	Project Number: CHAF0035	Facility: Chats Falls GS	Page: 1 of 12 Rev. 00
	BUSINESS CASE SUMMARY Main Dam Concrete Rehabilitation		

1. RECOMMENDATION

Approve this full release of \$40M to perform the rehabilitation of the concrete main dam, stop log sluices, at Chats Falls Generating Station, with 50% of the costs recoverable from Hydro Québec. This rehabilitation project will address existing concrete deterioration, operational problems with the stop log sluices, and emerging dam and personnel safety concerns. The project will be completed over a 5 year period to accommodate Ministry of Natural Resources (MNR) restrictions, and the historical flow and spill conditions (ie, minimize production losses).

Total Investment Cost: \$40M Gross (includes \$180k Developmental Release funding - \$162k spent to date as of end of 2011. 50% of these costs are to be recovered from Hydro Québec)

	2011 LTD	2012	2013	2014	2015	2016	Total
Project Cashflows Gross cash flows (\$M)	0.2	7.4	8.3	8.4	8.2	7.5	40
Project Cashflows Net cash flows (\$M)	0.1	3.7	4.2	4.2	4.1	3.8	20
2012 Final Budget Version OPG share (\$M)	0.1	2.5	2.5	2.0	2.0	2.0	11

Expenditure Type: Non-Standard

Investment Type: Sustaining – Maintain Condition Non-Production

Release Type: Full release under OAR element 1.1

Funding: The 2012 Business Plan includes funds for project execution in years 2012 - 2016. Additional scope items were identified during the definition phase activities and the RFP fixed price proposals were not received until after the finalization of the 2012-2016 Business Plan. The increased 2012 cash flows will be managed within the 2012 OSPG Non-Standard envelope, and future years (2013-2016) will be re-programmed in the 2013-2015 Business Plan. The 2001/2008 Chats Falls PCAs and 2001 Life Cycle Plan include this work.

Investment Financial Measures: The Present Value (PV) of the total costs related to this project is (\$25.2M).

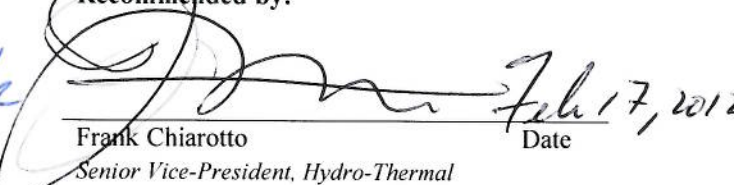
2. SIGNATURES

Submitted by:


 Jim Moreland
 OSPG Plant Group Manager

Date

Recommended by:


 Frank Chiarotto
 Senior Vice-President, Hydro-Thermal

Date

Finance Approval:


 Donn Hanbidge
 SVP & Chief Financial Officer

Date

Line Approval Per OAR:


 Tom Mitchell
 President & Chief Executive Officer

Date

ONTARIOPOWER GENERATION	Project Number: CHAF0035	Facility: Chats Falls GS	Page: 2 of 12 Rev. 00
	BUSINESS CASE SUMMARY Main Dam Concrete Rehabilitation		

3. BACKGROUND & ISSUES

Station Description:

Chats Falls GS is located on the Ottawa River, 56 km northwest of Ottawa. The station was built in 1931 and has 8 units with an installed capacity of 192 MW. The plant is owned jointly by Ontario Power Generation and Hydro Québec. Energy production from the facility is shared equally by both entities and investments are reimbursed by Hydro Québec on a project-by-project basis as per the OPG/Hydro Québec Operating Services Agreement. In 2011, OPG's revenue was \$24M based on half of the total energy production of 562 GWh. Chats Falls is considered a "Middle-of-the-Pack" asset in OPG Hydroelectric portfolio. Planned investment over the next ten years represent approximately \$37M (OPG costs), with the major projects including: main dam concrete restoration, replacement of the A/C station service, restoration of the generator rotor field poles, excitation system replacement and multiple repairs on the powerhouse building, etc. The NPV for the OPG owned half of the station, including the costs of the preferred alternative, is \$263M. This project secures the ongoing profitability of the station to OPG and Hydro-Québec.

Background and Issues (Refer to Appendix A for site layout):

The dam is divided into thirteen sections (also called divisions) for construction and identification purposes (see site layout in Appendix A). It was constructed in 1930-1931 using natural sand and coarse crushed rock aggregate and is 5.24km long and spans across the Ontario-Québec border by approximately 2.5km onto the Quebec side. The main dam includes four sluiceways and more than 4.5km of concrete gravity sections. The four sluiceway structures (Victoria Island, Ragged Chute, Wolverine Chute and Merrill Island) total 74 stop log sluices, with 42 in Québec and 32 in Ontario, and a sluiceway that has four automated gates.

The structures are currently experiencing significant deterioration leading to operational problems and potential structural, stability, and personnel safety issues. Structural and weathering-related deterioration of the dams and sluiceways has been observed and monitored since the 1940's. External engineering services were retained by Ontario Power Generation to review available information, carry out assessment inspections and prepare a complete scope and technical specification. A previous assessment also identified the presence of Alkali-Aggregate Reactivity (AAR) which has contributed to the concrete deterioration. A definition phase was completed with the objective to ensure that maximum life span would be attained while minimizing the investment costs for both OPG & Hydro Québec and extend the service life of the dam for an additional 40 years.

The powerhouse as well as the sluice gate adjacent to it is not included in the work, with the exception of the replacement of the handrails and minor concrete work on the Powerhouse headworks (Division 6). Three of four main sluice gates were recently replaced with the final gate to be completed in 2012.

This project will restore the dam structures and associated equipment to address existing deterioration, operational problems, and emerging dam and personnel safety concerns. The project will be completed over a 5 year period to accommodate Ministry of Natural Resources (MNR) restrictions, and the historical flow and spill conditions (ie, minimize production losses).

ONTARIOPOWER GENERATION	Project Number: CHAF0035	Facility: Chats Falls GS	Page: 3 of 12 Rev. 00
	BUSINESS CASE SUMMARY Main Dam Concrete Rehabilitation		

Summary of the current major problems

The main issues are as follows:

- There is extensive leakage and deterioration in various sections of the main gravity dam which is rated as poor (per dam safety criteria). Sealing of the joints/cracks and repairs to these sections is needed to ensure continued stability of the dam.
- The leakage should be repaired in the near future to prevent more extensive deterioration and increased rehabilitation costs in the future.
- The sluiceway decks and dam crest have significant damage including spalled and cracked concrete leading structural problems and inadequate hand rail anchoring. Two cracked sluiceway decks and end piers are “tilted” inwards limiting the removal and installation of stop log.
- The handrails are deteriorated and non-compliant with current building codes.

Further details are provided below.

Structural and Operational Issues

1. Gravity sections

The gravity sections at Chats Falls GS have extensive deterioration which has been exacerbated by concrete growth (Alkali-Aggregate Reactivity). Some sections will require extensive repairs to maintain the structural integrity and prevent potential problems such as dam failure and uncontrolled leakage.

Divisions #5 and #9 have major stress cracks and are leaking. The Division #5 leaks along the vertical joint and extends along a horizontal joint and water is leaking onto the adjacent roadway, creating significant ice buildup and hazardous conditions on the road during winter. Division #9 has diagonal cracks and horizontal joints that are leaking. Temporary sealing repairs were performed at some sections in 2000, however, these sections are leaking again.


2. Stop log sluiceway structures

There are four stop log sluiceways at Chats Falls GS: Merrill Island, Wolverine Chute, Ragged Chute and Victoria Island. The stop log sluiceways at Chats Falls were designed with steel gains and utilized wooden stop logs, which are removed and installed in the sluiceway using a mechanical log lifter located on the upper deck of the structure. The stop log sluiceways are also afflicted with AAR, and major problems have developed the past several years.

As such, the 2008 Plant Condition Assessment (PCA) recommended concrete restoration of the decks, expansion joints and end piers at Merrill and Wolverine sluiceways. The Victoria Island sluiceways are in better condition and require less repair. Surveys and reviews have also been undertaken over a number of years in response to concerns over inward movement of stop log sluiceways end piers due to AAR. This inward movement has led to a reduction of the distance between the gains of the sluiceways and inability to remove or install stop logs in the end sluices. The movement of the gains due to concrete growth jammed the wooden logs making these sluices inoperable.

2.1 Merrill Island & Wolverine Chute Sluiceways

The Merrill Island & Wolverine chute sluiceways respectively consist of 22 and 10 stop log sluiceways. Both structures are entirely located in the Province of Quebec. For both structures, there are signs of movement and horizontal cracking on both end piers, and portions of the deck are collapsing due to the pier movement. Rotation of the end piers resulted in

	Project Number: CHAF0035	Facility: Chats Falls GS	Page: 4 of 12 Rev. 00
	BUSINESS CASE SUMMARY Main Dam Concrete Rehabilitation		

closing of the log gains and the stop logs are jammed in position and cannot be removed. The proper gain opening dimensions need to be re-established so that new logs can be installed.

2.2 Victoria Island Sluiceway

The Victoria Island sluiceway consists of 10 stop log sluiceways. There are signs of some minor movement on both end piers. New stop logs were installed in October 2009.

Concrete deterioration

1. Gravity sections

All gravity sections are showing signs of concrete erosion at the waterline as a result of the water and ice action. There is also significant concrete deterioration along the vertical joints on the upstream face of the dam, and significant surface scaling on the crest along both edges where the handrails are anchored. This deterioration results in structural issues with the handrail anchorage as well as an uneven walking surface. The downstream face has severely deteriorated concrete surfaces due to leakage through joints, spalling of concrete due to freeze-thaw action and vegetation growth.

2. Stop log sluices structures

All stop log sluice structures show signs of concrete erosion at the waterline elevation on the exterior piers, as a result of the water and ice action. There is major surface scaling and spalling on the crest of the sluiceway sections, along both edges where the handrails are anchored. This deterioration results in structural issues with the handrail anchorage.

A technical specification was prepared and includes several types of repair methods that have been specifically developed for the different types of problems. This approach will ensure that for each type of deficiency, the most appropriate repairs will be performed to achieve optimum results and achieve maximum extension of the service life.

Handrail issues


1. Handrails

The gravity sections & stop log sluices structures are equipped with different types of handrails that do not meet OHSA regulations. Replacement of the handrails and installation new anchors was recommended. The existing cast iron upstream railing is poorly anchored in many locations, making the railing loose and generally unsafe for site staff. The railing on the Merrill Sluices has been temporarily stabilized. The paint on the railing has been tested positive for lead contamination. The assessment from 2010 clearly stated the need to remediate the situation by replacing all 5km of handrails with a new design.

4. ALTERNATIVES & ECONOMIC ANALYSIS

The Present Value of the total project costs are shown in the table below. Although the present value of the recommended alternative (Alt.3) is \$7.4M worse than deferring the project for an additional 12 years (Alt.2), the dam safety and operational risks associated with a deferral are considered to be unacceptable.

	Base Case	Alt 1	Alt 2	Alt 3 (Recommended)
Remaining costs (k\$)	0	\$49,869	\$58,984	\$39,846
PV (2012) (k\$)	0	(\$26,452)	(\$17,768)	(\$25,216)

	Project Number: CHAF0035	Facility: Chats Falls GS	Page: 5 of 12 Rev. 00
	BUSINESS CASE SUMMARY Main Dam Concrete Rehabilitation		

Base Case: *Status Quo (Do not conduct any concrete repairs or handrail replacement).*

- Not Recommended

This option is not recommended because it will not address the deficiencies outlined in the Background & Issues section. The option of leaving the stop log sluiceway end piers and expansion joints in the existing state with no concrete restoration is not recommended because it does not address the current concerns with structural integrity and operational problems which will lead to dam safety problems and possibly plant decommissioning or rebuild.

Alternative 1: *Restore the gravity sections only – Defer stop log sluices repairs five years.*

- Not Recommended

This alternative consists of complete restoration of all gravity sections, as well as replacement of both upstream and downstream handrails. Concrete restoration for the gravity sections includes sealing and reinforcement of cracks and construction joints, sealing of underwater cracks, restoration of deck edges and upstream dam face, restoration of eroded concrete at the waterline, and removal of deteriorated concrete and vegetation on downstream face. The scope of work also includes the restoration of the bulkhead Division #9 which is currently experiencing severe leakage, concrete deterioration and structural integrity issues.

- This alternative will reduce leakage through the dam as much as practical, and mitigate further concrete deterioration.
- This alternative will allow OPG to extend the service life of the water retention structures and avoid major concrete restoration work for a minimum of 40 years.
- This option will address the current problems with old and non-compliant handrails.

This option does not address current issues and concerns associated the four stop log sluiceways. Stop log sluices structures will continue to deteriorate and could eventually result in significant operational problems of removal and installation of the stop logs. There is a risk of failure of the stop logs leading to an uncontrolled released of water. There are additional risks with loss of structural integrity caused by severe deformations of the stop logs which could result in partial collapse, having a significant negative impact on the Health & Safety of the workforce, and unfavorable consequences to the reputation of both OPG and Hydro Québec. Loss of structural integrity could also result in major Dam Safety incident with the uncontrolled release of water. This could result in eventual plant/dam decommissioning or rebuild.


- ➔ Cost = approx. \$49,869k
- ➔ PV of Costs = (\$26,452k)

Alternative 2: *Restore the stop log sluices only – Defer gravity sections repairs 12 years.*

- Not Recommended

This alternative consists of performing complete restoration of all four stop log sluiceway structures, as well as replacement of both upstream and downstream handrails. Concrete work associated with this alternative consists of removal and reconstruction of concrete decks of the first and last sluice ways of both Merrill Island (Division 12) and Wolverine Chute (Division 10). The piers will also be repaired.

This alternative also includes resurfacing of concrete decks at all stop log sluiceways, and re-sealing of all expansion joints. The existing wooden stop logs will be replaced with pre-fabricated steel stop logs and rails for the log lifters will be reinstalled and re-aligned.

	Project Number: CHAF0035	Facility: Chats Falls GS	Page: 6 of 12 Rev. 00
	BUSINESS CASE SUMMARY Main Dam Concrete Rehabilitation		

- This alternative will ensure that operational risks associated with deformed concrete structures are mitigated;
- This alternative will allow extension of the service life of the sluiceways for 40 years.

While this alternative will aid OPG in protecting its assets and reduces some risks, this option will not address current issues and concerns associated with deteriorated gravity sections. The gravity sections will continue to deteriorate, additional structural issues will develop, and future project costs will escalate due to continued deterioration. Proceeding with this alternative could also have severe implications for the long term stability of the dam due to increased leakage, and erosion, which could lead to eventual plant/dam decommissioning or rebuild.

→ Cost = approx. \$58,984k
 → PV of Costs = (\$17,768k)

Alternative 3: Restore the gravity sections and all four stop log sluices structures without any deferrals.

- **Recommended**

This alternative consists of the complete rehabilitation of all gravity sections including all four stop log sluiceways, as well as replacement of upstream and downstream handrails. This alternative includes the work scope of both alternative #1 (restore the gravity sections) and alternative #2 (restore the stop log sluiceway structures).

- This alternative will mitigate the operational risks associated with deformed concrete structures and sluiceways.
- This alternative will allow a 40 year extension of the service life of the main gravity dam and sluiceways.
- This option will reduce leakage and mitigate further concrete deterioration.
- This option will address the current deficiencies with old and non-compliant handrails.

This option will provide the best financial solution while minimizing risks to the structures, personnel and the public. It will also allow the project to be completed within the planned five years of work.

→ Cost = approx. \$39,846k
 → PV of Costs = (\$25,216k)

Other alternatives considered but rejected

Alternative 4: Defer execution of the entire project till 2017.


- **Not Recommended**

This alternative postpones the execution of the work by five years. This option is technically unacceptable due to the significant dam safety risks of failure of the dam or sluiceway structures and loss of flow control capability of some sluiceways. This would also negatively impact OPG & Hydro Québec's public reputations. This option would not properly mitigate current deficiencies with non-compliant handrails. Finally this option would cause accelerated deterioration to the concrete structures resulting in significant increases in future repair costs estimated at 20% the five year period.

Alternative 5: Restoration of the gravity sections, all four stop log sluices structures plus applying sealant to the concrete structures.

- **Not Recommended**

This alternative includes the same scope of work as Alternative #3 but with the addition of a special concrete penetrating sealant on the structures (approximate cost of \$1 M). The dam was constructed in the 1930's without added air entrainment, a technology that was not available at the time of construction. Application of concrete sealant may better protect the surfaces

	Project Number: CHAF0035	Facility: Chats Falls GS	Page: 7 of 12 Rev. 00
	BUSINESS CASE SUMMARY Main Dam Concrete Rehabilitation		

from moisture ingress and slow down the amount of water infiltrating the concrete preventing further surface deterioration. Application of such a sealant may extend the service life for an estimated five years by minimizing water infiltration in the concrete and reducing the impact of freeze-thaw cycles as well as reducing future vegetation growth. However, this is an assumption which cannot be confirmed by the project's engineering support, nor will the contractor guarantee the service life extension. Although this option was found to be technically acceptable, there is no financial benefit to proceed with this as the Net Present Value is worse than Alternative #3.

5. THE PROPOSAL

Restoration of the stop log sluices, head works and main dam gravity sections at Chats Falls Generating Station as per Alternative #3 will include:

- Complete rehabilitation of all gravity sections (including sealing and reinforcement of cracks and construction joints, sealing of underwater cracks, restoration of deck edges and upstream face, restoration of concrete at waterline erosion, removal of deteriorated concrete and vegetation on downstream face).
- Complete restoration of all four stop log sluiceway structures (including removal and reconstruction of concrete decks of the first and last sluice ways and reconstruction of the piers and replacement of all exterior sluices).
- Resurfacing of concrete decks on all stop log sluices structures.
- Re-sealing of all expansion joints.
- Reinstallation & re-alignment of the log lifter rails.
- Recoating of the steel beams currently installed in the log chute (Division 8) to help minimize corrosion and extend their service life.
- Replacement of both upstream and downstream deteriorated and non-compliant handrails.

This project will restore the dam structures and associated equipment to address existing deterioration, operational problems, and emerging dam and personnel safety concerns and extend the service life of the dam and sluiceways for about 40 years. It also addresses the safety hazards associated with old and non-compliant handrails. The project will also minimize any negative impacts to OPG's public reputation associated with the failure of the dam or sluiceway.

The project will be completed over 5 years. Due to MNR restrictions, the in-water work cannot commence before July 15th and cannot be extended beyond Oct. 15th each year. OPG provided the contractors the historical flow and spill conditions during the RFP process, and based on these conditions and the restrictions regarding in-water work the execution needs to take place over a five year period. Hydro Québec were consulted regarding the cost/schedule and agree with the project execution plan.

6. PROJECT SCHEDULE


Q1 2012: Project Release

Q2 2012: Issue Purchase Order

June 2012: Construction work at site commencement

June to Nov. 2012:

- Sealing of underwater cracks (includes reinforcement where required) on Division 13.
- Concrete repairs (in water work) on Divisions 13 & 14.
- Concrete repairs (not in water work) on Divisions 13 & 14.
- Handrail replacement, utilities & cables trays work on Divisions 13 & 14.

	Project Number: CHAF0035	Facility: Chats Falls GS	Page: 8 of 12 Rev. 00
	BUSINESS CASE SUMMARY Main Dam Concrete Rehabilitation		

May to Nov. 2013:

- Sealing of underwater cracks (includes reinforcement where required) on Division 9.
- Repairs on Division 12 (coffer dam, anchors, gains, deck repairs including overlay, rail replacement, etc.).
- Concrete repairs (in water work) on Division 9.
- Installation of stress crack anchors and epoxy injection on Division 9.
- Concrete repairs (not in water work) on Division 9.
- Handrail replacement, utilities & cables trays work on Divisions 9 & 10 (stage with other repairs as required).

May to Nov. 2014:

- Sealing of underwater cracks (includes reinforcement where required) on Division 11.
- Repairs on Division 10 (coffer dam, anchors, gains, deck repairs including overlay, rail replacement, etc.).
- Concrete repairs (in water work) on Divisions 10 & 11.
- Concrete repairs (not in water work) on Divisions 6, 7, 8, 10 & 11.
- Hand rail replacement, utilities & cables trays work on Div 6,7,8,10,11.

May to Nov. 2015:

- Sealing of underwater cracks on Divisions 3 & 5.
- Concrete repairs (in water work) on Divisions 3 & 5.
- Concrete repairs (not in water work) on Divisions 3 & 5.
- Handrail replacement, utilities & cables trays work on Divisions 3, 4 & 5 (stage with other repairs as required).

May to Nov. 2016:

- Sealing of underwater cracks on Division 1.
- Concrete repairs (in water work) on Divisions 1 & 2.
- Repairs on Division 2 (coffer dam, anchors, gains, deck repairs including overlay, rail replacement, etc.).
- Concrete repairs (not in water work) on Divisions 1 & 2.
- Handrail replacement, utilities & cables trays work on Divisions 1 & 2 (stage with other repairs as required).

December 2016: Project execution complete.


June 2017: Project Closure Report (PCR).

7. QUALITATIVE FACTORS

- Mitigate the risks of an uncontrolled release of water at the sluiceways with jammed stop logs.
- Improved reliability of the stop log sluices structures and gravity (bulkhead) sections, continued availability of the assets will be maintained and protected;
- Service life extension of the structures;
- Minimization of the damage caused by freeze-thaw action, waterline erosion, leakage, etc;
- Work assignment has been designated in accordance with PWU/BTU Chestnut Park Accord process;
- This work will mitigate the emerging Dam Safety concerns with the gravity sections and stop log sluiceway structures;
- This work will eliminate any safety concerns with the handrails.

8. POST IMPLEMENTATION REVIEW (PIR)

For each year of programmed work:

	Project Number: CHAF0035	Facility: Chats Falls GS	Page: 9 of 12 Rev. 00
	BUSINESS CASE SUMMARY Main Dam Concrete Rehabilitation		


- After completion of the annual work, an engineering assessment to verify conformance to the engineering specifications will be performed by the engineering consultant and results will be documented in a yearly conformance report.
- Discrepancies and deviations from the technical requirements will be addressed through a review meeting and directions for subsequent work will be obtained.
- OSPG Environmental Support Unit (ESU) will perform a yearly evaluation of the work to confirm absence of negative impact on the environment.

At the end of the project (scheduled for October 2016):

- OSPG Asset Management (in coordination with Chats Falls Production) will confirm overall conformance to the initial technical specifications and that the following elements were properly addressed, which shall include:
 - Reduction of leakage in the gravity sections;
 - Removal of all vegetations on the gravity sections;
 - Repairing the upstream & downstream surfaces of the gravity sections;
 - Restoration of the walking surfaces on the decks and elimination of spalled concrete;
 - Elimination of the operational problems associated with stop log sluiceways;
 - Replacement of all handrails with OHSA compliant designed handrails;
- Asset Management in coordination with Dam Safety will evaluate the conformance and integrity of the rehabilitated structures and confirm performance against Dam Safety standards.
- OSPG Environmental Support Unit (ESU) will confirm that the work executed did not negatively impact the environment.

9. RISK ANALYSIS

Risk Description	Impacts	Initial Risk (before mitigation) (H,M,L)	Mitigating Activities	Residual Risk(after mitigation) (H,M,L)
Cost				
• Material and supplies costs escalation.	• Exceeding the release amount.	M	• Award of the contract will be done under fixed price agreement; • Detailed assessment showed the extent of the work involved in providing the deliverables;	L
• Labor cost escalation.	• Exceeding the release amount.	M	• Award of the contract will be done under fix price agreement; • Escalation included in fixed price; • BTU labor agreements are mostly known for the duration of the project.	L
Scope				
• Not performing or deferring the full release.	• Major risks related to structural integrity and possible equipment failure; • Increased mitigation costs.	H	• Accountability for plant production staff to perform annual localized guardrail inspection & repair.	L
• Possibility of discovery work.	• Escalated execution costs • Negative impact on the schedule and delay of the completion dates.	M	• Detailed assessment showed the extent of the work involved in providing the deliverables; • [REDACTED] contingency included to address unknown additional scope items.	L
Schedule				
• Delays in obtaining the deliverables	• Would delay the execution phase.	L	• Fixed schedule contract with hourly rates. • Delivery dates will be implemented and enforced in award of contract.	L

	Project Number: CHAF0035	Facility: Chats Falls GS	Page: 10 of 12 Rev. 00
	BUSINESS CASE SUMMARY Main Dam Concrete Rehabilitation		

Risk Description	Impacts	Initial Risk (before mitigation) (H,M,L)	Mitigating Activities	Residual Risk(after mitigation) (H,M,L)
<ul style="list-style-type: none"> Project is not completed within the agreed 5 year window. 	<ul style="list-style-type: none"> Would delay the execution phase. Would incur extra costs to the contractor/OPG. 	M	<ul style="list-style-type: none"> Fixed schedule contract. OPG provided station historical flows & times of sluiceway operation. Contractor developed the five year schedule as per the historical operation of the facility. 	L
<ul style="list-style-type: none"> OPG requires full access to work site, stopping contractor work. 	<ul style="list-style-type: none"> Negative impact on the schedule and delay of the completion dates; Escalated execution costs. 	H	<ul style="list-style-type: none"> Contractor to be aware of possibility that OPG may require access to site and will plan accordingly; OPG will work closely with contractor to minimize impact on work execution from unnecessary site access. 	L
<ul style="list-style-type: none"> Contractor initiates and continue in-water work outside the MNR allowed period 	<ul style="list-style-type: none"> Fines from the Ontario MNR. 	L	<ul style="list-style-type: none"> An execution schedule provided by contractor will be approved by OPG prior to being used by contractor. No in-water work to be executed prior to July 15th of each year. 	L
Resources				
<ul style="list-style-type: none"> Union strike or other work stoppage 	<ul style="list-style-type: none"> Negative impact on the schedule and delay of the completion dates; Escalated execution costs. 	L	<ul style="list-style-type: none"> CPA Collective agreements recently ratified provide up to 3 years without labor concerns. 	L
Environmental				
<ul style="list-style-type: none"> Construction or demolition materials enter the Ottawa River or are disposed of on firm lands. 	<ul style="list-style-type: none"> Possibility of fines from the Quebec MNR as well as from the Ontario MNR; Possible damage to the ecosystems and natural resources. 	M	<ul style="list-style-type: none"> Proposals will include complete plan to minimize or eliminate as much feasible potential spills and releases of materials into the environment; OPG prepared a complete environmental specification to accompany the work; Site manager will monitor to ensure conformance with the environmental specification. 	L
<ul style="list-style-type: none"> Sensitive species are disturbed or negatively impacted. 	<ul style="list-style-type: none"> Partial or total loss of local population of sensitive species, with potential regulatory and stakeholder consequences. 	L	<ul style="list-style-type: none"> Proponent's proposals will include complete plan to minimize any negative impacts on sensitive species. Certain wildlife habitats may be relocated for the duration of the work to minimize any impacts. 	L

Prepared by: Chris Hamel	Approved by:
Chris Hamel, P. Eng.	Gerry Foote
Project Engineer	Production Manager
Date: February 12, 2012	Date: Feb 14, 2012

