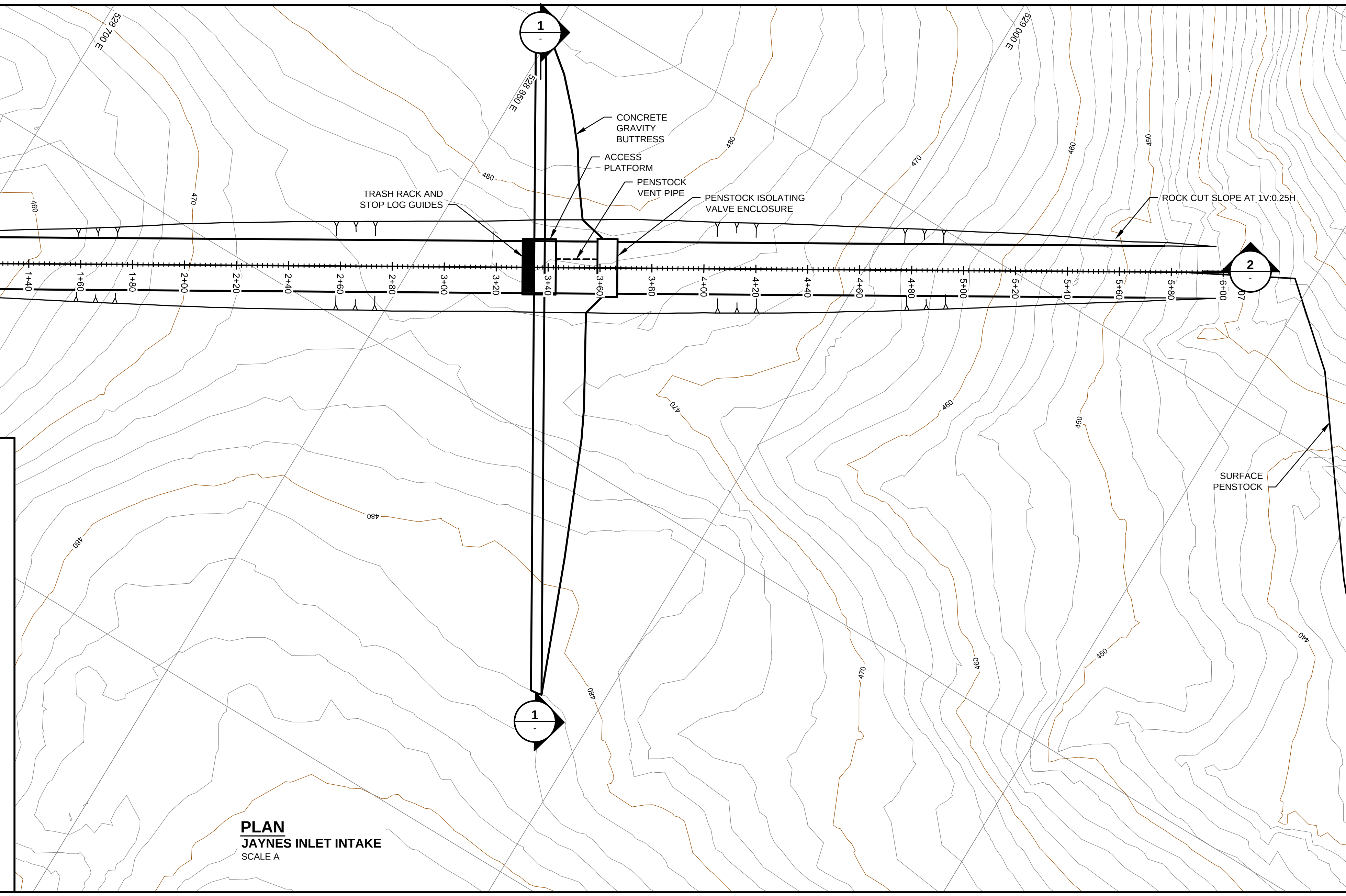
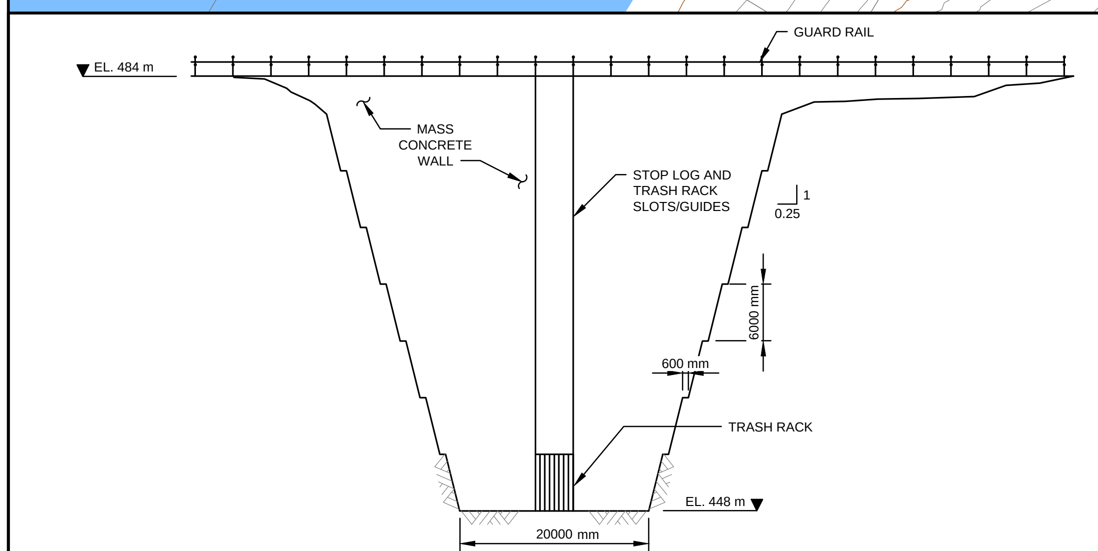
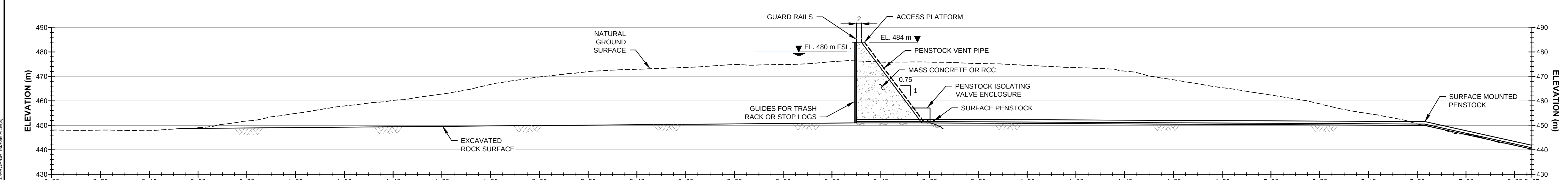


PLAN
JAYNES INLET INTAKE
SCALE A



SECTION 1
INTAKE UPSTREAM ELEVATION
SCALE C



LONGITUDINAL SECTION 2
INTAKE
SCALE B

LEGEND:

- ORIGINAL GROUND
- EXCAVATION LINE
- RIVER/STREAM/DRAINAGE
- MAJOR CONTOUR
- MINOR CONTOUR

NOTES:

1. COORDINATE GRID IS UTM NAD83 ZONE 19.
2. CONTOUR INTERVAL IS 2 METRES.
3. DIMENSIONS AND ELEVATIONS ARE IN METRES, UNLESS NOTED OTHERWISE.
4. ROCK TRENCH CUT AT 1V:0.25H, 6 m RISES WITH 0.6 m BENCH.

NOT FOR CONSTRUCTION

SCALE A: 20 10 0 20 40 60 80 100 m
SCALE B: 16 8 0 16 32 48 64 80 m
SCALE C: 8 4 0 10 20 30 40 m

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	12FEB'13	ISSUED WITH REPORT	SRM	AS	RAC	SRM

QULLIQ ENERGY CORPORATION

IQALUIT HYDROELECTRIC PROJECT

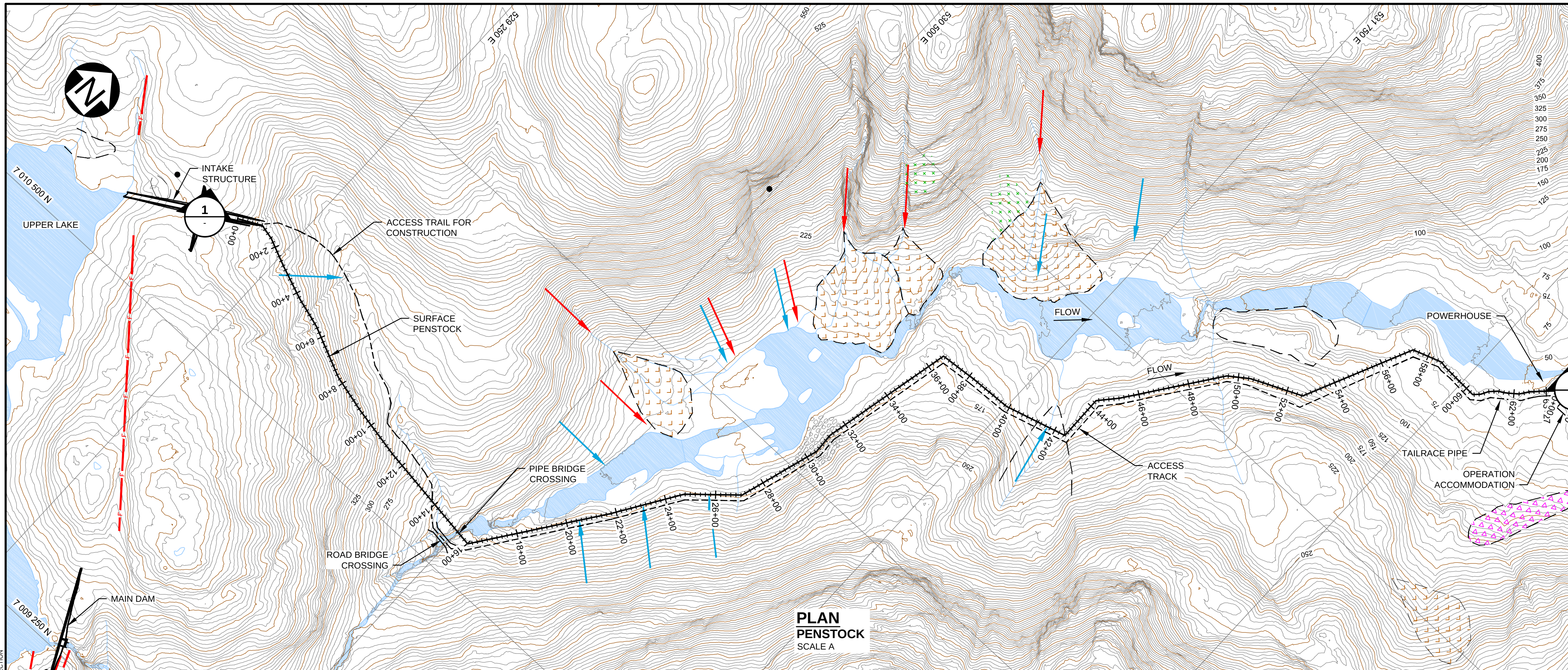
JAYNES INLET
INTAKE PLAN

Knight Piésold CONSULTING

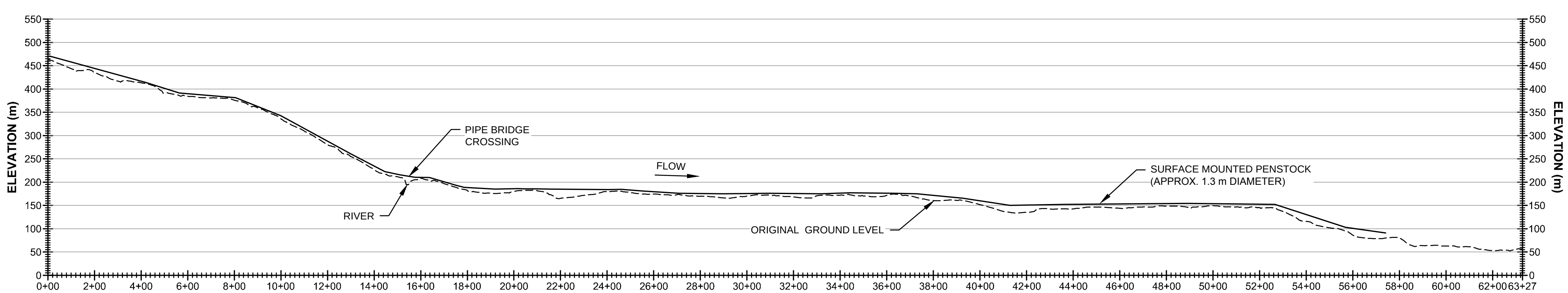
P/A NO.	REF NO.
NB103-137/8	1

FIGURE 3.3 REV 0

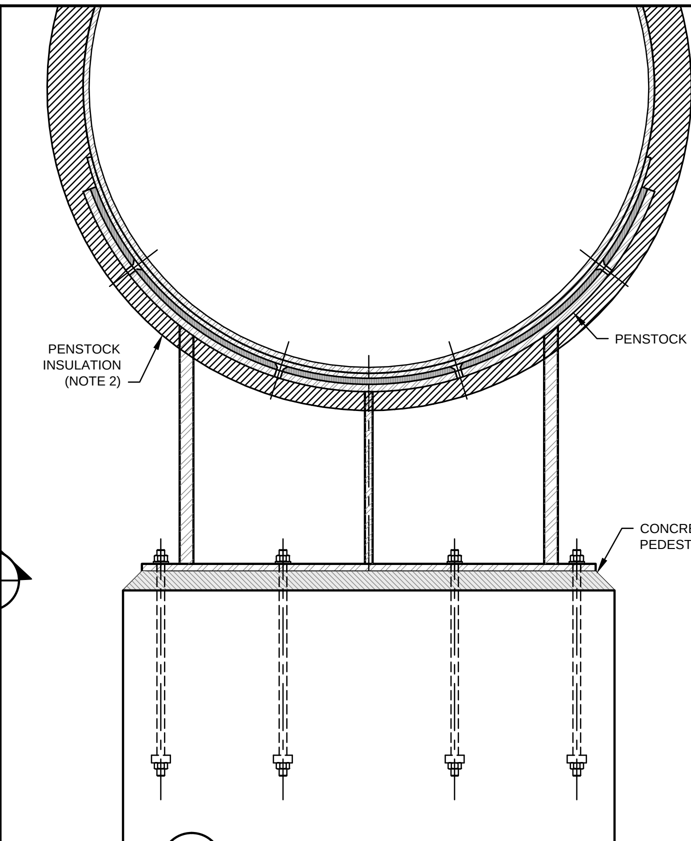
SAVED: I:\1\03\00137\08\A\Acad\FIGS\B09_r0, 2/7/2013 2:32:10 PM , ASIMPSON PRINTED: 2/7/2013 2:34:09 PM, INTAKE, ASIMPSON
XREF FILE(S): JAYNES, JAYNES-EMBK, JAYNES-POWERHOUSE, ALL-PROF-DH IMAGE FILE(S):



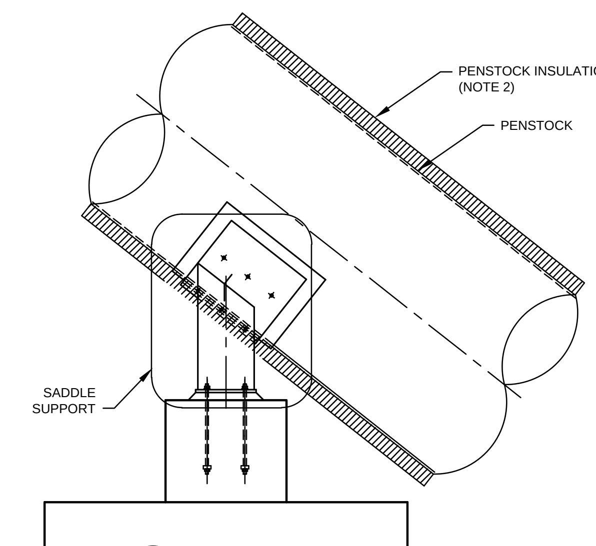
PLAN
PENSTOCK
SCALE A



SECTION
PENSTOCK
SCALE D



DETAIL A
SADDLE SUPPORT
SCALE B



DETAIL B
SADDLE SUPPORT
SCALE C

SCALE A: 200 100 0 200 400 600 800 1000 m
SCALE B: 0.2 0.1 0 0.2 0.4 0.6 0.8 1 m
SCALE C: 0.5 0.25 0 0.5 1.0 1.5 2.0 2.5 m
SCALE D: 250 125 0 250 500 750 1000 1250 m

LEGEND:

- DEBRIS FAN
- TALUS
- SCREE
- SNOW AVALANCHE HAZARD
- DEBRIS FLOW HAZARD
- ROCK AVALANCHE HAZARD
- ACCESS TRAIL
- GEOLOGICAL BOUNDARY
- FAULT LINE
- POWERHOUSE SITE

NOT FOR CONSTRUCTION

NOTES:

1. COORDINATE GRID IS UTM NAD83 ZONE 19N.
2. PENSTOCK INSULATION TO BE 150 mm RIGID POLYURETHANE WITH GALVANIZED STEEL OUTER JACKET.
3. PENSTOCK TO BE HEAT TRACED ALONG ITS ENTIRE LENGTH.
4. CONTOUR INTERVAL IS 5 METRES.

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	12FEB'13	ISSUED WITH REPORT	SRM	AS	RAC	SRM

QULLIQ ENERGY CORPORATION

IQALUIT HYDROELECTRIC PROJECT

JAYNES INLET PENSTOCK
PLAN, SECTION AND DETAILS

Knight Piésold CONSULTING

P/A NO. NB103-137/8 | REF NO. 1

FIGURE 3.4 | REV 0

3.4 POWERHOUSE

A suitable powerhouse location was identified at an elevation of about 75 masl on the right bank adjacent to the first fish barrier falls upstream of the lower lake. The plan and a section of the powerhouse are presented as Figures 3.5 and 3.6. The location of the powerhouse in relation to the river is shown in Photo 5. The Powerhouse will include a reinforced concrete substructure and prefabricated steel superstructure. It will house two identical Pelton turbine generator units, control room, loading bay and overhead service crane. The two Pelton turbines will be rated at 5 to 7.5 MW each.

The Powerhouse will also house a bypass facility. This bypass facility will allow water to continue to flow through the penstock when both the turbine generating units are out of service. This will prevent the water from freezing in the pipe. This bypass facility is likely to only be required during the extremely cold winter months on the rare occasion when both units are out of services.

The powerhouse will have a gate that opens during the open water season to discharge water to the stream.

3.5 TAILRACE AND OUTFALL

A tailrace pipeline, approximately 3.2 km in length and 1.2 m in diameter, will discharge water from the powerhouse to the lower lake during the winter months. The tailrace pipeline will either be buried or surface-mounted on pedestals depending on the actual ground conditions encountered. The tailrace will discharge into the lower lake through the tailrace outfall structure that includes an energy diffuser. The plan and section of the tailrace and a section of the outfall are shown on Figure 3.7. During the summer months, the water discharging from the powerhouse will exit the tailrace box directly adjacent to the powerhouse via an open channel and be returned to the Jaynes Inlet River directly downstream of the fish barrier waterfall.

The lower lake discharges directly into Jaynes Inlet, which opens into Cincinnati Press Channel and separates Baffin Island from Pugh Island. Jaynes Inlet empties completely at low tide, whereas the Cincinnati Press Channel is generally a deep-water channel (approximately 30 to 60 m deep).

The project will result in a continuous discharge of water to the lower lake throughout the winter. This, in turn, is expected to result in a continuous discharge from the lower lake to Jaynes Inlet. The east end of the lake near the outlet is shallow (Figure 3.8). To prevent the outlet of the lower lake from freezing, which would cause the lower lake level to rise and spill out the low relief sides, a channel will be excavated across the shallow outlet of the lake and a pipeline installed to allow for continuous discharge to Jaynes Inlet. The pipeline will be equipped with a screen to prevent the upward movement of fish from the sea into the lower lake. It is expected, with these measures, that the flow will be sufficient to prevent freezing. The water will be discharged to Jaynes Inlet, where there is over 10 m of seawater (including up to 2 m of ice) at high tide and where the sea ice rests on the bottom of Jaynes Inlet at low tide.

0	12FEB'13	ISSUED WITH REPORT	SRM	AS	RAC	SRM
REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D

LEGEND:

- — — ORIGINAL GROUND
- RIVER/STREAM/DRAINAGE
- MAJOR CONTOUR
- MINOR CONTOUR
- — — GEOLOGICAL BOUNDARY

NOTES:

1. COORDINATE GRID IS UTM NAD83 ZONE 19.
2. CONTOUR INTERVAL IS 2 METRES.
3. DIMENSIONS AND ELEVATIONS ARE IN METRES, UNLESS NOTED OTHERWISE.

NOT FOR CONSTRUCTION

SCALE B 5 2.5 0 5 10 15 20 25 m

QULLIQ ENERGY CORPORATION

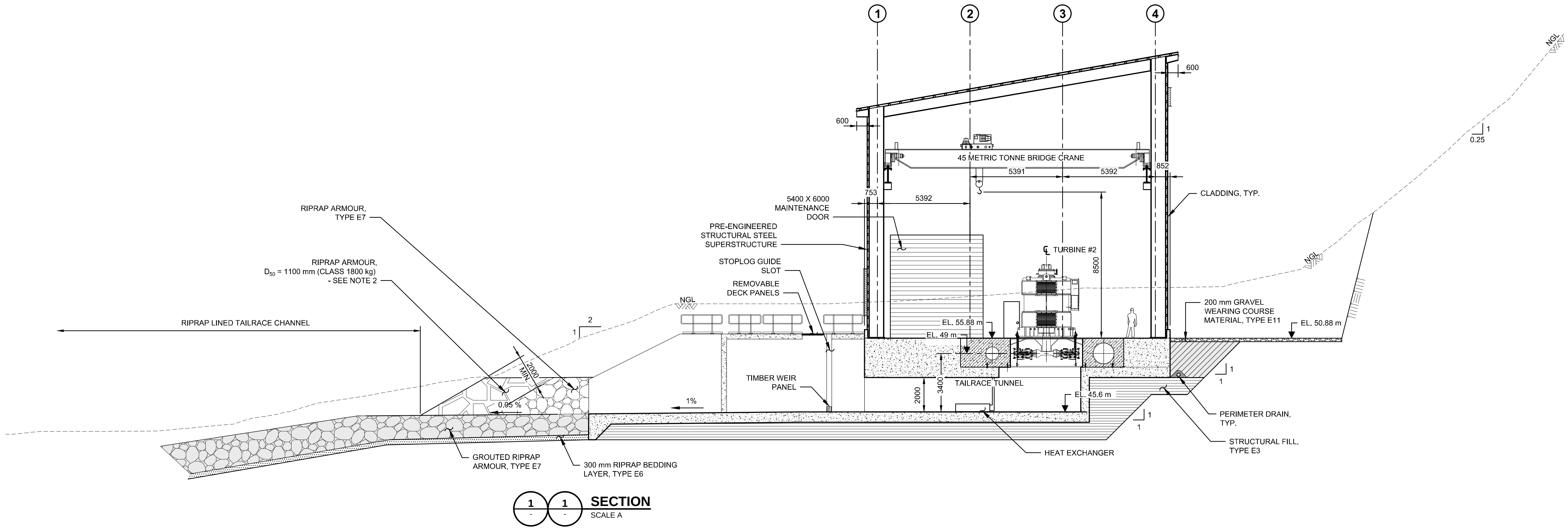
IQALUIT HYDROELECTRIC PROJECT

JAYNES INLET POWERHOUSE PLAN

Knight Piésold CONSULTING

P/A NO.	REF NO.
NB103-137/8	1

FIGURE 3.5 — REV 0



1 / - | 1 / - **SECTION**
SCALE A

LEGEND:

- STAGE 1 CONCRETE
- STAGE 2 CONCRETE
- PIPE BEDDING MATERIAL - TYPE E1
- PIPE ZONE MATERIAL - TYPE E2
- STRUCTURAL FILL - TYPE E3
- SELECT FILL - TYPE E4
- RIPRAP BEDDING LAYER - TYPE E6
- RIPRAP - TYPE E7
- GENERAL FILL - TYPE E9
- GRAVEL WEARING COARSE MATERIAL - TYPE E11

NOTES:

1. DIMENSIONS ARE IN MILLIMETRES AND ELEVATIONS ARE IN METRES, UNLESS NOTED OTHERWISE.
2. RIPRAP ARMOUR AT OUTLET OF TAILRACE CHANNEL TO TIED IN AND MATCH EXISTING RIPRAP SIZE FOR RIVER CHANNEL ARMOURING. CREEK BANK RIPRAP ARMOUR SHALL NOT BE SMALLER THAN D_{50} = 1100 mm (CLASS 1800 kg) ROCK WITH 2000 mm LAYER THICKNESS.
3. NGL = NATURAL GROUND LEVEL.

NOT FOR CONSTRUCTION

SCALE A: 2500 1250 0 2500 5000 7500 10000 12500 mm

QULLIQ ENERGY CORPORATION

IQALUIT HYDROELECTRIC PROJECT

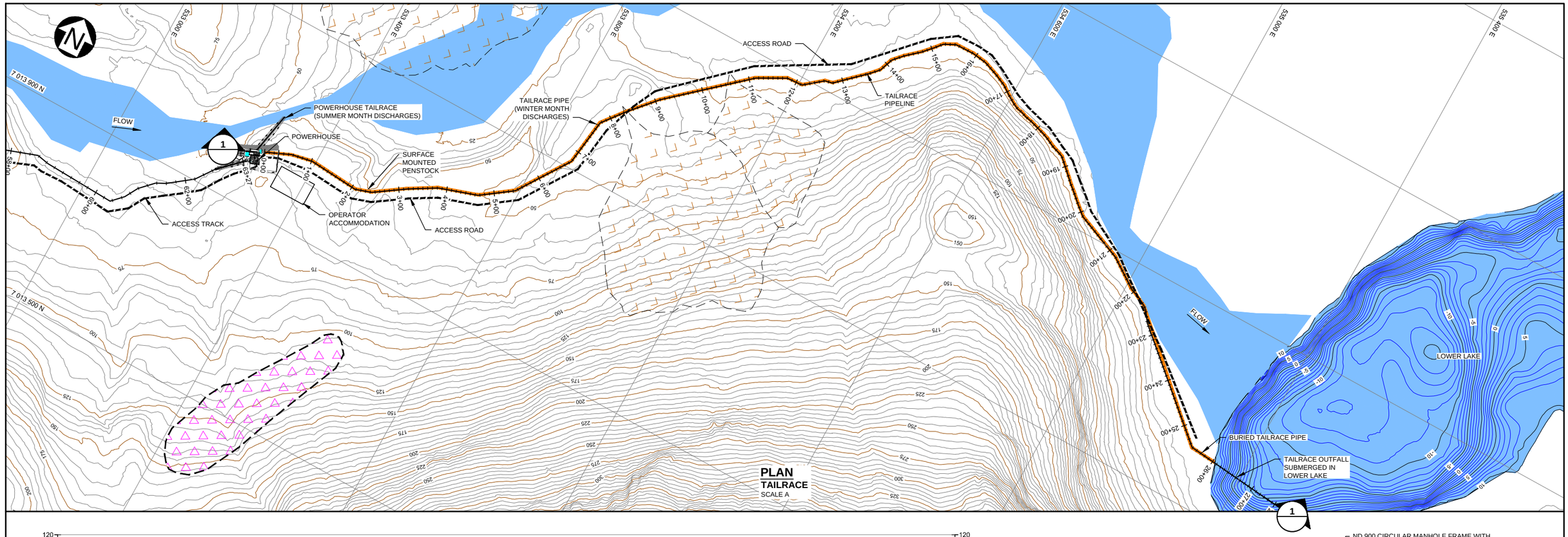
JAYNES INLET
POWERHOUSE GENERAL ARRANGEMENT
SECTION 1

Knight Piésold CONSULTING

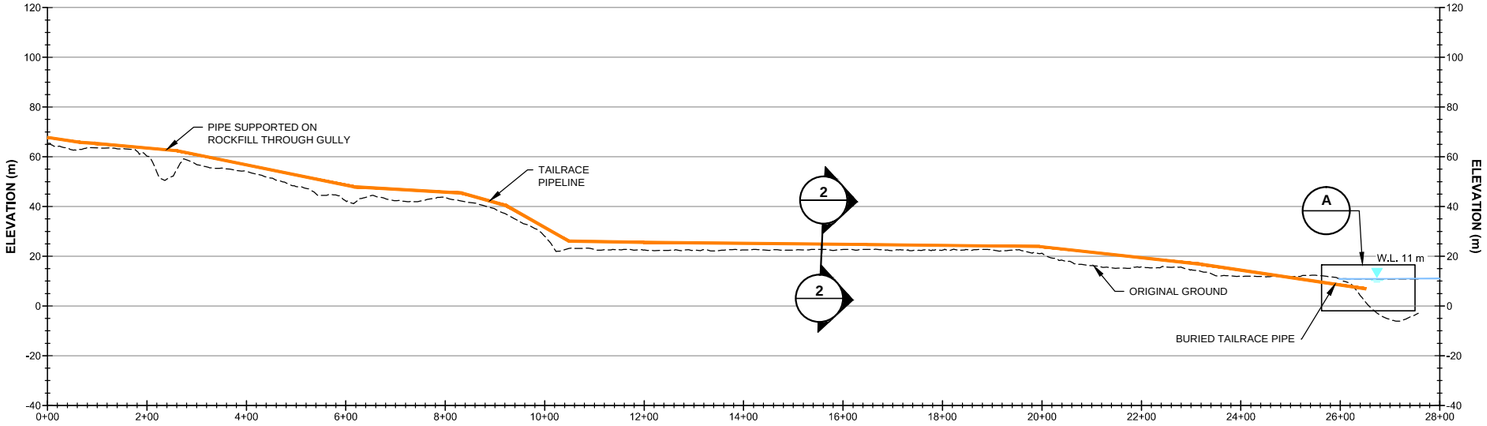
P/A NO.	REF NO.
NB103-137/8	1

FIGURE 3.6 REV 0

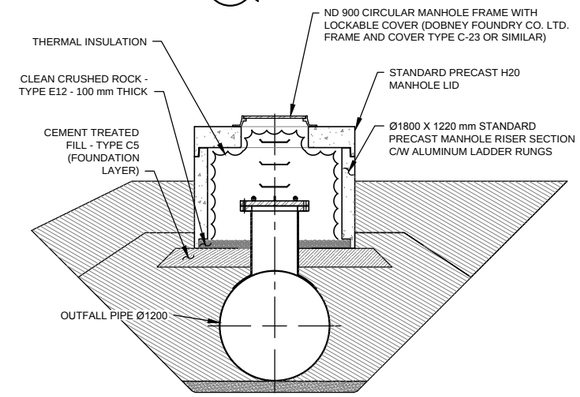
REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	12FEB'13	ISSUED WITH REPORT	SRM	AS	RAC	SRM



PLAN
TAILRACE
SCALE A



1 SECTION
TAILRACE
HORIZONTAL: SCALE B
VERTICAL: SCALE C



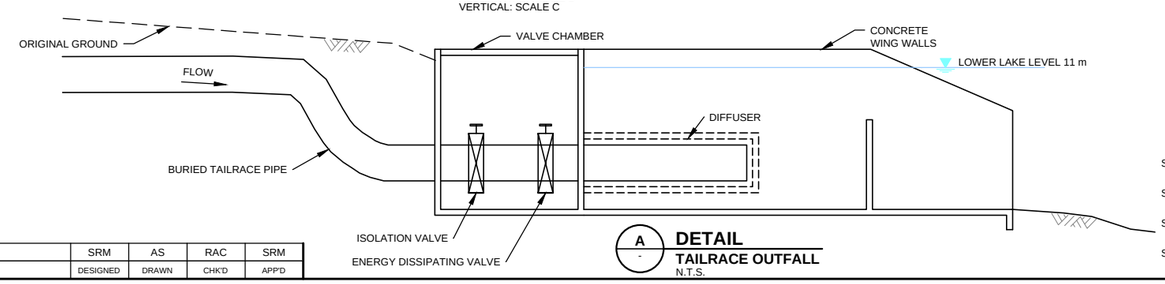
2 TYPICAL SECTION
ACROSS MANHOLE
(BURIED TAILRACE PIPE/OUTFALL)
SCALE D

LEGEND:

- WATER
- DEBRIS FAN
- TALUS
- ACCESS TRACK/ROAD
- GEOLOGICAL BOUNDARY
- TAILRACE PIPELINE

NOTES:

1. COORDINATE GRID IS UTM NAD83 ZONE19.
2. CONTOUR INTERVAL IS 5 METRES.



A DETAIL
TAILRACE OUTFALL
N.T.S.

NOT FOR CONSTRUCTION

SCALE A 80 40 0 100 200 300 400 m
SCALE B 120 60 0 120 240 360 480 600 m
SCALE C 20 10 0 20 45 70 95 120 m
SCALE D 0.8 0.4 0 1 2 3 4 m

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	12FEB'13	ISSUED WITH REPORT	SRM	AS	RAC	SRM

QULLIQ ENERGY CORPORATION

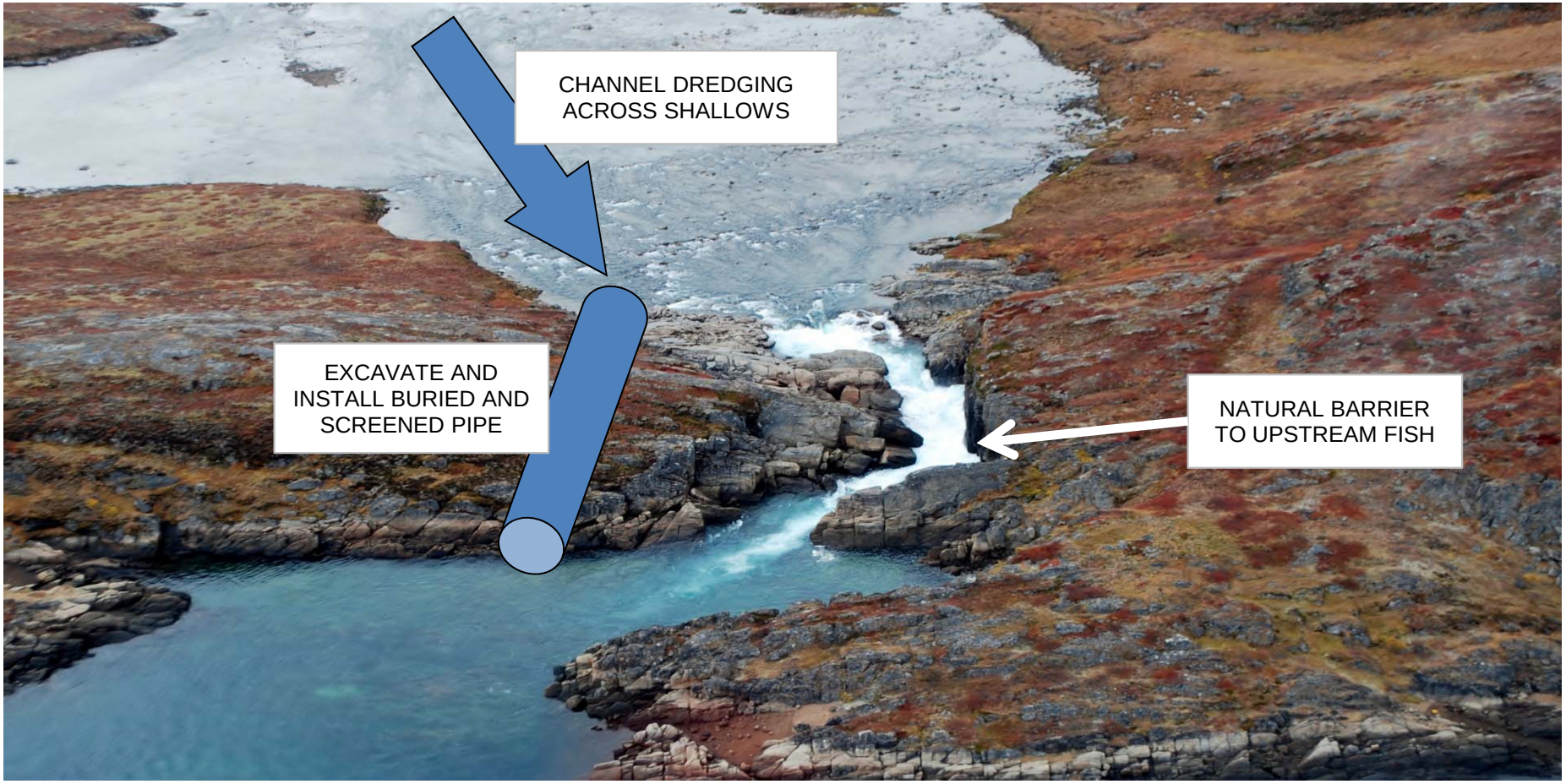
IQALUIT HYDROELECTRIC PROJECT

JAYNES INLET TAILRACE PIPE
PLAN AND SECTION

Knight Piésold CONSULTING

P/A NO. NB103-137/8 | REF NO. 1

FIGURE 3.7 | REV 0



REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	12FEB'13	ISSUED WITH REPORT	RDW	RAC	SRM

QULLIQ ENERGY CORPORATION

IQALUIT HYDROELECTRIC PROJECT

MODIFICATIONS TO LOWER LAKE DISCHARGE TO JAYNES INLET

Knight Piésold CONSULTING

P/A NO. NB103-137/8

REF. NO. 1

FIGURE 3.8

REV 0

3.6 CONSTRUCTION METHODOLOGY

At Jaynes Inlet, equipment and materials will be delivered by sealift each open water season during the construction phase. The sealift vessels will anchor at a suitable location within Frobisher Bay, and shallow draft barges will shuttle supplies into Jaynes Inlet at the location identified on Figure 1.2. The barges will arrive at high tide and beach in Jaynes Inlet. A ramp will be constructed by cutting into the shoreline at the barge landing site, to facilitate unloading of equipment and materials from the barge.

To facilitate construction, initial site capture will involve drilling, and blasting the shallow bedrock outcrops south of the lower lake to establish a reasonably flat working area for the camp and construction laydown area. A road will be constructed around the west side of the lower lake flanking the hillside to the powerhouse location (Figure 1.2).

An access track will be established from the powerhouse location up the valley to the upper lake working area (Figures 1.2 and 3.1). A temporary bridge will be necessary towards the top of the valley, as the access track crosses to the north side of the river and progresses up a steep chute to the intake area. The access track will be used to move heavy equipment and most of the consumables to the work area. People and supplies will also need to be transported to the upper lake working area by helicopter. Consideration is being given to installing and utilizing a highline system to move supplies to the upper lake area.

The anticipated construction equipment fleet is presented in Table 3.1. Construction activities will include the following:

- Drill, blast and excavation of the intake
- Crushing to produce aggregate for concrete manufacture
- Concrete production and construction of the main dam
- Installation of the surface penstock, surface tailrace, and outfall into the lower lake
- Construction of the powerhouse
- Drill, blast and excavation of a trench in the shallow outlet of lower lake and installation of the pipe outfall to Jaynes Inlet

Table 3.1 Typical Construction Equipment Fleet

Equipment	Proposed Use
1 L4 to B2 Helicopter	Transportation of people, slinging of materials, field surveys, monitoring
1 large transport helicopter	Transportation of people, slinging of larger materials and equipment
2 rock drills	Drilling for aggregate production and intake excavation
Dozers (3)	Move material; construct laydown and road, transport equipment and materials over access track
Front-end loaders	Move rock and fill, move containers
Zoom-boom	Move seacans and iso-containers
Haul trucks (4)	Move rock and soils
Crusher	Develop aggregate for construction

With regard to helicopter use, it will be necessary to utilize low-level flying around the Project site throughout the construction phase. However, during longer transits, such as to and from Iqaluit, a minimum flight altitude of 600 m will be followed, unless low cloud cover requires lower flight altitudes for safety reasons.

A 75-person trailer camp (approx.) will be established at the designated construction camp and laydown area south of the lower lake (Figure 1.2). Water for the camp will be drawn from the lower lake, and sewage will be treated in a packaged sewage treatment plant and discharged to Jaynes Inlet. The camp will be equipped with a modern incinerator to dispose of food wastes and other combustible and non-hazardous wastes. All other wastes will be stored in containers for annual shipment off-site by sealift. A summary of waste volumes and disposal methods is provided in Table 3.2.

Table 3.2 Construction Phase Waste Management Plan

Type of waste	Projected Amount Generated	Method of Disposal	Additional Treatment Procedures
Sewage (human waste)	15 m^3/day est.	Package sewage treatment plant	None
Greywater	4-6 m^3/day	Sump or sewage plant	None
Drilling brine	1 m^3/day	Sumps	None
Combustible wastes	0.5 tonne/day	Incineration	None
Non-Combustible wastes	Unknown	Storage in containers, off-site transport	Not applicable
Hazardous waste (waste oil)	Unknown	Storage in containers, off-site transport	Not applicable

Fuel will be delivered to site on the sealift in full 20,000 L capacity double-walled iso-containers. An estimated 20 iso-containers of diesel and 5 iso-containers of Jet A fuel will be delivered each construction season. The iso-containers will be moved across the site using a boom-truck and fuel may be delivered using smaller containers by helicopter.

3.7 FACILITY OPERATION AND MAINTENANCE

The facilities will most likely be remotely controlled from QEC headquarters in Iqaluit. It is also likely that there will be one or two full time caretakers at each of the facilities to respond to minor outages and maintenance requirements. Operator's accommodation will be provided adjacent to each powerhouse site.

With the onset of freshet each year and the accumulation of water from precipitation over the open water season, the upper lake will raise a maximum of 30 m, from its current height of 450 masl to the spillway elevation of 480 masl. Since the project operates with a discharge of approximately 4 m^3/s, the water level in the upper lake will drop slowly over the winter. During winter, water from the powerhouse will discharge via the tailrace pipeline to the lower lake, which will subsequently

discharge to Jaynes Inlet. During the open water season, a gate will divert the same flow to an armoured tailrace at the powerhouse into the adjacent river.

Annual maintenance inspections will be carried out by specialist dam safety, structural, mechanical and electrical engineers. This inspection will likely take place over a single week each year. There will also be environmental monitoring requirements at intervals throughout the year to help ensure the project is being operated in accordance with the approved regulatory requirements. There will also be regular maintenance inspections (4 times per year) along the transmission line. During the summer months, these inspections will likely be conducted via helicopter, and during the winter months via snow mobile. An 8 to 10-person permanent camp will be established to facilitate access to the sites for the various personnel. The permanent camp services will include running water, fuel storage, sewage collection/incineration, waste removal/incineration, security and backup power.

Every 10 to 15 years there will be a major maintenance inspection and servicing of the projects. This will likely take place over a four week period in the summer, with up to ten technicians and engineers involved. The same will be applicable to the transmission lines, with major maintenance inspections and servicing taking place every 10 to 15 years with a crew of about ten to fifteen technicians and engineers.

3.8 FACILITY DECOMMISSIONING

The facilities have an anticipated operational life of at least 40 years. If maintained and with necessary retrofits, it is expected that the Project will continue to produce electricity for the City of Iqaluit indefinitely.

If/when the Project must be decommissioned, it is anticipated that all aboveground components will be dismantled and removed, the intake plugged, the dam removed, and the area returned to its pre-development state. The powerhouse could be decommissioned through removal of the electrical and mechanical equipment, dismantling of the structure and disposal (or recycling) of the metal and other construction materials. Materials will either be disposed of on-site in a landfill or off-site. Some below-ground components such as concrete foundations may remain in place to minimize disturbance if they do not pose a risk to the environment or potential land users.