity of soil, and amount of compaction shall be as required by the Engineer.

.3 Excavation and preparation for upstream and downstream anchor trenches shall be done in accordance to the lines, grades, and geometry shown in the Contract Drawings. The anchor trench hinge-point at the top of the slope shall be uniformly graded so that no dips or bumps greater than 1.25 cm (0.5 inches) over or under the local grade occur. The width of the anchor trench hinge-point shall also be graded uniformly to ensure intimate contact between all cellular concrete blocks and underlying grade at the hinge point.

3.2 Inspection

.1 Immediately prior to placing the Armorflex® mats, the prepared subgrade shall be inspected by the Engineer, the Owner, and the manufacturer’s representative. No blocks shall be placed theron until that area has been approved by each of these parties.

3.3 Installation of Geosynthetics

.1 Geosynthetics (non-woven geotextile and woven Microgrid) shall be installed with a minimum overlap of 600 mm at adjacent edges.

.2 Geosynthetics shall be installed starting at the downstream end so that overlaps are in the direction of flow (i.e., upstream piece laid over downstream piece).

.3 Geosynthetics shall be anchored a minimum of 1.5 m at the upstream and downstream anchor trenches as well as at the top of channel banks except where the slope beyond the channel is greater than 2H:1V.

.4 Geotextile shall be placed smooth and free of tension stress, folds, wrinkles and creases.

.5 Geotextile shall be retained in place with sandbags as required.

.6 Installed geosynthetics shall be protected from displacement, damage, or deterioration before, during, and after placement of angular rock and Armorflex mats.

.7 Damaged or deteriorated geosynthetics shall be replaced to the approval of the Engineer.

.8 During delivery and storage, geosynthetics shall be protected from direct sunlight, ultraviolet rays, excessive heat, mud, dirt, dust, debris, and rodents.

.9 Non-woven geotextile shall meet or exceed the physical properties as presented in Table A.

Table A Non-Woven Geotextile

Property	**Minimum Requirements**
Grab Tensile / Elongation ASTM D4632	= 910 N / 50% minimum average roll value
CBR Puncture Strength ASTM D6241	= 2,330 N minimum average roll value
Tear (Trapezoidal) ASTM D4533	= 350 N minimum average roll value
Apparent Opening Size ASTM D4751	= 0.180 mm maximum average roll value
Water Flow Rate ASTM D4491	= 4,480 l/min/m² minimum average roll value
UV Resistance ASTM D4355	= 70% (500 hr.) typical value

.1 Woven microgrid shall meet or exceed the physical properties as presented inTable B.

Table B Woven Microgrid

Property	**Minimum Requirements**
Ultimate Strength ASTM D6637 Method A	= 29.2 kN/m
Creep Limited Strength ASTM D5262	= 16.8 kN/m

3.4 Placement of Armorflex® Mats

.1 Cellular concrete block/mats shall be constructed to the specified elevations, grades, and geometry shown on the Contract Drawings.

.2 The cellular concrete blocks shall be placed on the gravel bedding in such a manner as to produce a smooth plane surface in intimate contact with the gravel bedding. No individual block within the plane of placed cellular concrete blocks shall protrude more than 1.25 cm (0.5 inches) or as otherwise specified by the Engineer. To ensure that the cellular concrete blocks are flush and develop intimate contact with the subgrade, the blocks shall be "seated" with a roller or other means as approved by the Engineer.

.3 If assembled and placed as large mattresses, the cellular concrete mats shall be attached to a spreader bar or other approved device to aid in the lifting and placing of the mats in their proper position by the use of a crane or other approved equipment. The equipment used should have adequate capacity to place the mats without bumping, dragging, tearing, or otherwise damaging the underlying fabric. The mats shall be placed side-by-side and/or end-to-end so that the mats abut each other.

.4 Mat seams or openings between mats greater than 5 cm (2 inches) shall be filled with 30 MPA concrete or non-shrink grout. Whether placed by hand or in large mattresses, distinct changes in grade that results in a discontinuous revetment surface across the channel shall require a grout seam at the grade change location so as to produce a continuous surface.

.5 Anchor trenches shall be backfilled flush with the top of the blocks as shown on the Contract Drawings. The integrity of the trench backfill must be maintained so as to ensure a surface that is flush with the top surface of the cellular concrete blocks for its entire service life.

.6 The manufacturer of the Armorflex® mats shall provide on-site construction advice during the initial installation phases of the Works.

3.5 Transitions

.1 At longitudinal (i.e., parallel to the channel) mat to mat transitions, a piece of 20M rebar shall be threaded through the looped ends of the revetment cable to secure the mats together. The transition shall be filled with 30 Mpa concrete or grout hand finished so that it is flush with the top of the blocks that comprise the adjacent mats.

.2 At cross-sectional (i.e., perpendicular to the channel) mat to mat transitions, the adjoining mats will be connected to each other via the ground anchors installed at voided half blocks.

.3 Anchor trenches shall be installed at the top and bottom of the mat, perpendicular to the channel. Two rows of blocks shall be placed inside the trench at a 1H to 1V slope. The trench shall be backfilled with large diameter rock graded to create a smooth transition with the existing drop structure gabion baskets and channel.

3.6 Anchoring

.1 Ground anchors shall be installed at the locations indicated on the contract drawings.

.2 Following the placement of the Armorflex mats, the Contractor shall, at each anchor location: cut the woven Microgrid and expose and cut the non-woven geotextile prior to driving the anchors. The Contractor shall limit the extents of the cut portion of the geosynthetics as much as practically possible.

.3 Ground anchors shall be driven into the ground a minimum of 900 mm using a jack hammer and power drive steel. Once the anchor is at the proper depth, the drive steel shall be removed.

.4 Once the ground anchor has been driven to the proper depth, it shall be set by pulling upward on the anchor cable until resistance is met.

.5 The ground anchors shall be attached to the revetment cables or rebar using a 6.4 mm diameter braided steel cable secured with a crimp sleeve.

.6 Blocks in the mats shall be voided by the manufacturer to facilitate installation of ground anchors. These voided blocks shall be filled with 30 Mpa concrete or grout, hand finished so that it is flush with the top of the surrounding blocks.

3.7 Concrete / Grout

.1 Concrete shall be machine mixed using a concrete mix with a compressive strength rating of 30 MPa at 28 days.

.2 Non-shrink grout shall be machine mixed using a grout mix with a compressive strength rating of 30 MPa at 28 days.

.3 Concrete / grout shall be mixed to manufacturer’s specifications.

3.8 Rebar

.1 Rebar shall be laced through the mat revetment loops at mat to mat transitions.

.2 Overlapping pieces of rebar shall be contact lap spliced over a minimum length of 800 mm and secured together using tie wire.

4 MEASUREMENT FOR PAYMENT

.1 The Contractor’s unit price per unit of Armorflex® mat (Schedule of Values – Item 6) shall include all costs associated with the installation including, but not limited to: supply, delivery, storage, and installation of the mats, woven Microgrid, rebar, ground anchors, and concrete/grout; as well as time, travel, accommodations, and meal expenses required for the manufacturer’s representative to attend the Site.

***** END OF SECTION *****

Table of Contents

1 GENERAL

1.1 Scope

.1 This Section covers the materials and installation of large diameter for the transition between the existing gabion structure and Armorflex Mat and between the Armorflex Mat and the channel dowstream.

.2 Installation of large diameter rock shall be as shown on the Drawings and in accordance with these Specifications.

1.2 Related Sections

.1	Section 03 13 00	Surveying
.2	Section 31 05 16	Aggregates and Granular Materials
.3	Section 31 14 11	Earthwork and Related Work

2 PRODUCTS

2.1 Large Diameter Rock Minimum Requirements

.1 The Contractor is required to source on-Site and place all large diameter rock used for the transition between the existing gabion structure and the Armorflex® Mat and between the Armorflex® Mat and the channel dowstream.

.2 Large diameter rock shall consist of clean (i.e., free from soil and/or organic material), durable, sound, angular, and roughly equidimensional rock. The minimum dimension of any single rock shall not be less than ⅓ of its maximum dimension.

.3 The rock source shall be approved by the Engineer prior to the commencement of placement. Observation of the performance of the large diameter rock in nature (i.e., if there are exposures of the rock to be quarried that have not weathered or shown signs of breaking down) may be used as the basis for approval by the Engineer.

.4 If no rock meeting these minimum requirements can be sourced locally, the best available rock may be used at the discretion of the Engineer.

2.2 Source Quality Control

.1 The Contractor shall inform the Engineer of proposed material source (or proposed change in source) and provide access for visual observation at least two weeks prior to commencing production.

.2 Acceptance of material at the source does not preclude future rejection if it fails to conform to the requirements specified, lacks uniformity, or if its field performance is found to be unsatisfactory.

.3 Control of the gradation of large diameter rock placed at Site shall be by visual inspection:

.1 Sample piles known to meet the required gradation (through direct weighing of all the individual pieces in the sample) shall be provided by the Contractor and used for reference in judging the gradation of the riprap.

.2 The minimum size of sample piles shall be as follows:

.1 2 m by 2 m.

2.3 Large Diameter Rock

.1 Large diameter rock shall have the following gradation:

.1 Average dimension between 300 mm and 800 mm.

3 EXECUTION

3.1 Handling and Stockpiling

.1 Handling and stockpiling of large diameter rock shall be as specified in Section 31 05 16 - Aggregates and Granular Materials.

3.2 Place Large Diameter Rock

.1 Large diameter rock shall be placed starting at the toe of the slope and working up, taking care not to damage or displace the underlying Armorflex Mat.

.2 Large diameter rock shall not be dumped, but shall be placed using an excavator and dropped from heights no greater than 1.0 m.

.3 Large diameter rock shall be placed at slopes no steeper and thicknesses no less than those shown on the Drawings.

.4 Placement of large diameter rock shall be undertaken in such a manner that segregation of the material into zones of uniform size particles does not occur, and that the completed layer is stable and generally free of undulations or protruding rocks.

.5 Large rocks shall be uniformly distributed throughout the armour layer, and smaller rocks shall be used to fill voids between larger rocks.

3.3 Cleaning

.1 The Contractor shall leave large diameter rock stockpile site in tidy, well-drained condition, free of standing surface water.

.2 The Contractor shall leave any unused large diameter rocks in neat compact stockpiles as directed by the Engineer.

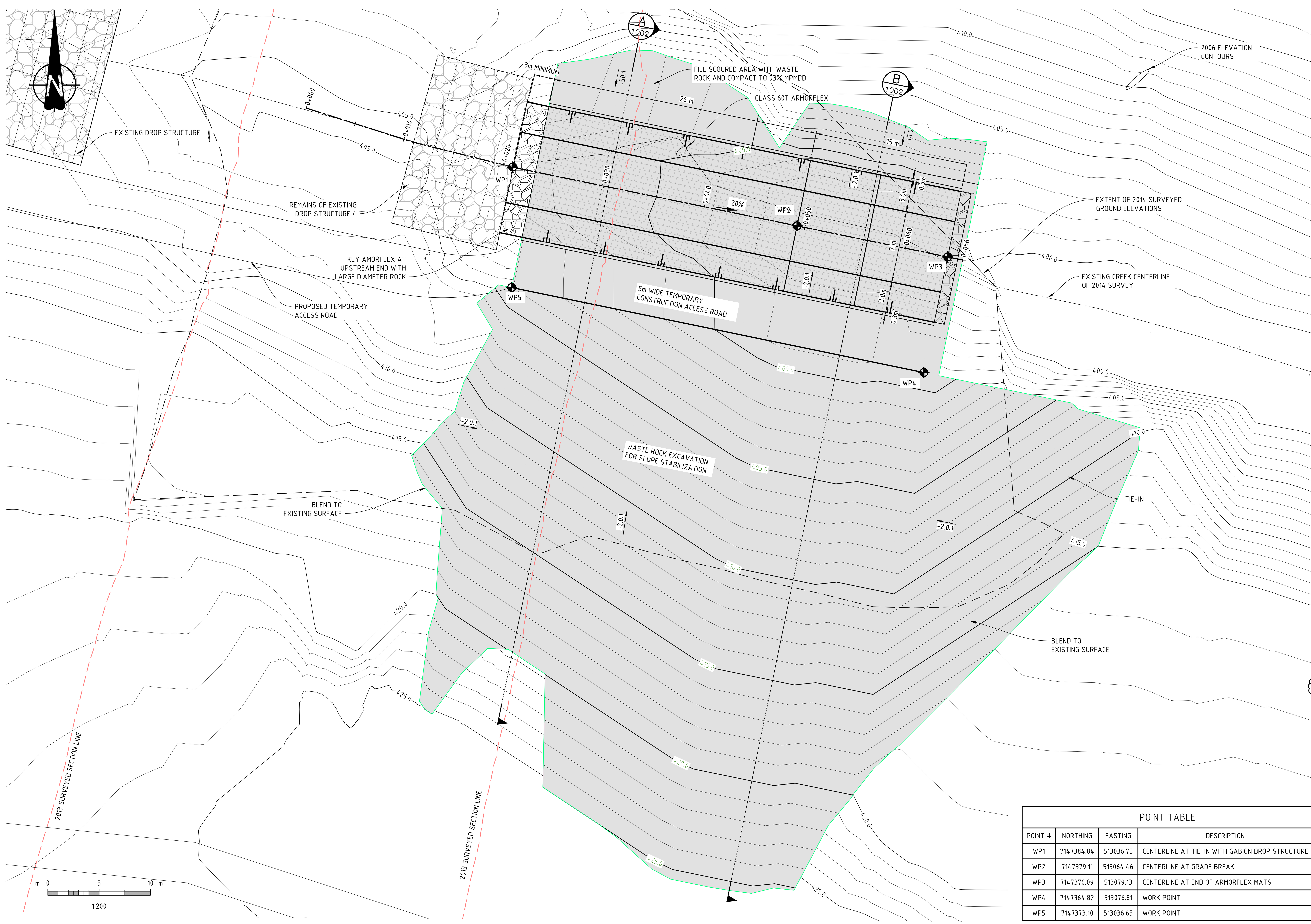
4 MEASUREMENT FOR PAYMENT

.1 The Contractor’s unit price per cubic metre of Produce and Placement of Large Rock (Schedule of Values - Item 5) shall include all costs associated with the placement of the material including but not limited to: processing (if required), stockpiling, loading, hauling and placing.

.2 Payment for Produce and Placement of Large Rock shall be based on the volume measured between the Subgrade of Channel Infill (SCI) and Large Diameter Rock (LDR) surveyed surfaces.

***** END OF SECTION *****

Appendix 2 Drawings



POINT TABLE			
POINT #	NORTHING	EASTING	DESCRIPTION
WP1	7147384.84	513036.75	CENTERLINE AT TIE-IN WITH GABION DROP STRUCTURE
WP2	7147379.11	513064.46	CENTERLINE AT GRADE BREAK
WP3	7147376.09	513079.13	CENTERLINE AT END OF ARMORFLEX MATS
WP4	7147364.82	513076.81	WORK POINT
WP5	7147373.10	513036.65	WORK POINT

NOTES:

GENERAL NOTES

1. DIMENSIONS AND ELEVATIONS ARE IN METRES.
2. ALL COORDINATES ARE IN NAD 83. THE FOLLOWING EXISTING SURVEY CONTROL POINTS SHOULD BE USED FOR REFERENCE:

ID	NORTHING (m)	EASTING (m)	ORTHOMETRIC HEIGHT (masl)
No. 2834	7148712.673	513447.724	606.823
No. 2835	7147272.790	513147.057	432.669
No. 1086	7147972.219	513176.710	590.955
No. 1192	7147563.984	512278.758	441.231

3. SITE PLAN, CHANNEL PROFILE, CROSS SECTIONS AND EARTHWORK QUANTITIES ARE BASED ON 2006 ELEVATION DATA FOR THE SITE AS WELL AS 2013 AND 2014 SURVEY OF THE CLINTON CREEK CHANNEL.

MATERIALS

4. FILL MATERIAL SHALL CONSIST OF UNFROZEN EXCAVATED WASTE ROCK
5. ARMORFLEX MATS SHALL BE CLASS 60T
6. 100mm MINUS ANGULAR ROCK
7. LARGE DIAMETER ROCK SHOULD HAVE AN AVERAGE DIMENSION OF BETWEEN 300 AND 800 mm AND SHOULD BE SOURCED ON SITE

APPROXIMATE MATERIAL QUANTITIES

EXCAVATION	9,500 m^3
FILL	1,000 m^3
100mm MINUS ANGULAR ROCK	120 m^3
CLASS 60T ARMORFLEX MATS (2.4m X 4.5m)	36
CLASS 60T ARMORFLEX MATS (2.4m X 5.3m)	18
NON-WOVEN GEOTEXTILE	900 m^2
WOVEN MICROGRID GEOTEXTILE	900 m^2
LARGE DIAMETER ROCK (300 TO 800 mm)	30 m^3
30Mpa CONCRETE OR GROUT	10m^3
DUCKBILL 68-DBD GROUND ANCHOR	312
20m REBAR	100m

EXECUTION - GENERAL

8. SURVEY OF EXISTING AND FINISHED GRADES SHALL BE COMPLETED BY THE SURVEYOR / CONTRACTOR FOR THE DETERMINATION OF QUANTITIES AND THE PREPARATION OF AS-BUILT DRAWINGS.

EXECUTION - BULK EARTHWORKS

9. THE UNSTABLE WASTE ROCK SLOPE ON THE SOUTH SIDE OF CLINTON CREEK, DOWNSTREAM OF THE DAMAGED GABION DROP STRUCTURE, SHALL BE CUT BACK TO A 2H:1V SLOPE. THE SLOPE ON THE NORTH SIDE OF CLINTON CREEK SHALL BE FILLED AT A SLOPE OF 50H:1V AND CUT BACK TO A 1H:1V SLOPE.
10. A PORTION OF THE EXCAVATED WASTE ROCK SHALL BE USED TO FILL THE CHANNEL AND CONSTRUCT A 5 M WIDE ACCESS ROAD DOWNSTREAM OF THE DAMAGED GABION DROP STRUCTURE. FINISHED ELEVATIONS AND COMPACTION REQUIREMENTS ARE SPECIFIED ON THE CHANNEL PROFILE AND SECTIONS.
11. REMAINING (I.E. WASTE) EXCAVATED WASTE ROCK SHALL BE STOCKPILED IN A LOCATION TO BE DETERMINED BY THE ONSITE ENGINEER AT THE START OF CONSTRUCTION.

EXECUTION - CHANNEL CONSTRUCTION

12. DAMAGED GABION BASKETS DOWNSTREAM OF START OF ARMORFLEX MATS SHALL BE REMOVED PRIOR TO CHANNEL INFILLING. ENGINEER SHALL CONFIRM IN THE FIELD WHICH BASKETS SHALL BE REMOVED. BASKETS SHALL BE CUT FLUSH WITH ADJOINING BASKETS AND ROCK MATERIAL TO BE STOCKPILED ON SITE.
13. NON-WOVEN GEOTEXTILE (NILEX 4553) SHALL BE INSTALLED ON TOP OF THE WASTE ROCK WITH A MINIMUM OVERLAP LENGTH OF 600mm AND KEYED IN AT THE EDGES A MINIMUM OF 1.5m.
14. 150 mm OF 100mm MINUS ANGULAR ROCK SHALL BE PLACED AND COMPACTED TO 95% MPMDD OVER THE WASTE ROCK FILL AS SHOWN ON THE PROFILE (DRAWING 1002). 6
15. WOVEN MICROGRID (STRATAGRID OR EQUIVALENT) SHALL BE INSTALLED ON TOP OF THE ANGULAR ROCK LAYER WITH A MINIMUM OVERLAP LENGTH OF 600mm AND KEYED IN AT THE EDGES A MINIMUM OF 1.5m.
16. CLASS 60T ARMORFLEX MATS SHALL BE INSTALLED ON TOP OF THE ANGULAR ROCK BEDDING IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS AND RECOMMENDATIONS. THE ARMORFLEX MATS ARE TO BE PLACED ACROSS THE CHANNEL (I.E., WITH THE LONGEST DIMENSION ALIGNED PERPENDICULAR TO THE DIRECTION OF FLOW) WITH THE 2.4 M X 5.3 M PLACED ACROSS THE CENTER OF THE CHANNEL AND THE TWO 2.4 M X 4.5 M MATS ON MAT EITHER SIDE SLOPES AND A PORTION OF THE CHANNEL BOTTOM.
17. LARGE DIAMETER ROCK SHALL BE SOURCED ON SITE AND USED TO KEY IN THE UPSTREAM AND DOWNSTREAM ENDS OF THE ARMORFLEX AS SHOWN ON DRAWING 1002, PROFILE.
18. DUCKBILL MODEL 68-DBD SHALL BE DRIVEN INTO THE WASTE ROCK A MINIMUM OF 900 mm AT EACH VOID FULL BLOCK AND $\frac{1}{2}$ BLOCK AND 2 AT EVERY MAT TO MAT CONNECTION AND AT MAT ENDS. THE ANCHORS SHALL BE SECURED TO THE REVETMENT CABLE USING FASTENERS PER MANUFACTURER'S RECOMMENDATIONS.
19. A 20M PIECE OF REBAR SHALL BE THREADED THROUGH THE REVETMENT CABLES, PARALLEL TO THE CHANNEL, TO CONNECT THE MATS AND SHALL BE BACKFILLED WITH 30 MPA CONCRETE.
20. SOME "FIELD ENGINEERING" MAY BE REQUIRED TO TIE THE PROPOSED CHANNEL INTO THE DAMAGED GABION DROP STRUCTURE UPSTREAM AND THE EXISTING CHANNEL DOWNSTREAM.

REV	DATE	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	CUSTOMER	REF DRAWING No	REFERENCE DRAWING TITLE
6	03-JUL-15	ISSUED FOR CONSTRUCTION	JH	JRG	JRG	AJT	LRM			
5	28-MAY-15	RE-ISSUED FOR TENDER	JRG	JH	JRG	AJT	LRM			
4	24-APR-15	RE-ISSUED FOR TENDER	JRG	JH	JRG	AJT	LRM			
3	20-APR-15	RE-ISSUED FOR TENDER	JRG	JH	JRG	AJT	AJT			
2	10-APR-15	ISSUED FOR TENDER	JH	BJM	JRG	AJT	LRM			
1	31-MAR-14	RE-ISSUED FOR CONSTRUCTION	JH		SC	AJT	LRM			
0	27-MAR-14	ISSUED FOR CONSTRUCTION	JH	BJM	SC	AT	LM			
A	06-MAR-14	ISSUED FOR CLIENT REVIEW	JH	BJM	SC	AT	LM			

D SHEET SCALE SHOWN

OneWay to zero harm

WORLEYPARSONS PROJECT No
307076-06729

ENGINEERING AND PERMIT STAMPS (As Required)

CUSTOMER

Yukon
Government
Department of Energy, Mines and Resources
Assessment and Abandoned Mines

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resources & energy

CLINTON CREEK
DROP STRUCTURE 4 REPAIR
PLAN

DRG No 307076-06729-00-CI-DGA-1001 REV 6

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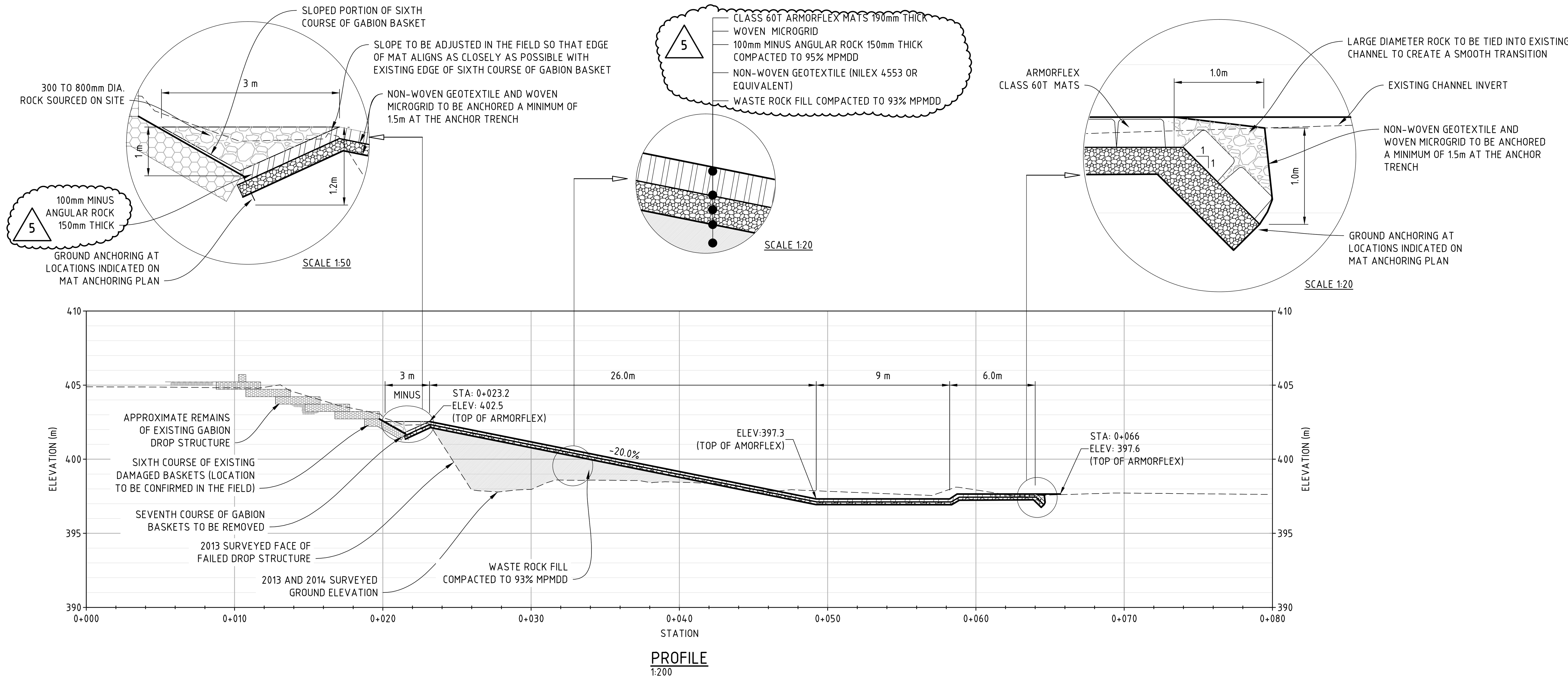

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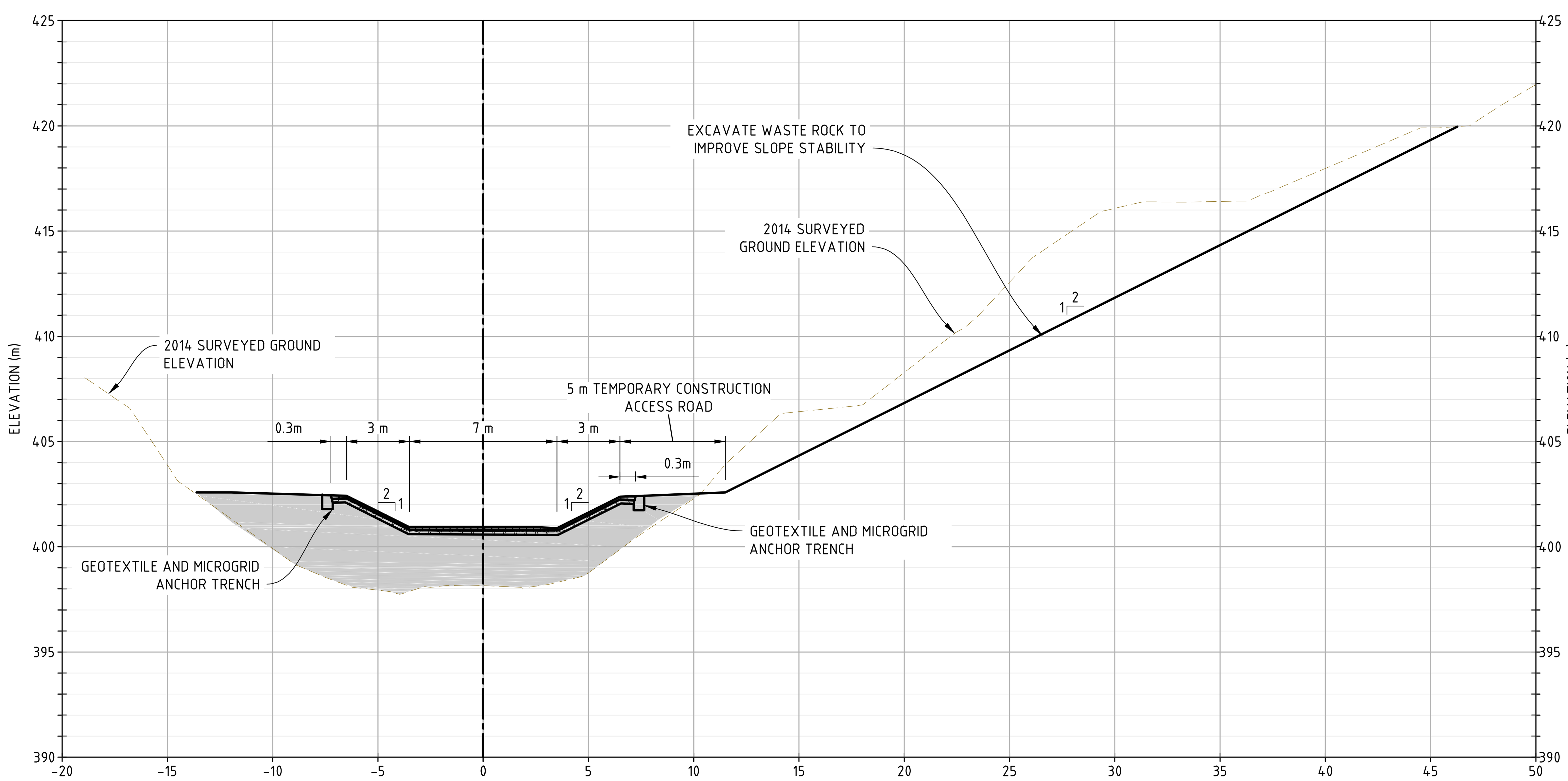

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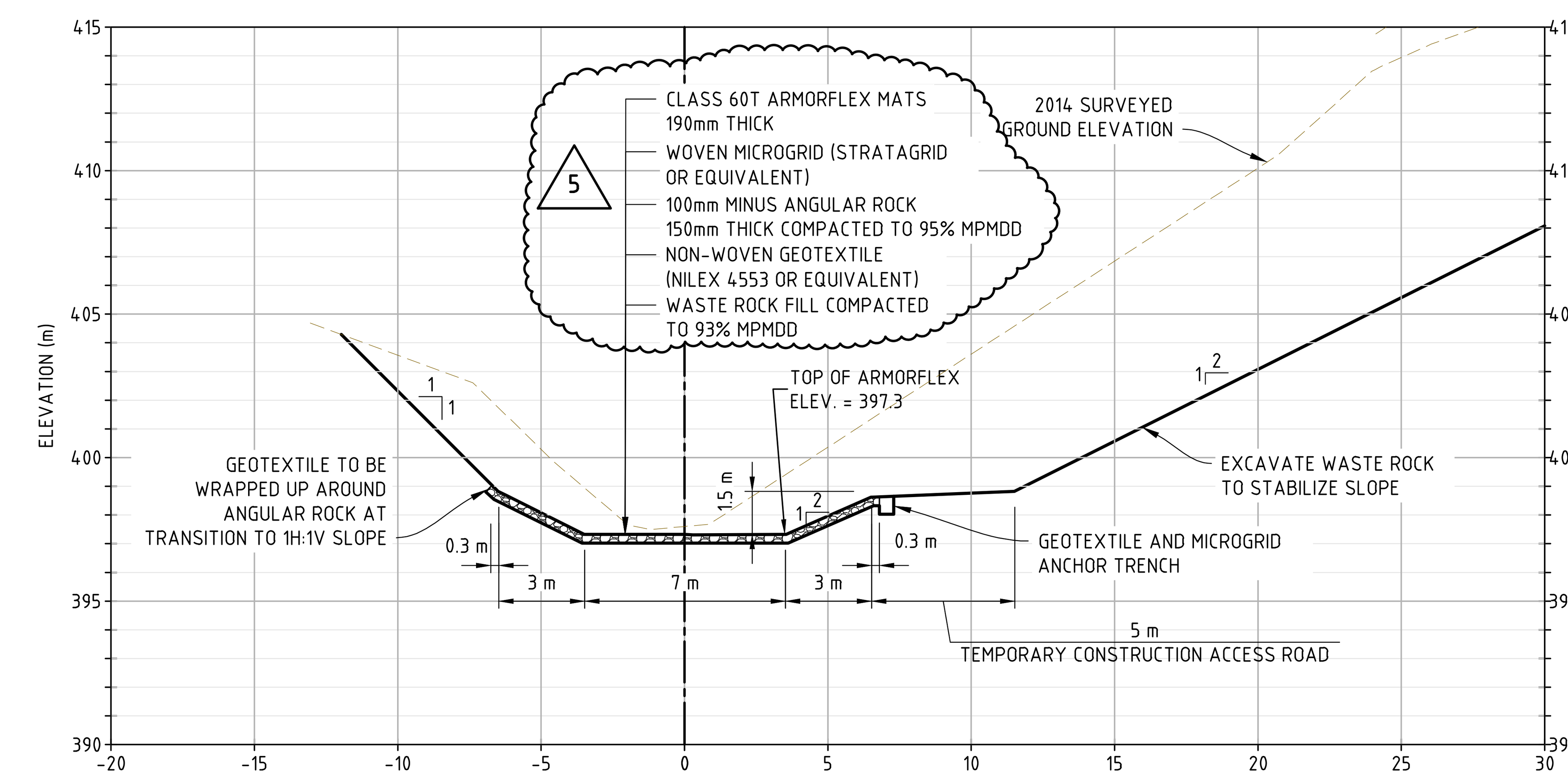

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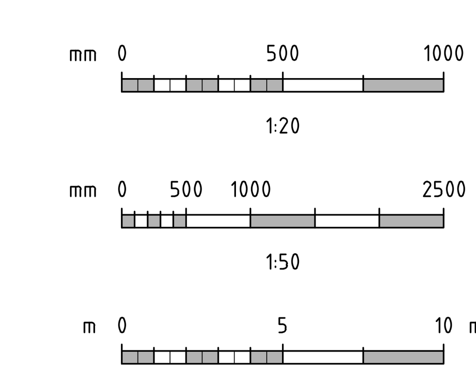

NOTES:

1. FOR GENERAL NOTES, SEE DWG. 1001.
2. DIMENSIONS AND ELEVATIONS ARE IN METRES.

REV	DATE (DD-MMM-YY)	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	CUSTOMER	REF DRAWING No	REFERENCE DRAWING TITLE
5	03-JUL-15	ISSUED FOR CONSTRUCTION	JH	JRG	JRG	AJT	LRM			
4	24-APR-15	RE-ISSUED FOR TENDER	JRG	JH	JRG	AJT	LRM			
3	20-APR-15	RE-ISSUED FOR TENDER	JRG	JH	JRG	AJT	AJT			
2	10-APR-15	ISSUED FOR TENDER	JH	BJM	JRG	AJT	LRM			
1	31-MAR-14	RE-ISSUED FOR CONSTRUCTION	JH		SC	AJT	LRM			
0	27-MAR-14	ISSUED FOR CONSTRUCTION	JH	BJM	SC	AT	LM			
A	06-MAR-14	ISSUED FOR CLIENT REVIEW	JH	BJM	SC	AT	LM			

D SHEET SCALE SHOWN

OneWay to zero harm

WORLEYPARSONS PROJECT No
307076-06729

ENGINEERING AND PERMIT STAMPS (As Required)

CUSTOMER

Yukon Government
Department of Energy, Mines and Resources
Assessment and Abandoned Mines

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CLINTON CREEK
DROP STRUCTURE 4 REPAIR
PROFILE AND SECTIONS

DRG No 307076-06729-00-CI-DGA-1002

REV 5

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PLOT DATE & TIME: 3/7/2015 3:23:24 PM
SAVE DATE & TIME: 3/7/2015 10:39:10 AM

NOTES:

1. FOR GENERAL NOTES, SEE DWG. 1001.
2. DIMENSIONS AND ELEVATIONS ARE IN METRES.
3. ACCESS ROAD AND CORRIDOR LOCATIONS ARE APPROXIMATE AND ARE TO BE CONFIRMED IN THE FIELD.
4. CONTRACTOR SHALL PREPARE A CONSTRUCTION WATER MANAGEMENT PLAN AND SUBMIT TO THE ENGINEER FOR APPROVAL PRIOR TO STARTING WORK.
5. APPROXIMATE WATER STORAGE CAPACITY IN HUDGEON LAKE IS 6,900m^3/cm INCREASE IN WATER LEVEL.
6. APPROXIMATE MONTH-AVERAGED DISCHARGE RATES FROM HUDGEON LAKE ARE SHOWN IN THE FOLLOWING TABLE:

JUNE	0.89m^3/s
JULY	0.56m^3/s
AUGUST	0.49m^3/s
SEPTEMBER	0.67m^3/s
OCTOBER	0.41m^3/s

7. FLOW RATES ARE BASED ON A DISCONTINUOUS FLOW RECORD FROM 1978 TO 2004 AND ARE PROVIDED FOR INFORMATION ONLY. AVERAGE RATES COULD BE IMPACTED BY HEAVY RAINS, LATE FRESHET, AND/OR LARGER THAN AVERAGE SNOWPACK. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO SELECT AND SIZE WATER DIVERSION INFRASTRUCTURE THAT WILL ENABLE THE TIMELY COMPLETION OF THE WORK AND TO DETERMINE LAKE WATER LEVELS AND FLOW RATES AT WHICH THE DIVERSION SHOULD BE TAKEN OUT OF SERVICE.

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5	03-JUL--15	ISSUED FOR CONSTRUCTION	JH	JRG	JRG	AJT	AJT			
4	08-JUN-15	RE-ISSUED FOR TENDER - REMOVED MATERIAL STOCKPILES	JRG	JH	JRG	AJT	AJT			
3	20-APR-15	RE-ISSUED FOR TENDER	JRG	JH	JRG	AJT	AJT			
2	10-APR-15	ISSUED FOR TENDER	JH	BJM	JRG	AJT	LRM			
1	31-MAR-14	RE-ISSUED FOR CONSTRUCTION	JH		JRG	AJT	LRM			
0	27-MAR-14	ISSUED FOR CONSTRUCTION	JH	BJM	SC	AT	LM			
A	06-MAR-14	ISSUED FOR CLIENT REVIEW	JH	BJM	SC	AT	LM			

D SHEET SCALE SHOWN

OneWay to zero harm

WORLEYPARSONS PROJECT No 307076-06729

ENGINEERING AND PERMIT STAMPS (As Required)

CUSTOMER

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CLINTON CREEK
DROP STRUCTURE 4 REPAIR
CONSTRUCTION STAGING PLAN

DRG No 307076-06729-00-CI-DGA-1003

REV 5

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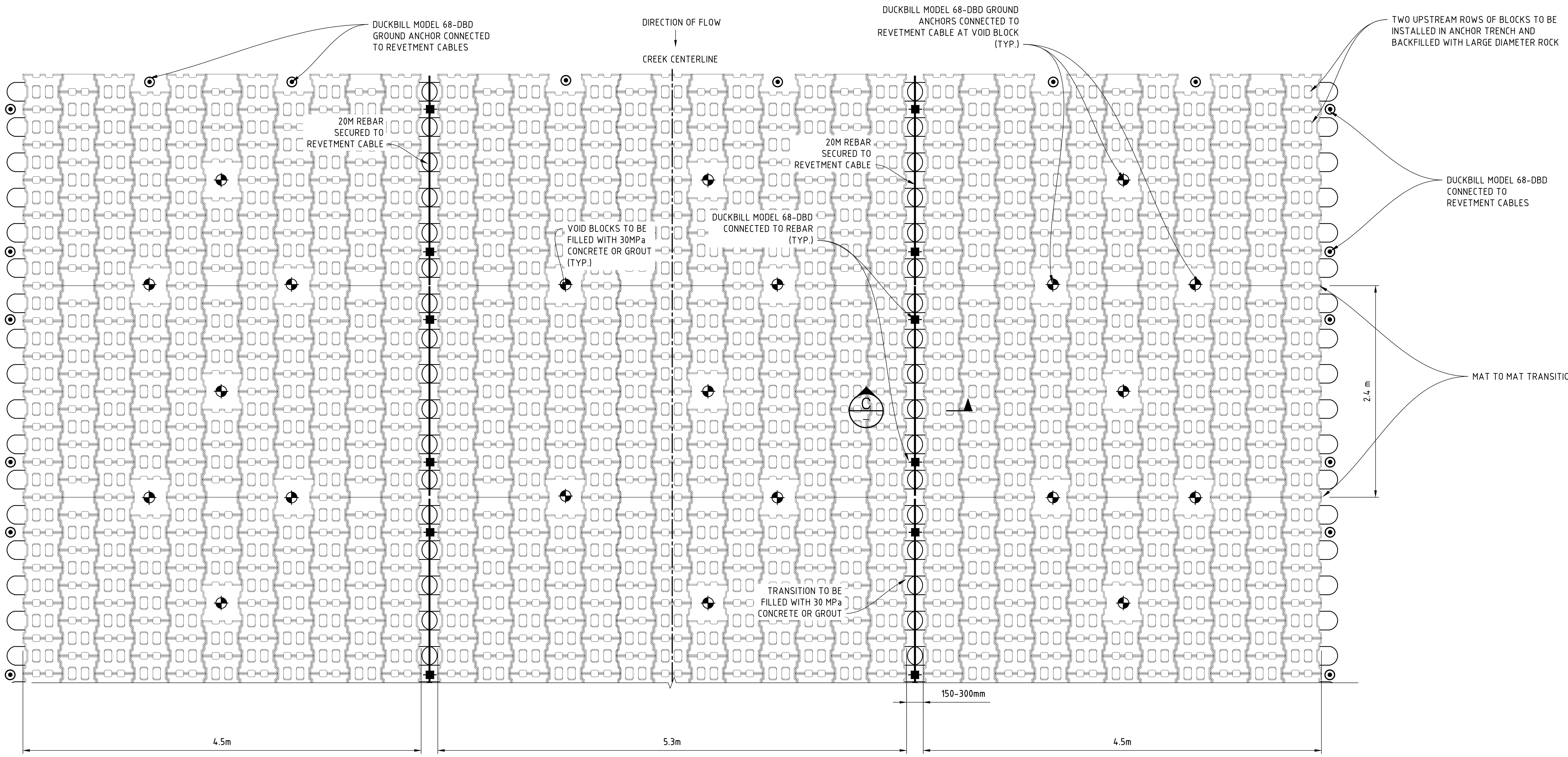

MAT ANCHORING PLAN
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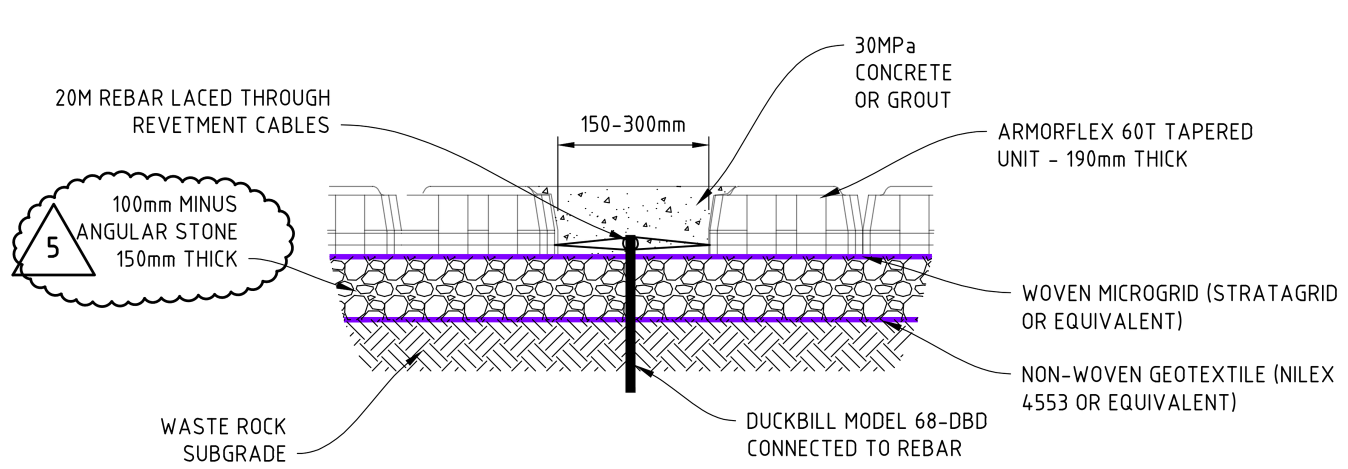

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1:30

LEGEND

- MAT TO MAT TRANSITION GROUND ANCHORS TO BE FILLED WITH GROUT OR CONCRETE
- OUTSIDE EDGE GROUND ANCHORS
- VOID BLOCK GROUND ANCHORS TO BE FILLED WITH GROUT OR CONCRETE

NOTES:

1. FOR GENERAL NOTES, SEE DWG. 1001.
2. DIMENSIONS AND ELEVATIONS ARE IN METRES.

REV	DATE (DD-MMM-YY)	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	CUSTOMER	REF DRAWING No	REFERENCE DRAWING TITLE
4	03-JUL-15	ISSUED FOR CONSTRUCTION	JH	JRG	JRG	AJT	LRM			
3	24-APR-15	RE-ISSUED FOR TENDER	JRG	JH	JRG	AJT	LRM			
2	20-APR-15	RE-ISSUED FOR TENDER	JRG	JH	JRG	AJT	AJT			
1	10-APR-15	ISSUED FOR TENDER	JH	JRG	JRG	AJT	LRM			

D SHEET SCALE SHOWN

OneWay to zero harm

WORLEYPARSONS PROJECT No
307076-06729

ENGINEERING AND PERMIT STAMPS (As Required)

CUSTOMER

Yukon Government
Department of Energy, Mines and Resources
Assessment and Abandoned Mines

"This drawing is prepared for the use of the contractual customer of WorleyParsons Canada Services Ltd. and WorleyParsons Canada Services Ltd. assumes no liability to any other party for any representations contained in this drawing."

WorleyParsons resources & energy

CLINTON CREEK
DROP STRUCTURE 4 REPAIR
MAT ANCHORING PLAN AND DETAIL

DRG No 307076-06729-00-CI-DGA-1004 REV 4

LOCATION: U:\YVR\307076\06729_GOY_DS4REPAIR\11_DRAWINGS\01_CIVIL\05_DS4 REPAIR\307076-06729-00-CI-DGA-1004.DWG
USER NAME: jiang.hu
PLOT DATE & TIME: 3/7/2015 3:24:22 PM
SAVE DATE & TIME: 3/7/2015 9:39:44 AM

Appendix 3 Test Results

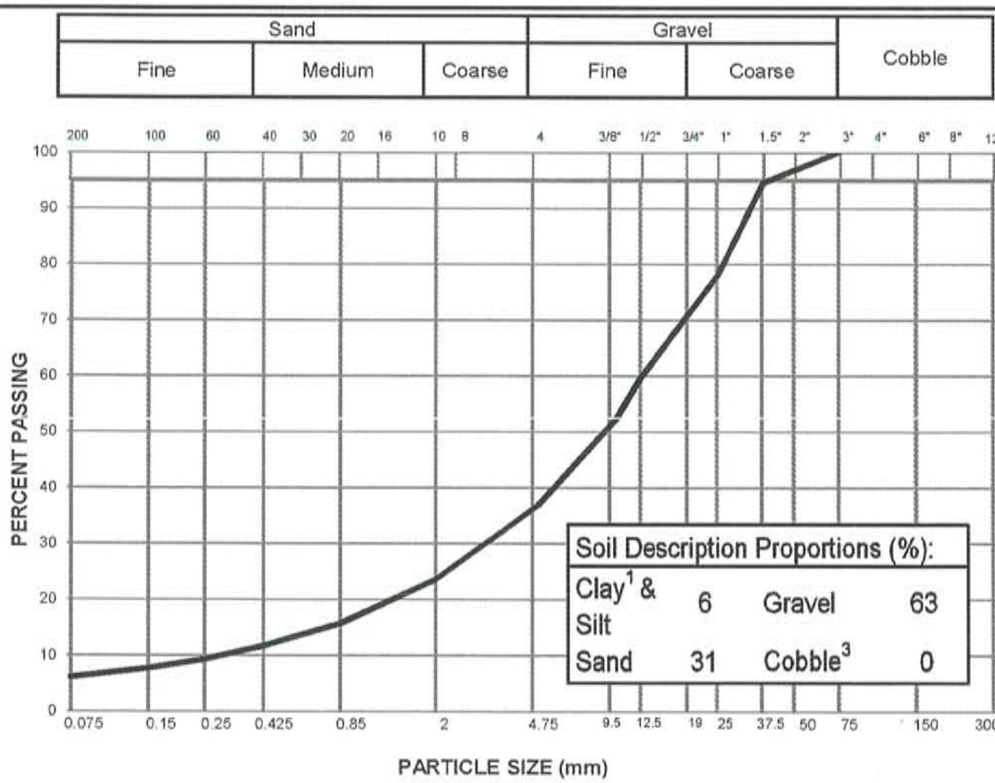
100 Minus Angular Rock – Particle Size Analysis and Moisture-Density Relationship Reports

PARTICLE SIZE ANALYSIS REPORT

ASTM D422, C136 & C117

Project:	Clinton Creek	Sample No.:	SA02
Project No.:	W14103619-01	Material Type:	
Site:	Clinton Creek Road	Sample Loc.:	Entrance Pit
Client:	WorleyParsons	Sample Depth:	
Client Rep.:	Margret McBride	Sampling Method:	Grab
Date Tested:	June 3, 2015 By: AMT	Date sampled:	May 31, 2015
Soil Description[2]:	GRAVEL - sandy, trace silt	Sampled By:	Client
		USC Classification:	Cu: 42.3
Moisture Content:	1.5%		Cc: 3.1

Particle Size (mm)	Percent Passing
300	
200	
150	
100	
75	100
50	
38	95
25	78
19	71
12.5	60
10	52
5	37
2	24
0.85	16
0.425	12
0.25	9
0.15	8
0.075	6.1



Soil Description Proportions (%):			
Clay[1] & Silt	6	Gravel	63
Sand	31	Cobble[3]	0

Notes: [1] The upper clay size of 2 um, per the Canadian Foundation Engineering Manual
[2] The description is visually based & subject to EBA description protocols
[3] If cobbles are present, sampling procedure may not meet ASTM C702 & D75

Specification:

Remarks:

Reviewed By: ______________ P.Eng.

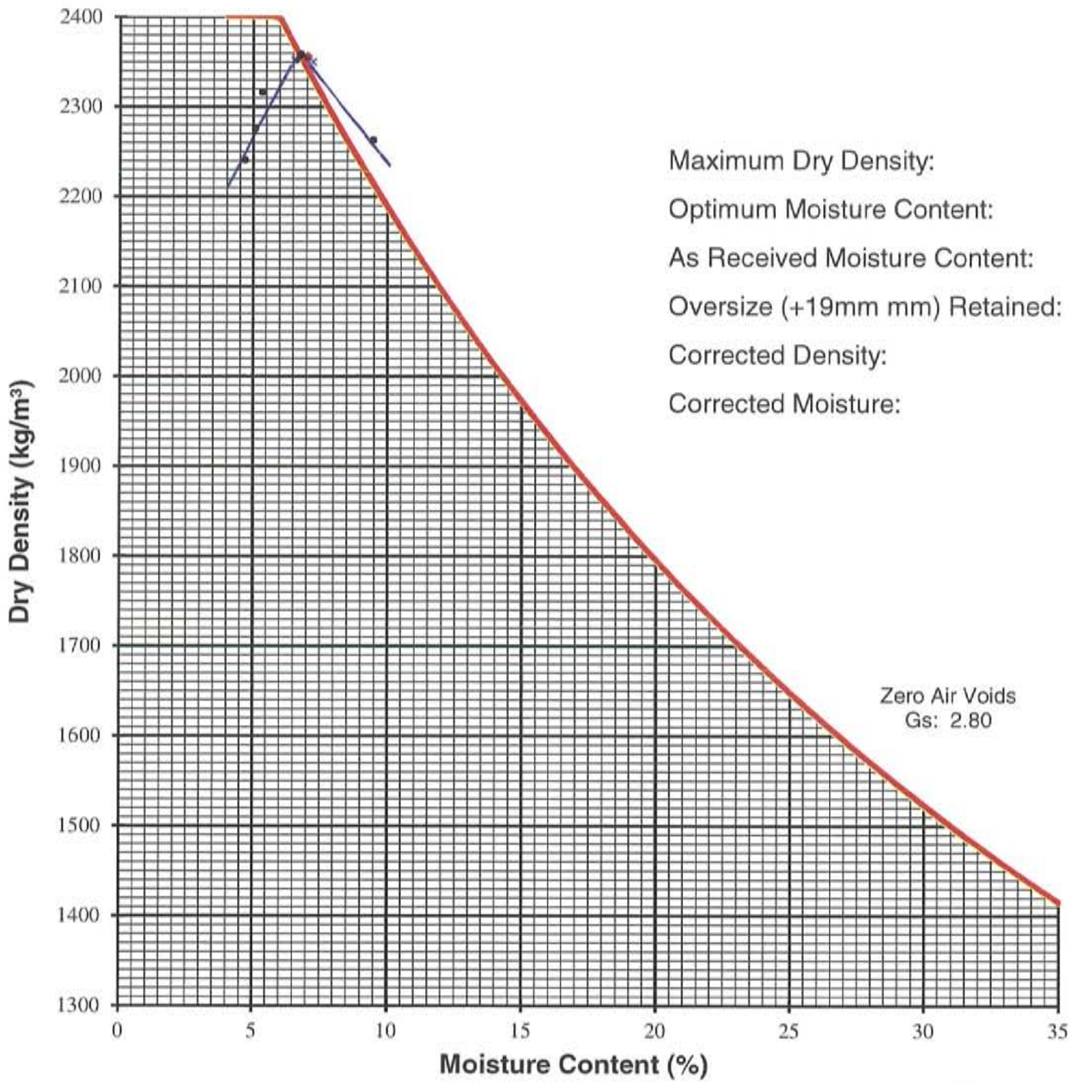
Data presented hereon is for the sole use of the stipulated client. Tetra Tech EBA is not responsible, nor can be held liable, for use made of this report by any other party, with or without the knowledge of Tetra Tech EBA. The testing services reported herein have been performed to recognized industry standards, unless noted. No other warranty is made. These data do not include or represent any interpretation or opinion of specification compliance or material suitability. Should engineering interpretation be required, Tetra Tech EBA will provide it upon written request.

TETRA TECH

MOISTURE-DENSITY RELATIONSHIP (Proctor) REPORT

ASTM D1557 Modified

Project:	Clinton Creek, Dawson City	Sample No.:	SA02
Client:	WorleyParsons	Sampled By:	RMD
Attention:	Margaret McBride	Sample Date:	June 2, 2015
Project No.:	W14103619-01	Test Date:	June 5, 2015
Description:	GRAVEL - sandy, trace silt	Preparation:	Oven Dry
Source:	Entrance Pit	Compaction:	Manual



Maximum Dry Density:	2355	kg/m³
Optimum Moisture Content:	7.0	%
As Received Moisture Content:		%
Oversize (+19mm mm) Retained:	30	%
Corrected Density:	2475	%
Corrected Moisture:	5.2	%

Remarks:

Reviewed By: C.E.T.

Data presented hereon is for the sole use of the stipulated client. Tetra Tech EBA is not responsible, nor can be held liable, for use made of this report by any other party, with or without the knowledge of Tetra Tech EBA. The testing services reported herein have been performed to recognized industry standards, unless noted. No other warranty is made. These data do not include or represent any interpretation or opinion of specification compliance or material suitability. Should engineering interpretation be required, Tetra Tech EBA will provide it upon written request.

TETRA TECH

Project Title:	REQUEST FOR BID FOR REPAIR OF CLINTON CREEK DROP STRUCTURES Tender No. 2015/16-1484

Attention All Planholders:

General

1.1 This addendum shall be read in conjunction with the specifications and Contract Documents.

1.2 Where inconsistent with the above, this addendum shall govern. This addendum forms an integral part of the RFB and Contract Documents and shall be included therein.

1.3 No consideration shall be allowed for increases (extras) to the CONTRACT PRICE due to failure of the Contractor being familiar with this addendum.

1.4 It is the planholder's responsibility to ensure all addenda have been received prior to the closing time and date.

1.5 The planholder should acknowledge receipt of addenda on the tender form.

Scope of this addendum:

Part H: Bid Form & Schedules DELETE SCHEDULE A – Schedule of Values and REPLACE with the revised SCHEDULE A - Schedule of Values

Part F: Specifications and Drawings

DELETE Drawing 307076-06729-00-CI-DGA-1001 Rev.4 and REPLACE with Drawing 307076-06729-00-CI-DGA-1001 Rev.5.

DELETE Drawing 307076-06729-00-CI-DGA-1003 Rev.3 and REPLACE with 307076-06729-00-CI-DGA-1003 Rev.4.

DELETE Specification SECTION 31 05 16 AGGREGATES AND GRANULAR MATERIALS and REPLACE with SECTION 31 05 16 AGGREGATES AND GRANULAR MATERIALS – Rev.1

ADD Appendix 3 - Test Results of Fill Material

Attachments:

1. Revised Schedule A – Schedule of Values
2. Part F: Drawing 1001 Drop Structure Plan Rev.5.
3. Part F: Drawing 1003 Drop Structure Construction Staging Plan Rev.4.
4. Part F: SECTION 31 05 16 AGGREGATES AND GRANULAR MATERIALS – Rev.1
5. Appendix 3 – Test Results – 100 mm Minus Angular Rock – Particle Size Analysis and Moisture-Density Relationship Reports

Continued...

Project Title: REQUEST FOR BID FOR REPAIR OF CLINTON CREEK DROP STRUCTURES
Tender No. 2015/16-1484

Scope of this addendum, continued:

Questions

Question 1. Please confirm whether the site is under the provisions of the Mine Act.

Answer 1. The Clinton Creek site is an abandoned mine site and is currently operating under Section 37 of the *Waters Act*, SY 2003 c.19. For further clarity the Clinton Creek Site is a mine.

The Work will be conducted under the provisions of the *Occupational Health and Safety Act*, R.S.Y. 2002, c. 159 and its regulations as outlined in section 6.3 PART C: Bid Submission Form And Contents.

Question 2. To ensure we meet safety standards and can create an adequate diversion plan, can you please provide us with the peak flows in the creek?

Answer 2. Using daily flow rates from 2011, 2013 and 2014 (June through September), estimated flow rates associated with various probabilities and durations were developed and are presented in the following table.

Exceedance Probability	**Peak flow (m^3/day)**	**Peak flow 7-Day Average (m^3/day)**
5%	1,030,000	580,000
10%	820,000	480,000
25%	540,000	330,000
50%	280,000	200,000

Over a 30 day period, these are the probabilities that the associated flow rate will be reached or exceeded over a single day and averaged over a 7 day period. For example, there is a 10% chance that the daily average flow rate will be 820,000 m^3/day or higher, and that the weekly average flow rate will be 480,000 m^3/day or higher.

The data presented above has the following limitations:

- These flow rates are estimated based on a limited data set, which can significantly impact the accuracy of estimates. This impact is magnified for less frequent storm events.
- The flow data was based on water level readings logged remotely, transcribed to flow readings based on a rating curve. This rating curve was completed based on flow rates of 1.6 m^3/s. This can impact the accuracy of flow rates logged during large flows.

Continued...

Project Title:	REQUEST FOR BID FOR REPAIR OF CLINTON CREEK DROP STRUCTURES Tender No. 2015/16-1484

Scope of this addendum, continued:

- The data logger is approximately 5 km downstream of the Hudgeon Lake outlet and monitors a catchment area of approximately 180 km^2, compared to the 117 km^2 catchment reporting to the Hudgeon Lake outlet. The data was scaled accordingly; however, the additional catchment area would largely be unattenuated which will skew the data.

Average flows during the June to September construction window recorded between 1978 and 2004 (with some data gaps) were also analyzed to estimate monthly average flow rates associated with various probabilities as shown in the following table.

	Monthly Average Flow			
Month	**5% Exceedance (m^3/s)**	**10% Exceedance (m^3/s)**	**25% Exceedance (m^3/s)**	**50% Exceedance (m^3/s)**
June	1.7	1.5	1.1	0.8
July	1.5	1.2	0.8	0.5
August	1.5	1.2	0.8	0.4
September	1.6	1.3	0.9	0.6

This information could be used to estimate the average flow rate that should be maintained to prevent prolonged water level rise in the lake. It should also be noted that a minimum flow rate of 0.2 m^3/s must be maintained at all times through the diversion to protect downstream habitat. The estimated surface area of Hudgeon Lake is 115 ha.

The provision of these estimated flow rates are provided for information only. It is the responsibility of the Contractor to design the water management protocols to address potential risks. This plan should include:

- Selecting diversion flow rates (maintain the minimum flow of 0.2m^3/s);
- Sizing the diversion dam height; and
- Regular monitoring of lake levels, diversion inspection, pump operation, and pre-determined actions to be taken in response to rising water levels (e.g., increasing pumping rate, removal of diversion and reinstatement of creek flow).

Question 3. Can you please provide us with the load rating and dimensions of the bridge (max load and width)?

Answer 3. Obtaining the information related to the bridge and ensuring that equipment and material can safely be mobilized to the site is the responsibility of the bidders. This information

Continued...

should be available through the Transport Engineering Branch (Amin Abdullah – Manager Bridges 867.633.7942) - Department of Highway and Public Work – Yukon.

Question 4. An extension for an additional five business days is requested for this tender.

Answer 4. YG is unable to provide an extension of the Closing Time due to time constraints for the delivery of the project.

Contract Officer: Geena Grossinger

Date: June 10, 2015

Signature:

SCHEDULE A – SCHEDULE OF VALUES

Revised – Addendum #1

REPAIR OF CLINTON CREEK DROP STRUCTURES, AAM 15-003

BIDDER NAME:

***UNIT PRICE TABLE*, DEFINITIONS & MEASUREMENT FOR PAYMENT PROCEDURES**

Item	Class of Labour, *Plant* or *Material*	Spec. Ref.	Unit of Measure	Approx. Quantity	Unit Price	Amount
1	Mobilization & Demobilization	02 02 00	Lump Sum			
2	Common Excavation of Waste Rock and Stockpile Excess *Material*	31 14 11	m^3	9,500		
3	Produce and Placement of Channel Infill Sub-base (Waste Rock)	31 14 11	m^3	1,000		
4	Channel Infill Base, 100 mm Minus Angular Rock Including Non-woven Geotextile					
	Load, Haul and Placement from on -Site Sourced	31 05 16	m^3	120		
5	Produce and Placement of Large Rock	31 37 10	m^3	30		
6	Supply, Delivery, and Placement of Armorflex					
	Armorflex (2.4 m by 4.5 m mats) including woven Microgrid, rebar, ground anchors and concrete/grout	31 36 19	each	36		
	Armorflex (2.4 m by 5.3 m mats) including woven Microgrid, rebar, ground anchors and concrete/grout	31 36 19	each	18		

BIDDER NAME:

Schedule A Continued

7	Environmental Compliance (Including Preparation of EMP)	02 14 00	Lump Sum			
8	Water Management (Including Preparation of WMP)	02 14 00	Lump Sum			
9	Provisional Cost Sum for Additional Work	01 11 00	Lump Sum			$75,000
TOTAL BID PRICE (NO GST) – Sum Items 1 - 9					$_________________	

Definitions of Lump Sum and *Unit Price* Items

1. Item 1 - Mobilization & Demobilization

    a. The Owner shall pay for mobilization at 60 percent of the lump sum price bid for "Mobilization and Demobilization" when the Contractor has delivered its full spread of equipment as listed on its equipment list submitted with its tender or the revised equipment list requested by the Engineer as well as the completion of the temporary access roads.

    b. The Owner shall pay for demobilization up to a maximum of 40 percent of the lump sum price bid for "Mobilization and Demobilization" when the Engineer is satisfied that equipment, camp items and other incidentals have been removed from the Site, the temporary access road has been deactivated, and that the Site has been trimmed and cleaned up.

    c. The Owner shall only pay once for mobilization and demobilization, regardless of the number of times the Contractor mobilizes or demobilizes.

    d. Nothing herein shall be construed to limit or preclude partial payments otherwise provided by the Contract.

2. Item 2 - Common Excavation of Waste Rock and Stockpile Excess *Material*

    a. The Contractor's *Unit Price* per cubic metre of Common Excavation of Waste Rock (Schedule of Values - Item 2) shall include all costs associated with the excavation of the waste rock slope and stockpiling of excess *Material* (i.e., *Material* not used to infill the channel).

    b. Payment for Common Excavation of Waste Rock shall be based on the volume measured between the Original Grade (OG) and the Finished Waste Rock Slope (FWRS) surveyed surfaces less the volume of waste rock used as Channel Infill Sub-base.

3. Item 3 - Produce and Placement of Channel Infill Sub-base (Waste Rock)

    a. The Contractor's Unit Price per cubic metre of Channel Infill Sub-base (Schedule of Values - Item 3) shall include all costs associated with the placement of the Material including, but not limited to: processing (if required), stockpiling, loading, hauling, placing, grading, addition of water, compacting, and completion of the quality control procedures described herein.

    b. Payment for Channel Infill Sub-base shall be based on the volume measured between the OG and the Subgrade of Channel Infill (SCI) surveyed surfaces.

4. Item 4 - Channel Infill Base, 100 mm Minus Angular Rock Including Non-woven Geotextile

    a. The Contractor's *Unit Price* per cubic metre of 100 mm Minus Angular Rock, used as Channel Infill Base *Material* (Schedule of Values - Item 4), shall include all costs associated with the placement of the *Material* including, but not limited to: placement of non-woven geotextile, processing (if required), supplying, stockpiling, loading, hauling, placing, grading, addition of water, compacting, and completion of the quality control procedures discussed herein.

    b. No separate payment for overhaul. Include all costs for hauling in the cubic metre *Unit Price* for this item.

    c. No payment for overbuild of the Channel Infill Base *Material* beyond neat lines shown on cross section.

d. Payment for blending of *Material*s to achieve specified gradation will be considered incidental to the costs of processing, and no separate payment will be made.

e. Payment for this item shall be based on the volume measured between the Subgrade of Channel Infill (SCI) and Grade of Channel Infill (GCI) surveyed surfaces.

5. Item 5 - Produce and Placement of Large Rock

a. The Contractor's *Unit Price* per cubic metre of Produce and Placement of Large Rock (Schedule of Values - Item 5) shall include all costs associated with the placement of the *Material* including but not limited to: processing (if required), stockpiling, loading, hauling and placing.

b. Payment for Produce and Placement of Large Rock shall be based on the volume measured between the Subgrade of Channel Infill (SCI) and Large Diameter Rock (LDR) surveyed surfaces.

6. Item 6 - Supply, Delivery, and Placement of Armorflex

a. The Contractor's *Unit Price* per unit of Armorflex® mat (Schedule of Values – Item 6) shall include all costs associated with the installation including, but not limited to: supply, delivery, storage, and installation of the mats, woven Microgrid, rebar, ground anchors, and concrete/grout; as well as time, travel, accommodations, and meal expenses required for the manufacturer's representative to attend the Site.

7. Item 7 and Item 8 - Environmental Compliance and Water Management

a. Payment by lump sum for Environmental Compliance is to be full compensation for the following:

i. Preparation of the EMP and WMP.

ii. Compliance with the EMP and WMP including the design, construction and maintenance of the water diversion and environmental protection activities, including but not limited to, sediment and erosion control; oil and fuel storage and spill plans; contaminated soil testing, storage, removal or treatment procedures; water and waste water use; equipment servicing and washing areas; water truck loading areas and pumping operations; procedures to test for and take leaking equipment out of service; garbage disposal and litter control; and protection of natural resources and wildlife.

iii. Attendance at environmental briefings, meetings and inspections by the appropriate employees of the Contractor as necessary.

b. Costs associated with compliance with the Mitigating Conditions are considered incidental to the work, and no separate payment will be made.

c. Costs associated with compliance with environmental laws, regulations, licenses, permits and authorizations are considered incidental to the work, and no separate payment will be made.

8. Item 9 - Provisional Cost Sum for Additional Work

a. A Provisional Cost Sum is provided in the *Unit Price Table*. This sum is to cover the cost of renting Contractor's equipment and for providing labour and *Material*s for undertaking any additional work as directed by the Engineer during the course of the project, which is not paid for under any other item in the contract.

b. Prior to the start of any such additional work, the Contractor shall submit an estimate to complete the additional work, on a time and *Material*s basis, to the Owner for approval.

NO SEPARATE PAYMENT WILL BE MADE FOR ANY OTHER COSTS. All other costs for completing the *Work* shall be considered incidental to the *Work* and shall be included within the appropriate Bid item.

POINT TABLE			

POINT #	NORTHING	EASTING	DESCRIPTION
WP1	7147384.84	513036.75	CENTERLINE AT TIE-IN WITH GABION DROP STRUCTURE
WP2	7147379.11	513064.46	CENTERLINE AT GRADE BREAK
WP3	7147376.09	513079.13	CENTERLINE AT END OF ARMORFLEX MATS
WP4	7147364.82	513076.81	WORK POINT
WP5	7147373.10	513036.65	WORK POINT

NOTES:

GENERAL NOTES

1. DIMENSIONS AND ELEVATIONS ARE IN METRES.
2. ALL COORDINATES ARE IN NAD 83. THE FOLLOWING EXISTING SURVEY CONTROL POINTS SHOULD BE USED FOR REFERENCE:

ID	NORTHING (m)	EASTING (m)	ORTHOMETRIC HEIGHT (masl)
No. 2834	7148712.673	513447.724	606.823
No. 2835	7147272.790	513147.057	432.669
No. 1086	7147972.219	513176.710	590.955
No. 1192	7147563.984	512278.758	441.231

3. SITE PLAN, CHANNEL PROFILE, CROSS SECTIONS AND EARTHWORK QUANTITIES ARE BASED ON 2006 ELEVATION DATA FOR THE SITE AS WELL AS 2013 AND 2014 SURVEY OF THE CLINTON CREEK CHANNEL.

MATERIALS

4. FILL MATERIAL SHALL CONSIST OF UNFROZEN EXCAVATED WASTE ROCK
5. ARMORFLEX MATS SHALL BE CLASS 60T
6. 100mm MINUS ANGULAR ROCK
7. LARGE DIAMETER ROCK SHOULD HAVE AN AVERAGE DIMENSION OF BETWEEN 300 AND 800 mm AND SHOULD BE SOURCED ON SITE

APPROXIMATE MATERIAL QUANTITIES

EXCAVATION	9,500 m^3
FILL	1,000 m^3
100mm MINUS ANGULAR ROCK	120 m^3
CLASS 60T ARMORFLEX MATS (2.4m X 4.5m)	36
CLASS 60T ARMORFLEX MATS (2.4m X 5.3m)	18
NON-WOVEN GEOTEXTILE	900 m^2
WOVEN MICROGRID GEOTEXTILE	900 m^2
LARGE DIAMETER ROCK (300 TO 800 mm)	30 m^3
30Mpa CONCRETE OR GROUT	10m^3
DUCKBILL 68-DBD GROUND ANCHOR	312
20m REBAR	100m

EXECUTION - GENERAL

8. SURVEY OF EXISTING AND FINISHED GRADES SHALL BE COMPLETED BY THE SURVEYOR / CONTRACTOR FOR THE DETERMINATION OF QUANTITIES AND THE PREPARATION OF AS-BUILT DRAWINGS.

EXECUTION - BULK EARTHWORKS

9. THE UNSTABLE WASTE ROCK SLOPE ON THE SOUTH SIDE OF CLINTON CREEK, DOWNSTREAM OF THE DAMAGED GABION DROP STRUCTURE, SHALL BE CUT BACK TO A 2H:1V SLOPE. THE SLOPE ON THE NORTH SIDE OF CLINTON CREEK SHALL BE FILLED AT A SLOPE OF 50H:1V AND CUT BACK TO A 1H:1V SLOPE.
10. A PORTION OF THE EXCAVATED WASTE ROCK SHALL BE USED TO FILL THE CHANNEL AND CONSTRUCT A 5 M WIDE ACCESS ROAD DOWNSTREAM OF THE DAMAGED GABION DROP STRUCTURE. FINISHED ELEVATIONS AND COMPACTION REQUIREMENTS ARE SPECIFIED ON THE CHANNEL PROFILE AND SECTIONS.
11. REMAINING (I.E. WASTE) EXCAVATED WASTE ROCK SHALL BE STOCKPILED IN A LOCATION TO BE DETERMINED BY THE ONSITE ENGINEER AT THE START OF CONSTRUCTION.

EXECUTION - CHANNEL CONSTRUCTION

12. DAMAGED GABION BASKETS DOWNSTREAM OF START OF ARMORFLEX MATS SHALL BE REMOVED PRIOR TO CHANNEL INFILLING. ENGINEER SHALL CONFIRM IN THE FIELD WHICH BASKETS SHALL BE REMOVED. BASKETS SHALL BE CUT FLUSH WITH ADJOINING BASKETS AND ROCK MATERIAL TO BE STOCKPILED ON SITE.
13. NON-WOVEN GEOTEXTILE (NILEX 4553) SHALL BE INSTALLED ON TOP OF THE WASTE ROCK WITH A MINIMUM OVERLAP LENGTH OF 600mm AND KEYED IN AT THE EDGES A MINIMUM OF 1.5m.
14. 190 mm OF 100mm MINUS ANGULAR ROCK SHALL BE PLACED AND COMPACTED TO 95% MPMDD OVER THE WASTE ROCK FILL AS SHOWN ON THE PROFILE (DRAWING 1002).
15. WOVEN MICROGRID (STRATAGRID OR EQUIVALENT) SHALL BE INSTALLED ON TOP OF THE ANGULAR ROCK LAYER WITH A MINIMUM OVERLAP LENGTH OF 600mm AND KEYED IN AT THE EDGES A MINIMUM OF 1.5m.
16. CLASS 60T ARMORFLEX MATS SHALL BE INSTALLED ON TOP OF THE ANGULAR ROCK BEDDING IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS AND RECOMMENDATIONS. THE ARMORFLEX MATS ARE TO BE PLACED ACROSS THE CHANNEL (I.E., WITH THE LONGEST DIMENSION ALIGNED PERPENDICULAR TO THE DIRECTION OF FLOW) WITH THE 2.4 M X 5.3 M PLACED ACROSS THE CENTER OF THE CHANNEL AND THE TWO 2.4 M X 4.5 M MATS ON MAT EITHER SIDE SLOPES AND A PORTION OF THE CHANNEL BOTTOM.
17. LARGE DIAMETER ROCK SHALL BE SOURCED ON SITE AND USED TO KEY IN THE UPSTREAM AND DOWNSTREAM ENDS OF THE ARMORFLEX AS SHOWN ON DRAWING 1002, PROFILE.
18. DUCKBILL MODEL 68-DBD SHALL BE DRIVEN INTO THE WASTE ROCK A MINIMUM OF 900 mm AT EACH VOID FULL BLOCK AND ½ BLOCK AND 2 AT EVERY MAT TO MAT CONNECTION AND AT MAT ENDS. THE ANCHORS SHALL BE SECURED TO THE REVETMENT CABLE USING FASTENERS PER MANUFACTURER'S RECOMMENDATIONS.
19. A 20M PIECE OF REBAR SHALL BE THREADED THROUGH THE REVETMENT CABLES, PARALLEL TO THE CHANNEL, TO CONNECT THE MATS AND SHALL BE BACKFILLED WITH 30 MPA CONCRETE.
20. SOME "FIELD ENGINEERING" MAY BE REQUIRED TO TIE THE PROPOSED CHANNEL INTO THE DAMAGED GABION DROP STRUCTURE UPSTREAM AND THE EXISTING CHANNEL DOWNSTREAM.

REV	DATE (DD-MMM-YY)	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	CUSTOMER	REF DRAWING No	REFERENCE DRAWING TITLE
5	28-MAY-15	RE-ISSUED FOR TENDER	JRG	JH	JRG	AJT	LRM			
4	24-APR-15	RE-ISSUED FOR TENDER	JRG	JH	JRG	AJT	LRM			
3	20-APR-15	RE-ISSUED FOR TENDER	JRG	JH	JRG	AJT	AJT			
2	10-APR-15	ISSUED FOR TENDER	JH	BJM	JRG	AJT	LRM			
1	31-MAR-14	RE-ISSUED FOR CONSTRUCTION	JH		SC	AJT	LRM			
0	27-MAR-14	ISSUED FOR CONSTRUCTION	JH	BJM	SC	AT	LM			
A	06-MAR-14	ISSUED FOR CLIENT REVIEW	JH	BJM	SC	AT	LM			

D SHEET SCALE SHOWN

OneWay™ to zero harm

WORLEYPARSONS PROJECT No 307076-06729

ENGINEERING AND PERMIT STAMPS (As Required)

HYDROTECHNICAL

PROFESSIONAL YUKON JACOB GENTLES TERRITORY ENGINEER

MAY 28, 2015

Geotechnical

PROFESSIONAL YUKON LEE MARTIN TERRITORY ENGINEER

May 28/15

CUSTOMER

Yukon Government
Department of Energy, Mines and Resources
Assessment and Abandoned Mines

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WorleyParsons resources & energy

CLINTON CREEK
DROP STRUCTURE 4 REPAIR
PLAN

DRG No 307076-06729-00-CI-DGA-1001 REV 5

PLOT DATE & TIME: 28/5/2015 1:50:35 PM
SAVE DATE & TIME: 27/5/2015 1:04:53 PM
USER NAME: jake.gentles
LOCATION: U:\YVR\307076\06729_GOY_DS4REPAIR\11_DRAWINGS\01_CIVIL\05_DS4 REPAIR\307076-06729-00-CI-DGA-1001 AND 1002.DWG

NOTES:

1. FOR GENERAL NOTES, SEE DWG. 1001.
2. DIMENSIONS AND ELEVATIONS ARE IN METRES.
3. ACCESS ROAD AND CORRIDOR LOCATIONS ARE APPROXIMATE AND ARE TO BE CONFIRMED IN THE FIELD.
4. CONTRACTOR SHALL PREPARE A CONSTRUCTION WATER MANAGEMENT PLAN AND SUBMIT TO THE ENGINEER FOR APPROVAL PRIOR TO STARTING WORK.
5. APPROXIMATE WATER STORAGE CAPACITY IN HUDGEON LAKE IS 6,900m^3/cm INCREASE IN WATER LEVEL.
6. APPROXIMATE MONTH-AVERAGED DISCHARGE RATES FROM HUDGEON LAKE ARE SHOWN IN THE FOLLOWING TABLE:

JUNE	0.89m^3/s
JULY	0.56m^3/s
AUGUST	0.49m^3/s
SEPTEMBER	0.67m^3/s
OCTOBER	0.41m^3/s

7. FLOW RATES ARE BASED ON A DISCONTINUOUS FLOW RECORD FROM 1978 TO 2004 AND ARE PROVIDED FOR INFORMATION ONLY. AVERAGE RATES COULD BE IMPACTED BY HEAVY RAINS, LATE FRESHET, AND/OR LARGER THAN AVERAGE SNOWPACK. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO SELECT AND SIZE WATER DIVERSION INFRASTRUCTURE THAT WILL ENABLE THE TIMELY COMPLETION OF THE WORK AND TO DETERMINE LAKE WATER LEVELS AND FLOW RATES AT WHICH THE DIVERSION SHOULD BE TAKEN OUT OF SERVICE.

REV	DATE (DD-MMM-YY)	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	CUSTOMER	REF DRAWING No	REFERENCE DRAWING TITLE
4	08-JUN-15	RE-ISSUED FOR TENDER - REMOVED MATERIAL STOCKPILES	JRG	JH	JRG	AJT	AJT			
3	20-APR-15	RE-ISSUED FOR TENDER	JRG	JH	JRG	AJT	AJT			
2	10-APR-15	ISSUED FOR TENDER	JH	BJM	JRG	AJT	LRM			
1	31-MAR-14	RE-ISSUED FOR CONSTRUCTION	JH		JRG	AJT	LRM			
0	27-MAR-14	ISSUED FOR CONSTRUCTION	JH	BJM	SC	AT	LM			
A	06-MAR-14	ISSUED FOR CLIENT REVIEW	JH	BJM	SC	AT	LM			

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WORLEYPARSONS PROJECT No
307076-06729

ENGINEERING AND PERMIT STAMPS (As Required)

PROFESSIONAL ENGINEER
YUKON TERRITORY
JACOB GENTLES
JUNE 8, 2015

CUSTOMER
Yukon
Government
Department of Energy, Mines and Resources
Assessment and Abandoned Mines

"This drawing is prepared for the use of the contractual customer of WorleyParsons Canada Services Ltd. and WorleyParsons Canada Services Ltd. assumes no liability to any other party for any representations contained in this drawing."

WorleyParsons
resources & energy

CLINTON CREEK
DROP STRUCTURE 4 REPAIR
CONSTRUCTION STAGING PLAN

DRG No 307076-06729-00-CI-DGA-1003 | REV 4

LOCATION: U:\YVR\307076\06729_GOY_DS4REPAIR\11_DRAWINGS\01_CIVIL\05_DS4 REPAIR\307076-06729-00-CI-DGA-1003.DWG
USER NAME: jake.gentles
PLOT DATE & TIME: 8/6/2015 12:59:30 PM
SAVE DATE & TIME: 8/6/2015 12:51:22 PM

Table of Contents

1 GENERAL

1.1 Scope

.1 This Section describes the general requirements for the following aggregate materials:

.1 100 mm Minus Angular Rock used as Channel Infill Base Material.

1.2 Related Sections

.1	Section 03 13 00	Surveying
.2	Section 31 14 11	Earthwork and Related Work
.3	Section 31 37 10	Large Diameter Rock
.4	Section 31 36 19	Armoflex Mat

1.3 References

.1 American Society for Testing of Materials International (ASTM):

.1 ASTM D422-63 (2007), Standard Test Method for Particle-Size Analysis of Soils

.2 ASTM D1557-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort

.2 Canadian General Standards Board (CGSB):

.1 CAN / CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric

1.4 Submittals

.1 All compaction and in-situ moisture content test results taken during placement of fill shall be submitted to the Engineer within 72 hours.

1.5 Quality Control

.1 Inspection and testing of materials shall be carried out by a qualified independent agency approved by the Engineer. Cost of testing, including transportation of samples, shall be considered incidental to the Work of this section.

2 PRODUCTS

2.1 All Aggregates

.1 Aggregate Quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, or other substances that would act in deleterious manner for use intended.

.2 Coarse aggregates shall be crushed rock, unless approved otherwise by the Engineer.

.3 Recycled materials including, but not limited to, asphaltic concrete, concrete, and glass are not permitted.

.4 Coarse aggregates shall be sourced from one of the stockpiles located at the Site described in Section 2.2 and confirmed by the Engineer.

2.2 Site Availability

.1 Several aggregate stockpiles have been identified at or near the Site; both immediately outside the entrance gate beside the Clinton Creek Road, and near the outlet of Hudgeon Lake. Based on initial sampling and sieve analysis of aggregate near the surface, this material is suitable for use as 100 mm Minus Angular Rock Gradation. The Contractor should note that several piles of this material are stockpiled and sorted by size. Only stockpiles of 100 mm are considered acceptable for use as 100 mm Minus Angular Rock. The piles to be used are to be confirmed by the Engineer prior to the Work starting.

2.3 100 mm Minus Angular Rock

.1 Unless otherwise approved by the Engineer, the 100 mm Minus Angular Rock used as Channel Infill Base shall have a gradation as shown in Table A.

Table A 100 mm Minus Angular Rock Gradation

Sieve Designation (mm)	Percent Passing
100	100
75	90 to 100
50	60 to 100
25	35 to 80
10	0 to 50
1.25	0 to 25
0.080	0 to 10

2.4 Source Quality Control

.1 Acceptance of material at the source does not preclude future rejection if it fails to conform to requirements specified, lacks uniformity, or if its field performance is found to be unsatisfactory.

3 EXECUTION

3.1 Processing

.1 Aggregates shall be processed uniformly using methods that prevent contamination, segregation, and degradation.

.2 Aggregates shall be blended, if required, to obtain gradation requirements, percentage of crushed particles, or particle shapes, as specified. Use approved methods and equipment.

.3 Aggregates shall be washed, if required to meet Specifications using only approved equipment.

.4 When operating in stratified deposits excavation equipment and methods that produce uniform, homogeneous aggregate shall be used.

3.2 Handling

.1 The Contractor shall handle and transport aggregates to avoid segregation, contamination, and degradation.

3.3 Stockpiling

.1 The Contractor shall stockpile aggregates on Site in locations as indicated on the Contractor's EMP unless directed otherwise by the Owner.

.2 During winter operations, the Contractor shall prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.

3.4 Cleaning

.1 The Contractor shall leave aggregate stockpile site in tidy, well-drained condition, free of standing surface water.

.2 The Contractor shall leave any unused aggregates in neat compact stockpiles as directed by the Owner.

3.5 Placement

.1 The Contractor shall not commence placing granular bedding until the channel infill subgrade has been inspected and approved by the Engineer.

.2 The Contractor shall remove any stones greater than 100 mm in diameter.

.3 The Contractor shall place granular bedding to the thickness, extents, and grade lines shown on the Contract Drawings.

.4 The Contractor shall begin spreading of granular bedding on a centreline or on the high side of a one-way slope.

.5 The Contractor shall place the material using methods that do not lead to segregation or degradation of aggregate.

.6 The Contractor shall place material to full width in uniform layers.

.7 The Contractor shall shape each layer to a smooth contour and compact to the specified density before placing the next layer.

3.6 Compaction

.1 All granular bedding requires approval by the Engineer prior to placement, and shall be placed and compacted under the direct supervision of the Engineer.

.2 Granular bedding areas shall be constructed to elevations shown in Contract Drawings by placing and compacting fill material in successive, approximately horizontal layers. The compacted granular bedding shall be free from lenses, pockets, voids, and other imperfections.

.3 The Contractor shall compact each layer to at least 95% of the Modified Proctor Maximum Dry Density.

.4 The Contractor shall be responsible for selecting equipment and methods of attaining the minimum level of compaction specified in this Specification; however, equipment and methods that will not damage the underlying geotextile shall be selected.

.5 If the moisture existing in the soil is insufficient for compacting to the specified density, the Contractor may elect to add water. If excess water is added, the soil shall be dried or removed at the Contractor's expense.

.6 The Contractor shall maintain embankment surfaces until the next course of material is placed or until project or that portion thereof is accepted.

3.7 Finish Tolerances

.1 The Contractor shall finish all areas to the final lines and grades shown on the Drawings.

.2 The Contractor shall ensure finished surface is uniformly compacted, smooth and free from any irregularities.

.3 The Contractor shall remove any loose rock material encountered in cut slopes and fill resulting in cavities.

3.8 Tests and Inspections

.1 The soil testing summarized in Table C is the minimum required during placement and compaction of granular bedding.

Table C Minimum Laboratory, Field Testing, and Field Measurements Required During Placement and Compaction of Granular Bedding Material

Test	ASTM Test Method	Testing Frequency	Standard
In Situ Density and Moisture Content (Nuclear)	D6938-10	One test per 25 m linear metres per lift	$\geq$ 95% of MPMDD -2 to +3% of OMC
Water Content (Oven)	D2216-10	One test per change in soil type (to compare with in situ results)	---

Test	ASTM Test Method	Testing Frequency	Standard
Laboratory Determination of Modified Proctor Density (MPD) and Optimum Moisture Content (OMC)	D1557-12	One test per week of construction and when borrow sources are changed	---
Construction Procedures Observation	---	Continuous	---
Number of Passes of Compaction Equipment	Observation / Minimum of Four	Continuous	---
Grade and Uniformity	Survey Controls	As necessary (tolerance ±50 mm)	---

4 MEASUREMENT FOR PAYMENT

.1 The Contractor’s unit price per cubic metre of 100 mm Minus Angular Rock, used as Channel Infill Base material (Schedule of Values - Item 4), shall include all costs associated with the placement of the material including, but not limited to: placement of non-woven geotextile, , loading, hauling, placing, grading, addition of water, compacting, and completion of the quality control procedures discussed herein.

.2 No separate payment for overhaul. Include all costs for hauling in the cubic metre unit price for this item.

.3 No payment for overbuild of the Channel Infill Base material beyond neat lines shown on cross section.

.4 Payment for blending of materials to achieve specified gradation will be considered incidental to the costs of processing, and no separate payment will be made.

.5 Payment for this item shall be based on the volume measured between the Subgrade of Channel Infill (SCI) and Grade of Channel Infill (GCI) surveyed surfaces.

***** END OF SECTION *****

Appendix 3 Test Results

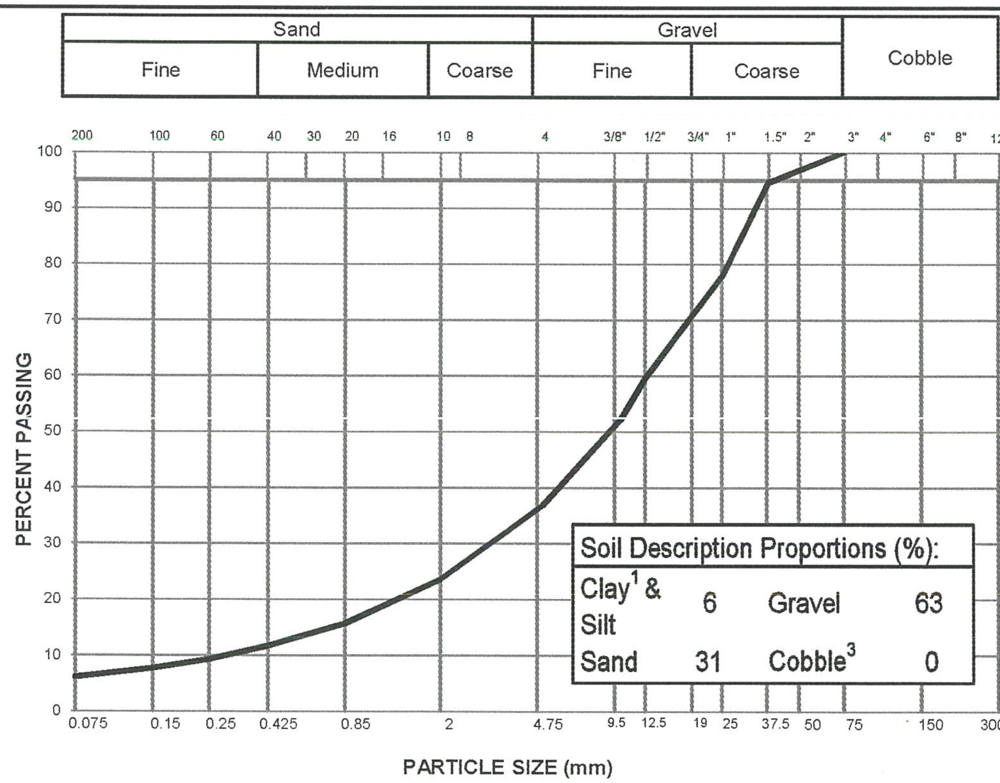
100 Minus Angular Rock – Particle Size Analysis and Moisture-Density Relationship Reports

PARTICLE SIZE ANALYSIS REPORT

ASTM D422, C136 & C117

Project:	Clinton Creek	Sample No.:	SA02
Project No.:	W14103619-01	Material Type:	
Site:	Clinton Creek Road	Sample Loc.:	Entrance Pit
Client:	WorleyParsons	Sample Depth:	
Client Rep.:	Margret McBride	Sampling Method:	Grab
Date Tested:	June 3, 2015 By: AMT	Date sampled:	May 31, 2015
Soil Description[2]:	GRAVEL - sandy, trace silt	Sampled By:	Client
		USC Classification:	Cu: 42.3
Moisture Content:	1.5%		Cc: 3.1

Particle Size (mm)	Percent Passing
300	
200	
150	
100	
75	100
50	
38	95
25	78
19	71
12.5	60
10	52
5	37
2	24
0.85	16
0.425	12
0.25	9
0.15	8
0.075	6.1



Soil Description Proportions (%):			
Clay[1] & Silt	6	Gravel	63
Sand	31	Cobble[3]	0

Notes: [1] The upper clay size of 2 um, per the Canadian Foundation Engineering Manual
[2] The description is visually based & subject to EBA description protocols
[3] If cobbles are present, sampling procedure may not meet ASTM C702 & D75

Specification: ______

Remarks: ______

Reviewed By: ______ P.Eng.

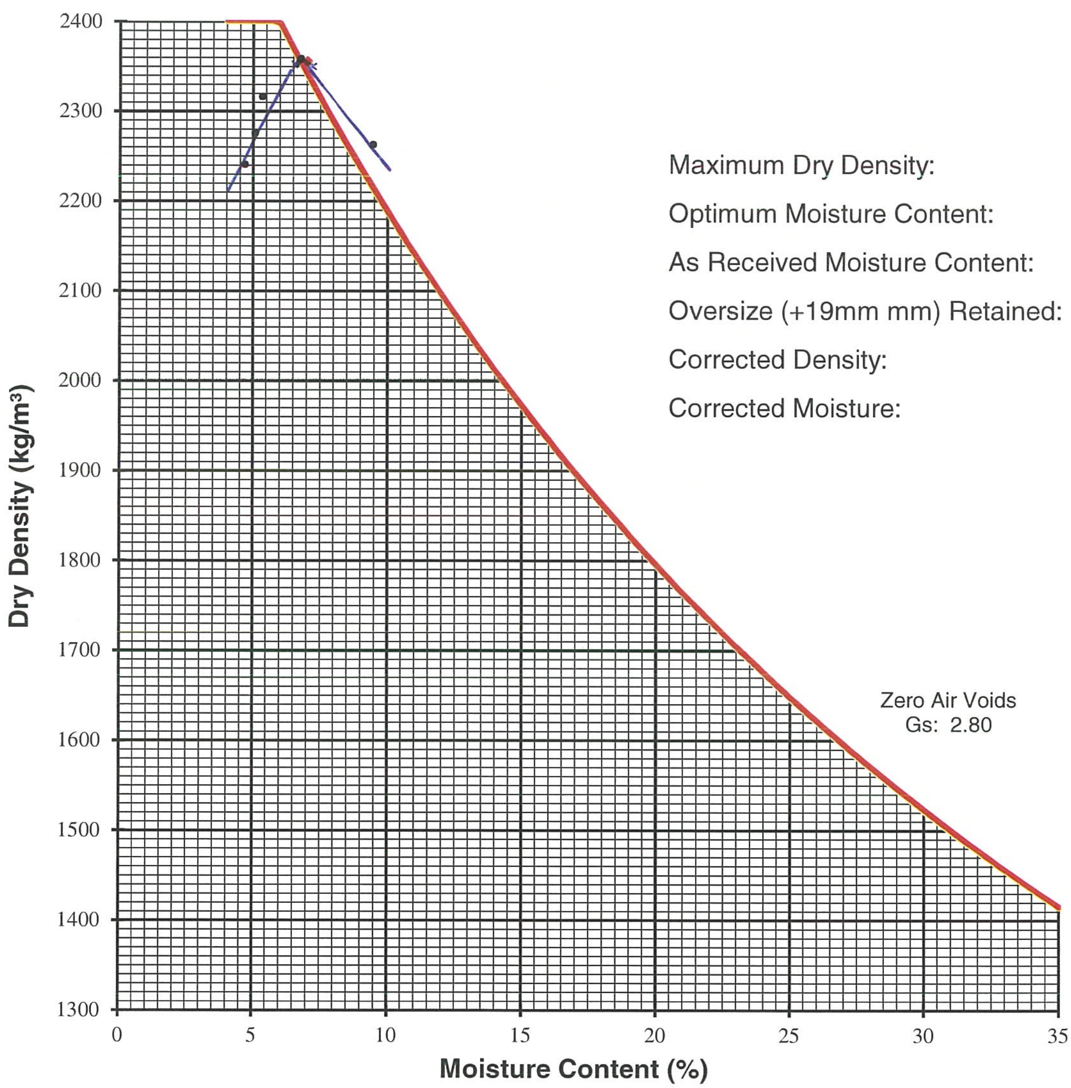
Data presented hereon is for the sole use of the stipulated client. Tetra Tech EBA is not responsible, nor can be held liable, for use made of this report by any other party, with or without the knowledge of Tetra Tech EBA. The testing services reported herein have been performed to recognized industry standards, unless noted. No other warranty is made. These data do not include or represent any interpretation or opinion of specification compliance or material suitability. Should engineering interpretation be required, Tetra Tech EBA will provide it upon written request.

TETRA TECH

MOISTURE-DENSITY RELATIONSHIP (Proctor) REPORT

ASTM D1557 Modified

Project:	Clinton Creek, Dawson City	Sample No.:	SA02
Client:	WorleyParsons	Sampled By:	RMD
Attention:	Margaret McBride	Sample Date:	June 2, 2015
Project No.:	W14103619-01	Test Date:	June 5, 2015
Description:	GRAVEL - sandy, trace silt	Preparation:	Oven Dry
Source:	Entrance Pit	Compaction:	Manual



Maximum Dry Density:	**2355**	kg/m³
Optimum Moisture Content:	**7.0**	%
As Received Moisture Content:		%
Oversize (+19mm mm) Retained:	**30**	%
Corrected Density:	**2475**	%
Corrected Moisture:	**5.2**	%

Remarks:

Reviewed By: C.E.T.

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TETRA TECH

Appendix 3

Design Report

GOVERNMENT OF YUKON ENERGY, MINES AND RESOURCES - ASSESSMENT AND ABANDONED MINES

Clinton Creek Drop Structure No. 4 Repair

Design Summary

307076-06729-00-WW-REP-0001

28 July 2015

WorleyParsons Canada
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GOVERNMENT OF YUKON ENERGY, MINES AND RESOURCES - ASSESSMENT AND ABANDONED MINES
CLINTON CREEK DROP STRUCTURE NO. 4 REPAIR
DESIGN SUMMARY

PROFESSIONAL
YUKON
JACOB GENTLES
TERRITORY
ENGINEER

JULY 28-2015

PROJECT 307076-06729 - CLINTON CREEK DROP STRUCTURE NO. 4 REPAIR

REV	DESCRIPTION	ORIG	REVIEW	WORLEYPARSONS APPROVAL	DATE	CLIENT APPROVAL	DATE
1	Re-Issued for Use	S. Clark	A. Timmis	L. Martin	31-Mar-14		
2	Re-Issued for Use	J. Gentles	A. Timmis	L. Martin	10-Apr-15		
3	Re-Issued for Use	J. Gentles	A. Timmis	L. Martin	03-Jul-15		
4	Re-Issued for Use	J. Gentles	A. Timmis	L. Martin	28-Jul-15		

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Any questions concerning the information or its interpretation should be directed to J. Gentles or A. Timmis.

CONTENTS

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Appendices

1. INTRODUCTION

Between 2002 and 2004, four gabion drop structures were installed in Clinton Creek, Yukon (YT), at the outlet of Hudgeon Lake to control the flow of water discharging from the lake. In 2010, high flows (estimated return period of approximately 100 to 200 years) in Clinton Creek caused damage to existing Drop Structure No. 4 (DS4). The Government of Yukon Energy, Mines and Resources' Assessment and Abandoned Mines (AAM) branch is currently costing permanent repair options for DS4; however, until a permanent solution can be implemented, short-term measures are required to protect the Clinton Creek channel against erosion that may undermine the stability of the adjacent waste rock and/or cause a rapid release of water from Hudgeon Lake (the works).

AAM retained WorleyParsons Canada Services Ltd. (WorleyParsons) to assess several options and to prepare a detailed design and tender package for the repair of DS4. This project includes the following scope of work:

- Developing concept designs for three potential repair options using existing survey data;
- Assembling quantity and AACE Class 4 (±40%) cost estimates for the three options;
- Presenting the results of this options assessment to AAM and Aboriginal Affairs and Northern Development Canada (AANDC); and
- Developing construction drawings, engineering specifications, a material take-off (MTO), and an AACE Class 2 (±20%) cost estimate for the preferred option.

This report includes the results of the development of the preferred option.

1.1 Options Assessment

The following three options were presented to the AAM and AANDC on February 12, 2014:

- Option A: stabilize the waste rock slope and construct a chute downstream of DS4 using riprap (A1), gabions (A2), Armorflex® articulated concrete revetment mat (A3), or precast concrete lock blocks (A4);
- Option B: install stacked grout-filled bags downstream of DS4; and
- Option C: install a launching windrow revetment upstream of DS4.

AAM and AANDC selected Option A3 as the preferred option.

2. DESIGN SUMMARY

2.1 Description

Option A3 detailed design drawings are provided in Appendix 1. This option includes the excavation of the waste rock slope located on the south side of Clinton Creek extending approximately 44 m downstream of the existing gabion structure. The chute will be armoured with Class 60T Armorflex® articulated concrete revetment mats with a stilling basin located at the downstream transition with the existing channel.

A design life of five to ten years was assumed based on the planned, future site-wide remediation (including the reconstruction of the upper portion of the Clinton Creek channel). Based on the design life, the channel was designed to convey the estimated 25-year peak instantaneous flow: 29 m^3/s (R48, Government of Yukon Energy, Mines and Resources 2003). A previous iteration of this design was submitted to AAM in March 2014; however, an update to the design was required to incorporate survey data collected in September 2014 and to issue the drawings for tender.

2.1.1 Waste Rock Regrading

The waste rock slope on the south side of the channel will be regraded to a slope of 2H to 1V to improve stability. Excavated waste rock will be placed and compacted to infill the scoured channel to create a chute downstream of the existing gabion structure. Excess waste rock will be stockpiled at the site. The waste rock will be compacted to 93% of the Modified Proctor Maximum Dry Density (MPMDD).

2.1.2 Revetment Mat

Class 60T Armorflex® mats were recommended by the manufacturer (Armortec Canada Inc.) as being capable of withstanding the hydrodynamic forces anticipated for this channel based on the design flow.

The 190 mm-thick mats will be installed on a 150 mm-thick bedding layer comprised of 100 mm minus angular rock largely free of fines. This material should meet the gradation provided in Table A.

Table A 100 mm Minus Angular Rock Gradation

Sieve Designation (mm)	Per Cent Passing
100	100
75	90 to 100
50	60 to 100
25	35 to 80
10	0 to 50
1.25	0 to 25
0.080	0 to 10

The angular rock bedding layer will be compacted to 95% MPMDD.

The mat system consists of interlocking, precast concrete blocks connected by longitudinal cables, aligned parallel to the long edge of the mat. The longitudinal cables form a loop at both ends of the mat (along the short edge).

The mats will be installed with the longitudinal axis oriented perpendicular to the direction of flow with a 20M piece of rebar laced through these loops to connect adjoining mats (i.e., at mat to mat transitions, parallel to the channel). The mats will be placed with a 150 mm to 300 mm gap, measured from the outside edges of the last row of blocks, which will be filled with 30 MPa concrete or grout. The concrete or grout, mixed on-site, will be finished by hand flush to the top of the adjoining mats.

Each 2.4 m-wide perpendicular section of mats will consist of a 5.3 m-long section centred across the channel bottom and two 4.5 m-long sections placed on either side of the channel. Adjoining perpendicular sections will be connected by their revetment cables as discussed in subsequent sections.

2.1.3 Geotextile

Non-woven geotextile (Nilex 4553 or approved equivalent) will be installed over the compacted waste rock as follows to prevent the migration of fines into the angular rock bedding layer:

- Overlap geotextile a minimum of 600 mm at adjacent edges;
- Overlaps should be in the direction of flow (i.e., upstream piece laid over downstream piece); and
- Geotextile should be anchored a minimum of 1.5 m at the top of the channel banks except where the slope beyond the channel is greater than 2H:1V and at the upstream and downstream anchor trenches.

As per the manufacturer's instructions, Strata Microgrid™, or equivalent, will be installed over the angular rock bedding layer following the same methodology described above. This will aid in keeping the bedding gravel in place under high velocity water.

2.1.4 Anchoring

The mats will be anchored to the waste rock using Duckbill model 68-DBD ground anchors driven 900 mm into the waste rock. Each anchor will be terminated with a crimped sleeve loop and connected to the revetment cable using 6.4 mm dia. braided steel cable secured with a crimp sleeve.

The mats will be assembled with four half-blocks and one full-block removed, as shown on Drawing No. 1004 in Appendix 1. Ground anchors will be driven at each void left by the removed blocks and connected to the revetment cable. At half-block voids, the anchor will be connected to the adjoining mats. The void will be filled with hand finished 30 MPa concrete or grout flush with the top of the surrounding blocks.

Two ground anchors will also be driven 900 mm into the waste rock and connected to the revetment cable loops at the outside ends of each mat, along the top of the channel, and at each mat to mat transition.

The revetment mat will be keyed in at the upstream end using large, angular rock (average diameter of 300 mm to 800 mm) to create a stable transition with the existing gabion structure and at the downstream end to resist erosion. Ground anchors will be driven and connected to the revetment cables at each half-block void along the outer edge of the mats.

The previous iteration of the design included an anchor trench at the upstream end of the mat. A downstream trench and ground anchors connected to the mats were added to the design to increase the stability and durability of the mats. This will reduce the possibility of damage to or failure of the mat.

2.1.5 Stilling Basin

The purpose of the stilling basin is to dissipate energy and induce a hydraulic jump over the mats. The stilling basin extends from the end of the channel chute at Station 0+049.2 downstream to Station 0+058.7 at an elevation 397.3 m and a depth of 0.3 m. The armorflex mats extend 6 m downstream of this basin to approximately Station 0+064, at an elevation of 397.6 m. This provides a transition to the existing channel and a buffer against potential erosion of the downstream channel.

The previous iteration of the design included a stilling basin with precast concrete lock blocks to reduce the length of the stilling basin (i.e., the addition of lock blocks increases the efficiency of a stilling basin and can induce a hydraulic jump over a shorter length than a stilling basin alone). During recent discussions, Armortec raised concerns over the placement of the lock blocks on top of the mats believing that this may impact the performance of the mats due to increased turbulence. To address this concern, the lock blocks were eliminated from the design and the stilling basin was extended in length from 7 m to 9 m.

2.1.6 Transitions

The upstream end of the chute will about the existing gabion baskets that comprise DS4. Based on observations made during site visits in August 2014 and May 2015, it was determined that the top five courses of gabion baskets remain intact (i.e., at a relatively flat longitudinal slope and with underlying soils supported the baskets). The sixth course of baskets has been undermined and the basket mesh damaged with the baskets twisted to a steep longitudinal angle. It is anticipated that the first section of mats will abut the sixth course of baskets.

Once the Clinton Creek diversion is in service, the existing gabion baskets will be inspected to determine:

- Whether the fifth course of gabion baskets is sound;
- The extent of the gabion baskets that will require removal; and
- Which damaged baskets in the sixth course and below will require removal.

Removal will be accomplished by cutting the gabion mesh, removing connecting devices, and removing the gabion rocks. If feasible, the gabion rocks should be stockpiled near the drop structure for potential reuse.

The mats should be laid from upstream to downstream, with the first section of mats starting as close as possible to the existing edge of the downstream edge of the fifth course of gabion baskets along the channel bottom. The first two rows of blocks along the mat should be installed at a 1H to 1V slope up from the gabion baskets to create an anchor trench. The trench will be backfilled with large diameter rock, sourced on-site and with an average dimension between 300 mm and 800 mm, to create a smooth transition from the gabion baskets to the chute.

The downstream end of the mat will transition with the existing channel at Station 0+064 (approximate). The two rows of blocks at the downstream end of the mat will be installed at a 1H to 1V slope down from the channel to create an anchor trench. This trench was added to this iteration of the design to increase erosion protection at the transition to reduce the potential for scouring of the channel propagating upstream and undermining the mat. The trench will be backfilled with large diameter rock to create a smooth transition between the mat and the existing channel downstream.

2.2 Design Summary

The design parameters for Option A3 are summarized in Table B.

Table B Option A3 Design Parameter Summary

Category	Description	
Performance	Designed to withstand the 25-year peak flood event	
	Design Flow = 29 m^3/s	
	Suggested 5- to 10-year design life	
Health and Safety	Risks to workers mitigated through slope stabilization	
Key Materials Quantities	Waste rock excavation:	9,500 m^3
	Waste rock fill:	1,000 m^3
	Class 60T Armorflex® Mats:	36 (4.5 m x 2.4 m each)
	Class 60T Armorflex® Mats:	18 (5.3 m x 2.4 m each)
	Non-Woven geotextile:	900 m^2
	Woven Microgrid™:	900 m^2
	100 mm minus angular rock:	120 m^3
	Large diameter rock:	30 m^3
	Duckbill 68-DBD ground anchors:	312 units
	20M rebar:	100 m
	30 MPa grout or concrete:	10 m^3

The chute characteristics are summarized in Table C.

Table C Chute Summary

Characteristic	Description
Bottom Width	7 m
Side Slopes	2H to 1V
Depth	1.5 m
Longitudinal Slope	20%
Lay Length	42 m
Mat Class	Armorflex® 60T - 190 mm thick
Mat Weight	300 kg/m^2 to 350 kg/m^2
Mat Size	2.4 m by 4.5 m (36 pieces) and 2.4 m by 5.3 m (18 pieces)
Bedding Material	100 mm minus angular rock

2.3 Water Management

Clinton Creek conveys discharge from Hudgeon Lake downstream to the confluence with Fortymile River. To facilitate construction, it will be necessary to divert discharge from Hudgeon Lake through a pipeline discharging downstream of DS4.

Historical flow measurements recorded on Clinton Creek downstream of Hudgeon Lake between 1978 and 2004 were taken from the report "Yukon Water Resources Hydrometric Program Historical Summary 1975 – 2004", prepared by Water Resources – Environment Programs Branch, Environment Yukon in March 2005. Mean peak and 75th percentile flow rates in Clinton Creek at DS4, averaged over the month of June, were estimated from these records and are as follows:

- Mean: 0.9 m^3/s (80,000 m^3/day);
- Peak: 1.8 m^3/s (160,000 m^3/day); and
- 75th percentile: 1.2 m^3/s (110,000 m^3/day).

These values are indicative of potential average flow conditions that may be encountered at the site and are based on a statistical analysis of discontinuous flow record of monthly average flows. As flow measurements were not recorded in every year between 1978 and 2004, and flow rates were averaged over the month, peak instantaneous flow conditions will likely be greater than these values. It should be noted that Hudgeon Lake has a surface area of approximately 115 ha and will attenuate peak runoff inflows from the surrounding area.

It is anticipated that construction will take place following freshet, which usually occurs in June. Though this will avoid large freshet flows, a larger than average snowpack or late and/or extended melting of the snowpack could result in a water level in Hudgeon Lake that is greater than the seasonal average. This could result in larger than average flow rates in Clinton Creek during construction. Similarly, periods of extreme rainfall could temporarily increase flow rates in Clinton Creek.

It will be the responsibility of the contractor to determine the capacity of the diversion as well as developing protocols for responding to elevated water levels in Hudgeon Lake and provide this information to AAM in the form of a water management plan.

3. COST ESTIMATE

3.1 Cost Estimate Basis

The construction cost estimate for Option A3 was prepared using the AACE Class 2 designation with accuracy and contingency as listed in Table D. It should be noted that while WorleyParsons believes that this estimate meets the stated accuracy, at the direction of AAM, no local contractor was consulted regarding constructability of the design or cost estimates. This is generally required for this level of estimate.

Table D Estimate Classification

Category	Description
Estimate Class	Class 2
Estimate Type	Construction
Estimate Accuracy	±20%
Included Contingency	13%
Estimating Methodologies	Direct quotations, allowances, and historical data

3.2 Assumptions

The following assumptions were made during the preparation of the cost estimate:

- Work will be performed during the summer using single shifts of 10 hours per day with an average crew size of four people;
- Work can be performed using a 30- to 35-tonne excavator, a bulldozer, a single drum soil compactor, and a 40-tonne rock truck;
- Aggregate (100 mm minus angular rock) hauling costs have been developed allowing for a 60 km one-way distance;
- Diesel fuel allowance was set at $1.60/L based on the Government of Yukon Energy, Mines and Resources (October 2013);
- Upgrades and/or repairs to the Fortymile Bridge will not be required prior to construction;
- Excavated material will not require off-site disposal or on-site containment; and
- Large diameter rock can be sourced on-site.

3.3 Cost Estimate Summary

The cost estimate is summarized in Table E. A detailed construction cost breakdown is provided in Appendix 2.

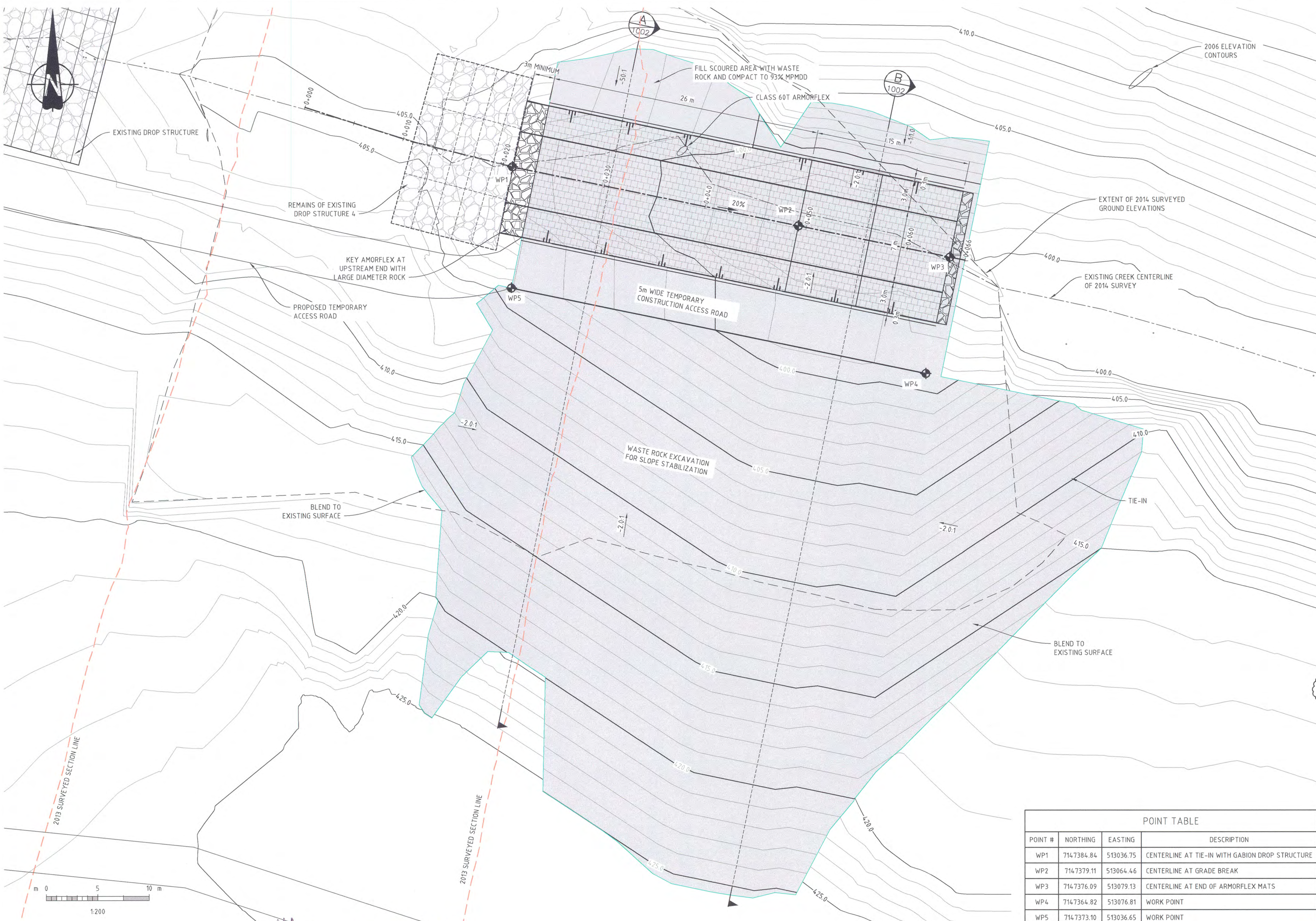
Table E Cost Estimate Summary

Category	Description	Total Cost ($CAD)
Direct Construction Costs	Supply and installation of materials, mobilization, and demobilization	428,000
Indirect Costs	Insurance, travel, camp, and environmental monitoring	240,000
Contingency	14%	91,000
Total Cost		**$759,000**

4. CONSTRUCTION SCHEDULE

A construction schedule is provided in Appendix 3. It was assumed that construction will start in the last week of July. The work is expected to last six weeks, including mobilization and demobilization.

Appendix 1 Issued for Construction Drawings



NOTES:

GENERAL NOTES

1. DIMENSIONS AND ELEVATIONS ARE IN METRES.
2. ALL COORDINATES ARE IN NAD 83. THE FOLLOWING EXISTING SURVEY CONTROL POINTS SHOULD BE USED FOR REFERENCE:

ID	NORTHING (m)	EASTING (m)	ORTHOMETRIC HEIGHT (masl)
No. 2834	7148712.673	513447.724	606.823
No. 2835	7147272.790	513147.057	432.669
No. 1086	7147972.219	513176.710	590.955
No. 1192	7147563.984	512278.758	441.231

3. SITE PLAN, CHANNEL PROFILE, CROSS SECTIONS AND EARTHWORK QUANTITIES ARE BASED ON 2006 ELEVATION DATA FOR THE SITE AS WELL AS 2013 AND 2014 SURVEY OF THE CLINTON CREEK CHANNEL.

MATERIALS

4. FILL MATERIAL SHALL CONSIST OF UNFROZEN EXCAVATED WASTE ROCK
5. ARMORFLEX MATS SHALL BE CLASS 60T
6. 100mm MINUS ANGULAR ROCK
7. LARGE DIAMETER ROCK SHOULD HAVE AN AVERAGE DIMENSION OF BETWEEN 300 AND 800 mm AND SHOULD BE SOURCED ON SITE

APPROXIMATE MATERIAL QUANTITIES

EXCAVATION	9,500 m^3
FILL	1,000 m^3
100mm MINUS ANGULAR ROCK	120 m^3
CLASS 60T ARMORFLEX MATS (2.4m X 4.5m)	36
CLASS 60T ARMORFLEX MATS (2.4m X 5.3m)	18
NON-WOVEN GEOTEXTILE	900 m^2
WOVEN MICROGRID GEOTEXTILE	900 m^2
LARGE DIAMETER ROCK (300 TO 800 mm)	30 m^3
30Mpa CONCRETE OR GROUT	10m^3
DUCKBILL 68-DBD GROUND ANCHOR	312
20m REBAR	100m

EXECUTION - GENERAL

8. SURVEY OF EXISTING AND FINISHED GRADES SHALL BE COMPLETED BY THE SURVEYOR / CONTRACTOR FOR THE DETERMINATION OF QUANTITIES AND THE PREPARATION OF AS-BUILT DRAWINGS.

EXECUTION - BULK EARTHWORKS

9. THE UNSTABLE WASTE ROCK SLOPE ON THE SOUTH SIDE OF CLINTON CREEK, DOWNSTREAM OF THE DAMAGED GABION DROP STRUCTURE, SHALL BE CUT BACK TO A 2H:1V SLOPE. THE SLOPE ON THE NORTH SIDE OF CLINTON CREEK SHALL BE FILLED AT A SLOPE OF 50H:1V AND CUT BACK TO A 1H:1V SLOPE.
10. A PORTION OF THE EXCAVATED WASTE ROCK SHALL BE USED TO FILL THE CHANNEL AND CONSTRUCT A 5 M WIDE ACCESS ROAD DOWNSTREAM OF THE DAMAGED GABION DROP STRUCTURE. FINISHED ELEVATIONS AND COMPACTION REQUIREMENTS ARE SPECIFIED ON THE CHANNEL PROFILE AND SECTIONS.
11. REMAINING (I.E. WASTE) EXCAVATED WASTE ROCK SHALL BE STOCKPILED IN A LOCATION TO BE DETERMINED BY THE ONSITE ENGINEER AT THE START OF CONSTRUCTION.

EXECUTION - CHANNEL CONSTRUCTION

12. DAMAGED GABION BASKETS DOWNSTREAM OF START OF ARMORFLEX MATS SHALL BE REMOVED PRIOR TO CHANNEL INFILLING. ENGINEER SHALL CONFIRM IN THE FIELD WHICH BASKETS SHALL BE REMOVED. BASKETS SHALL BE CUT FLUSH WITH ADJOINING BASKETS AND ROCK MATERIAL TO BE STOCKPILED ON SITE.
13. NON-WOVEN GEOTEXTILE (NILEX 4553) SHALL BE INSTALLED ON TOP OF THE WASTE ROCK WITH A MINIMUM OVERLAP LENGTH OF 600mm AND KEYED IN AT THE EDGES A MINIMUM OF 1.5m.
14. 150 mm OF 100mm MINUS ANGULAR ROCK SHALL BE PLACED AND COMPACTED TO 95% MPMDD OVER THE WASTE ROCK FILL AS SHOWN ON THE PROFILE (DRAWING 1002). 6
15. WOVEN MICROGRID (STRATAGRID OR EQUIVALENT) SHALL BE INSTALLED ON TOP OF THE ANGULAR ROCK LAYER WITH A MINIMUM OVERLAP LENGTH OF 600mm AND KEYED IN AT THE EDGES A MINIMUM OF 1.5m.
16. CLASS 60T ARMORFLEX MATS SHALL BE INSTALLED ON TOP OF THE ANGULAR ROCK BEDDING IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS AND RECOMMENDATIONS. THE ARMORFLEX MATS ARE TO BE PLACED ACROSS THE CHANNEL (I.E., WITH THE LONGEST DIMENSION ALIGNED PERPENDICULAR TO THE DIRECTION OF FLOW) WITH THE 2.4 M X 5.3 M PLACED ACROSS THE CENTER OF THE CHANNEL AND THE TWO 2.4 M X 4.5 M MATS ON MAT EITHER SIDE SLOPES AND A PORTION OF THE CHANNEL BOTTOM.
17. LARGE DIAMETER ROCK SHALL BE SOURCED ON SITE AND USED TO KEY IN THE UPSTREAM AND DOWNSTREAM ENDS OF THE ARMORFLEX AS SHOWN ON DRAWING 1002, PROFILE.
18. DUCKBILL MODEL 68-DBD SHALL BE DRIVEN INTO THE WASTE ROCK A MINIMUM OF 900 mm AT EACH VOID FULL BLOCK AND $\frac{1}{2}$ BLOCK AND 2 AT EVERY MAT TO MAT CONNECTION AND AT MAT ENDS. THE ANCHORS SHALL BE SECURED TO THE REVETMENT CABLE USING FASTENERS PER MANUFACTURER'S RECOMMENDATIONS.
19. A 20M PIECE OF REBAR SHALL BE THREADED THROUGH THE REVETMENT CABLES, PARALLEL TO THE CHANNEL, TO CONNECT THE MATS AND SHALL BE BACKFILLED WITH 30 MPA CONCRETE.
20. SOME "FIELD ENGINEERING" MAY BE REQUIRED TO TIE THE PROPOSED CHANNEL INTO THE DAMAGED GABION DROP STRUCTURE UPSTREAM AND THE EXISTING CHANNEL DOWNSTREAM.

POINT TABLE

POINT #	NORTHING	EASTING	DESCRIPTION
WP1	7147384.84	513036.75	CENTERLINE AT TIE-IN WITH GABION DROP STRUCTURE
WP2	7147379.11	513064.46	CENTERLINE AT GRADE BREAK
WP3	7147376.09	513079.13	CENTERLINE AT END OF ARMORFLEX MATS
WP4	7147364.82	513076.81	WORK POINT
WP5	7147373.10	513036.65	WORK POINT

REV	DATE (DD-MMM-YY)	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	CUSTOMER	REF DRAWING No	REFERENCE DRAWING TITLE
6	03-JUL-15	ISSUED FOR CONSTRUCTION	JH	JRG	JRG	AJT	LRM			
5	28-MAY-15	RE-ISSUED FOR TENDER	JRG	JH	JRG	AJT	LRM			
4	24-APR-15	RE-ISSUED FOR TENDER	JRG	JH	JRG	AJT	LRM			
3	20-APR-15	RE-ISSUED FOR TENDER	JRG	JH	JRG	AJT	AJT			
2	10-APR-15	ISSUED FOR TENDER	JH	BJM	JRG	AJT	LRM			
1	31-MAR-14	RE-ISSUED FOR CONSTRUCTION	JH		SC	AJT	LRM			
0	27-MAR-14	ISSUED FOR CONSTRUCTION	JH	BJM	SC	AT	LM			
A	06-MAR-14	ISSUED FOR CLIENT REVIEW	JH	BJM	SC	AT	LM			

JH LRM

D SHEET | SCALE SHOWN

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WORLEYPARSONS PROJECT No 307076-06729

ENGINEERING AND PERMIT STAMPS (As Required)

HYDROTECHNICAL

PROFESSIONAL ENGINEER YUKON TERRITORY JACOB GENTLES

JULY 3, 2015

Geotechnical

PROFESSIONAL ENGINEER YUKON TERRITORY LEE MARTIN

July 3, 2015

CUSTOMER

Yukon Government
Department of Energy, Mines and Resources
Assessment and Abandoned Mines

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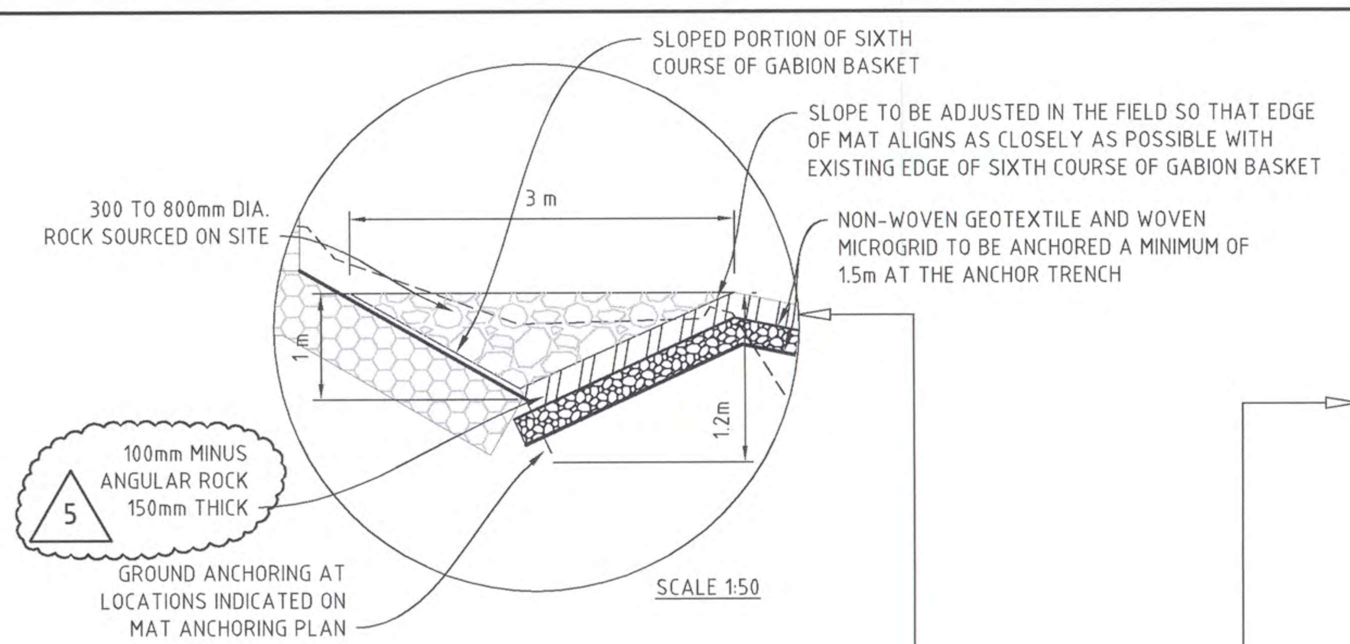
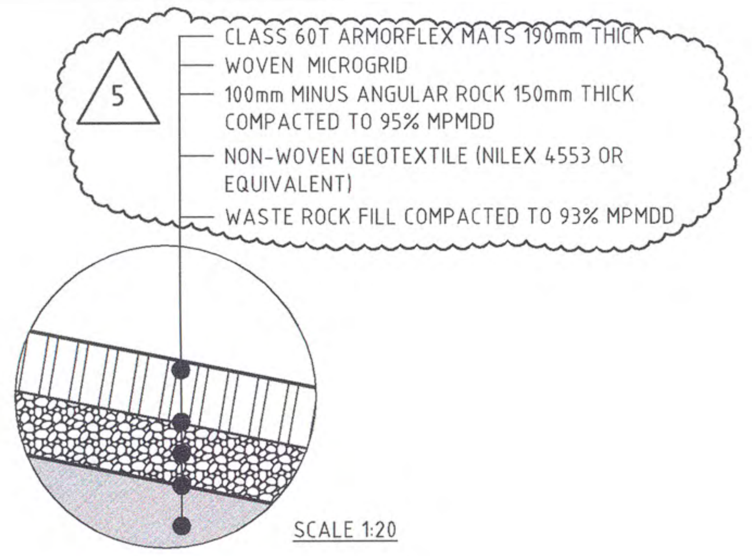
WorleyParsons resources & energy

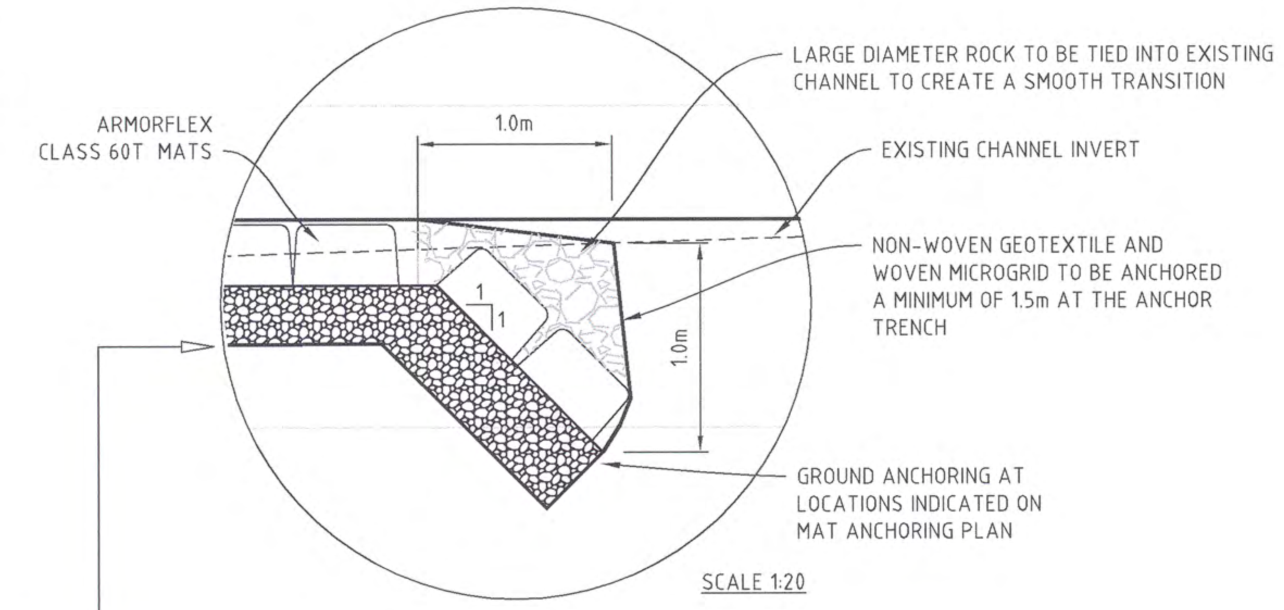
CLINTON CREEK
DROP STRUCTURE 4 REPAIR
PLAN

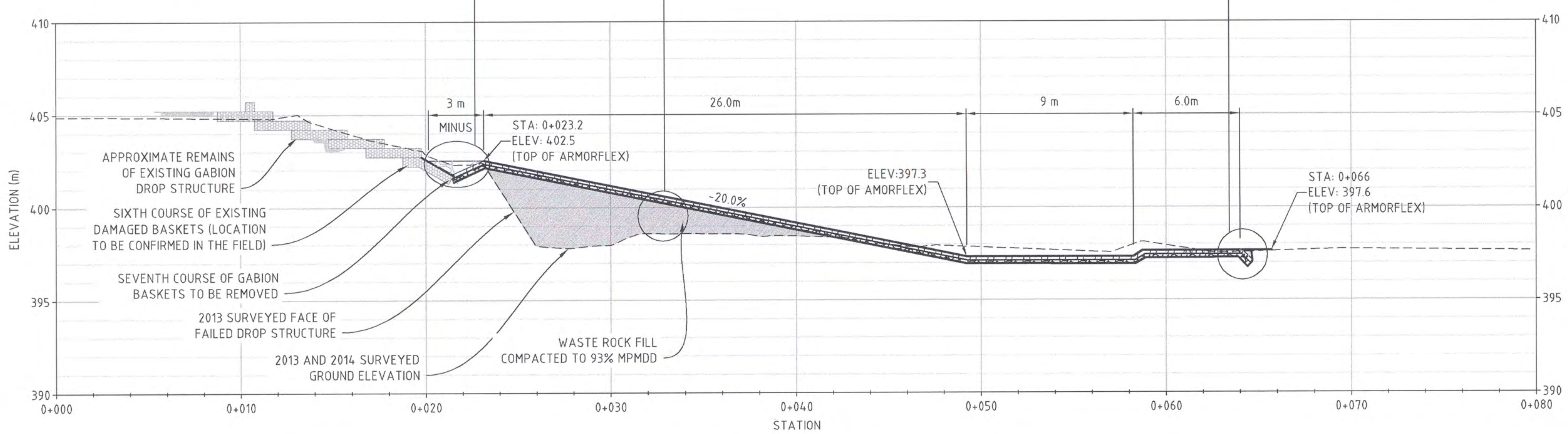
DRG No 307076-06729-00-CI-DGA-1001 REV 6

LOCATION: U:\YVR\307076\06729_GOY_DS4REPAIR\11_DRAWINGS\01_CIVIL\05_DS4 REPAIR\307076-06729-00-CI-DGA-1001 AND 1002.DWG USER NAME: jiang.hu PLOT DATE & TIME: 3/7/2015 10:11:12 AM SAVE DATE & TIME: 3/7/2015 9:41:49 AM









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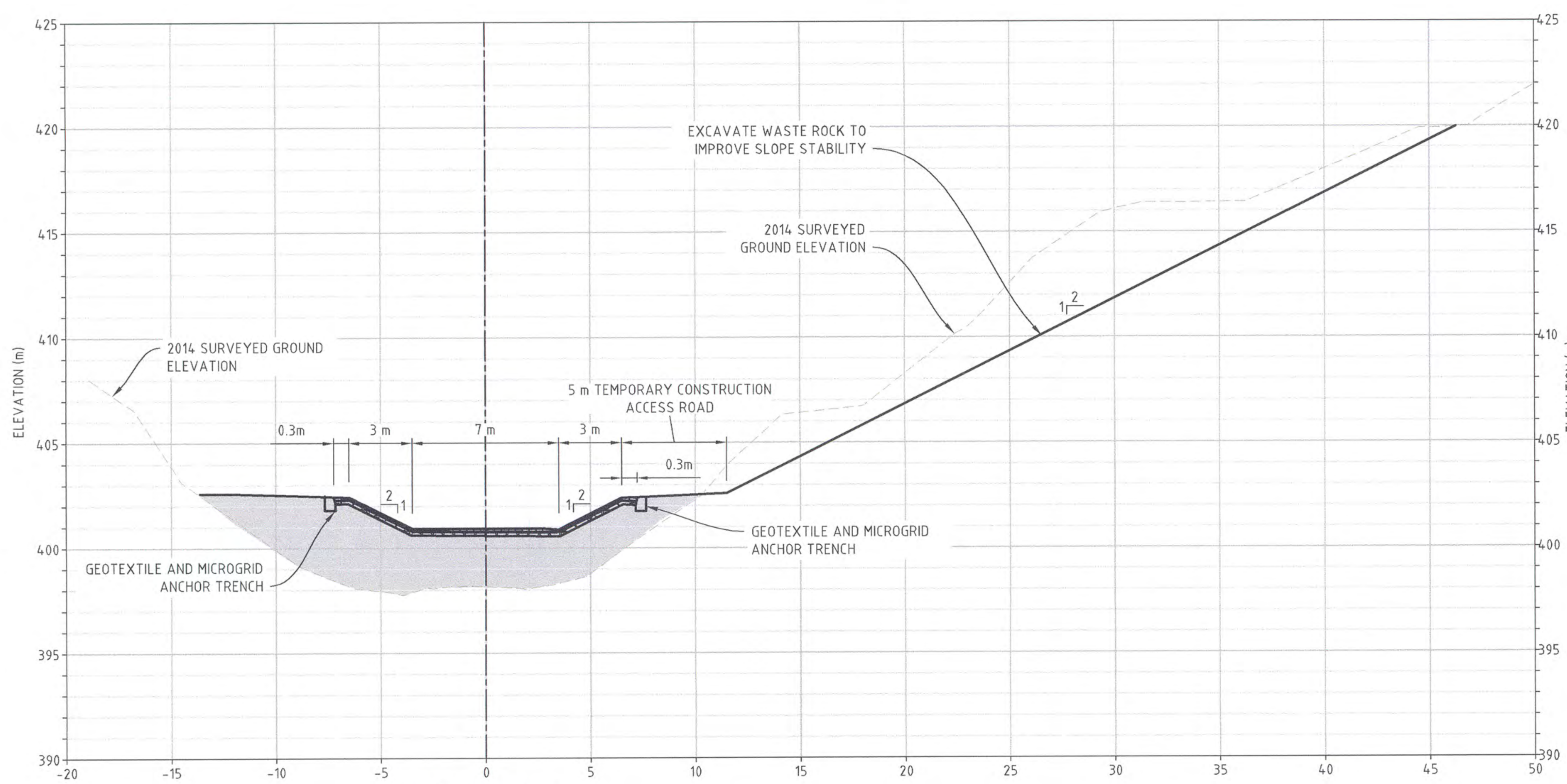

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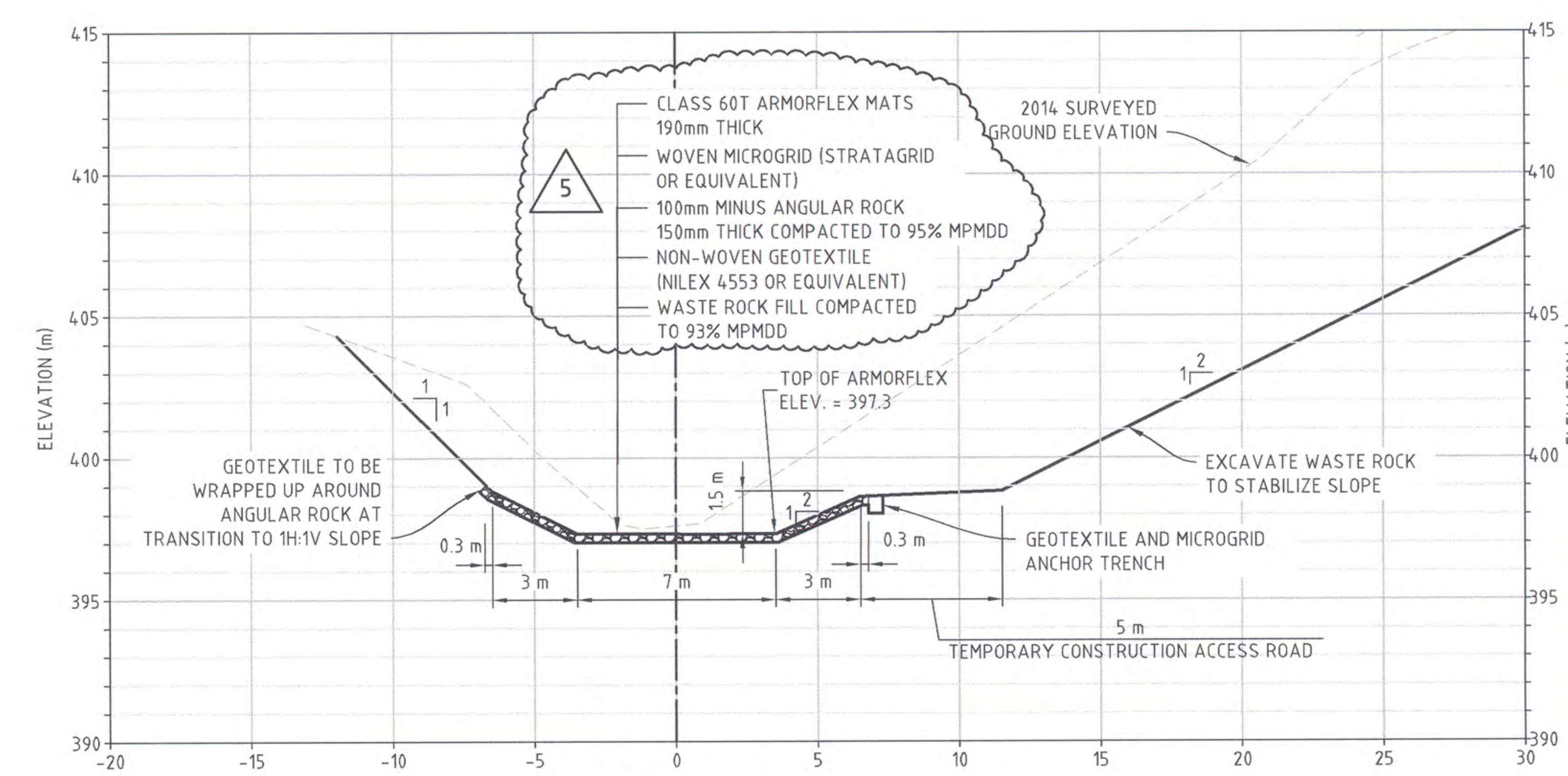

SECTION B-B
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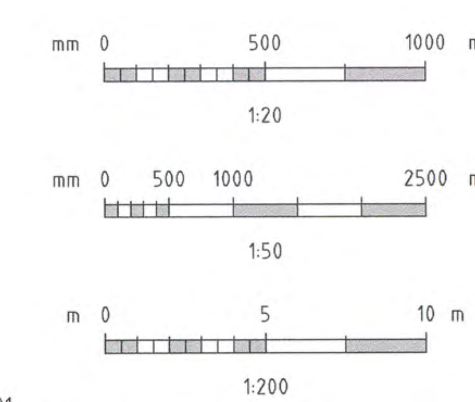

NOTES:

1. FOR GENERAL NOTES, SEE DWG. 1001.
2. DIMENSIONS AND ELEVATIONS ARE IN METRES.

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5	03-JUL-15	ISSUED FOR CONSTRUCTION	JH	JRG	JRG	AJT	LRM	
4	24-APR-15	RE-ISSUED FOR TENDER	JRG	JH	JRG	AJT	LRM	
3	20-APR-15	RE-ISSUED FOR TENDER	JRG	JH	JRG	AJT	AJT	
2	10-APR-15	ISSUED FOR TENDER	JH	BJM	JRG	AJT	LRM	
1	31-MAR-14	RE-ISSUED FOR CONSTRUCTION	JH		SC	AJT	LRM	
0	27-MAR-14	ISSUED FOR CONSTRUCTION	JH	BJM	SC	AT	LM	
A	06-MAR-14	ISSUED FOR CLIENT REVIEW	JH	BJM	SC	AT	LM	

REF DRAWING No | REFERENCE DRAWING TITLE

D SHEET | SCALE SHOWN

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WORLEYPARSONS PROJECT No 307076-06729

ENGINEERING AND PERMIT STAMPS (As Required)

HYDROTECHNICAL
PROFESSIONAL ENGINEER YUKON TERRITORY JACOB GENTLES
JULY 3, 2015

Geotechnical
PROFESSIONAL ENGINEER YUKON TERRITORY LEE MARTIN
July 3, 2015

CUSTOMER

Yukon Government
Department of Energy, Mines and Resources
Assessment and Abandoned Mines

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CLINTON CREEK
DROP STRUCTURE 4 REPAIR
PROFILE AND SECTIONS

DRG No 307076-06729-00-CI-DGA-1002 | REV 5

LOCATION: U:\YVR\307076\06729_GOY_DS4REPAIR\11_DRAWINGS\01_CIVIL\05_DS4 REPAIR\307076-06729-00-CI-DGA-1001 AND 1002.DWG

USER NAME: jiang.hu

PLOT DATE & TIME: 3/7/2015 9:34:36 AM
SAVE DATE & TIME: 3/7/2015 9:26:36 AM

NOTES:

1. FOR GENERAL NOTES, SEE DWG. 1001.
2. DIMENSIONS AND ELEVATIONS ARE IN METRES.
3. ACCESS ROAD AND CORRIDOR LOCATIONS ARE APPROXIMATE AND ARE TO BE CONFIRMED IN THE FIELD.
4. CONTRACTOR SHALL PREPARE A CONSTRUCTION WATER MANAGEMENT PLAN AND SUBMIT TO THE ENGINEER FOR APPROVAL PRIOR TO STARTING WORK.
5. APPROXIMATE WATER STORAGE CAPACITY IN HUDGEON LAKE IS 6,900m^3/cm INCREASE IN WATER LEVEL.
6. APPROXIMATE MONTH-AVERAGED DISCHARGE RATES FROM HUDGEON LAKE ARE SHOWN IN THE FOLLOWING TABLE:

JUNE	0.89m^3/s
JULY	0.56m^3/s
AUGUST	0.49m^3/s
SEPTEMBER	0.67m^3/s
OCTOBER	0.41m^3/s

7. FLOW RATES ARE BASED ON A DISCONTINUOUS FLOW RECORD FROM 1978 TO 2004 AND ARE PROVIDED FOR INFORMATION ONLY. AVERAGE RATES COULD BE IMPACTED BY HEAVY RAINS, LATE FRESHET, AND/OR LARGER THAN AVERAGE SNOWPACK. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO SELECT AND SIZE WATER DIVERSION INFRASTRUCTURE THAT WILL ENABLE THE TIMELY COMPLETION OF THE WORK AND TO DETERMINE LAKE WATER LEVELS AND FLOW RATES AT WHICH THE DIVERSION SHOULD BE TAKEN OUT OF SERVICE.

REV	DATE (DD-MMM-YY)	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	CUSTOMER	REF DRAWING No	REFERENCE DRAWING TITLE
			JH			AJT	LRM			
5	03-JUL--15	ISSUED FOR CONSTRUCTION	JH	JRG	JRG	AJT	AJT			
4	08-JUN-15	RE-ISSUED FOR TENDER - REMOVED MATERIAL STOCKPILES	JRG	JH	JRG	AJT	AJT			
3	20-APR-15	RE-ISSUED FOR TENDER	JRG	JH	JRG	AJT	AJT			
2	10-APR-15	ISSUED FOR TENDER	JH	BJM	JRG	AJT	LRM			
1	31-MAR-14	RE-ISSUED FOR CONSTRUCTION	JH		JRG	AJT	LRM			
0	27-MAR-14	ISSUED FOR CONSTRUCTION	JH	BJM	SC	AT	LM			
A	06-MAR-14	ISSUED FOR CLIENT REVIEW	JH	BJM	SC	AT	LM			

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307076-06729

ENGINEERING AND PERMIT STAMPS (As Required)

HYPROTECHNICAL
PROFESSIONAL ENGINEER
YUKON TERRITORY
JACOB GENTLES
JULY 3, 2015

Geotechnical
PROFESSIONAL ENGINEER
YUKON TERRITORY
LEE MARTIN
July 3, 2015

CUSTOMER

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Department of Energy, Mines and Resources
Assessment and Abandoned Mines

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CLINTON CREEK
DROP STRUCTURE 4 REPAIR
CONSTRUCTION STAGING PLAN

DRG No 307076-06729-00-CI-DGA-1003 | REV 5

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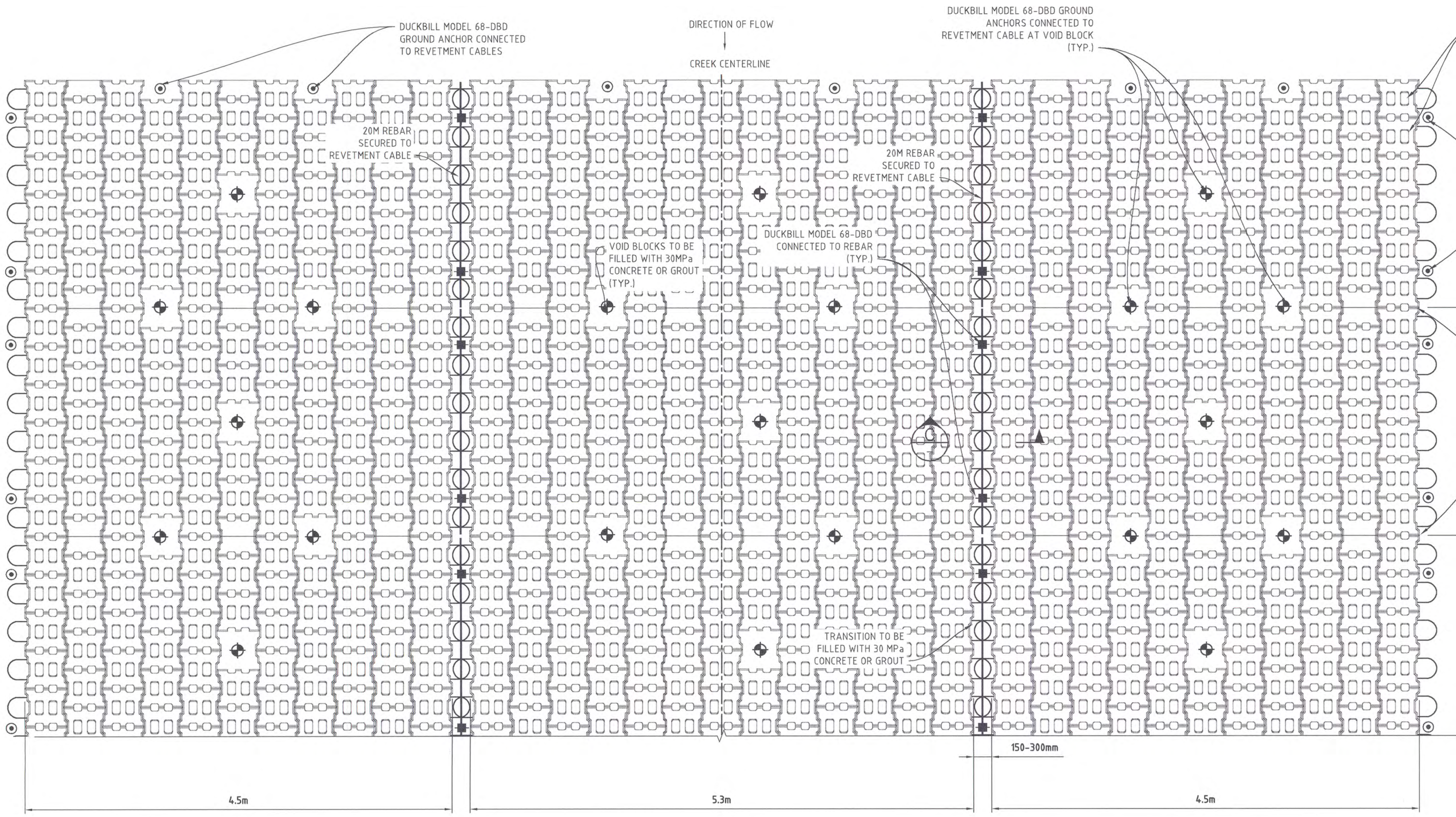

MAT ANCHORING PLAN
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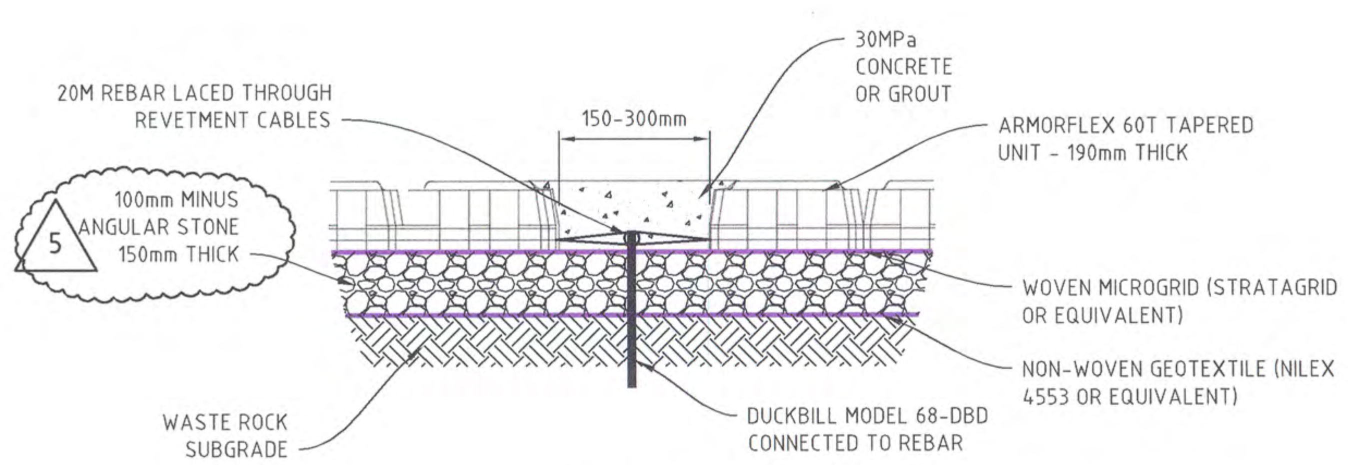

SECTION C-C'
1:20

LEGEND

- MAT TO MAT TRANSITION GROUND ANCHORS TO BE FILLED WITH GROUT OR CONCRETE
- OUTSIDE EDGE GROUND ANCHORS
- VOID BLOCK GROUND ANCHORS TO BE FILLED WITH GROUT OR CONCRETE

mm 0 500 1000 mm
1:20

m 0 0.5 1.0 1.5 m
1:30

NOTES:

1. FOR GENERAL NOTES, SEE DWG. 1001.
2. DIMENSIONS AND ELEVATIONS ARE IN METRES.

REV	DATE	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	CUSTOMER
			JH	JRG	JRG	AJT	LRM	
4	03-JUL-15	ISSUED FOR CONSTRUCTION	JH	JRG	JRG	AJT	LRM	
3	24-APR-15	RE-ISSUED FOR TENDER	JRG	JH	JRG	AJT	LRM	
2	20-APR-15	RE-ISSUED FOR TENDER	JRG	JH	JRG	AJT	AJT	
1	10-APR-15	ISSUED FOR TENDER	JH	JRG	JRG	AJT	LRM	

REF DRAWING No	REFERENCE DRAWING TITLE

D SHEET SCALE SHOWN

OneWay to zero harm

WORLEYPARSONS PROJECT No
307076-06729

ENGINEERING AND PERMIT STAMPS (As Required)

HYDROTECHNICAL
PROFESSIONAL ENGINEER
YUKON TERRITORY
JACOB GENTLES
JULY 3, 2015

Geotechnical
PROFESSIONAL ENGINEER
YUKON TERRITORY
LEE MARTIN
July 3, 2015

CUSTOMER
Yukon Government
Department of Energy, Mines and Resources
Assessment and Abandoned Mines

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CLINTON CREEK
DROP STRUCTURE 4 REPAIR
MAT ANCHORING PLAN AND DETAIL

DRG No 307076-06729-00-CI-DGA-1004
REV 4

LOCATION: U:\YVR\307076\06729_GOY_DS4REPAIR\11_DRAWINGS\01_CIVIL\05_DS4 REPAIR\307076-06729-00-CI-DGA-1004.DWG
USER NAME: jiang.hu
PLOT DATE & TIME: 3/7/2015 9:39:34 AM
SAVE DATE & TIME: 3/7/2015 8:50:19 AM

Appendix 2 Cost Estimate

WorleyParsons
resources & energy

ESTIMATE - SUMMARY

CLIENT:	Assessment and Abandoned Mines	**DATE:**	7-Jul-15
PROJECT TITLE:	Clinton Creek Site Closure LCCA - DS4 Temporary Repair - Detailed Design - Waste Stabilization an	**ACCURACY:**	+/-20%
PROJECT No.:	307076-06729	**AUTHOR:**	JG
MTO No.:		**REVISION:**	

REFERENCE	DESCRIPTION		TOTAL COST
1.00	DIRECT CONSTRUCTION COSTS (see detail sheet for breakdown)		**$ 428,000**
2.00	INDIRECT COSTS (see detail sheet for breakdown)		**$ 240,000**
3.01	EPCM COSTS		**$ -**
3.02	OWNERS COSTS		**$ -**
3.03	ESCALATION		**$ -**
	SUB TOTAL COSTS		**$ 668,000**
4.01	CONTINGENCY	14%	**$ 91,000**
	TOTAL COSTS		**$ 759,000**

ESTIMATE - DIRECT/INDIRECT/OTHER CONSTRUCTION COSTS DETAIL

WorleyParsons
resources & energy

CLIENT:	Assessment and Abandoned Mines	**DATE:**	7-Jul-15
PROJECT TITLE:	Clinton Creek Site Closure LCCA - DS4 Temporary Repair - Detailed Design - Waste Stabilization and Rock Chute	**ACCURACY:**	+/-20%
PROJECT No.:	307076-06729	**AUTHOR:**	JG
MTO No.:		**REVISION:**	2

Area / WBS	Sub Area	Description	Remarks	Qty	Unit	Mhr/Unit	Mhr Total	Mhr Cost ($)	Material/Unit ($)	Material Total ($)	Subcontract Costs/Unit ($)	Subcontract Total ($)	Other/Unit ($)	Other Total ($)	Allowance %	Allowance ($)	Sub Total ($)	Contingency %	Contingency ($)	Total ($)
DIRECT COSTS																				
							-	-		-		-		-		-	-		-	-
		Equipment Mob / Demob	Whitehorse to Dawson City 532km. Dawson City to Site	**6**	**EA**		-	-		-	5,586.00	33,516		-		-	33,516	20%	6,703	40,219
							-	-		-		-		-		-	-		-	-
		Bulk Earthworks					-	-		-		-		-		-	-		-	-
		Waste Rock Excavation (Slope Stabilization)	345Ex, D8 dozer, 40t rock trucks.	**9,500**	**M3**		-	-		-	6.31	59,945		-		-	59,945	20%	11,989	71,934
		Waste Rock Fill (93% MPMDD)	D8 Dozer, Single drum soil compactor	**1,000**	**M3**		-	-		-	4.05	4,050		-		-	4,050	20%	810	4,860
		Construct Access Road	5m w x 39m lg, 20% grade, on waste rock	**1**	**LS**		-	-		-	5,241.21	5,241		-		-	5,241	20%	1,048	6,289
							-	-		-		-		-		-	-		-	-
		Channel Armouring					-	-		-		-		-		-	-		-	-
		Gravel Bedding	Crushed angular rock, site-sourced, roller compacted	**120**	**M3**		-	-		-	70.00	8,400		-		-	8,400	25%	2,100	10,500
		Class 60T Armorflex Mats	2.4m x 4.5m mats, supply (U.S.) and placement, excludes delivery. Includes rebar, concrete, and manufacturer's representative	**36**	**EA**		-	-		-	3,240.00	116,640		-		-	116,640	10%	11,664	128,304
		Class 60T Armorflex Mats	2.4m x 5.3m mats, supply (U.S.) and placement, excludes delivery. Includes rebar, concrete, and manufacturer's representative	**18**	**EA**		-	-		-	3,816.00	68,688		-		-	68,688	10%	6,869	75,557
		Non-Woven Geotextile	Supply, delivery and installation	**900**	**M2**		-	-		-	12.00	10,800		-		-	10,800	20%	2,160	12,960
		Woven Microgrid Geotextile	Supply, delivery and installation	**900**	**M2**		-	-		-	15.00	13,500		-		-	13,500	20%	2,700	16,200
		Duckbill Model 68-DBD Ground Anchors	900 mm long, supply, installation, and delivery	**312**	**EA**		-	-		-	60.00	18,720		-		-	18,720	15%	2,808	21,528
		Large Diameter Rock for Tie-In to Existing Structure	Site sourced rock average dimension of 300 to 800 mm	**30**	**M3**		-	-		-	148.94	4,468		-		-	4,468	25%	1,117	5,585
							-	-		-		-		-		-	-		-	-
		Construction Water Management					-	-		-		-		-		-	-		-	-
		Aquadam	1.8m h x 30.5m lg	**1**	**EA**		-	-		-	26,000	26,000		-		-	26,000	20%	5,200	31,200
		Pumps, hoses, fuel & maintainence	150mm submersible	**2**	**EA**		-	-		-	9,287.20	18,574		-		-	18,574	20%	3,715	22,289
							-	-		-		-		-		-	-		-	-
		Support Equipment					-	-		-		-		-		-	-		-	-
		Shop truck	1ea	**35**	**DY**		-	-		-	300.00	10,500		-		-	10,500	20%	2,100	12,600
		Shop trailer	1ea	**1.2**	**MO**		-	-		-	2,000.00	2,303		-		-	2,303	20%	461	2,763
		Pick-up trucks	2ea	**35**	**DY**		-	-		-	300.00	10,500		-		-	10,500	20%	2,100	12,600
		Generator	1ea	**1.2**	**MO**		-	-		-	1,320.00	1,520		-		-	1,520	20%	304	1,824
							-	-		-		-		-		-	-		-	-
		Asbestos Equipment					-	-		-		-		-		-	-		-	-
		Equipment / vehicle heppa filters,		**1**	**LS**		-	-		-	6,000.00	6,000		-		-	6,000	25%	1,500	7,500
		PPE; respirators, overalls		**15**	**EA**		-	-		-	500.00	7,500		-		-	7,500	25%	1,875	9,375
							-	-		-		-		-		-	-		-	-
		Fuel Transportation	Transport from Dawson City to site (approx 110km one-way).				-	-		-		-		-		-	-		-	-
		Fuel truck & driver	27,000 liter tanker	**1**	**LD**		-	-		-	685.60	686		-		-	686	20%	137	823
			*fuel included in all-in rates.	24,210	liters		-	-		-		-		-		-	-		-	-
DIRECT COST SUB TOTAL							**-**	**-**		**-**		**427,551**		**-**	**0%**	**-**	**427,551**	**16%**	**67,360**	**494,911**

ESTIMATE - DIRECT/INDIRECT/OTHER CONSTRUCTION COSTS DETAIL

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CLIENT:	Assessment and Abandoned Mines	**DATE:**	7-Jul-15
PROJECT TITLE:	Clinton Creek Site Closure LCCA - DS4 Temporary Repair - Detailed Design - Waste Stabilization and Rock Chute	**ACCURACY:**	+/-20%
PROJECT No.:	307076-06729	**AUTHOR:**	JG
MTO No.:		**REVISION:**	2

Area / WBS	Sub Area	Description	Remarks	Qty	Unit	Mhr/Unit	Mhr Total	Mhr Cost ($)	Material/Unit ($)	Material Total ($)	Subcontract Costs/Unit ($)	Subcontract Total ($)	Other/Unit ($)	Other Total ($)	Allowance %	Allowance ($)	Sub Total ($)	Contingency %	Contingency ($)	Total ($)
INDIRECT COSTS																				
		TEMPORARY CONSTRUCTION CAMP	RV rental (2men per unit) and single per diem.	**165**	**MDY**		-	-		-	255.00	42,075		-		-	42,075	10%	4,208	46,283
		TEMPORARY FACILITIES AND CONSTRUCTION SITE SERVICES		**3%**			-	-		-	427,550.78	12,827		-		-	12,827	10%	1,283	14,109
		SNOW REMOVAL	n/a				-	-		-		-		-		-	-		-	-
		ROAD MAINTENANCE	n/a				-	-		-		-		-		-	-		-	-
		OVERTIME PREMIUM FOR COMPRESSED WORK WEEK	n/a				-	-		-		-		-		-	-		-	-
		NON-PRODUCTIVE TIME	n/a				-	-		-		-		-		-	-		-	-
		SPOT OVERTIME	n/a				-	-		-		-		-		-	-		-	-
		CONTRACTOR LOA AND TRAVEL	Edm to Dawson City charter flight + DC to Site by charter bus. 1 roundtrip/man.	**6**	**Round Trip**		-	-		-	1,144.00	6,864		-		-	6,864	10%	686	7,550
		HEAVY LIFT	n/a				-	-		-		-		-		-	-		-	-
		TRANSPORTATION AND FREIGHT	Aquadam & pumps.	**1**	**LD**		-	-		-	9,631.00	9,631		-		-	9,631	10%	963	10,594
		TRANSPORTATION AND FREIGHT	Armourflex. Quote from supplier.	**8**	**LD**		-	-		-	14,000.00	112,000		-		-	112,000	10%	11,200	123,200
		CAPITAL SPARE PARTS	n/a				-	-		-		-		-		-	-		-	-
		FIRST FILLS	n/a				-	-		-		-		-		-	-		-	-
		ENVIRONMENTAL ASSESSMENT, MONITORING AND TESTING SERVICES		**35**	**DY**		-	-		-	1,500.00	52,500		-		-	52,500	10%	5,250	57,750
		GEOTECHNICAL INVESTIGATIONS AND RECOMMENDATIONS	n/a				-	-		-		-		-		-	-		-	-
		CONSTRUCTION INSURANCE	n/a	**1%**			-	-		-	427,551	4,276		-		-	4,276		-	4,276
		BUILDING PERMITS	n/a				-	-		-		-		-		-	-		-	-
INDIRECT COST SUB TOTAL							**-**	**-**		**-**		**240,172**		**-**	**0%**	**-**	**240,172**	**10%**	**23,590**	**263,762**
OTHER COSTS																				
		EPCM					-	-		-		-		-		-	-		-	-
		OWNERS COSTS					-	-		-		-		-		-	-		-	-
		ESCALATION					-	-		-		-		-		-	-		-	-
OTHER COST SUB TOTAL							**-**	**-**		**-**		**-**		**-**		**-**	**-**		**-**	**-**
TOTAL																	**667,723**	**14%**	**90,949**	**758,672**

Appendix 3 Construction Schedule

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Contractor Man Power Schedule

2015

Description	Qty	UoM	Crew Size # of Men	Equivalent Man-Days	May					Jun				Jul				Aug				Sept			
					1	2	3	4	5	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Mob/Demob & Set-up Equip			4	12													4					3			
Waste Rock Excavation	9,500	M3	4	40														3	4						
Waste Rock Fill	1,000	M3	1	1															1						
Construct Access Rd.	39	M3	3	3															3						
Gravel Bedding	100	M3	3	24														1		3					
Class 60T Armorflex	54	EA	4	56															4	4	4				
Ground Anchors	414	EA	4	16																2	2				
Concrete/Grout	15	M3	2	4																2	2				
Place large diameter rock	30	M3	2	2																	2				
Aquadam	1	EA	4	6													4					4			
Pumps, Hose & Maintenance	2	EA	1	1													1	1	1	1	1	1			
TOTALS																									
Total Contractor Man-Days	165	Man-Days																							

Number indicates anticipated crew size

Unproductive Time

Support Personnel

Construction Work

Appendix 4

Daily Field Reports

WorleyParsons
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Daily Field Report

Report # 20150812_Clinton_Creek

PROJECT INFORMATION	
Project #: 307071-01056	**Date:** 12/08/2015
Project Name: Repair of Clinton Creek Drop Structures	**WorleyParsons Employee(s):** Mario Amendolia
Client: Government of Yukon (YG): Assessment & Abandoned Mines (AAM)	**Contractor: Sidhu Trucking**

Location: Clinton Creek DS4	**Start Up:** 07:30	**Shut Down:** 18:00
Operative Equipment on site: N/A	**Kms Driven:** 130	**Helicopter Hrs:** N/A
Site Description: Slightly wet, in good condition		
Weather: Light rain, cloudy		
Description of Work: Excavation of waste rock (not commenced)		
Vehicle Journey Management Form Completed: Y	**Field Level Hazard Assessment Completed:** Y	
Tailgate Meeting Completed: Y		

SUMMARY AND NOTES:

Daily Activities

7:30 Left Dawson City

10:00 -18:00 Arrived on site and met Luca and Patricia, brief tour of the site, met contractor (Bruce), surveyor and Yukon safety officers.

Surveyor started to lay out the perimeter of the excavation; he said that he will complete his job tomorrow.

At station 0+023.5 (on the south side of the new structure) the ground elevation is 424m rather than 425; photos of the drawing and a brief description of the issue was addressed in a previous email sent by Patricia.

Sidhu foreman (Bruce) said he will give me orientation.

A first aid trailer arrived on site.

No excavation work done today.

18:00 left site

20:00 met with Luca and Patricia to review the issue at station 0+023.5 and prepared email.

Day Samples and Tests: N/A

Crews/Employees On Site: AAM, Sidhu	**Visitors on Site: 2**

Any HSE Incidents / Near Misses? No

Incidents:	**0**	**Safety Talks:**	**Y**	**Inspections:**	**Y**	**SAZ Cards:**	**0**
Near Miss:	**0**	**JHA Reviews:**	**0**	**FLHA's:**	**N**	**Total Hours:**	**11**

HSE Notes (indicate HSE report number if applicable):

FORECAST ACTIVITIES:

Complete surveying, sampling waste rock

PHOTOGRAPHS:

Looking East: staking the N boundary of the work area

Looking East: staking the N boundary of the work area

Daily Field Report

Report # 20150813_Clinton_Creek

PROJECT INFORMATION	
Project #: 307071-01056	**Date:** 13/08/2015
Project Name: Repair of Clinton Creek Drop Structures	**WorleyParsons Employee(s):** Mario Amendolia
Client: Government of Yukon (YG): Assessment & Abandoned Mines (AAM)	**Contractor: Sidhu Trucking**

Location: Clinton Creek DS4	**Start Up:** 08:30	**Shut Down:** 17:00
Operative Equipment on site: N/A	**Kms Driven:** 30	**Helicopter Hrs:** N/A
Site Description: Ground slightly wet		
Weather: Cloudy and light rain		
Description of Work: Excavation of waste rock		
Vehicle Journey Management Form Completed: Y	**Field Level Hazard Assessment Completed:** Y	
Tailgate Meeting Completed: Y		

SUMMARY AND NOTES:

Daily Activities

8:30 Tailgate meeting with Patricia Rendell and Luca Poloni, then drive to site and completed FLHA.

08:45 -12:45 CAP completed survey of north side of structure and sampled 4 pails (5 gal each) of waste rock for sieve analysis and proctor. Raw survey data given to Client.

Contractor wants to start excavation at 2H:1V between stations 0+023.5 and 0+065.5 first, then continue regrading the slopes, as per design, west of sta. 0+023.5 and east of sta. 0+065.5 within the limits of the excavation.

Excavation is supposed to start this Saturday, Aug 15.

No excavation work done today.

16:00-18:00 Discussion and office work at Luca's place, then drive back to my place and completed DFR.

.

Day Samples and Tests:

4 pails of waste rock sampled by CAP

Crews/Employees On Site: AAM, Sidhu	**Visitors on Site: 0**

Any HSE Incidents / Near Misses? No

Incidents:	**0**	**Safety Talks:**	**Y**	**Inspections:**	**0**	**SAZ Cards:**	**0**
Near Miss:	**0**	**JHA Reviews:**	**N**	**FLHA's:**	**Y**	**Total Hours:**	**11**

HSE Notes (indicate HSE report number if applicable):

FORECAST ACTIVITIES:

Staging work and clean up

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Daily Field Report

Report # 20150813_Clinton_Creek

PHOTOGRAPHS:

CAP surveyor sampling waste rock material

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Daily Field Report

Report # 20150814_Clinton_Creek

PROJECT INFORMATION	
Project #: 307071-01056	**Date:** 14/08/2015
Project Name: Repair of Clinton Creek Drop Structures	**WorleyParsons Employee(s):** Mario Amendolia
Client: Government of Yukon (YG): Assessment & Abandoned Mines (AAM)	**Contractor: Sidhu Trucking**

Location: Clinton Creek DS4	**Start Up: 07**:00	**Shut Down:** 17:20
Operative Equipment on site: 3	**Kms Driven:** 30	**Helicopter Hrs:** N/A
Site Description: Ground slightly wet		
Weather: Partly cloudy and rain		
Description of Work: Excavation of waste rock		
Vehicle Journey Management Form Completed: Y	**Field Level Hazard Assessment Completed:** Y	
Tailgate Meeting Completed: Y		

SUMMARY AND NOTES:

Daily Activities

7:00 Tailgate meeting with contractor and client. Discussed general rules for job site.

8:30 Phone conference with L. Martin. It was discussed whether to grade the north slope to 1H:1V after the backfill at 50:1 is completed or to leave it as it is. The north slope will be left at its original grade.

9:30 arrived on site and completed FLHA; contractor started to cut the south slope with a dozer (D6M): he worked between sta. 0+023.5 and sta. 0+065.5. Late in the afternoon the material was loaded by a hoe (LINK 250) on a truck (TEREX) and placed in an area that was previously identified and approved by the client. The slope was checked by WP and it is very close to design.

17:20 left site

17:40 arrived at the cabin and started to write DFR.

Day Samples and Tests: N/A

Crews/Employees On Site: AAM, Sidhu	**Visitors on Site: 0**

Any HSE Incidents / Near Misses? No

Incidents:	**0**	**Safety Talks:**	**Y**	**Inspections:**	**0**	**SAZ Cards:**	**0**
Near Miss:	**0**	**JHA Reviews:**	**N**	**FLHA's:**	**Y**	**Total Hours:**	**11**

HSE Notes (indicate HSE report number if applicable):

FORECAST ACTIVITIES:

Continuing to cut the slope and removal of excavated material to dump area.

PHOTOGRAPHS:

Looking East: the D6M dozer cutting the slope

Looking North: the excavated waste rock is taken away to the dump area

The dump area on the SE corner of the work area where the waste rock is disposed of

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Daily Field Report

Report # 20150815_Clinton_Creek

PROJECT INFORMATION	
Project #: 307071-01056	**Date:** 15/08/2015
Project Name: Repair of Clinton Creek Drop Structures	**WorleyParsons Employee(s):** Mario Amendolia
Client: Government of Yukon (YG): Assessment & Abandoned Mines (AAM)	**Contractor: Sidhu Trucking**

Location: Clinton Creek DS4	**Start Up:** 07:00	**Shut Down:** 17:30
Operative Equipment on site: 4	**Kms Driven:** 23	**Helicopter Hrs:** N/A
Site Description: Ground wet		
Weather: Partly cloudy and rain		
Description of Work: Excavation of waste rock		
Vehicle Journey Management Form Completed: Y	**Field Level Hazard Assessment Completed:** Y	
Tailgate Meeting Completed: Y		

SUMMARY AND NOTES:

Daily Activities

7:00 Tailgate meeting with contractor and client. Discussed general rules for job site. Filled in FLHA.

8:15 Contractor warmed up his equipment, did the walk around the vehicles and started to work He is continuing to excavate the slope between the stations mentioned in yesterday's DFR. Sidhu engineer checked the slope already cut and realized that the slope is steeper than 2H:1V. Prior to his arrival on site there were no stakes indicating the depth to cut and the hoe operator was doing it by eye.

Contractor brought in another truck.

17:30 left site and went to Luca's place to discuss the issue of the steeper slope with L. Martin; it was decided to leave the slope already cut as it is now, that is 1.8H:1V, create a little bench and continue with a 2H:1V cut as per design. The contractor was informed about this solution.

19:00 arrived at the cabin and started to write DFR.

Day Samples and Tests: N/A

Crews/Employees On Site: AAM, Sidhu	**Visitors on Site: 0**

Any HSE Incidents / Near Misses? No

Incidents:	**0**	**Safety Talks:**	**Y**	**Inspections:**	**0**	**SAZ Cards:**	**1**
Near Miss:	**0**	**JHA Reviews:**	**N**	**FLHA's:**	**Y**	**Total Hours:**	**12**

HSE Notes (indicate HSE report number if applicable):

FORECAST ACTIVITIES:

Continuing to cut the slope and removal of excavated material to dump area.

PHOTOGRAPHS:

Looking North: excavation of the south slope

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Daily Field Report

Report # 20150827_Clinton_Creek

PROJECT INFORMATION	
Project #: 307071-01056	**Date:** 27/08/2015
Project Name: Repair of Clinton Creek Drop Structures	**WorleyParsons Employee(s):** Stephen Clark
Client: Government of Yukon (YG): Assessment & Abandoned Mines (AAM)	**Contractor: Sidhu Trucking**

Location: Clinton Creek DS4	**Start Up:** 07:30	**Shut Down:** 17:30
Operative Equipment on site: 4	**Kms Driven:** 120	**Helicopter Hrs:** N/A
Site Description: Ground wet		
Weather: Cloudy and rain		
Description of Work: Excavation of waste rock, setting up pumping diversion		
Vehicle Journey Management Form Completed: Y	**Field Level Hazard Assessment Completed:** Y	
Tailgate Meeting Completed: Y		

SUMMARY AND NOTES:

Daily Activities

07:30 Travel to site.

12:30 Arrived on site. Completed site safety orientation with Sidhu.

13:30 Inspected creek diversion, waste rock excavation, material stockpiles.

Notes:

- ***Hudgeon Lake 11.68m +0.27m at 12:30***
- ***Hudgeon Lake +0.28m at 15:00***
- ***Estimated discharge in Clinton Creek at fording***
    - ***Culvert 1: 1000 mm dia., WL 0 cm above crown, 1.15 cms***
    - ***Culvert 2: 600 mm dia., WL 0 cm above crown, 0.33 cms***
    - ***Culvert 3: 600 mm dia., WL 32 cm above crown, 0.50 cms***
    - ***Culvert 4: 600 mm dia., WL 36 cm above crown, 0.55 cms***
    - ***Culvert 5: 600 mm dia., WL 26 cm above crown, 0.45 cms***
    - ***Ford: 4.5m wide weir, 0.14 m water depth, ~0.4 cms***
    - ***Total lake discharge rate: 3.4 cms (3.0 – 3.8 cms)***
- ***Inspected sump with four 10" pumps connected to 12" hdpe pipes (total 1.26 cms pumping rate)***
- ***Waste rock resloping substantially completed. Permafrost encountered near east end.***

Day Samples and Tests: N/A

Crews/Employees On Site: AAM, Sidhu	**Visitors on Site: 0**

Any HSE Incidents / Near Misses? No

Incidents:	**0**	**Safety Talks:**	**Y**	**Inspections:**	**0**	**SAZ Cards:**	**0**
Near Miss:	**0**	**JHA Reviews:**	**N**	**FLHA's:**	**Y**	**Total Hours:**	**12**

HSE Notes (indicate HSE report number if applicable):

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Daily Field Report

Report # 20150827_Clinton_Creek

FORECAST ACTIVITIES:
Laying HDPE pipe for diversion on August 28. Possibly starting to pump August 29, however flows are very high.

PHOTOGRAPHS:

Looking North: Fording with one 1000mm culvert (closest), four 600mm culverts and a fording (farthest). Approx. 3.4 m3/s

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Daily Field Report

Report # 20150827_Clinton_Creek

Looking East: Pumping diversion, four 10” pumps connected to 12” hdpe. Sitting on old armorflex mat

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Daily Field Report

Report # 20150828_Clinton_Creek

PROJECT INFORMATION	
Project #: 307071-01056	**Date:** 28/08/2015
Project Name: Repair of Clinton Creek Drop Structures	**WorleyParsons Employee(s):** Stephen Clark
Client: Government of Yukon (YG): Assessment & Abandoned Mines (AAM)	**Contractor: Sidhu Trucking**

Location: Clinton Creek DS4	**Start Up:** 07:00	**Shut Down:** 17:30
Operative Equipment on site: 4	**Kms Driven:** 20	**Helicopter Hrs:** N/A
Site Description: Ground wet		
Weather: Cloudy and rain		
Description of Work: Excavation of waste rock, installation of pumping diversion		
Vehicle Journey Management Form Completed: Y	**Field Level Hazard Assessment Completed:** Y	
Tailgate Meeting Completed: Y		

SUMMARY AND NOTES:

Daily Activities

06:30 Travel to site.

07:00 Arrived on site. Daily tailgate meeting.

16:30 Left site.

17:00 Reporting.

Notes:

- ***Hudgeon Lake 11.68m +0.29m at 07:00***
- ***Hudgeon Lake +0.28m at 13:00***
- ***Started day with 45 m of HPDE pipe placed. Finished with 90 m of pipe. Had to stop because of ongoing waste rock excavation.***
- ***Some minor waste rock excavation, cleaning up slopes***

Day Samples and Tests: N/A

Crews/Employees On Site: AAM, Sidhu	**Visitors on Site: 0**

Any HSE Incidents / Near Misses? No

Incidents:	**0**	**Safety Talks:**	**Y**	**Inspections:**	**0**	**SAZ Cards:**	**0**
Near Miss:	**0**	**JHA Reviews:**	**N**	**FLHA's:**	**Y**	**Total Hours:**	**12**

HSE Notes (indicate HSE report number if applicable):

FORECAST ACTIVITIES:

Still excavating waste rock tomorrow. Will start burying HDPE pipe. Likely won't be complete pipe installation until Aug 30 or 31.

Daily Field Report

Report # 20150829_Clinton_Creek

PROJECT INFORMATION	
Project #: 307071-01056	**Date:** 29/08/2015
Project Name: Repair of Clinton Creek Drop Structures	**WorleyParsons Employee(s):** Stephen Clark
Client: Government of Yukon (YG): Assessment & Abandoned Mines (AAM)	**Contractor: Sidhu Trucking**

Location: Clinton Creek DS4	**Start Up:** 07:00	**Shut Down:** 17:30
Operative Equipment on site: 4	**Kms Driven:** 25	**Helicopter Hrs:** N/A
Site Description: Muddy but otherwise dry, frosty in morning		
Weather: Partly cloudy		
Description of Work: Excavation of waste rock, installation of pumping diversion		
Vehicle Journey Management Form Completed: Y	**Field Level Hazard Assessment Completed:** Y	
Tailgate Meeting Completed: Y		

SUMMARY AND NOTES:

Daily Activities

06:30 Travel to site.

07:00 Arrived on site. Daily tailgate meeting.

17:30 Left site.

18:00 Reporting.

Notes:

- ***Hudgeon Lake 11.68m +0.22m at 09:00 (2.8 m3/s)***
- ***Hudgeon Lake +0.20m at 17:00 (2.5 m3/s)***
- ***Excavated waste rock until 4pm. Installed 15 m of pipe before end of day.***

Day Samples and Tests: N/A

Crews/Employees On Site: AAM, Sidhu	**Visitors on Site: 0**

Any HSE Incidents / Near Misses? No

Incidents:	**0**	**Safety Talks:**	**Y**	**Inspections:**	**0**	**SAZ Cards:**	**0**
Near Miss:	**0**	**JHA Reviews:**	**N**	**FLHA's:**	**Y**	**Total Hours:**	**12**

HSE Notes (indicate HSE report number if applicable):

FORECAST ACTIVITIES:

All pipe laying tomorrow, and probably into Monday, August 31. Plan is to be pumping by September 1.

PHOTOGRAPHS:

3.4 m3/s in Clinton Creek (August 27 and 28)

2.8 m^3/s in Clinton Creek at 9am

2.5 m^3/s in Clinton Creek at 5pm

Looking north: Luca at proposed dam location. 0.76 m deep water at thalweg.

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Daily Field Report

Report # 20150830_Clinton_Creek

PROJECT INFORMATION	
Project #: 307071-01056	**Date:** 30/08/2015
Project Name: Repair of Clinton Creek Drop Structures	**WorleyParsons Employee(s):** Stephen Clark
Client: Government of Yukon (YG): Assessment & Abandoned Mines (AAM)	**Contractor: Sidhu Trucking**

Location: Clinton Creek DS4	**Start Up:** 07:00	**Shut Down:** 17:30
Operative Equipment on site: 4	**Kms Driven:** 25	**Helicopter Hrs:** N/A
Site Description: Muddy but otherwise dry, frosty in morning		
Weather: Partly cloudy		
Description of Work: Installation of pumping diversion		
Vehicle Journey Management Form Completed: Y	**Field Level Hazard Assessment Completed:** Y	
Tailgate Meeting Completed: Y		

SUMMARY AND NOTES:

Daily Activities

06:30 Travel to site.

07:00 Arrived on site. Daily tailgate meeting.

16:30 Left site.

17:00 Reporting.

Notes:

- ***Hudgeon Lake 11.68m +0.17m at 09:00 (2.1 m3/s)***
- ***Hudgeon Lake +0.15m at 17:00 (2.0 m3/s)***
- ***Installed 60 m of pipe by 4:00 pm today. Total 165 m of pipe installed.***
- ***Total 4x240 m of 12" HDPE total on site (installed and stockpiled). Some additional 12" layflat hose as well.***
- ***Looked at permafrost at the toe of excavated slope. ~1 L/s of water seeping from a 5 m wide area in permafrost layer. Fines are being carried with it.***

Day Samples and Tests: N/A

Crews/Employees On Site: AAM, Sidhu	**Visitors on Site: 0**

Any HSE Incidents / Near Misses? No

Incidents:	**0**	**Safety Talks:**	**Y**	**Inspections:**	**0**	**SAZ Cards:**	**0**
Near Miss:	**0**	**JHA Reviews:**	**N**	**FLHA's:**	**Y**	**Total Hours:**	**12**

HSE Notes (indicate HSE report number if applicable):

FORECAST ACTIVITIES:

Need to finish laying ~70 m of pipe. Bury pipe and install armorflex mat at outlet for erosion protection. Plan is to be pumping by September 1.

PHOTOGRAPHS:

Looking east: Permafrost layer along toe of excavated slope (dark brown area). Bottom 2-4 meters approximately.

Looking east: Top of permafrost region marked with survey stakes.

Looking east: ~1 L/s seepage of water from toe. Assumed to be rainwater running along top of permafrost. Delta of fine sediment deposited in background.

Looking west: 4x 165 meters of 12: HDPE pipe placed for diversion.

2.0 m^3/s in Clinton Creek.

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Daily Field Report

Report # 20150831_Clinton_Creek

PROJECT INFORMATION	
Project #: 307071-01056	**Date:** 31/08/2015
Project Name: Repair of Clinton Creek Drop Structures	**WorleyParsons Employee(s):** Stephen Clark
Client: Government of Yukon (YG): Assessment & Abandoned Mines (AAM)	**Contractor: Sidhu Trucking**

Location: Clinton Creek DS4	**Start Up:** 07:00	**Shut Down:** 17:30
Operative Equipment on site: 8	**Kms Driven:** 25	**Helicopter Hrs:** N/A
Site Description: Some mud but otherwise dry		
Weather: Partly cloudy, some rain in afternoon		
Description of Work: Installation of pumping diversion		
Vehicle Journey Management Form Completed: Y	**Field Level Hazard Assessment Completed:** Y	
Tailgate Meeting Completed: Y		

SUMMARY AND NOTES:

Daily Activities

06:30 Travel to site.

07:00 Arrived on site. Daily tailgate meeting.

17:30 Left site.

18:00 Reporting.

Notes:

- ***Hudgeon Lake 11.68m +0.12m at 07:00 (1.7 m3/s)***
- ***Hudgeon Lake +0.105m at 16:30 (1.6 m3/s) – Lake level didn't drop as much as I thought. The light rain in afternoon could have caused that.***
- ***Installed 45 m of pipe today. Total 210 m of pipe installed.***
- ***Built secondary containment for pump generators***
- ***Still ~1 L/s of water seeping from permafrost, but water is clear now.***

Day Samples and Tests: N/A

Crews/Employees On Site: AAM, Sidhu	**Visitors on Site: 0**

Any HSE Incidents / Near Misses? No

Incidents:	**0**	**Safety Talks:**	**Y**	**Inspections:**	**0**	**SAZ Cards:**	**0**
Near Miss:	**0**	**JHA Reviews:**	**N**	**FLHA's:**	**Y**	**Total Hours:**	**12**

HSE Notes (indicate HSE report number if applicable):

FORECAST ACTIVITIES:

Need to finish laying ~20 m of pipe. Looks like we're still on schedule to be pumping September 1.

PHOTOGRAPHS:

Looking northwest: Work area at 2pm

1.6 m3/s at 4:30pm

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Daily Field Report

Report # 20150901_Clinton_Creek

PROJECT INFORMATION	
Project #: 307071-01056	**Date:** 01/09/2015
Project Name: Repair of Clinton Creek Drop Structures	**WorleyParsons Employee(s):** Stephen Clark
Client: Government of Yukon (YG): Assessment & Abandoned Mines (AAM)	**Contractor: Sidhu Trucking**

Location: Clinton Creek DS4	**Start Up:** 07:00	**Shut Down:** 17:30
Operative Equipment on site: 8	**Kms Driven:** 30	**Helicopter Hrs:** N/A
Site Description: Some mud but otherwise dry		
Weather: Partly cloudy, some rain in afternoon		
Description of Work: Installation of pumping diversion		
Vehicle Journey Management Form Completed: Y	**Field Level Hazard Assessment Completed:** Y	
Tailgate Meeting Completed: Y		

SUMMARY AND NOTES:

Daily Activities

06:30 Travel to site.

07:00 Arrived on site. Daily tailgate meeting.

17:30 Left site.

18:00 Reporting.

Notes:

- ***Hudgeon Lake 11.68m +0.09m at 07:00 (1.7 m3/s)***
- ***Hudgeon Lake +0.75m at 17:00 (2.4 m3/s) – Pumps are on, ~1.1 m3/s.***
- ***Constructed inlet channel for pump sump.***
- ***Turned on pumps at ~4:30pm***

Day Samples and Tests: N/A

Crews/Employees On Site: AAM, Sidhu	**Visitors on Site: 0**

Any HSE Incidents / Near Misses? No

Incidents:	**0**	**Safety Talks:**	**Y**	**Inspections:**	**0**	**SAZ Cards:**	**0**
Near Miss:	**0**	**JHA Reviews:**	**N**	**FLHA's:**	**Y**	**Total Hours:**	**12**

HSE Notes (indicate HSE report number if applicable):

FORECAST ACTIVITIES:

Fish salvage September 2nd if flows in Clinton Creek permit. AAM have instructed Sidhu not to lower the water level of Hudgeon Lake below +5 cm on the staff gauge (411.73m). Need to see what ELR has to say about drawing down Hudgeon Lake when on site tomorrow for salvage.

PHOTOGRAPHS:

Looking northwest: Instream work area at 2pm

Looking west: Pump sump being connected to lake.

Looking east: Pipe outlet with armorflex and riprap

Looking east: Pipe outlet with pumps on

1.5 m3/s at 7:30am

2.4 m3/s at 5:00pm after pumps turned on. Pumps account for ~1.1 m3/s.

Daily Field Report

Report # 20150902_Clinton_Creek

PROJECT INFORMATION	
Project #: 307071-01056	**Date:** 02/09/2015
Project Name: Repair of Clinton Creek Drop Structures	**WorleyParsons Employee(s):** Stephen Clark
Client: Government of Yukon (YG): Assessment & Abandoned Mines (AAM)	**Contractor: Sidhu Trucking**

Location: Clinton Creek DS4	**Start Up:** 07:00	**Shut Down:** 17:30
Operative Equipment on site: 8	**Kms Driven:** 30	**Helicopter Hrs:** N/A
Site Description: Pretty dry		
Weather: Sunny, hot		
Description of Work: Fish salvage		
Vehicle Journey Management Form Completed: Y	**Field Level Hazard Assessment Completed:** Y	
Tailgate Meeting Completed: Y		

SUMMARY AND NOTES:

Daily Activities

06:30 Travel to site.

07:00 Arrived on site. Daily tailgate meeting.

17:30 Left site.

18:00 Reporting.

Notes:

- ***Hudgeon Lake 11.68m +0.00m at 07:00 (1.9 m3/s)***
- ***Hudgeon Lake -0.03m at 15:30 (1.1 m3/s)***
- ***Dam constructed at lake outlet at 1pm. Water level still dropping slowly.***
- ***Fish salvage mostly finished by 5:00pm***
- ***Large diameter rock (300-800mm diameter) checked. Photos attached for reference.***

Day Samples and Tests: N/A

Crews/Employees On Site: AAM, Sidhu	**Visitors on Site: 0**

Any HSE Incidents / Near Misses? No

Incidents:	**0**	**Safety Talks:**	**Y**	**Inspections:**	**0**	**SAZ Cards:**	**0**
Near Miss:	**0**	**JHA Reviews:**	**N**	**FLHA's:**	**Y**	**Total Hours:**	**12**

HSE Notes (indicate HSE report number if applicable): N/A

FORECAST ACTIVITIES:

Finish fish salvage tomorrow morning. Dewater construction area. Probably won't start filling until late Sept 3, or Sept 4.

PHOTOGRAPHS:

Looking northwest: Instream work area at 2pm

Looking west: Pump intake

Looking west: Coffer dam. ~5 m wide. Not constructed to full height.

Large Diameter Rock (300-800mm in specs) – 1 of 5. Stick is 1 m long from tip to just below orange.

Large Diameter Rock (300-800mm in specs) – 2 of 5

Large Diameter Rock (300-800mm in specs) – 3 of 5

Large Diameter Rock (300-800mm in specs) – 4 of 5

Large Diameter Rock (300-800mm in specs) – 5 of 5

Daily Field Report

Report # 20150902_Clinton_Creek

1.1 m3/s at 5:30pm. Coffer dam in place. Flow around construction area is completely diverted

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Daily Field Report

Report # 20150903_Clinton_Creek

PROJECT INFORMATION	
Project #: 307071-01056	**Date:** 03/09/2015
Project Name: Repair of Clinton Creek Drop Structures	**WorleyParsons Employee(s):** Stephen Clark
Client: Government of Yukon (YG): Assessment & Abandoned Mines (AAM)	**Contractor: Sidhu Trucking**

Location: Clinton Creek DS4	**Start Up:** 07:00	**Shut Down:** 17:30
Operative Equipment on site: 8	**Kms Driven:** 30	**Helicopter Hrs:** N/A
Site Description: Pretty dry		
Weather: Sunny, hot		
Description of Work: Fish salvage, moving rocks in channel, hauling fill for first lift.		
Vehicle Journey Management Form Completed: Y	**Field Level Hazard Assessment Completed:** Y	
Tailgate Meeting Completed: Y		

SUMMARY AND NOTES:

Daily Activities

06:30 Travel to site.

07:00 Arrived on site. Daily tailgate meeting.

17:30 Left site.

18:00 Reporting.

Notes:

- ***Hudgeon Lake 11.68m -0.04m at 07:00***
- ***Hudgeon Lake -0.05m at 15:30***
- ***Completed fish salvage at 1:00pm***
- ***Finished moving rocks in channel by 4:15pm***
- ***Hauled fill to channel until 5:00pm***

Directions:

- **First lift should be 0.5 m above pooled water. Where rocks are being filled in (except very large rocks), first lift should be no higher than top of rocks.**
- **Large rocks in channel can be collected but not stacked on top of each other to avoid pockets.**

Day Samples and Tests: N/A

Crews/Employees On Site: AAM, Sidhu	**Visitors on Site: 0**

Any HSE Incidents / Near Misses? No

Incidents:	**0**	**Safety Talks:**	**Y**	**Inspections:**	**N**	**SAZ Cards:**	**0**
Near Miss:	**0**	**JHA Reviews:**	**N**	**FLHA's:**	**Y**	**Total Hours:**	**12**

HSE Notes (indicate HSE report number if applicable):

Daily Field Report

Report # 20150903_Clinton_Creek

FORECAST ACTIVITIES:
Placing fill all day tomorrow. Potentially some repair of existing gabion structures.

PHOTOGRAPHS:

Looking northwest: Instream work area at 2pm

Looking north: pumps and finished coffer dam at lake outlet.

Looking northeast: Subgrade prior to fill. Rocks collected to deepest fill, beneath gabions.

Looking west: DS4 with 5 m tall survey rod (taken September 2)

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Daily Field Report

Report # 20150904_Clinton_Creek

PROJECT INFORMATION	
Project #: 307071-01056	**Date:** 04/09/2015
Project Name: Repair of Clinton Creek Drop Structures	**WorleyParsons Employee(s):** Stephen Clark
Client: Government of Yukon (YG): Assessment & Abandoned Mines (AAM)	**Contractor: Sidhu Trucking**

Location: Clinton Creek DS4	**Start Up:** 07:00	**Shut Down:** 17:30
Operative Equipment on site: 8	**Kms Driven:** 50	**Helicopter Hrs:** N/A
Site Description: Pretty dry		
Weather: Cloudy, light rain in afternoon		
Description of Work: Moving rocks in channel, compacting first lift, finding new fill material		
Vehicle Journey Management Form Completed: Y	**Field Level Hazard Assessment Completed:** Y	
Tailgate Meeting Completed: Y		

SUMMARY AND NOTES:

Daily Activities

06:30 Travel to site.

07:00 Arrived on site. Daily tailgate meeting.

17:30 Left site.

18:00 Reporting.

Notes:

- ***Hudgeon Lake 11.68m -0.08m at 07:00***
- ***Spaced out large boulders more to minimize voids in fill.***
- ***Placed first lift – 20-24% m/c, 64-67% MPMDD. Material deemed insufficient.***
- ***Proposed new channel fill material is similar in appearance to 100 mm minus at Entrance Pit. It was used for the coffer dam at Hudgeon Lake outlet. With moderate compactive effort the density was measured to be 2186 kg/m^3.***

Directions:

- **Boulders in fill should be spaced out more, and contractor should take care to fill voids when placing fill.**
- **Gabion baskets that have failed and within the channel infill should be removed, but rock from the baskets bay be spread out between lifts, and empty baskets can be buried similarly.**
- **The waste rock set aside for fill is found to be unsuitable at the current moisture content of >20%. Pile of orange rock (similar in appearance to 100 mm minus, but larger rocks) shall be used instead. The first lift of waste rock placed may be kept in place except where it is within 1.5 m of the bottom of 100mm minus crushed gravel. As per Lee Martin's direction, the new fill requires a "Control Strip", following Alberta Transportation guideline, to estimate a maximum compacted density in the field. All subsequent lifts shall be at least 98% of this density.**

Day Samples and Tests: N/A

Crews/Employees On Site: AAM, Sidhu	**Visitors on Site: 0**

Any HSE Incidents / Near Misses? No

Incidents:	**0**	**Safety Talks:**	**Y**	**Inspections:**	**0**	**SAZ Cards:**	**0**
Near Miss:	**0**	**JHA Reviews:**	**N**	**FLHA's:**	**Y**	**Total Hours:**	**12**

Daily Field Report

Report # 20150904_Clinton_Creek

HSE Notes (indicate HSE report number if applicable): N/A
FORECAST ACTIVITIES:
Placing fill all day tomorrow. Potentially some repair of existing gabion structures.

PHOTOGRAPHS:

Looking northwest: Instream work area at 4pm – removing some poorly compacted fill.

Looking north: Spacing out boulders to minimize voids in fill, 11am.

Looking north: Testing compacted waste rock. 20-24% m/c, 64-67% MPMDD. Material deemed not sufficient.

Proposed new channel fill. Same appearance as 100mm minus at Entrance Pit, but larger rocks, few fines.

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Daily Field Report

Report # 20150904_Clinton_Creek

Proposed new channel fill. Granular, no cohesiveness.

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Daily Field Report

Report # 20150905_Clinton_Creek

PROJECT INFORMATION	
Project #: 307071-01056	**Date:** 05/09/2015
Project Name: Repair of Clinton Creek Drop Structures	**WorleyParsons Employee(s):** Stephen Clark
Client: Government of Yukon (YG): Assessment & Abandoned Mines (AAM)	**Contractor: Sidhu Trucking**

Location: Clinton Creek DS4	**Start Up:** 07:00	**Shut Down:** 17:30
Operative Equipment on site: 8	**Kms Driven:** 50	**Helicopter Hrs:** N/A
Site Description: Pretty dry		
Weather: Sunny		
Description of Work: Removing damaged gabion baskets, placing fill		
Vehicle Journey Management Form Completed: Y	**Field Level Hazard Assessment Completed:** Y	
Tailgate Meeting Completed: Y		

SUMMARY AND NOTES:

Daily Activities

06:30 Travel to site.

07:00 Arrived on site. Daily tailgate meeting.

17:30 Left site.

18:00 Reporting.

Notes:

- ***Hudgeon Lake 11.68m -0.12m at 07:00.***
- ***Pulled out most of first lift of the unsuitable waste rock fill. Replaced with first lift of rocky orange fill.***
- ***Removed damaged gabion baskets at transition to armorflex.***
- ***Completed control section to get control dry density.***
- ***Placed first 2 lifts.***

Density Testing:

- ***Control dry density: 2113 kg/m^3.***
- **1st lift of orange fill: Average 2123 kg/m^3 dry density.**

Day Samples and Tests: N/A

Crews/Employees On Site: AAM, Sidhu	**Visitors on Site: 0**

Any HSE Incidents / Near Misses? No

Incidents:	**0**	**Safety Talks:**	**Y**	**Inspections:**	**0**	**SAZ Cards:**	**0**
Near Miss:	**0**	**JHA Reviews:**	**N**	**FLHA's:**	**Y**	**Total Hours:**	**12**

HSE Notes (indicate HSE report number if applicable): N/A

FORECAST ACTIVITIES:

Placing fill all day tomorrow. Excavating and hauling waste material from channel. Potentially placing 100 mm minus on Tuesday, Sept. 8

PHOTOGRAPHS:

Looking northwest: Instream work area at 4pm – removing some poorly compacted fill.

Looking northwest: Damaged gabion baskets removed. Top of Armorflex will tie into first level of intact gabions (second level shown).

Looking west: 2nd lift placed in channel.

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Daily Field Report

Report # 20150906_Clinton_Creek

PROJECT INFORMATION	
Project #: 307071-01056	**Date:** 06/09/2015
Project Name: Repair of Clinton Creek Drop Structures	**WorleyParsons Employee(s):** Stephen Clark
Client: Government of Yukon (YG): Assessment & Abandoned Mines (AAM)	**Contractor: Sidhu Trucking**

Location: Clinton Creek DS4	**Start Up:** 07:00	**Shut Down:** 17:30
Operative Equipment on site: 8	**Kms Driven:** 50	**Helicopter Hrs:** N/A
Site Description: Dry		
Weather: Sunny, frosty until 9:30am		
Description of Work: Removing damaged gabion baskets, placing fill		
Vehicle Journey Management Form Completed: Y	**Field Level Hazard Assessment Completed:** Y	
Tailgate Meeting Completed: Y		

SUMMARY AND NOTES:

Daily Activities

06:30 Travel to site.

07:00 Arrived on site. Daily tailgate meeting.

17:30 Left site.

18:00 Reporting.

Notes:

- ***Hudgeon Lake 11.68m -0.16m at 07:00***
- ***Placed 3 lifts***
- ***Removed waste material from channel***
- ***Some gabion repair (provisional work item)***

Density Testing:

- ***Testing consistently above 2100 kg/m^3***
- ***Fill is at times very coarse, lacking fines. Density testing occasionally yields very high or very low numbers coinciding with large rocks or voids between several rocks.***

Day Samples and Tests: N/A

Crews/Employees On Site: AAM, Sidhu	**Visitors on Site: 0**

Any HSE Incidents / Near Misses? No

Incidents:	**0**	**Safety Talks:**	**Y**	**Inspections:**	**0**	**SAZ Cards:**	**0**
Near Miss:	**0**	**JHA Reviews:**	**N**	**FLHA's:**	**Y**	**Total Hours:**	**12**

HSE Notes (indicate HSE report number if applicable): N/A

FORECAST ACTIVITIES:

Placing fill all day tomorrow. Excavating and hauling waste material from channel. Potentially placing 100 mm minus on Tuesday, Sept. 8

PHOTOGRAPHS:

Looking northwest: Instream work area at 2pm.

Looking southeast: Burying damaged gabion baskets in middle of channel infill.

Daily Field Report

Report # 20150906_Clinton_Creek

Looking west: Hudgeon Lake level.

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Daily Field Report

Report # 20150907_Clinton_Creek

PROJECT INFORMATION	
Project #: 307071-01056	**Date:** 07/09/2015
Project Name: Repair of Clinton Creek Drop Structures	**WorleyParsons Employee(s):** Stephen Clark
Client: Government of Yukon (YG): Assessment & Abandoned Mines (AAM)	**Contractor: Sidhu Trucking**

Location: Clinton Creek DS4	**Start Up:** 07:00	**Shut Down:** 17:30
Operative Equipment on site: 8	**Kms Driven:** 50	**Helicopter Hrs:** N/A
Site Description: Dry		
Weather: Sunny, frosty until 9:30am		
Description of Work: Excavating to subgrade in channel		
Vehicle Journey Management Form Completed: Y	**Field Level Hazard Assessment Completed:** Y	
Tailgate Meeting Completed: Y		

SUMMARY AND NOTES:

Daily Activities

06:30 Travel to site.

07:00 Arrived on site. Daily tailgate meeting.

17:30 Left site.

18:00 Reporting.

Notes:

- ***Hudgeon Lake 11.68m -0.19m at 07:00***
- ***Removed waste material from channel***
- ***Need to remove ~5-10 m3 of wet silt from RHS of channel at station 0+55 to 0+65. Will replace with rocky orange fill***
- ***Slow progress. Maybe only 10-15 truckloads of excavated material from channel all day***

Day Samples and Tests: N/A

Crews/Employees On Site: AAM, Sidhu	**Visitors on Site: 0**

Any HSE Incidents / Near Misses? No

Incidents:	**0**	**Safety Talks:**	**Y**	**Inspections:**	**N**	**SAZ Cards:**	**0**
Near Miss:	**0**	**JHA Reviews:**	**N**	**FLHA's:**	**Y**	**Total Hours:**	**12**

HSE Notes (indicate HSE report number if applicable): N/A

FORECAST ACTIVITIES:

Excavating and hauling waste from channel between Station 0+50 and 0+65

Daily Field Report

Report # 20150907_Clinton_Creek

PHOTOGRAPHS:

Looking northwest: Instream work area at 2pm

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Daily Field Report

Report # 20150908_Clinton_Creek

PROJECT INFORMATION	
Project #: 307071-01056	**Date:** 08/09/2015
Project Name: Repair of Clinton Creek Drop Structures	**WorleyParsons Employee(s):** Stephen Clark
Client: Government of Yukon (YG): Assessment & Abandoned Mines (AAM)	**Contractor: Sidhu Trucking**

Location: Clinton Creek DS4	**Start Up:** 07:00	**Shut Down:** 17:30
Operative Equipment on site: 9	**Kms Driven:** 50	**Helicopter Hrs:** N/A
Site Description: Dry		
Weather: Sunny, frosty until 9:30am		
Description of Work: Excavating to subgrade in channel		
Vehicle Journey Management Form Completed: Y	**Field Level Hazard Assessment Completed:** Y	
Tailgate Meeting Completed: Y		

SUMMARY AND NOTES:

Daily Activities

06:30 Travel to site.

07:00 Arrived on site. Daily tailgate meeting.

17:30 Left site.

18:00 Reporting.

Notes:

- ***Hudgeon Lake 11.68m -0.19m at 07:00***
- ***Completed small sub-excavation and backfill. ~15-20 m^3***
- ***Slow progress with channel excavation***
- ***46 ton excavator arrived on site Sept 7th to install armorflex mats***

Material delivered:

- ***12 60T Armorflex mats – looks to spec***
- ***3 rolls of Nilex 4510 nonwoven geotextile instead of Nilex 4553. 4510 seems to be a higher spec though***
- ***20m rebar, concrete, strata microgrid and insulating blankets***

Day Samples and Tests: N/A

Crews/Employees On Site: AAM, Sidhu	**Visitors on Site: 0**

Any HSE Incidents / Near Misses? No

Incidents:	**0**	**Safety Talks:**	**Y**	**Inspections:**	**0**	**SAZ Cards:**	**0**
Near Miss:	**0**	**JHA Reviews:**	**N**	**FLHA's:**	**Y**	**Total Hours:**	**12**

HSE Notes (indicate HSE report number if applicable): N/A

FORECAST ACTIVITIES:

At this rate, I expect placement of 100 mm minus base to begin Friday, September 11.

Daily Field Report

Report # 20150908_Clinton_Creek

PHOTOGRAPHS:

Looking northwest: Instream work area at 2pm

Looking west: Subexcavation on RHS of channel between station 0+50 and 0+65. 0.5 m deep

Armorflex mats

Armorflex mats: Crack through that will need repair. Only defect found in top mat on stack.

Armorflex mats: Pretty close to 190 cm block height.

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Daily Field Report

Report # 20150909_Clinton_Creek

PROJECT INFORMATION	
Project #: 307071-01056	**Date:** 09/09/2015
Project Name: Repair of Clinton Creek Drop Structures	**WorleyParsons Employee(s):** Stephen Clark
Client: Government of Yukon (YG): Assessment & Abandoned Mines (AAM)	**Contractor: Sidhu Trucking**

Location: Clinton Creek DS4	**Start Up:** 07:00	**Shut Down:** 17:30
Operative Equipment on site: 9	**Kms Driven:** 50	**Helicopter Hrs:** N/A
Site Description: Dry, wet in afternoon		
Weather: Sunny in am, rain for a couple of hours in afternoon		
Description of Work: Excavation and fill in channel		
Vehicle Journey Management Form Completed: Y	**Field Level Hazard Assessment Completed:** Y	
Tailgate Meeting Completed: Y		

SUMMARY AND NOTES:

Daily Activities

06:30 Travel to site.

07:00 Arrived on site. Daily tailgate meeting.

17:30 Left site.

18:00 Reporting.

Notes:

- ***Hudgeon Lake 11.68m -0.19m at 07:00***
- ***Completed another small sub-excavation and backfill. ~15-20 m^3***

Day Samples and Tests: N/A

Crews/Employees On Site: AAM, Sidhu	**Visitors on Site: 0**

Any HSE Incidents / Near Misses? No

Incidents:	**0**	**Safety Talks:**	**Y**	**Inspections:**	**0**	**SAZ Cards:**	**0**
Near Miss:	**0**	**JHA Reviews:**	**N**	**FLHA's:**	**Y**	**Total Hours:**	**12**

HSE Notes (indicate HSE report number if applicable): N/A

FORECAST ACTIVITIES:

I expect placement of 100 mm minus base to begin Friday, September 11.

PHOTOGRAPHS:

Looking northwest: Instream work area at 2pm

Daily Field Report

Report # 20150910_Clinton_Creek

PROJECT INFORMATION	
Project #: 307071-01056	**Date:** 10/09/2015
Project Name: Repair of Clinton Creek Drop Structures	**WorleyParsons Employee(s):** Stephen Clark
Client: Government of Yukon (YG): Assessment & Abandoned Mines (AAM)	**Contractor: Sidhu Trucking**

Location: Clinton Creek DS4	**Start Up:** 07:00	**Shut Down:** 17:30
Operative Equipment on site: 10	**Kms Driven:** 50	**Helicopter Hrs:** N/A
Site Description: Slightly wet		
Weather: Partly cloudy with showers		
Description of Work: Fill in channel		
Vehicle Journey Management Form Completed: Y	**Field Level Hazard Assessment Completed:** Y	
Tailgate Meeting Completed: Y		

SUMMARY AND NOTES:

Daily Activities

06:30 Travel to site.

07:00 Arrived on site. Daily tailgate meeting.

17:30 Left site.

18:00 Reporting.

Notes:

- ***Hudgeon Lake 11.68m -0.20m at 07:00***
- ***Placed 5 lifts of fill, but couldn't test last lift because nuclear densometer malfunctioned.***

Day Samples and Tests: N/A

Crews/Employees On Site: AAM, Sidhu	**Visitors on Site: 0**

Any HSE Incidents / Near Misses? No

Incidents:	**0**	**Safety Talks:**	**Y**	**Inspections:**	**N**	**SAZ Cards:**	**0**
Near Miss:	**0**	**JHA Reviews:**	**N**	**FLHA's:**	**Y**	**Total Hours:**	**12**

HSE Notes (indicate HSE report number if applicable): N/A

FORECAST ACTIVITIES:

Additional fill required before placement of geotextile, 100 mm minus, geogrid and then armorflex

PHOTOGRAPHS:

Looking northwest: Instream work area at 2pm.

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Daily Field Report

Report # 20151911_Clinton_Creek

PROJECT INFORMATION	
Project #: 307071-01056	**Date:** 11/09/2015
Project Name: Repair of Clinton Creek Drop Structures	**WorleyParsons Employee(s):** Stephen Clark
Client: Government of Yukon (YG): Assessment & Abandoned Mines (AAM)	**Contractor: Sidhu Trucking**

Location: Clinton Creek DS4	**Start Up:** 07:00	**Shut Down:** 17:30
Operative Equipment on site: 10	**Kms Driven:** 30	**Helicopter Hrs:** N/A
Site Description: Slightly wet		
Weather: Sunny		
Description of Work: Fill in channel		
Vehicle Journey Management Form Completed: Y	**Field Level Hazard Assessment Completed:** Y	
Tailgate Meeting Completed: Y		

SUMMARY AND NOTES:

Daily Activities

06:30 Travel to site.

07:00 Arrived on site. Daily tailgate meeting.

17:30 Left site.

18:00 Reporting.

Notes:

- ***Hudgeon Lake 11.68m -0.21m at 07:00***
- ***Finished fill on the north side***
- ***Excavated anchor trench at east end***
- ***Josee arrived on site and will be replacing Wayne Saturday and Sunday***
- ***Discussed with AAM that where armorflex ties into gabion structure on the south sideslope of channel, field fit will be required. Likely an access ramp lined with riprap will be required to direct floodwater from the drop structure into the armorflex channel.***
- ***Will be challenging to compact 100 mm minus on 2:1 slopes to 95% MPMDD. Can likely get 3/4 of the slope from the toe with roller (vibrator off), and pack the rest with excavator bucket***

Materials Delivered

- ***18 more Armorflex mats (30 total)***
- ***Duckbill anchors (actually delivered several days ago, didn't notice) – 68 DBD with 1m long 1/8" cable***
- ***Concrete mixers and additional grout bags***

Day Samples and Tests: N/A

Crews/Employees On Site: AAM, Sidhu	**Visitors on Site: 0**

Any HSE Incidents / Near Misses? No

Incidents:	**0**	**Safety Talks:**	**Y**	**Inspections:**	**0**	**SAZ Cards:**	**0**
Near Miss:	**0**	**JHA Reviews:**	**N**	**FLHA's:**	**Y**	**Total Hours:**	**12**

HSE Notes (indicate HSE report number if applicable): N/A

FORECAST ACTIVITIES:

Cleanup of channel south slope tomorrow morning. Should be placing geotextile and 100 mm minus by tomorrow afternoon.

PHOTOGRAPHS:

Looking northwest: Instream work area at 2pm

Looking north: Drop structure 3

DYWIDAG-SYSTEMS INTERNATIONAL

DSI

SHIP-TO ADDRESS:

P.S. Sidhu Trucking Ltd
165 Collins Lane
WHITEHORSE, YT Y1A-0A8
Contact: Jay @ 867-336-3695
Phone No.

Dywidag Systems International Canada, Lt

Dywidag Systems International
19433 96th Avenue
Suite 103
Surrey, BC V4N 4C4
Phone No: 604-888-8818
Fax No.: 604-888-5008

Job No.	J043026
Department	CN20
Shipment Method	COLLECT
Carrier	Manitoulin
Your Reference:	PO Sidhu
External Document No.	

Ship Ticket ST147558

Order No.	CO070206
Customer No.	C311080
Contact	Paul Krieg
Document Date	August 25, 2015
Shipment Date	August 25, 2015
Page No.	1

Pos.	Quantity	Unit	Description	Item No.	Location
15	315	pieces	68DBD anchor head with 1/8" x 1m (39")Galv. Wire Rope / standard 2" loop	CW ANS	CW
35			ship drive steel when ready on Air North		
37			(attention both: Jay @ 867-336-3695 &		
38			Paramjit 867-334-3874)		

Net Weight 198.45 lbs

Gross Weight 0.00 lbs

packed by: Ben

act. delivery date: 8-25-15

Duckbill anchors

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Daily Field Report

Report # 20150912_Clinton_Creek

PROJECT INFORMATION	
Project #: 307071-01056	**Date:** 12/09/2015
Project Name: Repair of Clinton Creek Drop Structures	**WorleyParsons Employee(s):** Stephen Clark
Client: Government of Yukon (YG): Assessment & Abandoned Mines (AAM)	**Contractor: Sidhu Trucking**

Location: Clinton Creek DS4	**Start Up:** 07:00	**Shut Down:** 17:30
Operative Equipment on site: 10	**Kms Driven:** 30	**Helicopter Hrs:** N/A
Site Description: Slightly wet		
Weather: Sunny		
Description of Work: Fill in channel		
Vehicle Journey Management Form Completed: Y	**Field Level Hazard Assessment Completed:** Y	
Tailgate Meeting Completed: Y		

SUMMARY AND NOTES:

Daily Activities

06:30 Travel to site.

07:00 Arrived on site. Daily tailgate meeting.

17:30 Left site.

18:00 Reporting.

Notes:

- ***Hudgeon Lake 11.68m -0.22m at 07:00***
- ***Cleaned up most of south side of channel***
- ***Placed geotextile and 100 mm minus crushed gravel between station 0+55 and 0+65***
- ***Tom Croskey from Armorflex arrived on site***
  - ***Approximately every 2nd or 3rd mat needs at least one block replaced. Replacement blocks should be arriving Monday, September 14.***
  - ***T. Croskey is happy with channel subbase infill, and OK with compaction of 100 mm minus crushed gravel 3/4 up the slope, and bucket pack the top***

Issues:

- ***100 mm minus gradation issue***
  - ***T. Croskey notes that he recommended clean 100 mm minus (nothing less than 13 mm) so that the gravel layer is "free draining"***
  - ***100 mm minus used has <10% fines. Lee Martin considers this material to be "free draining". The material appears to be substantially clean gravel with some sand.***
- ***Concrete used in Armorflex blocks appears to be of poor quality. Josee is concerned. Pictures attached.***
  - ***Some corners of concrete blocks crumble easily***
  - ***Some larger cracks, but not completely broken. May need to be filled with grout***

Day Samples and Tests: N/A

Crews/Employees On Site: AAM, Sidhu	**Visitors on Site: 0**
Any HSE Incidents / Near Misses? No	

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Daily Field Report

Report # 20150912_Clinton_Creek

Incidents:	**0**	**Safety Talks:**	**Y**	**Inspections:**	**0**	**SAZ Cards:**	**0**
Near Miss:	**0**	**JHA Reviews:**	**N**	**FLHA's:**	**Y**	**Total Hours:**	**12**
HSE Notes (indicate HSE report number if applicable): N/A							
FORECAST ACTIVITIES:							
Continue with geotextile and crushed gravel. Should begin Armorflex placement tomorrow.							

PHOTOGRAPHS:

Looking northwest: Instream work area at 2pm

Broken Armorflex block.

Typical top of Armorflex

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Daily Field Report

Report # 20150913_Clinton_Creek

PROJECT INFORMATION	
Project #: 307071-01056	**Date:** 13/09/2015
Project Name: Repair of Clinton Creek Drop Structures	**WorleyParsons Employee(s):** Stephen Clark
Client: Government of Yukon (YG): Assessment & Abandoned Mines (AAM)	**Contractor: Sidhu Trucking**

Location: Clinton Creek DS4	**Start Up:** 07:00	**Shut Down:** 17:30
Operative Equipment on site: 10	**Kms Driven:** 30	**Helicopter Hrs:** N/A
Site Description: Dry		
Weather: Partly cloudy		
Description of Work: Placing and compacting 100 mm minus, placing Armorflex mats		
Vehicle Journey Management Form Completed: Y	**Field Level Hazard Assessment Completed:** Y	
Tailgate Meeting Completed: Y		

SUMMARY AND NOTES:

Daily Activities

06:30 Travel to site.

07:00 Arrived on site. Daily tailgate meeting.

17:30 Left site.

18:00 Reporting.

Notes:

- ***Hudgeon Lake 11.68m -0.24m at 07:00***
- ***Compacted 100 mm minus crushed gravel between station 0+55 and 0+65***
- ***Placed 9 Armorflex mats (out of 54)***
- ***Placement of Armorflex mats***
  - ***Geotextile and geogrid overlapped 600 mm in the direction of flow and placed to the bottom of east anchor trench***
  - ***Larger rocks in 100 mm minus that stick up above grade should be removed (T. Croskey) before placing Armorflex mats to avoid leading edge of downstream block sticking up above trailing edge of upstream blocks***
  - ***2 blocks of Armorflex mats placed in downstream (east) anchor trench***
  - ***Aiming for max 5 cm separation between adjacent mats along the channel to avoid having to grout the gap. Adjacent mats across the channel should be 15-30 cm apart***

Issues:

- ***100 mm minus gradation issue (update)***
  - ***100 mm minus gravel doesn't compact to more than 85% MPMDD. Possibly a result of 30% oversize (>19mm) rejected from proctor test.***
  - ***We are now aiming for minimum 84% MPMDD***
- ***Concrete used in Armorflex blocks appears to be of poor quality (update)***
  - ***Tom Croskey stated that, while he is not happy with the appearance of mats, the visible cracking and chipping is incidental to typical manufacturing and shipping processes, except where he has identified that individual concrete blocks in the mat be replaced. Further, in Tom Croskey's experience with similar quality concrete, there have been no issues with freeze-that durability that he is aware of.***
  - ***Tom Croskey stated that blocks that are damaged while being placed should be repaired in situ by***

Daily Field Report

- ***filling open cells of damaged block with grout***
  - ***Armorflex blocks should be meeting 27.6 MPa compressive stress and 11.7 kg/m3 water absorption as per ASTM D6684-04 Standard Spec for ACB. Tom Croskey will send test data (1 day, 7 day, 28 day) for these mats once ready.***

Day Samples and Tests: N/A

Crews/Employees On Site: AAM, Sidhu	**Visitors on Site: 0**

Any HSE Incidents / Near Misses? No

Incidents:	**0**	**Safety Talks:**	**Y**	**Inspections:**	**0**	**SAZ Cards:**	**0**
Near Miss:	**0**	**JHA Reviews:**	**N**	**FLHA's:**	**Y**	**Total Hours:**	**12**

HSE Notes (indicate HSE report number if applicable): N/A

FORECAST ACTIVITIES:

Continue with geotextile and crushed gravel. Should begin Armorflex placement tomorrow.

PHOTOGRAPHS:

Looking northwest: Instream work area at 2pm.

Looking north: Placement of first Armorflex mat, ensuring min. 2 blocks buried.

Looking north: Targeting less than 5cm gap between adjacent mats along channel. Will grout gaps greater than 5cm.

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Daily Field Report

Report # 20150914_Clinton_Creek

PROJECT INFORMATION	
Project #: 307071-01056	**Date:** 14/09/2015
Project Name: Repair of Clinton Creek Drop Structures	**WorleyParsons Employee(s):** Stephen Clark
Client: Government of Yukon (YG): Assessment & Abandoned Mines (AAM)	**Contractor: Sidhu Trucking**

Location: Clinton Creek DS4	**Start Up:** 07:00	**Shut Down:** 17:30
Operative Equipment on site: 9	**Kms Driven:** 30	**Helicopter Hrs:** N/A
Site Description: Wet		
Weather: Rainy		
Description of Work: Placing and compacting 100 mm minus, placing Armorflex mats		
Vehicle Journey Management Form Completed: Y	**Field Level Hazard Assessment Completed:** Y	
Tailgate Meeting Completed: Y		

SUMMARY AND NOTES:

<u>Daily Activities</u>

06:30 Travel to site.

07:00 Arrived on site. Daily tailgate meeting.

17:30 Left site.

18:00 Reporting

Notes:

- ***Hudgeon Lake 11.68m -0.25m at 07:00***

Work Completed:

- ***Filled along south of channel between station 0+30 and 0+45***
- ***Placed geotextile and 100 mm minus crushed gravel between station 0+35 and 0+55***
- ***Installed most of duckbill anchors for the 9 mats in place. 2 of the 3 steel rods used to drive the anchors have broken. Sidhu ordering more.***
- ***Began replacement of rejected Armorflex blocks and repair of cracks with primer solution and Portland cement***

Issues:

- ***Concrete used in Armorflex blocks appears to be of poor quality (update)***
    - ***Tom Croskey has begun repairing cracks longer than 1 inch deep by applying a primer/water mix with spray bottle and spreading Portland cement powder over the crack***
    - ***Josee Perron and Stephen Clark have reviewed cracks in the 9 installed mats and have spray-painted ones requiring repair (fill with structural grout where blocks are broken, and apply primer and cement for major cracks)***

Day Samples and Tests: N/A

Crews/Employees On Site: AAM, Sidhu	**Visitors on Site: 0**

Any HSE Incidents / Near Misses?

Incidents:	**0**	**Safety Talks:**	**Y**	**Inspections:**	**0**	**SAZ Cards:**	**1**
Near Miss:	**0**	**JHA Reviews:**	**N**	**FLHA's:**	**Y**	**Total Hours:**	**12**

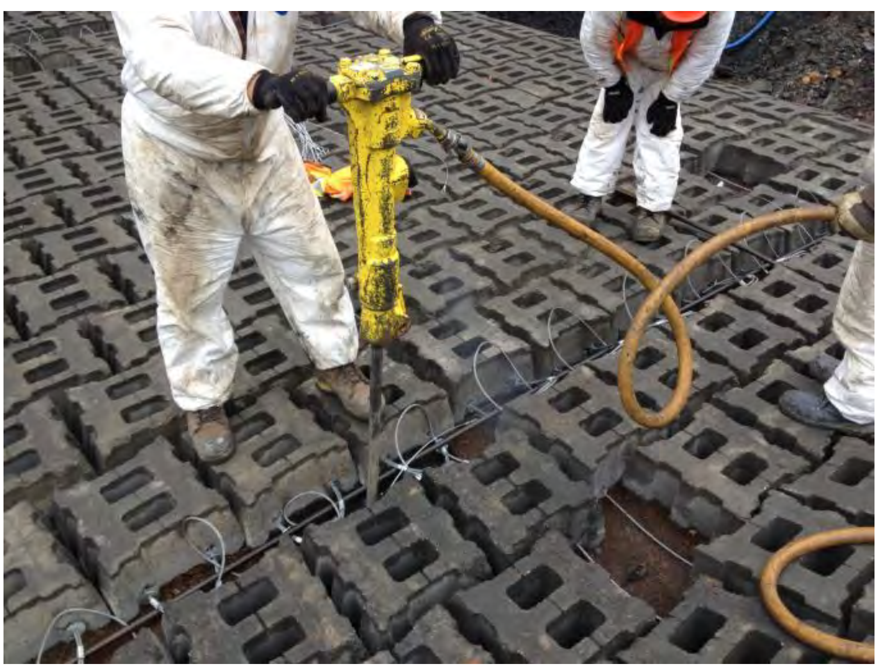
HSE Notes (indicate HSE report number if applicable): N/A

FORECAST ACTIVITIES:

Compact 100 mm minus crushed gravel between station 0+30 and 0+45. Placing Armorflex and installing anchors, filling with grout. Repairing damaged concrete blocks.

PHOTOGRAPHS:

Looking northwest: Instream work area at 2pm



Installing anchors with air hammer and steel rod

End of duckbill anchor (before setting)

Damaged duckbill anchor

Looking northwest: Filling north side of channel along 1:1 cut to top of Armorflex blocks

Looking west: 20m rebar between Armorflex mats

Daily Field Report

Report # 20150915_Clinton_Creek

PROJECT INFORMATION	
Project #: 307071-01056	**Date:** 15/09/2015
Project Name: Repair of Clinton Creek Drop Structures	**WorleyParsons Employee(s):** Stephen Clark
Client: Government of Yukon (YG): Assessment & Abandoned Mines (AAM)	**Contractor: Sidhu Trucking**

Location: Clinton Creek DS4	**Start Up:** 07:00	**Shut Down:** 17:30
Operative Equipment on site: 9	**Kms Driven:** 30	**Helicopter Hrs:** N/A
Site Description: Wet, muddy		
Weather: Rainy in AM, sunny in PM		
Description of Work: Placing and compacting 100 mm minus, placing Armorflex mats		
Vehicle Journey Management Form Completed: Y	**Field Level Hazard Assessment Completed:** Y	
Tailgate Meeting Completed: Y		

SUMMARY AND NOTES:

Daily Activities

06:30 Travel to site.

07:00 Arrived on site. Daily tailgate meeting.

17:30 Left site.

18:00 Reporting.

Notes:

- ***Hudgeon Lake 11.68m -0.21m at 07:00 (up 4 cm over 24 hours: only 2 pumps siphoning + rain)***
- ***Hudgeon Lake 11.68m -0.20m at 16:00 (up 1 cm over 9 hours: only 3 pumps siphoning + rain)***
- ***Noted 29 replaced Armorflex blocks as of 9:30am. This doesn't include broken blocks during placement that will be grouted.***

Work Completed

- ***Compacted 100 mm minus crushed gravel between station 0+35 and 0+55 and placed microgrid***
- ***Placed 18 Armorflex mats***
- ***Continued replacement of rejected Armorflex blocks and repair of cracks with primer solution and Portland cement***

Issues:

- ***Challenging to get some concrete blocks to sit properly due to slightly uneven surface***

Day Samples and Tests: N/A

Crews/Employees On Site: AAM, Sidhu	**Visitors on Site: 0**

Any HSE Incidents / Near Misses?

Incidents:	**0**	**Safety Talks:**	**Y**	**Inspections:**	**0**	**SAZ Cards:**	**0**
Near Miss:	**0**	**JHA Reviews:**	**N**	**FLHA's:**	**Y**	**Total Hours:**	**12**

HSE Notes (indicate HSE report number if applicable):

FORECAST ACTIVITIES:

Continue with placing Armorflex blocks. Still lots of work anchoring and grouting. About 10 m of crushed gravel yet to be placed and some fill on the south side of the channel.

PHOTOGRAPHS:

Looking northwest: Instream work area at 2pm.

Typical repair of long crack in concrete.

Replaced concrete blocks.

Looking south: 5th mat from end is typical of generally poor concrete. 3 blocks cracked during placement.

Looking northwest – Typical base for Armorflex. Generally smooth but difficult to have all blocks sit flat.

Looking north – 9th mat from end. Side mats are starting to get slightly rotated. Will try to correct with next row of mats.

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Daily Field Report

Report # 20150916_Clinton_Creek

PROJECT INFORMATION	
Project #: 307071-01056	**Date:** 16/09/2015
Project Name: Repair of Clinton Creek Drop Structures	**WorleyParsons Employee(s):** Stephen Clark
Client: Government of Yukon (YG): Assessment & Abandoned Mines (AAM)	**Contractor: Sidhu Trucking**

Location: Clinton Creek DS4	**Start Up:** 07:00	**Shut Down:** 18:00
Operative Equipment on site: 9	**Kms Driven:** 210	**Helicopter Hrs:** N/A
Site Description: Wet, muddy		
Weather: Rainy in AM, sunny in PM		
Description of Work: Placing and compacting 100 mm minus, placing Armorflex mats		
Vehicle Journey Management Form Completed: Y	**Field Level Hazard Assessment Completed:** Y	
Tailgate Meeting Completed: Y		

SUMMARY AND NOTES:

Daily Activities

06:55 Travel to Dawson

09:30 Picked up Lee and Jake

10:30 Travelled back to site

13:00 Arrived at site

18:00 Left site

18:30 Reporting

Notes:

- ***Hudgeon Lake 11.68m -?.??***

Work Completed

- ***Placed 9 Armorflex mats***
- ***Installed duckbill anchors***
- ***Placed 100 mm minus between station 0+23 and 0+35***

Subcontractors

- ***Underhill surveyors arrived on site at 10:00 and left site at 18:00***

Day Samples and Tests: N/A

Crews/Employees On Site: AAM, Sidhu	**Visitors on Site: 0**

Any HSE Incidents / Near Misses?

Incidents:	**0**	**Safety Talks:**	**Y**	**Inspections:**	**0**	**SAZ Cards:**	**0**
Near Miss:	**0**	**JHA Reviews:**	**0**	**FLHA's:**	**Y**	**Total Hours:**	**12**

HSE Notes (indicate HSE report number if applicable): N/A

FORECAST ACTIVITIES:

Continue with placing Armorflex blocks. Still lots of work anchoring and grouting, and some fill and crushed gravel on the south side of the channel.

PHOTOGRAPHS:

Looking northwest: Instream work area at 2pm.

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Daily Field Report

Report # 20150917_Clinton_Creek

PROJECT INFORMATION	
Project #: 307071-01056	**Date:** 17/09/2015
Project Name: Repair of Clinton Creek Drop Structures	**WorleyParsons Employee(s):** Stephen Clark
Client: Government of Yukon (YG): Assessment & Abandoned Mines (AAM)	**Contractor: Sidhu Trucking**

Location: Clinton Creek DS4	**Start Up:** 07:00	**Shut Down:** 17:30
Operative Equipment on site: 9	**Kms Driven:** 30	**Helicopter Hrs:** N/A
Site Description: Wet, muddy		
Weather: Rainy in AM, sunny in PM		
Description of Work: Placing and compacting 100 mm minus, placing Armorflex mats		
Vehicle Journey Management Form Completed: Y	**Field Level Hazard Assessment Completed:** Y	
Tailgate Meeting Completed: Y		

SUMMARY AND NOTES:

<u>Daily Activities</u>

06:30 Travel to site

07:00 Arrived on site. Daily tailgate meeting.

17:30 Left site

18:00 Reporting

Notes:

- ***Hudgeon Lake 11.68m -0.20m at 07:00***
- ***Field fit transition from gabion drop structure to armorflex channel will require quite a bit of riprap. Armorflex channel is narrower, and side slopes of drop structure have settled considerably.***
- ***Contractor did not cover up concrete today as we don't expect freezing conditions tonight. Concrete placed tomorrow will require insulation and tarps.***

Work Completed

- ***Placed 9 Armorflex mats***
- ***Filled 31 voids (19%) with grout***
- ***Filled 20 m of trench between mats (23%) with grout***

Subcontractors

- ***Underhill surveyors arrived on site at 10:00 and left site at 17:30***

Day Samples and Tests: N/A

Crews/Employees On Site: AAM, Sidhu, Underhill	**Visitors on Site: 0**

Any HSE Incidents / Near Misses?

Incidents:	**0**	**Safety Talks:**	**Y**	**Inspections:**	**0**	**SAZ Cards:**	**0**
Near Miss:	**0**	**JHA Reviews:**	**N**	**FLHA's:**	**Y**	**Total Hours:**	**12**

HSE Notes (indicate HSE report number if applicable): N/A

FORECAST ACTIVITIES:

Continue with placing Armorflex blocks. Still lots of work anchoring and grouting, and some fill and crushed gravel on the south side of the channel.

PHOTOGRAPHS:

Looking northwest: Instream work area at 2pm

Looking east: Transition from Gabions to Armorflex

Looking east: Transition from gabions to Armorflex

Filling void with grout using shovel

Grouted void

Looking east: Loose cables to be tucked in, should not stick out of grouted trench

Daily Field Report

Report # 20150918_Clinton_Creek

PROJECT INFORMATION	
Project #: 307071-01056	**Date:** 18/09/2015
Project Name: Repair of Clinton Creek Drop Structures	**WorleyParsons Employee(s):** Stephen Clark
Client: Government of Yukon (YG): Assessment & Abandoned Mines (AAM)	**Contractor: Sidhu Trucking**

Location: Clinton Creek DS4	**Start Up:** 07:00	**Shut Down:** 17:30
Operative Equipment on site: 8	**Kms Driven:** 210	**Helicopter Hrs:** N/A
Site Description: Wet, muddy		
Weather: Rainy in AM, sunny in PM		
Description of Work: Placing and compacting 100 mm minus, placing Armorflex mats		
Vehicle Journey Management Form Completed: Y	**Field Level Hazard Assessment Completed:** Y	
Tailgate Meeting Completed: Y		

SUMMARY AND NOTES:

<u>Daily Activities</u>

06:30 Travel to site.

07:00 Arrived on site. Daily tailgate meeting.

08:45 Left site. Travel to Dawson.

10:45 Arrived in Dawson City.

14:00 Dropped Lee and Jake off at the airport.

15:30 Left Dawson City.

17:30 Arrived at camp.

18:00 Reporting.

Notes:

- ***Hudgeon Lake 11.68m -0.19m at 07:00***
- ***Contractor covered up concrete today with insulation as freezing conditions are expected tonight.***

Work Completed

- ***Placed 6 Armorflex mats (94% complete)***
- ***Installed anchors (~50% complete)***
- ***Filled 33 voids with grout (40% complete)***
- ***Filled 15 m of trench between mats with grout (40% complete)***

Day Samples and Tests: N/A

Crews/Employees On Site: AAM, Sidhu	**Visitors on Site: 0**

Any HSE Incidents / Near Misses?

Incidents:	**0**	**Safety Talks:**	**Y**	**Inspections:**	**0**	**SAZ Cards:**	**0**
Near Miss:	**0**	**JHA Reviews:**	**N**	**FLHA's:**	**Y**	**Total Hours:**	**12**

HSE Notes (indicate HSE report number if applicable): N/A

FORECAST ACTIVITIES:

3 more Armorflex blocks to place. About 50% of anchors left to install and 60% of grout. Riprap in upstream and downstream anchor trenches. Field fit transition from gabions to Armorflex at west end of channel.

PHOTOGRAPHS:

Looking northwest: Instream work area at 7am, following day

Looking south: upstream anchor trench at 7am, following day

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Daily Field Report

Report # 20150919_Clinton_Creek

PROJECT INFORMATION	
Project #: 307071-01056	**Date:** 19/09/2015
Project Name: Repair of Clinton Creek Drop Structures	**WorleyParsons Employee(s):** Stephen Clark
Client: Government of Yukon (YG): Assessment & Abandoned Mines (AAM)	**Contractor: Sidhu Trucking**

Location: Clinton Creek DS4	**Start Up:** 07:00	**Shut Down:** 17:30
Operative Equipment on site: 8	**Kms Driven:** 30	**Helicopter Hrs:** N/A
Site Description: Dry		
Weather: Partly cloudy		
Description of Work: Placing and compacting 100 mm minus, placing Armorflex mats		
Vehicle Journey Management Form Completed: Y	**Field Level Hazard Assessment Completed:** Y	
Tailgate Meeting Completed: Y		

SUMMARY AND NOTES:

Daily Activities

06:30 Travel to site.

07:00 Arrived on site. Daily tailgate meeting.

17:30 Left site.

18:00 Reporting.

Notes:

- ***Hudgeon Lake 11.68m -0.19m at 07:00***

Work Completed

- ***Rotated one incorrectly installed Armorflex mat***
- ***Placed and compacted 2 lifts of fill and 1 lift of 100 mm minus crushed gravel under final 3 mats at southwest corner of channel.***
- ***Placed 3 Armorflex mats (100% complete)***
- ***Installed some anchors before last steel rod broke (40% complete)***
- ***Filled 0 voids with grout (40% complete)***
- ***Filled 0 m of trench between mats with grout (40% complete)***

Day Samples and Tests: N/A

Crews/Employees On Site: AAM, Sidhu	**Visitors on Site: 0**

Any HSE Incidents / Near Misses?

Incidents:	**0**	**Safety Talks:**	**Y**	**Inspections:**	**0**	**SAZ Cards:**	**0**
Near Miss:	**0**	**JHA Reviews:**	**N**	**FLHA's:**	**Y**	**Total Hours:**	**12**

HSE Notes (indicate HSE report number if applicable): N/A

FORECAST ACTIVITIES:
60% of anchors left to install and 60% of grout. Riprap in upstream and downstream anchor trenches. Field fit transition from gabions to Armorflex at west end of channel.

PHOTOGRAPHS:

Looking northwest: Instream work area at 7am, following day

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Daily Field Report

Report # 20150920_Clinton_Creek

PROJECT INFORMATION	
Project #: 307071-01056	**Date:** 20/09/2015
Project Name: Repair of Clinton Creek Drop Structures	**WorleyParsons Employee(s):** Stephen Clark
Client: Government of Yukon (YG): Assessment & Abandoned Mines (AAM)	**Contractor: Sidhu Trucking**

Location: Clinton Creek DS4	**Start Up:** 07:00	**Shut Down:** 17:30
Operative Equipment on site: 8	**Kms Driven:** 30	**Helicopter Hrs:** N/A
Site Description: Dry		
Weather: Some snow in am, cloudy		
Description of Work: Installing anchors and grouting		
Vehicle Journey Management Form Completed: Y	**Field Level Hazard Assessment Completed:** Y	
Tailgate Meeting Completed: Y		

SUMMARY AND NOTES:

<u>Daily Activities</u>

06:30 Travel to site.

07:00 Arrived on site. Daily tailgate meeting.

17:30 Left site.

18:00 Reporting.

Notes:

- ***Hudgeon Lake 11.68m -0.19m at 07:00***

Work Completed

- ***Installed anchors (90% complete)***
- ***Filled 0 voids and trench with grout (~60% complete)***
- ***Dug roadside ditch along top of 2:1 cut slope***

Unfinished Work:

- ***Place riprap in upstream and downstream anchor trench***
- ***Fill north and south access road to top of gabion steps and place additional riprap along sides of channel at transition from gabions to Armorflex (field fit)***
- ***Drive and set duckbill anchors***
- ***Grout voids and transitions in Armorflex mats***
- ***Bury ends of geotextile and microgrid along sides of channel***
- ***Remove vegetation from gabions***

Day Samples and Tests: N/A

Crews/Employees On Site: AAM, Sidhu	**Visitors on Site: 0**

Any HSE Incidents / Near Misses?

Incidents:	**0**	**Safety Talks:**	**Y**	**Inspections:**	**0**	**SAZ Cards:**	**0**
Near Miss:	**0**	**JHA Reviews:**	**N**	**FLHA's:**	**Y**	**Total Hours:**	**12**

Daily Field Report

Report # 20150920_Clinton_Creek

HSE Notes (indicate HSE report number if applicable): N/A

FORECAST ACTIVITIES:

10% of anchors left to install and 40% of grout. Riprap in upstream and downstream anchor trenches. Field fit transition from gabions to Armorflex at west end of channel.

PHOTOGRAPHS:

Looking northwest: Instream work area at 2pm

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Daily Field Report

Report # 20150921_Clinton_Creek

PROJECT INFORMATION	
Project #: 307071-01056	**Date:** 21/09/2015
Project Name: Repair of Clinton Creek Drop Structures	**WorleyParsons Employee(s):** Stephen Clark
Client: Government of Yukon (YG): Assessment & Abandoned Mines (AAM)	**Contractor: Sidhu Trucking**

Location: Clinton Creek DS4	**Start Up:** 07:30	**Shut Down:** 18:00
Operative Equipment on site: 8	**Kms Driven:** 30	**Helicopter Hrs:** N/A
Site Description: Dry		
Weather: Cloudy in am, sunny in pm		
Description of Work: Installing anchors and grouting, placing some riprap		
Vehicle Journey Management Form Completed: Y	**Field Level Hazard Assessment Completed:** Y	
Tailgate Meeting Completed: Y		

SUMMARY AND NOTES:

<u>Daily Activities</u>

07:00 Travel to site.

07:30 Arrived on site. Daily tailgate meeting.

18:00 Left site.

18:30 Reporting.

Notes:

- ***Hudgeon Lake 11.68m -0.19m at 07:00***
- ***Installed half of duckbill anchors along north edge of 6 most downstream mats (non-grouted anchors) since it was very difficult to install the anchors into the shale bedrock. This is a non-critical area, so I don't see an issue with it.***

Work Completed

- ***Installed anchors (100% complete)***
- ***Filled voids and trench with grout (100% complete)***
- ***Filled south side of upstream and downstream anchor trenches with riprap***

Unfinished Work:

- ***Place riprap in upstream and downstream anchor trench***
- ***Fill north and south access road to top of gabion steps and place additional riprap along sides of channel at transition from gabions to Armorflex (field fit)***
- ***Bury ends of geotextile and microgrid along sides of channel***
- ***Remove vegetation from gabions***

Day Samples and Tests: N/A

Crews/Employees On Site: AAM, Sidhu	**Visitors on Site: 0**

Any HSE Incidents / Near Misses?

Incidents:	**0**	**Safety Talks:**	**Y**	**Inspections:**	**0**	**SAZ Cards:**	**0**
Near Miss:	**0**	**JHA Reviews:**	**N**	**FLHA's:**	**Y**	**Total Hours:**	**12**

Daily Field Report

Report # 20150921_Clinton_Creek

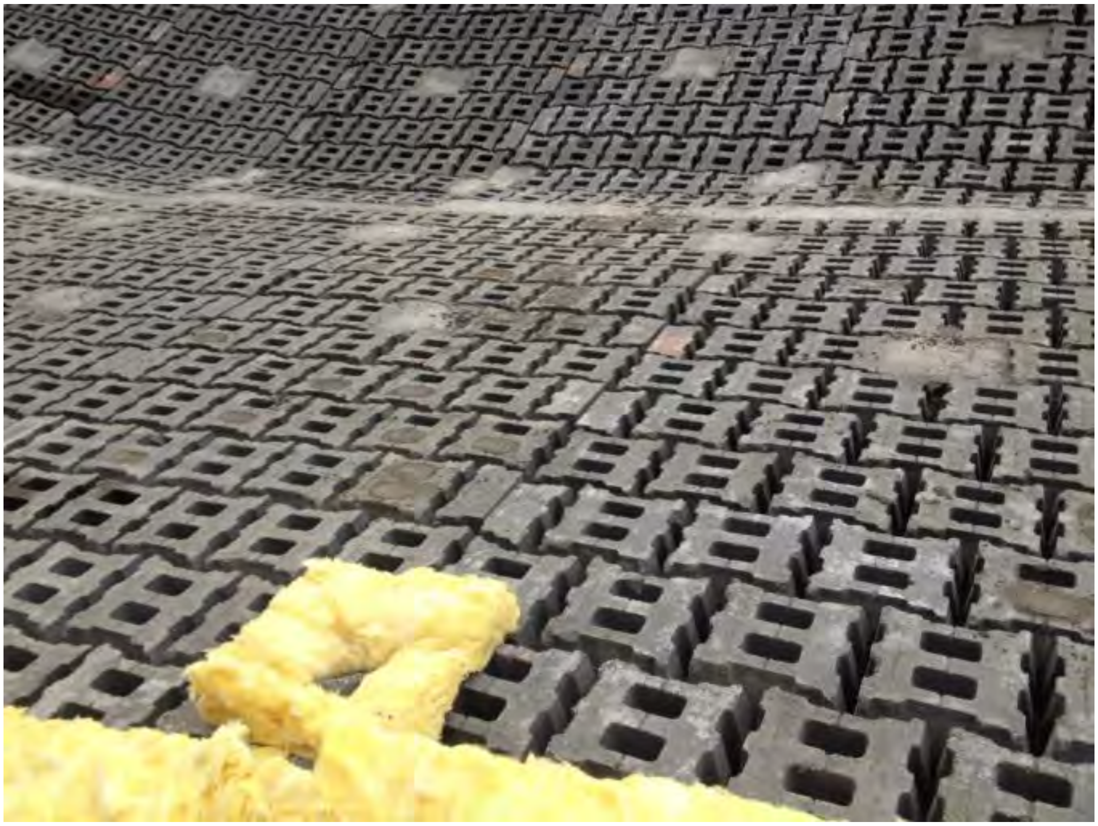
HSE Notes (indicate HSE report number if applicable): N/A

FORECAST ACTIVITIES:
Finish riprap in upstream and downstream anchor trenches. Field fit transition from gabions to Armorflex at west end of channel. Remove diversion pipes and coffer dams.

PHOTOGRAPHS:

Looking northwest: Instream work area at 2pm

Repair of broken Armorflex blocks – fill both voids with grout



Repair of blocks with large cracks: filled one or both voids in block with grout

Filled half of downstream anchor trench with riprap

WorleyParsons
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Daily Field Report

Report # 20150921_Clinton_Creek

Looking northeast: transition from gabions to Armorflex

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resources & energy

Daily Field Report

Report # 20150922_Clinton_Creek

PROJECT INFORMATION	
Project #: 307071-01056	**Date:** 22/09/2015
Project Name: Repair of Clinton Creek Drop Structures	**WorleyParsons Employee(s):** Stephen Clark
Client: Government of Yukon (YG): Assessment & Abandoned Mines (AAM)	**Contractor: Sidhu Trucking**

Location: Clinton Creek DS4	**Start Up:** 07:30	**Shut Down:** 17:00
Operative Equipment on site: 6	**Kms Driven:** 30	**Helicopter Hrs:** N/A
Site Description: Dry, frozen ground		
Weather: Sunny, cold		
Description of Work: Installing anchors and grouting, placing some riprap		
Vehicle Journey Management Form Completed: Y	**Field Level Hazard Assessment Completed:** Y	
Tailgate Meeting Completed: Y		

SUMMARY AND NOTES:

Daily Activities

07:00 Travel to site

07:30 Arrived on site. Daily tailgate meeting.

17:00 Left site

17:30 Reporting and packing up

Notes:

- ***Hudgeon Lake 11.68m -0.22m at 07:00***
- ***-10 Celsius at 8am – frozen ground most of morning***
- ***Work is substantially complete. Final inspection tomorrow (Sept. 23rd) with Josee***

Work Completed

- ***Finished filling upstream and downstream anchor trenches with riprap***
- ***Partially completed transition from gabion-to-armorflex***
- ***Buried ends of geotextile and microgrid (not yet compacted)***
- ***Removed some vegetation from gabions***
- ***Disconnected two pumps and removed unburied pipe***

Unfinished Work:

- ***Fill north and south access road to top of gabion steps and place additional riprap along sides of channel at transition from gabions to Armorflex (field fit)***
- ***Compact soil over ends of geotextile and microgrid along sides of channel***
- ***Remove vegetation from gabions***

Day Samples and Tests: N/A

Crews/Employees On Site: AAM, Sidhu	**Visitors on Site: 0**

Any HSE Incidents / Near Misses?

Incidents:	**0**	**Safety Talks:**	**Y**	**Inspections:**	**0**	**SAZ Cards:**	**0**
Near Miss:	**0**	**JHA Reviews:**	**N**	**FLHA's:**	**Y**	**Total Hours:**	**12**

Daily Field Report

Report # 20150922_Clinton_Creek

HSE Notes (indicate HSE report number if applicable): N/A

FORECAST ACTIVITIES:

Build up access roads and at a bit of riprap at gabion-to-armorflex transition. Compact soil over buried ends of geotextile and microgrid. Remove diversion pipes and coffer dams. Final inspection with AAM Wednesday.

PHOTOGRAPHS:

Looking northwest: Instream work area at 2pm

Looking west: Drainage ditch at top of 2:1 slope

Looking east: North side of gabion-to-armorflex transition to be filled with riprap

Looking east: South side of gabion-to-armorflex transition. Road to be built up to flagging on lath. Riprap to be placed out to flagging tied to gabions

Daily Field Report

Report # 20150922_Clinton_Creek

Looking northwest: Most of riprap placed at upstream transition. Will build up north and south access roads with rocky fill and place a bit more rock up higher as needed (high up rock might not necessarily meet our spec for large diameter rock)

WorleyParsons
resources & energy

Daily Field Report

Report # 20150923_Clinton_Creek

PROJECT INFORMATION	
Project #: 307071-01056	**Date:** 23/09/2015
Project Name: Repair of Clinton Creek Drop Structures	**WorleyParsons Employee(s):** Stephen Clark
Client: Government of Yukon (YG): Assessment & Abandoned Mines (AAM)	**Contractor: Sidhu Trucking**

Location: Clinton Creek DS4	**Start Up:** 07:30	**Shut Down:** 18:30
Operative Equipment on site: 6	**Kms Driven:** 30	**Helicopter Hrs:** N/A
Site Description: Dry, frozen ground		
Weather: Sunny, cold		
Description of Work: Installing anchors and grouting, placing some riprap		
Vehicle Journey Management Form Completed: Y	**Field Level Hazard Assessment Completed:** Y	
Tailgate Meeting Completed: Y		

SUMMARY AND NOTES:

Daily Activities

07:00 Travel to site

07:30 Arrived on site. Daily tailgate meeting.

18:30 Left site

20:30 Arrived in Dawson City

Notes:

- ***Hudgeon Lake 11.68m -0.21m at 07:00***
- ***Hudgeon Lake 11.68m -0.20m at 17:00 (opening dam)***
- ***Final inspection with AAM (Josee Perron and Wayne Emery). Deficiencies list:***
    - ***Additional grouting of gaps > 5 cm required (completed)***
    - ***One wiggly block protruding into flow should be fixed (completed)***
    - ***Access roads on north and south sides of gabion-to-armorflex transition should be built up to Stephen Clark's lath w/ flagging. Material should be compacted and at least wide enough for a roller to run on it.***
    - ***Anchor trench on south side needs to be cleaned up. Some geogrid showing. Should be filled to top of Armorflex, similar to north side.***
    - ***Berm downstream of Armorflex should be removed to reduce water levels in final 15 m of Armorflex channel.***
- ***Armorflex looked good under the 200-300 L/s flow experienced after opening the dam. However, downstream berm (~20 cm high) was not removed by contractor prior and did not erode significantly under these flow conditions. This caused water to back up in the channel.***

Work Completed

- ***Regraded waste rock slope (provisional cost work)***
- ***Compacted soil over geotextile and microgrid on north side of channel***
- ***Fixed wiggly block and grouting of some gaps in Armorflex***
- ***Removed dam from lake outlet, and shut off pumps once minimum 200 L/s was established in the constructed channel.***

Day Samples and Tests: N/A

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Daily Field Report

Report # 20150923_Clinton_Creek

Crews/Employees On Site: AAM, Sidhu				**Visitors on Site: 0**			
Any HSE Incidents / Near Misses?							
Incidents:	**0**	**Safety Talks:**	**Y**	**Inspections:**	**0**	**SAZ Cards:**	**0**
Near Miss:	**0**	**JHA Reviews:**	**N**	**FLHA's:**	**Y**	**Total Hours:**	**12**
HSE Notes (indicate HSE report number if applicable): N/A							
FORECAST ACTIVITIES:							
Remove diversion pipes and complete items on the deficiencies list.							

PHOTOGRAPHS:

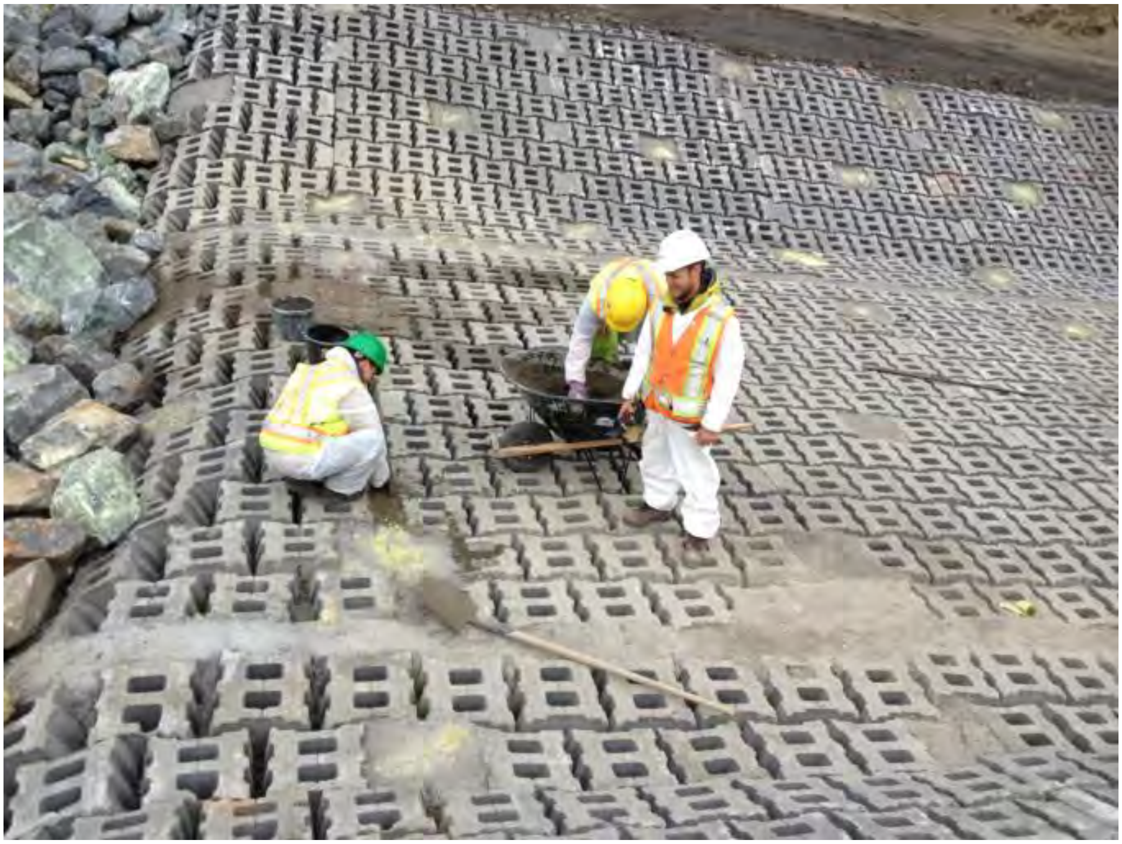
Looking northwest: Instream work area at 2pm

Looking northwest: Instream work area at 6:00pm – Need to remove berm at outlet

Looking northeast: Riprap at outlet (berm located behind riprap)

> 5 cm gap between mats to be filled with grout

> 5 cm gap between mats to be filled with grout



Looking north: AAM and WP filling gaps with grout. Fixing wobbly block

Looking west: Some of geogrid on south side not covered and compacted

Looking east: Most of south side anchor trench looks ok, but some areas are below top of armorflex or not covering geogrid.

Looking southeast: North anchor trench completed. Some orange rocky fill to be brought in to build up north access road to orange flagging on the lath and compacted with roller compactor.

Looking east: South access road to be built up to orange flagging on lath with rocky fill and compacted with roller compactor.

Looking north: Minimum 200 L/s achieve as measured at notch in DS1. Weir flow: 0.8m wide, ~0.35 m deep.

Appendix 5

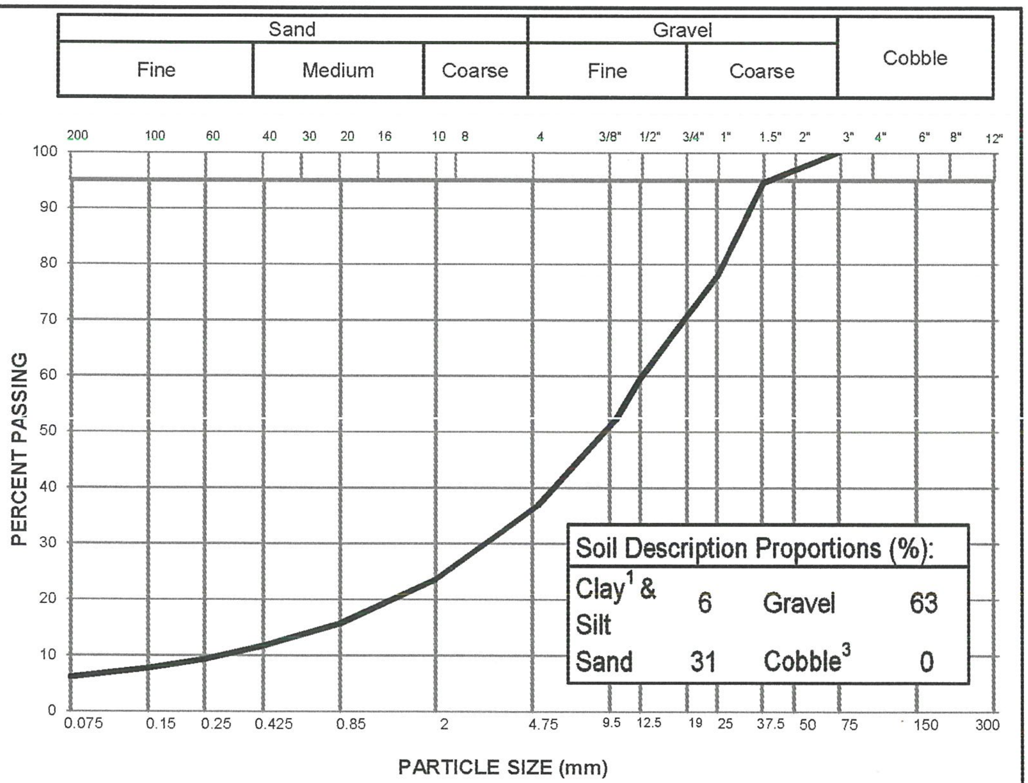
Proctor Test and Sieve Analysis Results

PARTICLE SIZE ANALYSIS REPORT

ASTM D422, C136 & C117

Project:	Clinton Creek	Sample No.:	SA02
Project No.:	W14103619-01	Material Type:	
Site:	Clinton Creek Road	Sample Loc.:	Entrance Pit
Client:	WorleyParsons	Sample Depth:	
Client Rep.:	Margret McBride	Sampling Method:	Grab
Date Tested:	June 3, 2015 By: AMT	Date sampled:	May 31, 2015
Soil Description[2]:	GRAVEL - sandy, trace silt	Sampled By:	Client
		USC Classification:	Cu: 42.3
Moisture Content:	1.5%		Cc: 3.1

Particle Size (mm)	Percent Passing
300	
200	
150	
100	
75	100
50	
38	95
25	78
19	71
12.5	60
10	52
5	37
2	24
0.85	16
0.425	12
0.25	9
0.15	8
0.075	6.1



Soil Description Proportions (%):			
Clay[1] & Silt	6	Gravel	63
Sand	31	Cobble[3]	0

Notes: [1] The upper clay size of 2 um, per the Canadian Foundation Engineering Manual

[2] The description is visually based & subject to EBA description protocols

[3] If cobbles are present, sampling procedure may not meet ASTM C702 & D75

Specification: ______________________

Remarks: ______________________

Reviewed By: ______________________ P.Eng.

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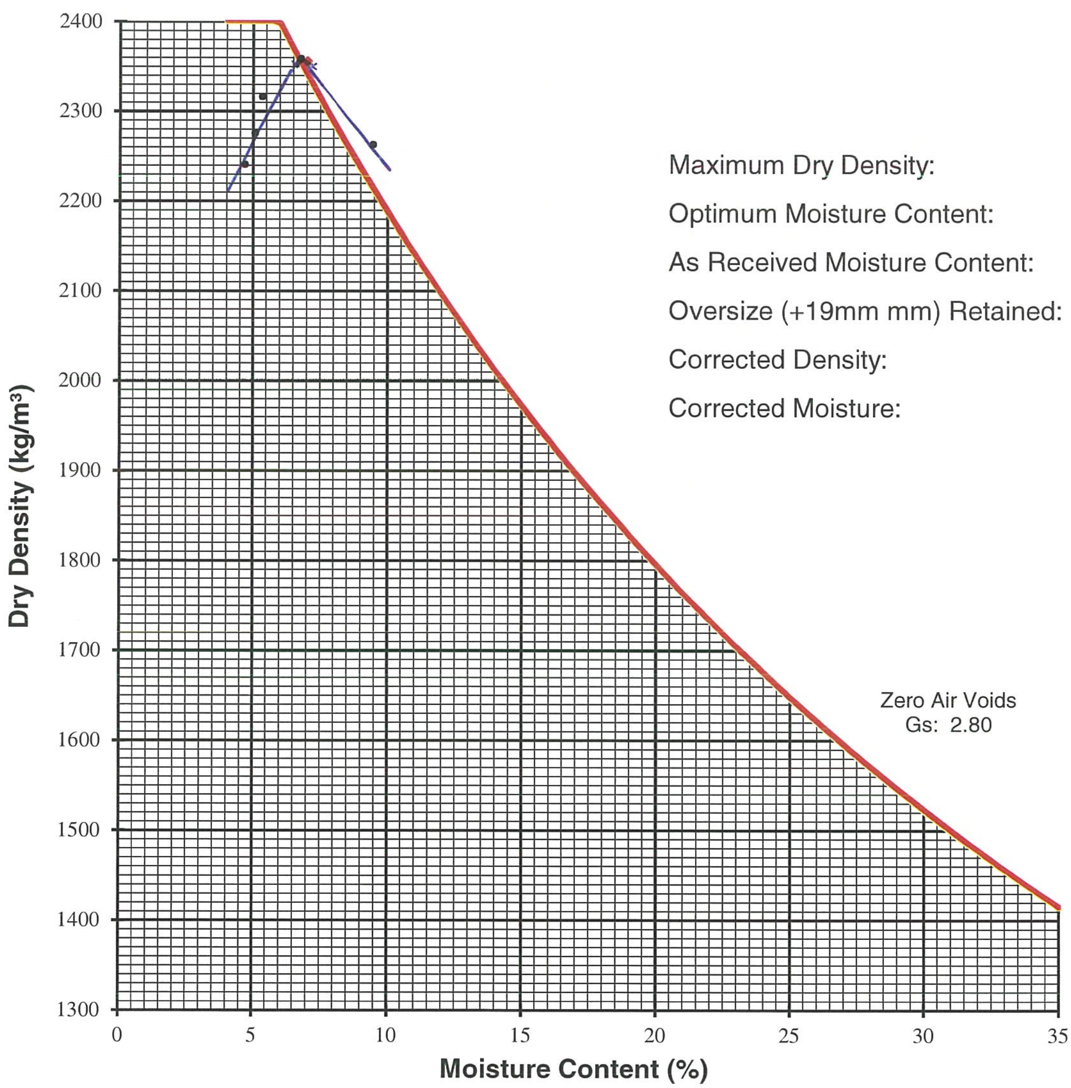
TETRA TECH

MOISTURE-DENSITY RELATIONSHIP (Proctor) REPORT

ASTM D1557 Modified

Project:	Clinton Creek, Dawson City	Sample No.:	SA02
Client:	WorleyParsons	Sampled By:	RMD
Attention:	Margaret McBride	Sample Date:	June 2, 2015
Project No.:	W14103619-01	Test Date:	June 5, 2015
Description:	GRAVEL - sandy, trace silt	Preparation:	Oven Dry
Source:	Entrance Pit	Compaction:	Manual



Maximum Dry Density:	2355	kg/m³
Optimum Moisture Content:	7.0	%
As Received Moisture Content:		%
Oversize (+19mm mm) Retained:	30	%
Corrected Density:	2475	%
Corrected Moisture:	5.2	%

Remarks:

Reviewed By: C.E.T.

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TETRA TECH

ASTM C136

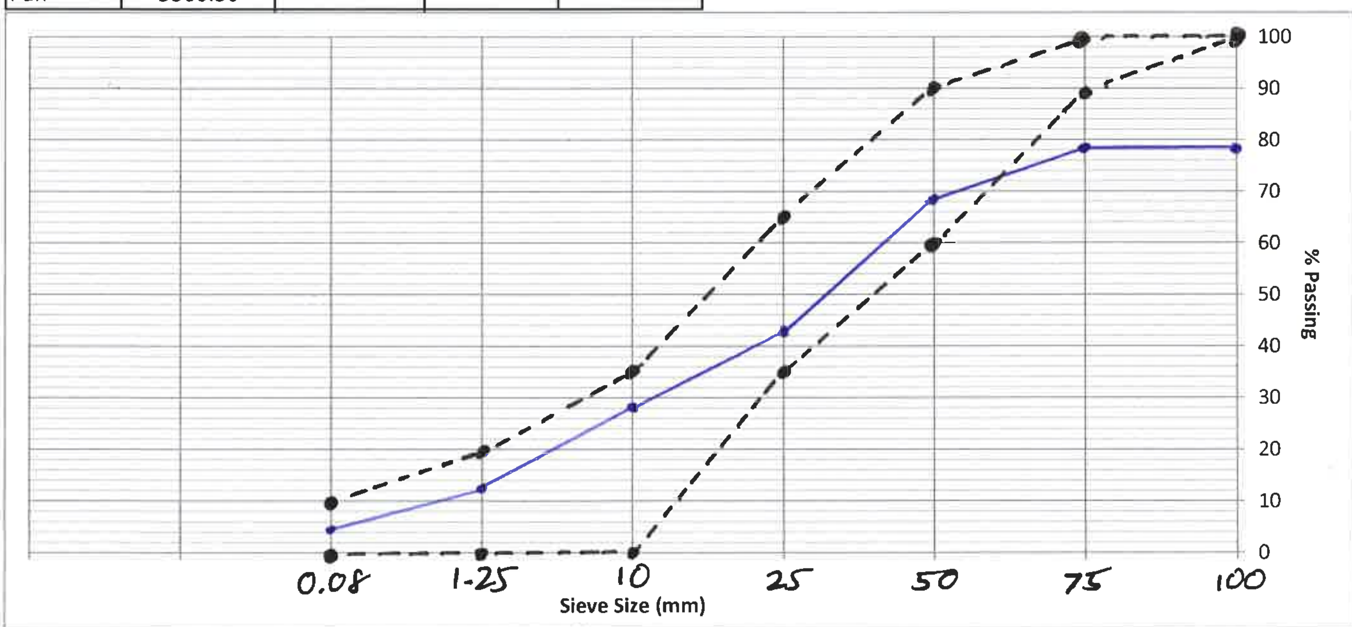
SIEVE ANALYSIS OF FINE AND COARSE AGGREGATE

PROJECT NUMBER:	YT15070	LOCATION:	Clinton Creek
DATE SAMPLED:	09/09/2015	MATERIAL TYPE:	Waste Rock
DATE TESTED:	16/09/2015	SAMPLE No.:	2 of 3
TECHNICIAN:	Parth Joshi	SAMPLE TIME:	-

I	J	K	L	M
Sieve No.	Cumulative Mass (g)	Percent Retained (%) (100-L)	Percent Passing (%) (D-J)/D	Granular Specification
100.0mm	1175.00 *	21.27	78.73	100 - 100
75.0mm	1175.00	21.27	78.73	90 - 100
50.0mm	1711.20	30.97	69.03	60 - 90
25.0mm	3130.20	56.66	43.34	35 - 65
20.0mm				-
12.5mm				-
10.0mm	3964.30	71.76	28.24	0 - 35
5.0mm				-
2.5mm				-
1.25mm	4859.10	87.95	12.05	0 - 20
0.315mm				-
0.080mm	5290.60	95.76	4.24	0 - 10
Pan	5360.30			---

A	Mass Wet Aggregate and Tare (g):		7064.70
B	Mass Dry Aggregate and Tare	(A/1+F)	6885.3
C	Mass Tare (g):		1360.70
D	Mass Dry Aggregate Before Wash (g):		5524.60
E	Mass Moisture (g):	(A-B)	179.40
F	Moisture Content (%):	(E/D)*100	3.25%
G	Mass Dry Aggregate Afer Wash (g):		5367.9
H	Fineness Modulus*		

*Fineness Modulus = (Total % of sample retained on a series of sieves/100)



COMMENTS: • One oversized rock ≅ 174mm at the narrowest is not included. 8.81 kg

* • One rock ≅ 110mm retained by 100mm sieve. included

REVIEWED BY & DATE:

T: 0.00%

MOISTURE - DENSITY RELATION TEST

M-41

PROJECT NO:	YT15070	CONTRACT NO:		TEST NO:	1
DATE SAMPLED:	SEPT-9-15	SAMPLE NO:	2 and 3	CONTRACTOR:	Siddhu
DATE TESTED:	SEPT-16-15	SAMPLE SOURCE:	Waste Rock	Consultant:	CAP Engineering

COMPACTION STANDARD: ☑ ASTM D698 ☐ ASTM D1557 METHOD: C

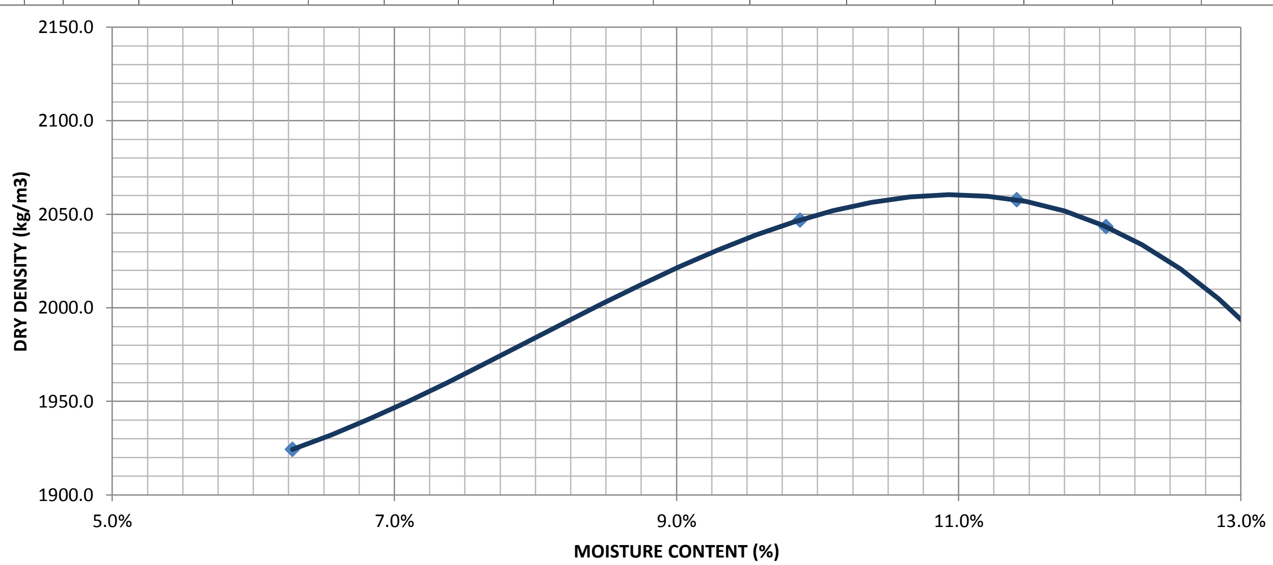
RAMMER TYPE: ☑ MANUAL ☐ AUTO VISUAL SOIL CLASSIFICATION: Pit run

PREPARATION: ☑ MOIST ☐ DRY AS RECEIVED MOISTURE CONTENT: 3.25%

DENSITY	A	VOLUME OF MOLD (cm^3)	2124.0	2124.0	2124.0	2124.0	
	B	WEIGHT OF WET SAMPLE + MOLD (g)	10970	11403	11495.4	11489	
	C	WEIGHT OF MOLD (g)	6626.0	6626.0	6626.0	6626.0	
	D	WEIGHT OF WET SAMPLE (g)	4344.0	4777.0	4869.4	4863.0	
	E	WET DENSITY (kg/m^3)	2045.2	2249.058	2292.56	2289.55	
	F	DRY DENSITY (kg/m^3)	1924.4	2046.9	2057.7	2043.4	
MOISTURE CONTENT	G	MOISTURE ADDED / RUN NUMBER (g)	Insitu	~4%	~6%	~8%	
	H	CONTAINER NUMBER	L-4	L-7	L-6	L-5	
	I	WEIGHT OF WET SAMPLE + TARE (g)	594.3	599.4	738.3	816.4	
	J	WEIGHT OF DRY SAMPLE + TARE (g)	572.2	565.3	685.4	752.2	
	K	TARE OF CONTAINER (g)	220.2	220	221.9	219.2	
	L	WEIGHT OF WATER (g)	22.1	34.1	52.9	64.2	
	M	WEIGHT OF DRY SOIL (g)	352.0	345.3	463.5	533.0	
	N	MOISTURE CONTENT (%)	6.3%	9.9%	11.4%	12.0%	

% RETAINED:					
4.75mm SIEVE:	44.3%				
9.5mm SIEVE:	60.0%	OPTIMUM MOISTURE CONTENT (%)	11.0%	*CORRECTED OPTIMUM M/C (%)	
19.0mm SIEVE:	81.3%	MAXIMUM DRY DENSITY (kg/m^3)	2070.0	*CORRECTED DRY DENSITY (kg/m^3)	

*OVERSIZE ROCK CORRECTION PER ASTM D4718



HAS AN IDENTICAL SAMPLE BEEN SENT TO A TESTING LABORATORY?	NO				
IF YES, LAB NAME:	MT.Sima	BAG NO.	NA	DATE:	Sep-17-15
REMARKS:					
TESTED BY:	Parth Joshi	CONTRACTOR PROJECT MANAGER:			
REVIEWED BY:		DATE:			

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T: 0.00%

MOISTURE - DENSITY RELATION TEST

M-41

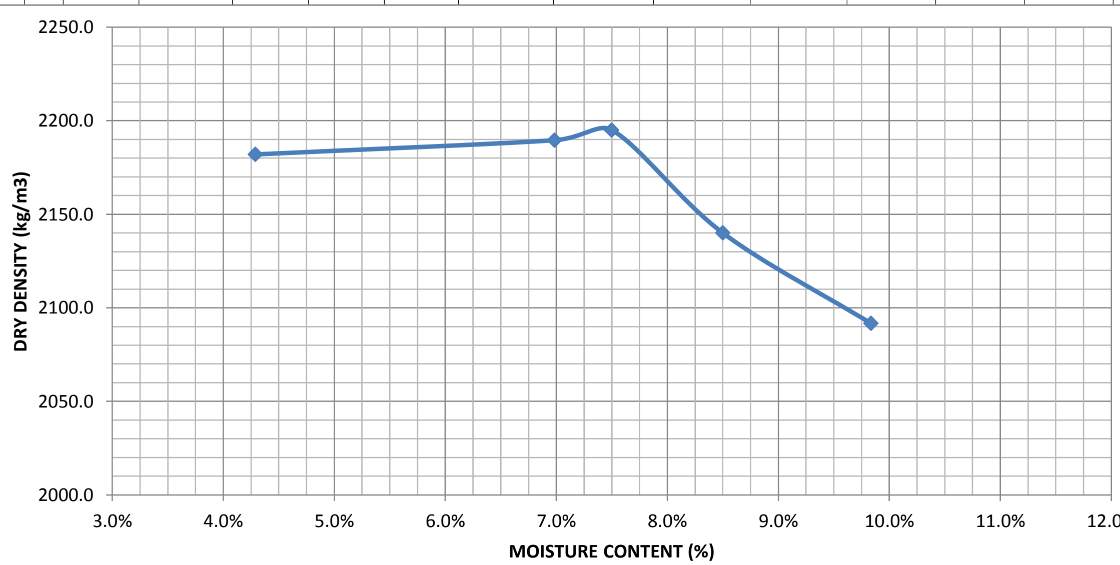
PROJECT NO:	YT15070	CONTRACT NO:	--	TEST NO:	1
DATE SAMPLED:	Aug-13-15	SAMPLE NO:	1	CONTRACTOR:	Sidhu Trucking
DATE TESTED:	Aug-19-15	SAMPLE SOURCE:	Slope	Consultant:	CAP Engineering

COMPACTION STANDARD:	☐ ASTM D698	☑ ASTM D1557	METHOD:	C	
RAMMER TYPE:	☑ MANUAL	☐ AUTO		VISUAL SOIL CLASSIFICATION:	Waste Material
PREPARATION:	☑ MOIST	☐ DRY		AS RECEIVED MOISTURE CONTENT:	7.00%

DENSITY	A	VOLUME OF MOLD (cm^3)	2124.0	2124.0	2124.0	2124.0	2124.0
	B	WEIGHT OF WET SAMPLE + MOLD (g)	11461.5	11601.5	11638.1	11559.8	11507.6
	C	WEIGHT OF MOLD (g)	6628.2	6626.0	6626.2	6628.0	6627.9
	D	WEIGHT OF WET SAMPLE (g)	4833.3	4975.5	5011.9	4931.8	4879.7
	E	WET DENSITY (kg/m^3)	2275.56	2342.514	2359.65	2321.94	2297.41
	F	DRY DENSITY (kg/m^3)	2182.0	2189.6	2195.0	2140.0	2091.7
MOISTURE CONTENT	G	MOISTURE ADDED / RUN NUMBER (g)	4%	Insitu	~7.5%	~9%	~10%
	H	CONTAINER NUMBER	1	2	3	5	4
	I	WEIGHT OF WET SAMPLE + TARE (g)	1070	1364.9	933.8	0	880
	J	WEIGHT OF DRY SAMPLE + TARE (g)	1026	1275.8	870	0	801.2
	K	TARE OF CONTAINER (g)	0	0	0	0	0
	L	WEIGHT OF WATER (g)	44.0	89.1	63.8	0.0	78.8
	M	WEIGHT OF DRY SOIL (g)	1026.0	1275.8	870.0	0.0	801.2
	N	MOISTURE CONTENT (%)	4.3%	7.0%	7.5%	8.5%	9.8%

% RETAINED:					
4.75mm SIEVE:	12.6%				
9.5mm SIEVE:	27.1%	OPTIMUM MOISTURE CONTENT (%)	7.5%	*CORRECTED OPTIMUM M/C (%)	8.3%
19.0mm SIEVE:	63.4%	MAXIMUM DRY DENSITY (kg/m^3)	2195.0	*CORRECTED DRY DENSITY (kg/m^3)	2259.3

*OVERSIZE ROCK CORRECTION PER ASTM D4718



HAS AN IDENTICAL SAMPLE BEEN SENT TO A TESTING LABORATORY?		YES			
IF YES, LAB NAME:	MT.Sima	BAG NO.	1	DATE:	Aug-19-15
REMARKS:					
TESTED BY:	Jessica Pottier	CONTRACTOR PROJECT MANAGER:			
REVIEWED BY:		DATE:			

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Appendix 6

In Situ Density Testing Results

Date	Station (m)	Northing (m)	Easting (m)	Elev. (m)	Probe Depth	Material	Dry Density (kg/m^3)		Moisture (%)		Percent Compaction	Accepted (yes/no)	Mode	Mode - Nuclear "N", Balloon "B", or Sand "S"
							Field	Max	Field	Optimum				Remarks
04-Sep-15	0 + 39.0	7147378.7	513053.9	398.1	300	Waste Rock	1504	2259	22.2%	8.3%	66.6%	no	N	
04-Sep-15	0 + 35.0	7147380.0	513050.1	398.9	300	Waste Rock	1523	2259	23.5%	8.3%	67.4%	no	N	
04-Sep-15	0 + 37.0	7147378.6	513051.9	398.5	300	Waste Rock	1417	2259	27.3%	8.3%	62.7%	no	N	Retest
04-Sep-15	0 + 37.0	7147381.6	513052.5	398.5	300	Waste Rock	1444	2259	24.4%	8.3%	63.9%	no	N	
04-Sep-15	0 + 29.0	7147382.2	513044.4	400.1	300	Waste Rock	1516	2259	21.3%	8.3%	67.1%	no	N	
04-Sep-15	0 + 37.0	7147378.6	513051.9	398.5	300	Waste Rock	1430	2259	26.7%	8.3%	63.3%	no	N	Retest
04-Sep-15	0 + 37.0	7147382.1	513052.6	398.5	300	Waste Rock	1542	2259	21.9%	8.3%	68.3%	no	N	
04-Sep-15	0 + 37.0	7147378.6	513051.9	398.5	300	Waste Rock	1483	2259	24.0%	8.3%	65.6%	no	N	Retest
04-Sep-15	0 + 37.0	7147382.1	513052.6	398.5	300	Waste Rock	1405	2259	25.7%	8.3%	62.2%	no	N	
04-Sep-15														
04-Sep-15					250		2186							Dam at Hudgeon Lake Outlet (Orange Fill)
04-Sep-15														
05-Sep-15	0 + 37.0	7147378.6	513051.9	398.2	250	Orange Fill	2134	2113	9.3%	N/A	101.0%	yes	N	
05-Sep-15	0 + 33.0	7147379.9	513048.1	398.8	250	Orange Fill	2113	2113	8.6%	N/A	100.0%	yes	N	
05-Sep-15														
05-Sep-15	Control Strip													
05-Sep-15	0 + 34.3	7147377.7	513048.9	399.5	250	Orange Fill	2345	2113	6.6%	N/A	111.0%		N	4 passes
05-Sep-15	0 + 36.3	7147378.8	513051.2	399.0	250	Orange Fill	2067	2113	9.9%	N/A	97.8%		N	
05-Sep-15	0 + 42.3	7147377.6	513057.1	398.0	250	Orange Fill	1989	2113	10.8%	N/A	94.1%		N	
05-Sep-15														
05-Sep-15	0 + 34.3	7147377.7	513048.9	399.5	250	Orange Fill	2324	2113	7.3%	N/A	110.0%		N	6 passes
05-Sep-15	0 + 34.3	7147377.7	513048.9	399.5	250	Orange Fill	2127	2113	9.1%	N/A	100.7%		N	rotate 90°
05-Sep-15	0 + 36.3	7147378.8	513051.2	399.0	250	Orange Fill	2107	2113	10.5%	N/A	99.7%		N	
05-Sep-15	0 + 36.3	7147378.8	513051.2	399.0	250	Orange Fill	2120	2113	10.2%	N/A	100.3%		N	rotate 90°
05-Sep-15	0 + 42.3	7147377.6	513057.1	398.0	250	Orange Fill	2007	2113	10.6%	N/A	95.0%		N	
05-Sep-15	0 + 42.3	7147377.6	513057.1	398.0	250	Orange Fill	2071	2113	9.8%	N/A	98.0%		N	rotate 90°
05-Sep-15														
05-Sep-15	0 + 34.3	7147377.7	513048.9	399.5	250	Orange Fill	2046	2113	9.8%	N/A	96.8%	yes	N	8 passes
05-Sep-15	0 + 34.3	7147377.7	513048.9	399.5	250	Orange Fill	2204	2113	7.8%	N/A	104.3%	yes	N	rotate 90°
05-Sep-15	0 + 36.3	7147378.8	513051.2	399.0	250	Orange Fill	2100	2113	10.0%	N/A	99.4%	yes	N	
05-Sep-15	0 + 36.3	7147378.8	513051.2	399.0	250	Orange Fill	2090	2113	10.7%	N/A	98.9%	yes	N	rotate 90°
05-Sep-15	0 + 42.3	7147377.6	513057.1	398.0	250	Orange Fill	2037	2113	11.0%	N/A	96.4%	yes	N	
05-Sep-15	0 + 42.3	7147377.6	513057.1	398.0	250	Orange Fill	2030	2113	11.3%	N/A	96.1%	yes	N	rotate 90°
05-Sep-15														
05-Sep-15	STA 0 + 36.3 chosen as best representation by Stephen Clark (WorleyParsons)													
05-Sep-15	Average (2120 + 2107) = 2113													
05-Sep-15														
05-Sep-15	0 + 28.0	7147383.4	513043.7	399.1	250	Orange Fill	2053	2113	9.1%	N/A	97.2%	yes	N	Subcut
05-Sep-15														

Date	Station (m)	Northing (m)	Easting (m)	Elev. (m)	Probe Depth	Material	Dry Density (kg/m^3)		Moisture (%)		Percent Compaction	Accepted (yes/no)	Mode	Mode - Nuclear "N", Balloon "B", or Sand "S"
							Field	Max	Field	Optimum				Remarks
08-Sep-15	0 + 62.7	7147373.2	513077.0	397.1	300	Orange Fill	1941	2113	6.0%	N/A	91.9%	no	N	Subcut
08-Sep-15	0 + 62.7	7147373.2	513077.0	397.1	300	Orange Fill	2099	2113	6.5%	N/A	99.3%	yes	N	Retest
08-Sep-15														
08-Sep-15	0 + 53.0	7147375.4	513067.5	396.8	250	Orange Fill	2077	2113	5.1%	N/A	98.3%	yes	N	Subcut
08-Sep-15														
09-Sep-15	0 + 49.0	7147376.2	513063.6	396.8	250	Orange Fill	2009	2113	7.7%	N/A	95.1%	yes	N	Subcut
09-Sep-15														
09-Sep-15	0 + 49.0	7147378.2	513064.0	396.9	250	Orange Fill	2105	2113	7.2%	N/A	99.6%	yes	N	Subcut
09-Sep-15														
09-Sep-15	0 + 23.5	7147389.2	513040.3	401.1	250	Orange Fill	1969	2113	6.4%	N/A	93.2%	no	N	
09-Sep-15	0 + 23.5	7147389.2	513040.3	401.1	250	Orange Fill	2130	2113	6.7%	N/A	100.8%	yes	N	Retest
09-Sep-15	0 + 28.0	7147383.4	513043.7	400.4	200	Orange Fill	2129	2113	6.7%	N/A	100.8%	yes	N	
09-Sep-15														
09-Sep-15	0 + 32.0	7147378.5	513046.7	400.4	200	Orange Fill	2005	2113	6.8%	N/A	94.9%	yes	N	
09-Sep-15	0 + 32.0	7147378.5	513046.7	400.4	200	Orange Fill	2036	2113	5.8%	N/A	96.4%	yes	N	rotate 90°
09-Sep-15	0 + 32.0	7147389.6	513049.0	401.7	250	Orange Fill	2269	2113	5.9%	N/A	107.4%	yes	N	
09-Sep-15	0 + 32.0	7147389.6	513049.0	401.7	250	Orange Fill	2134	2113	5.6%	N/A	101.0%	yes	N	rotate 90°
09-Sep-15														
09-Sep-15	0 + 25.0	7147384.0	513040.7	401.0	250	Orange Fill	2066	2113	7.5%	N/A	97.8%	yes	N	
09-Sep-15	0 + 29.5	7147385.4	513045.6	400.6	200	Orange Fill	2104	2113	8.7%	N/A	99.6%	yes	N	
09-Sep-15														
10-Sep-15	0 + 25.5	7147378.7	513040.1	402.2	250	Orange Fill	2071	2113	7.9%	N/A	98.0%	yes	N	
10-Sep-15	0 + 24.5	7147388.2	513041.1	401.5	250	Orange Fill	2088	2113	9.7%	N/A	98.8%	yes	N	
10-Sep-15	0 + 34.5	7147373.8	513048.3	400.3	250	Orange Fill	2061	2113	7.1%	N/A	97.5%	yes	N	
10-Sep-15														
10-Sep-15	0 + 27.5	7147389.9	513044.5	401.4	250	Orange Fill	2038	2113	9.5%	N/A	96.5%	yes	N	
10-Sep-15	0 + 25.0	7147382.4	513040.4	401.5	250	Orange Fill	2138	2113	9.4%	N/A	101.2%	yes	N	
10-Sep-15														
10-Sep-15	0 + 26.0	7147377.9	513040.5	401.4	250	Orange Fill	2095	2113	9.0%	N/A	99.1%	yes	N	
10-Sep-15	0 + 26.0	7147389.7	513042.9	401.5	250	Orange Fill	2082	2113	10.5%	N/A	98.5%	yes	N	
10-Sep-15														
10-Sep-15	0 + 24.0	7147383.2	513039.6	401.8	250	Orange Fill	2134	2113	10.6%	N/A	101.0%	yes	N	
10-Sep-15	0 + 23.5	7147387.7	513040.0	401.9	250									Nuke Malfunction
10-Sep-15														
11-Sep-15	0 + 32.0	7147392.4	513049.6	401.3	200	Orange Fill	2318	2113	9.1%	N/A	109.7%	yes	N	
11-Sep-15	0 + 32.0	7147392.4	513049.6	401.3	200	Orange Fill	2240	2113	10.0%	N/A	106.0%	yes	N	
11-Sep-15	0 + 35.5	7147394.1	513053.5	400.8	250	Orange Fill	2257	2113	7.4%	N/A	106.8%	yes	N	
11-Sep-15	0 + 32.0	7147376.7	513046.4	400.5	250	Orange Fill	2068	2113	7.9%	N/A	97.9%	yes	N	
11-Sep-15	0 + 23.5	7147376.0	513037.5	402.5	200	Orange Fill	2104	2113	8.5%	N/A	99.6%	yes	N	
11-Sep-15														
11-Sep-15	0 + 30.0	7147391.8	513047.5	401.8	200	Orange Fill	2131	2113	9.9%	N/A	100.9%	yes	N	

Date	Station (m)	Northing (m)	Easting (m)	Elev. (m)	Probe Depth	Material	Dry Density (kg/m^3)		Moisture (%)		Percent Compaction	Accepted (yes/no)	Mode	Mode - Nuclear "N", Balloon "B", or Sand "S"
							Field	Max	Field	Optimum				Remarks
11-Sep-15	0 + 34.5	7147391.4	513052.0	401.1	250	Orange Fill	2151	2113	7.9%	N/A	101.8%	yes	N	
11-Sep-15														
11-Sep-15	0 + 29.0	7147395.4	513047.2	402.1	250	Orange Fill	2058	2113	8.7%	N/A	97.4%	yes	N	
11-Sep-15	0 + 34.0	7147393.9	513052.0	401.5	250	Orange Fill	2177	2113	8.0%	N/A	103.0%	yes	N	
11-Sep-15	0 + 32.0	7147376.0	513046.2	400.9	250	Orange Fill	2106	2113	8.2%	N/A	99.7%	yes	N	
11-Sep-15	0 + 35.0	7147375.6	513049.2	400.4	250	Orange Fill	2021	2113	8.6%	N/A	95.6%	yes	N	
11-Sep-15														
11-Sep-15	0 + 25.0	7147392.2	513042.4	402.7	250	Orange Fill	2118	2113	8.5%	N/A	100.2%	yes	N	
11-Sep-15														
11-Sep-15	0 + 31.0	7147394.6	513049.0	402.1	200	Orange Fill	2104	2113	8.4%	N/A	99.6%	yes	N	
11-Sep-15	0 + 34.7	7147391.8	513052.3	401.4	250	Orange Fill	2198	2113	6.3%	N/A	104.0%	yes	N	
11-Sep-15														
11-Sep-15	0 + 31.0	7147394.8	513049.1	402.3	250	Orange Fill	2130	2113	8.5%	N/A	100.8%	yes	N	
11-Sep-15	0 + 25.0	7147394.8	513043.0	403.3	250	Orange Fill	2152	2113	8.3%	N/A	101.8%	yes	N	
11-Sep-15														
13-Sep-15	0 + 56.7	7147377.6	513071.8	397.1	100	100mm Minus	2109	2475	6.6%	5.2%	85.2%	no	N	
13-Sep-15	0 + 56.7	7147377.6	513071.8	397.1	100	100mm Minus	2118	2475	5.5%	5.2%	85.6%	yes	N	Retest
13-Sep-15	0 + 60.5	7147378.8	513075.9	397.1	100	100mm Minus	2095	2475	3.6%	5.2%	84.6%	yes	N	
13-Sep-15	0 + 60.0	7147372.0	513074.0	397.9	100	100mm Minus	1933	2475	4.6%	5.2%	78.1%	yes	N	Side slope (2:1)
13-Sep-15														
14-Sep-15	0 + 30.5	7147376.0	513044.7	401.4	200	Orange Fill	2064	2113	9.1%	N/A	97.7%	yes	N	
14-Sep-15														
14-Sep-15	0 + 55.5	7147375.1	513070.0	397.1	100	100mm Minus	2204	2475	5.5%	5.2%	89.1%	yes	N	
14-Sep-15	0 + 32.5	7147384.3	513048.4	400.5	100	100mm Minus	2121	2475	5.2%	5.2%	85.7%	yes	N	
14-Sep-15														
14-Sep-15	0 + 33.7	7147374.7	513047.7	401.1	250	Orange Fill	2022	2113	7.8%	N/A	95.7%	no	N	
14-Sep-15	0 + 27.0	7147375.4	513041.0	402.3	250	Orange Fill	2049	2113	8.6%	N/A	97.0%	no	N	
14-Sep-15	0 + 33.7	7147374.7	513047.7	401.1	250	Orange Fill	2108	2113	11.1%	N/A	99.8%	yes	N	Retest
14-Sep-15	0 + 27.0	7147375.4	513041.0	402.3	250	Orange Fill	2180	2113	8.1%	N/A	103.2%	yes	N	Retest
14-Sep-15														
14-Sep-15	0 + 29.0	7147374.9	513042.9	402.2	250	Orange Fill	2147	2113	8.9%	N/A	101.6%	yes	N	
14-Sep-15														
14-Sep-15	0 + 28.4	7147373.5	513042.0	402.8	250	Orange Fill	2012	2113	8.2%	N/A	95.2%	no	N	
14-Sep-15	0 + 28.4	7147373.5	513042.0	402.8	250	Orange Fill	2061	2113	8.6%	N/A	97.5%	yes	N	Retest
14-Sep-15	0 + 32.0	7147373.8	513045.8	401.9	250	Orange Fill	2112	2113	7.5%	N/A	100.0%	yes	N	
14-Sep-15														
15-Sep-15	0 + 39.0	7147380.2	513054.2	399.2	100	100mm Minus	2291	2475	8.9%	5.2%	92.6%	yes	N	
15-Sep-15	0 + 44.0	7147383.1	513059.9	398.2	100	100mm Minus	2197	2475	7.8%	5.2%	88.8%	yes	N	
15-Sep-15														
17-Sep-15	0 + 28.8	7147384.7	513044.8	401.2	100	100mm Minus	2264	2475	7.4%	5.2%	91.5%	yes	N	
17-Sep-15	0 + 27.4	7147380.1	513042.4	401.5	100	100mm Minus	2180	2475	8.0%	5.2%	88.1%	yes	N	

Date	Station (m)	Northing (m)	Easting (m)	Elev. (m)	Probe Depth	Material	Dry Density (kg/m^3)		Moisture (%)		Percent Compaction	Accepted (yes/no)	Mode	Mode - Nuclear "N", Balloon "B", or Sand "S"
							Field	Max	Field	Optimum				Remarks
17-Sep-15														
19-Sep-15	0 + 23.2	7147377.0	513037.5	402.9	250	Orange Fill	2134	2113	7.0%	N/A	101.0%	yes	N	
19-Sep-15														
19-Sep-15	0 + 23.2	7147377.5	513037.6	403.1	250	Orange Fill	2070	2113	7.8%	N/A	98.0%	yes	N	
19-Sep-15														
19-Sep-15	0 + 23.2	7147376.5	513037.3	403.5	250	Orange Fill	2024	2113	9.7%	N/A	95.8%	no	N	
19-Sep-15	0 + 23.2	7147376.5	513037.3	403.5	250	Orange Fill	2154	2113	7.8%	N/A	101.9%	yes	N	Retest

DAILY COMPACTION REPORT - GR[illegible]NG AND SUBGRADE PROJECTS

M-40

PROJECT NO:	YT15070	PROJECT:	Clinton Creek	% COMPLETED:		QA CONSULTANT:	CONTRACTOR: Sidhu Trucking
GAUGE TYPE:	Troxler 3430	GAUGE #:	S/N 77-13601	DATE TESTED:	04 Sept 15	PRIME CONSULTANT:	
PROCTOR #:	2259 8.3% m	WEATHER:	7°C Overcast			METHOD USED: ☑ ASTM D698 ☐ ASTM D1557	

DEPTH BELOW GRADE (mm)	STATION	LOCATION	PROBE DEPTH	USCS TYPE	DRY DENSITY (kg/m³) FIELD	DRY DENSITY (kg/m³) MAXIMUM	MOISTURE (%) FIELD	MOISTURE (%) OPTIMUM	% COMP	ACCEPTED (YES/NO)	MODE	MODE - NUCLEAR "N", BALLOON "B", or SAND "S" REMARKS
~~300~~ 1x1m	0+039	2.5m °/s R	300		1504	2259	22.2%	8.3%	67%	No	N	
1x1m	0+035	2 m°/s R	300		1523	2259	23.5%	8.3%	67%	No	N	
1100	0+037	3m °/s R	300		1417	2259.	27.3%	8.3%	63%	No	N	Retest
1100	0+037	⊈	300		1444	2259	24.4%	8.3%	64%	No	N	
1100	0+029	1m °/s R	300.		1516	2259	21.3%	8.3%	67%	No	N	
1100	0+037	3m °/s R	300		1430	2259	26.7%	8.3%	63%	NO	N	Retest
1100	0+037	½m °/s L	300		1542	2259	21.9%	8.3%	68%	NO	N	Retest
1100	0+037	3m°/s R	300		1483	2259	24.%	8.3%	66%	No	N	Retest
1100	0+037	0.5 °/s L	300		1405	2259	25.7%	8.3%	62%	No	N	Retest
N/A	Dam / Red rock		250		~~1844~~ 2186	N/A	~~8.1~~ 6.8	N/A				

COMMENTS: Previous Standard Counts: DS 2524 MS 635
Today : DS 2530 MS 646.

1st lift used to cover boulders ect 1m → 0.7m

TECHNOLOGISTS: Kieran Hogan

PROJECT MANAGER:

RECEIVED BY:

*** Contractor's Representative

DATE RECEIVED: TIME:

*** Signature indicates receipt of data on the date and time indicated

C A D

DAILY COMPACTION REPORT - GRADING AND SUBGRADE PROJECTS

M-40

PROJECT NO:	YT15070	PROJECT:	Clinton Creek Mine	% COMPLETED:		QA CONSULTANT:		CONTRACTOR:	Sidhu Trucking
GAUGE TYPE:	Troxler 3430	GAUGE #:	69195	DATE TESTED:	5/9/15	PRIME CONSULTANT:			
PROCTOR #:	N/A / TBD	WEATHER:	Foggy -3°C Am / sunny 7°C PM			METHOD USED:	☑ ASTM D698	☐ ASTM D1557	

DEPTH BELOW GRADE (mm)	STATION	LOCATION	PROBE DEPTH	USCS TYPE	DRY DENSITY (kg/m³) FIELD	DRY DENSITY (kg/m³) MAXIMUM	MOISTURE (%) FIELD	MOISTURE (%) OPTIMUM	% COMP	ACCEPTED (YES/NO)	MODE	MODE - NUCLEAR "N", BALLOON "B", or SAND "S" REMARKS
1400	0+037	3m o/s R	250		2134	—	9.3%	—		Yes	N	
1600	0+033	2.5 o/s R	250		2113	—	8.6%	—		Yes	N	
	Control Strip											
1100	0+034.3	4.5 o/s R	250		2345	—	6.6%	—			N	4 passes w/h vib
700	0+036.3	3m o/s R	250		2067	—	9.9%	—			N	4 passes w/h vib
-500 (cut)	0+042.3	3m o/s R	250		1989	—	10.8%	—			N	4 Passes w/h vib
-			Rotate -90° →		2127		9.08					
1100	0+034.3	4.5 o/s R	250		2324	—	7.3%	—			N	6 Passes w/h vib
700	0+036.3	3 o/s R	250	Rotate 90°	2120 2107	—	10.2% 10.5%	—			N	6 Passes w/h vib
-500	0+042.3	3 o/s R	250	Rotate 90	2071 2007	—	9.8% 10.6%	—			N	6 Passes w/h vib.
1100	0+034.3	4.5 o/s R	250		2046	—	9.8%	—			N	8 Passes w/h vib
Rotate 90°					2204	—	7.8%	—			N	" " "
700	0+036.3	3 o/s R	250		2100	—	10.0%	—			N	" " "
Rotate 90°					2090.	—	10.7%	—			N	" " "
-500	0+042.3	3m o/s R	250		2037	—	11.0%	—			N	" " "
Rotate 90°					2030	—	11.3%	—			N	" " "
Sta	0+036.3 chosen	as	best representation				by Steve clarke (Worley Parsons)					
Average	2120 + 2107 =	4227/2	= 2113.5.									
2300	0+028	0 o/s (℄)	250		2053	2115	9.1%	—	97.2	Yes	N	

COMMENTS: yesterdays Standard count: DS 2530 MS 646. Today: DS 2533 MS 648

Black waste Rock Remove, new LIFT of orange/brown Placed.

TECHNOLOGISTS: Kieran Hogan

PROJECT MANAGER:

RECEIVED BY:

*** Contractor's Representative

DATE RECEIVED:

TIME:

*** Signature indicates receipt of data on the date and time indicated

CAD

DAILY COMPACTION REPORT - GRADING AND SUBGRADE PROJECTS

M-40

PROJECT NO: YT15070	PROJECT: Clinton Creek Mine	% COMPLETED:		QA CONSULTANT:		CONTRACTOR:	Sidhu Trucking
GAUGE TYPE: Troxler 3430	GAUGE #: 69195	DATE TESTED:	5/9/15	PRIME CONSULTANT:			
PROCTOR #: N/A / TBD	WEATHER: Foggy -3°C Am / sunny 7°C PM			METHOD USED:	☑ ASTM D698	☐ ASTM D1557	

DEPTH BELOW GRADE (mm)	STATION	LOCATION	PROBE DEPTH	USCS TYPE	DRY DENSITY (kg/m^3) FIELD	DRY DENSITY (kg/m^3) MAXIMUM	MOISTURE (%) FIELD	MOISTURE (%) OPTIMUM	% COMP	ACCEPTED (YES/NO)	MODE	MODE - NUCLEAR "N", BALLOON "B", or SAND "S" REMARKS
1400	0+037	3m%R	250		2134	—	9.3%	—		Yes	N	
1600	0+033	2.5%R	250		2113	—	8.6%	—		Yes	N	
	Control Strip											
1100	0+034.3	4.5%R	250		2345	—	6.6%	—			N	4 passes w/h vib
-700	0+036.3	3m%R	250		2067	—	9.9%	—			N	4 passes w/h vib
-500 (cut)	0+042.3	3m%R	250		1989	—	10.8%	—			N	4 Passes w/h vib
-			Rotate -90° →		2127		9.0%					
1100	0+034.3	4.5%R	250	↑	2324	—	7.3%	—			N	6 Passes w/h vib
700	0+036.3	3%R	250	Rotate 90°	2120 2107	—	10.2% 10.5%	—			N	6 Passes w/h vib
-500	0+042.3	3%R	250	Rotate 90	2071 2007	—	9.8% 10.6%	—			N	6 Passes w/h vib.
1100	0+034.3	4.5%R	250		2046	—	9.8%	—			N	8 Passes w/h vib
Rotate 90°					2204	—	7.8%	—			N	" " "
700	0+036.3	3%R	250		2100	—	10.0%	—			N	" " "
Rotate 90°					2090.	—	10.7%	—			N	" " "
-500	0+042.3	3m%R	250		2037	—	11.0%	—			N	" " "
Rotate 90°					2030	—	11.3%	—			N	" " "
Sta	0+036.3 chosen	as	best	representation			by Steve Clarke (Worley Parsons)					
Average	2120 + 2107 =	4227/2		= 2113.5								
2300	0+028	0%(℄)	250		2053	2115	9.1%	—	97.2	Yes	N	

COMMENTS: yesterdays Standard counts:
DS 2530 MS 646. Today: DS 2533 MS 648

Black waste Rock Remove, new Lift of orange/brown Placed.

TECHNOLOGISTS: Kieran Hogan

PROJECT MANAGER:

RECEIVED BY:

*** Contractor's Representative

DATE RECEIVED: TIME:

*** Signature indicates receipt of data on the date and time indicated

CAD

DAILY COMPACTION REPORT - GRADING AND SUBGRADE PROJECTS

M-40

PROJECT NO:	YT15070	PROJECT:	Clinton Creek mine	% COMPLETED:		QA CONSULTANT:		CONTRACTOR:	Sidhu Trucking
GAUGE TYPE:	Troxler 343	GAUGE #:	69195.	DATE TESTED:	~~08~~ Sept 15	PRIME CONSULTANT:			
PROCTOR #:	2113	WEATHER:	-7°C am →			METHOD USED:	☑ ASTM D698 ☐ ASTM D1557		

DEPTH BELOW GRADE (mm)	STATION	LOCATION	PROBE DEPTH	USCS TYPE	DRY DENSITY (kg/m³) FIELD	DRY DENSITY (kg/m³) MAXIMUM	MOISTURE (%) FIELD	MOISTURE (%) OPTIMUM	% COMP	ACCEPTED (YES/NO)	MODE	REMARKS (MODE - NUCLEAR "N", BALLOON "B", or SAND "S")
Subcut	Right	side of	creek	bed	sta	65+5 →	58+7					
370	62+7	3+3%sR	300		1941	2113.	6.0%	—	91.8	No	N	center of subcut.
370	62+7	3+3%sR	300		2099	2113	6.5%	—	99.4%	Yes	N	Retest.
320	53+0	3m%sR	250		2077	2113	5.1%	—	98.3%	Yes	N	2nd subcut

COMMENTS: Yesterday's Standard Count: DS = 2559 MS = 641 } 07 sept 15
Today's standard Count. DS = 2530 MS = 650
08 Sept 15 count DS = 2523 MS = 648

No density tests done on Sept 07/15

TECHNOLOGISTS: Kieran Hogan

PROJECT MANAGER:

RECEIVED BY:

*** Contractor's Representative

DATE RECEIVED: TIME:

*** Signature indicates receipt of data on the date and time indicated

CAP

DAILY COMPACTION REPORT - GRADING AND SUBGRADE PROJECTS

M-40

PROJECT NO: YT15070	PROJECT: Clinton Creek Mine	% COMPLETED:		QA CONSULTANT:	CONTRACTOR: Sidhu Trucking
GAUGE TYPE: Troxler 3430	GAUGE #: 69195	DATE TESTED: 09sept15		PRIME CONSULTANT:	
PROCTOR #: 2113	WEATHER: 5°C am →			METHOD USED: ☑ ASTM D698 ☐ ASTM D1557	

MODE - NUCLEAR "N", BALLOON "B", or SAND "S"

DEPTH BELOW GRADE (mm)	STATION	LOCATION	PROBE DEPTH	USCS TYPE	DRY DENSITY (kg/m³) FIELD	DRY DENSITY (kg/m³) MAXIMUM	MOISTURE (%) FIELD	MOISTURE (%) OPTIMUM	% COMP	ACCEPTED (YES/NO)	MODE	REMARKS
Finish 360	0+049	3m °/s R	250		2009	2113	7.7%	—	95.1	Yes	N	Subcut #3
300	0+049	1m °/s R	250		2105.	2113	7.2%	—	99.6%	Yes	N	Subcut #4
	Fill	in creek	bed.									
1900	0+023.5	5m °/s L	250		1969	2113	6.4%	—	93.2%	No	N	
1900	0+023.5	5m °/s L	250		2130	2113	6.7%	—	100.8%	Yes	N	Retest after more compaction.
1000	0+028	0°/s (℄)	200		2129	2113	6.7%	—	100.8%	Yes	N	
550	0+032	4.2°/s R	200		2005.	2113	6.8%	—	94.9	Yes	N	
550	0+032	4.2°/s R	200		2036	2113	5.8%	—	96.4	Yes	N	Retest Rotated 90°
400	0+032	7.2°/s L	250		2269.	2113	5.9%	—	107.4%	Yes	N	
400	0+032	7.2°/s L	250		2134	2113	5.6%	—	101.0%	Yes	N	Retest Rotated 90°
950	0+025	0°/s (℄)	250		2066.	2113	7.5%	—	97.8%	Yes	N	
450	0+029.5	2.3°/s L	200		2104	2113	8.7%	—	99.6	Yes	N	

COMMENTS: Yesterdays count Ds=2523 MS=648
Todays Count Ds=2537 MS=650

TECHNOLOGISTS:

PROJECT MANAGER:

RECEIVED BY:

*** Contractor's Representative

DATE RECEIVED:

TIME:

*** Signature indicates receipt of data on the date and time indicated

15/05/2014

CAP

DAILY COMPACTION REPORT - GRADING AND SUBGRADE PROJECTS

M-40

PROJECT NO: YT15070	PROJECT: Clinton Creek	% COMPLETED:		QA CONSULTANT:	CONTRACTOR: Sidhu Trucking
GAUGE TYPE: Troxler 3430	GAUGE #: 69195	DATE TESTED:	10/09/15	PRIME CONSULTANT:	
PROCTOR #: 2113	WEATHER: 5°C overcast, light shower's in the pm			METHOD USED: ☑ ASTM D698	☐ ASTM D1557

DEPTH BELOW Finish GRADE (mm)	STATION	LOCATION	PROBE DEPTH	USCS TYPE	DRY DENSITY (kg/m³) FIELD	DRY DENSITY (kg/m³) MAXIMUM	MOISTURE (%) FIELD	MOISTURE (%) OPTIMUM	% COMP	ACCEPTED (YES/NO)	MODE	MODE - NUCLEAR "N", BALLOON "B", or SAND "S" REMARKS
		¢ side	slope		Subgrade	Fill					~~N~~	
Creek bed		5.3m/s R	250	—	2071	2113	7.9%	—	98.0	Yes	N	
550	0+025.5	4.2m/s L	250	—	2088	2113.	9.7%	—	98.8	Yes	N	
950	0+024.5	8.5m/s L	250	—	2061	2113	7.1%	—	97.5	Yes	N	
1300	0+034.5											
		6.5m/s L	250	—	2038	2113	9.5%	—	96.4	Yes	N	
1600	0+027.5	1.6m/s R	250	—	2138	2113	9.4%	—	101.2	Yes	N	
500	0+025											
		6m/s R	250	—	2095.	2113	9.0%	—	99.1	Yes	N	
1600	0+026	6m/s L	250		2082	2113	10.5%		98.5	Yes	N	
1500	0+026											
		1m/s R	250		2134	2113.	10.6%	—	101.0	Yes	N	
350	0+024	3.5m/s L	250	←								Nuke malfunction - Moisture value
380	0+023.5											

COMMENTS:

TECHNOLOGISTS: Kieran Hogan

PROJECT MANAGER:

RECEIVED BY:

*** Contractor's Representative

DATE RECEIVED: TIME:

*** Signature indicates receipt of data on the date and time indicated

Pg 1

M-40

DAILY COMPACTION REPORT - GR[illegible]ING AND SUBGRADE PROJECTS

PROJECT NO:		PROJECT:		% COMPLETED:		QA CONSULTANT:		CONTRACTOR:	
GAUGE TYPE:		GAUGE #:		DATE TESTED:		PRIME CONSULTANT:			
PROCTOR #:		WEATHER:				METHOD USED:	☐ ASTM D698	☐ ASTM D1557	

DEPTH BELOW GRADE (mm)	STATION	LOCATION	PROBE DEPTH	USCS TYPE	DRY DENSITY (kg/m³) FIELD	DRY DENSITY (kg/m³) MAXIMUM	MOISTURE (%) FIELD	MOISTURE (%) OPTIMUM	% COMP	ACCEPTED (YES/NO)	MODE	REMARKS (MODE - NUCLEAR "N", BALLOON "B", or SAND "S")
Left & Right Slope Fill Subgrade.												
800	0+032	10m%s L	200	—	2318	2113	9.1%	—	109.7%	Yes	N	
800	0+032	10m%s L	200	—	2240	2113.	10.0%	—	106.%	Yes	N	Retest Rotated 90°
600	0+035.5	12.5%s L	250	—	2257	2113	7.4%	—	106.8%	Yes	N	
1300	0+032	6m%s R	250	—	2068	2113	7.9%	—	97.9%	Yes.	N.	
1300	0+023.5	8.5m%s R	200	—	2104	2113	8.5%	—	99.6%	Yes	N	
700	0+030	9m%s L	200	—	2131	2113	9.9%	—	100.8%	Yes	N	
500	0+034.5	9.5m%s L	250	—	2151	2113	7.9%	—	101.8%	Yes	N	
600	0+029	12.5%s L	250	—	2058	2113	8.7%	—	97.4%	Yes	N	
200	0+034	12.0%s L	250	—	2177	2113	8.0%	—	103.1%	Yes	N	
1200	0+032	6.7%s R	250	—	2106	2113	8.2%	—	99.7%	Yes	N	
1100	0+035	6.5%s R	250	—	2021	2113	8.6%	—	95.6%	Yes	N	
800	0+025	8.4% L	250	—	2118	2113	8.5%	—	100.2%	Yes	N	
~~150~~	~~0+031~~	~~12m%s~~										
150	0+031	12m%s L	200	—	2164.	2113	8.4%	—	99.6%	Yes	N	
100	0+034.7	10m%s L	250	—	2198	2113	6.3%	—	104.0%	Yes	N	
-20	0+031	12.3%s L	250	—	2130	2113	8.5%	—	100.8%	Yes	N	
170	0+025	11%s L	250	—	2152	2113	8.3%.		101.9%	Yes	N	

COMMENTS: Last count DS 2531 MS 645
Today's Count DS. 2532 MS 646

TECHNOLOGISTS: Kieran Hogan

PROJECT MANAGER:

RECEIVED BY:
*** Contractor's Representative

DATE RECEIVED: TIME:

*** Signature indicates receipt of data on the date and time indicated

CAD

DAILY COMPACTION REPORT - GRADING AND SUBGRADE PROJECTS

M-40

PROJECT NO:	Y715070	PROJECT:	Clinton Creek	% COMPLETED:		QA CONSULTANT:		CONTRACTOR:	Sidhu Trucking
GAUGE TYPE:	Troxler 3430	GAUGE #:	69195	DATE TESTED:	~~12~~ 13 Sept 15	PRIME CONSULTANT:			
PROCTOR #:	~~2113~~ 2475	WEATHER:	0°C Overcast →			METHOD USED:	☑ ASTM D698	☐ ASTM D1557	

DEPTH BELOW GRADE (mm)	STATION	LOCATION	PROBE DEPTH	USCS TYPE	DRY DENSITY (kg/m³) FIELD	DRY DENSITY (kg/m³) MAXIMUM	MOISTURE (%) FIELD	MOISTURE (%) OPTIMUM	% COMP	ACCEPTED (YES/NO)	MODE	REMARKS (MODE - NUCLEAR "N", BALLOON "B", or SAND "S")
~~100mm Material~~						~~2475~~		~~5.2%~~				
~~200~~	~~0+056.7~~	~~℄ (0%s)~~	~~100~~	~~—~~	~~2109~~	~~2475~~	~~6.6%~~	~~6.6%~~ 5.2%	~~85.2%~~	~~NO~~	~~N~~	
200	0+056.7	℄ (ø %s)	100	—	2118	2475	5.5%	5.2%	85.6%	Yes.	N	Retest after more compaction
200	0+060.5	2m %s L	100	—	2095	2475	3.6%	5.2%	84.7%	Yes	N	
200	0+060	5m %s R	100	—	1933	2475	4.6%	5.2%	78.1%	Yes	N	Side Slope (2:1) Test.

COMMENTS: Last standard count DS: 2532 MS: 646
12/09/15 ~~Today~~'s standard count DS: 2512✓ M: 642✓
13/09/15 DS: 2544✓ M: 639✓

± 85% compaction = Pass as per Steve Clark Worley Parsons.

TECHNOLOGISTS: Kieran Hogan

PROJECT MANAGER:

RECEIVED BY:

*** Contractor's Representative

DATE RECEIVED: TIME:

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M-40

DAILY COMPACTION REPORT - GR ING AND SUBGRADE PROJECTS

PROJECT NO:	YT15070	PROJECT:	Clinton Creek	% COMPLETED:		QA CONSULTANT:		CONTRACTOR:	Sidhu Trucking
GAUGE TYPE:	Troxler 3430	GAUGE #:	69195	DATE TESTED:	14Sept15	PRIME CONSULTANT:	
PROCTOR #:	SG 2113/ 100mm 2475	WEATHER:	-1°C Light Rain			METHOD USED:	☑ ASTM D698 ☐ ASTM D1557

MODE - NUCLEAR "N", BALLOON "B", or SAND "S"

DEPTH BELOW GRADE (mm)	STATION	LOCATION	PROBE DEPTH	USCS TYPE	DRY DENSITY (kg/m³) FIELD	DRY DENSITY (kg/m³) MAXIMUM	MOISTURE (%) FIELD	MOISTURE (%) OPTIMUM	% COMP	ACCEPTED (YES/NO)	MODE	REMARKS
SG	Fill											
1000	0+030.5	7m°/s R	250	—	2064	2113	9.1%	—	97.7	Yes	N	
100mm	Fill											
200	0+055.5	2.8°/s R	100	—	2204	2475	5.5%	5.2%	89.1	Yes	N	
200	~~0+030.5~~ 0+052.5	1.8m°/s L	100	—	2121	2475	5.2%	5.2%	85.7	Yes	N	
SG Fill												
650	0+033.7	7.7m°/s R	250	—	2022	2113	7.8%	—	95.7%	Yes	N	did not average 98%
800	0+027	8.4m°/s R	250	—	2049	2113	8.6%	—	97.0	Yes	N	more compaction Required
650	0+033.7	7.7m°/s R	250	—	2108	2113	11.1%	—	99.8%	Yes	N	Retest ✓
800	0+027	8.4m°/s R	250	—	2180	2113	8.1%	—	103.2%	Yes	N	Retest. ✓
500	0+029	8.5m°/s R	250	—	2147	2113	8.9%	—	101.6%	Yes	N	
40(ϕ)	0+028.4	10m°/s R	250	—	2012	2113	8.2%	—	95.2	No	N	more compaction Required
(40) ϕ	0+028.4	10m°/s R	250	—	2061	2113	8.6%	—	97.5	Yes	N	Retest ✓
200	0+032	9m°/s R	250	—	2112	2113	7.5%	—	100.0	Yes	N	

COMMENTS: Last Count: DS=2544 MS=639
Today's Count: DS=2535 ✓ MS=644 ✓

TECHNOLOGISTS: Kieran Hogan

PROJECT MANAGER:

RECEIVED BY:

*** Contractor's Representative

DATE RECEIVED: TIME:

*** Signature indicates receipt of data on the date and time indicated

15/05/2014

M-40

DAILY COMPACTION REPORT - GRADING AND SUBGRADE PROJECTS

PROJECT NO:	YT.5070	PROJECT:	Clinton Creek	% COMPLETED:		QA CONSULTANT:		CONTRACTOR: Sidhu Trucking
GAUGE TYPE:	Troxler 3430	GAUGE #:	69195	DATE TESTED:	15sept15	PRIME CONSULTANT:		
PROCTOR #:	2113 56/2475 100mm	WEATHER:	-1°C Raining 2°C overcast			METHOD USED:	☑ ASTM D698	☐ ASTM D1557

DEPTH BELOW GRADE (mm)	STATION	LOCATION	PROBE DEPTH	USCS TYPE	DRY DENSITY (kg/m^3) FIELD	DRY DENSITY (kg/m^3) MAXIMUM	MOISTURE (%) FIELD	MOISTURE (%) OPTIMUM	% COMP	ACCEPTED (YES/NO)	MODE	REMARKS (MODE - NUCLEAR "N", BALLOON "B", or SAND "S")
190	0+039	1m o/s R	100	—	2291	2475	8.9%	5.2%	92.6	Yes	N	100 mm material
250	0+044	3m o/s L	100	—	2197	2475	7.8%	5.2%	88.8	Yes	N	100 mm material

COMMENTS: Last Standard count: DS = 2535 MS = 644
Today's Count: DS = 2530 ✓ MS = 635 ✓

TECHNOLOGISTS: Kieran Hogan

PROJECT MANAGER:

RECEIVED BY:
*** Contractor's Representative

DATE RECEIVED: TIME:

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15/05/2014

DAILY COMPACTION REPORT - GRADING AND SUBGRADE PROJECTS

PROJECT NO: YT15070	PROJECT: Clinton Creek	% COMPLETED:	QA CONSULTANT:	CONTRACTOR: Sidhu Trucking	
GAUGE TYPE: Troxler 3430.	GAUGE #: 69195	DATE TESTED: 16 Sept 15	PRIME CONSULTANT:		
PROCTOR #: 2113 SG/2475 100mm	WEATHER: +1°C overcast → +6°C & overcast		METHOD USED: ☑ ASTM D698 ☐ ASTM D1557		

DEPTH BELOW GRADE (mm)	STATION	LOCATION	PROBE DEPTH	USCS TYPE	DRY DENSITY (kg/m³) FIELD	MAXIMUM	MOISTURE (%) FIELD	OPTIMUM	% COMP	ACCEPTED (YES/NO)	MODE	MODE - NUCLEAR "N", BALLOON "B", or SAND "S" REMARKS
190	0+028.8	1.5m o/s L	100	—	2264	2475	7.4%	5.2%	91.5%	Yes	N	100 mm Material
190	0+027.4	3.5m o/s R	100	—	2180	2475	8.6%	5.2%	88.1%	Yes	N	" "

COMMENTS: Last Standard Count: DS = 2530 MS = 635.
16/9/15 ~~Today's~~ Counts DS = 2539 ✓ MS = 641 ✓
~~No~~ compaction tests done on Sept 16/15
17/9/15 Standard Counts DS = MS = 643 ✓

TECHNOLOGISTS: Kieran Hogan

PROJECT MANAGER:

RECEIVED BY:

*** Contractor's Representative

DATE RECEIVED: TIME:

*** Signature indicates receipt of data on the date and time indicated

DAILY COMPACTION REPORT - GRADING AND SUBGRADE PROJECTS

M-40

PROJECT NO:	YT15070	PROJECT:	Clinton Creek	% COMPLETED:	
GAUGE TYPE:	Troxler 3430	GAUGE #:	69195	DATE TESTED:	19 Sept 15
PROCTOR #:	21135G / 2475 100mm	WEATHER:	-5°C Partly Cloudy		

QA CONSULTANT:	
PRIME CONSULTANT:	
METHOD USED:	☑ ASTM D698 ☐ ASTM D1557
CONTRACTOR:	Sidhu Trucking

MODE - NUCLEAR "N", BALLOON "B", or SAND "S"

DEPTH BELOW GRADE (mm)	STATION	LOCATION	PROBE DEPTH	USCS TYPE	DRY DENSITY (kg/m³) FIELD	DRY DENSITY (kg/m³) MAXIMUM	MOISTURE (%) FIELD	MOISTURE (%) OPTIMUM	% COMP	ACCEPTED (YES/NO)	MODE	REMARKS
900	0+023.2	7.5m c/s R	250	—	2134	2113	7.0%	—	101.0%	Yes	N	SG Fill
750	0+023.2	7m c/s R	250	—	2070	2113	7.8%	—	98.0%	Yes	N	SG Fill
380	0+023.2	8m c/s R	250	—	2024	2113	9.7%	—	95.8	No	N	SG Fill more compaction
380	0+023.2	8m c/s R	250	—	2154	2113	7.8%	—	102.0	Yes	N	SG Fill (Retest)

COMMENTS: Last Standard Count: DS = 2523 MS = 643
18/9/15 ... Standard Counts: DS = 2536 MS = 641
NO compaction testing done on 18 Sept 15
19/9/15 Today's standard count: DS = 2520 MS = 633

TECHNOLOGISTS: Kieran Hogan

PROJECT MANAGER:

RECEIVED BY:

*** Contractor's Representative

DATE RECEIVED: TIME:

*** Signature indicates receipt of data on the date and time indicated

Appendix 7

Armorflex ASTM Test Results

ARMORTEC
Erosion Control Solutions
Tom Croskey
President, Armortec Canada Inc.

December 14, 2015

Jake Gentles, P.Eng.

Worley Parsons Group

4321 Still Creek Drive

Burnaby, BC V5C 6S7

Canada

RE: Concrete Testing for Armorflex Product – Clinton Mine Spillway

Dear Jake:

Attached please find the testing results of the concrete blocks used for the Clinton Mine Spillway. These blocks were produced in Spruce Grove, AB at the Armtec Plant in the Acheson Industrial Park. Please call with any questions.

Regards,

T.S. Croskey Jr.

Tom Croskey

Cc: Jeff Redwood, Worley Parsons Group

Armortec Canada Inc. • 18300 Minnetonka Blvd., Suite 106 • Deep Haven, MN 55391
Phone 952.476.5979 • Fax 952.476.7475 • Mobile 612.669.2466 • tscroskey@qwestoffice.net

Armtec
Edmonton
Quality Assurance

Armortec

	MPA									Densities								
	1 day MPA			7 day MPA			28 day MPA			7 day Density			28 day density					
Date	20-Aug-15			26-Aug-15			16-Sep-15			26-Aug-15			16-Sep-15					
Cube #	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6			
Results	28.26	3135	30.35	23.59	29.56	22.65	29.02	34.51	29.07	125	129	128	127	125	127			
Test Number	79		Date:	20-Aug														
	MPA									Densities								
	1 day MPA			7 day MPA			28 day MPA			7 day Density			28 day density					
Date	21-Aug-15			27-Aug-15			17-Sep-15			27-Aug-15			17-Sep-15					
Cube #	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6			
Results	35.34	31.25	32.87	39.84	39.6	51.28	28.39	25.66	28.7	127	130	127	129	130	129			
Test Number	80		Date:	24-Aug														
	MPA									Densities								
	1 day MPA			7 day MPA			28 day MPA			7 day Density			28 day density					
Date	25-Aug-15			31-Aug-15			21-Sep-15			31-Aug-15			21-Sep-15					
Cube #	1	2	3	4	5	6	7	8	9									
Results		27.86	27.64	31.49	35.2	38.71	33.89	44.4	28.73	140	137	135	136	132	133			
Test Number	81		Date:	25-Aug														
	MPA									Densities								
	1 day MPA			7 day MPA			28 day MPA			7 day Density			28 day density					
Date	26-Aug-15			1-Sep-15			22-Sep-15			1-Sep-15			22-Sep-15					
Cube #	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6			
Results	21.01	18.05	22.58	30.42	35.91	24.17	28.48	33.26	28.27	133	130	130	135	137	133			
Test Number	82		Date:	28-Aug														
	MPA									Densities								
	1 day MPA			7 day MPA			28 day MPA			7 day Density			28 day density					
Date	29-Aug-15			4-Sep-15			25-Sep-15			4-Sep-15			25-Sep-15					
Cube #				4	5	6	7	8	9	1	2	3	4	5	6			
Results				29.29	34.51	26.93	28.04	30.77	29.23	131	133	133	132	130	129			
Test Number	83		Date:	29-Aug														
	MPA									Densities								
	1 day MPA			7 day MPA			28 day MPA			7 day Density			28 day density					
Date																		
Cube #				4	5	6	7	8	9	1	2	3	4	5	6			
Results				39.83	41.6	54.92	51.92	51.57	48.5	133	136	134	133	132	131			
Test Number	85		Date:	22-Sep														

Appendix 8

Belisle Civil Consulting Water Management Plan

CLINTON CREEK
DROP STRUCTURE 4 REPAIR
WATER MANAGEMENT PLAN

Prepared by: Jay Belisle, P. Eng., Belisle Civil Consulting Inc.
Ph.: 867-393-3695
Email: J@belislecivilconsulting.com
For: Sidhu Trucking Ltd.
Revised: July 30, 2015

1.0 Introduction

Belisle Civil Consulting has been invited to prepare a water management plan (WMP) for the diversion of Clinton Creek for the repairs to drop structures (DS) 1, 2, 3 & 4. The Clinton Creek turn off is located at km 59.0 on the Top of the World Highway #9. The Site is another 41.0 km on the Clinton Creek Access Road. The Clinton Creek Access Road includes the Fortymile River Bridge near the confluence of the Fortymile and Yukon Rivers. The Top of the World Highway is accessible via a ferry from Dawson City over the open water months. Access to the Site is therefore limited by the ferry schedule.

2.0 Scope of Plan

The work is planned to take place between late July to early September, 2015.

The WMP plan will address the following points:

- Selecting diversion flow rates (maintain the minimum flow of 200 L/s);
- Sizing the diversion and dam height; and
- Regular monitoring of lake levels, diversion inspection, pump operation, and predetermined actions to be taken in response to rising water levels (e.g., increasing pumping rate, removal of diversion and reinstatement of creek flow).

3.0 Background Information

From Addendum 1, answer 2, the surface area of Hudgeon Lake is 115 Ha.

From drawing 1003 prepared by Worley Parsons the approximate month-averaged discharge rates from Hudgeon Lake are:

July	560 L/s
August	490 L/s
September	670 L/s
October	410 L/s

From Answer 2 of Addendum 1 is the following information:

Exceedance Probability %	Peak Flow – Daily L/s	Peak Flow 7-Daily Average L/s
5	11920	6713
10	9490	5556
25	6250	3820
50	3241	2315

From answer 2 of addendum 1 is:

	Monthly Average Flow (L/s) Exceedance			
Month	5%	10%	25%	50%
July	1500	1200	800	500
August	1500	1200	800	400
September	1600	1300	900	600

It has also been noted from addendum one that a minimum flow rate of 200 L/s is to be maintained at all times to ensure downstream fish habitat is maintained.

4.0 Creek Diversion

The creek will not be diverted until the waste rock excavation has been completed and the access to the work area has been completed. Some of the waste rock excavation will have to be stockpiled on site nearby for the channel infill.

To divert the creek it is planned to use submersible pumps, which will be powered by an on-site generator. It is planned to have five 10 inch submersible pumps on site, each with a maximum pumping capacity of 315 L/s. Four pumps will be placed into the inlet pool with 1 pump nearby for backup in the event that one of the pumps fail. From the pump inlet to the discharge point there is a 15m elevation drop (gaining head), there will be no elevation head loss. Velocity losses will be minimized by using 12" diameter HDPE.

The pumps will be powered by a diesel generator. If this generator fails, another will be sourced and brought to site. The generator location is to have a berm 1m wide and 0.5m high berm constructed around it using common material. This is to isolate the generator area from the stream and prevent any fuel/oil getting into the creek in the event there is a fuel/oil spill. A spill kit will be kept on site in the event there is a fuel/oil spill. The generator will be located at least 100' away from the water and is to be set up on the South side of Clinton Creek.

An inlet pool 6m x 4m x 3m deep with 2:1 side slopes will be excavated in the dry beside the creek and lined with 1m deep blanket of rip rap. When finished the pool will be 2m in depth. The invert of the inlet pool will be below the invert of the creek channel where the inlet channel begins.

Then a channel 1m deep and 1m wide with 2:1 side slopes will be excavated to just before the creek. The inlet channel will not be lined, however if the channel shows signs of erosion, rip rap will be placed into the channel until the erosion stops. Four pumps will be placed into the inlet pool and 12" diameter HDPE piping connection on the South side of the creek to the discharge point will be completed. Each pump will have a separate run of 12" diameter HDPE to the discharge point.

To control initial sediment a 2" pump will be used to fill the inlet channel and the inlet pool from the creek and the sediment allowed to settle prior to opening the inlet channel. The inlet channel will be partially opened and one 10" pump will be turned on. At this point in time the fish salvaging operation needs to commence.

Once pumping operation is satisfactory and the fish salvaging is complete, the inlet channel will be fully opened to allow all the creek flow into the inlet pool. Another 10" pump will be turned on to keep up with present flow of water. The water will discharge back into the creek bed on to a blanket of rip rap which will be 5m wide x 5m long and 1m deep to slow the water down and prevent stream erosion. If work can be completed safely, fish salvaging will be conducted from the rip rap discharge apron to the bottom of drop structure 4. As shown on the updated construction schedule it is anticipated to have fish salvaging occurring on August 29, 2015.

The rip rap blanket with geotextile underneath of it will be constructed prior to turning on the first 10" pump. To control sediment release into the stream the rip rap will be placed carefully using an excavator with a thumb attachment. If necessary, a silt fence will be constructed down-stream of the rip rap blanket location to minimize sediment release. The discharge point will be just downstream of the work area on the South side of the creek. Fish salvage of the work area should be completed after the rip rap blanket is placed and the first pump is turned on, but before the water in the natural channel is fully diverted to the new inlet channel. All of the pumps will have fish screens on them.

At all times a min. flow rate of 200 L/s will be maintained down-stream of the work area to maintain fish habitat.

It is not anticipated that the water will flow back into the work area. The point of discharge will be selected so that this is not possible. However, if water does start backwatering up the creek into the work area an eart berm will be constructed just upstream of the discharge point. Also it has been anticipated to construct a sump at the bottom of drop structure 4 so that if any sediment laden water from the creek bed starts to make its way into the creek, the sump can be pumped with a 2" submersible to a location outside of the creek bed and allowed to soak into the ground.

The discharge point will be closely monitored in the beginning for stream erosion. If stream erosion is evident the 1m thick rip rap blanket will be extended to stop any in stream erosion. If it is evident that TSS are still making their way down the stream then a silt fence will be erected downstream of the discharge point across the creek. The silt fence will have to be inspected at the start and end of each shift to ensure it is effective.

Once the above steps have been completed an earth berm of common material will be constructed across the mouth of the creek. The earth berm will be constructed in the dry as 100% of the creek flow will be going into the inlet pool. If there is any residual water in the channel, it will be pumped into the inlet channel using the 2" submersible pump.

To construct the earth berm the material will come from on site. The berm will be four meters wide (at the top), approximately 2m in height with 2:1 side slopes and will be compacted to 95% SPD. In the middle of the dam a notch will be constructed 5m wide x 0.5m deep and lined with rip rap. The rip rap will be selectively sourced from the waste rock excavation. Also on the down-stream side of the dam a 1m thick spill way apron of rip rap (armoring) will be constructed. The lake side of the dam below the notch is also to have a 1m thick inlet apron (armoring) constructed of rip rap. Any residual water in the stream channel will be pumped out to the discharge point using a 2" submersible pump.

The fjord access #2 across the creek will be maintained at all times during construction.

After construction and the pumping operation comes to an end the berm across the creek will be removed and the water will be allowed to flow in the natural creek channel. One pump will be kept in operation until the water in the natural channel makes it to the monitoring area of the creek. Then the last pump will be shut down and all flow will be back in the natural creek channel. The pumps and discharge piping will be removed, the inlet pool will be filled back in, the rip rap blanket at the discharge area will be removed and stockpiled near the creek for future use; the creek will be contoured to a natural state if required for fish passage.

5.0 Lake/Creek Monitoring

A section of creek downstream of the discharge point will be selected for monitoring creek flow. A location will be selected and a cross section of the creek bed recorded. A calibrated chart will be created for area of creek cross section vs. depth of water in the creek channel. In the thalweg of the creek cross section a steel bar will be driven into the ground. A survey rod will be used to measure the depth of the water at the steel rod. A current meter will be used to measure the velocity of the creek. Flow will be calculated as flow area x velocity. Flow measurements will be recorded at the start and end of each shift or as necessary if changes to the pumping operation are required.

Hudgeon Lake will have its' water level and flow rate monitored on a daily basis as well. At least one measurement per day will be recorded or as necessary if the water level is rising fast due to a large rain event. A bench mark will be set by the shore of the lake and this will used to measure the lake level.

The effectiveness of the inlet pool will be monitored daily during construction. If necessary a new inlet channel will be constructed and if necessary a new inlet pool will be constructed (might have to be deeper than the original).

The water levels and flow rates will be recorded by the site superintendent Bruce Funk. As well the inspection and monitoring of the diversion operation will be by the site superintendent.

6.0 Pumping Operation

The pumps will be connected to HDPE piping which will be placed on the South side of the creek, following the proposed alignment shown on the staging drawing. The joints on the pipe will be connected using flanged connections. All bends on the pipe will be restrained with weight. It is proposed to use concrete lock blocks on either side of the pipe with earth piled on top of the concrete blocks. Where necessary, earth will be piled over top of the HDPE piping to allow construction vehicle access.

Throughout construction the pumps and piping will be monitored and will be in compliance with the EMP. The inlet pool and rip rap discharge area will be monitored during construction and will likely have to be adjusted through the duration of the project to eliminate and prevent any stream erosion.

The pumping operation will be checked by one of the workers on site in the evening prior to the superintendent going to bed (10 pm) and early in the morning prior to start of shift (5am). Camp is proposed being 8 km away from the work site so an audible alarm will not be heard from that distance. Having workers wake up at strange hours to go check the pumping operation is not warranted as workers who do not get proper sleep and are tired are an occupational hazard to themselves and to others on the work site.

It is anticipated to have two pumps running all the time (630 L/s) so that if one pump goes down (during the night) a minimum flow of 315 L/s will be maintained. With two pumps run continuously, 54,432 m^3 of water will pass through the diversion in a day.

With two pumps running continuously, it is expected that water level in Hudgeon lake will roughly stay the same. Based on the monthly averaged discharge rates presented on drawing 1003 from Worley Parsons. If we assume the discharge rate for July, August and early September from the lake will be 600 L/s and the pumping operation is at 630 L/s then over a 6 week period with the surface area of the lake being 115 Ha, the lake level will drop 0.09m.

Keeping the lake level roughly the same is the anticipated strategy. If a large rain event does occur and the water level of the lake begins to rise, the other two 10" pumps will be activated for a total capacity of 1260 L/s. The dam will have a height of 1.0 m above the present water level (to the top of the notch in the dam) of Hudgeon Lake, which is roughly elevation 412.6 m. This represents storage for 1,150,000 m^3 of water. If the dam starts backing up water, then the steps below will be taken.

If the water level reaches 50cm below the notch height in the dam the work site will be prepared for a quick evacuation, work will continue. However, the dam will require constant monitoring for seepage and signs of distress.

At 20 cm below the notch height, the work area will be cleared in the event that water keeps rising and overtops the dam. At this point it is likely that one of two things are going to happen, the water overtakes the dam and floods the site or, the water recedes and construction continues.

If you have any further questions, please do not hesitate to contact me at the undersigned.

Jay Belisle

Jay Belisle, P. Eng.

PROFESSIONAL
YUKON
JAY BELISLE
TERRITORY
ENGINEER

PERMIT TO PRACTICE
BELISLE CIVIL CONSULTING INC.
SIGNATURE Jay Belisle
Date Aug 4/2015
PERMIT NUMBER PP324
Association of Professional
Engineers of Yukon

Appendix 9

Minnow Environmental Inc. Fish Salvage Plan

Fish Salvage Plan
For The Clinton Creek
Drop Structure Repair

Report Prepared for:

Yukon Government
Assessment and Abandoned Mines
Whitehorse, Yukon
Y1A 2C6

Report Prepared by:

Minnow Environmental Inc.
2 Lamb Street
Georgetown, Ontario
L7G 3M9

August 2015

Fish Salvage Plan
For The Clinton Creek
Drop Structure Repair

Report Prepared for:

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Assessment and Abandoned Mines
Whitehorse, YT
Y1A 2C6

Report Prepared by:
Minnow Environmental Inc.

Kevin Martens B.Sc.
Project Manager

Cynthia Russel.
Senior Reviewer

August 2015

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1.0 INTRODUCTION

1.1 Background and Scope

The Yukon Government (YG) is undertaking a construction project on Clinton Creek downstream of Hudgeon Lake to repair damaged gabion drop structures. The construction is being implemented by Sidhu Trucking Ltd. based on a design developed by Worley Parsons (contacts for the project provided in Attachment 1 of the Monitoring SOP). Site access improvements are expected to start on August 8 and construction will extend 6 to 8 weeks.

The Yukon Government has requested Ecological Logistics & Research Ltd. (ELR) to assist in the fish salvage aspect associated with this construction project, with Minnow Environmental developing the fish salvage plan in conjunction with ELR. Fish salvage events will take place to accommodate a creek crossing downstream of the construction area and while flow is being redirected downstream of the drop structure construction area. This document describes the proposed fish salvage plan and the methods to be employed.

1.2 Project Objective and Approach

The objectives of the project are:

1. To remove resident fish outside of the creek crossing and construction areas.
2. To provide ongoing support in terms of fish protection through the construction period.

Two areas will be subject to fish salvage, including a creek crossing where temporary culverts will be installed, and the fourth gabion drop structure construction area. The creek crossing fish salvage will involve blocking a short section of Clinton creek temporarily. Following fish removal, a temporary road crossing with culverts will be installed. Once installation is complete, nets will be removed.

The fourth drop structure represents a barrier to upstream fish passage, and therefore, no fish are expected to reside in the reach upstream towards Hudgeon Lake. To ensure the safety of the fish salvage crew, the salvage area will be assessed at the beginning of construction. If the waste rock area is stable, fish salvage in the drop structure area may occur before access road construction begins. Prior to the collection and relocation of fish from the fourth drop structure area, the contractor will be expected to gradually draw down the flow within Clinton Creek to concentrate fish and expedite the salvage program (the degree of draw down will be based on site conditions at the time and will be decided on site with the contractor).

1.3 Report Overview

This report is presented in four sections, the first of which is this introduction (Section 1.0). Section 2.0 describes the fish salvage methods. Section 3.0 describes the proposed monitoring during construction and Section 4.0 provides key project contacts.

2.0 FORD CROSSING AND CONSTRUCTION AREA FISH SALVAGE

The Yukon Government is planning to conduct repairs to damaged gabion drop structures on Clinton Creek. The construction area will focus on the fourth gabion drop structure. In order to undertake the repair work within the creek, a temporary creek crossing must be constructed, and the flow within Clinton Creek will need to be diverted around the construction area to provide for a dry creek bed. The temporary creek crossing will be located downstream of the fourth gabion drop structure. Flow from Clinton Creek will be diverted at the outlet of Hudgeon Lake via an earth fill dam constructed at the lake outlet and a water pumping system to pump the water via a pipeline to Clinton Creek downstream of the construction area. Prior to installation of the temporary culvert crossing and creating a dry creek bed for construction, fish salvage programs must be implemented to move fish within the affected reaches downstream. Fish will be collected under a license to collect fish from the Department of Fisheries and Oceans (DFO).

The fish salvage will be conducted by qualified biologists with ELR. For the temporary creek crossing, ½" nylon mesh block nets (approximately 3 to 6 feet high) will be installed upstream and downstream of the affected area. Fish will be collected by electrofishing team using the methods described below. Following installation of the culverts and the construction of the temporary road crossing, the block nets will be removed to allow fish to repopulate the area.

For removal of fish within the drop structure area, ELR staff will work with the contractor to adjust the pumping rate below the dam to ensure adequate flow for resident fish but reduced water levels to promote the collection of fish within the watercourse. A fish barrier (block net) will be installed at the downstream end of the construction zone to prevent fish from moving upstream into the construction area. A ½" nylon mesh block net (approximately 3 to 6 feet high) will be secured to both sides of the stream bank and within the stream and will be supported by rebar posts driven into the substrate. Fish will be captured primarily by electrofishing but minnow trapping and/or seine netting may also be employed.

An electrofishing team, consisting of the electrofisher operator and a single netter, will employ a multiple pass removal method through each of the fish salvage areas, whereby one upstream to downstream electrofishing pass (or "sweep") of the enclosed area will be repeated to yield a fish removal pattern (i.e., diminishing catches). Once no fish are captured in two consecutive passes, it will be determined that the area has been cleared of fish and the salvage operation will completed. Fish captured will be placed in aerated containers and transported downstream of the temporary crossing or construction areas to locations with sufficient flow and depth to support fish species being released. All Fish captured will be identified and counted for inclusion into a salvage report to be provided to DFO. As catch efficiencies are reduced, flow through the construction area can be further reduced to again increase fish concentrations. Following the fish removal, Clinton Creek within the construction area will be dry, with no fish present. As no flow will be present in this section, maintaining a barrier at the downstream end of the construction zone will not be required.

A salvage report should be prepared by ELR which should describe the methods employed and the fish collection records to be submitted to DFO.

3.0 ONGOING MONITORING

During the construction period, an on-site monitor will collect daily turbidity readings at five locations (Figure 3.1), including:

- Hudgeon Lake near pump (background, site code HL),
- Clinton Creek downstream of the bypass discharge (site code CC1),
- Clinton Creek upstream of the confluence with Wolverine Creek (site code CC2),
- Wolverine Creek upstream of the confluence with Clinton Creek (site code WC1),
- Clinton Creek downstream of the confluence with Wolverine Creek (site code CC3).

Weekly water sampling will also take place at each of the five locations, and include samples for analysis of total suspended solids (TSS) and total metals. Minnow has prepared a standard operating procedure (SOPs) which provides details regarding sample collection and submission.

Should a significant rainfall event occur, or turbidity concentrations exceed 50 NTU at stations CC1 or CC2, increased sampling frequencies will be required (as outlined in the Monitoring SOP), and additional monitoring stations will be sampled, including Clinton Creek at the mouth (site code CC4), Fortymile River upstream of Clinton Creek (site code FRUS), and Fortymile River downstream of Clinton Creek (site code FRDS). Collection of water samples for asbestos analysis will also be collected from select locations before construction begins, at the end of the construction period, and if turbidity concentrations exceed 50 NTU.

The on-site monitor will also inspect the sediment mitigation measures implemented by the contractor. Generally, the inspection will assess the silt fencing and erosion control measures lining roads or other disturbed areas to ensure that runoff from these areas is not by passing/short circuiting the fencing and reporting directly to Clinton Creek. Should the mitigation measures appear to be compromised or not working as intended, the on-site monitor will meet and work with the contractor to modify the mitigation measures to remedy the problem as best as possible.

Finally, the on-site monitor will review the weekly monitoring activities with personnel from Minnow and/or ELR and identify any issues that might affect fish or fish habitat. Any issues discussed will be documented and measures to address outstanding issues will be identified and a process for implementing these measure will also be identified.

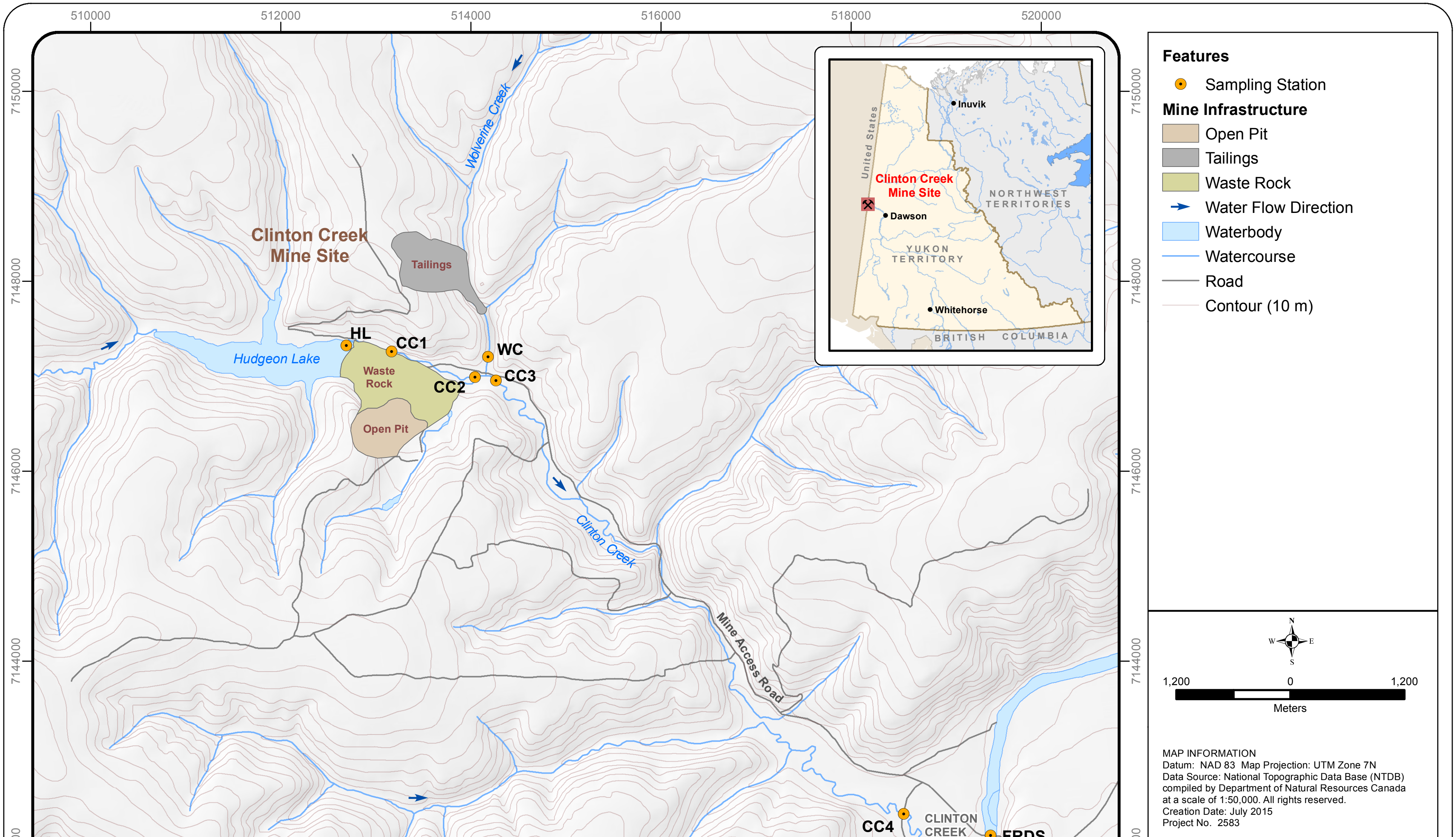

Figure 3.1: Sampling Stations Near Clinton Creek Mine Site

minnow environmental inc.

4.0 KEY CONTACTS

The fish salvage will be implemented by qualified ELR staff. Monitoring results will be directed to Minnow, ELR, and YG staff, with ELR providing local assistance if required. Key project contacts are as follows:

1. Lead Biologist
   Cynthia Russel, Senior Aquatic Ecologist
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4. Yukon Government – Environment
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Appendix 10

Acid Rock Drainage and Metal Leaching Lab Test Results

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Date: September 22, 2015

Dear Ms. Perron

CLINTON CREEK LAB TEST RESULTS, REV. 0

1. Introduction

Lab testing has been completed on samples recovered during the May 31, 2015 site visit. Acid rock drainage and metal leaching (ARD/ML) testing was carried out at the Maxxam Analytics (Maxxam) laboratory in Burnaby, British Columbia (BC). General Geotechnical characteristics testing was carried out at the Tetra Tech EBA (TT) laboratory in Whitehorse, Yukon (YT). A summary of the completed tests is provided in Table A.

Table A Lab Testing Summary

Test Type	Testing Standard	No. of Tests Conducted
Modified Acid Base Accounting (ABA) Package (paste pH, total sulphur [by Leco])	ASTM D3987	6
Carbonate Carbon (CO_2 HCl method)	ASTM D4373	6
Ultratrace Metals on Solids by Aqua Regia Digestion (Group 1F-MS)	QOP Hg FIMS	6
Sulphur speciation (sulphate sulphur, sulphide sulphur, insoluble sulphur [by difference])	ASTM D5504, D5623	6
Shake Flask Extraction	MEND	2
Grain Size Analysis (sieve/hydrometer)	ASTM D422	2
Atterberg Limits	ASTM D4318	2
Modified Proctor Analysis	ASTM D1557	2

2. Soil Testing

Soil samples were recovered by Advisian at two locations: at a natural sand hill face along the Clinton Creek access road, termed herein "Sand Hill Pit", and at a quarried rock face (i.e. rock pile) immediately outside the Clinton Creek access gate, termed herein "Entrance Pit". Samples from Sand Hill Pit were taken from the sand pit located 27 km from the turn off from the Top of the World Highway on May 31, 2015. Recovered samples comprised coarse grained soils comprised mostly of sand and gravel of relatively uniform grain size distribution at both locations. Fines content ranged from 6% to 11% suggesting non-plastic material. Therefore, Atterberg Limit testing could not be completed. Modified Proctor analysis indicated corrected densities of 2,210 kg/m³ and 2,475 kg/m³ with corresponding optimum moisture contents of 8.2% and 5.2% for Sand Hill Pit and Entrance Pit, respectively. Soil test results are summarized in Table B and detailed test results are provided in Appendix A.

Table B Soils Test Results Summary

Location	Soil Classification	Gravel	Sand	Fines	Corrected Proctor Density	Corrected Optimum Moisture	In Situ Moisture	Plasticity Index
Sand Hill Pit	Sand and gravel, some silt	37%	52%	11%	2,210 kg/m³	8.2%	7.4%	non-plastic
Entrance Pit	Gravel, sandy, and trace silt	63%	31%	6%	2,475 kg/m³	5.2%	1.5%	non-plastic

3. Acid Rock Drainage (ARD) Testing

3.1 Introduction

To assess the potential of the waste pile and Entrance Pit material to generate ARD/ML, an ARD/ML screening level program was conducted.

3.2 Sampling and Laboratory Testing

A total of six samples (three waste rock and three Entrance Pit rock) were collected by Advisian personnel during the site visit, and sent to Maxxam in Burnaby, BC for testing. Samples were collected from different locations of the waste rock pile and Entrance Pit site to capture potential spatial variability within the piles.

The ARD/ML program comprised:

- ABA including fizz test, paste pH, inorganic carbon (CO2), sulphur speciation (total sulphur, sulphide sulphur [measured], sulphate sulphur, and insoluble sulphate sulphur, by difference) and the Modified-Sobek Neutralization Potential (MS-NP).
- Ultratrace metal analysis using aqua-regia, followed by ion coupled plasma mass spectrometry (ICP-MS).
- MEND Shake Flask Extraction test.

3.3 Laboratory Analytical Results

3.3.1 Quality Assurance (QA)

A quality assurance (QA) framework was followed to assess the accuracy of laboratory analytical results. QA included the following:

- Relative percent difference (RPD): duplicate samples were included in the analyses and their RPD calculated. Results show that RPD values within acceptable range (±20%) indicate good reproducibility.
- Sulphur species balance: all samples had total sulphur higher than sulphate sulphur and sulphide sulphur.
- Standards: standards used in the analyses were reported with the analytical results, and are within the expected values.

3.3.2 Acid Base Accounting (ABA)

ABA was used to evaluate the balance between acid potential (AP) and neutralization potential (NP) of samples. The ratio of NP to AP is used as a tool for the classification of geological materials according to their ARD potential ("Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials" by MEND 2009).

ABA sampling is strictly static testing, meaning it provides information on the samples only as they occur at the time of analysis. Results provide the present drainage pH of the sample (paste pH). They also allow initial classification of the samples with respect to the potential for future acidic drainage (MEND 2009). Static testing does not provide any information on rates of acid generation or neutralization under site-specific conditions. Thus, where sulphide minerals are present in rock samples, ABA testing cannot be used alone to make definitive conclusions about the potential for long-term acid generation.

Results of the ABA are reported in Table C and laboratory results are provided in Appendix B.

Table C Acid Base Accounting Results

Sample ID	Description	Paste pH (units)	CO_2 (weight per cent [wt.%])	$CaCO_3$ Equivalent (kg $CaCO_3$/T)	Total Sulphur (wt.%)	Sulphate Sulphur (wt.%)	Sulphide Sulphur (wt.%)	Non-Extractable Sulphur (by difference) (wt.%)	Acid Generation Potential (kg $CaCO_3$/T)	MS-NP (kg $CaCO_3$/T)	T-NPR	S-NPR	Fizz Rating	ARD Classification
CCENTPILES01	Meta- Sandstone	9.2	14.86	337.70	0.18	**0.01**	0.11	0.07	5.63	266	47.3	78.3	Moderate	Non-PAG
CCENTPILES02	Meta- Sandstone	9.3	14.13	321.10	0.24	**0.01**	0.15	0.09	7.50	265	35.3	56.4	Moderate	Non-PAG
CCENTPILES03	Meta- Sandstone	9.2	15.07	342.50	0.15	**0.01**	0.09	0.06	4.69	280	59.7	100.0	Moderate	Non-PAG
CCWR01	Serpentinized Utramafic	9.5	1.12	25.50	0.15	0.05	0.01	0.09	4.69	155	33.1	516.0	None	Non-PAG
CCWR02	Graphitic Argillite	8.5	8.94	203.20	0.16	0.04	0.04	0.08	5.00	136	27.2	104.8	Strong	Non-PAG
CCWR03	Mudstone/Siltstone	8.7	4.37	99.30	0.57	0.21	0.18	0.18	17.81	104	5.8	18.6	Moderate	Non-PAG

CCENTPILE = Clinton Creek Entrance Pit

CCWR = Clinton Creek Waste Rock

GREY values are detection limit.

T-NPR = Neutralization potential ratio calculated assuming total sulphur as source of acidity.

S-NPR = Neutralization potential ratio calculated assuming the sum of sulphide sulphur and non-extractable sulphur as source of acidity.

Paste pH

Paste pH indicates the present drainage pH of each sample. The present pH provides an indication of ongoing sulphide oxidation or previous weathering processes. Paste pH values lower than 6.0 are considered signs of the release of acidity, while pH values greater than 6.0 indicate sulphide oxidation associated with neutralization or negligible sulphide oxidation.

The paste pH of the waste rock samples ranges from 8.5 to 9.5 with a median of 8.7, while the paste pH of the Entrance Pit samples ranges from 9.2 to 9.3 with a median of 9.2. These neutral to slightly alkaline paste pH values indicate that, at the present time, all samples tested have sufficient NP to buffer acidity produced from sulphide oxidation.

Sulphur Species and Acid Potential (AP)

Determining the types of sulphur species in the samples and their concentration is an important aspect of the ARD/ML assessment. Sulphide minerals are particularly important because they determine the potential for ARD/ML.

Total sulphur content of the waste rock samples varies from 0.15 weight per cent (wt.%) to 0.57 wt.% with a median value of 0.16 wt.%, while total sulphur content of the Entrance Pit samples varies from 0.15 wt.% to 0.24 wt.% with a median of 0.18 wt.%. These values indicate low sulphur content with the exception of one waste rock sample (CCWR03).

Sulphate sulphur content of all the samples is extremely low with the exception of one sample (CCWR03). The sulphide sulphur content is also very low and range from 0.09 wt.% to 0.15. wt.% (median of 0.11 wt.%) in the Entrance Pit and from 0.01 wt.% to 0.18 wt.% (median 0.04 wt.%) in the waste pile.

Figure A is a plot of total sulphur versus sulphide sulphur and illustrates that sulphide sulphur is a major source of sulphur in the Entrance Pit samples while the waste rock samples contain an additional unidentified source of sulphur. This unidentified sulphur could be derived from low solubility or insoluble acidic sulphur species, elemental sulphur, alunite, or organically bound sulphur (MEND 2009), and further tests are usually needed to determine its origin. Because total sulphur is used in the estimation of AP (below), no additional test is needed.

The samples do comprise an undetermined source of sulphur and limited information is available with respect to their sulphide mineralogy. Thus, the AP was estimated conservatively using total sulphur. The calculated AP is very low and varies from 4.7 kg $CaCO_3$/t to 7.5 kg $CaCO_3$/t (median of 5.6 kg $CaCO_3$/t) in the Entrance Pit samples and from 4.7 kg $CaCO_3$/t to 17.8 kg $CaCO_3$/t (median of 5.0 kg $CaCO_3$/t) in the waste rock samples.

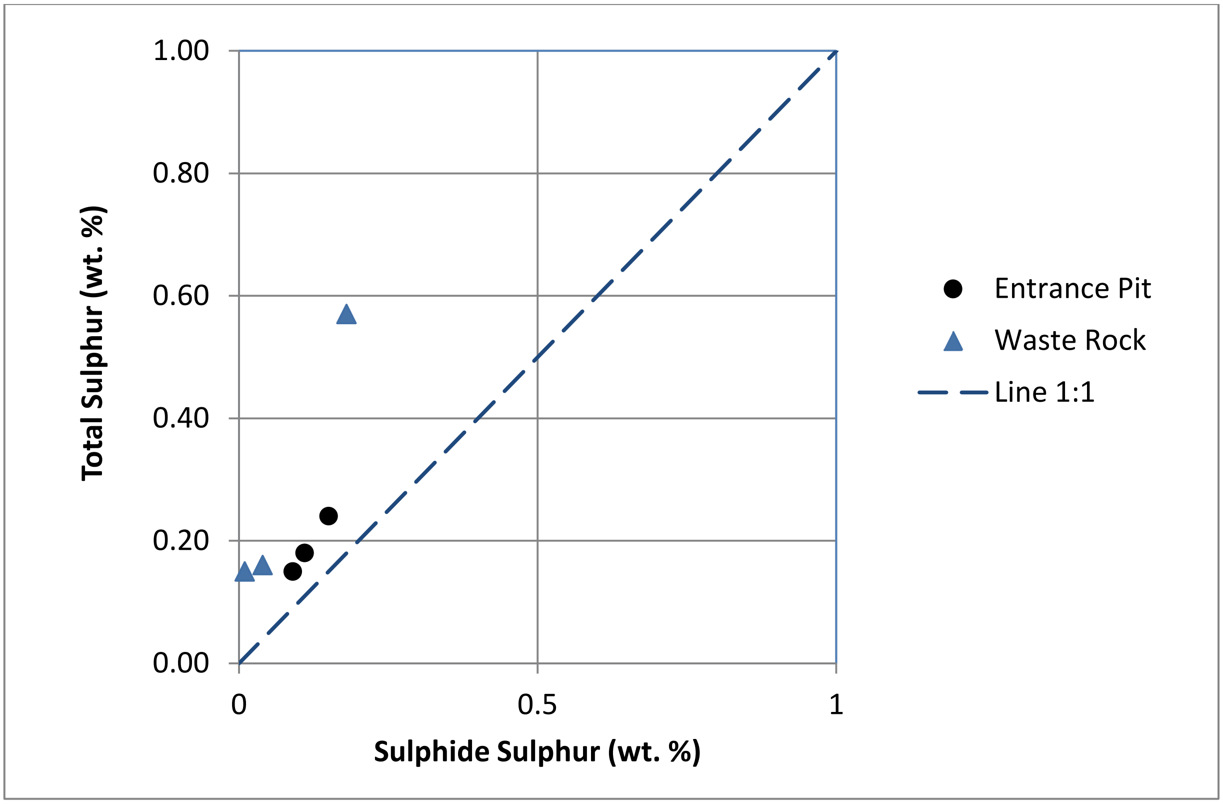

Figure A Total Sulphur versus Sulphide Sulphur

Carbonate Species and Neutralization Potential

Carbonate minerals such as calcite are the most effective in neutralizing acidity generated from sulphide oxidation. Fast dissolving carbonate minerals like calcite, aragonite, and dolomite and the most reactive non-carbonates like anorthite are particularly important for neutralization. There are carbonate minerals, including iron and manganese carbonates that do not contribute to neutralizing potential.

The carbonate carbon measured during the ABA test as CO2 indicates readily available NP derived mainly from carbonates minerals. The CO2 content was used to estimate the carbonate NP.

The CO2 of the Entrance Pit samples ranges from 14.1 wt.% to 15.1 wt.% (median 14.9%) indicating potentially high carbonate NP (Table C). The waste rock samples contain lower NP as indicated by CO2 content ranging from 1.1 wt.% to 8.9 wt.% (median 4.4 wt.%). This NP is theoretically sufficient to buffer the acidity generated from these waste rock samples.

The NP of the samples was estimated using the MS-NP method to approximate the bulk NP of the samples. The MS-NP includes NP from fast reactive carbonates and most-reactive silicates. The MS-NP of the Entrance Pit samples ranges from 266 kg CaCO3/t to 280 kg CaCO3/t, while the MS-NP of waste rock sample ranges from 104 kg CaCO3/t to 155 kg CaCO3/t. These are significant NP, especially in low sulphide sulphur environment.

Figure B is a plot of carbonate NP versus MS-NP and illustrates that iron and manganese carbonate, considered net neutral in terms of neutralization capacity, contribute some NP to the carbonate NP in four of the six samples (samples above the 1:1 relationship line). Also, one waste rock sample shows significant NP from alumino-silicates (sample below the 1:1 relationship line).

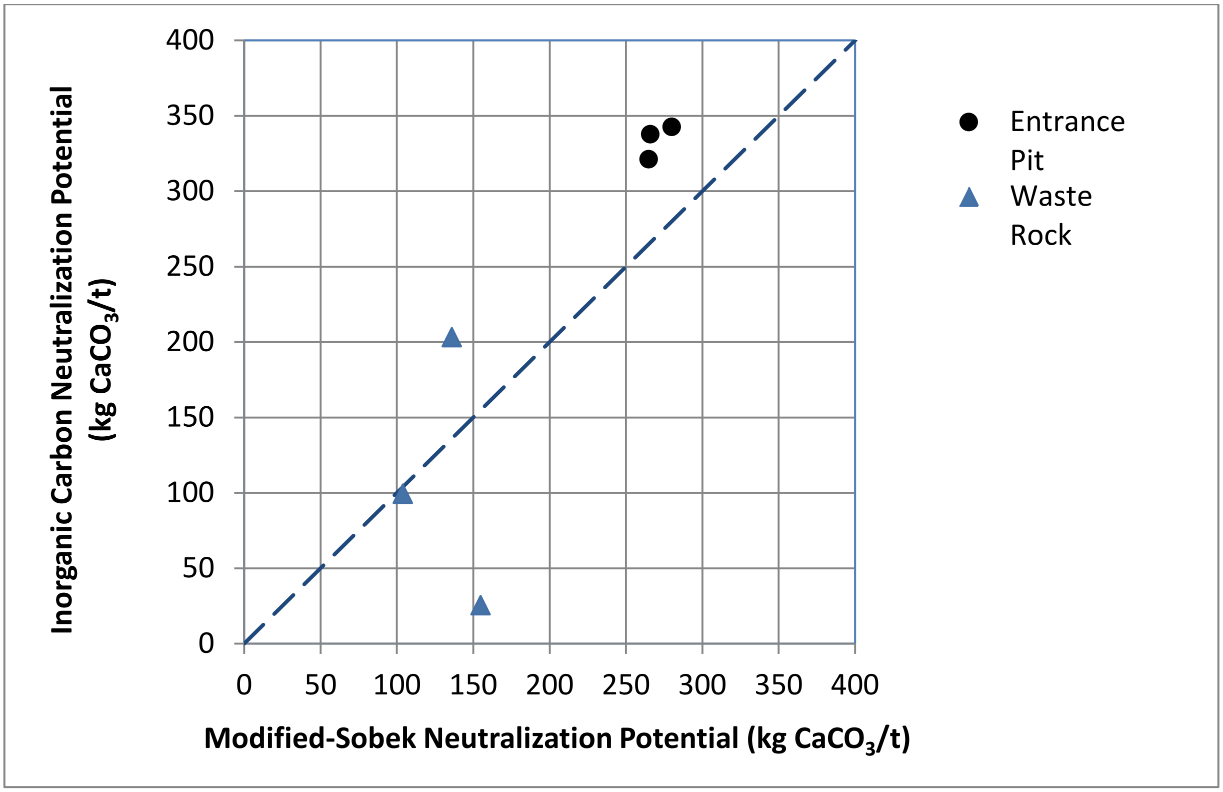

Figure B Carbonate NP versus Modified-Sobek NP

Acid Rock Drainage (ARD) Classification

The neutralization potential ratio (NPR) assesses the balance between acid generation and neutralization capacities of the sample, and is used worldwide as screening criteria for the classification of geological materials based on their ARD potential (MEND 2009). The NPR of the samples was calculated using the MS-NP and the AP calculated from the total sulphur, and was called T-NPR.

The non-site-specific criteria developed in British Columbia and used worldwide are shown in Table D (MEND 2009) and were used to classify the rock samples based on their ARD potential. The calculated NPR in Table C (T NPT) shows that all samples have a T-NPR much higher than 2, which indicates that they are all classified as non-potentially acid generating (non-PAG). The result is shown graphically in Figure C.

Table D ARD Potential Screening Criteria based on NPR

Classification	Potential for ARD	Initial Screening Criteria	Comments
Potentially Acid Generating (PAG) or Acid Generating (AG)	Likely	NPR < 1	Likely ARD generating unless sulphide materials are non-reactive.
Uncertain	Uncertain	1 ≤ NPR ≤ 2	Possibly ARD generating if NP is insufficiently reactive or is depleted at a faster rate than sulphides. Requires further static and/or kinetic testing.
Non-Potentially Acid Generating (Non-PAG)	Low	NPR > 2	Non-potentially ARD generating unless significant preferential exposure of sulphides along fracture planes, or extremely reactive sulphides in combination with insufficiently reactive NP.

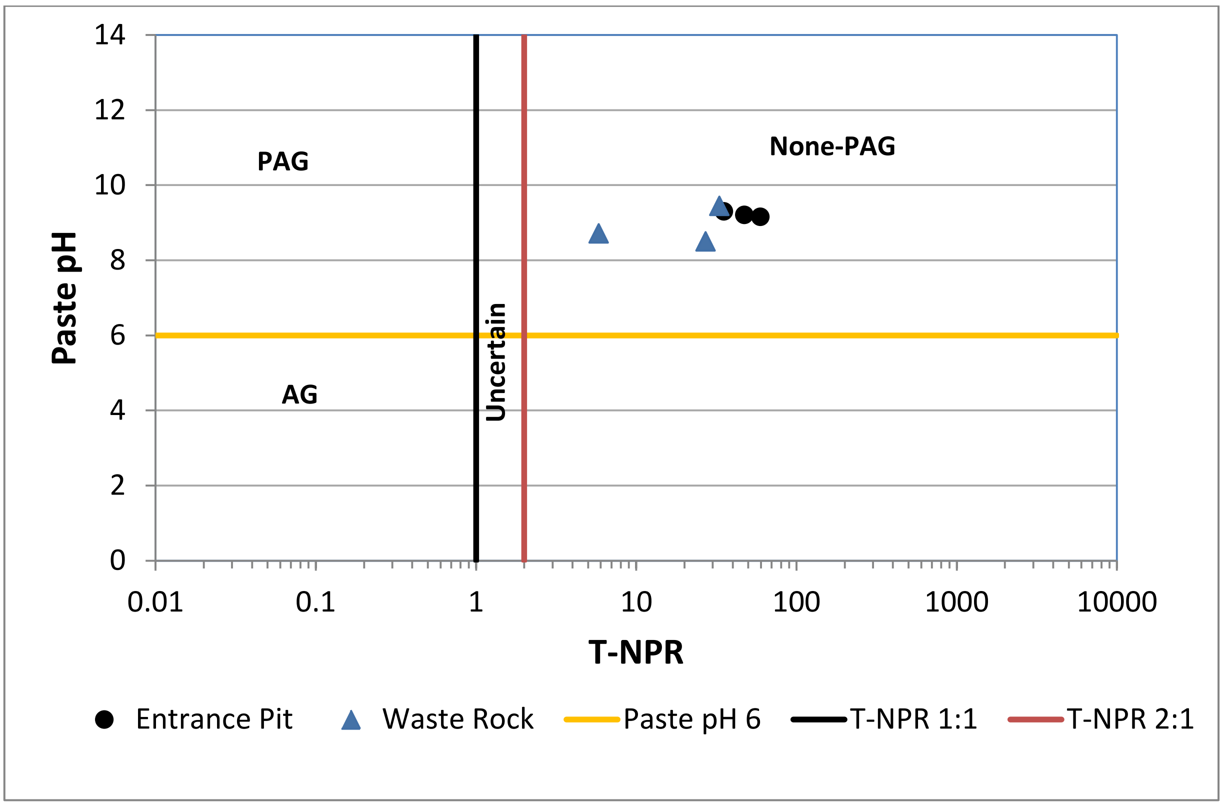

Figure C Paste pH versus T-NPR

3.3.3 Solid-Phase Metal Analysis and Metal Leaching (ML)

Acid generation from sulphide oxidation increases the weathering of rock forming minerals releasing their elemental constituents (e.g. metals, metalloids) into the environment; however, several metals and metalloids can still be released at high concentration under non-acidic conditions. This is the case of arsenic, molybdenum, selenium, antimony and zinc, for example.

Several tests including solid-phase metal analyses are used to assess the metal content (reservoir) of the rock which can be interpreted as a sign of potential ML. Solid-phase metal analyses measure metal concentrations in a sample in order to identify whether the concentration of a given metal is higher or lower than a selected screening value ("Draft guidelines and recommended methods for the prediction of metal leaching and acid rock drainage at mine sites in British Columbia" by W.A. Price 1997). A sample with an elemental concentration higher than the screening value is considered enriched in that element. This indicates an abundance of the element in the rock and may (or may not) be sign of potential for ML, because site-specific conditions ultimately determine the weathering rate and the release and mobility of the element. The screening value generally used can be three, five, or ten times the composition (also known as abundance) of the average composition of the continental crust or a rock type similar to the rock sampled.

For screening purposes for the Clinton Creek waste and Entrance Pit samples, metal concentrations of the samples were compared to the five times the average composition of the continental crust. The results of the solid-phase metal analyses and screening process are reported in Table E and Table F, respectively.

Table F shows that several metals including arsenic, antimony, selenium, mercury, nickel, and magnesium exceed the screening value in one or more samples. This indicates an elevated abundance of arsenic, mercury, nickel, magnesium, and antimony in the Entrance Pit samples and the abundance of nickel, selenium, antimony, chromium, magnesium, and bismuth in the waste rock. These elevated metal contents could result in metal leaching depending on site conditions, especially in the case of arsenic, antimony, and selenium, because these metals and metalloids can reach elevated concentration in solution under non-acidic conditions; however, detailed tests are required to simulate and assess whether weathering process would result in leachates with metal concentration above those permissible under applicable guidelines. The exceedance of magnesium is expected because of the nature of the rock hosting the mineralization at Clinton Creek.

Please note that the average abundance used for screening is a global average value, thus a comparison with a rock similar to those sampled, if known in detail, may provide different results.

Table E Ultratrace Metals Test Results

Sample ID	Mo (ppm)	Cu (ppm)	Pb (ppm)	Zn (ppm)	Ag (ppm)	Ni (ppm)	Co (ppm)	Mn (ppm)	Fe (%)	As (ppm)	U (ppm)	Au (ppm)	Th (ppm)	Sr (ppm)	Cd (ppm)	Sb (ppm)	Bi (ppm)
Detection Limit	**0.01**	**0.01**	**0.01**	**0.1**	**2.0**	**0.1**	**0.1**	**1.0**	**0.01**	**0.1**	**0.1**	**0.2**	**0.1**	**0.5**	**0.010**	**0.020**	**0.02**
CCENTPILES01	0.27	9.61	0.90	7.8	25	1150	44.5	755	3.54	25.2	0.1	2.0	0.1	199	0.04	6.50	0.02
CCENTPILES02	0.18	5.18	0.80	6.2	20	1430	58.1	679	3.88	29.8	0.1	3.5	0.1	179	0.03	7.62	0.02
CCENTPILES03	0.19	15.8	0.91	10.0	28	1230	56.8	864	4.44	31.4	0.1	0.6	0.1	202	0.03	7.73	0.02
CCWR01	1.24	10.9	3.41	25.8	49	1790	77.5	464	3.42	2.3	0.3	0.2	1.3	30.3	0.20	1.29	0.04
CCWR02	2.53	25.3	5.54	33.2	104	822	43.1	483	3.00	9.0	0.6	0.2	1.7	132	0.33	4.56	0.08
CCWR03	5.38	17.6	6.62	59.4	89	1180	38.4	427	3.08	6.3	0.8	0.2	3.1	88.3	0.40	0.81	0.13

Sample ID	V (ppm)	Ca (%)	P (%)	La (ppm)	Cr (ppm)	Mg (%)	Ba (ppm)	Ti (%)	B (ppm)	Al (%)	Na (%)	K (%)	W (ppm)	Sc (ppm)	Tl (ppm)	Hg (ppm)	Se (ppm)	Te (ppm)	Ga (ppm)	S (%)
Detection Limit	**2.0**	**0.01**	**0.001**	**0.5**	**0.5**	**0.01**	**0.5**	**0.001**	**20**	**0.01**	**0.001**	**0.010**	**0.1**	**0.1**	**0.0**	**5.0**	**0.1**	**0.02**	**0.1**	**0.02**
CCENTPILES01	26	2.84	0.002	0.5	398	15.3	316	0.001	20	0.08	0.008	0.02	0.5	7.8	0.26	1650	0.2	0.05	0.8	0.15
CCENTPILES02	23	2.33	0.001	0.5	482	16.4	380	0.002	20	0.05	0.009	0.02	0.7	6.4	0.33	2300	0.2	0.02	0.6	0.23
CCENTPILES03	49	2.92	0.001	0.5	433	15.8	417	0.002	20	0.10	0.008	0.02	0.8	9.8	0.31	2240	0.3	0.02	0.6	0.15
CCWR01	18	0.56	0.012	3.9	1500	20.5	36.1	0.004	178	0.40	0.003	0.04	0.4	8.1	0.03	32	0.9	0.02	1.0	0.12
CCWR02	16	2.34	0.026	5.2	331	10.4	336	0.001	20	0.14	0.006	0.03	0.2	7.1	0.11	513	0.6	0.02	0.4	0.15
CCWR03	20	1.59	0.023	6.8	796	11.4	75.3	0.002	79	0.33	0.005	0.04	0.3	5.7	0.06	95	1.2	0.02	0.7	0.54

GREY value indicates detection limit.

Table F Elemental Exceedances

Sample ID	Description	Arsenic (ppm)	Bismuth (ppm)	Chromium (ppm)	Mercury (ppm)	Magnesium (%)	Nickel (ppm)	Sulphur (%)	Antimony (ppm)	Selenium (ppm)
CCENTPILES01	Meta- Sandstone	**25.2**	0.02	398	**1.650**	**15.30**	**1,150**	0.15	**6.50**	0.2
CCENTPILES02	Meta- Sandstone	**29.8**	0.02	482	**2.300**	**16.40**	**1,430**	0.23	**7.62**	0.2
CCENTPILES03	Meta- Sandstone	**31.4**	0.02	433	**2.240**	**15.80**	**1,230**	0.15	**7.73**	**0.3**
CCWR01	Serpentinized Utramafic	2.3	0.04	**1,500**	0.032	**20.50**	**1,790**	0.12	**1.29**	**0.9**
CCWR02	Graphitic Argillite	9.0	**0.08**	331	**0.513**	10.40	**822**	0.15	**4.56**	**0.6**
CCWR03	Mudstone/Siltstone	6.3	**0.13**	**796**	0.095	11.40	**1,180**	**0.54**	0.81	**1.2**
Five Times Continental Crustal Abundance Value	---	9	0.0425	510	0.425	11.65	420	0.175	1.0	0.25

BOLD value indicates exceedance of the screening value (five times average abundance of continental crust).

CCENTPILE = Clinton Creek Entrance Pit

CCWR = Clinton Creek Waste Rock

3.3.4 Shake Flask Extraction Test (SFE)

The SFE test is used to identify the readily soluble constituents contained within a rock sample under vigorous short term conditions. Soluble constituents may include elements as surface coatings and soluble minerals. During the test, a crushed sample is placed in a flask at a 3:1 deionized water to solid ratio by weight and gently agitated for 24 hours. The greater volume of water ensures that the solubility limits do not inhibit dissolution of minerals and gentle agitation keeps the sample particles continuously exposed to the extraction fluid. After 24 hours, the sample is left to settle and the supernatant is filtered and analyzed by ICP-MS. For screening purposes, the concentrations are often compared to applicable water quality guidelines. The results of the SFE are shown in Table G.

Overall, the concentrations of chemical elements and metals in both leachates are low. The following are also important observations:

- pH is circum-neutral to slightly alkaline.
- The acidity released is below the detection limit in agreement with the low sulphide sulphur values and indicates low sulphide-oxidation rates.
- there is presently sufficient alkalinity to neutralise the acidity released from these samples.
- Sulphate content of sample CCWR03 is high, in agreement with the high sulphate content from the ABA.
- The electric conductivity of the waste rock leachate is high (1066 µS/cm) reflecting its high ions content.

The SFE data indicate that sulphide oxidation rates and associated metal release have been low in the samples. Neutralizing minerals in the samples have been able to buffer the acidity produced, in agreement with the ABA results that show NPR values >> 2.

As a screening tool, the results of the SFE were compared to the Metal Mining Effluent Regulations Schedule 4 Maximum Authorized Concentration in a Grab Sample (MMER Schedule 4). Table G shows no exceedance of the MMER.

SFE results were additionally screened against the Canadian Council of Ministers of the Environment Water Quality guideline for the Protection of Aquatic Life (CCME). Exceedances of CCME guidelines included pH, arsenic and chromium in CCENTPILES02 and chromium and selenium in CCWR03. The metals exceeding the CCME guidelines (arsenic, selenium, chromium) are metals that can have enhanced mobility under neutral and alkaline conditions, depending on their chemical forms. Because the conditions of the SFE test (large surface area of the sample resulting from crushing increasing the solubility of minerals, shaking of the sample for 24hrs) are likely to be different than site conditions (e.g. oxido-reduction conditions, particle surface area, pH, hydrogeology/hydrology, litho-geochemistry, geology) comparison against CCME aquatic life guidelines serves only to identify elements of potential concern. Exceedances of CCME guidelines in the SFE leachate do not definitively signify exceedances under field conditions, and, likewise, meeting the guidelines cannot be considered a measure of compliance. More accurate estimation of long-term metal leaching potential requires kinetic testing.

Table G Results of the Shale Flask Extraction Test

Parameters/Metals	Units	Detection Limits	Sample ID		MMER Schedule 4 Column 4: Maximum Authorized Concentration in a Grab Sample (mg/L)	Canadian Environmental Quality Guidelines for the Protection of Aquatic Life (mg/L)	
			CCENTPILES02	CCWR03		Chronic	Acute
pH	pH Units	N/A	9.48	8.57	6-9.5	6.5-9.0	---
EC	uS/cm	0.5	107.9	1066.0	---	---	---
ORP	mV		80.0	100	---	---	---
SO_4	mg/L	0.5	4.6	522	---	---	---
Acidity to pH4.5	mg/L	0.5	<0.5	<0.5	---	---	---
Acidity to pH8.3	mg/L	0.5	<0.5	<0.5	---	---	---
Total Alkalinity	mg/L	0.5	47.0	14	---	---	---
Bicarbonate	mg/L	0.5	58.0	17	---	---	---
Carbonate	mg/L	0.5	<0.5	<0.5	---	---	---
Hydroxide	mg/L	0.5	<0.5	<0.5	---	---	---
Fluoride	mg/L	0.01	0.1	0	---	---	---
Dissolved Chloride	mg/L	0.5	<0.5	1	---	---	---
Hardness CaCO3	mg/L	0.50	50.7	551	---	---	---
Dissolved Aluminum (Al)	mg/L	0.00050	0.0209	0.00813	---	0.1*	---
Dissolved Antimony (Sb)	mg/L	0.000020	0.00523	0.000365	---	---	---
Dissolved Arsenic (As)	mg/L	0.000020	0.00665	0.000161	1.0	0.005	---
Dissolved Barium (Ba)	mg/L	0.000020	0.356	0.0374	---	---	---
Dissolved Beryllium (Be)	mg/L	0.000010	<0.000010	<0.000010	---	---	---
Dissolved Bismuth (Bi)	mg/L	0.0000050	<0.0000050	<0.0000050	---	---	---
Dissolved Boron (B)	mg/L	0.050	<0.050	0.379	---	1.5	29
Dissolved Cesium (Cs)	mg/L	0.000050	0.00587	0.00392	---	---	---
Dissolved Cadmium (Cd)	mg/L	0.0000050	<0.0000050	<0.0000050	---	0.00009	0.001
Dissolved Calcium (Ca)	mg/L	0.050	4.46	166	---	---	---
Dissolved Chromium (Cr)	mg/L	0.00010	0.0300	0.00209	---	0.001***	---
Dissolved Cobalt (Co)	mg/L	0.0000050	0.0000238	0.0000466	---	---	---
Dissolved Copper (Cu)	mg/L	0.000050	0.000130	<0.000050	6.0	0.002-0.004**	---
Dissolved Lanthanum (La)	mg/L	0.000050	<0.000050	<0.000050	---	---	---
Dissolved Iron (Fe)	mg/L	0.0010	0.0022	0.0022	---	0.3	---
Dissolved Lead (Pb)	mg/L	0.0000050	<0.0000050	0.0000058	0.4	0.001-0.007**	---
Dissolved Lithium (Li)	mg/L	0.00050	0.00284	0.00908	---	---	---

Parameters/Metals	Units	Detection Limits	Sample ID		MMER Schedule 4 Column 4: Maximum Authorized Concentration in a Grab Sample (mg/L)	Canadian Environmental Quality Guidelines for the Protection of Aquatic Life (mg/L)	
			CCENTPILES02	CCWR03		Chronic	Acute
Dissolved Magnesium (Mg)	mg/L	0.050	9.60	32.7	---	---	---
Dissolved Manganese (Mn)	mg/L	0.000050	0.000058	0.00127	---	---	---
Dissolved Phosphorus (P)	mg/L	0.0020	0.0030	0.0035	---	---	---
Dissolved Molybdenum (Mo)	mg/L	0.000050	0.000231	0.00862	---	0.073	---
Dissolved Nickel (Ni)	mg/L	0.000020	0.00154	0.00615	1.0	0.025-0.15**	---
Dissolved Potassium (K)	mg/L	0.050	1.65	3.66	---	---	---
Dissolved Rubidium (Rb)	mg/L	0.000050	0.00849	0.0103	---	---	---
Dissolved Selenium (Se)	mg/L	0.000040	0.000474	0.00676	---	0.001	---
Dissolved Silicon (Si)	mg/L	0.10	1.73	1.37	---	---	---
Dissolved Silver (Ag)	mg/L	0.0000050	<0.0000050	<0.0000050	---	0.0001	---
Dissolved Sodium (Na)	mg/L	0.050	0.305	0.465	---	---	---
Dissolved Strontium (Sr)	mg/L	0.000050	0.0751	0.485	---	---	---
Dissolved Sulphur (S)	mg/L	10	<10	176	---	---	---
Dissolved Tellurium (Te)	mg/L	0.000020	<0.000020	0.000110	---	---	---
Dissolved Thallium (Tl)	mg/L	0.0000020	0.000150	0.000118	---	0.0008	---
Dissolved Thorium (Th)	mg/L	0.0000050	<0.0000050	<0.0000050	---	---	---
Dissolved Tin (Sn)	mg/L	0.00020	<0.00020	<0.00020	---	---	---
Dissolved Titanium (Ti)	mg/L	0.00050	<0.00050	<0.00050	---	---	---
Dissolved Tungsten (W)	mg/L	0.000010	0.000658	0.000523	---	---	---
Dissolved Uranium (U)	mg/L	0.0000020	0.0000266	0.000104	---	0.015	0.033
Dissolved Vanadium (V)	mg/L	0.00020	0.00124	0.00030	---	---	---
Dissolved Zinc (Zn)	mg/L	0.00010	0.00023	<0.00010	1.0	0.03	---
Dissolved Zirconium (Zr)	mg/L	0.00010	<0.00010	<0.00010	---	---	---
Dissolved Mercury (Hg)	mg/L	0.000050	<0.000050	<0.000050	---	0.000026	---

Notes:

*pH dependent

**Hardness dependent

***Guideline for chromium (VI)

Highlighted values are exceedance of the chronic CCME water quality guidelines for the protection of aquatic life

CCME: Canadian Council of Ministers of the Environment

MMER: Metal Mining Effluent Regulations

Concentrations of metals in the guidelines are total concentrations for most case

3.4 Conclusion

All samples tested have NP that far exceeded the AP and thus, on the basis of the available data, the potential of the waste pile and Entrance Pit rock to generate ARD has been classified as very low.

Total elemental analysis of the rocks indicated that the concentrations of several metals were enriched with respect to the reference levels used for comparative purposes (5*abundance in continental crust). In the leaching test (SFE test), no parameters exceeded MMER maximum authorized concentrations in a grab sample. On the basis of this criteria (i.e. meeting MMER guidelines), the proposed use of waste rock material and Entrance Pit material for construction of DS4 is acceptable.

Comparison of the SFE results against CCME guidelines for the protection of aquatic life did indicate exceedances for 3 metals: arsenic, selenium, and chromium. These metals were also identified as having enriched concentrations with respect to 5*crustal abundance (in one or more of the samples tested). Depending on site geochemical conditions, these elements can all be present as species/in chemical forms that are mobile under circumneutral conditions. The potential for long-term leaching of metals under neutral conditions cannot be estimated by the current work; further kinetic testing would provide a more robust estimation of metal leaching potential.

Given the current presence of large volumes of waste rock in the former Clinton Creek valley, screening of downstream water samples for potential concentrated elevations of these metals should be considered. However, considering the ratio between the current volume of waste rock in the valley, versus the volume proposed to be used during construction, no significant change to downstream water quality is anticipated.

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Appendix A

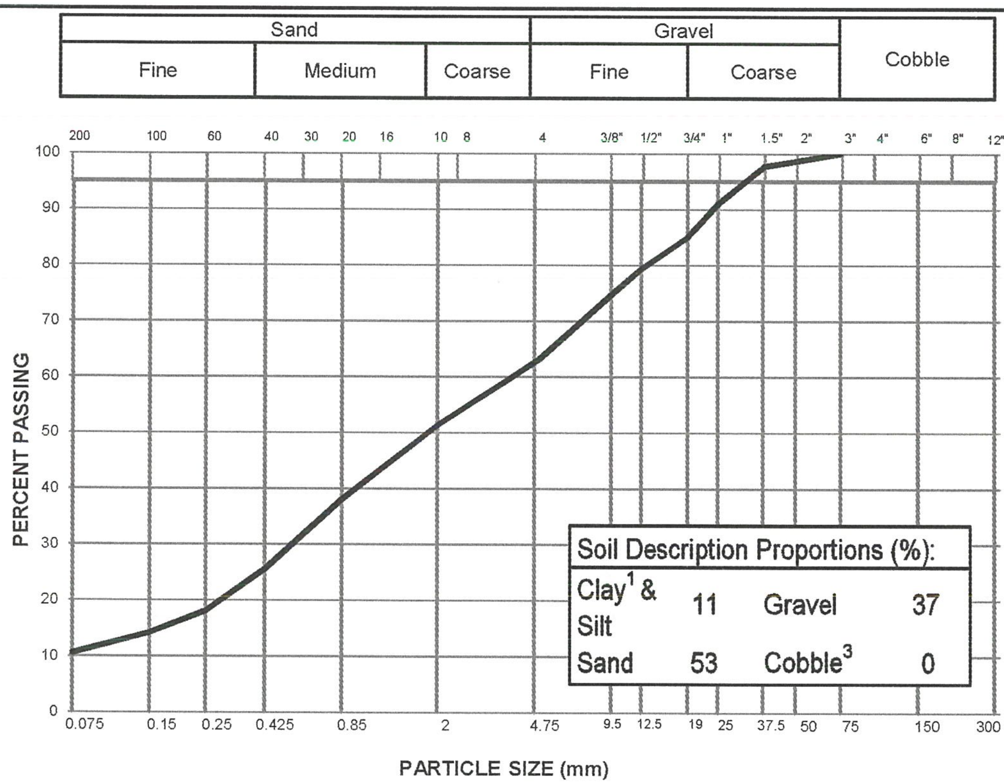
Tetra Tech EBA Lab Test Results

PARTICLE SIZE ANALYSIS REPORT

ASTM D422, C136 & C117

Project:	Clinton Creek	Sample No.:	SA01
Project No.:	W14103619-01	Material Type:	
Site:	Clinton Creek Road	Sample Loc.:	Sand Hill Pit
Client:	WorleyParsons	Sample Depth:	Surface
Client Rep.:	Margret McBride	Sampling Method:	Grab
Date Tested:	June 4, 2015 By: AMT	Date sampled:	May 31, 2015
Soil Description[2]:	SAND and GRAVEL - some silt	Sampled By:	Client
		USC Classification:	Cu: #N/A
Moisture Content:	7.4%		Cc: #N/A

Particle Size (mm)	Percent Passing
300	
200	
150	
100	
75	100
50	
38	98
25	91
19	85
12.5	79
10	76
5	63
2	51
0.85	38
0.425	26
0.25	18
0.15	14
0.075	10.6



Soil Description Proportions (%):			
Clay[1] & Silt	11	Gravel	37
Sand	53	Cobble[3]	0

Notes: [1] The upper clay size of 2 um, per the Canadian Foundation Engineering Manual

[2] The description is visually based & subject to EBA description protocols

[3] If cobbles are present, sampling procedure may not meet ASTM C702 & D75

Specification: ______________________

Remarks: ______________________

Reviewed By: ______________________ P.Eng.

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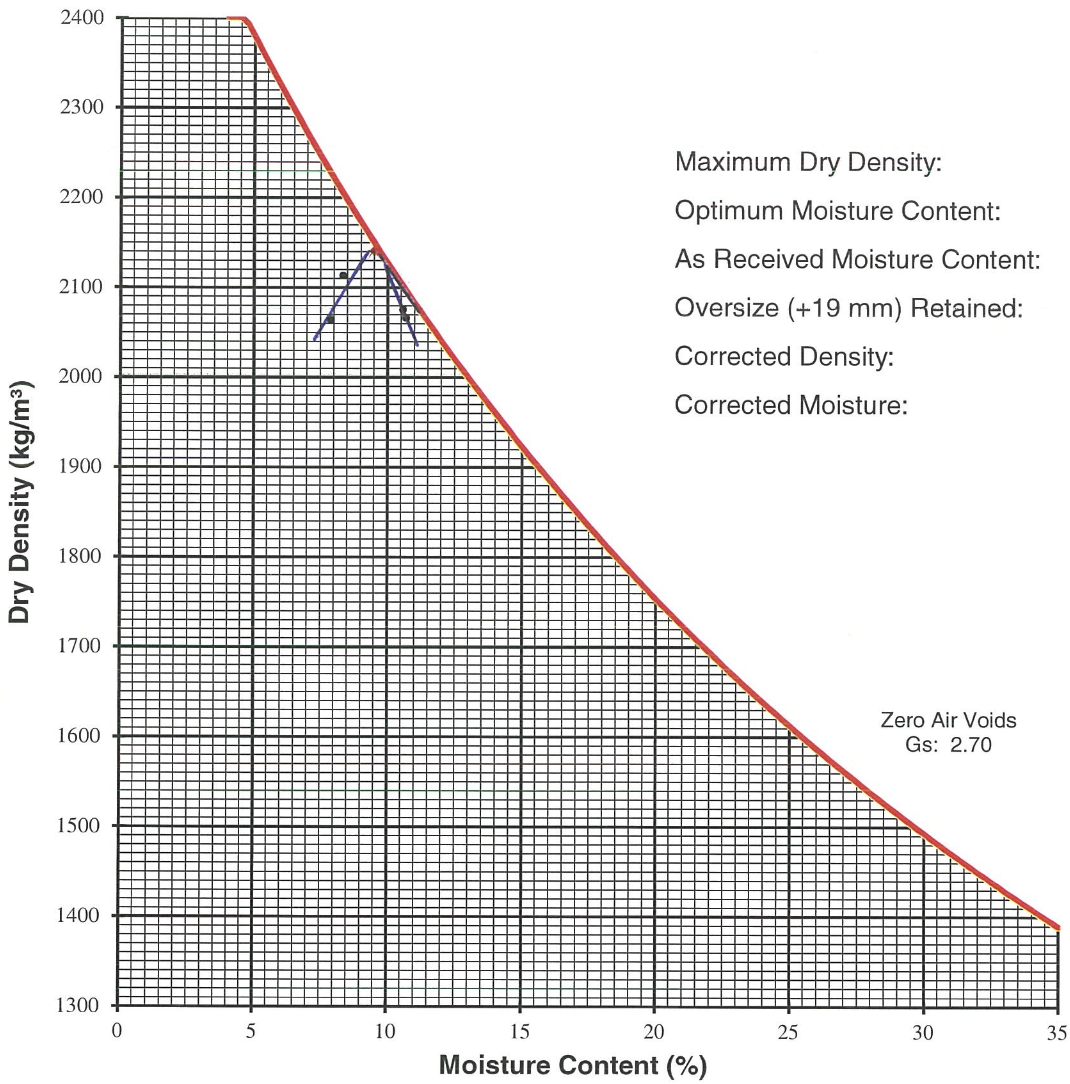
TETRA TECH

MOISTURE-DENSITY RELATIONSHIP (Proctor) REPORT

ASTM D1557 Modified

Project:	Clinton Creek, Dawson City	Sample No.:	SA01
Client:	WorleyParsons	Sampled By:	MCP
Attention:	Margaret McBride	Sample Date:	06/02/2015
Project No.:	W14103619-01	Test Date:	June 5, 2015
Description:	SAND and GRAVEL - some silt	Preparation:	Oven Dry
Source:	Sand Hill Pit	Compaction:	Manual



Maximum Dry Density:	**2140**	kg/m³
Optimum Moisture Content:	**9.5**	%
As Received Moisture Content:		%
Oversize (+19 mm) Retained:	**15**	%
Corrected Density:	**2210**	%
Corrected Moisture:	**8.2**	%

Remarks:

Reviewed By: C.E.T.

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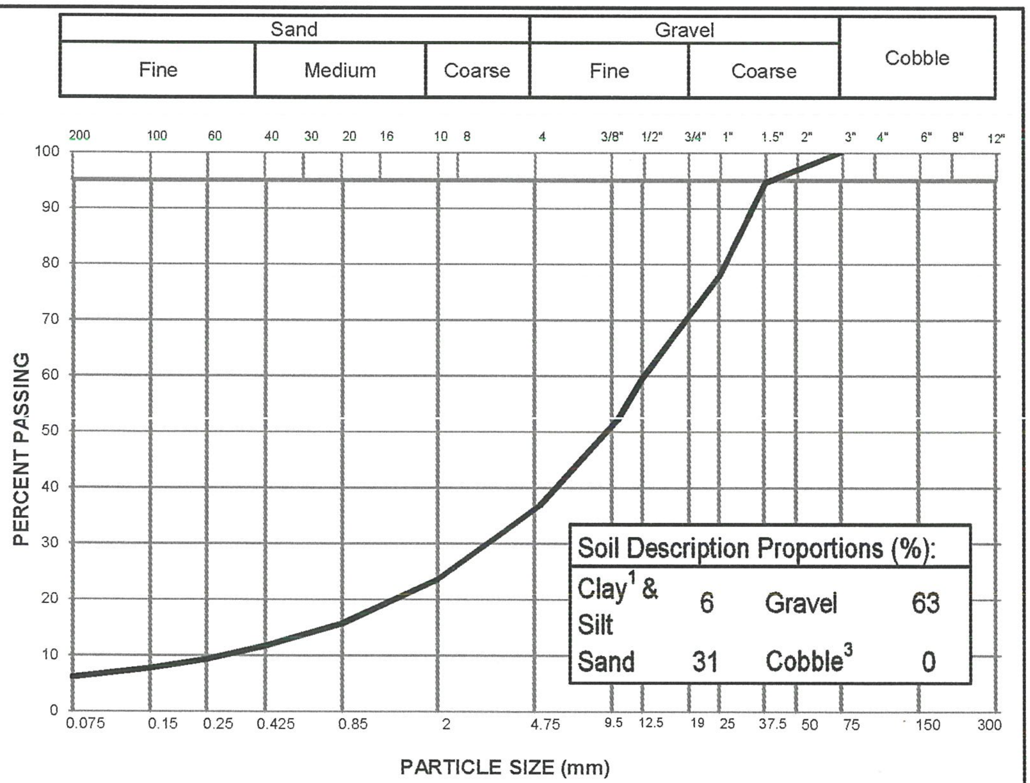
TETRA TECH

PARTICLE SIZE ANALYSIS REPORT

ASTM D422, C136 & C117

Project:	Clinton Creek	Sample No.:	SA02
Project No.:	W14103619-01	Material Type:	
Site:	Clinton Creek Road	Sample Loc.:	Entrance Pit
Client:	WorleyParsons	Sample Depth:	
Client Rep.:	Margret McBride	Sampling Method:	Grab
Date Tested:	June 3, 2015 By: AMT	Date sampled:	May 31, 2015
Soil Description[2]:	GRAVEL - sandy, trace silt	Sampled By:	Client
		USC Classification:	Cu: 42.3
Moisture Content:	1.5%		Cc: 3.1

Particle Size (mm)	Percent Passing
300	
200	
150	
100	
75	100
50	
38	95
25	78
19	71
12.5	60
10	52
5	37
2	24
0.85	16
0.425	12
0.25	9
0.15	8
0.075	6.1



Notes: [1] The upper clay size of 2 um, per the Canadian Foundation Engineering Manual

[2] The description is visually based & subject to EBA description protocols

[3] If cobbles are present, sampling procedure may not meet ASTM C702 & D75

Specification: ______________________

Remarks: ______________________

Reviewed By: ______________________ P.Eng.

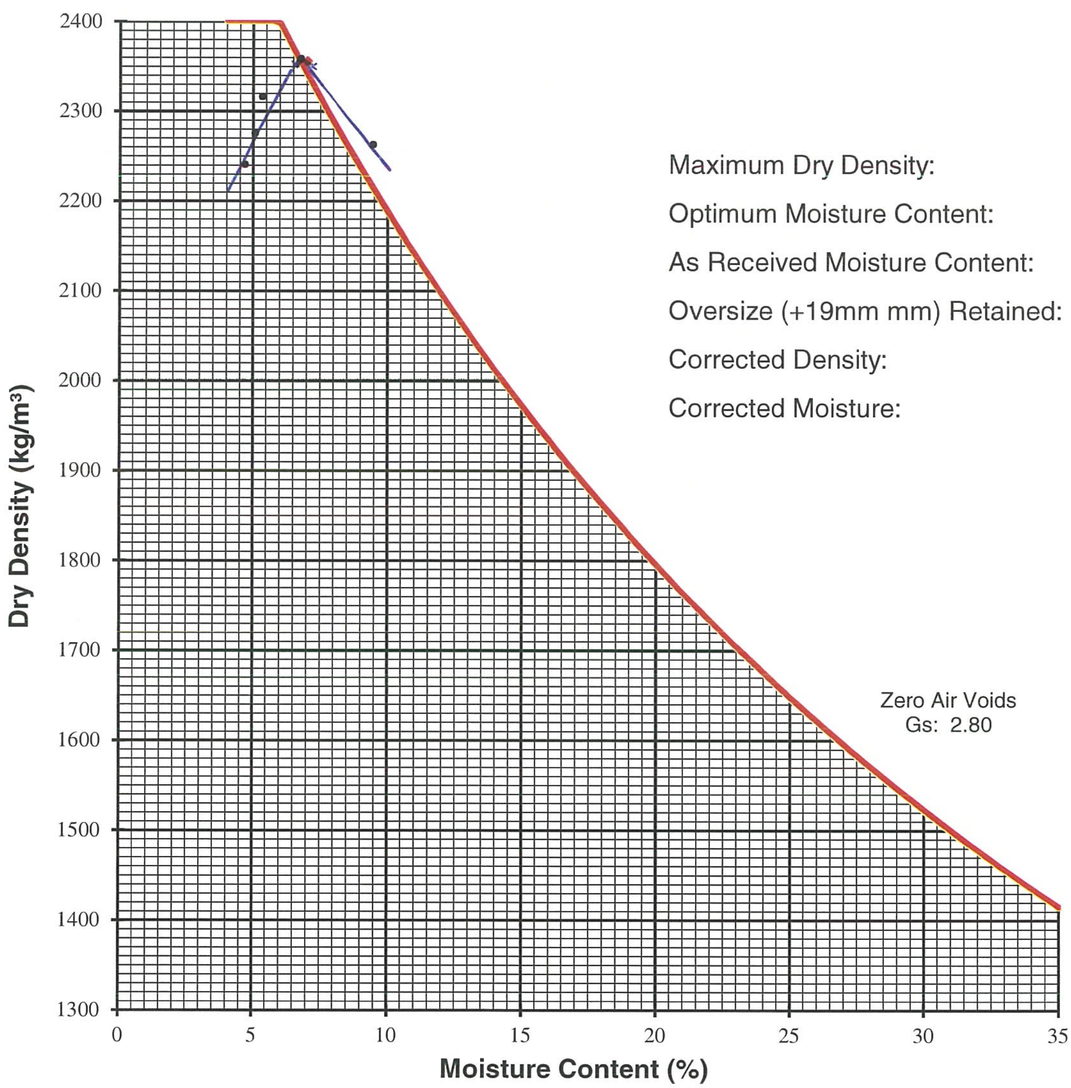
Data presented hereon is for the sole use of the stipulated client. Tetra Tech EBA is not responsible, nor can be held liable, for use made of this report by any other party, with or without the knowledge of Tetra Tech EBA. The testing services reported herein have been performed to recognized industry standards, unless noted. No other warranty is made. These data do not include or represent any interpretation or opinion of specification compliance or material suitability. Should engineering interpretation be required, Tetra Tech EBA will provide it upon written request.

TETRA TECH

MOISTURE-DENSITY RELATIONSHIP (Proctor) REPORT

ASTM D1557 Modified

Project:	Clinton Creek, Dawson City	Sample No.:	SA02
Client:	WorleyParsons	Sampled By:	RMD
Attention:	Margaret McBride	Sample Date:	June 2, 2015
Project No.:	W14103619-01	Test Date:	June 5, 2015
Description:	GRAVEL - sandy, trace silt	Preparation:	Oven Dry
Source:	Entrance Pit	Compaction:	Manual



Maximum Dry Density:	**2355**	kg/m³
Optimum Moisture Content:	**7.0**	%
As Received Moisture Content:		%
Oversize (+19mm mm) Retained:	**30**	%
Corrected Density:	**2475**	%
Corrected Moisture:	**5.2**	%

Remarks:

Reviewed By: C.E.T.

Data presented hereon is for the sole use of the stipulated client. Tetra Tech EBA is not responsible, nor can be held liable, for use made of this report by any other party, with or without the knowledge of Tetra Tech EBA. The testing services reported herein have been performed to recognized industry standards, unless noted. No other warranty is made. These data do not include or represent any interpretation or opinion of specification compliance or material suitability. Should engineering interpretation be required, Tetra Tech EBA will provide it upon written request.

TETRA TECH

Appendix B

Maxxam Analytics Lab Test Results

Table 1: ABA Test Results for CLINTON CREEK Project

Maxxam

Maxxam Analytics 4606 Canada Way, Burnaby, BC Canada V5G 1K5 Tel: 604 734 7276 Fax: 604 731 2386 www.maxxam.ca

Maxxam Sample No	Sample ID	Paste pH	CO2	CaCO3 Equiv.	Total S	HCl Extractable Sulphur	HNO3 Extractable Sulphur	Non Extractable Sulphur (by diff.)	Acid Generation Potential	Mod. ABA Neutralization Potential	Fizz Rating	Net Neutralization Potential	Neutralization Potential Ratio
	Units	**pH Units**	**wt%**	**Kg CaCO3/T**	**wt%**	**wt%**	**wt%**	**wt%**	**Kg CaCO3/T**	**Kg CaCO3/T**	**N/A**	**Kg CaCO3/T**	**N/A**
MJ1359	CCENTPILES01	9.21	14.86	337.7	0.18	<0.01	0.11	0.07	3.4	266	MODERATE	263	78.3
MJ1360	CCENTPILES02	9.30	14.13	321.1	0.24	<0.01	0.15	0.09	4.7	265	MODERATE	260	56.4
MJ1361	CCENTPILES03	9.16	15.07	342.5	0.15	<0.01	0.09	0.06	2.8	280	MODERATE	277	100.0
MJ1362	CCWR01	9.45	1.12	25.5	0.15	0.05	0.01	0.09	0.3	155	NONE	155	516.0
MJ1363	CCWR02	8.50	8.94	203.2	0.16	0.04	0.04	0.08	1.3	136	STRONG	135	104.8
MJ1364	CCWR03	8.71	4.37	99.3	0.57	0.21	0.18	0.18	5.6	104	MODERATE	98.4	18.6
Detection Limits		*N/A*	*0.02*	*0.5*	*0.02*	*0.01*	*0.01*	*0.02*	*0.3*	*0.1*	*N/A*	*0.1*	*0.1*
Maxxam SOP #		*Y0SOP-00*	*LECO*	*BBY WI-00033*	*Acme*	*BBY0SOP-00010*	*BBY0SOP-00010*	*BBY WI-00033*	*BBY WI-00033*	*BBY0SOP-00020*	*BBY0SOP-00*	*BBY WI-00033*	*BBY WI-00033*

Notes:

Lawrence, R.W. 1991. Acid Rock Drainage Prediction Manual

References:

Acid Generation Potential = HNO3 Extractable Sulphide Sulphur*31.25

CaCO3 Equivalency = Carbonate Carbon (CO2)*(100/44)*10

Carbonate carbon (CO2; HCl direct method) by Leco done at Acme Labs.

Fizz Rating - Reference method used is based on NP method.

Non Extractable Sulphur = (Total Sulphur)-(HCl Extractable Sulphate Sulphur)-(HNO3 Extractable Sulphide Sulphur)

Net Neutralization Potential = (Modified ABA Neutralization Potential)-(Acid Generation Potential (HNO3 Extr))

Mod. ABA Neutralization Potential - MEND Acid Rock Drainage Prediction Manual, MEND Project 1.16.1b (pages 6.2-11 to 17), March 1991.

Neutralization Potential Ratio = (Neutralization Potential)/(Acid Generation Potential)

Paste pH - Field and Laboratory Methods Applicable to Overburdens and Minesoils, (EPA 600 / 2-78-054, March 1978).

HCl Extractable Sulphur is based on a modified version of ASTM Method D 2492-02

HCl Extractable Sulphur and HNO3 Extractable Sulphur is based on a modified version of ASTM Method D 2492-02

Total sulphur, total carbon & carbonate carbon (CO2; HCl direct method) by Leco done at Acme Labs.

Table 2: ABA QAQC Test Results for CLINTON CREEK Project

Maxxam Analytics 4606 Canada Way, Burnaby, BC Canada V5G 1K5 Tel: 604 734 7276 Fax: 604 731 2386 www.maxxam.ca

Duplicate QC

Maxxam Sample No	Sample ID	Paste pH Reported	Paste pH Dup	CO2 Reported	CO2 Dup	Total S Reported	Total S Dup	HCl Extractable Sulphur Reported	HCl Extractable Sulphur	HNO3 Extractable Sulphur Reported	HNO3 Extractable Sulphur Dup	Mod. ABA Neutralization Potential Reported	Mod. ABA Neutralization Potential Reported Dup	Fizz Rating Reported	Fizz Rating Dup
	Units	pH Units	pH Units	wt%	wt%	wt%	wt%	wt%	wt%	wt%	wt%	Kg CaCO3/T	Kg CaCO3/T	N/A	N/A
MJ1359 Dup	CCENTPILES01	9.21	9.25					<0.01	<0.01	0.11	0.11	266	266	MODERATE	MODERATE
MJ1362 Dup	CCWR01											155	156	NONE	NONE
MJ1363 Dup	CCWR02			8.94	8.84										
MJ1364 Dup	CCWR03					0.57	0.63								

Reference Material QC

	Paste pH	CO2	Total S	HCl Extractable Sulphur	HNO3 Extractable Sulphur	Mod. ABA Neutralization Potential Reported
Units	pH Units	wt%	wt%	wt%	wt%	Kg CaCO3/T
Reference Material						
ARD-Paste pH 8.29 (7929564) (8.29 pH Units)	8.23					
KZK-1ModS Slight (7929565) (58.9 Kg CaCO3/T)						56.5
ARD Spike C02 (7930329) (1.55 wt%)		1.39				
ARD REF MAT GS311-1 (7930330) (2.32 wt%)			0.18			
ARD Spike C02 (7930329) (1.55 wt%)		1.35				
ARD SPIKE GS910-4 CS (7930330) (8.27 wt%)			0.24			
RS10 STD (0.06 % S)				0.05		
ARD Ref Mat DBOHC (0.27 wt%)				0.27		
ARD Ref Mat S-S (0.36 wt%)					0.36	
ARD Ref Mat DBOHN (0.26 wt%)					0.25	

Blank QC

	Paste pH	CO2	Total S	HCl Extractable Sulphur	HNO3 Extractable Sulphur	Mod. ABA Neutralization Potential Reported
Method Blank				<0.01	<0.01	
Method Blank		<0.02				
Method Blank			<0.02			

Table 3: Ultratrace Metals Test Results for CLINTON CREEK Project

Maxxam

Maxxam Analytics 4606 Canada Way, Burnaby, BC Canada V5G 1K5 Tel: 604 734 7276 Fax: 604 731 2386 www.maxxam.ca

Maxxam Sample No	Sample ID	Mo	Cu	Pb	Zn	Ag	Ni	Co	Mn	Fe	As	U	Au	Th	Sr	Cd	Sb	Bi	V
	Units	ppm	ppm	ppm	ppm	ppb	ppm	ppm	ppm	%	ppm	ppm	ppb	ppm	ppm	ppm	ppm	ppm	ppm
MJ1359	CCENTPILES01	0.27	9.61	0.90	7.8	25	1150	44.5	755	3.54	25.2	<0.1	2.0	<0.1	199	0.04	6.50	<0.02	26
MJ1360	CCENTPILES02	0.18	5.18	0.80	6.2	20	1430	58.1	679	3.88	29.8	<0.1	3.5	<0.1	179	0.03	7.62	<0.02	23
MJ1361	CCENTPILES03	0.19	15.8	0.91	10.0	28	1230	56.8	864	4.44	31.4	<0.1	0.6	<0.1	202	0.03	7.73	<0.02	49
MJ1362	CCWR01	1.24	10.9	3.41	25.8	49	1790	77.5	464	3.42	2.3	0.3	<0.2	1.3	30.3	0.20	1.29	0.04	18
MJ1363	CCWR02	2.53	25.3	5.54	33.2	104	822	43.1	483	3.00	9.0	0.6	0.2	1.7	132	0.33	4.56	0.08	16
MJ1364	CCWR03	5.38	17.6	6.62	59.4	89	1180	38.4	427	3.08	6.3	0.8	<0.2	3.1	88.3	0.40	0.81	0.13	20
QAQC																			
Duplicates																			
MJ1364 Dup	CCWR03	5.20	15.9	7.18	53.8	104	1200	40.3	457	3.18	7.8	0.8	<0.2	3.2	90.4	0.25	0.95	0.15	21
Blanks																			
Method Blank										<0.01									
Method Blank						<2							<0.2						
Method Blank		<0.01	<0.01	0.01	<0.1		<0.1	<0.1	<1		<0.1	<0.05		<0.1	<0.5	<0.01	<0.02	<0.002	<2
Reference Material																			
REF OREAS45EA (%) (7930331)										22.62									
True Values REF OREAS45EA										**23.51**									
Percent Difference (7930331)										-3.8									
Reference Material																			
REF OREAS45EA PPB (7930332)						330							53.1						
True Values REF OREAS45EA PPB						**260**							**53**						
Percent Difference (7930332)						26.9							0.2						
Reference Material																			
REF OREAS45EA PPM (7930333)		1.48	719.16	14.53	31		405.1	51	417		9.7	1.8		10.2	4.0	0.05	0.28	0.27	321
True Values REF OREAS45EA PPM		**1.39**	**709**	**14.3**	**28.9**		**381**	**52**	**400**		**9.1**	**1.73**		**10.7**	**3.5**	**0.02**	**0.2**	**0.26**	**303**
Percent Difference (7930333)		6.5	1.4	1.6	7.3		6.3	-1.9	4.3		6.6	4.0		-4.7	14.3	150.0	40.0	3.8	5.9
Reference Material																			
DS10 % (7930331)										2.91									
True Values DS10 %										**2.719**									
Percent Difference (7930331)										7.0									
Reference Material																			
DS10 ppb (7930332)						1998							62.4						
True Values DS10 ppb						**2020**							**91.9**						
Percent Difference (7930332)						-1.1							-32.1						
Reference Material																			
DS10 ppm (7930333)		14.39	161.65	156.99	376.6		75.2	13.5	909		46.3	2.7		7.3	70.9	2.52	7.31	13.09	45
True Values DS10 ppm		**14.69**	**154.61**	**150.55**	**370**		**74.6**	**12.9**	**875**		**43.7**	**2.59**		**7.5**	**67.1**	**2.49**	**8.23**	**11.65**	**43**
Percent Difference (7930333)		-2.0	4.6	4.3	1.8		0.8	4.7	3.9		5.9	4.2		-2.7	5.7	1.2	-11.2	12.4	4.7
Detection Limits		0.01	0.01	0.01	0.1	2	0.1	0.1	1	0.01	0.1	0.05	0.2	0.1	0.5	0.01	0.02	0.002	2
Maxxam SOP #		*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*

Maxxam Sample No	Sample ID	Ca	P	La	Cr	Mg	Ba	Ti	B	Al	Na	K	W	Sc	Tl	Hg	Se	Te	Ga	S
	Units	%	%	ppm	ppm	%	ppm	%	ppm	%	%	%	ppm	ppm	ppm	ppb	ppm	ppm	ppm	%
MJ1359	CCENTPILES01	2.84	0.002	<0.5	398	15.3	316	0.001	<20	0.08	0.008	0.02	0.5	7.8	0.26	1650	0.2	0.05	0.8	0.15
MJ1360	CCENTPILES02	2.33	<0.001	<0.5	482	16.4	380	0.002	<20	0.05	0.009	0.02	0.7	6.4	0.33	2300	0.2	<0.02	0.6	0.23
MJ1361	CCENTPILES03	2.92	0.001	<0.5	433	15.8	417	0.002	<20	0.10	0.008	0.02	0.8	9.8	0.31	2240	0.3	<0.02	0.6	0.15
MJ1362	CCWR01	0.56	0.012	3.9	1500	20.5	36.1	0.004	178	0.40	0.003	0.04	0.4	8.1	0.03	32	0.9	0.02	1.0	0.12
MJ1363	CCWR02	2.34	0.026	5.2	331	10.4	336	0.001	<20	0.14	0.006	0.03	0.2	7.1	0.11	513	0.6	<0.02	0.4	0.15
MJ1364	CCWR03	1.59	0.023	6.8	796	11.4	75.3	0.002	79	0.33	0.005	0.04	0.3	5.7	0.06	95	1.2	<0.02	0.7	0.54
QAQC																				
Duplicates																				
MJ1364 Dup	CCWR03	1.63	0.022	6.9	819	11.8	78.3	0.002	91	0.34	0.006	0.04	0.3	5.9	0.07	114	1.6	<0.02	0.7	0.57
Blanks																				
Method Blank		<0.01	<0.001			<0.01		<0.001		<0.01	<0.001	<0.01								<0.02
Method Blank																<5				
Method Blank				<0.5	<0.5		<0.5		<20				<0.05	<0.1	<0.02		<0.1	<0.02	<0.1	
Reference Material																				
REF OREAS45EA (%) (7930331)		0.04	0.03			0.09		0.099		3.14	0.02	0.06								0.04
True Values REF OREAS45EA		**0.036**	**0.029**			**0.095**		**0.106**		**3.32**	**0.02**	**0.053**								**0.036**
Percent Difference (7930331)		11.1	3.4			-5.3		-6.6		-5.4	0.0	13.2								11.1
Reference Material																				
REF OREAS45EA PPB (7930332)																<5				
True Values REF OREAS45EA PPB																**10**				
Percent Difference (7930332)																				
Reference Material																				
REF OREAS45EA PPM (7930333)				6.7	838.6		151.4		<20				<0.05	77.4	0.06		0.8	0.08	12.2	
True Values REF OREAS45EA PPM				**6.57**	**849**		**148**							**78**	**0.072**		**0.63**	**0.07**	**11.7**	
Percent Difference (7930333)				2.0	-1.2		2.3							-0.8	-16.7		27.0	14.3	4.3	
Reference Material																				
DS10 % (7930331)		1.11	0.083			0.81		0.083		1.06	0.068	0.35								0.31
True Values DS10 %		**1.09**	**0.079**			**0.81**		**0.077**		**1.06**	**0.066**	**0.35**								**0.3**
Percent Difference (7930331)		1.8	5.1			0.0		7.8		0.0	3.0	0.0								3.3
Reference Material																				
DS10 ppb (7930332)																285				
True Values DS10 ppb																**300**				
Percent Difference (7930332)																-5.0				
Reference Material																				
DS10 ppm (7930333)				17.7	58		445.8		<20				3.3	3.2	5.51		2.3	4.89	4.5	
True Values DS10 ppm				**17.5**	**54.6**		**359**						**3.32**	**2.8**	**5.1**		**2.3**	**5.01**	**4.3**	
Percent Difference (7930333)				1.1	6.2		24.2						-0.6	14.3	8.0		0.0	-2.4	4.7	
Detection Limits		0.01	0.001	0.5	0.5	0.01	0.5	0.001	20	0.01	0.001	0.01	0.05	0.1	0.02	5	0.1	0.02	0.1	0.02
Maxxam SOP #		*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*

Maxxam Analytics 4606 Canada Way, Burnaby, BC Canada V5G 1K5 Tel: 604 734 7276 Fax: 604 731 2386 www.maxxam.ca

Table 3B: MEND SFE Test Results for project CLINTON CREEK

Maxxam Sample No	Sample ID	Sample Weight	Volume Used	pH	EC	ORP	SO4	Acidity to pH4.5	Acidity to pH8.3	Total Alkalinity	Bicarbonate	Carbonate	Hydroxide	Fluoride	Dissolved Chloride	Hardness CaCO3	Dissolved Aluminum (Al)
	Units	g	ml	pH Units	uS/cm	mV	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
MJ1360	CCENTPILES02	250	750	9.48	107.9	80.0	4.6	<0.5	<0.5	47	58	<0.5	<0.5	0.07	<0.5	50.7	0.0209
MJ1364	CCWR03	250	750	8.57	1066.0	100	522	<0.5	<0.5	14	17	<0.5	<0.5	0.05	0.6	551	0.00813
QAQC																	
Duplicates																	
MU4850	CCENTPILES02 SPLIT DUP	250	750	9.53	108.4	80.0	3.9	<0.5	<0.5	52	64	<0.5	<0.5	0.07	<0.5	54.5	0.0191
MJ1360 Dup	CCENTPILES02 LEACHATE DUP							<0.5	<0.5	45	55	<0.5	<0.5	0.07			
Blanks																	
Method Blank		0	750	5.87	0.6	205	1.5	<0.5	<0.5	0.7	0.8	<0.5	<0.5	<0.01	<0.5	<0.50	<0.00050
Method Blank																	<0.00050
Method Blank																	<0.00050
Method Blank								<0.5	<0.5								
Method Blank										0.6	0.7	<0.5	<0.5				
Method Blank														0.01			
Method Blank															<0.5		
Method Blank							<0.5										
Reference Material																	
CRC ICPMS H2O (7990532) % Recovery																	105.88190
True Values CRC ICPMS H2O																	**100**
Detection Limits				N/A	0.5											0.50	0.00050
Reference Material																	
Acidity 8.3 W-Van (7990711) % Recovery									102.1								
True Values Acidity 8.3 W-Van									**100**								
Reference Material																	
Alkalinity W Soln' B (7991657) % Recovery										94.96							
True Values Alkalinity W Soln' B										**47.6**							
Reference Material																	
Fluoride water (7991864) % Recovery														96.0			
True Values Fluoride water														**0.5**			
Reference Material																	
Chloride W K-Van (7992265) % Recovery															102.03		
True Values Chloride W K-Van															**20**		
Reference Material																	
Sulphate W K-Van (7992270) % Recovery							98.92										
True Values Sulphate W K-Van							**20**										
Detection Limits				N/A	0.5		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.01	0.5	0.50	0.00050
Maxxam SOP #		BBY0SOP-000	Y0SOP-000	Y0SOP-000	BBY0SOP-00006	Y0SOP-00	Y6SOP-000	BBY6SOP-00037	Y6SOP-000	BBY6SOP-00026	BBY6SOP-00026	BBY6SOP-0002	BBY6SOP-00026	BBY6SOP-00048	BBY6SOP-00011	BBY WI-00033	BY7SOP-0000

References:

Hardness = (Calcium*2.497) + (Magnesium*4.118)

Standard Methods for the Examination of Water and Wastewater, 22nd Edition, 2012, Oxidation-Reduction Potential measurement in Clean Water, 2580 B

Dissolved Antimony (Sb)	Dissolved Arsenic (As)	Dissolved Barium (Ba)	Dissolved Beryllium (Be)	Dissolved Bismuth (Bi)	Dissolved Boron (B)	Dissolved Cesium (Cs)	Dissolved Cadmium (Cd)	Dissolved Calcium (Ca)	Dissolved Chromium (Cr)	Dissolved Cobalt (Co)	Dissolved Copper (Cu)	Dissolved Lanthanum (La)	Dissolved Iron (Fe)	Dissolved Lead (Pb)	Dissolved Lithium (Li)	Dissolved Magnesium (Mg)	Dissolved Manganese (Mn)	Dissolved Phosphorus (P)	Dissolved Molybdenu m (Mo)	Dissolved Nickel (Ni)	Dissolved Potassium (K)	Dissolved Rubidium (Rb)
mg/L	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
0.00523	0.00665	0.356	<0.000010	<0.0000050	<0.050	0.00587	<0.0000050	4.46	0.0300	0.0000238	0.000130	<0.000050	0.0022	<0.0000050	0.00284	9.60	0.000058	0.0030	0.000231	0.00154	1.65	0.00849
0.000365	0.000161	0.0374	<0.000010	<0.0000050	0.379	0.00392	<0.0000050	166	0.00209	0.0000466	<0.000050	<0.000050	0.0022	0.0000058	0.00908	32.7	0.00127	0.0035	0.00862	0.00615	3.66	0.0103
0.00558	0.00664	0.370	<0.000010	<0.0000050	<0.050	0.00520	<0.0000050	4.75	0.0304	0.0000329	0.000187	<0.000050	0.0090	<0.0000050	0.00310	10.3	0.000099	0.0055	0.000243	0.00152	1.86	0.00905
<0.000020	0.000026	<0.000020	<0.000010	<0.0000050	<0.050	<0.000050	<0.0000050	<0.050	<0.00010	<0.0000050	<0.000050	<0.000050	<0.0010	<0.0000050	<0.00050	<0.050	<0.000050	0.0040	<0.000050	<0.000020	<0.050	<0.000050
<0.000020	0.000023	<0.000020	<0.000010	<0.0000050	<0.050	<0.000050	<0.0000050	<0.050	<0.00010	<0.0000050	<0.000050	<0.000050	<0.0010	<0.0000050	<0.00050	<0.050	<0.000050	0.0021	<0.000050	<0.000020	<0.050	<0.000050
<0.000020	<0.000020	<0.000020	<0.000010	<0.0000050	<0.050	<0.000050	<0.0000050	<0.050	<0.00010	<0.0000050	<0.000050	<0.000050	<0.0010	<0.0000050	<0.00050	<0.050	<0.000050	<0.0020	<0.000050	<0.000020	<0.050	<0.000050
100.58000	101.49500	105.25500	97.20300	103.24000		103.28000	101.75900		103.06400	103.63300	104.39900	103.92000	105.70390	101.66100	97.59500		101.66600		100.45000	103.60200		
1	**10**	**10**	**10**	**1**		**1**	**10**		**10**	**10**	**10**	**1**	**100**	**10**	**10**		**10**		**1**	**10**		
0.000020	0.000020	0.000020	0.000010	0.0000050	0.050	0.000050	0.0000050	0.050	0.00010	0.0000050	0.000050	0.000050	0.0010	0.0000050	0.00050	0.050	0.000050	0.0020	0.000050	0.000020	0.050	0.000050
0.000020	0.000020	0.000020	0.000010	0.0000050	0.050	0.000050	0.0000050	0.050	0.00010	0.0000050	0.000050	0.000050	0.0010	0.0000050	0.00050	0.050	0.000050	0.0020	0.000050	0.000020	0.050	0.000050
BY7SOP-0000	BY7SOP-000	BY7SOP-0000	BY7SOP-0000	BY7SOP-0000	BY7SOP-0000	BY7SOP-000	BBY7SOP-00003	BY7SOP-0000	BBY7SOP-00002	BBY7SOP-00002	BY7SOP-0000	BY7SOP-0000	BY7SOP-0000	BY7SOP-0000	BY7SOP-0000	BY7SOP-0000	BY7SOP-0000	BY7SOP-0000	BY7SOP-0000	BY7SOP-0000	BY7SOP-0000	BY7SOP-0000

Dissolved Selenium (Se)	Dissolved Silicon (Si)	Dissolved Silver (Ag)	Dissolved Sodium (Na)	Dissolved Strontium (Sr)	Dissolved Sulphur (S)	Dissolved Tellurium (Te)	Dissolved Thallium (Tl)	Dissolved Thorium (Th)	Dissolved Tin (Sn)	Dissolved Titanium (Ti)	Dissolved Tungsten (W)	Dissolved Uranium (U)	Dissolved Vanadium (V)	Dissolved Zinc (Zn)	Dissolved Zirconium (Zr)	Dissolved Mercury (Hg)
mg/L	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
0.000474	1.73	<0.0000050	0.305	0.0751	<10	<0.000020	0.000150	<0.0000050	<0.00020	<0.00050	0.000658	0.0000266	0.00124	0.00023	<0.00010	<0.000050
0.00676	1.37	<0.0000050	0.465	0.485	176	0.000110	0.000118	<0.0000050	<0.00020	<0.00050	0.000523	0.000104	0.00030	<0.00010	<0.00010	<0.000050
0.000553	1.81	<0.0000050	0.325	0.0779	<10	0.000027	0.000176	<0.0000050	<0.00020	<0.00050	0.000721	0.0000230	0.00148	0.00021	<0.00010	<0.000050
<0.000040	<0.10	0.0000070	<0.050	<0.000050	<10	<0.000020	<0.0000020	<0.0000050	<0.00020	<0.00050	<0.000010	<0.0000020	<0.00020	<0.00010	<0.00010	<0.000050
<0.000040	<0.10	<0.0000050	<0.050	<0.000050	<10	<0.000020	<0.0000020	<0.0000050	<0.00020	<0.00050	<0.000010	<0.0000020	<0.00020	<0.00010	<0.00010	<0.000050
<0.000040	<0.10	<0.0000050	<0.050	<0.000050	<10	<0.000020	<0.0000020	<0.0000050	<0.00020	<0.00050	<0.000010	<0.0000020	<0.00020	<0.00010	<0.00010	<0.000050
97.95800		89.23000		97.04700		106.21000	102.15000		98.28000	101.42400		104.71100	102.41900	104.62600		108.43000
10		**1**		**10**		**1**	**1**		**1**	**10**		**10**	**10**	**10**		**1**
0.000040	0.10	0.0000050	0.050	0.000050	10	0.000020	0.0000020	0.0000050	0.00020	0.00050	0.000010	0.0000020	0.00020	0.00010	0.00010	0.000050
0.000040	0.10	0.0000050	0.050	0.000050	10	0.000020	0.0000020	0.0000050	0.00020	0.00050	0.000010	0.0000020	0.00020	0.00010	0.00010	0.000050
BY7SOP-0000	BY7SOP-0000	BY7SOP-0000	BY7SOP-0000	3Y7SOP-000	3Y7SOP-000	BY7SOP-0000	BY7SOP-0000	BY7SOP-0000	BY7SOP-0000	BY7SOP-0000	BY7SOP-0000	BY7SOP-0000	BY7SOP-0000	BY7SOP-0000	BY7SOP-0000	BBY7SOP-00002

Anion Sum	Cation Sum	Balance %
N/A	**N/A**	**N/A**
1.04	1.07	-1.20
11.2	11.1	0.200
1.13	1.15	-1.10
0.0440	0.000	100
BBY WI-00033	BBY WI-00033	BBY WI-00033

Table 4: Sample List for CLINTON CREEK Project

Maxxam Sample ID	Client Sample ID	Sample Form	Dry Weight Received (kg)
MJ1359	CCENTPILES01	Rock	7.920
MJ1360	CCENTPILES02	Rock	6.819
MJ1361	CCENTPILES03	Rock	8.200
MJ1362	CCWR01	Rock	7.707
MJ1363	CCWR02	Rock	6.391
MJ1364	CCWR03	Rock	5.975

Total Weight	43.01
Total Samples Recei	6

Maxxam Analytics 4606 Canada Way, Burnaby, BC Canada V5G 1K5 Tel: 604 734 7276 Fax: 604 731 2386 www.maxxam.ca

Table 5: Sample Summary for CLINTON CREEK Project

Date Samples Rec'd by Maxxam:	6 sample were rec'd on 2-Jun-2015.
Sample Prep Conducted by Maxxam:	YES
Date of Analysis:	June 2015

Client:	WORLEYPARSONS CANADA SERVICES
Client Project Name:	CLINTON CREEK
Client Project No:	
ARD Project #:	
Maxxam Job No:	B545827
Contact Person:	ACCOUNTS PAYABLE
E-mail Address:	CAN.TradeAP@WorleyParsons.com

Data Validated by:	Ashley Leow
Position:	Burnaby ARD Laboratory Supervisor

Sample Storage

Sample rejects (and selected test residues where applicable) have been archived
Standard archive protocol is archiving for samples for 3 months after testing is complete.
If archiving is required past 3 months a fee will be required.

Appendix 11

Material Construction Specification Data Sheet

NILEX CIVIL ENVIRONMENTAL GROUP
Unearthing better results.

PRODUCT SPECIFICATIONS

Nilex Nonwoven 4510

PROPERTY	TEST	UNIT	VALUE (MARV)
Mechanical			
Grab Tensile Strength	ASTM-D4632	N (lb)	1112 (250)
Elongation	ASTM-D4632	%	50
CBR Puncture*	ASTM-D6241	N (lb)	2781 (625)
Trapezoidal Tear	ASTM-D4533	N (lb)	445 (100)
Hydraulic			
Apparent Opening Size	ASTM-D4751	mm (US Sieve)	0.150 (100)
Permittivity	ASTM-D4491	sec^{-1}	1.2
Water Flow Rate	ASTM-D4491	$l/m/m^2$ (gpm/ft^2)	3463 (85)
Endurance			
UV Resistance	ASTM-D4355	% retained at 500 hrs	70
Packaging			
Roll Width	Measured	m (ft)	4.57 (15)
Roll Length	Measured	m (ft)	91.5 (300)

*Note: Mullen Burst ASTM D3786 and Puncture Strength ASTM D4833 are no longer recognized by ASTM Committee D35 as an acceptable geotextile test method. Puncture Strength ASTM 4833 has been replaced with the Static (CBR) Puncture ASTM D6241. For more information, refer to the ASTM website at www.astm.org

Disclaimer: The information provided by Nilex is believed to be correct and is generally based on information supplied by the manufacturers of the product offered. Any recommendations made by Nilex concerning uses or applications of our products are also believed to be reliable; however, as Nilex has no control over design execution, and field conditions of the project which incorporate the product. Nilex disclaims all warranties, expressed or implied, including, without limitation, the warranties of merchantability and/or fitness for a particular purpose.

STRATAGRID
Product Data Sheet

STRATAGRID® is a geogrid reinforcement for soil. These high performance geogrids are constructed of high molecular weight and high tenacity polyester yarns utilizing a complex knitting process and polymeric coating to provide superior engineering properties. STRATAGRID is engineered to be mechanically and chemically durable, in both the harsh construction installation phase and in aggressive soil environments (pH range from 3 - 9).

Design Properties			Microgrid[1,2]	SG150[1]	SG200	SG350	SG500	SG550	SG600	SG700	SG1200	SG1300	SG1400
Ultimate and Creep Limited Tensile Strengths													
Ultimate Strength[3] (MD)	ASTM D 6637 Method A Single-Rib	lbs/ft	2,000	1,875	3,600	5,000	6,400	8,150	9,100	11,800	13,704	20,556	27,408
		(kN/m)	(29.2)	(27.4)	(52.5)	(73.0)	(93.4)	(118.9)	(132.8)	(172.2)	(200.0)	(300.0)	(400.0)
Creep Limited Strength	ASTM D 5262D 6992	lbs/ft	1,149	1,136	2,323	3,226	4,129	5,258	5,871	7,613	8,841	13,262	17,683
		(kN/m)	(16.8)	(16.6)	(33.9)	(47.1)	(60.3)	(76.7)	(85.7)	(111.1)	(129.0)	(193.5)	(258.0)

Long-term Design Strength (LTDS or T_{al}) [4]

Sands, Silt & Clay	lbs/ft	871	861	1,919	2,666	3,412	4,346	4,852	6,292	7,307	10,960	14,614
	(kN/m)	(12.7)	(12.6)	(28.0)	(38.9)	(49.8)	(63.4)	(70.8)	(91.8)	(106.6)	(159.9)	(213.2)

Molecular Properties

Item	Test Method	Unit	Spec
Molecular Weight (min)	GRI GG8	g/mol	25,000
Caboxyl End Group (CEG) Count (max)	GRI GG7	meq/kg	30

Physical Properties

Roll Dimensions[5]	Width x Length	feet	8 x 225	6 x 150	6 x 300	6 x 300	6 x 300	6 x 300	6 x 300	6 x 300	12.5 x 200	12.5 x 200	12.5 x 200
		(m)	(2.44 x 68.6)	(1.83 x 45.7)	(1.83 x 91.4)	(1.83 x 91.4)	(1.83 x 91.4)	(1.83 x 91.4)	(1.83 x 91.4)	(1.83 x 91.4)	(3.8 x 61)	(3.8 x 61)	(3.8 x 61)
		feet	-	12 x 150	12 x 225	12 x 225	12 x 225	12 x 225	12 x 225	12 x 225	-	-	-
		(m)	-	(3.66 x 45.7)	(3.66 x 68.6)	(3.66 x 68.6)	(3.66 x 68.6)	(3.66 x 68.6)	(3.66 x 68.6)	(3.66 x 68.6)	-	-	-
Area		Sq. Yds.	200	100/200	200/300	200/300	200/300	200/300	200/300	200/300	277	277	277
		(Sq. m.)	(167.2)	(83.6/167.2)	(167.2/250.8)	(167.2/250.8)	(167.2/250.8)	(167.2/250.8)	(167.2/250.8)	(167.2/250.8)	(231.8)	(231.8)	(231.8)
Product Weight[6]		oz/sy	4.5	5.5	6.5	7.0	9.0	10.5	11.0	13.0	18	25.6	33.6
		(g/sq.m.)	(152.6)	(186.5)	(220.4)	(237.3)	(305.2)	(356.0)	(373.0)	(440.8)	(610)	(869)	(1140)
Weight per Roll[6]		lbs	70	45/80	95/135	100/143	125/180	145/210	150/218	175/255	315	450	630
		(kg)	(31.7)	(20.4/36.3)	(43.1/61.2)	(45.4/64.8)	(56.7/81.6)	(65.7/95.3)	(68.3/98.8)	(79.4/115.6)	(142.9)	(204.1)	(286.8)

1) Denotes both machine and cross-machine direction strength (Biaxial Strength). 2) Microgrid ultimate tensile strength determined in accordance with ASTM D 4595 3) Minimum Average Roll Values for machine direction unless otherwise noted (Lot Avg minus 2 x Standard Deviation). 4) LTDS or Tal = TULT / (RFcreep x RFinstallation damage x RFdurability) for sand, silt and clay soil Dmax ≤ 25mm, D50 < 0.2mm. Installation damage factor for other soils available upon request. 5) Special order roll sizes are available for SG product styles, 12-ft widths and/or custom roll lengths. 6) Roll Weights are average values including shipping cores. Actual roll weights may vary. 7) Stratagrid soil and segmental retaining wall unit interface properties are available upon request. 8) For permanent walls the above LTDS or Tal should account for an overall factor of safety for uncertainties per industry standards; typically FSunc = 1.5 [Note Ta = LTDS/FSunc]. 9) At time of manufacturing, handling, storage and shipping may change these properties.

STRATA
Global GeoSolutions

CLINTON CREEK - DROP STRUCTURE 4 REPAIR

DRAWING INDEX:

SHEET TITLE: ARMORFLEX CL 60T - PLAN SHEET

CHK'ED BY:	DATE:	REVISION DATE:	CAD FILE:
TC	05-08-15	07-27-15	ARMORTEC CANADA
DRAWN BY:	**SCALE:**	**DRAWING NO:**	**DRAWING NAME:**
MDD	N.T.S.	AC008-15	CLINTON CREEK-T

McCOY DRAFTING & DESIGN, LLC

ARMORTEC
CANADA, INC.
17113 MINNETONKA BLVD., SUITE 223
MINNETONKA, MN. 55345
PHONE: (952) 476-5979
FAX: (952) 476-7475
tscroskey@qwest.net

PROJECT NAME:
CLINTON CREEK
DROP STRUCTURE 4 REPAIR

NO.	DESCRIPTION	BY

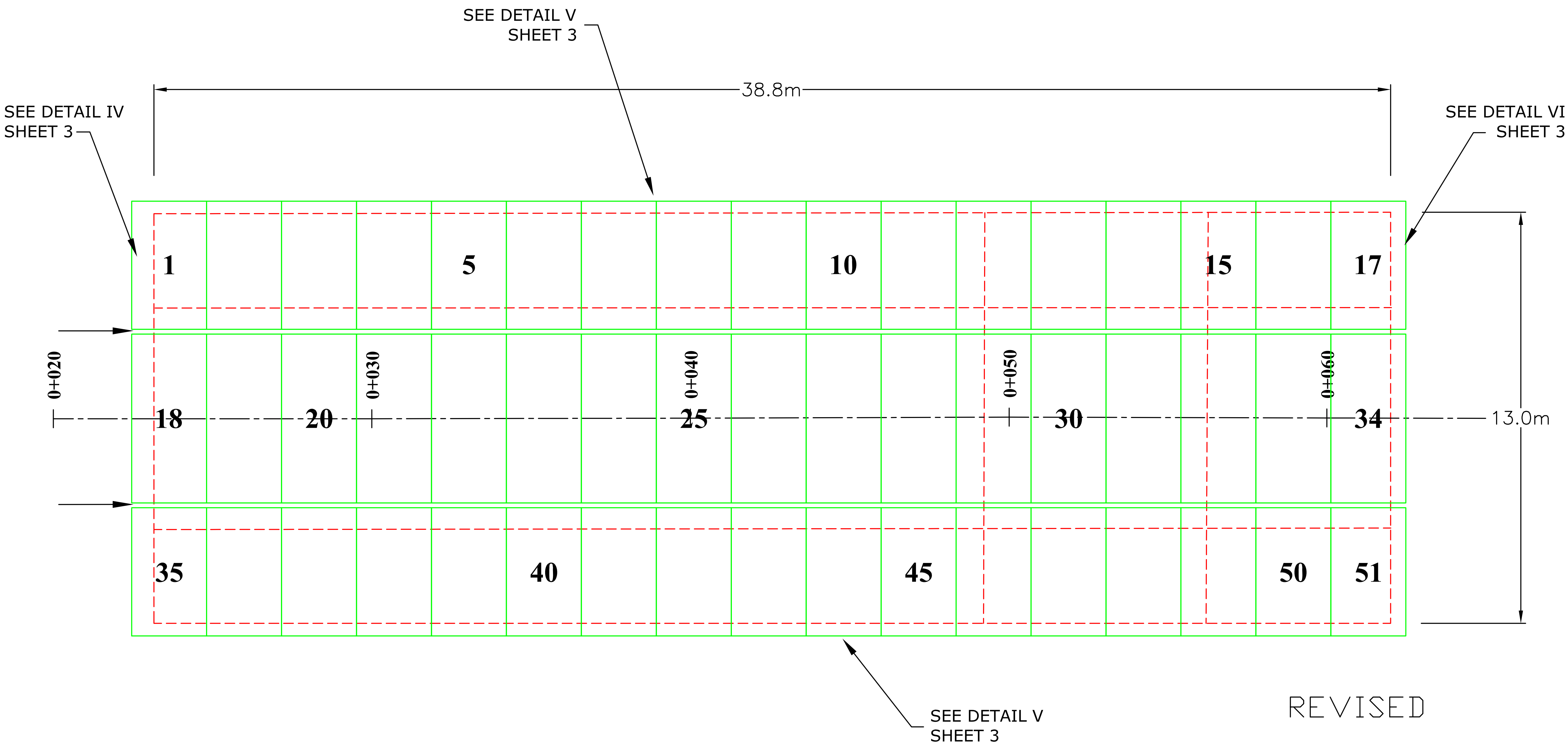
REVISIONS

NOTES:

1. ALL MAT SIZES ARE AS SPECIFIED ON CORRESPONDING SPREADSHEET.
2. TOE ANCHORS AND SLOPE FACTORS HAVE BEEN ADDED TO LENGTHS OF ALL MATS.
3. ⟶ INDICATES GROUT SEAM LOCATIONS. (SEE DETAILS ON SHEET 3)
4. - - - - INDICATES AREAS TAKEN FROM SUPPLIED PDF FILES, PROVIDED BY WORLEY PARSONS.

CL 60T MATTRESS TOTALS:

RECTANGULAR MATS	583.4 SQ.M
SQ.M. TOTAL	583.4 SQ.M



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MDD	N.T.S.	AC008-15	CLINTON CREEK-P

SHT. 2 OF 4.

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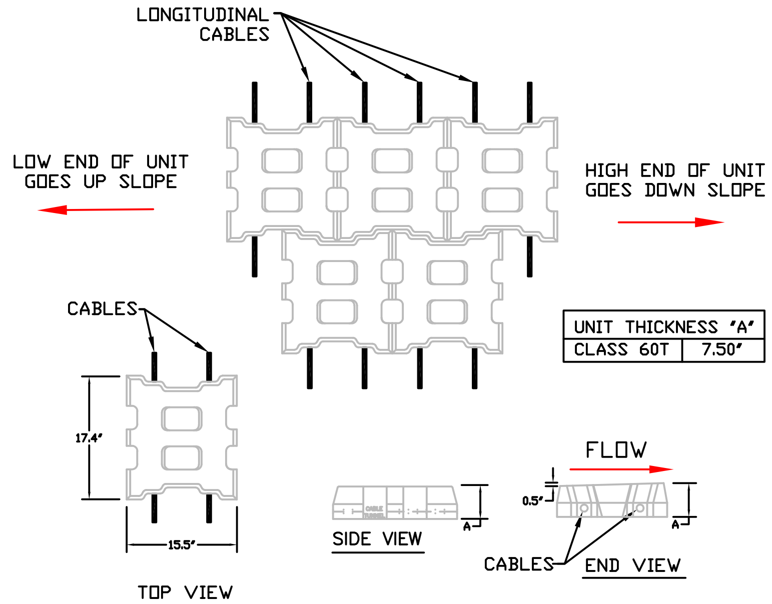
FAX: (952) 476-7475
tscroskey@qwest.net

PROJECT NAME: CLINTON CREEK DROP STRUCTURE 4 REPAIR

REVISIONS

NO.	DESCRIPTION	BY



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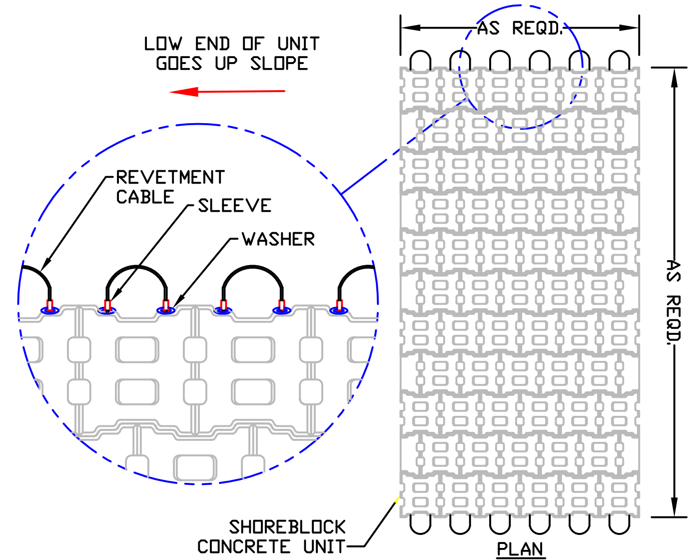
NOT TO SCALE



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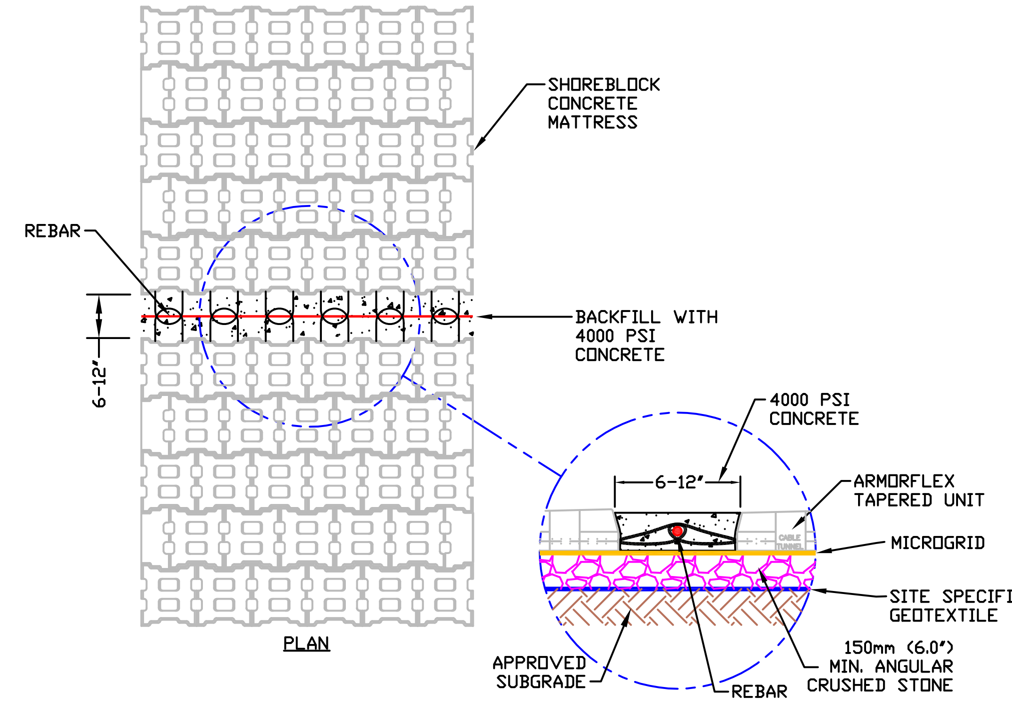

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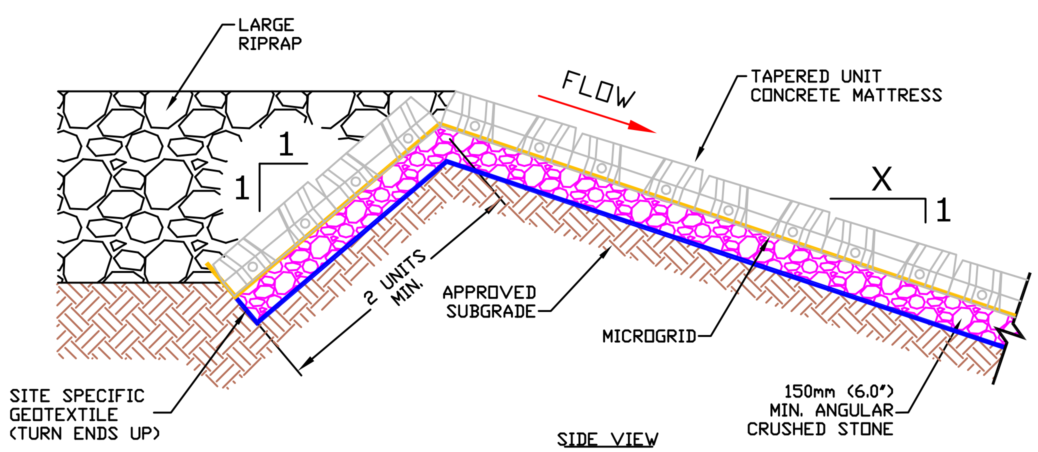

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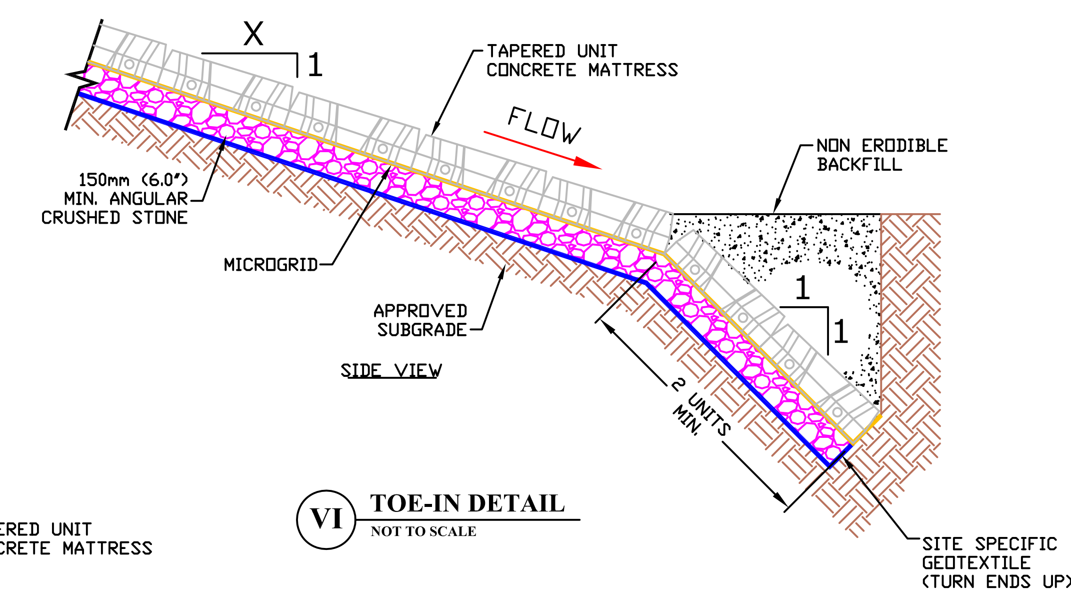
NOT TO SCALE



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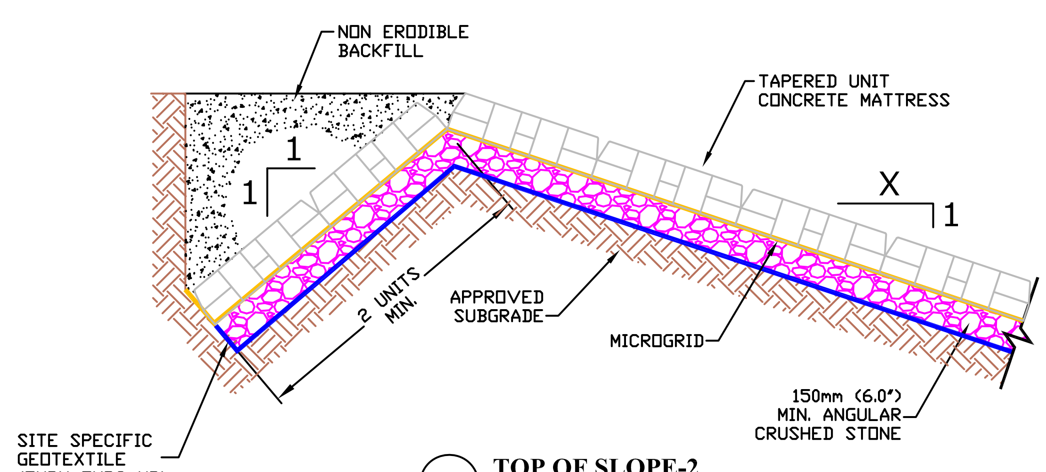

V TOP OF SLOPE-2
NOT TO SCALE

SHEET TITLE: ARMORFLEX CL 60T - PLAN SHEET
CHK'ED BY: TC
DATE: 05-08-15
REVISION DATE: 07-27-15
CAD FILE: ARMORTEC CANADA
DRAWN BY: MDD
SCALE: N.T.S.
DRAWING NO: AC008-15
DRAWING NAME: CLINTON CREEK-D

SHT. 3 OF 4.

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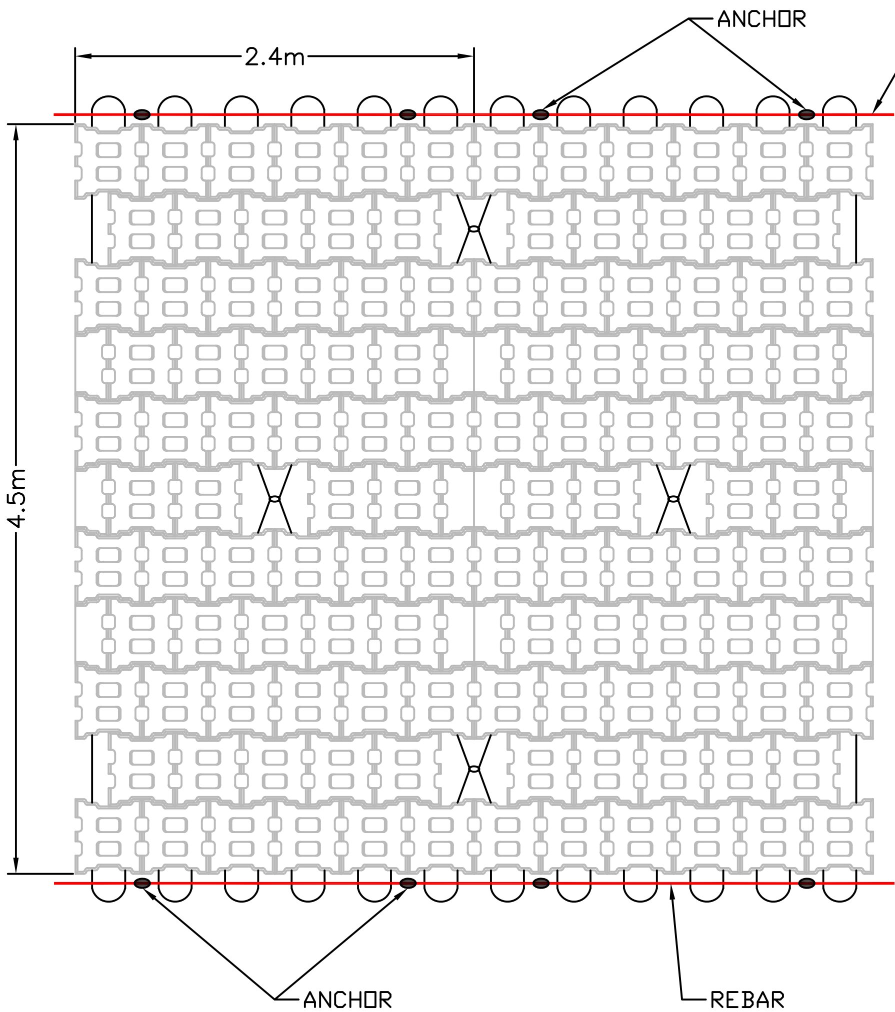
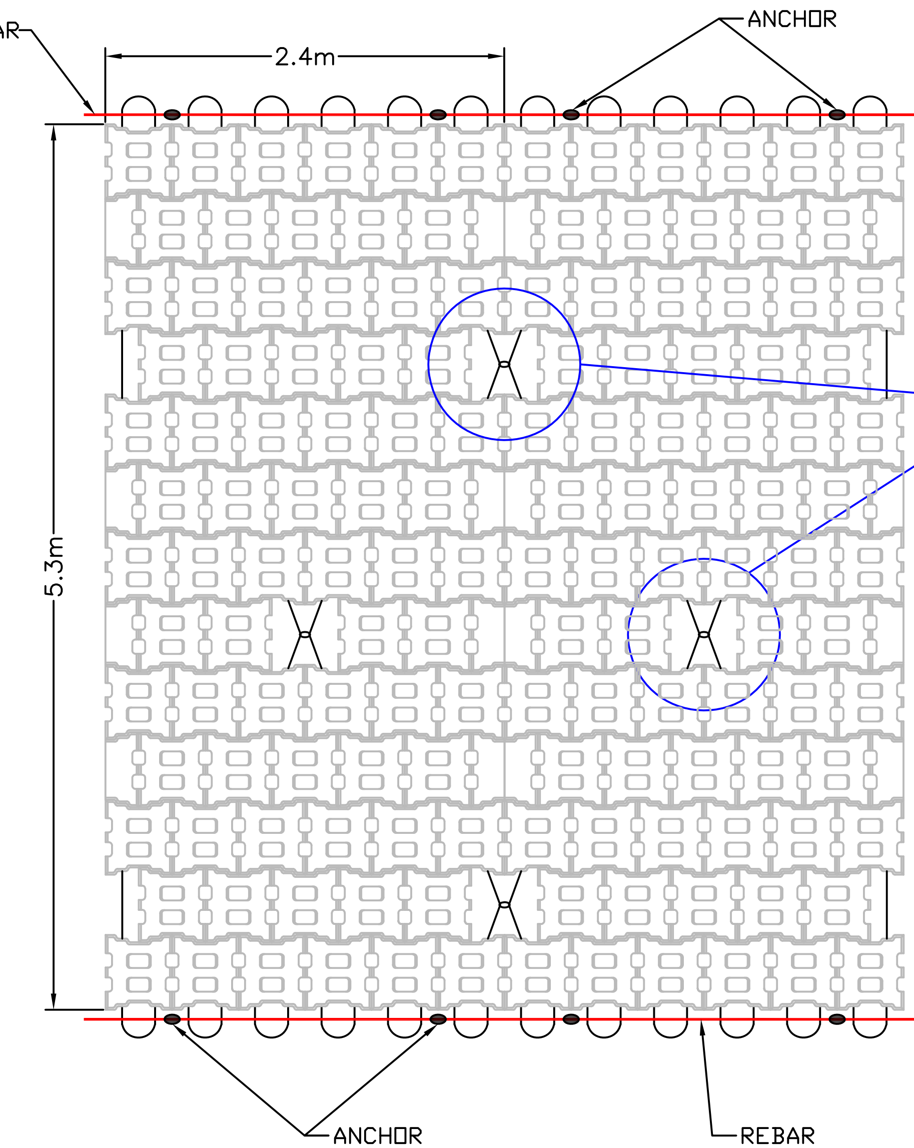
tscroskey@qwest.net

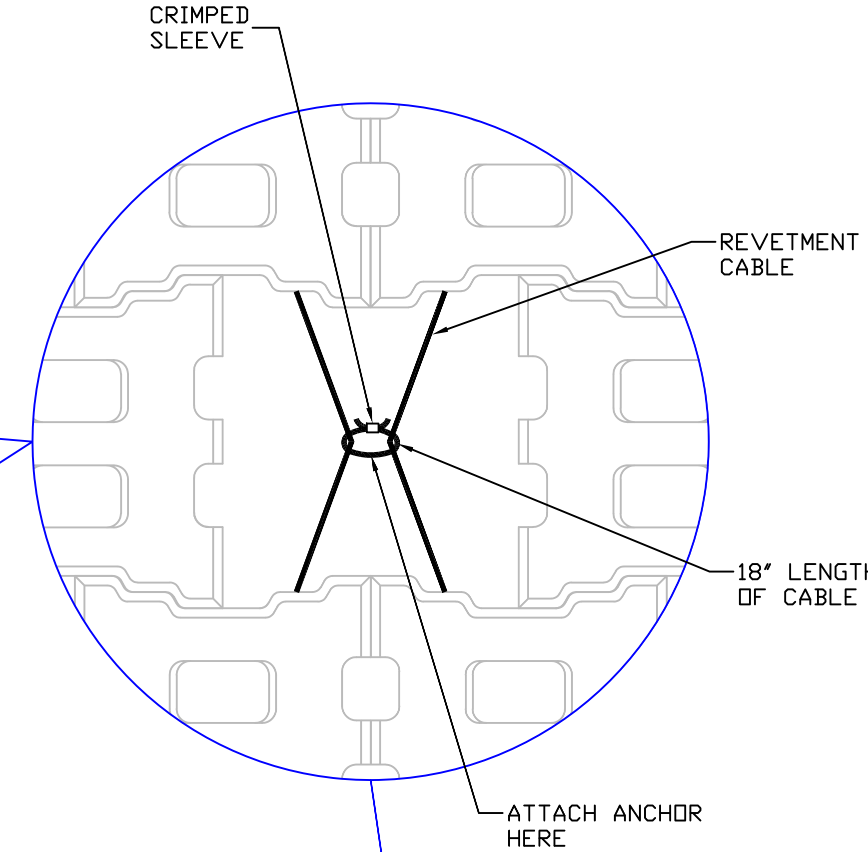
PROJECT NAME: CLINTON CREEK DROP STRUCTURE 4 REPAIR

NO.	DESCRIPTION	BY

REVISIONS







VII **MAT ANCHOR PLACEMENT**

NOT TO SCALE

SHEET TITLE: ARMORFLEX CL 60T – PLAN SHEET				
CHK'D BY: TC	DATE: 05-08-15	REVISION DATE: 07-27-15	CAD FILE: ARMORTEC CANADA	
DRAWN BY: MDD	SCALE: N.T.S.	DRAWING NO: AC008-15	DRAWING NAME: CLINTON CREEK-D2	SHT. 4 OF 4.

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PROJECT NAME: CLINTON CREEK DROP STRUCTURE 4 REPAIR

NO.	DESCRIPTION	BY

REVISIONS

ARMORTEC
Erosion Control Solutions

Project: Clinton Creek
Drop Structure 4 Repair
ArmorFlex Mattress Layout Spreadsheet

Creation Date: 7/27/2015

Please Label Mat Installation Sequence	*Mat #*	*Unit Wt lbs/sq.ft.*	*Mat Length max (M)*	*Mat Length min (M)*	*Mat Width max (M)*	*Mat Width min (M)*	*Mat Weight (lbs)*	*Total Mat Coverage (sq.M.)*
	1	60	4.5	4.5	2.4	2.4	6976	10.8
	2	60	4.5	4.5	2.4	2.4	6976	10.8
	3	60	4.5	4.5	2.4	2.4	6976	10.8
	4	60	4.5	4.5	2.4	2.4	6976	10.8
	5	60	4.5	4.5	2.4	2.4	6976	10.8
	6	60	4.5	4.5	2.4	2.4	6976	10.8
	7	60	4.5	4.5	2.4	2.4	6976	10.8
	8	60	4.5	4.5	2.4	2.4	6976	10.8
	9	60	4.5	4.5	2.4	2.4	6976	10.8
	10	60	4.5	4.5	2.4	2.4	6976	10.8
	11	60	4.5	4.5	2.4	2.4	6976	10.8
	12	60	4.5	4.5	2.4	2.4	6976	10.8
	13	60	4.5	4.5	2.4	2.4	6976	10.8
	14	60	4.5	4.5	2.4	2.4	6976	10.8
	15	60	4.5	4.5	2.4	2.4	6976	10.8
	16	60	4.5	4.5	2.4	2.4	6976	10.8
	17	60	4.5	4.5	2.4	2.4	6976	10.8
	18	60	5.3	5.3	2.4	2.4	8216	12.7
	19	60	5.3	5.3	2.4	2.4	8216	12.7
	20	60	5.3	5.3	2.4	2.4	8216	12.7
	21	60	5.3	5.3	2.4	2.4	8216	12.7
	22	60	5.3	5.3	2.4	2.4	8216	12.7
	23	60	5.3	5.3	2.4	2.4	8216	12.7
	24	60	5.3	5.3	2.4	2.4	8216	12.7
	25	60	5.3	5.3	2.4	2.4	8216	12.7
	26	60	5.3	5.3	2.4	2.4	8216	12.7
	27	60	5.3	5.3	2.4	2.4	8216	12.7
	28	60	5.3	5.3	2.4	2.4	8216	12.7
	29	60	5.3	5.3	2.4	2.4	8216	12.7
	30	60	5.3	5.3	2.4	2.4	8216	12.7
	31	60	5.3	5.3	2.4	2.4	8216	12.7
	32	60	5.3	5.3	2.4	2.4	8216	12.7
	33	60	5.3	5.3	2.4	2.4	8216	12.7
	34	60	5.3	5.3	2.4	2.4	8216	12.7
	35	60	4.5	4.5	2.4	2.4	6976	10.8
	36	60	4.5	4.5	2.4	2.4	6976	10.8
	37	60	4.5	4.5	2.4	2.4	6976	10.8
	38	60	4.5	4.5	2.4	2.4	6976	10.8
	39	60	4.5	4.5	2.4	2.4	6976	10.8
	40	60	4.5	4.5	2.4	2.4	6976	10.8
	41	60	4.5	4.5	2.4	2.4	6976	10.8
	42	60	4.5	4.5	2.4	2.4	6976	10.8
	43	60	4.5	4.5	2.4	2.4	6976	10.8
	44	60	4.5	4.5	2.4	2.4	6976	10.8
	45	60	4.5	4.5	2.4	2.4	6976	10.8
	46	60	4.5	4.5	2.4	2.4	6976	10.8
	47	60	4.5	4.5	2.4	2.4	6976	10.8

ARMORTEC
Erosion Control Solutions

Project: Clinton Creek
Drop Structure 4 Repair
ArmorFlex Mattress Layout Spreadsheet

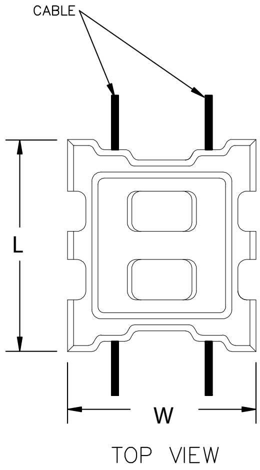
Creation Date: 7/27/2015

Please Label Mat Installation Sequence	*Mat #*	*Unit Wt lbs/sq.ft.*	*Mat Length max (M)*	*Mat Length min (M)*	*Mat Width max (M)*	*Mat Width min (M)*	*Mat Weight (lbs)*	*Total Mat Coverage (sq.M.)*
	48	60	4.5	4.5	2.4	2.4	6976	10.8
	49	60	4.5	4.5	2.4	2.4	6976	10.8
	50	60	4.5	4.5	2.4	2.4	6976	10.8
	51	60	4.5	4.5	2.4	2.4	6976	10.8

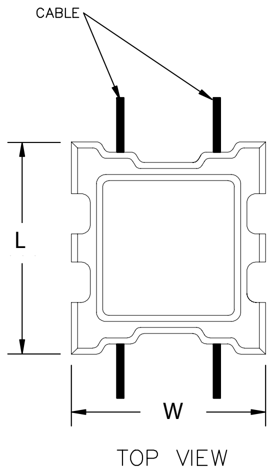
Project Total: 583.4

ArmorFlex®

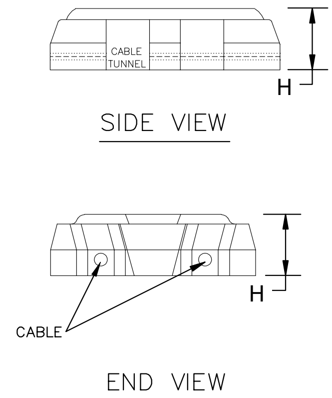
(not to scale)

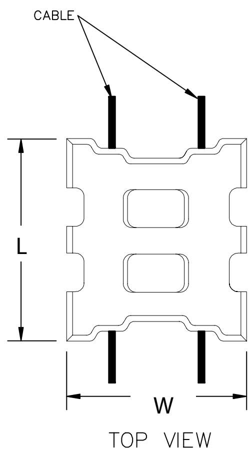


Open Cell Block

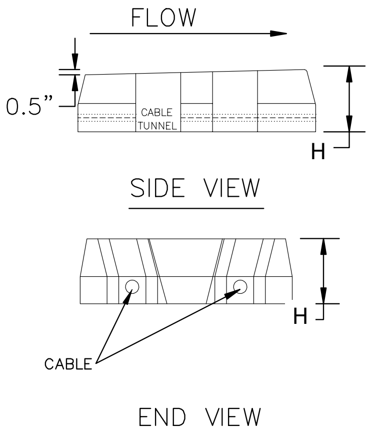


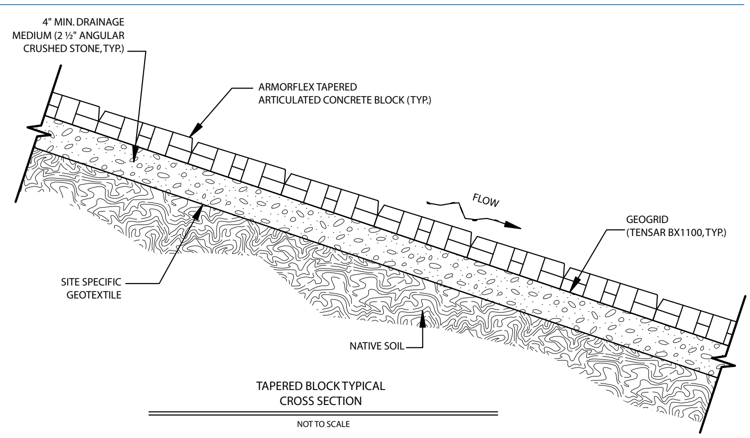
Close Cell Block



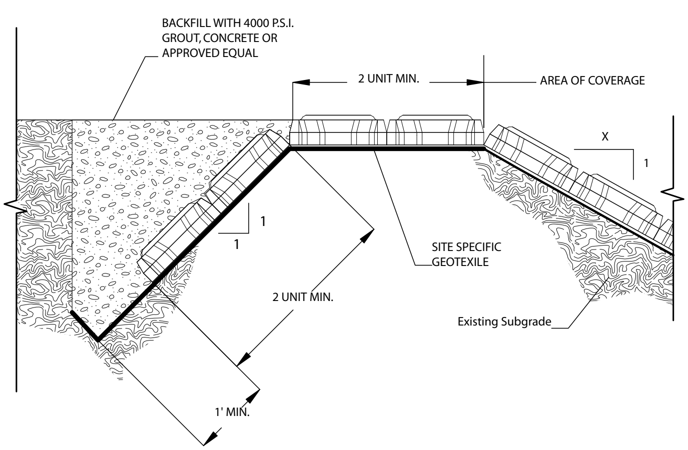


Tapered Series





Tapered Series - Cross Section



Top of Slope - Standard Detail

ArmorFlex Unit Specification

Concrete Block Class	Open/Closed Cell	Nominal Dimensions			Gross Area/ (sq. ft.)	Block Weight		Open Area %
		L	W	H		lbs	lbs/sq. ft.	
30s	Open	13.0	11.6	4.75	0.98	33-35	34-36	20
50s	Open	13.0	11.6	6.00	0.98	42-45	43-46	20
40	Open	17.4	15.5	4.75	1.77	59-64	33-36	20
50	Open	17.4	15.5	6.00	1.77	76-82	43-46	20
70	Open	17.4	15.5	8.50	1.77	108-117	61-66	20
40L	Open	17.4	23.6	4.75	2.58	97-105	38-41	20
70L	Open	17.4	23.6	8.50	2.58	174-188	68-73	20
45s	Closed	13.0	11.6	4.75	0.98	39-42	38-43	10
55s	Closed	13.0	11.6	6.00	0.98	50-54	49-55	10
45	Closed	17.4	15.5	4.75	1.77	71-77	40-43	10
55	Closed	17.4	15.5	6.00	1.77	91-98	52-56	10
85	Closed	17.4	15.5	8.50	1.77	136-146	77-83	10
45L	Closed	17.4	23.6	4.75	2.58	109-118	42-46	10
85L	Closed	17.4	23.6	8.50	2.58	207-223	80-87	10
High Velocity Application Block Classes								
40-T	Open	17.4	15.5	4.75	1.77	58-63	33-35	20
50-T	Open	17.4	15.5	6.00	1.77	75-81	43-46	20
70-T	Open	17.4	15.5	8.50	1.77	116-124	65-70	20

DYWIDAG-SYSTEMS INTERNATIONAL

DSI

SHIP-TO ADDRESS:

P.S. Sidhu Trucking Ltd
165 Collins Lane
WHITEHORSE, YT Y1A-0A8
Contact: Jay @ 867-336-3695
Phone No.:

Dywidag Systems International Canada, Lt

Dywidag Systems International
19433 96th Avenue
Suite 103
Surrey, BC V4N 4C4
Phone No: 604-888-8818
Fax No.: 604-888-5008

Job No.	J043026
Department	CN20
Shipment Method	COLLECT
Carrier	Manitoulin

Your Reference: PO Sidhu

External Document No.

Ship Ticket ST147558

Order No.	**CO070206**
Customer No.	C311080
Contact	Paul Krieg
Document Date	August 25, 2015
Shipment Date	August 25, 2015
Page No.	1

Pos.	Quantity	Unit	Description	Item No.	Location
15	315	pieces	68DBD anchor head with 1/8" x 1m .(39")Galv. Wire Rope / standard 2" loop	CW ANS	CW
35			ship drive steel when ready on Air North		
37			(attention both: Jay @ 867-336-3695 &		
38			Paramjit 867-334-3874)		

Net Weight: 198.45 lbs

Gross Weight: 0.00 lbs

packed by: Ben

act. delivery date: 8-25-15

Duckbill Earth Anchors

Holding Capacity

Duckbill Model	Ultimate Capacity	Normal Soil*	Normal Installation Depth
40	580 lbs (261 kg)	300 lbs (135 kg)	20 inches (.5m)
68	2,045 lbs (920 kg)	1,100 lbs (495 kg)	30 inches (.75m)
88	6,180 lbs (2,781 kg)	3,000 lbs (1,350 kg)	42 inches (1.05m)
138	10,670 lbs (4,802 kg)	5,000 lbs (2,250 kg)	60 inches (1.5 m)

- Typical Blow Count Per ASTM-D1586. Normal Soil Blow Count Range 24-40.
- Common Soil Type – Dense Fine Sand; Very Hard Silts and Clays; Dense Clays; Sands; and Gravel; Hard Silts and Clays.

DUCKBILL® EARTH ANCHORS

FORESIGHT® PRODUCTS, LLC

6430 East 49th Drive
Commerce City, CO 80022 (USA)
WATS: 1-800-325-5360
TEL: 303-286-8955
FAX: 303-287-3866
WEB: www.duckbill.com
E-Mail: sales@earthanchor.com

QUIKRETE®

CEMENT & CONCRETE PRODUCTS™

CONCRETE MIX

PRODUCT NO. 1101

DIVISION 3

Structural Concrete
03 31 00

PRODUCT DESCRIPTION

QUIKRETE® Concrete Mix is a pre-blended mixture of cement and aggregates for general structural uses, requiring only the addition of water.

PRODUCT USE

QUIKRETE® Concrete Mix is designed for pouring concrete 2" (51 mm) thick or more and building or repairing anything out of concrete, including:

- Foundation walls and footings
- Sidewalks, curbs, steps, ramps and walkways
- Appliance and equipment platforms
- Pipe and post footings
- Floor slabs and patios
- Pools, fish pools, stepping stones
- Splashblocks and bird baths
- Riprap & slope protection
- Driveway repairs

SIZES

- QUIKRETE® Concrete Mix is available in:
  - 40 lb (18.1 kg) bags
  - 60 lb (27.2 kg) bags
  - 80 lb (36.3 kg) bags

YIELD

- An 80 lb (36.3 kg) bag yields approximately 0.60 cu ft (17 L)
- A 60 lb (27.2 kg) bag yields approximately 0.45 cu ft (12.7 L)
- A 40 lb (18.1 kg) bag yields approximately 0.30 cu ft (8.5 L)

TECHNICAL DATA

APPLICABLE STANDARDS

ASTM International - ASTM C387 Standard Specifications for Packaged, Dry, Combined Materials for Mortar and Concrete

PHYSICAL/CHEMICAL PROPERTIES

QUIKRETE® Concrete Mix exceeds the compressive strength requirements of ASTM C387, as shown in Table 1.

TABLE 1 TYPICAL COMPRESSIVE STRENGTH[1]

Compressive strength, ASTM C39

Age	Typical Values
7 days	2500 psi (17.2 MPa)
28 days	4000 psi (27.6 MPa)
Slump Range	2" – 3" (51-76 mm)

[1]Tested under laboratory conditions in accordance with ASTM C387

INSTALLATION

PREPARATORY WORK

Stake out the planned area and remove sod or soil to the desired depth. Nail and stake forms securely in place. Tamp and compact the sub-base until firm.

MACHINE MIXING INSTRUCTIONS

QUIKRETE® Concrete Mix can be mixed in a barrel type concrete mixer or a mortar mixer.

- Choose the mixer size most appropriate for the size of the job to be done
- Allow at least 1 cu ft (28 L) of mixer capacity for each 80 lb (36.3 kg) bag of QUIKRETE® Concrete Mix to be mixed at one time
- For each 80 lb (36.3 kg) bag of QUIKRETE® Concrete Mix to be mixed, add approximately 6 pt (2.8 L) of fresh water to the mixer
- Turn on the mixer and begin adding the concrete to the mixer
- If the material becomes too difficult to mix, add additional water until a workable mix is obtained
- If a slump cone is available, adjust water to achieve a 2" - 3" (51 - 76 mm) slump

Note - Final water content should be approximately 6 - 9 pt (2.8 - 4.3 L) of water per 80 lb (36.3 kg) bag of concrete. For other bag sizes, use Table 2 to determine water content.

HAND MIXING INSTRUCTIONS

- Empty concrete bags into a suitable mixing container
- For each 80 lb (36.3 kg) bag of mix, add approximately 6 pt (2.8 L) of clean water
- Work the mix with a shovel, rake or hoe and add water as needed until a stiff, moldable consistency is achieved
- Be sure all material is wet
- Do not leave standing puddles

Note - For other bag sizes, use Table 2 to determine water content.

TABLE 2 MIXING WATER FOR QUIKRETE® CONCRETE MIX

Package size, lb (kg)	Starting Water Content, pt (L)	Final Water, Content, pt (L)
80 (36.3)	6 (2.8)	6-9 (2.8-4.3)
60 (27.2)	4 (1.9)	4-7 (1.9-3.3)
40 (18.1)	3 (1.4)	3-4.5 (1.4-2.1)

APPLICATION

Method for Pouring a Slab

- Dampen the sub-grade before concrete is placed
- Do not leave standing puddles
- Shovel or place concrete into the form; fill to the full depth of the form
- After concrete has been compacted and spread to completely fill the forms without air pockets, strike off and float immediately
- To strike off, use a straight board (screed), moving the edge back and forth with a saw-like motion to smooth the surface
- Use a darby or bull float to float the surface; this levels any ridges and fills voids left by the straight edge
- Cut the concrete away from the forms by running an edging tool or trowel along the forms to compact the slab edges
- Cut 1" (25.4 mm) deep control joints into the slab every 6' - 8' (1.8 - 2.4 m) using a grooving tool
- Allow concrete to stiffen slightly, waiting until all water has evaporated from the surface before troweling or applying a broom finish

Note - For best results, do not overwork the material.

Method for Setting Fence Posts

- Dig post hole about 3 times the diameter of the post. Hole depth should be 1/3 the overall post height
- Place 6" (152 mm) of dry concrete mix in the bottom of the hole. Position the post, checking that it is level and plumb. Combine concrete mix with water and place into the hole
- When standing water has evaporated from the concrete, smooth the surface. Taper it away from the post so rain will flow in that direction. Wait 24 hours before post is subjected to any strain
- For load-bearing applications, follow local building codes for proper footing specifications

FINISHING

Any standard concrete finishing technique is acceptable for use with QUIKRETE® Concrete Mix. Concrete can be hand troweled, power-troweled, broom finished or finished with other specialty finishes.

CURING

General

Curing is one of the most important steps in concrete construction. Proper curing increases the strength and durability of concrete, and a poor curing job can ruin an otherwise well-done project. Proper water content and temperature are essential for good curing. In near freezing temperatures the hydration process slows considerably. When weather is too hot, dry or windy, water is lost by evaporation from the concrete, and hydration stops, resulting in finishing difficulties and cracks. The ideal circumstances for curing are ample moisture and moderate temperature and wind conditions. Curing should be started as soon as possible and should continue for a period of 5 days in warm weather at 70°F (21°C) or higher or 7 days in colder weather at 50 - 70°F (10 - 21°C).

Specific Curing Methods

- QUIKRETE® Acrylic Cure & Seal – Satin Finish provides the easiest and most convenient method of curing. Apply by spray, brush or roller soon after the final finishing operation when the surface is hard. The surface may be damp, but not wet, when applying curing compound. Complete coverage is essential
- Other methods of providing proper curing include covering the surface with wet burlap; keeping the surface wet with a lawn sprinkler and sealing the concrete surface with plastic sheeting or waterproof paper to prevent moisture loss
- If burlap is used, it should be free of chemicals that could weaken or discolor the concrete. New burlap should be washed before use. Place it when the concrete is hard enough to withstand surface damage and sprinkle it periodically to keep the concrete surface continuously moist
- Water curing with lawn sprinklers, nozzles or soaking hoses must be continuous to prevent interruption of the curing process
- Curing with plastic sheets is convenient. They must be laid flat, thoroughly sealed at joints and anchored carefully along edges

PRECAUTIONS

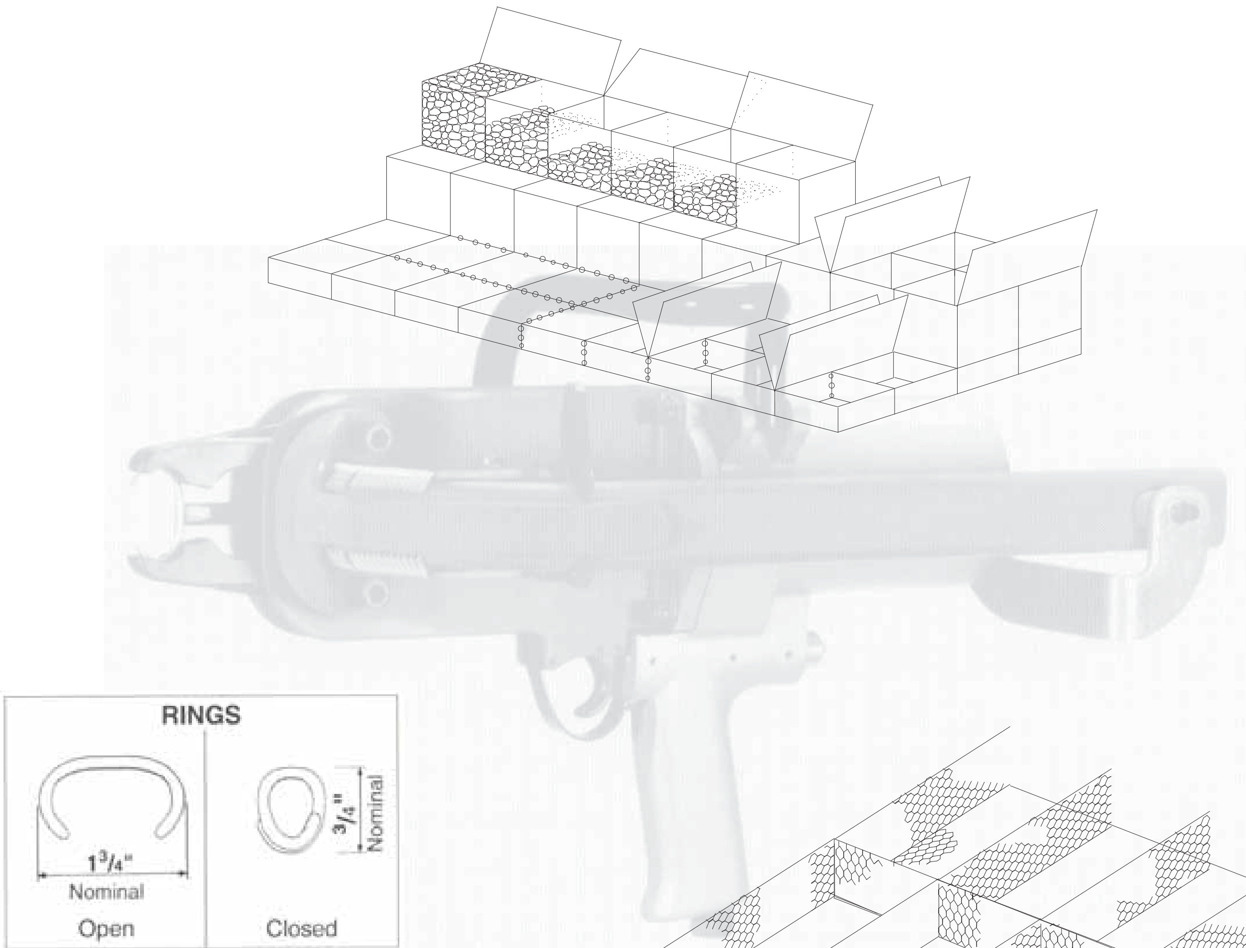
- Curing compounds should not be applied if rain or temperatures below 50°F (10°C) are expected within 24 hours
- Curing with plastic or burlap can cause patchy discoloration in colored concrete. For colored concrete, wet curing or the use of QUIKRETE® Acrylic Cure & Seal – Satin Finish is recommended
- Do not use curing compounds during late fall on surfaces where de-icers will be used to melt ice and snow. Using curing compounds at that time may prevent proper air drying of the concrete, which is necessary to enhance its resistance to damage caused by de-icers
- Protect concrete from freezing during the first 48 hours. Plastic sheeting and insulation blankets should be used if temperatures are expected to fall below 32°F (0°C)

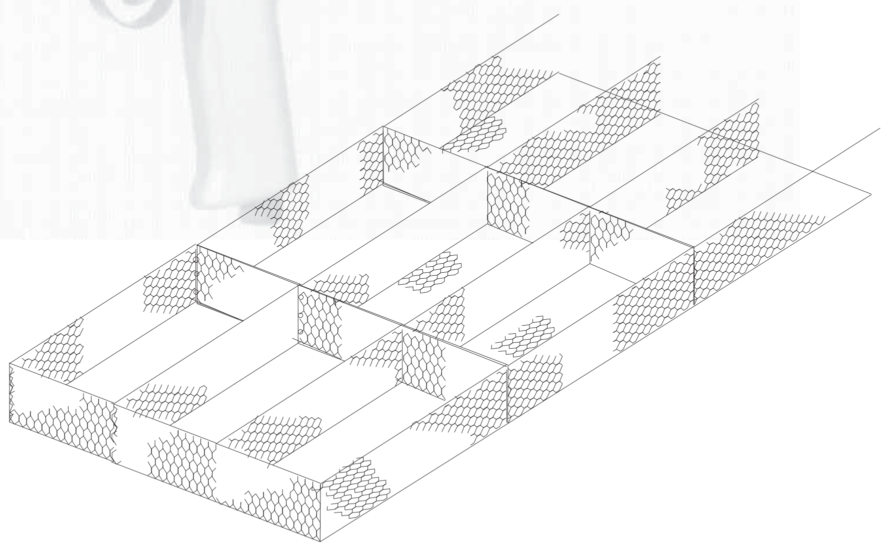
WARRANTY

The QUIKRETE® Companies warrant this product to be of merchantable quality when used or applied in accordance with the instructions herein. The product is not warranted as suitable for any purpose or use other than the general purpose for which it is intended. Liability under this warranty is limited to the replacement of its product (as purchased) found to be defective, or at the shipping companies' option, to refund the purchase price. In the event of a claim under this warranty, notice must be given to The QUIKRETE® Companies in writing. This limited warranty is issued and accepted in lieu of all other express warranties and expressly excludes liability for consequential damages.

The QUIKRETE® Companies
One Securities Centre
3490 Piedmont Rd., NE, Suite 1300, Atlanta, GA 30305
(404) 634-9100 • Fax: (404) 842-1425

Fastening Systems





MACCAFERRI

Traditionally, gabions, mattresses and Maccaferri's other wire mesh products have been assembled and connected using lacing wire, laced by hand. Since this can be a time consuming task when properly done, Maccaferri has developed an alternative fastening system, using high tensile ring fasteners and either a pneumatic tool or manual pliers.

Fasteners

The fasteners are available in galvanized or galfan, for use with the corresponding type of material, or stainless steel for use with PVC coated mesh in highly corrosive environments. When used in conjunction with either the pneumatic tool or the manual pliers, these fasteners tightly connect the mesh, unlike some other, less effective, fastening systems. The tensile strength of these fasteners is 220,000 to 270,000 psi, providing impressive strength and durability when installed at the suggested four to six inch spacing.

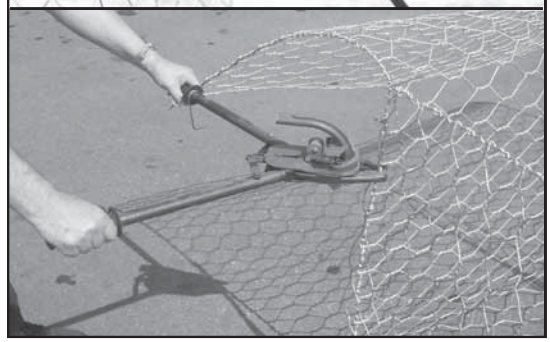
The use of ring fasteners can drastically reduce the assembly and installation operations of Maccaferri's wire mesh products when compared to the conventional method of wire lacing by hand. Projects constructed with this fastening system display improved durability, resistance, and appearance, which translates into an increase in overall quality.

Specifications:

Size: 11 gauge
Tensile Strength: 220,000 to 270,000 psi
Type: galvanized, galfan, stainless steel
Quantity: 1,600 rings/box

Pneumatic Tool

For the ultimate in speed and efficiency in the installation of gabions and other Maccaferri wire mesh products, our strong pneumatic tool can't be surpassed. This light weight and speedy tool can reduce assembly and installation time by up to 50% over lacing by hand. Contact your local Maccaferri representative about our tool rental program.



Specifications:

Power: compressed air (100 psi at the tool)
Maximum: 40 cycles/minute
Hose: 3/8" max. diameter, 100 foot max. length
Weight: 14 pounds
Capacity: 80 fasteners

Manual Pliers

Maccaferri also offers manual pliers as part of our fastening system. The pliers are handy for smaller projects where setting up an air compressor may be inconvenient. They are also invaluable in tight situations where the pneumatic tool may not fit. Having one or two of these around the project site can be convenient for getting to those tight spots, and to free up the pneumatic tools for the bulk of the installation process.

Specifications:

Weight: 9 pounds
Length: 28 inches
Opening Angle: 80°
Capacity: 40 fasteners

This fastening system is available from Maccaferri Inc. Contact your Maccaferri representative today!

MACCAFERRI

website: www.maccaferri-usa.com

Headquarters:
10303 Governor Lane Boulevard
Williamsport, MD 21795-3116
tel: 301-223-6910
fax: 301-223-6134
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Maccaferri Inc.

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MD, Williamsport
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NM, Albuquerque
PR, Caguas
TX, Lewisville

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MACCAFERRI

TECHNICAL DATA SHEET

Rev: 01, Issue Date 03.01.2009

American Units

ROLLED MESH

GALVANIZED & PVC COATED

Product Description

Rolled mesh consists of zinc coated double twisted steel woven wire mesh manufactured in accordance with ASTM A975-97. The wire used in the manufacture of the mesh is heavily galvanized zinc coated soft temper steel. A PVC coating is then applied to provide additional protection for use in polluted, contaminated or aggressive environments: in salt, fresh water, acid soil or wherever the risk of corrosion is present. The PVC coating has a nominal thickness of 0.02 in (0.50 mm). Besides our standard gray, the PVC coating is also available in black, tan and brown. The standard specifications for the wire-mesh are shown in Tables 2, 3, 4.
Rolled Mesh is used for a wide variety of civil applications. It is used in conjunction with other double twisted wire mesh products such as gabions, mattresses, etc. or it is used alone for rockfall applications, repair work, etc. Rolled Mesh is supplied at standard lengths and can be cut to fit on site.

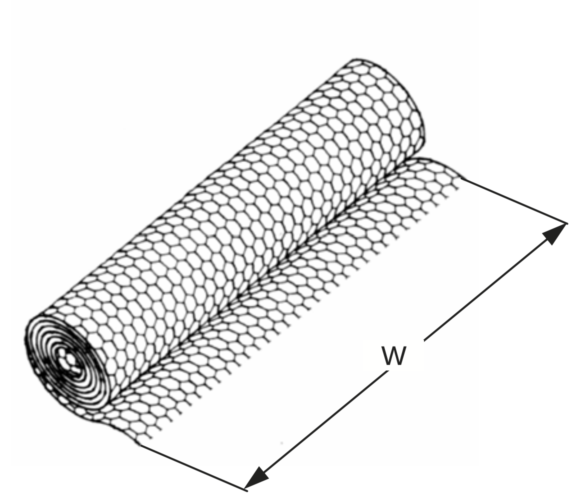

Figure 1

Wire

All tests on wire must be performed prior to manufacturing the mesh. All wire should comply with ASTM A975-97, style 3 coating, galvanized and PVC coated steel wire. Wire used for the manufacture of Rolled Mesh and the lacing wire, shall have a maximum tensile strength of 75,000 psi (515 MPa) as per ASTM A641/A641M-03, soft temper steel.

Woven Wire Mesh Type 8x10 and 6x8

The mesh and wire characteristics shall be in accordance with ASTM A975-97 Table 1, Mesh type 8x10 and PVC coated, the nominal mesh opening, D = 3.25 in. (83 mm) and for type 6x8, D = 2.5 in. (64 mm) as per Figure 2.
The minimum mesh properties for strength and flexibility should be in accordance with the following:

- *Mesh Tensile Strength* shall be a minimum of 2900 lb/ft (42.3 kN/m) for mesh type 8x10 and 2300 lb/ft (33.6 kN/m) for mesh type 6x8 when tested in accordance with ASTM A975-97 section 13.1.1.
- *Punch Test* resistance shall be a minimum of 5300 lb (23.6 kN) for mesh type 8x10 and 4000 lb (17.8 kN) for mesh type 6x8 when tested in compliance with ASTM A975-97 section 13.1.4.
-

The tolerance on the opening of mesh "D" being the distance between the axis of two consecutive twists, is according to ASTM A975-97.

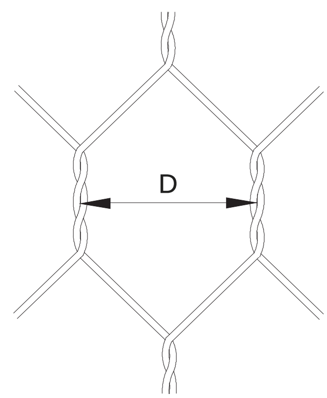

Figure 2

P.V.C. (Polyvinyl Chloride) Coating

The technical characteristics and the resistance of the PVC to aging should meet the relevant standards. The main values for the PVC material are as follows:

- The initial property of the PVC coating shall be in compliance with ASTM A975-97 section 8.2.
- Prior to UV and abrasion degradation, the PVC polymer coating shall have a projected minimum durability of 60 years when tested in accordance with *UL 746B Polymeric Material-Long Term Property Evaluation* for heat aging test.

Lacing Operations

Lacing operations to connect Rolled Mesh are made by using lacing wire specified in Table 3 and described in Figure 3. Stainless steel ring fasteners can be used instead of lacing wire (Figure 4 and Figure 6).
Stainless steel rings for PVC coated netting shall be in accordance with ASTM A975-97 section 6.3.
Spacing of the rings shall be in accordance with ASTM A975-97 Table 2, Panel to Panel connection, Pull-Apart Resistance. In any case, ring fasteners spacing shall not exceed 6 in. (150 mm) (Figure 3).

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Maccaferri reserves the right to amend product specifications without notice and specifiers are requested to check as to the validity of the specifications they are using.

Table 1 - Sizes for Mesh

L=Length ft (m)	W=Width ft (m)
150	6.0 or 12.0
(45.7)	(1.83 or 3.66)

All sizes and dimensions are nominal. Tolerances of +/-1% of the length, and ± 5% of the width shall be permitted.

Table 2 - Standard mesh-wire

Type	D in. (mm)	Tolerance	Wire Dia in. (mm)
6x8	2.50 (64)	±10%	0.087 (2.2)
8x10	3.25 (83)	±10%	0.106 (2.7)

Table 3 - Standard wire diameters

		Lacing Wire	Mesh Wire	Selvedge Wire
6x8	ø in. (mm)	0.087 (2.2)	0.087 (2.2)	0.106 (2.7)
8x10	ø in. (mm)	0.087 (2.2)	0.106 (2.7)	0.134 (3.4)

Lacing Operations

Lacing operations can be made by using lacing wire specified in Table 3 and described in Figure 3. Stainless steel ring fasteners (Figure 4), using the appropriate tools shown in Figure 6 for connection, can be used instead of, or to complement lacing wire.

Stainless Steel rings for PVC coated wire mesh shall be in accordance with ASTM A975-97 section 6.3.

Spacing of the rings shall be in accordance with ASTM A975-97 Table 2, Panel to Panel connection, Pull-Apart Resistance. Ring fasteners spacing shall not exceed 6 in. (150 mm) (Figure 3). Rings diameter: 0.118 in. (3.00 mm).

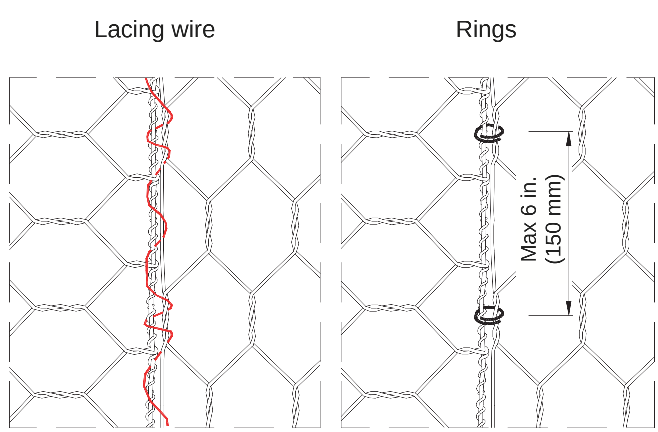


Figure 3

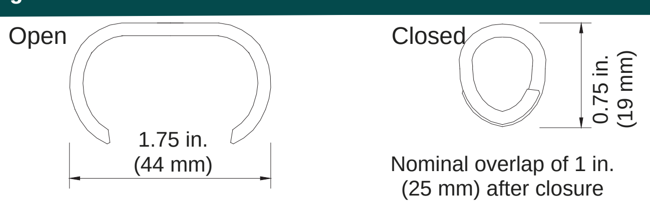


Figure 4

Table 4 - Wire tolerances and coating

Wire Diameter in. (mm)	0.087 (2.20)	0.106 (2.70)	0.134 (3.40)
Wire Tolerance ± ø in. (mm)	0.004 (0.1)	0.004 (0.1)	0.004 (0.1)
Minimum Quantity/Zinc oz/ft ^{2} (g/m^2)	0.70 (214)	0.80 (244)	0.85 (259)
Wire + PVC Diameter in. (mm)	0.127 (3.20)	0.146 (3.70)	0.174 (4.40)

PVC coating is available in four colors:

GRAY
BLACK
TAN
BROWN

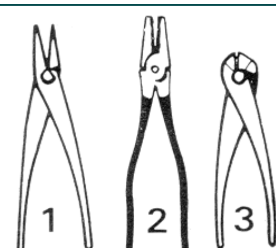
Figure 5

Quantity Request

When requesting a quotation, please specify:

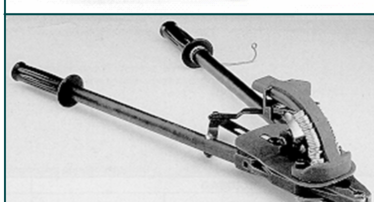
- number of units,
- size of units (length x width, see Table1),
- type of mesh,
- type of coating.

EXAMPLE: No. 100 rolled mesh, 3.25 in. (83 mm), Mesh type 8x10, Wire diameter 0.106 in. (2.7 mm), Galvanized + PVC coated.



A 1) Pliers 2) Pliers with nipper 3) Nipper

B Pneumatic Spenax tool



C Manual tool

Figure 6

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website: www.maccaferri-usa.com

MACCAFERRI, INC.

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MACCAFERRI

TECHNICAL DATA SHEET

Rev: 01, Issue Date 03.01.2009

International System of Units

GABION
GALVANIZED & PVC COATED

Product Description

Gabions are baskets manufactured from 8x10 double twisted hexagonal woven steel wire mesh, as per ASTM A975-97 (Figs. 1, 2). Gabions are filled with stones at the project site to form flexible, permeable, monolithic structures such as retaining walls, channel linings, and weirs for erosion control projects.

The steel wire used in the manufacture of the gabion is heavily zinc coated soft temper steel. A PVC coating is then applied to provide additional protection for use in polluted, contaminated or aggressive environments: in salt, fresh water, acid soil or wherever the risk of corrosion is present. The PVC coating has a nominal thickness of 0.50 mm (0.02 in.). The standard specifications of the mesh-wire are shown in Table 2.

The gabion is divided into cells by diaphragms positioned at approximately 1 m (3 ft) centers (Fig. 1).

To reinforce the structure, all mesh panel edges are selvedged with a wire having a greater diameter (Table 3). Dimensions and sizes of PVC coated gabions are shown in Table 1.

Gabions shall be manufactured and shipped with all components mechanically connected at the production facility.

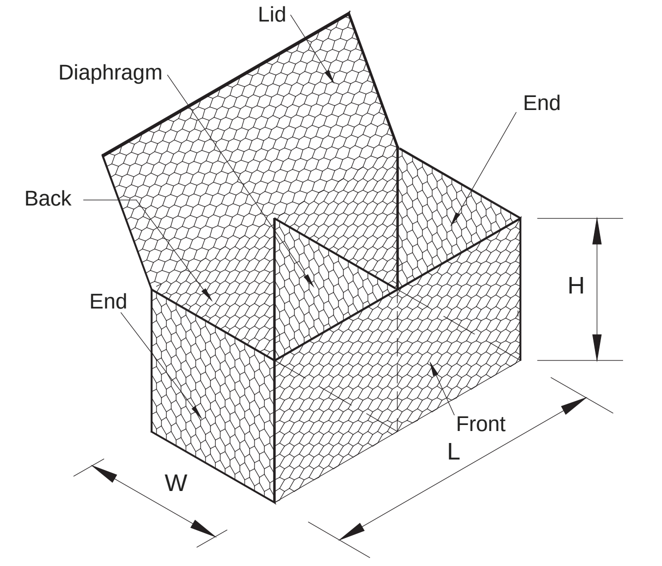

Figure 1

Wire

All tests on wire must be performed prior to manufacturing the mesh. All wire should comply with ASTM A975-97, style 3 coating, galvanized and PVC coated steel wire. Wire used for the manufacture of gabions and the lacing wire, shall have a maximum tensile strength of 515 MPa (75,000 psi) as per ASTM A641-03, soft temper steel.

Woven Wire Mesh Type 8x10

The mesh and wire characteristics shall be in accordance with ASTM A975-97 Table 1, Mesh type 8x10 and PVC coated. The nominal mesh opening, D = 83 mm (3.25 in.) as per Fig. 2.

The minimum mesh properties for strength and flexibility should be in accordance with the following:

- *Mesh Tensile Strength* shall be a minimum of 42.3 kN/m (2900 lb/ft) when tested in accordance with ASTM A975-97 section 13.1.1.
- *Punch Test* resistance shall be a minimum of 23.6 kN (5300 lb) when tested in compliance with ASTM A975-97 section 13.1.4.
- *Connection to Selvedges* shall be 17.5 kN/m (1200 lb/ft) when tested in accordance with ASTM A975-97.

The tolerance on the opening of mesh 'D' being the distance between the axis of two consecutive twists, is according to ASTM A975-97

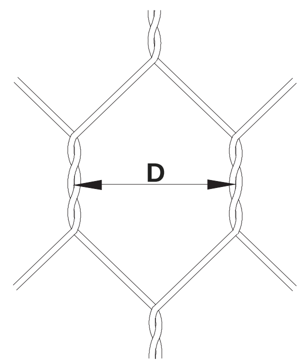

Figure 2

P.V.C. (Polyvinyl Chloride) Coating

The technical characteristics and the resistance of the PVC to aging should meet the relevant standards. The main values for the PVC material are as follows:

- The initial property of the PVC coating shall be in compliance with ASTM A975-97 section 8.2.
- Prior to UV and abrasion degradation, the PVC polymer coating shall have a projected minimum durability of 60 years when tested in accordance with *UL 746B Polymeric Material—Long Term Property Evaluation* for heat aging test.

Lacing, Assembly and Installation

Gabion units are assembled and connected to one another using lacing wire specified in Table 3 and described in Fig. 3. MacTie preformed stiffeners or lacing wire can be used as internal connecting wires when a structure requires more than one layer of gabions to be stacked on top of each other. Internal connecting wires with lacing wire shall connect the exposed face of a cell to the opposite side of the cell. Internal connecting preformed stiffeners shall connect the exposed face of a cell to the adjacent side of the cell. Preformed stiffeners are installed at 45° to the face/side of the unit, extending an equal distance along each side to be braced (approximately 1 ft. (300 mm)). An exposed face is any side of a gabion cell that will be exposed or unsupported after the structure is completed.

Stainless steel ring fasteners can be used instead of, or to complement, the lacing wire (Fig. 4).

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Maccaferri reserves the right to amend product specifications without notice and specifiers are requested to check as to the validity of the specifications they are using.

Table 1—Sizes for gabions

L=Length m	W=Width m	H=Height m	# of cells
2	1	0.3	2
3	1	0.3	3
4	1	0.3	4
2	1	0.5	2
3	1	0.5	3
4	1	0.5	4
2	1	1	2
3	1	1	3
4	1	1	4

All sizes and dimensions are nominal. Tolerances of ± 5% of the width, and length height, of the gabions shall be permitted.

Stainless steel rings for PVC coated gabions shall be in accordance with ASTM A975-97 section 6.3.
Spacing of the rings shall be in accordance with ASTM A975-97 Table 2, Panel to Panel connection, Pull-Apart Resistance. In any case, ring fasteners spacing shall not exceed 6 in (150 mm) (Fig. 3).
The rings can be installed using pneumatic or manual tools (Fig. 5).
For full details, please see the Gabion Product Installation Guide.

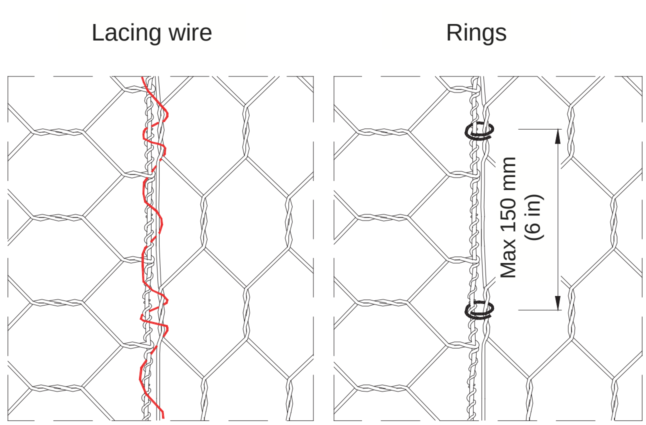


Figure 3

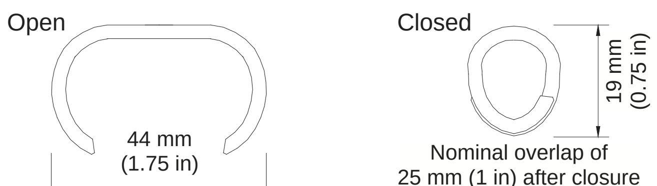


Figure 4

Table 2—Standard mesh-wire

Type	D mm (in.)	Tolerance	Internal Wire Dia mm (in.)	External Wire Dia mm (in.)
8x10/ ZN+PVC	83 (3.25)	±10%	2.70 (0.106)	3.70 (0.146)

Table 3—Standard wire diameters

	Lacing Wire	Mesh Wire	Selvedge Wire / Preformed Stiffeners
PVC Mesh Diameter mm (ø in.)	2.2/3.2 (0.087/0.127)	2.7/3.7 (0.106/0.146)	3.4/4.4 (0.134/0.174)
Wire Tolerance mm (± ø in.)	0.10 (0.004)	0.10 (0.004)	0.10 (0.004)
Minimum Quantity/Zinc g/m^2 (oz/ft^2)	214 (.70)	244 (0.80)	259 (0.85)
Wire + PVC diameter mm (in.)	3.20 (0.127)	3.70 (1.46)	4.40 (0.174)

Quantity Request

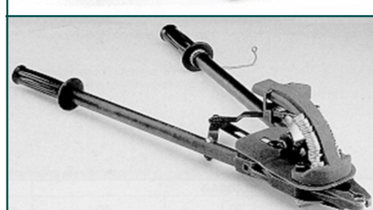
When requesting a quotation, please specify:

- number of units,
- size of units (length x width x height, see Table 1),
- type of mesh,
- type of coating.

EXAMPLE: No. 100 gabions 2x1x1 m - Mesh type 8x10 - Wire diameter 2.7/3.7 mm - Galvanized + PVC coated.

A Lid closer

B Pneumatic Spenax tool



C Manual tool

Figure 5

MACCAFERRI

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KY, Lexington
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NJ, Ramsey
NM, Albuquerque
OH, Worthington
PR, Caguas
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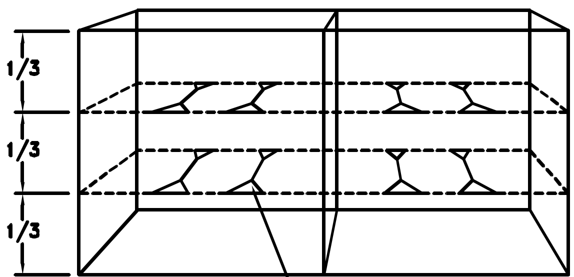
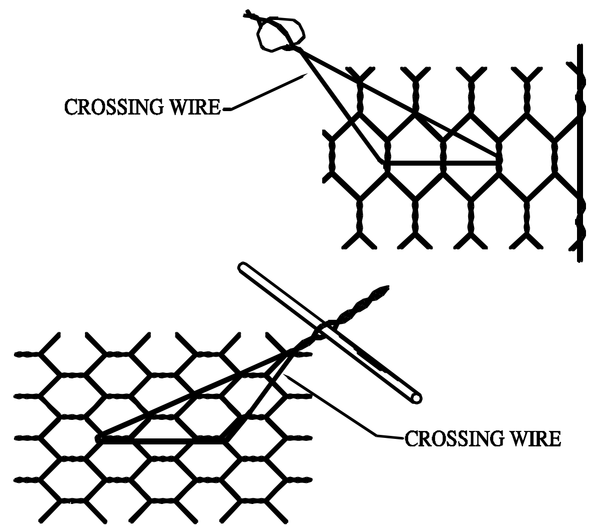
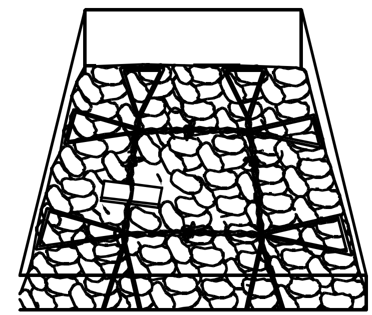


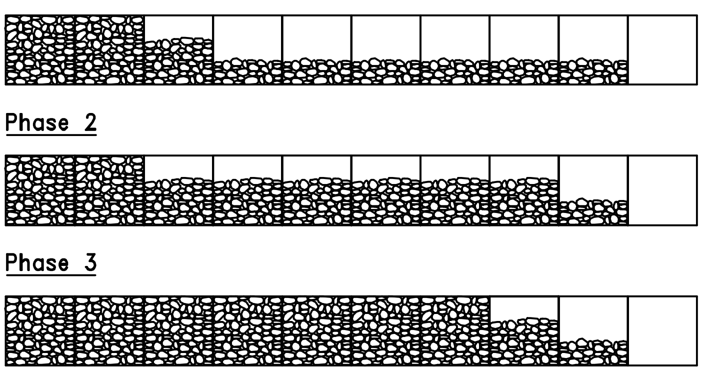


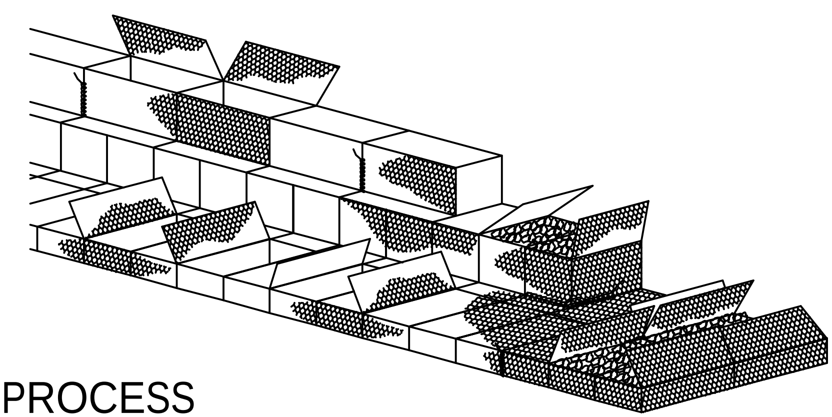


Phase 1

Phase 2

Phase 3





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DRAWING TITLE: Gabion Basket Filling

SCALE: NOT TO SCALE

DRAWING NO. /Filling_Gabion.dwg

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Williamsport, MD 21795-3116, USA
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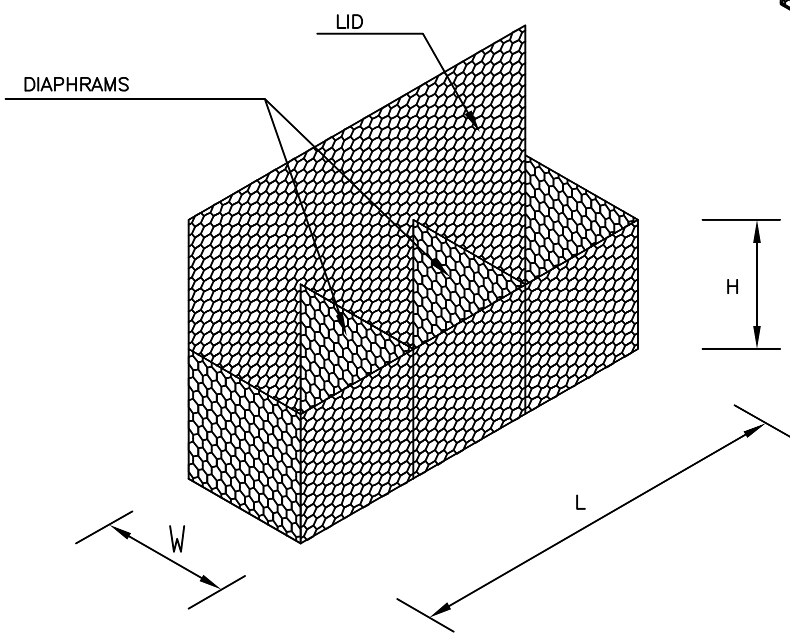

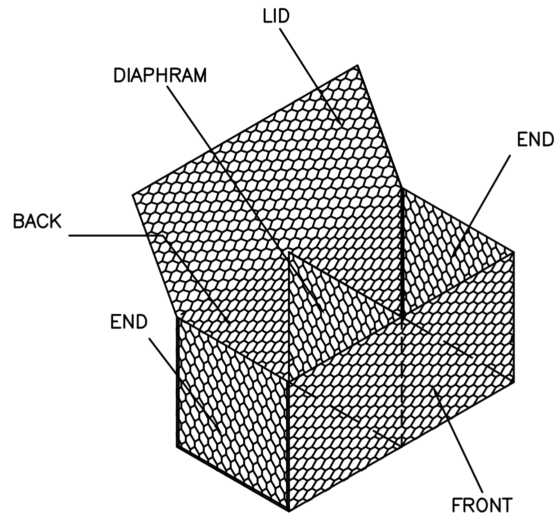

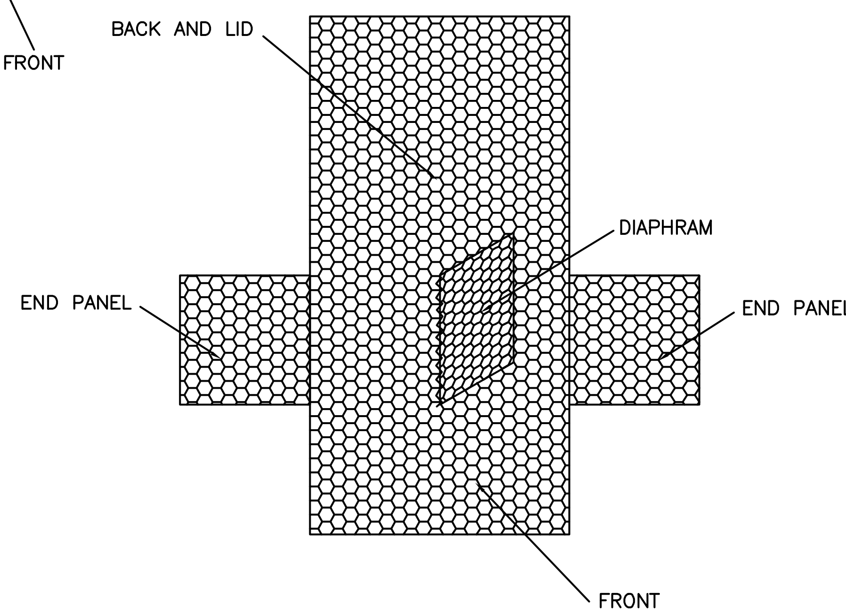

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DRAWING TITLE: Gabion Basket Diagram

SCALE: NOT TO SCALE

DRAWING NO. /gb.dwg

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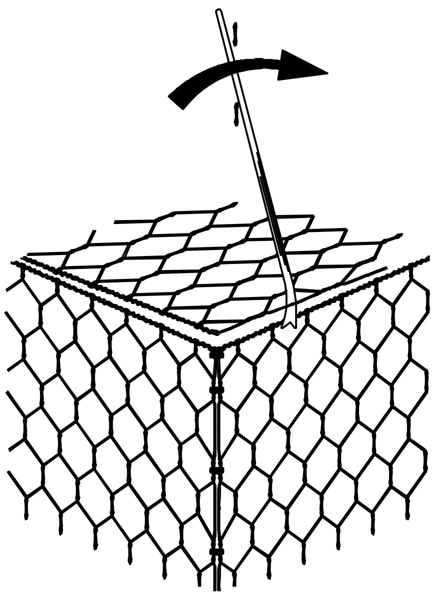

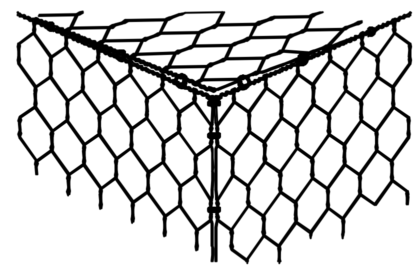

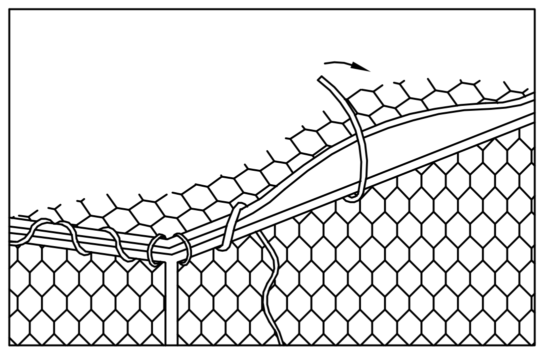

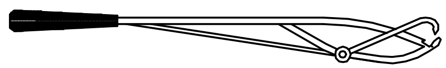

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DRAWING TITLE: Gabion Basket Closing	SCALE: NOT TO SCALE
	DRAWING NO. /Closing_Gabion.dwg

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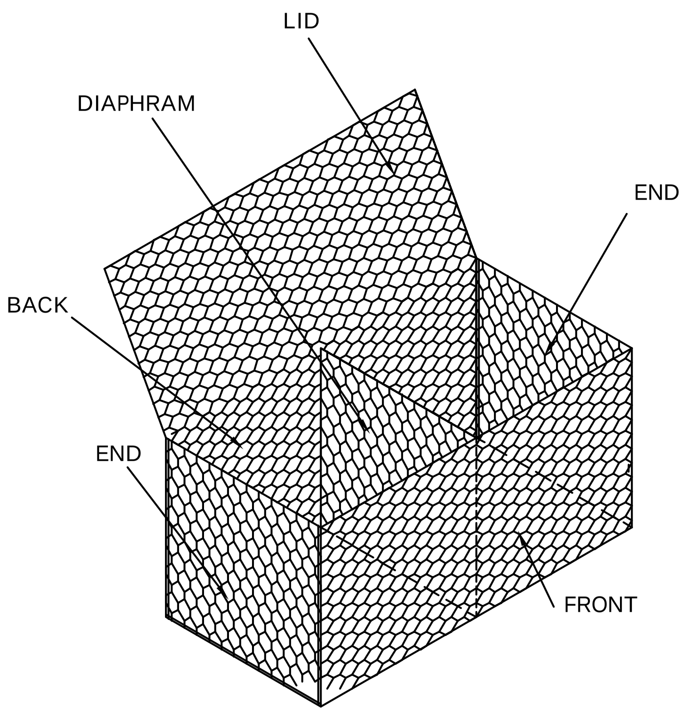
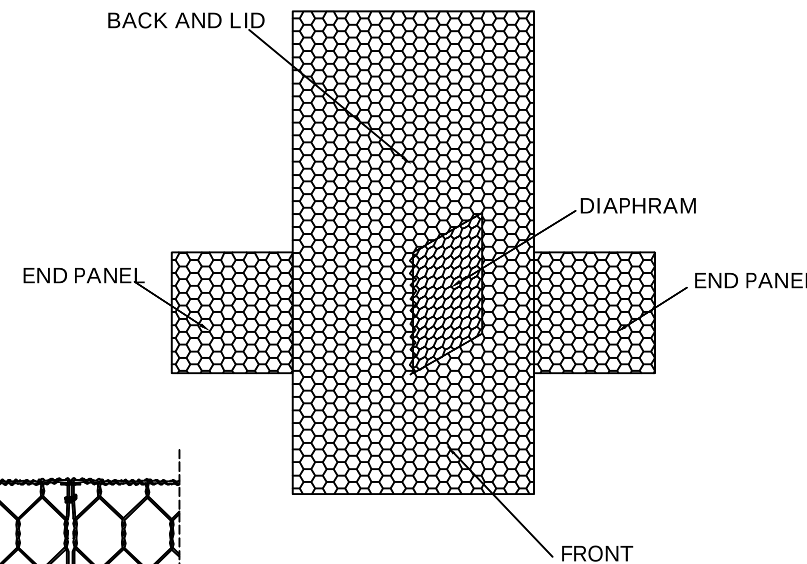
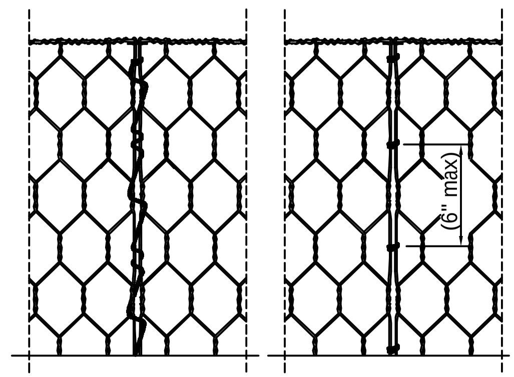
Tel : 301-223-9610 Fax : 301-223-6134





GABION BASKET



Edges are joined together, using the appropriate lacing techniques.
MANUAL: continuous wire looped tightly around every other mesh opening, alternating single and double loops.
MECHANICAL: using a pneumatic or hand tool, employing stainless steel "C" shaped fasteners. For continuity and strength, the recommended spacing is 6" max

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DRAWINGS

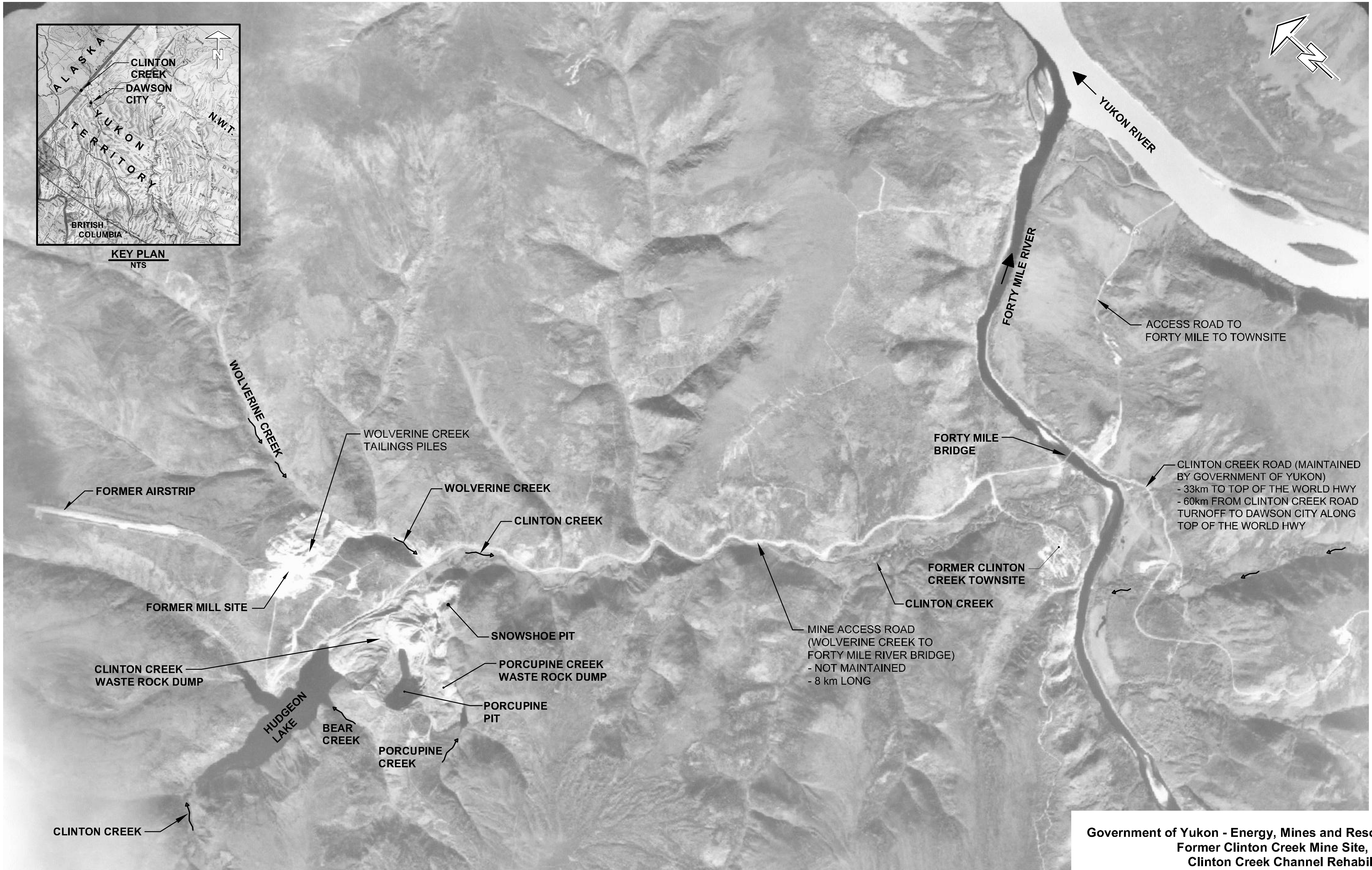

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IMAGE DATE AUG 17, 1988

AECOM

Government of Yukon - Energy, Mines and Resources
Former Clinton Creek Mine Site, Yukon
Clinton Creek Channel Rehabilitation

Site Location Plan

Drawing - 01

B SIZE 11" x 17" (279.4mm x 431.8mm)

PLOT: 11/07/20 4:23:41 PM

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Appendix 12

Air Monitoring Results

Fibre(s) In Air Report

Wes-Har Asbestos Analysis & Consulting Ltd.

For General Contractor

Sidhu Trucking Ltd. #10 Sunset Dr. N, Whitehorse

Location : Clinton Creek Mine Site, North of Dawson City, YT
Contractor : Sidhu Trucking Ltd. #10 Sunset Dr. N, Whitehorse
Project : ClintonCrek

14502 Clinton		Time On	Time Off	Flow	Volume	Fibre	Field	Load	Fibre mm^2		Analyzed	Type	Location	Fibre/mL
1	**4**	750 Aug 16, 2015	1716 Aug 16, 2015	2.50	1415.0	14.0	100	H	17.8	GN	Aug 18, 2015	Amb	**Excavator**	**0.005**
2	**2**	751 Aug 16, 2015	1716 Aug 16, 2015	2.50	1412.5	13.0	100	M	16.6	GN	Aug 18, 2015	Amb	**Rock Truck**	**0.005**
3	**7**	801 Aug 16, 2015	1724 Aug 16, 2015	2.50	1407.5	6.5	100	L	8.3	GN	Aug 18, 2015	Amb	**Beside Haul Road**	**0.002**

Load - Particulate / Fibre Filter Loading Characteristics : L - Light M - Moderate H - Heavy O - Overload

Comments

Samples Analyzed In Accordance With The NIOSH Asbestos and Other Fibres by PCM METHOD 7400 [8/15/94]
Limit of Detection (LOD) 7 Fibres/mm2
Range 100 to 1300 Fibres/mm2 filter area
< Means Less Than
Samples Submitted Will Be Retained For 30 Days After Receipt And Will Be Disposed Of Thereafter Unless Otherwise Notified In Writng
Amb Means Ambient; Occ Means Occupational; Clr Means Clean Room; Blk Means Blank
AC Means Air Clearance; PtA Means Post Abatement; PrA Means Pre Abatement

Sample Submited By General Contractor

August 18, 2015 [Facsimile]

G. Nawrocki — Analyst

H. McKnight — Reviewed By

Fibre(s) In Air Report

Wes-Har Asbestos Analysis & Consulting Ltd.

For General Contractor
Sidhu Trucking Ltd.

Location : Clinton Creek
Contractor : Sidhu Trucking Ltd.
Project : ClintonCrek

14527 Clinton		Time On	Time Off	Flow	Volume	Fibre	Field	Load	Fibre mm^2		Analyzed	Type	Location	Fibre/mL
1	**1**	945 Aug 25, 2015	1608 Aug 25, 2015	2.50	957.5	27.0	100	L	34.4	HM	Aug 31, 2015	Amb	**210 Link Belt**	**0.014**
2	**2**	945 Aug 25, 2015	1645 Aug 25, 2015	2.50	1050.0	3.5	100	L	< 7	HM	Aug 31, 2015	Amb	**Out Side**	**< 0.003**
3	**3**	945 Aug 25, 2015	1650 Aug 25, 2015	2.50	1062.5	62.5	100	M	79.6	HM	Aug 31, 2015	Amb	**Rock Truck**	**0.029**

Load - Particulate / Fibre Filter Loading Characteristics : L - Light M - Moderate H - Heavy O - Overload

Comments

Samples Analyzed In Accordance With The NIOSH Asbestos and Other Fibres by PCM METHOD 7400 [8/15/94]
Limit of Detection (LOD) 7 Fibres/mm2
Range 100 to 1300 Fibres/mm2 filter area
< Means Less Than
Samples Submitted Will Be Retained For 30 Days After Receipt And Will Be Disposed Of Thereafter Unless Otherwise Notified In Writng
Amb Means Ambient; Occ Means Occupational; Clr Means Clean Room; Blk Means Blank
AC Means Air Clearance; PtA Means Post Abatement; PrA Means Pre Abatement
Sample Submited By General Contractor

August 31, 2015 [Facsimile]

H. McKnight
Analyst

G. Nawrocki
Reviewed By

Fibre(s) In Air Report

Wes-Har Asbestos Analysis & Consulting Ltd.

For P S Sidhu Trucking
10 Sunset Dr. N,
Whitehorse, YT Y1A 4M8

Location : Clinton Creek Site

Project : ClintonCr

14559 Clinton		Time On	Time Off	Flow	Volume	Fibre	Field	Load	Fibre mm 2		Analyzed	Type	Location	Fibre/mL
1	**1**	730 Sep 13, 2015	1700 Sep 13, 2015	2.50	1425.0	22.5	100	L	28.6	HM	Sep 18, 2015	Amb	**210 Backhoe**	**0.008**
2	**4**	730 Sep 13, 2015	1700 Sep 13, 2015	2.50	1425.0	45.0	100	L	57.3	HM	Sep 18, 2015	Amb	**Rock Truck**	**0.015**
3	**7**	730 Sep 13, 2015	1700 Sep 13, 2015	2.50	1425.0	1.0	100	L	< 7	HM	Sep 18, 2015	Amb	**Outside Air**	**< 0.002**

Load - Particulate / Fibre Filter Loading Characteristics : L - Light M - Moderate H - Heavy O - Overload

Comments

Samples Analyzed In Accordance With The NIOSH Asbestos and Other Fibres by PCM METHOD 7400 [8/15/94]
Limit of Detection (LOD) 7 Fibres/mm2
Range 100 to 1300 Fibres/mm2 filter area
< Means Less Than
Samples Submitted Will Be Retained For 30 Days After Receipt And Will Be Disposed Of Thereafter Unless Otherwise Notified In Writng
Amb Means Ambient; Occ Means Occupational; Clr Means Clean Room; Blk Means Blank
AC Means Air Clearance; PtA Means Post Abatement; PrA Means Pre Abatement

Sample Submited By P S Sidhu Trucking

September 18, 2015 [Facsimile]

H. McKnight
Analyst

G. Nawrocki
Reviewed By