Design of Pipeline System to Augment Natural Replenishment of Nipissar Lake

Rankin Inlet, Nunavut, Canada

FSC Project # 2010-0570

December 15, 2010

Prepared for:

The Office of the Regional Director
Kivalliq Region
Department of Community and Government Services
Government of Nunavut

Prepared by:

FSC Architects & Engineers
Bldg. 1088C, Noble House
Iqaluit, Nunavut
X0A 0H0

LISTEN. DESIGN. MANAGE.

FSC File: 2010-0570
15 December, 2010

Government of Nunavut
Dept. of Community & Government Services
Project Management/O&M Building, PO Bag 002
Rankin Inlet, Nunavut X0C 0G0

Attn: Mr. Jeff Hunter, Project Officer

Re: Design of Pipeline System to Augment Natural Replenishment of Nipissar Lake

Rankin Inlet, Nunavut, Canada

Dear Mr. Hunter,

Following please find our Submission of the Final Design Report for this project.

We consider that this submission, together with the attached Issued for Review drawings is suitable for submission to the Nunavut Water Board for their review and approval.

This submission reflects changes to the Schematic Design Report coming from meetings both on site and in CGS offices in Rankin Inlet.

Please contact Kevin Hodgins or myself should you have any questions.

Sincerely,

FSC ARCHITECTS & ENGINEERS

Walter Orr, P. Eng., Principal
Civil Engineering

Table of Contents

1 Scope of Work

1.1 GENERAL

FSC understands from our earlier work on this project and the GN prepared Terms of Reference that the GN requires Professional Engineering Services for the design and production of tender documents for a pipeline between First Landing Lake and Nipissar Lake intended to augment the natural replenishment of Nipissar Lake which will be suitable to satisfy the community of Rankin Inlet's water demand for a minimum period of 20 years.

It is noted in the Terms of Reference that the Work required to complete this task may include:

1. A study of the volume of water required to augment the natural replenishment of the water supply lake for a 20 year project life.
2. Research and a site visit to develop an understanding of the existing water supply system and the topography of the subject lakes and interlaying land mass.
3. A basic topographical survey of the proposed pipeline route.
4. Sizing of pumps and piping and a development of a possible pumping schedule to determine the composition of the system with respect to weather, topography and other factors.
5. Design of minimalist intake and discharge structures.

2 Stage One: Design Services - Requirements

2.1.1 General

In this first component of the project we have completed the preliminary routing study and topographic survey. Next, we have established a recommended pipe and pump sizing based on the hydraulic analysis of the system.

We have consulted with the community and the GN as the project advanced. This Final Design Report highlights the recommended system elements or additions to the defined conclusions. This report includes two alternative conceptual designs meeting all program requirements, including budgets.

2.1.2 Preliminary Routing Studies

Prior to completing detailed ground surveys, we reviewed the available aerial photography and digital mapping to complete an initial reconnaissance of the possible routing options. This initial research allowed us to complete the ground truthing efficiently and narrow the field surveys to only areas that are pre-selected as practical routes based on accessibility, terrain and soil type.

2.1.3 Topographic Survey

We have completed the topographic survey utilizing state of the art differential GPS survey equipment. We ensured survey accuracy by triangulation and projection of the GPS equipment by referring to locally established geodetic control points.

Mr. Clay Peck completed the survey. He accessed the survey rotes by use of a four wheel quad vehicle and worked to choose a routing that will minimize disruption to the natural landscape, and maximize operation requirements

2.1.4 Submission #1: Schematic Design Report.

In this Schematic Design Stage we include:

- Design calculations, including amount of volume required to be pumped each calendar year for the design life of the system, complete with estimated durations of seasonal pumping.
- Consideration of seasonal constraints – when pumping will occur, etc.
- Proposed path of pipeline system
- Pipeline intake location(s) and intake design
- Pipeline discharge location(s) and discharge design
- Pump locations, proposed pump operations, pump size and capacity
- Proposed capacity of pipeline system
- Size of pipeline (length, diameter, etc.)
- Design measures for system reliability, and furthermore, system redundancy
- Class D estimates for material supply and construction.
- Community consultation

- Review and verification of the technical feasibility and practicality of the recommended alternative.
- Implementation plan and schedule and identify potential construction techniques.
- Identification of known environmental, construction and other constraints/restrictions.
- System operations will be identified and explained.
- We are prepared to attend at teleconference review meetings following this submission.

3 Submission #2: Final Design Report.

The Final Design Report, provides the following information:

3.1 DESIGN CALCULATIONS

In evaluating the requirements of this project, we drew heavily on the 20087/8 and 2009 FSC reports examining Rankin Inlets water requirements.

Currently Rankin Inlet is consuming water at approximately 469 LCPD, with a 2009 population of 2499. Utilizing a 2030 population growth rate of 3% gives a population of 4649.

From the FSC 2009 report, the average Water resupply to Nipissar Lake is 311,789 m3/year

We have calculated the expected water consumption at varying per capita rates as per the FSC 2009 report, extended to 2030.

For example if we take the demand rate in year 2030 to be 344 LCPD, this results in a consumption in Year 2030: = 4649 x 344 x 365 / 1000 = 583,713 m3/year

Required Water to be made up into Nipissar Lake from Lower Landing Lake = 583,713 – 311,789 = 271,924 m3/year..

The highest pumping requirement in 2030 is 484,029 m3/year. See Table 2 following.

Table 1 – Rankin Inlet Water Demand

Population Growth Rate		2010 Pop.	2.0% Growth	2.5% Growth	3.0% Growth
2030 Population		2,499	3788	4197	4649
Water Consumption Rate A	301 LCPD	274,553	416,130	461,134	510,749
Water Consumption Rate B	331 LCPD	301,917	457,605	507,094	561,654
Water Consumption Rate MACA	344 LCPD	313,774	475,577	527,010	583,713
Water Consumption Rate C	393 LCPD	358,469	543,319	602,078	666,858
Water Consumption Rate D (current)	469 LCPD	427,791	648,389	718,511	795,818

Table 2 – Rankin Inlet Water Shortfall

Required Recharge Year 2030	2010 Pop.	2.0% Growth	2.5% Growth	3.0% Growth
301 LCPD	-37,236	104,341	149,345	198,960
331 LCPD	-9,872	145,816	195,305	249,865
344 LCPD	1,985	163,788	215,221	271,924
393 LCPD	46,680	231,530	290,289	355,069
469 LCPD	116,002	336,600	406,722	484,029

3.2 CONSIDERATION OF SEASONAL CONSTRAINTS

It is anticipated that the typical pumping season would extend over a maximum of 3 months each year, from Mid June to Mid September. While a longer season could possibly be utilized, starting earlier runs into problems with ice cover on Lower Landing Lake, and access to the site itself.

Starting later could run into problems with freeze up of the pipe.

It would be possible to pump in the winter or the early spring, however freeze up concerns of the pipeline if flow should be interrupted make that a less desirable time. It does, however, make the intake situation a bit easier as the intake would simply drop through a hole in the ice on Lower Landing Lake.

Depending on requirements for total flow, we would recommend that the pumping season be constrained to a three month season in the summer.

3.3 PROPOSED PATH OF PIPELINE SYSTEM

From Lower Landing Lake to Nipissar, we considered basically two options.

Option 1 effectively follows the roadway between the two lakes, with the pipeline following the routing of the of the road passing by, at a minimal offset to the roadway.

Option 2 goes overland from Lower Landing Lake to Nipissar, with the routing selected to minimize elevation changes in the line requiring high point air releases, or low point drains.

Option 1 is slightly shorter than Option 2 and has the additional advantage of easier access for construction and maintenance. However, Option 1 has the disadvantage of going up over a high point of land, some 18 m higher than the lake. This additional 'head' requirement will significantly raise the pumping effort required, and poses issues with possible excessive pipe head loss running downhill resulting in suction on the pipe.

In addition, Option 1 would have a number of high and low points along the line, either requiring an air release valve or a water drain valve. As such, operationally it would be significantly more challenging to operate.

Option 2 would be cheaper to operate, and require a smaller and cheaper pump than Option 1.

In addition, Option 2 is 'graded' so that there is only one low point in the system, and only two high points, for easier filling and draining of the line each year. This greatly simplifies operation of the line.

Community Consultation

On September 29 2010 FSC carried out a site meeting with representatives of the Community of Rankin Inlet, and the Government of Nunavut (GN).

Representing the Community of Rankin Inlet were Councilors Jackson Lindell and Pujuutt Kusugak, and the Economic Development Officer, Damian MacInnis.

Representing the GN was Jim Wall, Rankin Inlet Utilidor Systems Manager.

Representing FSC was Walter Orr, P. Eng.

The routing of the line, both Option 1 and 2 locations were reviewed, and discussion took place on the merits of each. Option 1 was recognized as being somewhat easier to construct, but Option 2 was seen to be acceptable.

The proposed intake location (See Section 3.4 following) was examined, and all agreed that it would be appropriate technically to withdraw water at that location.

The only concern mentioned, and one which applied to either Option, was that there was a portion of both routes that crossed a primary snowmobile route, near Lower Landing Lake. It was agreed that a portion of the route (centered on where the line crossed the road to the river) should be buried to prevent interference with the pipe by snowmobiles.

Recommended Routing Option

The recommended pipeline routing is Option 2.

3.4 PIPELINE INTAKE LOCATION(S) AND INTAKE DESIGN

3.4.1 Initial Approach

Initially, our approach to the intake location looked to a spot adjacent to Lower Landing Lake, at a location where deeper water is near shore. This location is also accessible by a short road extension from the existing trail near Lower Landing Lake.

However, upon review of the location, several things stand out that have lead us to reconsider that location. These include the requirement to cross the river with the pipeline to get access to the site, additional length of pipeline to reach that location. Finally the fact that the intake location would be some distance away from the pump location would require a lengthy intake line, possibly more than 100 m in length. Given that one of the mandates for this work is to avoid costly permanent installations, such as a permanent intake line and submersible pumps, this would require a flexible hose intake to be used.

Such a lengthy line would cause problems with excessive head loss on the suction side of the pump, significantly limiting the available flow rate.

In addition, the initially evaluated location is in an area which floods each spring. Access to the area for pump servicing, and refueling could be a problem.

3.4.2 Revised Intake Location

A revised location was examined at the visit in October. The revised location draws water from the river rather than from the lake itself. The pump would be set at the location of the abutments for the old bridge location (the bridge itself is now gone). The intake would be into an existing pool on the south side of the river, adjacent to the pump location.

The revised location would be accessed from the old roadway, which is still intact. The intake line length would be significantly shorter than the other location, a maximum of 30 m in length.

We reviewed the proposed location two times in September, at the time of the year with near the lowest river flows, historically. At both times, there was sufficient depth (over 1 m) at the proposed location, to fully cover the proposed intake structure.

The recommended intake location is at that point.

See Figure 1 following.

Figure 1

3.4.3 Intake Type

The intake type proposed is a screened intake 'can' connected to the flexible intake line. The 'can' is constructed of Stainless Steel, with openings in the wire mesh of 0.1 inch (2.5 cm). It is capable of flowing up to 770 USGPM, the anticipated flow rate of the 250 mm pipeline.

3.4.4 Intake Design

An all weather, year round permanent intake is a significant cost to a project. Such and intake can run in the mid $100,000s (i.e. $500,000) to low $1,000,000s depending on length an details.

Given the seasonal summer only nature of the pipeline, providing an all weather, year round permanent intake would seem to be an unnecessary expense.

We recommend that a seasonal flexible pipe intake be used, with the actual intake itself be a floating structure, anchored in place throughout the summer season.

3.5 PIPELINE DISCHARGE LOCATION(S) AND DISCHARGE DESIGN

We recommend the pipeline end at the closest end of Nipissar Lake to Lower Landing Lake, approximately where shown on the picture following.

Figure 2

The discharge will be on to a concrete pad at the edge of the lake. The pad will armored with rip rap to prevent soil erosion from the flowing water.

3.6 PUMP LOCATIONS, PROPOSED PUMP OPERATIONS, PUMP SIZE AND CAPACITY

Given the recommendation to utilize a flexible temporary intake line, it is important to have the pump as close to the intake as possible.

We propose to use a trailer mounted, diesel powered pump, set on a pad near the edge of Lower Landing Lake, which connects to both the intake and pipelines with flexible piping.

The pad on which the pump will sit will be surrounded by chain link fence with a vehicle gate, for security and vandalism protection.

The pump size and power ratings depend on the pipeline route, size, material and on the chosen pump rate.

The pump rate depends upon the duration of pumping in any one season, and the amount at which the water consumption demand exceeds the capacity of Nipissar Lake.

3.7 PROPOSED CAPACITY OF PIPELINE SYSTEM

The following Table illustrates the different pump rates required for delivery of water at the year 2030. The rates shown are for different population growth rates, different water consumptions and for different pumping durations.

Table 3

Number of Days Pumping and Required Pump Rate				
301 LCPD		2.0% Growth	2.5% Growth	3.0% Growth
30 Days Pumping	20%	531 USGPM	760 USGPM	1,012 USGPM
45 Days Pumping	20%	354 USGPM	507 USGPM	675 USGPM
60 Days Pumping	20%	265 USGPM	380 USGPM	506 USGPM
75 Days Pumping	20%	212 USGPM	304 USGPM	405 USGPM
90 Days Pumping	20%	177 USGPM	253 USGPM	337 USGPM
105 Days Pumping	20%	152 USGPM	217 USGPM	289 USGPM

Down Time

Number of Days Pumping and Required Pump Rate				
344 LCPD		2.0% Growth	2.5% Growth	3.0% Growth
30 Days Pumping	20%	833 USGPM	1,095 USGPM	1,383 USGPM
45 Days Pumping	20%	556 USGPM	730 USGPM	922 USGPM
60 Days Pumping	20%	417 USGPM	547 USGPM	692 USGPM
75 Days Pumping	20%	333 USGPM	438 USGPM	553 USGPM
90 Days Pumping	20%	278 USGPM	365 USGPM	461 USGPM
105 Days Pumping	20%	238 USGPM	313 USGPM	395 USGPM

Down Time

Number of Days Pumping and Required Pump Rate				
469 LCPD		2.0% Growth	2.5% Growth	3.0% Growth
30 Days Pumping	20%	1,712 USGPM	2,069 USGPM	2,462 USGPM
45 Days Pumping	20%	1,142 USGPM	1,379 USGPM	1,642 USGPM
60 Days Pumping	20%	856 USGPM	1,035 USGPM	1,231 USGPM
75 Days Pumping	20%	685 USGPM	828 USGPM	985 USGPM
90 Days Pumping	20%	571 USGPM	690 USGPM	821 USGPM
105 Days Pumping	20%	489 USGPM	591 USGPM	704 USGPM

The pump rates are shown in US Gallons per minute (USGPM) as that is the standard pump metric for this market.

3.8 SIZE OF PIPELINE (LENGTH, DIAMETER, ETC.)

The pipeline length (for the recommended Option 2) is approximately 4350 m, and the intake line is taken to be 50 m.

The pipe material will be High Density Polyethylene (HDPE) for reasons of flow capacity, durability flexibility and cost.

We will provide estimates for different pipe wall thickness (dimension ratios).

At schematic design we evaluated two possible pump choices for this pipeline. One pump was a 4" pump, powered by a 4 cylinder 75 HP diesel engine. The other was a 6" pump, powered by a 6 cylinder 95 HP diesel engine.

The 6" pump showed little benefit over the 4" pump, and the 4" pumps was and is recommended for use with any of the reviewed pipeline sizes.

Chart 1

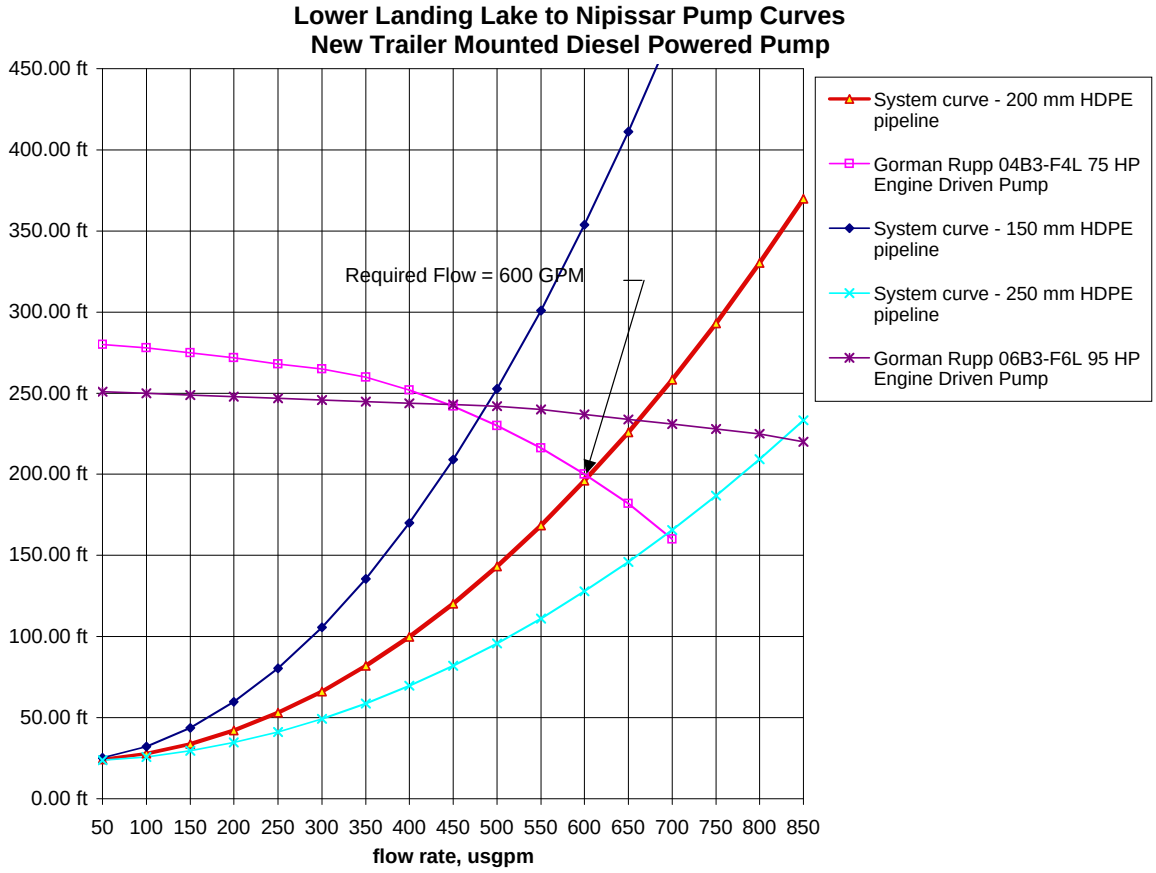


Chart 1 shows that both pumps would produce around 450 to 475 USGPM with a 150 diameter pipeline. The 4" pump gives 600 USGPM and the 6" pump 660 GPM into a 200 mm pipeline. The 4" pump gives 700 USGPM and the 6" pump 825 GPM into a 250 mm pipeline.

Given the above chart, and the previous Table 3 required pump rates, it is apparent that the desired pipeline diameter is linked to the growth of the community, and the success in reducing the water consumption per capita.

We recommend the 4" 75 HP pump. We see little benefit to the 6" pump over the 4", and the pump can be changed in a fairly straightforward way anyway if required in the future.

We recommend either the 200 mm or 250 mm pipelines. With the 75 HP pump, and extended pumping durations, it can supply each of the scenarios in Table 3 up to 2.5% growth and 469 LCPD, and all scenarios with 344 LCPD.

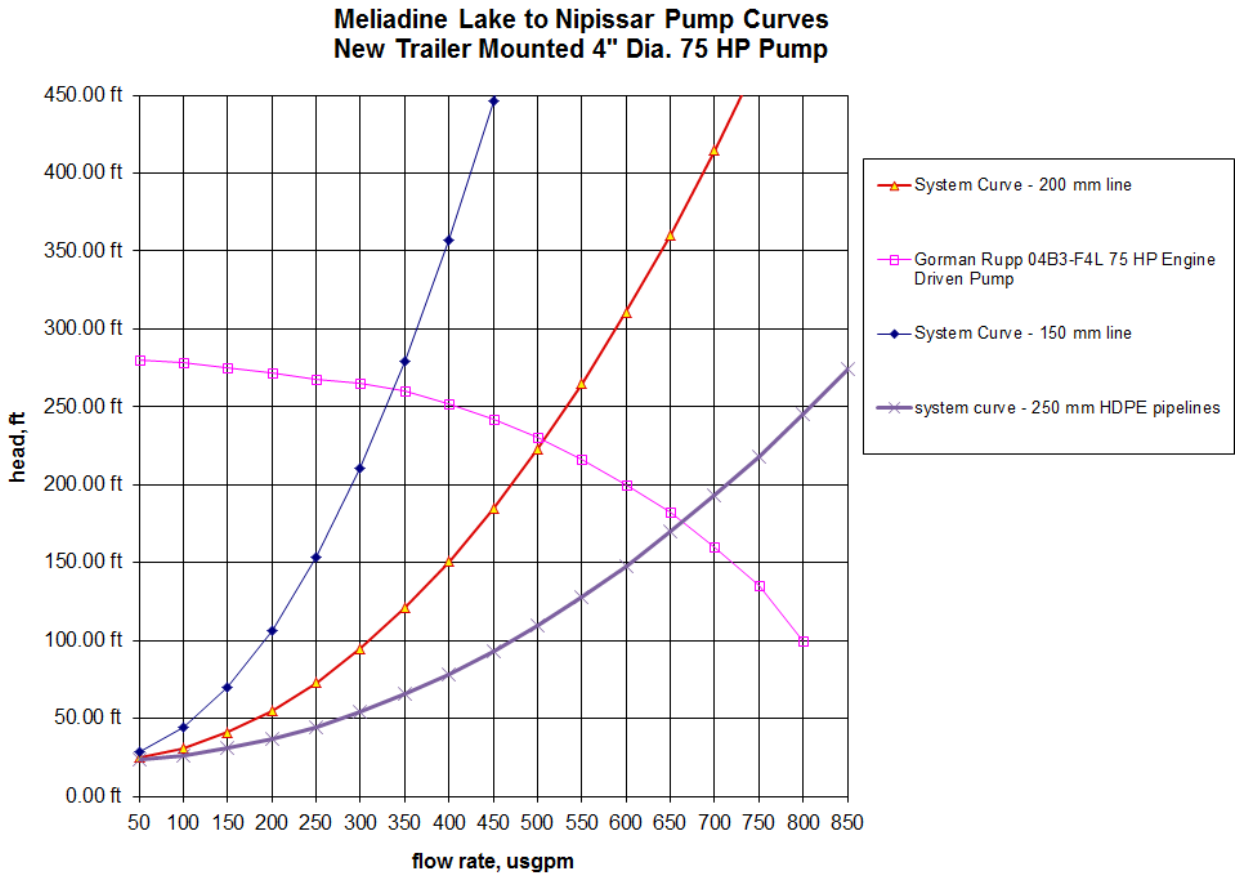
Where the 250 mm diameter pipeline has some merit is future growth. There have been discussions that state that in the future, it could be possible that the water supply source could be moved from Lower Landing Lake to Meliadine Lake in the future.

While the merits of such a relocation or move is not a part of this project, providing sufficient pipeline capacity for such a move would be prudent, if it comes at a sufficiently low additional cost.

A 250 mm pipeline, extended to Meliadine Lake, would provide lower head losses than a 200 mm pipeline. These lower head losses would be required to allow reasonable flow rates, without excessive pumping costs.

The following chart shows the pump rate curve for pumping from Meliadine Lake with an extended much longer pipeline.

Chart 2



3.9 DESIGN MEASURES FOR SYSTEM RELIABILITY, AND FURTHERMORE, SYSTEM REDUNDANCY

One issue that is significant in terms of cost, and operations is whether or not to cover the pipeline with an earth berm for protection.

A pipe berm would provide protection to the pipeline, from vandalism or inadvertent damage. It would also minimize the problem of safety concerns due to running into the pipeline on a snowmobile early in the year or when the pipe would be uncovered by drifting.

However, a pipe berm comes at a substantial cost, and presents additional construction difficulties of how to move and place the material for the berm, when constructing away from the road itself.

Given the high volume of snowmobile traffic near the end of the pipeline adjacent to the road crossing near the river, we recommend covering a portion of the pipeline with a gravel berm where it crosses the road near Lower Landing Lake.

3.10 ESTIMATES FOR MATERIAL SUPPLY AND CONSTRUCTION.

We have put together the following estimates for 150 mm, 200 mm and 250 mm pipelines.

150 mm Diameter Pipelines	**Length**		**$ per m**		**Cost**
150 mm DR 17 HDPE - Supply	4250	$	10.90	$	46,325.00
- Install	4250	$	20.00	$	85,000.00
Access Road Repair and Fenced Pad			$ per m^3		
25 mm gravel	400 m^3	$	75.00	$	30,000.00
Pipeline Berm (340 m)	340		$ per m^3		
25 mm gravel	184 m^3	$	100.00	$	18,360.00
Pump	1	$	50,000.00	$	50,000.00
Summer Only Intake	1	$	20,000.00	$	20,000.00
Spill Basin	1	$	3,500.00	$	3,500.00
Pipeline Location Fittings	85	$	100.00	$	8,500.00
High point Air Release	2	$	500.00	$	1,000.00
Shipping	25,245 kg	$	0.50	$	12,622.50
Contractors OH - Div 1			28%	$	77,086.10
Contingency			25%	$	88,098.40
Total				$	440,492.00

200 mm Diameter Pipelines	**Length**		**$ per m**		**Cost**
200 mm DR 17 HDPE - Supply	4250	$	18.50	$	78,625.00
- Install	4250	$	25.00	$	106,250.00
Access Road Repair and Fenced Pad			$ per m^3		
25 mm gravel	400 m^3	$	75.00	$	30,000.00
Pipeline Berm (340 m)	340		$ per m^3		
25 mm gravel	231 m^3	$	100.00	$	23,120.00
Pump	1	$	50,000.00	$	50,000.00
Summer Only Intake	1	$	20,000.00	$	20,000.00
Spill Basin	1	$	3,500.00	$	3,500.00
Pipeline Location Fittings	85	$	120.00	$	10,200.00
High point Air Release	2	$	500.00	$	1,000.00
Shipping	42,543 kg	$	0.50	$	21,271.25
Contractors OH - Div 1			28%	$	96,310.55
Contingency			25%	$	110,069.20
Total				$	550,346.00

250 mm Diameter Pipelines	**Length**		**$ per m**		**Cost**
250 mm DR 17 HDPE - Supply	4250	$	28.75	$	122,187.50
- Install	4250	$	30.00	$	127,500.00
Access Road Repair and Fenced Pad			$ per m^3		
25 mm gravel	400 m^3	$	75.00	$	30,000.00
Pipeline Berm (340 m)	340		$ per m^3		
25 mm gravel	286 m^3	$	100.00	$	28,560.00
Pump	1	$	50,000.00	$	50,000.00
Summer Only Intake	1	$	20,000.00	$	20,000.00
Pipeline Location Fittings	85	$	140.00	$	11,900.00
Spill Basin	1	$	3,500.00	$	3,500.00
High point Air Release	2	$	500.00	$	1,000.00
Shipping	51,893 kg	$	0.50	$	25,946.25
Contractors OH - Div 1			28%	$	117,766.25
Contingency			25%	$	134,590.00
Total				$	672,950.00

3.11 SUMMARY

FSC recommends construction of the following:

250 mm diameter HDPE pipeline, running from the old bridge location on the river between Lower Landing Lake and the bay.

The pipeline is to be covered for a portion of it's length near it's intake, but largely run on the surface with hold down stakes for location.

The pipeline routing is to be such that there is only one low point for drainage, and two high point air releases along the pipeline route, to simplify operations.

The Intake is to be a seasonal, relocatable intake screen, connected to a 150 mm diameter flexible suction line.

The pump is to be a 75 HP diesel engine powered, trailer mounted pump, and is to be stored in a sea can adjacent to the intake location when not in use.

The estimated cost of construction of the pipeline and accessories is $672,950 not including Project Management or Engineering.

4 Appendix A – Pipe Material Quotation

KWH PIPE (CANADA) LTD.
CORPORATE OFFICE
6507 MISSISSAUGA ROAD
MISSISSAUGA, ON L5N 1A6

Salesman: CURT SMIGEL
Phone:604-202-7904
Fax: 905-858-0208
Email:curt.smigel@kwhpipe.ca

Sales Quote

Quote Number	2833
Quote Date	6/22/2010
Expires on	6/29/2010
Terms	NET 30
Created By	GKAYE
FOB Point	Saskatoon, SK

To

FSC Architects & Engineers
Yellowknife, NWT
Canada

Customer Contact

Attention: Walter Orr
Email: waltero@fsc.ca
Phone: 867-920-2882 Ext:
Fax: 867-920-4319

Project: HDPE Pipe - Budget Pricing

Line	Estimated Ship Date	Description	Qty	Unit of Measure	Price	Amount
1	7/16/2010	6IPS DR17 SCLAIRPIPE X50' PE3608 F714 C906 NSF	13,150.00	FT	3.33	43,789.50
FROM STOCK.						
2	7/16/2010	8IPS DR17 SCLAIRPIPE X50' PE3608 F714 C906 NSF	13,150.00	FT	5.64	74,166.00
FROM STOCK.						
3	7/16/2010	10IPS DR17 SCLAIRPIPE X50' PE3608 F714 C906 NSF	13,150.00	FT	8.77	115,325.50
FROM STOCK						

All prices shown in Canadian Dollars **Total Price:** **233,281.00**

KWH PIPE (CANADA) LTD.
CORPORATE OFFICE
6507 MISSISSAUGA ROAD
MISSISSAUGA, ON L5N 1A6

Salesman: CURT SMIGEL
Phone:604-202-7904
Fax: 905-858-0208
Email:curt.smigel@kwhpipe.ca

Sales Quote

Quote Number	2833
Quote Date	6/22/2010
Expires on	6/29/2010
Terms	NET 30
Created By	GKAYE
FOB Point	Saskatoon, SK

STANDARD QUOTATION NOTES:

1. APPLICABLE TAXES ARE NOT INCLUDED.
2. QUOTATION IS SUBJECT TO THE ATTACHED KWH STANDARD " TERMS AND CONDITIONS OF SALE ".
3. SHIP DATE INDICATED IS BASED ON CURRENT PLANT LOADING AND IS SUBJECT TO CONFIRMATION WHEN ORDER IS RECEIVED.
4. QUOTATION IS SUBJECT TO CONFIRMATION WHEN ORDER IS RECEIVED.
5. A 2% MONTHLY STORAGE FEE WILL BE INVOICED FOR SHIPMENTS DELAYED FOURTEEN (14) DAYS PAST THE AGREED UPON SHIP DATE.
6. ALL PIPE DIAMETERS 12" AND SMALLER REQUIRE FULL BUNDLE QUANTITIES TO BE ORDERED.
7. IF BUNDLES ARE REQUIRED TO BE BROKEN, THERE WILL BE A "BREAK BUNDLE" CHARGE OF $ 250 PER SIZE/DR.
8. ESTIMATED FREIGHT IS BASED ON CURRENT RATES THAT MAY BE SUBJECT TO CHANGE WITHOUT NOTICE. ACTUAL FREIGHT RATE WILL BE CONFIRMED AT TIME OF PURCHASE
9. ALL SALES ARE FINAL. NO RETURN OF MERCHANDISE WILL BE ACCEPTED

KWH PIPE (CANADA) LTD.
CORPORATE OFFICE
6507 MISSISSAUGA ROAD
MISSISSAUGA, ON L5N 1A6

Salesman: CURT SMIGEL
Phone:604-202-7904
Fax: 905-858-0208
Email:curt.smigel@kwhpipe.ca

Sales Quote

Quote Number	2833
Quote Date	6/22/2010
Expires on	6/29/2010
Terms	NET 30
Created By	GKAYE
FOB Point	Saskatoon, SK

Terms and Conditions

1. Acceptance/ Governing Terms: Unless otherwise specifically agreed in writing, the following terms and conditions of sale ("terms") shale apply to any sale of products and/ or services (as defined below) (collectively, "deliverables") by KWH Pipe (Canada) Ltd. ("KWH") specified either on quotation form KWH to Purchase (a "quotation") or an order (whether written or oral) by Purchaser to KWH (an "Order") that was based on a quotation and that has been accepted by KWH. An order may be accepted by KWH only by a written sales memorandum, invoice or other written confirmation from KWH promising to provide Purchaser Deliverables as ordered and such acceptance may be subject to the approval by KWH of the creditworthiness Purchaser. Unless otherwise state, Quotations shall be null and void unless accepted by Purchase within 30 days from the date of the Quotation. Purchaser shall be deemed to have full knowledge of the terms and such terms shall be binding if either the Purchaser provides written acceptance to KWH or Deliverables referred to herein as delivered to and accepted by the Purchaser. A Quotation accepted by the Purchaser or an Order accepted by KWH together with these Terms and all Specifications (as defined below) shall constitute the Agreement between KWH and the Purchaser (the "Agreement"). Any additional or different terms and conditions prepared by Purchaser are deemed to be unacceptable to KWH (are expressly objected to and rejected by KWH and shall not become a part to this Agreement. In the event of an conflict or inconsistency between the Terms herein and the terms and conditions contained in any acknowledgement or in any other form issued by Purchaser whether or not any such form has been acknowledge or accepted by KWH the Terms herein shall prevail unless specifically indicated in writing.
2. INTERPRETATION: In this Agreement: "Products" means all products, goods, supplies, components, material, articles, systems, processes, and/or equipment to be provided by KWH to Purchaser pursuant to this Agreement: "Services" means all services, labour, work, welding, fusion, joining and/or applications of any kind to be provided by KWH to Purchaser pursuant to this Agreement and "Specifications" means any and all specifications and instructions and plans for the products and/or services whether provided by Purchaser or KWH pursuant to this Agreement including any document providing the scope and/or design of such Products and/or Services, all functional, technical, operational, performance, quality and similar requirements, drawings, schematics, illustrations, Products and/or Service descriptions and any other data relating to the provision of Products and/or Services.
3. PAYMENTS: Payment for Deliverables provided within Canada shall be made in full by the Purchaser within thirty continuous days from the invoice date. Payment for Deliverables provided to all other destinations shall be made by confirmed irrevocable letter of credit. All amounts due and not paid when due bear interest until fully paid on such overdue amounts at a rate of 2.5 % per month (30% annum). All references to currency herein are to lawful money of Canada and all amounts payable are payable in Canadian dollars for Canadian customer quotations and to lawful money of the United States of America and all amounts are payable in United States dollars for all other customers. If purchaser fails to make payments in accordance to this Agreement or Purchasers financial situation becomes unsatisfactory at the sole discretion of KWH, KWH may in its sole discretion either suspend the provision of Deliverables until such payments are made, terminated this Agreement or if applicable require payment in advance for any Deliverables to be provided hereunder.
4. SHIPPING/ PRICES: Unless otherwise stated in the Quotation, quoted prices re subject to change by KWH with or without notice until Purchaser's acceptance unless otherwise specified prices stated or quoted to the Purchaser are Ex Works (Incoterms 2000). KWH is production plant. All costs of shipment and insurance shall, unless agreed otherwise in writing, be for the account of the Purchaser. Unless otherwise agreed, Purchaser shall contract for carriage on usual terms or shall provide shipping instruction to KWH for KWH to arrange for such carriage at Purchasers risk and expense. Purchaser must obtain at its own risk and expense any export license or other official authorization and carry out where applicable, all customs formalities necessary for the export of the Deliverables. KWH shall provide the Purchaser, at the Purchaser's request, risk and expense assistance in doing so. KWH responsibility for Deliverables ceases upon delivery to the Purchaser at the production plant. In the event of loss or damage during shipment, Purchasers claim shall be against the carry only. KWH shall, however, give the Purchaser and reasonable assistance to secure adjustment to the Purchaser's claim against the carry provided immediate notice of such claim is given Purchaser to KWH.
5. SALES TAX AND LOCAL IMPORT DUTIES: prices stated or quoted do not include Federal, provincial, state or municipal sales taxes, value-added taxes or other taxes or duties. Where appropriate, KWH's invoices shall include taxes to be collected by KWH, including goods and services tax. Any changes in such taxes between the date of this Agreement and the provision of the relevant Deliverables shall be for Purchasers account.
6. DELIVERY: Delivery schedules are approximate and are based on the prevailing market conditions applicable respectively at the time of the Quotation and KWH's acceptance of an Order. KWH may extend delivery schedules or may, at its option, cancel Purchaser's order in full or in part without liability other than to return any deposit or prepayment which is unearned by reason of the cancellation. If the parties, instead of specifying a date for delivery of the Deliverable have specified a period of time on the expiry of which such delivery shall take place, such period shall began upon the later of (i) the acceptance of the relevant Order by KWH or (ii) the receipt by KWH in satisfactory form off all advanced payments as may be required, an agreed securities, all permits and approvals and upon the completion of all other formalities and the fulfillment of any other preconditions set out therein. If Purchaser fails to accept delivery of any Deliverables within 30 days of the time of agreed, Purchaser shall still pay the purchase price as if such acceptance had taken place unless the parties agree upon a new delivery date. KWH shall be entitled to store and insure any such Deliverables at Purchaser's expense and risk. Unless the Purchaser accepts the Deliverables within a final reasonable period determined by KWH, KWH may terminate this Agreement in whole or in part or sell the Deliverables in the reasonable interest of the Purchaser. Further KWH shall be entitled to compensation for any additional costs for loses suffered by KWH due to such Purchaser's failure.
7. DELAY IN DELIVERY: KWH shall forthwith advise Purchaser of any anticipated delays in the provision of the Deliverables. KWH shall not be liable or responsible for any damages, costs, back chargers or other expenses incurred by Purchaser due to delay in the provision of Deliverables regardless of the cause of such delay (including equipment failure or malfunction or other commercial delays), whether or not such delay can be attributed to KWH.
8. PERMITS: Purchaser undertakes to obtain, all its own expense, all permits, approvals, consents, waivers, licences, certificates, and authorizations, or any item of similar effect, as may be necessary or required for the full performance of this Agreement.
9. SECURITY AND RETENTION OF TITLE: If the parties have agreed that security shall be provided by Purchaser under his Agreement, this Agreement shall not become effective and KWH shall not commenced any work, production or delivery until such security is provided to the reasonable satisfaction of KWH. KWH and its sole discretion may require Purchaser to placed security for the payment of the purchase price if KWH has reason to believe that Purchaser may not be able to pay the purchase price in full when due. KWH has the right to suspend the performance of its obligations under this Agreement if the payment owing by the Purchaser to KWH is overdue (whether pursuant to this Agreement or otherwise) or if Purchaser does not provide security acceptable to KWH when required. Title of the deliverables shall remain with KWH until paid for in full by Purchaser to the extent that such retention of title is valid under applicable law Risk of loss and/or damage to Deliverables shall pass from KWH to Purchaser upon transfer and receipt (whether to accepted or not) of Deliverables as provided herein.
10. CANCELLATION: This Agreement is not subject to changes for cancellation by Purchaser, in whole or in part, without prior written consent of KWH. If KWH consents in writing to any changes or cancellation, or if this Agreement is terminated by KWH as a result of the repudiation or breach of any of the terms of this Agreement by Purchaser, KWH reserves the right to charge Purchaser with reasonable costs based upon expenses already incurred and commitments by KWH.
11. SHIPPING ERRORS: Any error in weight, number or other specifications must be noted on the bill of lading and Purchaser shall notify KWH of any claims arising therefrom in writing within 10 days after receipt by Purchaser of Deliverables. Unless so notified, KWH shall have no liability in respect to any of such error.
12. RETURNED PRODUCTS: No products may be returned to KWH without KWH's prior written consent. KWH reserves the right to decline or accept all returns subject to a handling/restocking charge. The amount of credit, if any, provided by KWH to Purchaser for returned products, shall be at the sole discretion of KWH. Credit for return Products shall be issued to Purchaser only where such Products are returned by Purchaser and not by any subsequent owner.
13. ACCEPTANCE TEST: Acceptance tests may be carried out only if agreed to in writing by the parties and KWH reserves the right to appoint an independent testing authority if such tests are conducted. If for some reasons beyond KWH's control, the acceptance tests cannot be carried out within the specified time by the parties, the qualities to be determined in the test shall be deemed approved and the Deliverables accepted.
14. JOBSITE AND ACCESS: Purchaser shall prepare the job site (including entry an access therefrom) in accordance with the Specifications, KWH's Field Service Guide (a copy of which has been provided to Purchaser) and in accordance with any applicable requirements as may be communicated to Purchaser by KWH from time to time. Purchaser grants to KWH and to such persons or entities as KWH may reasonably designate in connection with the provisions of the deliverables hereunder, full right of access to the job site of the Purchaser as may be necessary for the provision of the Deliverables hereunder subject only to reasonable security restrictions as Purchaser may require and that should be notified in advance to KWH.
15. VEHICLE ACCESS: Where delivery to the job site is included in the price payable by the Purchaser under this Agreement, such delivery should be construed too mean motor truck delivery as close to job site, designated storage area, or to line of trench as is practical for loaded standard highway motor trucks and trailers operating under their own power. The Purchaser shall provide and maintain a suitable access, including access roads to the job site, for safe and efficient provisions of the Deliverables.
16. CONFIDENTIALITY: All specifications and other documents and information provided to the Purchaser by KWH shall be treated in confidence by Purchaser. Such items shall remain the exclusive property of KWH and may not without the prior written consent of KWH, be copy, reproduced or communicated to any third party. All such documents and information shall be returned to KWH upon request.
17. Force Majeure: KWH shall not be responsible for any direct or indirect damages whatsoever caused by delays beyond the control of KWH, and without limiting the generality of the foregoing, KWH shall not be responsible for any damages due to delays caused by storms, fires, floods, acts of God, labour difficulties, (including lockouts, strikes and slowdowns) material procurement delays (including inability to obtain power, materials, labour, equipment or transportation) acts of war or terrorism, quarantine restrictions, commercial impossibility, court injunctions or order, or any cause beyond its control.
18. WARRANTY: KWH warrants only that the product shall be free from latent defects and shall be made in a workmanlike manner and in conformity with the specifications related thereto. To the extent Services are to be provided hereunder, KWH warrants only that all work rendered shall be provided in a workmanlike manner and in conformity with the Specifications related thereto. For a period of 12 months following the shipping date of any products or the provision of any Service, as applicable, but not thereafter, upon demonstration that any such Products and/or Services include latent defects or do not materially conform to the specifications as applicable, attributable to KWH as manufacturer or Service provider. KWH shall at its sole option, repair or replace such defective Product or re-perform the Service free of charge. Ex Works (Incoterms 2000) or equivalent, or allow credit to the Purchaser in equal amount, provided that the Purchaser gives written notice to KWH of the alleged defect or material nonconformity within 7 days of its discovery and submits to KWH on demand, for examination and testing, all such Products allegedly defective or which allegedly do not materially conform to the Specifications or provides to KWH on demand, access to the purchasers premise or job site, as applicable, for examination and testing of all services which allegedly do not materially conform with the specifications. In default of such notice and submission, all responsibility on the part of KWH to repair, replace, correct, re-perform or allow credit shall cease. Any products (or parts thereof) returned to KWH pursuant to this provision shall become the property of KWH. Any products not manufactured by KWH or Services not provided by KWH are not warranted, except insofar as the same are warranted to KWH by the manufacturer of such Products or the provider of the Services, but in no event does KWH bind itself to any greater warranty then the ones provided for herein at KWH's sole option. When Products and/or Services are provided in accordance with Purchaser's Specifications, KWH assumes no liability for loss or damage arising from improper or inadequate design or instructions and when provided based on or using materials provided by Purchaser, KWH assumes no liability for loss for damage arising from defects in or inadequacy of such materials. To the extent that any Deliverable is to be repaired, replaced, corrected or performed as provided for herein, KWH shall not be liable for any damage caused if's the course of digging up, lifting up, dismounting, transportation, mounting or establishment in connection with such Deliverables.
19. LIMITED WARRANTIES: It is understood and Purchaser agrees that the warranties provided in section 0 constitute KWH's sole warranties with respect to the Deliverables and that all other warranties, express or implied, legal or contractual, on the part of KWH with respect to the Deliverables and that all other warranties, are hereby excluded, and in particular, but without limiting the generality of forgoing, no liability is assumed nor is KWH responsible for damage or delays caused by defective materials or workmanship or negligence of KWH, nor shall any allowances for repairs, alterations or re-performance be made unless effected with the prior written consent of KWH. Further, KWH shall not be responsible for any damage or delays caused by defects arising out of faulty maintenance, incorrect installation, incorrect operation, excess of loading from erosion, cavitation, abnormal soil conditions, unsatisfactory foundation, excessive stress during sinking, building or installation work not undertaken by KWH and another reason beyond KWH's control.
20. LIMITED LIABILITY: Notwithstanding any other provision of this Agreement, to the maximum extent permitted under applicable law, in no event, and under no circumstances shall the aggregate liability of KWH (including remedies for defective goods, rectification work and damages) exceed the aggregate purchase price Ex Works (incoterm 2000) for the applicable Products and/or service provided pursuant to this Agreement. KWH shall not be liable under any circumstances for any incidental, consequential, indirect, special or punitive damages arising out of or related to the Performance of this Agreement or the provision of or failure to provide the Deliverables, including without limitation damages or injuries to any person (including death), loss of profits, loss of business revenue, loss of production, loss of use, loss of contracts, interruption of operation, failure to realize expected savings or other commercial or economic losses of any kind, whether or not foreseeable, whether such liability is based in contract or tort, negligence, strict liability or otherwise, or whether or not KWH has been the advised of the possibility of any such liability.
21. INDEPENDENT CONTRACTOR: KWH is an independent contractor of Purchaser and nothing in this Agreement can be read to imply or construe KWH as a partner, agent or employee of Purchaser. Neither party shall have authority to commit or create any liability on the part of the other or to bind the other party in any way.
22. DISPUTES: Unless otherwise agreed to in writing, any controversy, questions or claim or other dispute arising out of relating to this Agreement must be conclusively settled by submission to arbitration in accordance with the rules of arbitration of the Arbitration Act (Ontario) for domestic sales and to the International Commercial Arbitration Act (Ontario) for International Sales. The arbitration shall be held in Toronto, Canada. The number of arbitrators shall be one and the arbitration shall be conducted in English. Notwithstanding the foregoing, KWH reserves the right to initiate legal proceedings against the Purchaser in any, competent court of law for the purpose of collecting unpaid invoices.
23. WAIVER'S: No failure or delayed by KWH in enforcing any of the terms and conditions of this Agreement shall prejudice, or restrict its rights and powers under this Agreement nor shall any waiver of any breach operate as a waiver of any subsequent breach.
24. GENERAL: this Agreement: (a) shall be governed by and enforced in accordance with the laws of the Province of Ontario and the federal laws of Canada applicable therein and the parties consent to venue in Ontario and the parties agree that the International Sale of Goods Act (Ontario) does not apply to this Agreement; (b) may not be assigned by Purchaser without the prior written consent of KWH; (c) shall insure to the benefit of and be binding upon the respective heirs, exectors, administrators, other legal representatives, successors and permitted assigns of the parties; and (d) constitutes the entire Agreement between the parties with respect to the subject matter hereof and cancels and supersedes any prior understandings Agreements, representations or warranties, express or implied, between the parties with respect thereto. Any provision of this Agreement that contemplates performance or observance subsequent to any termination or expiration of this Agreement (in whole or in part) shall survive any such termination or expiration and continue in full force and effect. No modifications of or amendment to this Agreement is valid or binding unless set forth in writing and executed by the parties. Any provision of this Agreement that declared unenforceable or invalid shall be severed from the balance hereof with out affecting the remaining provisions hereof.

5 Appendix B – Issued For Review Design Drawings