

2026-2027 General Rate Application (NSEB M12451)
NSPI Responses to NSEB Undertakings

REDACTED

1 **Undertaking U-10:**

2
3 **To provide the Yates Report.**

4
5 Response U-10:

6
7 Please refer to Redacted Attachment 1 for a copy of the 2018 Yates Hydro
8 Decommissioning Report.

REDACTED (CONFIDENTIAL INFORMATION REMOVED)

REDACTED Hydro Asset Study Appendix C Page 1 of 143



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NOVA SCOTIA POWER INC.

HYDRO PRODUCTION

SITE DECOMMISSIONING ESTIMATE SUMMARY
FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY
(BY SYSTEM)

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I. DISCLAIMER

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- 1.) This report is prepared solely for the exclusive use of the Client and it may not be used in whole or in part or relied upon in any manner or for any purpose whatsoever by any other party. There are no representations of any kind made by the Consultant to any party with whom the Consultant has not entered into a contract.
- 2.) The report is: Site Decommissioning Estimate Summary for Asset Retirement Obligations (ARO) Study (By System) (the "Project").
- 3.) Data required to support detailed engineering assessments have not always been available and in such cases engineering judgments have been made which may subsequently turn out to not be accurate. Therefore, there are risks inherent with this sort of project. The Consultant accepts no liability beyond using reasonable diligence, professional skill and care in preparing the report in accordance with the standard of care, skill and diligence expected of professional engineering firms performing substantially similar work at the time such work is performed. This is based on the circumstances the Consultant knew or ought to have known given the information it had at the date the report was written and after due inquiry based on that information.
- 4.) Construction Costs and Construction Contract Time estimates provided by the Consultant to the Client are subject to change and are contingent upon factors, including market forces, over which the Consultant has no control. The Consultant does not guarantee the accuracy of such estimates nor does the Consultant represent that bids, negotiated prices or the time for performance will not vary from such estimates. More definitive estimates regarding costs and time for performance may be assessed only when bids and negotiated prices are received for the Work.
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- 6.) This report speaks only as of its date and to conditions observed at that time. Conditions may change (or may have changed) by virtue of the passage of time or due to direct or indirect human intervention causing any one or more changes in plans or procedures or due to other factors.
- 7.) The report does not extend to any latent defect or other deficiency in the Project which could not have been reasonably discoverable or discovered by reasonable observation, with the exception of any latent defect or other such deficiency of which the Consultant had actual knowledge.
- 8.) This report is to be read in conjunction with all other data and information received and referenced throughout the report. Except as stated in the report, the Consultant has not made any independent verification of such data and information and does not have responsibility for the accuracy or completeness thereof.

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II. EXECUTIVE SUMMARY

Examinations and derivations of conceptual plans and related cost estimates for demolitions at 31 hydro generation sites have been carried out and are presented herein.

Planning has focused on conceptualization of logical demolition and decommissioning methodology and costs derivations for structural demolition of powerhouses at each site including removals of related generating equipment such turbo-generators, governors, wicket gates and associated components, head covers, scroll cases, main line valves and control mechanisms and portions of pipelines found within the confines of each powerhouse.

Although much of the written site demolition planning descriptions presented herein may appear similar from site to site at first glance, please note that each river hydro-electric generating system and each hydro-electric development located therein is markedly different. Therefore it has been necessary to develop demolition remediation plans that are tailor-made for each location.

In order to streamline the planning derivation and cost estimating process, where possible, similar components and arrangements at various sites have been identified and categorized so that they can be addressed similarly during this work.

The aggregate estimated demolition costs for the 31 NSPI Hydro Production sites involved in this study is approximately \$34,385,000.

(Note: site cost estimates are in \$CDN and do not include applicable taxes.)

Please refer to the following individual hydro-electric generation system descriptions, powerhouse demolition plan descriptions and associated spreadsheets elsewhere in this report for more detailed information.

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III. POWERHOUSE DEMOLITIONS STUDY OVERVIEW

1. Introduction

The following pages and attachments represent an estimate of demolition costs associated with conceptual powerhouse decommissioning plans for each of NSPI's 31 identified hydro sites (except the Harmony Development, which has already been removed, and the Annapolis Tidal Development, which is being addressed elsewhere.).

This estimate is intended to provide a reasonable approximation of expected costs per site for conceptual demolition plans, including consideration for site security (public safety) during demolition works; worker safety; environmental protection for the site; removal from site of features and equipment associated with the powerhouse structures and their operation; removal and disposal off-site of generated demolition debris not suitable for buried disposal at site; and site environmental remediation, as appropriate. Note that demolition methodology has been derived to reflect basic safety and environmental requirements (by law and/or policy of the regulatory authority having jurisdiction and NSPI).

In-stream powerhouses will be completely removed, including concrete substructure, but where practical existing structures will be demolished to a few feet below finished grade and infilled with suitable construction debris and least costly imported granular and/or common fill. At "in-stream" locations, only clean granular fill will be utilized as backfill.

Estimated costs are compiled and presented in accordance with AACE International Recommended Practices for a Class 5 estimate and are arranged to be in conformance with Canadian Council of Ministers of the Environment (CCME) National Guidelines for the Decommissioning of Industrial Sites. The primary characteristic for a typical Class 5 estimate is that the maturity level of project definition and deliverables is at about 0 percent to 2 percent. Secondary characteristics include: the purpose for the estimate is normally for concept screening; and, methodology for derivation of the estimate includes approximations based on judgement, analogy and limited mathematical determinations. The published expected accuracy range for such an estimate shows a typical variation in low and high ranges as follows: Low is considered minus 20 percent to minus 50 percent; while High range is considered to be +30 percent to +100 percent.

According to AACE, estimate accuracy is generally driven by the following:

- Level of non-familiar technology on each project;
- Complexity of the project;
- Quality of reference cost estimating data;
- Experience and skill level of the estimator;
- Estimating techniques employed;
- Time and level of effort budgeted to prepare the estimate;
- Unique or remote nature of project locations;

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- The accuracy of the composition of the input and output streams.

For this project we are addressing 31 individual powerhouse sites and therefore 31 individual projects which display their own unique characteristics, conditions and work-plan requirements. The estimate total for the 31 sites is included in the Summary and Conclusions section of this report.

Demolition methodology requirements are unique for each powerhouse site and have therefore been individually derived for each site in consideration of specific site conditions, powerhouse configuration and construction arrangement, as well as location and access condition for each powerhouse and proximity to required resources and potential disposal sites and their associated tariffs (tipping fees).

Although most powerhouses share a very general common configuration, each hydro powerhouse development is unique and will present its own set of circumstances during any planned decommissioning or demolition activities. As a result, demolition cost estimates cannot be directly extrapolated from one site to another. For example: some powerhouses (such as those found on the Mersey River) form an integral part of the gravity dam and head-works structure, while others (such as Paradise) can be located more than two miles from the main dam and intake head-works. Some sites utilize independent intake structures, gates and penstocks, while others have gated intakes incorporated into the powerhouse structure. The main powerhouse at Wreck Cove is located within a granite mountain in the Cape Breton Highlands. In various powerhouses some turbo-generators are large, others like that found at Fall River are relatively small. Some turbo-generator units are horizontal while most are vertical in orientation. For each arrangement then, a demolition plan must be formulated that adequately addresses the conditions encountered at that site.

To streamline the estimating process, we have compartmentalized the planning to take into account specific similarities in several powerhouse configurations rather than just carry out a completely independent estimate for each of the 31 sites addressed by this study. To assist with the streamlining process specific demolition categorizations are included in this study and are described in detail elsewhere in this section of the report.

Conceptual demolition plans represented by this study consider current man-hour rates, as well as current machine/equipment rates, and estimated time to complete designated demolition and/or other required tasks for each site, as per site specific conceptualized decommissioning requirements.

The costs detailed in this report are representative of demolition of assets directly associated with existing powerhouses and existing machinery and mechanical and electrical cabinets, controls and related equipment used in the generation of electricity. Demolition of equipment used in the transmission and distribution of that electricity is not included. Costs for removals of dams and/or other similar or associated structures and/or facilities including, but not limited to, intake structures and related operating equipment (except where noted otherwise), pipelines and penstocks, head-ponds, storage reservoirs, canals, spillways and other water control facilities/devices and other infrastructure not directly associated with a powerhouse structure and its generating equipment, are not included in this study.

Note that one of the parameters of this report is to minimize possible costs associated with on-going maintenance and operations of facilities expected to remain in place. Therefore, all constructed features associated with the powerhouse and its operation will be removed and the site will be remediated to reflect pre-construction or near to pre-construction condition where possible. Note that in some cases there may be cause to review and consider implementation of features and facilities that may enhance public safety at these sites. However, such examination and consideration will be best employed at a more detailed planning stage.

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Please also note that the decommissioning cost estimates herein do not include broad environmental assessments or costs for unforeseen environmental clean-ups (buried dump sites, etc.). Some specific habitat restorations and related work will be required and is included as noted or described in the plan for each powerhouse site.

Costs which may be associated with obtaining demolition permits, licenses, environmental assessments and permits or for possible costs associated with land or other similar acquisitions necessary for site decommissioning work to be carried out are not included in the estimates in this study.

Removal of fish ladders or other fish passage infrastructure, unless specifically noted otherwise is not included as part of this study.

Sites subjected to demolition will be considered to be left in their natural or near natural remediated and rehabilitated state. This will necessitate the complete removal of existing structural components, including the entire powerhouse substructure.

However, in order to reduce some of the demolition costs, construction debris, such as plain and clean concrete and masonry materials, will be buried at a suitable site location where possible. Other materials, such as steel rebar, structural steel and other building materials will be removed from site and disposed of off-site at appropriately licensed disposal and recycling facilities. Sites will be left in "brown-field" condition.

A hazardous materials assessment is not included in this exercise.

Asbestos has been identified in various locations in various plant sites over the years and efforts have been undertaken to have that material removed or rendered inert when discovered. It is expected that this material will occasionally be encountered during demolition work and that special precautions will be necessary when it is encountered to ensure safe removal from site. However, there is no allowance for that work in the estimates contained herein, those costs would be additional.

Costs associated with the removal of polychlorinated biphenyls (PCB's) and oil-filled cable are not included in this study. As well, costs associated with clean-up of PCB contaminations outside the vessels or normal containments are not included.

Finally, derivation of costs associated with archaeological assessments and specific investigations at sites of archaeological significance are not included in this study. Similarly, engagement of local Mi'kmaq communities is not included in this study, but will be carried out by others.

Specific methodology for demolition exercises at each site will vary depending upon how each contractor would plan to carry out the work and what equipment might be at the contractors' disposal. It is the intent of this report to provide reasonable median demolition cost estimates for each site based on location, known conditions, characteristics and requirements which might affect costs.

Construction of conventional earth-fill cofferdams at each site forms a large part of costs identified in this study. These cofferdams will be required for debris containment during the demolition process and more importantly, would be required for dewatering the area of work during sub-structure removals. Silt-

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booms, silt fences and oil spill containment booms and provision of oil-spill clean-up tools and equipment will be required during planned demolitions. However, no costs have been included in the individual site estimates to cover any environmental clean-up activities that may be collateral to undertaken demolition work.

The demolition process would involve the procurement of services of experienced contractors and related site supervision.

Demolition contractor(s) would probably be engaged through a procurement process to ensure that only appropriately experienced contractors would be engaged. Work carried out by those crews at each site would include removal of in-plant mechanical operating equipment and related components, removal of turbo-generators and related parts, and demolition and removal of powerhouse superstructure and substructure, as required. Removal of all electrical and controls equipment directly related to transmission is not included.

Credit for limited material salvage values is included in stated pricing. This issue is discussed in more detail in this section.

The demolition contractor would be responsible for all off-site material disposals.

Site access obstructions such as fencing, ditches, or strategically located fill or boulders may be required at some sites. No permanent site road gates are considered at this time.

A general decommissioning/demolition procedure for each hydro powerhouse site will consist of the following:

1. Develop/Engineer a Demolition, Material Removal and Disposal, Site Remediation and Public Safety Plan for each site. This may involve preparation of drawings, specifications and tender documents.
2. Prepare, apply for and obtain various site specific environmental and related approvals (and permitting under the Navigable Waters Protection Act, where applicable) in order to proceed with the Planned Decommissioning Works. (Note: Costs for these activities are not included in this estimate.)
3. Tender and Award of Planned Decommissioning Works
4. Contractor General Mobilization, Removals and installation of temporary facilities as required.
5. Demolition
6. Site Remediations and Access Removals and Site Access Obstruction installation, as required.
7. Clean-up, implementation of long term site security plan as deemed necessary.

A detailed breakdown of the basic required demolition steps for the site is listed in each site descriptions in this document.

Demolition cost estimates herein also include interest and other overhead costs expected to be incurred during the demolition process. Related engineering and planning costs, as well as site supervision during demolition, are also included in each site cost estimate.

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Please note that these cost and infrastructure estimates are intended for the sole purpose of determining appropriate asset retirement obligations for system components described herein. Any use of the information contained herein for other purposes or by parties other than those for whom this work was carried out is not permitted. (Please refer to Disclaimer.)

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2. Demolition Categories

Powerhouses and related structures in the Nova Scotia Power Inc. Hydro Production currently in service were erected and commissioned between the late 1920's and the 1980's. Since then building technology and related codes and guidelines have evolved and as a result the appearances and structural arrangements of the powerhouses vary greatly from system to system across the Nova Scotia Power Inc. (NSPI) Hydro Production powerhouse inventory.

Adding to that the requirement for tailor-made engineering for each powerhouse structure to specifically suit each site's topography, geology, hydrology and production requirements, mean that it is a rare occurrence when any two powerhouse designs are similar. Therefore estimates for demolition and rehabilitation for each site must be completed on a generally individual basis.

However, many powerhouses on various systems do share some basic configurations which will enable some limited streamlining of the demolition cost estimate process. For instance, some of the powerhouse structures on the Mersey River Hydro System, constructed between the 1920's and 1950's share some basic architecture and mechanical arrangements, as do some of the structures on the Black River and Avon River systems which were constructed in the 1930's to 1950's. Therefore, the planning approach for basic demolition techniques for some structural components at similar facilities may be somewhat similar.

Where powerhouse superstructures are constructed of brick and mortar or where reinforced concrete is of lighter construction or the concrete is subjected to alkali aggregate reactivity demolition, may be easier and faster than at structures where the superstructure is constructed of much heavier and much higher strength solid reinforced concrete.

Many powerhouses utilize a combination of reinforced concrete and structural steel in order to reduce the quantity of concrete utilized during original construction. Many of the powerhouse substructures will be constructed exclusively of reinforced concrete.

Some powerhouses have been constructed with multiple similar turbo-generators and related equipment, while others have non similar multiple units and others feature single stand-alone generating units.

As well, the plant intake and outlet arrangements vary from powerhouse site to site. Some powerhouses are fed water via canals and penstock pipelines, while others are fed directly through an intake or gated head works that is integrated into the dam and powerhouse structure. Where penstock pipes are above ground, foundations will generally be relatively shallow, while buried penstock pipes will suggest that a powerhouse will have a more extensive and deeper concrete substructure arrangement. Some demolition planning will be similar where inlet configurations are similar.

Powerhouse outlet/tailrace conditions will vary from site to site but where the general outflow arrangements are similar, demolition and site remediation planning will be somewhat similar. However, note that in some locations, the powerhouse draft-tube and tailrace outlet is at or near the original river bed. In other locations original rivers have been diverted to enable construction of power stations. In such circumstances, the tailrace channel can extend a considerable distance to rejoin the original river alignment. Long tailrace arrangements will therefore involve considerable (but similar) downstream remediation efforts upon powerhouse retirement.

Therefore, to assist in conceptual demolition planning efforts and site restoration estimating, we will consider three main powerhouse arrangement categorizations for each site. These categorizations will

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consider inlet/intake configuration and conditions, general building architecture and construction as well as outlet/draft-tube and tailrace arrangements:

I. Intake Arrangement Demolition Categories:

- Category A – Powerhouses with penstock pipeline above ground, normally at the rear of the powerhouse. This arrangement normally suggests that the powerhouse will have a shallower concrete substructure.
- Category B – Powerhouses with penstock pipeline below ground, normally at the rear of the powerhouse. This arrangement normally suggests that the powerhouse will have a deeper and more substantial concrete substructure.
- Category C – Powerhouses with concrete headworks intake structure constructed integral with dam and powerhouse. This arrangement is usually characteristic of a substantial and multi-level concrete substructure.

II. Architectural Demolition Categories:

- Category A – Above ground brick and mortar, Reinforced Concrete and structural steel superstructure with Reinforced Concrete Substructure. This arrangement is normally lightest and easiest to dismantle. With some exceptions, many of these structures were constructed prior to World War II.
- Category B – Above ground reinforced concrete superstructure and reinforced concrete Substructure. This arrangement, unless subjected to alkali aggregate reactivity is normally the strongest and most durable structural arrangement. As a result it is expected that disassembly for this arrangement will be the most difficult and time-consuming. Many of these structures were constructed after World War 2 as post-disaster structures, although some of these structures were constructed in the 1920's and 1930's.
- Category C – Other. This covers powerhouse structural arrangements that are not covered by categories A and B above.

III. Outlet, Draft-Tube and Tailrace Arrangement Categories:

- Category A – Reinforced concrete and/or steel draft tube and direct (or near direct) outflow of tailrace into the original water course. This arrangement will require the least downstream remediation work as a result of powerhouse removal.
- Category B – Reinforced Concrete and/or Steel Draft Tube and outflow to a constructed tailrace diversion channel. This arrangement will require the most downstream remedial work as a result of powerhouse removal. It will be necessary to restore the tailrace channel to pre-construction or near original conditions.

The following is a listing of how each of the powerhouse structures will be categorized under these headings:

I. Intake Arrangement Demolition Categories:

- Category A – Penstock pipe above ground at rear of powerhouse. The following powerhouses reflect this arrangement:
 - i. Avon No.1 Development
 - ii. Avon No. 2 Development
 - iii. Methals Development

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- iv. Hollow Bridge Development
 - v. Hells Gate Nos. 1 and 2 Developments
 - vi. White Rock Development
 - vii. Bear River Gulch Development
 - viii. Sissiboo Falls Development
 - ix. Weymouth, Nos. 1 and 2 Developments
 - x. Roseway Nos. 1 and 2 Developments
 - xi. Sandy Lake Nos. 1 and 2, and Coon Pond Nos. 1 and 2 (shared powerhouse structure) Developments
 - xii. Tidewater Nos. 1 and 2 Developments
 - xiii. Dickie Brook Nos. 1 and 2 Developments
- Category B – Penstock pipe below ground at rear of powerhouse. The following powerhouses reflect this arrangement:
 - i. Lumsden Development
 - ii. Nictaux Development
 - iii. Paradise Development
 - iv. Lequille Development
 - v. Bear River Ridge Development
 - vi. Fourth Lake Development
 - vii. Deep Brook, Nos. 1 and 2 Development
 - viii. Fall River Development (shallow bury)
 - ix. Ruth Falls, Nos 1, 2 and 3 Developments
 - x. Gisborne Development
 - xi. Wreck Cove Nos. 1 and 2 Development
- Category C – Concrete Headworks Intake Structure Integral with Dam and Powerhouse. The following powerhouses reflect this arrangement:
 - i. Tusket Nos. 1, 2 and 3 Development
 - ii. Upper Lake Falls No. 1 and 2 Development
 - iii. Lower Lake Falls No. 1 and 2 Development
 - iv. Big Falls No. 1 and 2 Development
 - v. Lower Great Brook No. 1 and 2 Development
 - vi. Cowie Falls No. 1 and 2 Development
 - vii. Malay Falls Nos. 1, 2 and 3 Developments

II. Architectural Demolition Categories:

- Category A – Above ground brick and mortar, reinforced concrete and structural steel superstructure with reinforced concrete substructure. The following powerhouses reflect this arrangement:
 - i. Avon No. 1 Development

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- ii. Avon No. 2 Development
 - iii. Hollow Bridge Development
 - iv. Lumsden Development
 - v. Hells Gate, Nos. 1 and 2 Developments
 - vi. Nictaux Development
 - vii. Roseway, Nos. 1 and 2 Developments
 - viii. Dickie Brook, Nos. 1 and 2 Development
- Category B – Above Ground Reinforced Concrete Superstructure (Heavy Construction) and Reinforced Concrete Substructure. The following powerhouses reflect this arrangement:
 - i. Methals Development
 - ii. White Rock Development
 - iii. Paradise Development
 - iv. Lequille Development
 - v. Bear River Ridge Development
 - vi. Bear River Gulch Development
 - vii. Fourth Lake Development
 - viii. Sissiboo Falls Development
 - ix. Weymouth Falls Nos. 1 and 2 Developments
 - x. Tusket Nos. 1, 2 and 3 Development
 - xi. Upper Lake Falls, Nos. 1 and 2 Development
 - xii. Lower Lake Falls, Nos. 1 and 2 Development
 - xiii. Big Falls, Nos. 1 and 2 Development
 - xiv. Lower Great Brook, Nos. 1 and 2 Development
 - xv. Deep Brook, Nos. 1 and 2 Development
 - xvi. Cowie Falls, Nos. 1 and 2 Development
 - xvii. Sandy Lake, Nos. 1 and 2 and Coon Pond, Nos. 1 and 2 (Mill Lake) Development
 - xviii. Tidewater , Nos. 1 and 2 Development
 - xix. Malay Falls, Nos. 1, 2 and 3 Developments
 - xx. Ruth Falls, Nos. 1, 2 and 3 Developments
 - xxi. Gisborne Development
- Category C – Other
 - i. Fall River Development
 - ii. Wreck Cove, Nos. 1 and 2 Development

III. Outlet, Draft-Tube and Tailrace Arrangement Categories:

- Category A – Reinforced concrete and/or steel draft tube and direct or near direct outflow to original water course. The following powerhouses reflect this arrangement:
 - i. Avon No.2 Development

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- ii. Methals Development
 - iii. Lumsden Development
 - iv. Hells Gate Nos. 1 and 2 Developments
 - v. Bear River Gulch Development
 - vi. Nictaux Development
 - vii. Fourth Lake Development
 - viii. Sissiboo Development
 - ix. Upper Lake Falls, Nos. 1 and 2 Development
 - x. Lower Great Brook, Nos. 1 and 2 Development
 - xi. Cowie Falls, Nos. 1 and 2 Development
 - xii. Tidewater, Nos. 1 and 2 Development
 - xiii. Ruth Falls, Nos. 1, 2 and 3 Developments
 - xiv. Malay Falls, Nos. 1, 2 and 3 Developments
 - xv. Dickie Brook, Nos. 1 and 2 Development
- Category B – Reinforced Concrete and/or Steel Draft Tube and outflow to constructed tailrace diversion.
The following powerhouses reflect this arrangement:
 - i. Avon No. 1 Development
 - ii. Hollow Bridge Development
 - iii. White Rock Development
 - iv. Paradise Development
 - v. Lequille Development
 - vi. Bear River Ridge Development
 - vii. Weymouth, Nos. 1 and 2 Developments
 - viii. Tusket, Nos. 1, 2 and 3 Development
 - ix. Roseway, Nos. 1 and 2 Developments
 - x. Lower Lake Falls, Nos. 1 and 2 Development
 - xi. Big Falls, Nos. 1 and 2 Development
 - xii. Deep Brook, Nos. 1 and 2 Development
 - xiii. Sandy Lake, Nos. 1 and 2 and Coon Pond , Nos. 1 and 2 Developments
 - xiv. Fall River Development
 - xv. Gisborne Development
 - xvi. Wreck Cove, Nos. 1 and 2 Development

3. Planned Demolition Methodology

General overall demolition methodology will involve various steps in establishing site security, worker safety and environmental protection during the dismantling, demolition and restoration process.

Demolition planning will consider that the dam, reservoir and any intake penstock pipeline infrastructure will be removed by others prior to commencement of powerhouse disassembly. All electrical and communications equipment directly related to transmission will be removed by others. As well, it is assumed that no outstanding asbestos abatement or other hazardous materials or site environmental

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SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

issues will exist which would adversely affect demolition planning. All fisheries related infrastructure at each site will be removed by others except where specifically noted otherwise.

Although specific planning for demolition and restoration works will be tailored to each powerhouse site, each plan will encompass the following general considerations:

- Installation of site temporary security arrangements and contractor site temporary infrastructure to support planned activities, to protect public safety during the course of the work and to protect the environment. This may include the installation and maintenance of environmental protection features such as containment berms, silt curtains and fences, and oil booms during the course of the work at each site. Water control cofferdam structures such as dikes and berms will also be constructed at this time to encapsulate the building demolition foot-print. Cofferdams, dikes and berms may become permanent features or parts of other permanent features at demolition sites. Capacity for dewatering, sedimentation control and oil spill containment during demolition work will be provided at each site.
- Contaminated cooling water and lubricating and hydraulic oils and related fluids remaining in the powerhouse will be removed for recycling.
- Various machinery and control mechanisms will be dismantled and removed from each powerhouse, including turbo-generator parts and overhead cranes. Note that it has been assumed that existing overhead lifting devices such as bridge cranes and powered chain-falls will be utilized for disassembly efforts as possible. This may require management of electrical removals in such a manner that electrical power remains supplied to lifting devices for a period during disassembly works, or may necessitate that some sort of temporary power is supplied to that equipment prior to its removal from the building.
- Depending on site and powerhouse structural arrangements, some turbo-generator equipment can be removed from the powerhouse structure during machinery disassembly, while it may be expedient to remove other components once the roof of the powerhouse structure is removed. Exact removals methodology will depend on powerhouse configuration and site arrangement and how a chosen demolition contractor may wish to manage materials at site. For the purposes of this exercise, it will be expected that larger items such as generator stators will be removed from the building when the roof is removed. Other turbo-generator components can be removed as is most expedient.
- Windows, doors and miscellaneous components will be removed as practical prior to general structural demolition.
- Note that some temporary shoring and other support structures may have to be constructed or employed during the disassembly and demolition efforts to ensure structural stability and worker safety during building removal efforts.
- Roof removal will be carried out in a carefully planned disassembly exercise that may involve cutting-out and removing parts of reinforced concrete slabs and beams with engineered lifts at several locations. Trusses, where present, may be removed one at a time but without disassembly into smaller parts.
- Walls and main floors will be removed with conventional heavy demolition equipment including excavators and large percussion hammers. Demolition material will be separated (as practical) and stockpiled as it is knocked down, in preparation for disposal.
- Considerable excavation will be necessary where significant substructure removals are required, depending on the depth of foundations. Once the substructure is removed, excavations will be backfilled with excavated and demolished concrete and masonry material as appropriate and with least costly

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imported fill as necessary. Along with significant excavations will be a requirement for water management as surface and groundwater will infiltrate excavations and will have to be removed.

- Plain concrete and masonry materials separated from reinforcing steel and embedded metal parts can be disposed of by burying at site. Rebar and embedded metal parts will have to be disposed of off-site. Note that unless the powerhouse is located “in-stream” the entire building substructure may not require removal from the powerhouse location. Concrete debris suitable for disposal at site will be buried in an appropriate site location.
- Rebar, other metal components and demolition materials will be trucked away from site to the nearest facility which is licensed by the Province of Nova Scotia to accept construction and building demolition debris. Note that tipping fees at such facilities have become significant in recent years.
- If practical, selected metals and other materials may be separated and harvested for salvage value. Note though that such activities may be prohibitively costly, precluding the practicality of such endeavours.
- At some locations the existing powerhouse will be located in-stream and/or in the original riverbed. Where that condition exists it may be necessary or appropriate to maintain or construct a diversion channel for river flow. Significant erosion protection around the infilled demolition excavation may be necessary. At such sites the entire powerhouse structure and substructure will be removed.
- The powerhouse site will be restored to pre-construction “brown-field” site condition.
- Where necessary, tailrace diversion channels will be restored to original or near original pre-construction condition.
- Powerhouse site access driveways will be removed and restored to original condition or near original condition where appropriate. In some cases it will be more practical to leave access roadways in place to facilitate search and rescue and firefighting activities. Stream crossing bridge structures (except culverts) will be removed where such a feature could present a hazard to the general public or where such a structure could represent an on-going maintenance liability.
- Significant efforts in multi-disciplinary engineering and other related technical support will be required during demolition and restoration planning and site works for each powerhouse.

4. Demolition Costs

Since of the work as described herein would be carried out by contractors, costs for demolition work throughout this study are based on standard current contractor pricing and contractor unit rates, although some of those rates may be averaged or optimized to better reflect actual market conditions.

This study has utilized the following sources for provision of costs for construction/demolition rates for men and equipment, including overhead costs and profit (plus HST):

Elliot Excavators Ltd.

- Bobcat E85 Mini-Excavator [REDACTED] plus transport to site
- Hitachi 35 Mini-Excavator with hydraulic hammer [REDACTED] plus transport to site
- Volvo 210 Excavator [REDACTED] plus transport to site
- John Deere 350 Excavator [REDACTED] plus transport to site
- John Deere 350 Excavator with hydraulic hammer [REDACTED] plus transport to site

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- Komatsu D39 Dozer [REDACTED] plus transport to site
- Pick-up truck [REDACTED]
- A.W. Leil Cranes
- 18 ton boom truck [REDACTED] including travel to and from site
- 28 ton boom truck [REDACTED] including travel to and from site
- 200 ton mobile crane [REDACTED] plus mobilization and demobilization costs and travel to and from site.

J. Mason Contracting Limited

- Un-skilled labour [REDACTED]
- Skilled trades rate [REDACTED]
- Foreman Rate [REDACTED] including truck
- Dale Fabrication Inc.
- Dump truck and Driver [REDACTED]

Disposal Site Tipping Fees:

Costs for tipping fees at Halifax C&D Recycling Ltd. in Goodwood, and at Torbrook C&D Disposal and Recovery near the Town of Annapolis Royal have been utilized in costs estimation. Published rates for those tipping fees are as follows:

Halifax C&D Recycling

1. Concrete with Rebar (no metal projections)
2. Concrete with Rebar(with metal projections)
3. Mixed loads

[REDACTED]
[REDACTED]
[REDACTED]

Torbrook C&D Disposal and Recovery

1. Construction and sorted demolition debris
 - Brick, block, concrete
 - Asphalt
 - Asphalt shingles
 - Drywall
 - Wood Brush
2. Construction and Demolition Debris (Mixed)
3. Scrap Metals (This is a disposal fee, not a salvage value)

[REDACTED]

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Estimated disposal costs derived in this study per site consider estimated demolition material volumes and weights generated at each site for disposal, and include trucking at hourly rates including driver, and estimated disposal site tipping fees.

5. Salvage Values

Salvage Values:

Pertinent posted material salvage values for Mississauga Ontario on July 16, 2018 are as follows:

Copper (bare)	
Iron	
Steel	
Stainless steel	
Yellow brass	
Mixed aluminum	
Electric motors and generators	
Insulated wire no. 1	
Insulated wire no. 2	
Aluminum wire	

Note that nickel and other metal materials will be available in small quantities but will in all likelihood not be worth efforts required to salvage.

Copper windings on turbo-generator rotor poles may take considerable effort to remove and separate from the base metal stubs, and may not be worth efforts required for such material separation and sorting.

In accordance with the above rates, a 500 pound stainless steel Francis runner (turbine) will be worth approximately [REDACTED] in salvage value. Although many runners have been replaced over the years with stainless steel units, several less valuable cast iron or carbon steel Francis and Kaplan (or similar) turbines remain in service. A similar cast iron turbine would have a salvage value of about \$40. Costs for removing and transporting such a turbine will exceed salvage value.

A moderately large 10 ton vertical rotor assembly may be worth about [REDACTED] in salvage, and a matching cast iron stator and its steel stack may be worth about [REDACTED]. Other miscellaneous parts including stainless steel clad carbon steel shafts and iron wicket gates and related parts may fetch as much as [REDACTED] salvage value. Therefore, rotor, stator, shafts and other miscellaneous parts on such a unit may have a total salvage value of about [REDACTED].

A 200 ton mobile crane may be needed to handle a moderately large unit rotor and stator. Costs for that equipment may be in the range of about [REDACTED] including travel and mobilization. Some assembly at site may be required (counter-weight and jib installation). (Cost starts when mobile crane unit leaves its yard and runs until it returns.) Trucking of the rotor will be about [REDACTED]. Therefore,

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cost for salvaging those larger parts could be [REDACTED] Cost for salvage appears to exceed the salvage value for those parts.

Therefore, it appears that salvage value for larger components at single-unit developments may be marginal or negative. However, these parts must be removed from each powerhouse as part of the decommissioning process. If they are removed and stockpiled in a manner which is supportive of salvage intent, there may be some nominal salvage values which can be realized.

Although there will be potential for harvesting smaller components for salvage value, the benefits will probably be relatively small and not worthy of further detailed consideration in a Class 5 estimate. However, it is worth noting that at sites with multiple units, crane mobilization and some transportation costs can be shared between units, yielding higher incremental or nominal salvage values. Where there is reasonable potential for such credits, a negative value has been provided on the pertinent spreadsheet estimate.

Please note though that where salvage credits are applied, there will probably be proportionately increased demolition costs.

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IV. SYSTEM DEMOLITIONS

1. Avon Hydro Electric System

The Avon Hydro Generating System, located on the Avon River, upstream of Martock, outside Windsor in Hants County of Nova Scotia, is comprised of two Hydro-electric generating developments namely Avon No. 1 and Avon No 2.

The “run-of-the-river” facilities are arranged in series on the Avon River, with Avon No. 1 located downstream of Avon No. 2. This nomenclature arrangement is unique to the NSPI hydro production inventory and are named in order from upstream plants to downstream plants.

Both powerhouses were originally constructed in about the 1920’s by the Avon River Power Company, a precursor to the Nova Scotia Power Commission and Nova Scotia Power Inc. (NSPI). In the late 1950’s the Avon No. 1 plant was replaced with a more modern facility.

a) Avon No. 1 Development

In about 1958 the old original Avon No. 1 powerhouse and pipeline were removed and replaced with a more modern brick masonry and peaked roof building. The original surge tank was removed as part of this work and most of the original pipeline was replaced with a new canal and gated concrete intake structure. The former wood stave penstock was replaced with a new wood stave pipe which was extended from the new intake structure to the powerhouse. This newer arrangement has maintained a production capacity of about 4.2 MW from a single vertical generating unit with about 117 feet of head since the 1958 reconstruction.

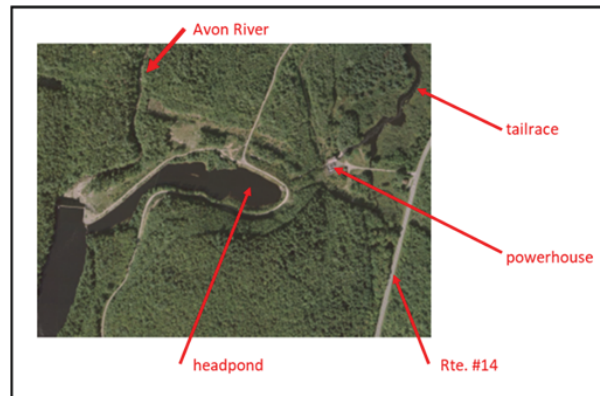


Photo 1: Avon No. 1 Development

The powerhouse can be accessed via a 500 foot-long (+/-) gravel driveway directly off Trunk Highway Rte. 14 in Upper Vaughan.

Avon No. 1 utilizes tailrace flow and/or spill from Avon No. 2 as its source for generation. Water that spills at the Avon No. 1 diversion dam (MacDonald Dam) bypasses Avon No. 1 and flows directly into the Avon River. Outflow from Avon No. 2 traverses a meandering path in a constructed tailrace channel for more than 3000 linear feet before flow once again joins up with the Avon River.

Demolition planning for this facility will consider that the intake penstock pipeline will be dewatered and removed by others, that all electrical and communications equipment directly related to transmission will be removed by others and that there are no outstanding asbestos

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abatement or other hazardous material or environmental issues at this site that would adversely affect demolition planning. Note that there is some material laydown area at site.

Although the masonry superstructure of the building may be demolished with relative ease, the reinforced concrete substructure removal will require significant work with heavy equipment and will include substantial excavations.

Following demolition planning categorizations apply to the Avon No. 1 facility:

- Intake Classification – Category A, penstock pipe is exposed above ground;
- Architectural Classification – Category A, reinforced concrete, steel and masonry'
- Outlet (Draft-tube) Classification – Category B, a lengthy tailrace channel will require significant remediation.

Therefore the following tasks have been considered in the demolition planning and costs derivation exercise:

- Install silt, debris and environmental containments, temporary security fencing (chain-link), silt fence, silt curtain and oil boom.
- Removal of accessible lubricating oil and previously undrained closed-system cooling water (for recycling).
- Removal of small machinery and turbo generator mechanical and electrical controls including but not limited to compressors and tanks, governors and related pressure tanks, bearing cooling systems and filters and related piping, throttle linkage components, electrical and communications cables, and miscellaneous smaller equipment and piping.
- Removal of HVAC equipment and localized heating units for areas within the building and for those heaters strategically placed to provide assistance for turbo-generator operation.
- Installation of a granular and relatively water-tight earth-fill cofferdam at the draft-tube outlet and tailrace.
- Removal of main turbo-generator components such as the Exciter; top frame; Rotor and Generator Shaft; Speed Ring, Wicket Gates, shafts and related parts; Turbine Shaft, Head-cover and Turbine; and Stator can be facilitated with the existing powerhouse overhead Bridge Crane, although a temporary power source and connection for the crane may be required. Those components can then be set aside as required for salvage and disposal once the roof structure is removed.
- Removal of Roofing, Sheathing, and support Trusses and related miscellaneous parts and components. Set aside and stockpile for salvage and disposal.
- Remove overhead Bridge Crane and stockpiled turbo-generator main components, sort and stockpile at site for salvage and disposal.
- Dismantle exterior walls and related components. Stockpile demolition material for disposal.
- Remove and demolish main floor reinforced concrete slab at generator level. Stockpile demolition material for disposal.

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SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

- Remove exposed interior steel penstock and related parts; also remove scroll case, throat ring, steel draft-tube parts and other related miscellaneous items. Stockpile and sort for salvage and disposal.
- Remove reinforced concrete foundation substructure to a few feet below new finished grade elevation. Stockpile debris for disposal.
- Remove auxiliary storage buildings and buried services including the on-site sewage disposal system, sanitary pumps and piping, any well and related freshwater piping and equipment.
- Disposal of construction and demolition debris – truck selected material to a designated construction debris disposal facility, while suitable other material such as pulverized concrete and masonry materials may be buried at site.
- Deliver or sell stockpiled salvage material.
- Infill foundation substructure excavation with compacted granular material and selected appropriate demolition debris to the tailrace cofferdam. The cofferdam can remain once graded to match site.
- Improve site surface drainage as required.
- Place topsoil, sods/hydro-seed, miscellaneous rudimentary landscaping as may be required for public safety and to facilitate surface drainage requirements.
- Once it is drained, remediate the lengthy tailrace with clean gravel and crushed stone, as well as clean fill as required. Grade surfaces, hydro-seed and/plant trees or other vegetation to return this area to a near natural state.
- Remove gravel access driveway from Highway No. 14.

The bulk of the costs associated with the decommissioning exercise include building demolition and related materials disposal, and site protection and remediation post demolition.

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SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

b) Avon No. 2 Development

Completed in about 1929, Avon No. 2 is fed via a diversion dam (Falls Dam) at Falls Lake, a power canal and a steel penstock, and has a single vertically oriented generating unit with a capacity of about 3.0 MW, sourced from approximately 142 feet of head. This structure includes a combination of reinforced concrete and clay tile blocks while its substructure is comprised of reinforced concrete and mass concrete cast directly into the blasted or otherwise excavated hill-side bedrock.

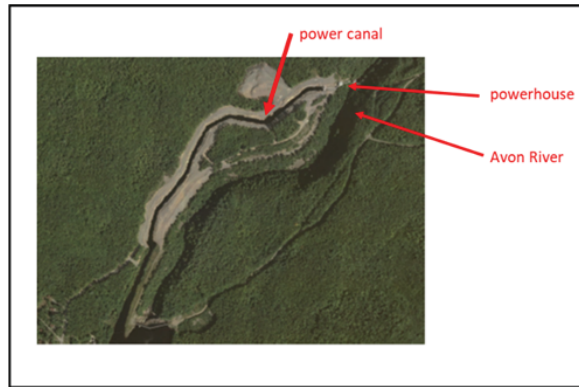


Photo 2: Avon No. 2 Development

The powerhouse can be accessed via gravel topped backroads which begin about a half-mile north of the Avon No. 1 access driveway at trunk highway No. 14. Gravel roads following parts of the Avon No. 1 head pond and power canal lead to the top of the hill and Falls Lake. Near the top of the slope is a dedicated powerhouse access side road which is hewn out of the east side rock face of the spillway gorge leading from Falls Lake Dam. The side road follows the east side of the gorge in the up-stream direction for about 1200 feet, and down slope to powerhouse grade. The powerhouse is on the west side of the river and is accessed from the gravel access via a steel and timber bridge which crosses the river.

Considerable work will be required to demolish and remove materials to the east side of the river. Due to bedrock proximity, there is limited opportunity to bury materials at this site, although there may be some potential burial sites at the upper end of the access road. The access roadway and bridge to the powerhouse are to be removed.

Outflow from the Avon No. 2 draft-tube enters directly into the Falls Dam spillway channel and original Avon River stream bed, where it is eventually diverted to the Avon No. 1 generator.

Demolition planning for this facility will consider that the intake penstock pipeline will be dewatered and removed by others, all electrical and communications equipment directly related to transmission will be removed by others and that there are no outstanding asbestos abatement or other hazardous material or environmental issues at this site that would adversely affect demolition planning. There is very limited available material lay-down area at this site.

Following demolition planning categorizations apply to the Avon No. 2 facility:

- Intake Classification – Category A, penstock pipe is exposed above ground;
- Architectural Classification – Category A, reinforced concrete, steel and masonry;
- Outlet (Draft-tube) Classification – Category A, the draft tube discharges flow almost directly to Falls Dam spillway channel, the Avon River and the MacDonald Dam head pond.

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SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

Therefore the following tasks have been considered in the demolition planning and costs derivation exercise:

- Install silt, debris and environmental containments, temporary security fencing (chain-link), silt fence, silt curtain and oil boom.
- Removal of accessible lubricating oil and previously undrained closed-system cooling water (for recycling).
- Removal of small machinery and turbo generator mechanical and electrical controls including but not limited to compressors and tanks, governors and related pressure tanks, bearing cooling systems and filters and related piping, throttle linkage components, electrical and communications cables and miscellaneous smaller equipment and piping.
- Removal of HVAC equipment and localized heating units for areas within the building and for those heaters strategically placed to provide assistance for turbo-generator operation.
- Installation of a granular and relatively water-tight earth-fill cofferdam at the draft-tube outlet and tailrace. This will necessitate the movement of granular and other materials from the east side of the Avon River to the west side. Some erosion protection will be necessary.
- Removal of main turbo-generator components such as Exciter; top frame; Rotor and Generator Shaft; Speed Ring, Wicket Gates, shafts and related parts; Turbine Shaft, Head-cover and Turbine; and Stator can be facilitated with the existing powerhouse overhead Bridge Crane, although a temporary power source and connection for the crane may be required. Those components can then be set aside as required for salvage and disposal once the roof structure is removed.
- Removal of Roofing, Sheathing, support Trusses and related miscellaneous parts and components. Set aside, stockpile for salvage and disposal.
- Remove overhead Bridge Crane and stockpiled turbo generator main components, sort and stockpile at site for salvage and disposal.
- Dismantle exterior walls and related components, stockpile demolition material for disposal. If there is limited room at site a large crane may have to be brought to site for early removals activities as there is limited laydown room on the powerhouse side of the river.
- Remove and demolish main floor reinforced concrete slab. Stockpile demolition material for disposal. If there is limited room at site a large crane may have to be brought to site for early removals activities as there is limited laydown room on the powerhouse side of the river.
- Remove exposed interior steel penstock, main penstock butterfly valve and related parts; scroll case, throat ring, steel draft-tube parts and other related miscellaneous items. Stockpile and sort for disposal and salvage.
- Remove reinforced concrete foundation substructure. This structure is in close proximity to the Avon River and its draft-tube can be considered to be "in-stream". Remove directly or stockpile as where possible for disposal.
- Disposal of construction and demolition debris – a large 200-ton or similar capacity mobile crane will be required to move construction debris and related components across the river to a location on the access road where excavators and similar equipment can move that material to trucks for transport to a designated disposal facility.

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SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

- Deliver or sell stockpiled salvage material. A large crane will be required to move this material to the east side of the river so that it can be transported to market.
- Infill foundation substructure excavation with compacted clean granular material to the existing tailrace cofferdam structure. The cofferdam can remain once graded to match site. Provide finish erosion protection. Material will have to be moved from the east side of the river to the west side to accomplish this task.
- Improve site surface drainage as required.
- Place topsoil, sods/hydro-seed, miscellaneous rudimentary landscaping as may be required for public safety and to facilitate surface drainage requirements.
- Remove and dismantle structural steel and timber river crossing which provides access to the powerhouse from the east side of the river. Once the bridge is removed from site the access side road shall be removed. Other gravel roads in the area should remain in place to facilitate ground-search rescue and fire-fighting activities.

The bulk of the costs associated with the decommissioning exercise include building demolition and related materials disposal, and site protection and remediation post demolition.

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Nova Scotia Power Hydro Production

Site Decommissioning Estimate Summary for Asset Retirement Obligations (ARO) Study

Avon River Hydro Electric Generation System

Avon No. 1 Development		
Item Description	Estimated Decommissioning Costs	Assumptions/Notes
SITE REMEDIATIONS		
Site Remediation Issues	\$410,500.00	Remediate 3000 ft. log tailrace channel.
Site Access Removals	\$15,000.00	Includes re-grading at site access roads.
Site Services Removals	\$10,000.00	Includes removal of buried water and waste-water buried.
BUILDINGS & STRUCTURES		
Powerhouse & Related Auxiliary Structures Removals	\$175,800.00	Includes roof structure removal, removal of superstructure walls, partial removal of sub-structure; infilling of the powerhouse and an estimate of off-site disposal costs.
Auxiliary Buildings Removals (not associated with Production Plant)	\$5,000.00	Removal of miscellaneous auxiliary structures.
BOILERS & AUXILIARIES		
Boilers & Auxiliaries - NOT APPLICABLE	\$0.00	N/A
TURBINES, GENERATORS & AUXILIARIES		
Turbo Generator Removals	\$35,300.00	Single Vertical turbo-generator unit.
Turbo Generator Control Removals	\$8,500.00	Includes disassembly and removal of governor systems, pumps, servos and associated piping.
ELECTRICAL		
On-Site Distribution Lines Removals	\$3,000.00	Interior and exterior at powerhouse.
Electrical Power Systems Removals	\$9,000.00	Powerhouse
Other Auxiliary Systems and Equipment Removals	\$3,000.00	Powerhouse
Electrical Control and Communication	\$5,000.00	Powerhouse
COMMON SERVICES		
Building Ventilation & Heating Removals	\$5,200.00	Limited HVAC at this site.
Plant Operating Equipment Removals	\$10,750.00	
GENERAL AND DISTRIBUTED		
Field Facilities & Decommissioning (Mobilization incl)	\$30,000.00	
Estimated Administration & Overhead Expenses	\$81,317.60	
SALVAGE		
Scrap Metals - General (Inc. Turbine)	-\$500.00	Allowance
General Parts	-\$1,000.00	Allowance
Insulated Wire and Cables No. 1	-\$1,000.00	Allowance
Insulated Wire and Cables No. 2	-\$1,000.00	Allowance
ENGINEERING & PROJECT MANAGEMENT		
Engineering & Project Management	\$87,126.00	
Site Decommissioning Estimate Subtotal Avon No. 1 Development \$890,993.60		
Notes: 1. Transmission cable, substations and related transformers to be removed by others in preparation for general demolition. 2. HST is additional to stated estimated costs.		

Figure 1

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Nova Scotia Power Hydro Production
Site Decommissioning Estimate Summary for Asset Retirement Obligations (ARO) Study
Avon River Hydro Electric Generation System

Avon No. 2 Development		
Item Description	Estimated Decommissioning Costs	Assumptions/Notes
SITE REMEDIATIONS		
Site Remediation Issues	\$276,825.00	
Site Access Removals	\$90,000.00	Remediate 1200 ft. long access road and Avon River crossing structure.
Site Services Removals	\$0.00	No sewage disposal at this site.
BUILDINGS & STRUCTURES		
Powerhouse & Related Auxiliary Structures Removals	\$222,250.00	Includes roof structure removal, removal of superstructure walls, removal of sub-structure; infilling of the powerhosue and an estimate of off-site disposal costs.
Auxiliary Buildings Removals (not associated with Production Plant)	\$0.00	No auxilliary buildings at this site.
BOILERS & AUXILIARIES		
Boilers & Auxiliaries - NOT APPLICABLE	\$0.00	N/A
TURBINES, GENERATORS & AUXILIARIES		
Turbo Generator Removals	\$39,300.00	Single Vertical turbo-generator unit.
Turbo Generator Control Removals	\$8,500.00	Includes dissembly and removal of governor systems, pumps, servos and associated piping.
ELECTRICAL		
On-Site Distribution Lines Removals	\$3,000.00	Interior and exterior at powerhouse.
Electrical Power Systems Removals	\$9,000.00	Powerhouse
Other Auxiliary Systems and Equipment Removals	\$3,000.00	Powerhouse
Electrical Control and Communication	\$5,000.00	Powerhouse
COMMON SERVICES		
Building Ventilation & Heating Removals	\$5,200.00	Limited HVAC at this site.
Plant Operating Equipment Removals	\$10,750.00	
GENERAL AND DISTRIBUTED		
Field Facilities & Decommissioning (Mobilization incl)	\$30,000.00	
Estimated Administration & Overhead Expenses	\$78,716.40	
SALVAGE		
Scrap Metals - General (Inc. Turbine)	-\$500.00	Allowance
General Parts	-\$1,000.00	Allowance
Insulated Wire and Cables No. 1	-\$1,000.00	Allowance
Insulated Wire and Cables No. 2	-\$1,000.00	Allowance
ENGINEERING & PROJECT MANAGEMENT		
Engineering & Project Management	\$84,339.00	
Site Decommissioning Estimate Subtotal Avon No. 2 Development \$862,380.40		
Notes: 1. Transmission cable, substations and related transformers to be removed by others in preparation for general demolition. 2. HST is additional to stated estimated costs.		

Figure 2

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

2. Bear River Hydro Electric System

In Bear River there are two hydro-electric developments that comprise the Bear River Hydro-Electric Generation System and discharge water into the Bear River and the Annapolis Basin. The Ridge Development is fed by Ridge Head Pond, which is located on South Mountain above the Town of Bear River. Ridge powerhouse discharges to Sam Harris Pond which serves as the forebay for the downstream Gulch Development. Gulch plant discharges flow directly to the Bear River just above tidewater level in the Town of Bear River.

Both Bear River developments incorporate diversions to the original Bear River alignment. Both Bear River powerhouses are fed via pipelines which incorporate surge tanks and above ground penstock pipes.

These developments were originally constructed in the 1950's by the Nova Scotia Power Commission, a precursor to NSPI.

a) Ridge Development

Completed in 1957, the Ridge Development plant harnesses approximately 140 feet of head and provides 3.0 MW of electrical generation capacity from a single vertical generation unit.

The powerhouse can be accessed via the paved Jefferson Road and gravelled Sam Harris Road. Jefferson Road is located about two and a half miles east of Bear River along the Clementsvale Road and Sam Harris Road is located about two miles south and east along Jefferson Road. Once off Jefferson Road, the Sam Harris back road to the Ridge powerhouse meanders through a densely forested area for about three miles in a mostly southerly direction where it passes the powerhouse.

Demolition planning for this facility will consider that the intake penstock pipeline will be dewatered and removed by others, all electrical and communications equipment directly related to transmission will be removed by others and that there are no outstanding asbestos abatement or other hazardous materials or environmental issues at this site that would adversely affect demolition planning. Note that there is some limited material laydown area at site but more laydown area can be cleared.

There is room at site to bury clean concrete debris.

Following demolition planning categorizations apply to the Ridge facility:

- Intake Classification – Category B, penstock pipe is buried;
- Architectural Classification – Category B, the tailrace channel will require remediation to the original Bear River alignment.

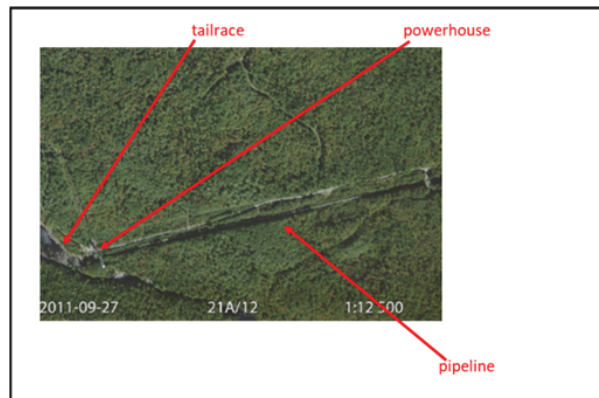


Photo 3: Ridge Development

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

- Outlet (Draft-tube) Classification – Category B, the tailrace channel will require remediation to the original Bear River alignment.

Therefore the following tasks have been considered in the demolition planning and costs derivation exercise:

- Construct additional material lay-down area as required.
 - Install silt, debris and environmental containments, temporary security fencing (chain-link), silt fence, silt curtain and oil boom.
 - Removal of accessible lubricating oil and previously undrained closed-system cooling water (for recycling).
 - Removal of small machinery and turbo generator mechanical and electrical controls including but not limited to compressors and tanks, governors and related pressure tanks, bearing cooling systems and filters and related piping, throttle linkage components, electrical and communications cables and miscellaneous smaller equipment and piping.
 - Removal of HVAC equipment and localized heating units for areas within the building and for those heaters strategically placed to provide assistance for turbo-generator operation.
 - Installation of a granular and relatively water-tight earth-fill cofferdam at the draft-tube outlet and tailrace.
 - Removal of main turbo-generator components such as Exciter; top frame; Rotor and Generator Shaft; Speed Ring, Wicket Gates, shafts and related parts; Turbine Shaft, Head-cover and Turbine; and Stator can be facilitated with the existing powerhouse overhead Bridge Crane, although a temporary power source and connection for the crane may be required. Those components can then be set aside as required for salvage and disposal once the roof structure is removed.
 - Removal of Roofing, Sheathing, support structure and related miscellaneous parts and components. Set aside, stockpile for salvage and disposal.
 - Remove overhead Bridge Crane and stockpiled turbo-generator main components, sort and stockpile at site for salvage and disposal.
 - Demolish exterior walls and related components, stockpile demolition material for disposal.
 - Remove and demolish main floor reinforced concrete slab. Stockpile demolition material for disposal.
 - Remove exposed interior steel penstock, butterfly valve and related parts; also remove scroll case, throat ring, steel draft-tube parts and other related miscellaneous items. Stockpile and sort for salvage and disposal.
 - Remove reinforced concrete foundation substructure to a few feet below new finished grade elevation. Stockpile debris for disposal.
 - Remove buried services including the on-site sewage disposal system, sanitary pumps and piping, any freshwater piping and equipment.
 - Disposal of construction and demolition debris – truck selected materials to a designated construction debris disposal facility, while suitable other material, such as pulverized concrete devoid of rebar and embedded metals, can be buried at site.
 - Deliver or sell stockpiled salvage material.
-

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

- Infill foundation substructure excavation with compacted granular material and selected demolition debris to the tailrace cofferdam. The cofferdam can remain once graded to match site. Provide erosion protection as required.
- Improve site surface drainage as required.
- Place topsoil, sods/hydro-seed, miscellaneous rudimentary landscaping as may be required for public safety and to facilitate surface drainage requirements.
- Once it is drained, remediate the tailrace with clean gravel and crushed stone, as well as clean fill as required. Grade surfaces, hydro-seed and/plant trees or other vegetation to return this area to a near natural state.
- Gravel woods roads in the area should remain in place to facilitate ground-search rescue and fire-fighting activities.

The bulk of costs associated with the decommissioning exercise include building demolition and related materials disposal, and site protection and remediation post demolition.

b) Gulch Development

Completed in 1952 in the Town of Bear River, the Gulch plant provides approximately 6.0 MW from 250 feet of head with a single vertical turbo-generator unit.

The powerhouse is located at the corner of River Road and Parker Road in the Town of Bear River.

Demolition planning for this facility will consider that the intake penstock pipeline will be dewatered and removed by others, all electrical and communications equipment directly related to transmission will be removed by others and that there are no outstanding asbestos abatement or other hazardous materials or environmental issues at this site that would adversely affect demolition planning. There is ample available material lay-down area at this site and immediately across River Road.

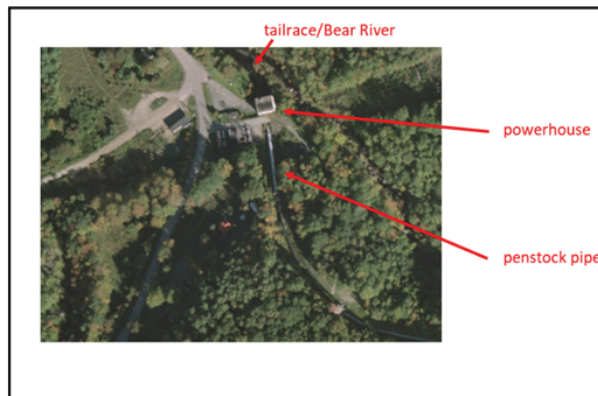


Photo 4: Gulch Development

It is recommended that demolition material not be buried at this site.

Following demolition planning categorizations apply to the Gulch facility:

- Intake Classification - Category A, penstock pipe is exposed above ground;
- Architectural Classification – Category B, reinforced concrete and structural steel;
- Outlet (Draft-tube) Classification – Category A, draft tube discharges directly into Bear River.

Therefore the following tasks have been considered in the demolition planning and costs derivation exercise:

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

- Install silt, debris and environmental containments, temporary security fencing (chain-link), silt fence, silt curtain and oil boom.
- Removal of accessible lubricating oil and previously undrained closed-system cooling water (for recycling).
- Removal of small machinery and turbo generator mechanical and electrical controls including but not limited to compressors and tanks, governors and related pressure tanks, bearing cooling systems and filters and related piping, throttle linkage components, electrical and communications cables and miscellaneous smaller equipment and piping.
- Removal of HVAC equipment and localized heating units for areas within the building and for those heaters strategically placed to provide assistance for turbo-generator operation.
- Installation of a granular and relatively water-tight earth-fill cofferdam at the draft-tube outlet and tailrace. Provide erosion protection and protection against extreme tides
- Removal of main turbo-generator components such as Exciter; top frame; Rotor and Generator Shaft; Speed Ring, Wicket Gates, shafts and related parts; Turbine Shaft, Head-cover and Turbine; and Stator can be facilitated with the existing powerhouse overhead Bridge Crane, although a temporary power source and connection for the crane may be required. Those components can then be set aside as required for salvage and disposal once the roof structure is removed.
- Removal of roofing, sheathing, support structure and related miscellaneous parts and components. Set aside, stockpile for salvage and disposal.
- Remove overhead Bridge Crane and stockpiled turbo generator main components, sort and stockpile at site for salvage and disposal.
- Demolish exterior walls and related components, stockpile demolition material for disposal.
- Remove and demolish main floor reinforced concrete slab. Stockpile demolition material for disposal.
- Remove exposed interior steel penstock, main penstock butterfly valve and related parts; also remove scroll case, throat ring, steel draft-tube parts and other related miscellaneous items. Stockpile and sort for disposal and salvage.
- Remove reinforced concrete foundation substructure. The outlet for this structure in “in-stream”.
- Remove auxiliary buildings and related buried services including Town buried services or an on-site sewage disposal system, sanitary pumps and piping, any well and related freshwater service piping and equipment.
- Disposal of construction and demolition debris, truck all materials to a designated disposal facility.
- Deliver or sell stockpiled salvage material.
- Infill foundation substructure excavation with compacted clean granular material to the existing tailrace cofferdam structure. The cofferdam can remain once graded to match site. Provide erosion protection.
- Improve site surface drainage as required.
- Place topsoil, sods/hydro-seed, miscellaneous rudimentary landscaping as may be required for public safety and to facilitate surface drainage requirements.

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

- Gravel roads in the area should remain in place to facilitate ground-search rescue and fire-fighting activities.

The bulk of costs associated with the decommissioning exercise include building demolition and related materials disposal, and site protection and remediation post demolition.

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REDACTED Hydro Asset Study Appendix C Page 35 of 143

Nova Scotia Power Hydro Production
Site Decommissioning Estimate Summary for Asset Retirement Obligations (ARO) Study
Bear River Hydro Electric Generation Station

Ridge Development		
Item Description	Estimated Decommissioning Costs	Assumptions/Notes
SITE REMEDIATIONS		
Site Remediation Issues	\$207,650.00	Remediate tailrace
Site Access Removals	\$0.00	N/A
Site Services Removals	\$10,000.00	Site sewage disposal system to be removed.
BUILDINGS & STRUCTURES		
Powerhouse & Related Auxiliary Structures Removals	\$200,300.00	Includes roof structure removal, removal of superstructure walls; partial removal of sub-structure; infilling of the powerhouse and an estimate of off-site disposal costs.
Auxiliary Buildings Removals (not associated with Production Plant)	\$0.00	No auxiliary structures at this site.
BOILERS & AUXILIARIES		
Boilers & Auxiliaries - NOT APPLICABLE	\$0.00	N/A
TURBINES, GENERATORS & AUXILIARIES		
Turbo Generator Removals	\$35,300.00	Single Vertical turbo-generator unit.
Turbo Generator Control Removals	\$8,500.00	Includes disassembly and removal of governor systems, pumps, servos and associated piping.
ELECTRICAL		
On-Site Distribution Lines Removals	\$3,500.00	Interior and exterior at powerhouse.
Electrical Power Systems Removals	\$9,000.00	Powerhouse
Other Auxiliary Systems and Equipment Removals	\$3,000.00	Powerhouse
Electrical Control and Communication	\$5,000.00	Powerhouse
COMMON SERVICES		
Building Ventilation & Heating Removals	\$5,200.00	Limited HVAC at this site.
Plant Operating Equipment Removals	\$10,750.00	Removal of tailrace gate.
GENERAL AND DISTRIBUTED		
Field Facilities & Decommissioning (Mobilization incl)	\$30,000.00	
Estimated Administration & Overhead Expenses	\$59,158.40	
SALVAGE		
Scrap Metals - General (Inc. Turbine)	-\$500.00	Allowance
General Parts	-\$1,000.00	Allowance
Insulated Wire and Cables No. 1	-\$1,000.00	Allowance
Insulated Wire and Cables No. 2	-\$1,000.00	Allowance
ENGINEERING & PROJECT MANAGEMENT		
Engineering & Project Management	\$63,384.00	
Site Decommissioning Estimate Subtotal		
Ridge Development		\$647,242.40
Notes:		
1. Transmission cable, substations and related transformers to be removed by others in preparation for general demolition.		
2. HST is additional to stated estimated costs.		

Figure 3

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REDACTED Hydro Asset Study Appendix C Page 36 of 143

Nova Scotia Power Hydro Production

**Site Decommissioning Estimate Summary for Asset Retirement Obligations (ARO) Study
Bear River Hydro Electric Generation Station**

Gulch Development		
Item Description	Estimated Decommissioning Costs	Assumptions/Notes
SITE REMEDIATIONS		
Site Remediation Issues	\$299,700.00	Remediate tailrace.
Site Access Removals	\$2,500.00	Includes removal of paved parking area.
Site Services Removals	\$10,000.00	Site sewage disposal to be removed.
BUILDINGS & STRUCTURES		
Powerhouse & Related Auxiliary Structures Removals	\$302,200.00	Includes roof structure removal, removal of superstructure walls, partial removal of sub-structure; infilling of the powerhouse and an estimate of off-site disposal costs.
Auxiliary Buildings Removals (not associated with Production Plant)	\$10,000.00	Auxiliary structures at this site.
BOILERS & AUXILIARIES		
Boilers & Auxiliaries - NOT APPLICABLE	\$0.00	N/A
TURBINES, GENERATORS & AUXILIARIES		
Turbo Generator Removals	\$35,300.00	Single Vertical turbo-generator unit.
Turbo Generator Control Removals	\$8,500.00	Includes disassembly and removal of governor systems, pumps, servos and associated piping.
ELECTRICAL		
On-Site Distribution Lines Removals	\$3,500.00	Interior and exterior at powerhouse.
Electrical Power Systems Removals	\$9,000.00	Powerhouse
Other Auxiliary Systems and Equipment Removals	\$3,000.00	Powerhouse
Electrical Control and Communication	\$7,500.00	Powerhouse
COMMON SERVICES		
Building Ventilation & Heating Removals	\$5,200.00	Limited HVAC at this site.
Plant Operating Equipment Removals	\$10,750.00	
GENERAL AND DISTRIBUTED		
Field Facilities & Decommissioning (Mobilization incl)	\$30,000.00	
Estimated Administration & Overhead Expenses	\$82,560.80	
SALVAGE		
Scrap Metals - General (Inc. Turbine)	-\$500.00	Allowance
General Parts	-\$1,000.00	Allowance
Insulated Wire and Cables No. 1	-\$1,000.00	Allowance
Insulated Wire and Cables No. 2	-\$1,000.00	Allowance
ENGINEERING & PROJECT MANAGEMENT		
Engineering & Project Management	\$88,458.00	
Site Decommissioning Estimate Subtotal Gulch Development \$904,668.80		
Notes: 1. Transmission cable, substations and related transformers to be removed by others in preparation for general demolition. 2. HST is additional to stated estimated costs.		

Figure 4

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

3. Black River Hydro Electric System

The Black River Hydro Generating System, located on the Black River and Gaspereau River, in the Gaspereau Valley south of Wolfville in Kings County, Nova Scotia is comprised of five Hydro-electric generating developments and six generating units. Furthest upstream powerhouse is at Methals Falls, which feeds water through Black River Lake to the Hollow Bridge Development which in turn feeds water via Lumsden Pond to the Lumsden powerhouse. From there, water traverses to Hells Gate Development, where two generating units are located. Downstream of Hells Gate flow of the Black River becomes part of the larger Gaspereau River. Downstream of the confluence of the Black and Gaspereau rivers is the White Rock Generating Station from where water is discharged into the lower reaches of the Gaspereau River and its marine estuary.

At this generating system power houses were originally constructed from about the 1930's to the 1950's by the Avon River Power Company and Nova Scotia Light and Power, precursors to the Nova Scotia Power Commission and Nova Scotia Power Inc. (NSPI).

a) Methals Development

In 1948 a powerhouse was constructed at Methals Falls at the upstream end of Black River Lake. This development impounded water in Methals Pond and harnessed about 45 feet of head while providing generating capacity of about 3.2 MW from a single vertically oriented generating unit. The reinforced concrete powerhouse structure is coupled to a reinforced concrete intake structure by a relatively short penstock pipe (less than 100 feet long).

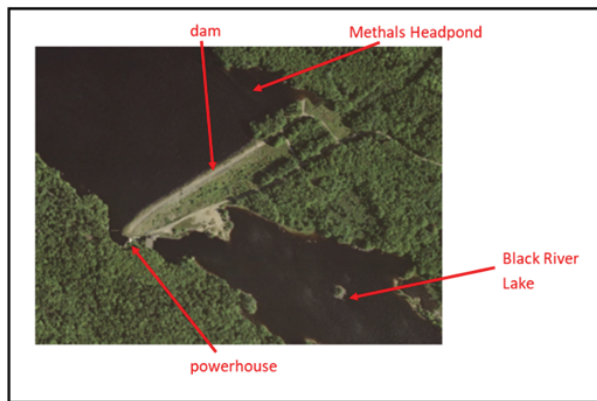


Photo 5: Methals Development

The powerhouse is accessed via the gravelled surface Methals Road, from Black River Road and Deep Hollow road. Methals Road runs about five miles through cottage country and wood lands along the northwest shore of Black River Lake. The road is gated part way along its length, once past the cottages area.

Methals draft tube and tailrace outflow discharges directly into Black River Lake which acts as a storage pond for the Hollow Bridge Development about seven miles downstream.

Demolition planning for this facility will consider that the intake penstock pipeline will be dewatered and removed by others, all electrical and communications equipment directly related to transmission will be removed by others and that there are no outstanding asbestos abatement or other hazardous materials issues at this site that would adversely affect demolition planning. There is ample material laydown area at site.

There is ample room at this site to bury suitable concrete debris, devoid of rebar, and embedded metals.

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

Following demolition planning categorizations apply to the Methals facility:

- Intake Classification - Category A, penstock pipe is exposed above ground;
- Architectural Classification – Category B, reinforced concrete and structural steel;
- Outlet (Draft-tube) Classification – Category A, the draft tube discharges flow directly into Black River Lake.

Therefore the following tasks have been considered in the demolition planning and costs derivation exercise:

- Install silt, debris and environmental containments, temporary security fencing (chain-link), silt fence, silt curtain and oil boom.
- Removal of accessible lubricating oil and previously undrained closed-system cooling water (for recycling).
- Removal of small machinery and turbo generator mechanical and electrical controls including but not limited to compressors and tanks, governors and related pressure tanks, bearing cooling systems and filters and related piping, throttle linkage components, electrical and communications cables, and miscellaneous smaller equipment and piping.
- Removal of HVAC equipment and localized heating units for areas within the building and for those heaters strategically placed to provide assistance for turbo-generator operation.
- Installation of a granular and relatively water-tight earth-fill cofferdam at the draft-tube outlet and tailrace.
- Removal of main turbo-generator components such as Exciter; top frame; Rotor and Generator Shaft; Speed Ring, Wicket Gates, shafts and related parts; Turbine Shaft, Head-cover and Turbine; and Stator can be facilitated with the existing powerhouse overhead Bridge Crane, although a temporary power source and connection for the crane may be required. Those turbo-generator components can then be set aside as required for salvage and disposal once the roof structure is removed.
- Removal of Roofing and related miscellaneous materials and components. Set aside, stockpile for disposal.
- Remove reinforced concrete roof structure.
- Remove overhead Bridge Crane and stockpiled turbo generator main components, sort and stockpile at site for salvage and disposal.
- Dismantle, tear-down exterior reinforced concrete walls and related components and stockpile demolition material for disposal.
- Remove and demolish main floor reinforced concrete slab at generator level. Stockpile demolition material for disposal.
- Remove exposed interior steel penstock and related parts; also remove scroll case, throat ring, steel draft-tube parts and other related miscellaneous items. Stockpile and sort for salvage and disposal.
- Remove reinforced concrete foundation substructure. This powerhouse appears to be located “in-stream” and therefore will require complete removal. Stockpile debris for disposal.
- Remove buried services including the on-site sewage disposal system, sanitary pumps and piping, and related freshwater piping and equipment.

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

- Disposal of construction and demolition debris – truck selected material to Annapolis or Halifax for construction debris disposal, while suitable other material such as pulverized concrete devoid of rebar and embedded metals can be buried at site.
- Deliver/sell stockpiled salvage material.
- Infill foundation substructure excavation location with compacted clean granular material to the tailrace cofferdam. The cofferdam can remain once graded to match site. An outlet channel for flow from points upstream to Black River Lake may have to be constructed.
- Improve site surface drainage as required.
- Place topsoil, sods/hydro-seed, miscellaneous rudimentary landscaping as may be required for public safety and to facilitate surface drainage requirements.
- Gravel access road should remain in place to facilitate ground-search rescue and fire-fighting activities, however, bridge over existing spillway channel should be removed.

The bulk of the costs associated with the decommissioning exercise include building demolition and related materials disposal, and site protection and remediation post demolition.

b) Hollow Bridge Development

Completed in 1940, Hollow Bridge is fed from the upstream storage of Black River Lake via a twin sliding gate at the Hollow Bridge Power Canal inlet. The power canal is about one and a half miles long and incorporates an intake structure and steel head gate for a fibreglass (FRP) pipeline and penstock (with a steel surge tank tower) which feeds the powerhouse turbo-generator. About 147 feet of head produces about 5.4 MW of generating capacity from a single vertical generating unit.

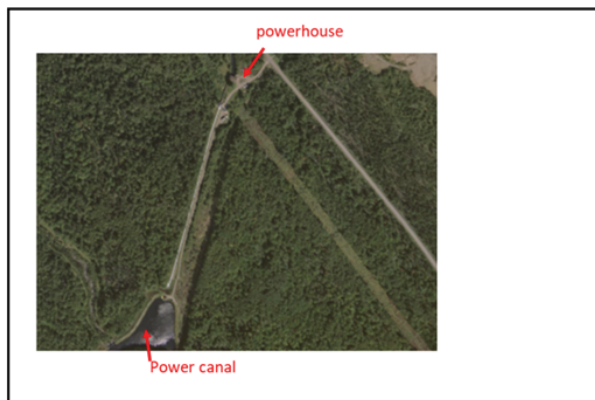


Photo 6: Hollow Bridge Development

The power canal acts as a diversion for the original river and a spillway has been constructed in the canal. The spillway sends excess water to Lumsden Pond via a constructed spillway channel. The main spillway for Black River Lake is at Forks Dam, located at the south side of the lake and some distance from Hollow Bridge Development. It sends excess water from Black River Lake into the Avon River, which is downstream of the Avon River Hydro Electric Generation System.

Hollow Bridge powerhouse is accessed via a gated gravel driveway off the gravel portion of the Black River Road about a half mile south and east of the intersection of Black River Road and Davison Street. The powerhouse is visible about 200 feet from the main road.

Outflow from Hollow Bridge draft-tube enters a constructed tailrace channel approximately 1200 feet long which transports flow to Lumsden Pond where water is thence directed to the Lumsden powerhouse for generation. That tailrace channel will require extensive remediation as part of the decommissioning effort.

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

Demolition planning for this facility will consider that the intake penstock pipeline will be dewatered and removed by others, all electrical and communications equipment directly related to transmission will be removed by others and that there are no outstanding asbestos abatement or other hazardous materials or environmental issues at this site that would adversely affect demolition planning. Some material laydown space is available at this site. There appears to be an opportunity to bury selected suitable demolition materials at this site.

Following demolition categorizations apply to the Hollow Bridge facility:

- Intake Classification - Category A, penstock pipe is exposed above ground;
- Architectural Classification – Category B, reinforced concrete and structural steel;
- Outlet (Draft-tube) Classification – Category B, a lengthy tailrace channel will require significant remediation.

Therefore the following tasks have been considered in the demolition planning and costs derivation exercise:

- Install silt, debris and environmental containments, temporary security fencing (chain-link), silt fence, silt curtain and oil boom.
- Removal of accessible lubricating oil and previously undrained closed-system cooling water (for recycling).
- Removal of small machinery and turbo generator mechanical and electrical controls including but not limited to compressors and tanks, governors and related pressure tanks, bearing cooling systems and filters and related piping, throttle linkage components, electrical and communications cables and miscellaneous smaller equipment and piping.
- Removal of HVAC equipment and localized heating units for areas within the building and those heaters strategically placed to provide assistance for turbo-generator operation.
- Installation of a granular and relatively water-tight earth-fill cofferdam at the draft-tube outlet and tailrace.
- Removal of main turbo-generator components such as Exciter; top frame; Rotor and Generator Shaft; Speed Ring, Wicket Gates, shafts and related parts; Turbine Shaft, Head-cover and Turbine; and Stator can be facilitated with the existing powerhouse overhead Bridge Crane, although a temporary power source and connection for the crane may be required. Those turbo-generator components can then be set aside as required for salvage and disposal once the roof structure is removed.
- Removal of Roofing, Sheathing, support Trusses and related miscellaneous parts and components. Set aside, stockpile for salvage and disposal.
- Remove overhead Bridge Crane and stockpiled turbo generator main components, sort and stockpile at site for salvage and disposal.
- Dismantle exterior walls and related components, stockpile demolition material for disposal.
- Remove and demolish main floor reinforced concrete slab. Stockpile demolition material for disposal.
- Remove exposed interior steel penstock, main penstock butterfly valve and related parts; also remove scroll case, throat ring, steel draft-tube parts and other related miscellaneous items. Stockpile and sort for salvage and disposal.

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

- Remove reinforced concrete foundation substructure to a few feet below new finished grade elevation. Stockpile debris, where appropriate for disposal, or remove directly from site.
- Disposal of construction and demolition debris – transport selected material to a designated disposal facility, while suitable other material such as pulverized concrete devoid of rebar and embedded metals can be buried at site.
- Deliver/sell stockpiled salvage material.
- Infill foundation substructure location with compacted granular material and selected demolition debris to the tailrace cofferdam. The cofferdam can remain once graded to match site.
- Improve site surface drainage as required.
- Place topsoil, sods/hydro-seed, miscellaneous rudimentary landscaping as may be required for public safety and to facilitate surface drainage requirements.
- Once it is drained, remediate the tailrace channel with clean gravel and crushed stone, as well as clean fill as required. Grade surfaces, hydro-seed and/plant trees or other vegetation to return this area to a near natural state.

The bulk of the costs associated with the decommissioning exercise include building demolition and related materials disposal, and site protection and remediation post demolition.

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

c) Lumsden Development

The Lumsden powerhouse was completed in 1942 and is fed from the Lumsden Pond head pond via a large concrete penstock embedded in the main earthen dam. The development harnesses about 60 feet of head to provide about 2.8 MW of generating capacity from a single vertically oriented generating unit.

At Lumsden the forebay and tailrace are located at the original river bed for the Black River. Spillway flow is directed into the Lumsden tailrace.

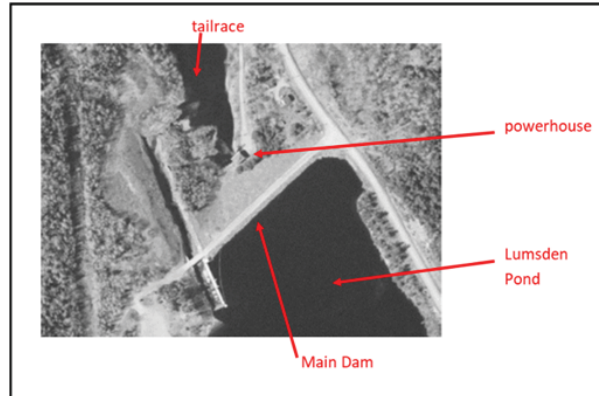


Photo 7: Lumsden Development

Lumsden powerhouse is accessed via a gravelled gated driveway about 1500 feet long directly from Black River Road about a quarter mile north of Corkum and Burns Road.

Outflow from Lumsden draft-tube enters directly into the tailrace at the original Black River alignment and makes its way into the Hells Gate power canal which in turn, transports flow to the Hells Gate powerhouse for generation.

Demolition planning for this facility will consider that the intake penstock pipeline will be dewatered and removed by others, all electrical and communications equipment directly related to transmission will be removed by others and that there are no outstanding asbestos abatement or hazardous materials or environmental issues at this site that would adversely affect demolition planning. Only limited material laydown space is available at this site.

A considerable earthen cofferdam will be required to isolate substructure removal work since the powerhouse discharges water directly into the large tailrace channel/river.

Following demolition categorizations apply to the Lumsden facility:

- Intake Classification - Category B, penstock pipe is buried below ground;
- Architectural Classification – Category A, reinforced concrete, steel and masonry;
- Outlet (Draft-tube) Classification – Category A, the draft tube discharges flow directly into the Black River.

Therefore the following tasks have been considered in the demolition planning and costs derivation exercise:

- Install silt, debris and environmental containments, temporary security fencing (chain-link), silt fence, silt curtain and oil boom.
- Removal of accessible lubricating oil and previously undrained closed-system cooling water (for recycling).
- Removal of small machinery and turbo generator mechanical and electrical controls including but not limited to compressors and tanks, governors and related pressure tanks, bearing cooling systems and

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

filters and related piping, throttle linkage components, electrical and communications cables and miscellaneous smaller equipment and piping.

- Removal of HVAC equipment and localized heating units for areas within the building and those heaters strategically placed to provide assistance for turbo-generator operation.
- Installation of a granular and relatively water-tight earth-fill cofferdam at the draft-tube outlet and tailrace.
- Removal of main turbo-generator components such as Exciter; top frame; Rotor and Generator Shaft; Speed Ring, Wicket Gates, shafts and related parts; Turbine Shaft, Head-cover and Turbine; and Stator can be facilitated with the existing powerhouse overhead Bridge Crane, although a temporary power source and connection for the crane may be required. Those turbo-generator components can then be set aside as required for salvage and disposal once the roof structure is removed.
- Removal of Roofing, Sheathing, support trusses and related miscellaneous parts and components. Set aside, stockpile for salvage and disposal, or remove directly from site.
- Remove overhead Bridge Crane and stockpiled turbo generator main components, sort and stockpile at site for salvage and disposal.
- Dismantle superstructure exterior walls and related components, stockpile demolition material for disposal or remove directly from site.
- Remove and demolish main floor reinforced concrete slab. Stockpile demolition material for disposal or remove directly from site.
- Remove exposed interior steel penstock, main penstock butterfly valve and related parts; also remove scroll case, throat ring, steel draft-tube parts and other related miscellaneous items. Stockpile and sort for salvage and disposal.
- Remove reinforced concrete foundation substructure. This powerhouse appears to be located "in-stream" and therefore full substructure removal is required. Stockpile debris, where appropriate, for disposal or remove directly from site.
- Disposal of construction and demolition debris – transport selected material to a designated disposal facility, while suitable other material such as pulverized concrete devoid of rebar and embedded metals can be buried at site.
- Deliver/sell stockpiled salvage material.
- Infill foundation substructure location with compacted clean granular material to the tailrace cofferdam. The cofferdam can remain once graded to match site. An outlet channel from points upstream may have to be constructed.
- Improve site surface drainage as required.
- Place topsoil, sods/hydro-seed, miscellaneous rudimentary landscaping as may be required for public safety and to facilitate surface drainage requirements.
- Remove access road driveway.

The bulk of the costs associated with the decommissioning exercise include building demolition and related materials disposal, and site protection and remediation post demolition.

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

d) Hells Gate Development

The Hells Gate Development is comprised of two generating units known as Hells Gate No. 1 and Hells Gate No. 2. They share a single powerhouse structure which was first constructed to house Unit No. 1 in about 1930. The powerhouse was expanded to accommodate Unit No. 2 in about 1949. Each vertical unit each provides about 3.4 MW from about 185 feet of head for a total of about 6.8 MW. Each unit is serviced by a dedicated overhead bridge crane and is fed by a dedicated exposed steel penstock pipe with flow originating at the gated concrete intake structure at the power canal forebay.

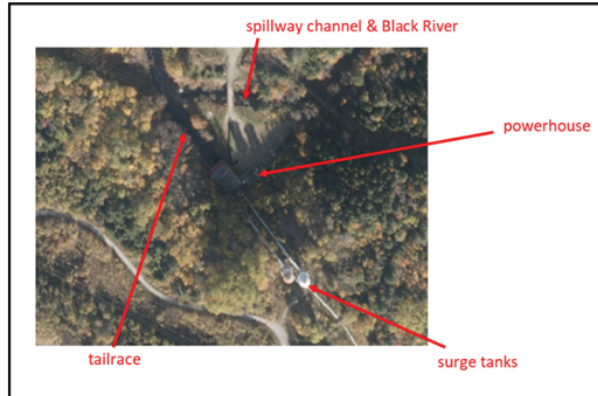


Photo 8: Hells Gate Development

At Hells Gate the power canal and forebay comprise a diversion to the main Black River which comprises the main spillway channel for the development, and flows through an area locally known as "Three Pools".

The tailrace incorporates a slight off-set diversion to the original Black River alignment but discharges outflow to the original river alignment. Spillway flow at Hells Gate follows the original Black River arrangement from the power canal inlet and spillway diversion dam to the tailrace channel.

Hells Gate powerhouse is accessed via a gravelled gated roadway known as Hells Gate Road, about 2200 feet long on a relatively steep down-grade directly from Black River Road, located about a half mile southwest of Nowlan Mountain Road.

Outflow from Hells Gate enters almost directly into the original Black River and makes its way to confluence of the Black and Gaspereau rivers about 1500 feet downstream of the powerhouse. From there, flow makes its way into White Rock Pond and the associated power canal for that development.

Demolition planning for this facility will consider that the intake penstock pipeline will be dewatered and removed by others, all electrical and communications equipment directly related to transmission will be removed by others and that there are no outstanding asbestos abatement or other hazardous materials or environmental issues at this site that would adversely affect demolition planning. Significant material laydown space is available at this site.

There appears to be some opportunity at this site for buried disposal of selected suitable materials.

Following demolition categorizations apply to the Hells Gate facility:

- Intake Classification - Category A, twin exposed above ground penstocks;
- Architectural Classification – Category A, reinforced concrete, steel and masonry;

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

- Outlet (Draft-tube) Classification – Category A, the draft tubes discharge flow almost directly into the Black River.

Therefore the following tasks have been considered in the demolition planning and costs derivation exercise:

- Install silt, debris and environmental containments, temporary security fencing (chain-link), silt fence, silt curtain and oil boom.
 - Removal of accessible lubricating oil and previously undrained closed-system cooling water (for recycling).
 - Removal of small machinery and turbo generator mechanical and electrical controls (for both units) including but not limited to compressors and tanks, governors and related pressure tanks, bearing cooling systems and filters and related piping, throttle linkage components, electrical and communications cables and miscellaneous smaller equipment and piping.
 - Removal of HVAC equipment and localized heating units for areas within the building and those heaters strategically placed to provide assistance for turbo-generator operation.
 - Installation of a granular and relatively water-tight earth-fill cofferdam at the draft-tube outlet and tailrace.
 - Removal of main turbo-generator components (for both units) such as Exciter; top frame; Rotor and Generator Shaft; Speed Ring, Wicket Gates, shafts and related parts; Turbine Shaft, Head-cover and Turbine; and Stator can be facilitated with the existing powerhouse overhead Bridge Cranes, although a temporary power source and connection for the cranes may be required. Those turbo-generator components can then be set aside as required for salvage and disposal once the roof structure is removed.
 - Removal of Roofing, Sheathing, roof support structure and related miscellaneous parts and components. Set aside, stockpile for salvage and disposal.
 - Remove overhead Bridge Cranes and stockpiled turbo generators main components, sort and stockpile at site for salvage and disposal.
 - Dismantle exterior and interior walls and related components, stockpile demolition material for disposal.
 - Remove and demolish main floor reinforced concrete slab. Stockpile demolition material for disposal.
 - Remove exposed interior steel penstocks, main penstock butterfly valves and related parts; also remove scroll cases, throat rings, steel draft-tube parts and other related miscellaneous items. Stockpile and sort for salvage and disposal.
 - Remove remnant reinforced concrete foundation substructure to a few feet below new finished grade elevation. Stockpile debris as where appropriate for disposal.
 - Disposal of construction and demolition debris – transport selected material to a designated disposal facility, while suitable other material, such as pulverized concrete devoid of rebar and embedded metals, can be buried at site.
 - Deliver/sell stockpiled salvage material.
 - Infill foundation substructure location with compacted granular material and appropriate demolition debris to the tailrace cofferdam. The cofferdam can remain once graded to match site.
 - Improve site surface drainage as required.
-

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

- Place topsoil, sods/hydro-seed, miscellaneous rudimentary landscaping as may be required for public safety and to facilitate surface drainage requirements.
- Remove remaining auxiliary buildings at the powerhouse site and along the access road, and on-site sewage disposal system.
- Gravel access road should remain in place to facilitate ground-search rescue and fire-fighting activities. The access bridge across spillway channel should be removed in consideration of probable limited flow capacity under the structure, and probable increased flow in the original Black River.

The bulk of the costs associated with the decommissioning exercise include building demolition and related materials disposal, and site protection and remediation post demolition.

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

e) White Rock Development

Completed in 1952, the White Rock Development is comprised of a single vertical unit with output capacity of about 3.2 MW from about 58 feet of head. The powerhouse is fed by a dedicated exposed FRP penstock pipe with flow originating at a gated concrete intake structure at the head of the power canal.

The White Rock the Power Canal and forebay comprise a diversion to the main Gaspereau River. The powerhouse outlet tailrace channel completes the diversion arrangement, reincorporating flow into the Gaspereau River about 800 feet downstream of the powerhouse. Spillway flow at White Rock follows the original Gaspereau River from the power canal inlet and spillway diversion dam. From the spillway and tailrace flows carries into the Gaspereau River estuarial region.

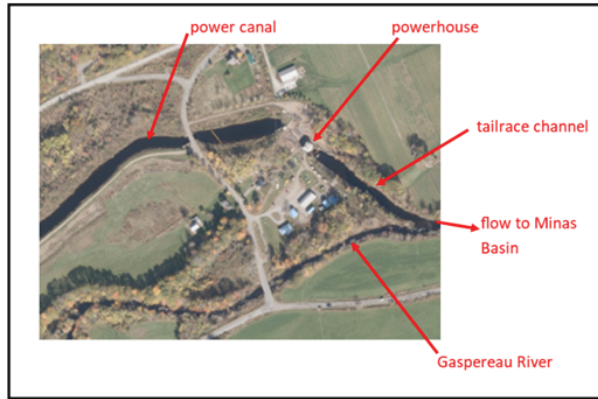


Photo 9: White Rock Development

White Rock powerhouse is located at the north east end of the NSPI White Rock Shops work yard, on Black River Road.

Demolition planning for this facility will consider that the intake penstock pipeline will be dewatered and removed by others, all electrical and communications equipment directly related to transmission will be removed by others and that there are no outstanding asbestos abatement or hazardous materials or environmental issues at this site that would adversely affect demolition planning. Significant material laydown space is available at this site.

As part of a site rehabilitation, the 800 foot-long tailrace of White Rock powerhouse to the Gaspereau River will require rehabilitation.

Following demolition categorizations apply to the Hells Gate facility:

- Intake Classification - Category A, penstock pipe is exposed above ground;
- Architectural Classification – Category B, reinforced concrete and structural steel;
- Outlet (Draft-tube) Classification – Category B, a moderately wide and lengthy tailrace channel will require significant remediation.

Therefore the following tasks have been considered in the demolition planning and costs derivation exercise:

- Install silt, debris and environmental containments, temporary security fencing (chain-link), silt fence, silt curtain and oil boom.
- Removal of accessible lubricating oil and previously undrained closed-system cooling water (for recycling).
- Removal of small machinery and turbo generator mechanical and electrical controls including but not limited to compressors and tanks, governors and related pressure tanks, bearing cooling systems and

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

filters and related piping, throttle linkage components, electrical communication cables and miscellaneous smaller equipment piping.

- Removal of HVAC equipment and localized heating units for areas within the building and those heaters strategically placed to provide assistance for turbo-generator operation.
- Installation of a granular and relatively water-tight earth-fill cofferdam at the tailrace outlet to the Gaspereau River.
- Removal of main turbo-generator components such as Exciter; top frame; Rotor and Generator Shaft; Speed Ring, Wicket Gates, shafts and related parts; Turbine Shaft, Head-cover and Turbine; and Stator can be facilitated with the existing powerhouse overhead Bridge Crane, although a temporary power source and connection for the crane may be required. Those turbo-generator components can then be set aside as required for salvage and disposal once the roof structure is removed.
- Removal of Roofing, Sheathing, roof support structure and related miscellaneous parts and components. Set aside, stockpile for salvage and disposal.
- Remove overhead Bridge Crane and stockpiled turbo generators main components, sort and stockpile at site for salvage and disposal.
- Dismantle exterior walls and related components, stockpile demolition material for disposal.
- Remove and demolish generator floor and entrance main floor reinforced concrete slab and mass concrete structure. Stockpile demolition material for disposal.
- Remove exposed interior steel penstock, and related parts; also remove scroll case, throat ring, steel draft-tube parts and other related miscellaneous items. Stockpile and sort for salvage and disposal.
- Remove remnant reinforced concrete foundation substructure to a few feet below new finish grade elevation. Stockpile debris as where appropriate for disposal.
- Disposal of construction and demolition debris – transport selected materials to a designated disposal facility, while suitable other material, such as pulverized concrete devoid of rebar and embedded metals, can be buried at site.
- Deliver/sell stockpiled salvage material.
- Infill foundation substructure location and tailrace with compacted granular material and selected demolition debris to the tailrace cofferdam. Grade to match or compliment surroundings. The cofferdam can remain once graded to match site.
- Improve site surface drainage as required.
- Place topsoil, sods/hydro-seed, miscellaneous rudimentary landscaping as may be required for public safety and to facilitate surface drainage requirements.

The bulk of the costs associated with the decommissioning exercise include building demolition and related materials disposal, and site protection and remediation post demolition.

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Nova Scotia Power Hydro Production
Site Decommissioning Estimate Summary for Asset Retirement Obligations (ARO) Study
Black River Hydro Electric Generation System

Methals Development		
Item Description	Estimated Decommissioning Costs	Assumptions/Notes
SITE REMEDIATIONS		
Site Remediation Issues	\$242,300.00	
Site Access Removals	\$10,000.00	Includes re-grading at site access roads.
Site Services Removals	\$10,000.00	Includes removal of buried water and waste-water buried.
BUILDINGS & STRUCTURES		
Powerhouse & Related Auxiliary Structures Removals	\$196,050.00	Includes roof structure removal, removal of superstructure walls, partial removal of sub-structure; infilling of the powerhouse and an estimate of off-site disposal costs.
Auxiliary Buildings Removals (not associated with Production Plant)	\$0.00	No miscellaneous auxiliary structures at this site
BOILERS & AUXILIARIES		
Boilers & Auxiliaries - NOT APPLICABLE	\$0.00	N/A
TURBINES, GENERATORS & AUXILIARIES		
Turbo Generator Removals	\$35,300.00	Single Vertical turbo-generator unit.
Turbo Generator Control Removals	\$8,500.00	Includes disassembly and removal of governor systems, pumps, servos and associated piping.
ELECTRICAL		
On-Site Distribution Lines Removals	\$3,000.00	Interior and exterior at powerhouse.
Electrical Power Systems Removals	\$9,000.00	Powerhouse
Other Auxiliary Systems and Equipment Removals	\$3,000.00	Powerhouse
Electrical Control and Communication	\$5,000.00	Powerhouse
COMMON SERVICES		
Building Ventilation & Heating Removals	\$5,200.00	Limited HVAC at this site.
Plant Operating Equipment Removals	\$10,750.00	
GENERAL AND DISTRIBUTED		
Field Facilities & Decommissioning (Mobilization incl)	\$30,000.00	
Estimated Administration & Overhead Expenses	\$63,627.20	
SALVAGE		
Scrap Metals - General (Inc. Turbine)	-\$600.00	Allowance
General Parts	-\$1,000.00	Allowance
Insulated Wire and Cables No. 1	-\$1,000.00	Allowance
Insulated Wire and Cables No. 2	-\$1,000.00	Allowance
ENGINEERING & PROJECT MANAGEMENT		
Engineering & Project Management	\$68,172.00	
Site Decommissioning Estimate Subtotal Methals Development \$696,299.20		
Notes: 1. Transmission cable, substations and related transformers to be removed by others in preparation for general demolition. 2. HST is additional to stated estimated costs.		

Figure 5

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Nova Scotia Power Hydro Production

**Site Decommissioning Estimate Summary for Asset Retirement Obligations (ARO) Study
Black River Hydro Electric Generation System**

Hollow Bridge Development		
Item Description	Estimated Decommissioning Costs	Assumptions/Notes
SITE REMEDIATIONS		
Site Remediation Issues	\$209,600.00	Remediate 1200 ft. long tailrace channel.
Site Access Removals	\$5,000.00	Includes re-grading at site access roads.
Site Services Removals	\$0.00	No site sewage disposal system at this location.
BUILDINGS & STRUCTURES		
Powerhouse & Related Auxiliary Structures Removals	\$157,500.00	Includes roof structure removal, removal of superstructure walls, partial removal of sub-structure; infilling of the powerhouse and an estimate of off-site disposal costs.
Auxiliary Buildings Removals (not associated with Production Plant)	\$0.00	No miscellaneous auxiliary structures at this site
BOILERS & AUXILIARIES		
Boilers & Auxiliaries - NOT APPLICABLE	\$0.00	N/A
TURBINES, GENERATORS & AUXILIARIES		
Turbo Generator Removals	\$35,300.00	Single Vertical turbo-generator unit.
Turbo Generator Control Removals	\$8,500.00	Includes disassembly and removal of governor systems, pumps, servos and associated piping.
ELECTRICAL		
On-Site Distribution Lines Removals	\$2,500.00	Interior and exterior at powerhouse.
Electrical Power Systems Removals	\$9,000.00	Powerhouse
Other Auxiliary Systems and Equipment Removals	\$3,000.00	Powerhouse
Electrical Control and Communication	\$5,000.00	Powerhouse
COMMON SERVICES		
Building Ventilation & Heating Removals	\$5,200.00	Limited HVAC at this site.
Plant Operating Equipment Removals	\$10,750.00	
GENERAL AND DISTRIBUTED		
Field Facilities & Decommissioning (Mobilization incl)	\$30,000.00	
Estimated Administration & Overhead Expenses	\$53,911.20	
SALVAGE		
Scrap Metals - General (Inc. Turbine)	-\$500.00	Allowance
General Parts	-\$1,000.00	Allowance
Insulated Wire and Cables No. 1	-\$1,000.00	Allowance
Insulated Wire and Cables No. 2	-\$1,000.00	Allowance
ENGINEERING & PROJECT MANAGEMENT		
Engineering & Project Management	\$57,762.00	
Site Decommissioning Estimate Subtotal Hollow Bridge Development \$589,523.20		
Notes: 1. Transmission cable, substations and related transformers to be removed by others in preparation for general demolition. 2. HST is additional to stated estimated costs.		

Figure 6

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Nova Scotia Power Hydro Production

**Site Decommissioning Estimate Summary for Asset Retirement Obligations (ARO) Study
Black River Hydro Electric Generation System**

Lumsden Development		
Item Description	Estimated Decommissioning Costs	Assumptions/Notes
SITE REMEDIATIONS		
Site Remediation Issues	\$244,200.00	Considerable cofferdams required at this site.
Site Access Removals	\$35,000.00	Includes re-grading at site access roads.
Site Services Removals	\$0.00	No site sewage disposal system at this location.
BUILDINGS & STRUCTURES		
Powerhouse & Related Auxiliary Structures Removals	\$178,150.00	Includes roof structure removal, removal of superstructure walls, partial removal of sub-structure; infilling of the powerhouse and an estimate of off-site disposal costs.
Auxiliary Buildings Removals (not associated with Production Plant)	\$0.00	No miscellaneous auxiliary structures at this site
BOILERS & AUXILIARIES		
Boilers & Auxiliaries - NOT APPLICABLE	\$0.00	N/A
TURBINES, GENERATORS & AUXILIARIES		
Turbo Generator Removals	\$35,300.00	Single Vertical turbo-generator unit.
Turbo Generator Control Removals	\$8,500.00	Includes disassembly and removal of governor systems, pumps, servos and associated piping.
ELECTRICAL		
On-Site Distribution Lines Removals	\$3,500.00	Interior and exterior at powerhouse.
Electrical Power Systems Removals	\$9,000.00	Powerhouse
Other Auxiliary Systems and Equipment Removals	\$3,000.00	Powerhouse
Electrical Control and Communication	\$5,000.00	Powerhouse
COMMON SERVICES		
Building Ventilation & Heating Removals	\$5,200.00	Limited HVAC at this site.
Plant Operating Equipment Removals	\$10,750.00	
GENERAL AND DISTRIBUTED		
Field Facilities & Decommissioning (Mobilization incl)	\$30,000.00	
Estimated Administration & Overhead Expenses	\$63,571.20	
SALVAGE		
Scrap Metals - General (Inc. Turbine)	-\$500.00	Allowance
General Parts	-\$1,000.00	Allowance
Insulated Wire and Cables No. 1	-\$1,000.00	Allowance
Insulated Wire and Cables No. 2	-\$1,000.00	Allowance
ENGINEERING & PROJECT MANAGEMENT		
Engineering & Project Management	\$68,112.00	
Site Decommissioning Estimate Subtotal		
Lumsden Development	\$695,783.20	
Notes:		
1. Transmission cable, substations and related transformers to be removed by others in preparation for general demolition.		
2. HST is additional to stated estimated costs.		

Figure 7

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**Nova Scotia Power Hydro Production
Site Decommissioning Estimate Summary for Asset Retirement Obligations (ARO) Study
Black River Hydro Electric Generation System**

Hell's Gate Development		
Item Description	Estimated Decommissioning Costs	Assumptions/Notes
SITE REMEDIATIONS		
Site Remediation Issues	\$300,650.00	
Site Access Removals	\$40,000.00	Includes re-grading at site access roads.
Site Services Removals	\$15,000.00	Site sewage disposal system and freshwater systems to be removed.
BUILDINGS & STRUCTURES		
Powerhouse & Related Auxiliary Structures Removals	\$285,500.00	Includes roof structure removal, removal of superstructure walls, partial removal of sub-structure; infilling of the powerhouse and an estimate of off-site disposal costs.
Auxiliary Buildings Removals (not associated with Production Plant)	\$8,000.00	Auxiliary structures at this site.
BOILERS & AUXILIARIES		
Boilers & Auxiliaries - NOT APPLICABLE	\$0.00	N/A
TURBINES, GENERATORS & AUXILIARIES		
Turbo Generator Removals	\$70,600.00	Two vertical turbo-generator units.
Turbo Generator Control Removals	\$17,000.00	Includes disassembly and removal of governor systems, pumps, servos and associated piping.
ELECTRICAL		
On-Site Distribution Lines Removals	\$3,500.00	Interior and exterior at powerhouse.
Electrical Power Systems Removals	\$15,000.00	Powerhouse
Other Auxiliary Systems and Equipment Removals	\$6,000.00	Powerhouse
Electrical Control and Communication	\$12,000.00	Powerhouse
COMMON SERVICES		
Building Ventilation & Heating Removals	\$12,500.00	Limited HVAC at this site.
Plant Operating Equipment Removals	\$21,500.00	
GENERAL AND DISTRIBUTED		
Field Facilities & Decommissioning (Mobilization incl)	\$30,000.00	
Estimated Administration & Overhead Expenses	\$93,772.00	
SALVAGE		
Scrap Metals - General (Inc. Turbine)	-\$1,000.00	Allowance
General Parts	-\$2,000.00	Allowance
Insulated Wire and Cables No. 1	-\$1,800.00	Allowance
Insulated Wire and Cables No. 2	-\$1,800.00	Allowance
ENGINEERING & PROJECT MANAGEMENT		
Engineering & Project Management	\$100,470.00	
Site Decommissioning Estimate Subtotal		
Hell's Gate Development		\$1,024,892.00
Notes:		
1. Transmission cable, substations and related transformers to be removed by others in preparation for general demolition.		
2. HST is additional to stated estimated costs.		

Figure 8

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Nova Scotia Power Hydro Production

Site Decommissioning Estimate Summary for Asset Retirement Obligations (ARO) Study

Black River Hydro Electric Generation System

White Rock Development		
Item Description	Estimated Decommissioning Costs	Assumptions/Notes
SITE REMEDIATIONS		
Site Remediation Issues	\$300,650.00	Remediate 800 ft. long Tailrace channel.
Site Access Removals	\$40,000.00	No site sewage disposal system at this location.
Site Services Removals	\$15,000.00	No site sewage disposal system at this location.
BUILDINGS & STRUCTURES		
Powerhouse & Related Auxiliary Structures Removals	\$285,500.00	Includes roof structure removal, removal of superstructure walls, partial removal of sub-structure; infilling of the powerhouse and an estimate of off-site disposal costs.
Auxiliary Buildings Removals (not associated with Production Plant)	\$8,000.00	No miscellaneous auxiliary structures at this site
BOILERS & AUXILIARIES		
Boilers & Auxiliaries - NOT APPLICABLE	\$0.00	N/A
TURBINES, GENERATORS & AUXILIARIES		
Turbo Generator Removals	\$70,600.00	Single vertical turbo-generator unit.
Turbo Generator Control Removals	\$17,000.00	Includes disassembly and removal of governor systems, pumps, servos and associated piping.
ELECTRICAL		
On-Site Distribution Lines Removals	\$3,500.00	Interior and exterior at powerhouse.
Electrical Power Systems Removals	\$15,000.00	Powerhouse
Other Auxiliary Systems and Equipment Removals	\$6,000.00	Powerhouse
Electrical Control and Communication	\$12,000.00	Powerhouse
COMMON SERVICES		
Building Ventilation & Heating Removals	\$12,500.00	Limited HVAC at this site.
Plant Operating Equipment Removals	\$21,500.00	
GENERAL AND DISTRIBUTED		
Field Facilities & Decommissioning (Mobilization incl)	\$30,000.00	
Estimated Administration & Overhead Expenses	\$93,772.00	
SALVAGE		
Scrap Metals - General (Inc. Turbine)	-\$1,000.00	Allowance
General Parts	-\$2,000.00	Allowance
Insulated Wire and Cables No. 1	-\$1,800.00	Allowance
Insulated Wire and Cables No. 2	-\$1,800.00	Allowance
ENGINEERING & PROJECT MANAGEMENT		
Engineering & Project Management	\$100,470.00	
Site Decommissioning Estimate Subtotal White Rock Development \$1,024,892.00		
Notes: 1. Transmission cable, substations and related transformers to be removed by others in preparation for general demolition. 2. HST is additional to stated estimated costs.		

Figure 9

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

4. Dickie Brook Hydro Electric System

The Dickie Brook Development is a small stand-alone single powerhouse development located near Guysborough Town. Dickie Brook consists of two horizontal turbo-generator units which utilize water from Tom's Lake and upstream storage for generation. Water is fed to the turbo-generator via an above ground polyethylene and steel penstock pipeline. Outflow is discharged directly into the estuarial region of the Salmon River.

a) Dickie Brook Development

In 1948 the Dickie Brook Hydro-Electric Generation Station was commissioned and put into service 3 miles south and west of Guysborough Town.

At the Dickie Brook Development, water from Toms Lake head pond is directed to the Dickie Brook powerhouse via a polyethylene pipeline and steel penstock pipe. The powerhouse two horizontally oriented turbo-generators each produce about 1.3 MW of power from approximately 298 feet of head for a total capacity of 2.6 MW. There is original accommodation for an unconstructed third unit in the penstock arrangement at this site.

The reinforced concrete generator/turbine floor of the powerhouse is integral with the outlet draft tubes and powerhouse substructure.

Access to the powerhouse is south on Trunk Rte. 16 via Guysborough Town to paved Larry's River Road. About a mile and a half along Larry's River Road, turn onto gravelled Mountain Road. The powerhouse is located about 400 feet along Mountain Road from Larry's River Road, on the left.

Demolition planning for this facility will consider that the intake penstock will be dewatered and removed and all electrical and communications equipment directly related to transmission will be removed by others. It is also assumed that there will be no outstanding asbestos abatement or other hazardous materials or environmental issues at this site that would adversely affect demolition planning. Note that there is ample material laydown area available at this site, and there may be potential for buried disposal at site for some demolition generated materials.

Since the powerhouse is built on the estuarial portion of the Salmon River, it is subjected to tidal influences and has been flooded on multiple occasions when a storm-surge has been experienced. Although the powerhouse is a relatively small and shallow structure a considerable cofferdam may be required to enable safe substructure removals.

A significant cofferdam may be required to aide in substructure removals. Erosion protection and adequate height to handle tidal influences will be necessary.

Following demolition planning categorizations apply to the Dickie Brook facility:

- Intake Classification - Category A, a exposed above ground steel intake pipe is located at the rear of the structure;
- Architectural Classification – Category C, other. Wood, steel and concrete framed and cladded structure on a concrete foundation sub-structure;
- Outlet (Draft-tube) Classification – Category A, draft tube outlet discharges directly into the Salmon River estuarial region.

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

Therefore the following tasks have been considered in the demolition planning and costs derivation exercise:

- Install silt, debris and environmental containments, temporary security fencing (chain-link), silt fence, silt curtain and oil boom.
- Removal of accessible lubricating oil and previously undrained closed-system cooling water (for recycling).
- Removal of small machinery and turbo generator mechanical and electrical controls including but not limited to compressors and tanks, governors and related pressure tanks, bearing cooling systems and filters and related piping, throttle linkage components, electrical and communications cables and miscellaneous smaller equipment and piping.
- Removal of HVAC equipment and localized heating units for areas within the building and for those heaters strategically placed to provide assistance for turbo-generator operation.
- Installation of a granular and relatively water-tight earth-fill cofferdam at the draft-tube outlet and tailrace.
- Removal of main turbo-generator components such as Exciter; Rotor and Generator Shaft; Speed Ring, Wicket Gates and related parts; Turbine Shaft, Head-cover and Turbine; Stator and steel draft-tube can be facilitated with the existing powerhouse overhead Bridge Crane, although a temporary power source and connection for the crane may be required. Those components can then be set aside as required for salvage and disposal once the roof structure is removed.
- Disassembly of Roofing, Sheathing and related miscellaneous parts and components. Set aside, stockpile for salvage and disposal.
- Remove overhead Bridge Crane and stockpiled turbo-generator main components, sort and stockpile at site for salvage and disposal.
- Disassembly of exterior superstructure and related components, stockpile demolition material for disposal.
- Remove and demolish main floor reinforced concrete slab and related reinforced concrete substructure. Stockpile demolition material for disposal. This powerhouse outlets directly to the tidal marine estuary of the Salmon River and is therefore considered to be "in-stream".
- Remove auxiliary buildings including house and garage.
- Remove buried services, including site waste water disposal system, well and any freshwater piping and equipment.
- Disposal of construction and demolition debris – truck selected material to a designated construction debris disposal facility, while suitable other materials such as pulverized concrete devoid of rebar and embedded metals, can be buried at site.
- Deliver or sell stockpiled salvage material.
- Infill foundation substructure excavation with compacted clean granular material to the tailrace cofferdam. The cofferdam can remain once graded to match site. Provide erosion protection as required.
- Improve site surface drainage as required.

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

- Place topsoil, sods/hydro-seed, miscellaneous rudimentary landscaping as may be required for public safety and to facilitate surface drainage requirements.

The bulk of costs associated with the decommissioning exercise include building demolition and related materials disposal, and site protection and remediation post demolition.

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Site Decommissioning Estimate Summary for Asset Retirement Obligations (ARO) Study

Dickie Brook Hydro Electric Generation System

Dickie Brook Development		
Item Description	Estimated Decommissioning Costs	Assumptions/Notes
SITE REMEDIATIONS		
Site Remediation Issues	\$330,500.00	Outlet discharges directly to Salmon River estuary, lengthy cofferdam required, draft-tubes removal, tailrace remediation and erosion protection required.
Site Access Removals	\$0.00	Powerhouse site is directly accessed from Mountain Road without formal driveways.
Site Services Removals	\$10,000.00	Remove site sewage disposal system at this location.
BUILDINGS & STRUCTURES		
Powerhouse & Related Auxiliary Structures Removals	\$167,950.00	Includes roof structure removal, removal of superstructure walls, partial removal of sub-structure; infilling of the powerhouse and an estimate of off-site disposal costs.
Auxiliary Buildings Removals (not associated with Production Plant)	\$12,500.00	Remove administration facility (house) and garage.
BOILERS & AUXILIARIES		
Boilers & Auxiliaries - NOT APPLICABLE	\$0.00	N/A
TURBINES, GENERATORS & AUXILIARIES		
Turbo Generator Removals	\$32,600.00	Two horizontal turbo-generator units.
Turbo Generator Control Removals	\$8,500.00	Includes disassembly and removal of governor systems, pumps, servos and associated piping.
ELECTRICAL		
On-Site Distribution Lines Removals	\$4,500.00	Interior and exterior at powerhouse.
Electrical Power Systems Removals	\$9,000.00	Powerhouse
Other Auxiliary Systems and Equipment Removals	\$3,000.00	Powerhouse
Electrical Control and Communication	\$5,000.00	Powerhouse
COMMON SERVICES		
Building Ventilation & Heating Removals	\$4,000.00	Limited HVAC at this site.
Plant Operating Equipment Removals	\$5,000.00	
GENERAL AND DISTRIBUTED		
Field Facilities & Decommissioning (Mobilization incl)	\$30,000.00	
Estimated Administration & Overhead Expenses	\$69,725.60	
SALVAGE		
Scrap Metals - General (Inc. Turbine)	-\$250.00	Allowance
General Parts	-\$800.00	Allowance
Insulated Wire and Cables No. 1	-\$800.00	Allowance
Insulated Wire and Cables No. 2	-\$800.00	Allowance
ENGINEERING & PROJECT MANAGEMENT		
Engineering & Project Management	\$74,706.00	
Site Decommissioning Estimate Subtotal Dickie Brook Development		\$764,331.60
Notes:		
1. Transmission cable, substations and related transformers to be removed by others in preparation for general demolition.		
2. HST is additional to stated estimated costs.		

Figure 10

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

5. Fall River Hydro Electric System

The Fall River Development consists of a single hydro-electric development and powerhouse. This stand-alone development consists of a single horizontal turbo-generator unit which utilizes water from Miller Lake and upstream storage for generation. Flow is fed to the single horizontal turbo-generator via a partially buried reinforced fibre-glass penstock pipeline. Outflow is discharged via a tailrace channel which carries the flow back to the original Fall River alignment where it discharges into Lake Thomas and the Shubenacadie River watershed.

a) Fall River Development

In 1985 a new hydro-electric power generation station was commissioned in Fall River, 15 miles north of Halifax. This plant replaced an earlier power generating station at or near this site which operated for several decades before being decommissioned in the 1950's or 1960's.

Inflow from Miller Lake is diverted from the original water course and falls via a penstock pipeline to the powerhouse where a single turbo-generator unit produces about 500 kW (0.5 MW) of power from about 83 feet of head. The penstock is partly buried along its length and is underground at the rear of the powerhouse. The tailrace channel returns flow to the original Fall River alignment downstream of the powerhouse.

The powerhouse structure is a steel clad structural steel frame supported on a reinforced concrete slab and draft-tube sub-structure.

Access to the powerhouse is via Trunk Highway Rte. 2 and the gravelled surface Ray's Lane in Fall River.

Demolition planning for this facility will consider that the intake penstock will be dewatered and all electrical and communications equipment directly related to transmission will be removed by others. It is also assumed that there will be no outstanding asbestos abatement or other hazardous materials or environmental issues at this site that would adversely affect demolition planning. Note that there is some material laydown area available at this site, but little potential yard area for burying demolition generated debris.

Following demolition planning categorizations apply to the Fall River facility:

- Intake Classification - Category B, a buried FRP intake pipe is located at the rear of the structure;
- Architectural Classification – Category C, other. Steel framed and clad structure on a shallow concrete foundation structure;
- Outlet (Draft-tube) Classification – Category B, a constructed tailrace channel will require remediation.

Therefore the following tasks have been considered in the demolition planning and costs derivation exercise:

- Install silt, debris and environmental containments, temporary security fencing (chain-link), silt fence, silt curtain and oil boom.
- Removal of accessible lubricating oil and previously undrained closed-system cooling water (for recycling).

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

- Removal of small machinery and turbo generator mechanical and electrical controls including but not limited to compressors and tanks, governors and related pressure tanks, bearing cooling systems and filters and related piping, throttle linkage components, electrical and communications cables and miscellaneous smaller equipment and piping.
- Removal of HVAC equipment and localized heating units for areas within the building and for those heaters strategically placed to provide assistance for turbo-generator operation.
- Installation of a granular and relatively water-tight earth-fill cofferdam at the draft-tube outlet and tailrace.
- Removal of main turbo-generator components such as Exciter; Generator; scroll case and turbine assembly; shafts and related parts can be facilitated with the existing powerhouse overhead Bridge Crane, although a temporary power source and connection for the crane may be required. Those components can then be set aside as required for salvage and disposal once the roof structure is removed. Note that the turbo-generator is a small Barber Unit which can probably be removed with limited disassembly.
- Disassembly of Roofing, Sheathing and related miscellaneous parts and components. Set aside, stockpile for salvage and disposal.
- Remove overhead Bridge Crane and stockpiled turbo-generator main components, sort and stockpile at site for salvage and disposal.
- Disassembly of exterior superstructure cladding and related components, stockpile demolition material for disposal.
- Remove structural steel superstructure framework.
- Remove and demolish main floor reinforced concrete slab and related reinforced concrete substructure. Stockpile demolition material for disposal.
- Remove buried services and any freshwater piping and equipment.
- Disposal of construction and demolition debris – truck to a construction debris disposal facility located near Halifax.
- Deliver or sell stockpiled salvage material.
- Infill foundation substructure excavation with compacted granular material to the tailrace cofferdam. The cofferdam can remain once graded to match site. Provide erosion protection as required.
- Improve site surface drainage as required.
- Place topsoil, sods/hydro-seed, miscellaneous rudimentary landscaping as may be required for public safety and to facilitate surface drainage requirements.
- Once it is drained, remediate the tailrace channel with clean gravel and crushed stone, as well as clean fill as required. Grade surfaces, hydro-seed and/plant trees or other vegetation to return this area to a near natural state.

The bulk of costs associated with the decommissioning exercise include building demolition and related materials disposal, and site protection and remediation post demolition.

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Nova Scotia Power Hydro Production
Site Decommissioning Estimate Summary for Asset Retirement Obligations (ARO) Study
Fall River Hydro Electric Generation System

Fall River Development		
Item Description	Estimated Decommissioning Costs	Assumptions/Notes
SITE REMEDIATIONS		
Site Remediation Issues	\$134,950.00	Remediate tailrace channel.
Site Access Removals	\$3,000.00	Remove driveway.
Site Services Removals	\$0.00	No site sewage disposal system at this location.
BUILDINGS & STRUCTURES		
Powerhouse & Related Auxiliary Structures Removals	\$92,500.00	Includes roof structure removal, removal of superstructure walls, partial removal of sub-structure; infilling of the powerhouse and an estimate of off-site disposal costs.
Auxiliary Buildings Removals (not associated with Production Plant)	\$6,500.00	Remove office building in this location.
BOILERS & AUXILIARIES		
Boilers & Auxiliaries - NOT APPLICABLE	\$0.00	N/A
TURBINES, GENERATORS & AUXILIARIES		
Turbo Generator Removals	\$17,000.00	One horizontal turbo-generator unit.
Turbo Generator Control Removals	\$5,000.00	Includes disassembly and removal of governor systems, pumps, servos and associated piping.
ELECTRICAL		
On-Site Distribution Lines Removals	\$3,000.00	Interior and exterior at powerhouse.
Electrical Power Systems Removals	\$7,000.00	Powerhouse
Other Auxiliary Systems and Equipment Removals	\$3,000.00	Powerhouse
Electrical Control and Communication	\$4,000.00	Powerhouse
COMMON SERVICES		
Building Ventilation & Heating Removals	\$3,500.00	Limited HVAC at this site.
Plant Operating Equipment Removals	\$8,000.00	
GENERAL AND DISTRIBUTED		
Field Facilities & Decommissioning (Mobilization incl)	\$30,000.00	
Estimated Administration & Overhead Expenses	\$35,554.40	
SALVAGE		
Scrap Metals - General (Inc. Turbine)	-\$150.00	Allowance
General Parts	-\$750.00	Allowance
Insulated Wire and Cables No. 1	-\$750.00	Allowance
Insulated Wire and Cables No. 2	-\$750.00	Allowance
ENGINEERING & PROJECT MANAGEMENT		
Engineering & Project Management	\$38,094.00	
Site Decommissioning Estimate Subtotal		
Fall River Development		\$388,698.40
Notes:		
1. Transmission cable, substations and related transformers to be removed by others in preparation for general demolition.		
2. HST is additional to stated estimated costs.		

Figure 11

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

6. Lequille Hydro Electric System

Lequille Development is one of three conventional stand-alone hydro-electric developments that discharge water from South Mountain watersheds into the Annapolis River or other tributaries to the Annapolis River and the Annapolis Basin. The other two such developments are located at Nictaux and at Paradise. A fourth development, the Annapolis Tidal Power Generation Station, is also on the Annapolis River but is outside the scope of this study.

Each of these three facilities are located on their own tributary rivers, have their own watersheds and are fed via pipelines and buried penstock pipes from impoundment head ponds and storage reservoirs located in the upper reaches of the South Mountain in the Annapolis Valley area.

These developments were constructed in the 1950's and 1960's by the Nova Scotia Power Commission and Nova Scotia Light and Power Company, precursors to NSPI.

a) Lequille Development

Completed in 1968 at Lequille, at the toe of the South Mountain, about three miles south east of Annapolis Royal in Annapolis County off Trunk Route 8, the Lequille Development harnesses approximately 386 feet of head to provide 11.1 MW of generating capacity from a single vertically oriented turbo-generator.

The powerhouse is situated on Dugway Road and discharges water into Allains Brook.

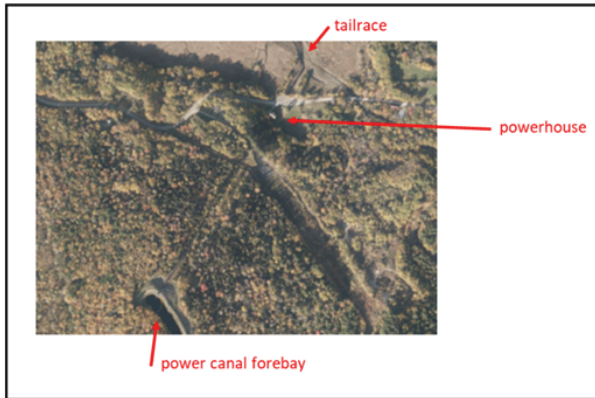


Photo 10: Lequille Development

Demolition planning for this facility will consider that the intake penstock pipeline will be dewatered and removed by others, all electrical and communications equipment directly related to transmission will be removed by others and that there are no outstanding asbestos abatement or other hazardous materials or environmental issues at this site that would adversely affect demolition planning. There is ample available material lay-down area at this site, though not immediately adjacent to the powerhouse.

The tailrace tunnel under paved Dugway Road shall be concrete filled to conserve the integrity of the roadway. Auxiliary structures include a garage over-looking the powerhouse site, which shall be removed.

Although the powerhouse structure is designed to appear to be as period masonry construction, it is in fact a modern reinforced concrete installation.

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

Following demolition planning categorizations apply to the Avon No. 2 facility:

- Intake Classification - Category B, penstock pipe is buried below ground;
- Architectural Classification – Category B, reinforced concrete and structural steel;
- Outlet (Draft-tube) Classification – Category B, the draft tube and tailrace consist of a tunnel under the adjacent local paved road to a tailrace timber outfall structure, which feeds a small tailrace channel to Allains Brook and thus to the Annapolis Basin.

Therefore the following tasks have been considered in the demolition planning and costs derivation exercise:

- Install silt, debris and environmental containments, temporary security fencing (chain-link), silt fence, silt curtain and oil boom.
- Removal of accessible lubricating oil and previously undrained closed-system cooling water (for recycling).
- Removal of small machinery and turbo generator mechanical and electrical controls including but not limited to compressors and tanks, governors and related pressure tanks, bearing cooling systems and filters and related piping, throttle linkage components, electrical and communication cables and miscellaneous smaller equipment and piping.
- Removal of HVAC equipment and localized heating units for areas within the building and for those heaters strategically placed to provide assistance for turbo-generator operation.
- Installation of a granular and relatively water-tight earth-fill cofferdam at the draft-tube outlet structure and tailrace. This cofferdam will have to be adequate to isolate the demolition works from the tides of the Annapolis Basin and the Bay of Fundy.
- Removal of main turbo-generator components such as Exciter; top frame; Rotor and Generator Shaft; Speed Ring, Wicket Gates, shafts and related parts; Turbine Shaft, Head-cover and Turbine; and Stator can be facilitated with the existing powerhouse overhead Bridge Crane, although a temporary power source and connection for the crane may be required. Those components can then be set aside as required for salvage and disposal once the roof structure is removed.
- Removal of Roofing, Sheathing, support structure and related miscellaneous parts and components. Set aside, stockpile for salvage and disposal.
- Remove overhead Bridge Crane and stockpiled turbo generator main components, sort and stockpile at site for salvage and disposal.
- Demolish exterior walls and related components, stockpile demolition material for disposal.
- Remove and demolish main floor reinforced concrete slab. Stockpile demolition material for disposal.
- Remove exposed interior steel penstock, main penstock butterfly valve and related parts; also remove scroll case, throat ring, steel draft-tube parts and other related miscellaneous items. Stockpile and sort for disposal and salvage.
- Remove reinforced concrete foundation substructure to a few feet below new finished grade elevation and abandon, secure the tailrace tunnel crossing under Dugway Road.

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

- Infill foundation substructure excavation with compacted granular material and selected clean demolition debris to the existing tailrace cofferdam structure. The cofferdam can remain once graded to match site.
- Remove auxiliary buildings and buried services including the on-site sewage disposal system, sanitary pumps and piping, any well and related freshwater piping and equipment and paved driveways and roads.
- Disposal of construction and demolition debris, truck selected materials to a designated disposal facility, while suitable material, such as pulverized concrete devoid of rebar and embedded metals, can be buried at site.
- Deliver or sell stockpiled salvage material.
- Improve site surface drainage as required.
- Place topsoil, sods/hydro-seed, miscellaneous rudimentary landscaping as may be required for public safety and to facilitate surface drainage requirements.
- Once it is drained, fill the tailrace tunnel with pumped concrete to ensure any future structural deterioration will not result in failure of the roadway; remove the timber outfall structure; remediate the tailrace channel with clean gravel and crushed stone, as well as clean fill as required. Grade surfaces, hydro-seed and/plant trees or other vegetation to return this area to a near natural state. Note that the tailrace remediations will be subject to tidal influences.

The bulk of the costs associated with the decommissioning exercise include building demolition and related materials disposal, and site protection and remediation post demolition. There is considerable cost in concreting the tailrace channel.

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Site Decommissioning Estimate Summary for Asset Retirement Obligations (ARO) Study

Lequille Hydro Electric Generation System

Lequille Development		
Item Description	Estimated Decommissioning Costs	Assumptions/Notes
SITE REMEDIATIONS		
Site Remediation Issues	\$507,500.00	Tailrace tunnel to be concrete filled.
Site Access Removals	\$2,500.00	Includes removal of paved parking area.
Site Services Removals	\$10,000.00	Site sewage disposal system to be removed.
BUILDINGS & STRUCTURES		
Powerhouse & Related Auxiliary Structures Removals	\$265,800.00	Includes roof structure removal, removal of superstructure walls, partial removal of sub-structure; infilling of the powerhouse and an estimate of off-site disposal costs.
Auxiliary Buildings Removals (not associated with Production Plant)	\$8,000.00	Auxiliary structures at this site.
BOILERS & AUXILIARIES		
Boilers & Auxiliaries - NOT APPLICABLE	\$0.00	N/A
TURBINES, GENERATORS & AUXILIARIES		
Turbo Generator Removals	\$39,300.00	Single Vertical turbo-generator unit.
Turbo Generator Control Removals	\$8,500.00	Includes disassembly and removal of governor systems, pumps, servos and associated piping.
ELECTRICAL		
On-Site Distribution Lines Removals	\$3,500.00	Interior and exterior at powerhouse.
Electrical Power Systems Removals	\$9,000.00	Powerhouse
Other Auxiliary Systems and Equipment Removals	\$5,000.00	Powerhouse
Electrical Control and Communication	\$5,000.00	Powerhouse
COMMON SERVICES		
Building Ventilation & Heating Removals	\$5,200.00	Limited HVAC at this site.
Plant Operating Equipment Removals	\$10,750.00	Removal of tailrace gate.
GENERAL AND DISTRIBUTED		
Field Facilities & Decommissioning (Mobilization incl)	\$30,000.00	
Estimated Administration & Overhead Expenses	\$101,925.60	
SALVAGE		
Scrap Metals - General (Inc. Turbine)	-\$500.00	Allowance
General Parts	-\$1,000.00	Allowance
Insulated Wire and Cables No. 1	-\$1,000.00	Allowance
Insulated Wire and Cables No. 2	-\$1,000.00	Allowance
ENGINEERING & PROJECT MANAGEMENT		
Engineering & Project Management	\$109,206.00	
Site Decommissioning Estimate Subtotal Lequille Development \$1,117,681.60		
Notes: 1. Transmission cable, substations and related transformers to be removed by others in preparation for general demolition. 2. HST is additional to stated estimated costs.		

Figure 12

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

7. Mersey River Hydro Electric System

At the Mersey River Hydro Electric System there are six run of the river hydro-electric developments each with two turbo-generating units that utilize water from the Mersey River for electrical generation and discharge water directly back into the river or via a tailrace diversion outflow canal.

The Mersey River hydro developments are as follows: Upper Lake Falls Development on the main system flowage and storage at the southeast end of Lake Rossignol where the Mersey River exits the Lake; Lower Lake Falls Development, located about one and a half miles downstream and east of Upper Lake Falls; Big Falls Development, which is located about three miles downstream and southeast of Lower Lake Falls; Lower Great Brook Development which is about eight miles downstream and southeast of Big Falls; Deep Brook Development which is about five miles east of Lower Great Brook; and Cowie Falls Development which is located in the Village of Milton, Queens County, about 2 miles downstream and southeast of Deep Brook.

Construction on hydro power developments on the Mersey River started in the 1920's by the Bowater Mersey Paper Company Limited as a means to provide electricity for processes in the newly constructed paper mill located near the mouth of the Mersey River in Liverpool Harbour (Brooklyn, NS). Construction continued into the 1950's and in the 1960's, the generating assets were eventually taken over from BowaterMersey by the Nova Scotia Power Commission, a precursor to NSPI.

In recent decades concrete powerhouse structures on the Mersey River have been befallen with structural deterioration associated with Alkali Aggregate Reactivity (AAR). This condition will affect demolition planning and related equipment selection.

a) Upper Lake Falls Development

At the Upper Lake Falls Development (Mersey No. 1 and 2), completed in about 1929, inflow from Lake Rossignol is channelled through the integral powerhouse gated intake structure and turbo generators and to the tailrace channel at what appears to be the original Mersey River alignment.

The Upper Lake Falls Development utilizes two vertically oriented turbo-generators, each with a 2.7 MW generating capacity providing about 5.4 MW total, from about 35 feet of head.

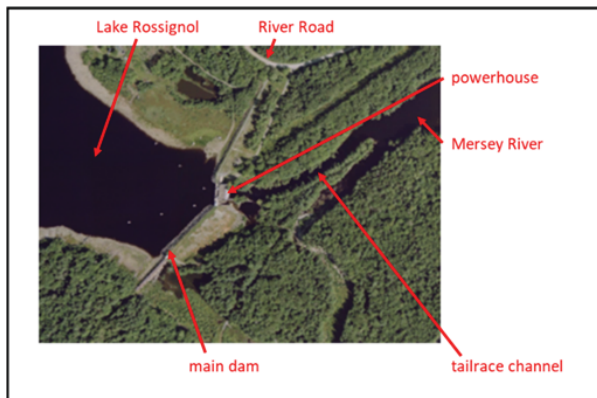


Photo 11: Upper Lake Falls Development

Turbo-generators are fed directly from the lake forebay via a dual concrete intake structure which is integral with the powerhouse. Each generating unit has its own concrete intake chamber and draft-tube outlet to the tailrace channel.

The powerhouse incorporates a generator floor and support structure over a heavy turbine floor and related supports. The pressurized intake chamber is found below the turbine floor, while the draft tube outlet and building substructure are located beneath the intake chamber. The head

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

cover for each unit is located at the turbine floor. Steel penstock pipes and butterfly valves are accessed in the basement (turbine floor) area for both developments.

Access to the powerhouse is via a 600 foot long gravelled driveway access located about 20 miles northwest of Milton via gravel topped River Road at Lake Rossignol.

Demolition planning for this facility will consider that the intake chambers will be dewatered and all electrical and communications equipment directly related to transmission will be removed by others. It is also assumed that there will be no outstanding asbestos abatement or other hazardous materials or environmental issues at this site that would adversely affect demolition planning. Note that there is ample material laydown area available at site.

Ample room is available at site to bury clean concrete demolition debris.

Since the powerhouse is located on the original Mersey River Lake Rossignol outlet alignment and the alignment and construction likely involved considerable rock excavation, the original alignment may no longer be suitable for the Mersey River. A remediated site arrangement may include a short river diversion to avoid potential erosion and local flooding problems associated with having the river flow through a filled area located in the original river alignment.

Following demolition planning categorizations apply to the Upper Lake Falls facility:

- Intake Classification - Category C, concrete intake structure is integral with the powerhouse structure;
- Architectural Classification – Category B, reinforced concrete and structural steel;
- Outlet (Draft-tube) Classification – Category B, since the Lake Rossignol outlet for the Mersey River may require some realignment, part of the tailrace channel will require some remediation.

Therefore the following tasks have been considered in the demolition planning and costs derivation exercise:

- Install silt, debris and environmental containments, temporary security fencing (chain-link), silt fence, silt curtain and oil boom.
- Removal of accessible lubricating oil and previously undrained closed-system cooling water (for recycling).
- Removal of small machinery and turbo generator mechanical and electrical controls including but not limited to compressors and tanks, governors and related pressure tanks, bearing cooling systems and filters and related piping, throttle linkage components, electrical and communications cables and miscellaneous smaller equipment and piping.
- Removal of HVAC equipment and localized heating units for areas within the building and for those heaters strategically placed to provide assistance for turbo-generator operation.
- Installation of a granular and relatively water-tight earth-fill cofferdam at the draft-tube outlet and tailrace.
- Removal of main turbo-generator components such as Exciter; top frame; Rotor and Generator Shaft; Speed Ring, Wicket Gates, shafts and related parts; Turbine Shaft, Head-cover and Turbine; and Stator can be facilitated with the existing powerhouse overhead Bridge Crane, although a temporary power source

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SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

and connection for the crane may be required. Those components can then be set aside as required for salvage and disposal once the roof structure is removed.

- Removal of Roofing, Sheathing, support structure and related miscellaneous parts and components. Set aside, stockpile for salvage and disposal.
- Remove overhead Bridge Crane and stockpiled turbo-generator main components, sort and stockpile at site for salvage and disposal.
- Demolish superstructure exterior walls and related components, stockpile demolition material for disposal.
- Remove and demolish generator floor reinforced concrete slab and related exterior support walls at that level. Stockpile demolition material for disposal.
- Remove head gates and related equipment and components and demolish intake structure.
- Remove and demolish turbine floor reinforced concrete slab and interior/exterior walls at that level. Stockpile demolition material for disposal.
- Remove exposed interior steel parts; including throat ring, head cover, steel draft-tube parts and other related miscellaneous items. Stockpile and sort for salvage and disposal.
- Remove reinforced concrete foundation substructure. This structure is considered to be “in-stream”. Stockpile debris for disposal.
- Remove buried services including the on-site sewage disposal system, sanitary pumps and piping, any freshwater piping and equipment.
- Disposal of construction and demolition debris – truck selected materials to a designated construction debris disposal facility, while suitable other materials, such as pulverized concrete devoid of rebar and embedded metals, can be buried at site.
- Deliver or sell stockpiled salvage material.
- Re-construct the river outlet from Lake Rossignol as and where required.
- Infill foundation substructure excavation with compacted clean granular material to the tailrace cofferdam. The cofferdam can remain once graded to match site. Provide erosion protection as required.
- Improve site surface drainage as required.
- Place topsoil, sods/hydro-seed, miscellaneous rudimentary landscaping as may be required for public safety and to facilitate surface drainage requirements.
- Once it is drained, remediate and infill the tailrace as and where required with clean gravel and crushed stone, and clean fill as required. Grade surfaces, hydro-seed and/plant trees or other vegetation to return this area to a near natural state.
- Gravel woods roads in the area should remain in place to facilitate ground-search rescue and fire-fighting activities.

The bulk of costs associated with the decommissioning exercise include building demolition and related materials disposal, and site protection and remediation post demolition.

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

b) Lower Lake Falls Development

At the Lower Lake Falls Development (Mersey No. 3 and 4), also completed in about 1929, inflow from the Upper Lake Falls tailrace channel is diverted from the original river alignment to a power canal forebay located approximately a half mile east of the spillway and original river alignment. Inflow to the turbo-generators is through the integral powerhouse gated intake structure and turbo generators and to the tailrace diversion channel which runs for 1500 feet to the original Mersey River alignment.

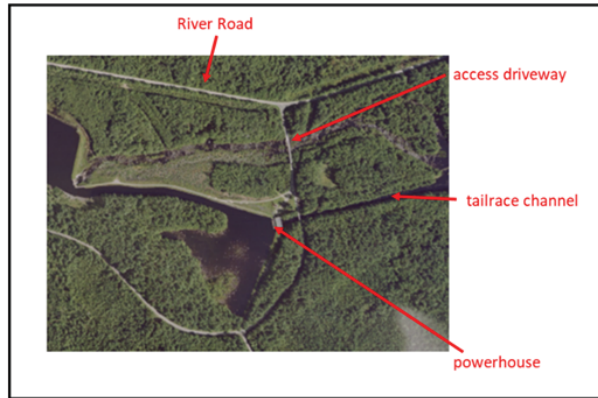


Photo 12: Lower Lake Falls Development

The Lower Lake Falls Development utilizes two vertically oriented turbo-generators, each with a 3.6 MW, for a total of 7.2 MW generating capacity while harnessing about 48 feet of head.

Turbo-generators are fed directly from the forebay via a dual concrete intake structure which is integral with the powerhouse. Each generating unit has its own concrete intake chamber and draft-tube outlet to the tailrace channel.

The powerhouse incorporates a generator floor and support structure over a heavy turbine floor and related supports. The pressurized intake chamber is found below the turbine floor, while the draft tube outlet and building substructure are located beneath the intake chamber. The head cover for each unit is located at the turbine floor.

Access to the powerhouse is via a bridge over the spillway channel and a 500 foot long gravelled driveway access located about 18 miles northwest of Milton via gravel topped River Road.

Demolition planning for this facility will consider that the intake chambers will be dewatered and all electrical and communications equipment directly related to transmission will be removed by others. It is also assumed that there will be no outstanding asbestos abatement or other hazardous materials or environmental issues at this site that would adversely affect demolition planning. Note that there is ample material laydown area available at this site.

Although not in the water course following site infrastructure removals, due to the structural configuration, most of the powerhouse substructure will require removal.

There is adequate room at site for buried disposal of clean concrete debris.

Following demolition planning categorizations apply to the Lower Lake Falls facility:

- Intake Classification - Category C, concrete intake structure is integral with the powerhouse structure;
- Architectural Classification – Category B, reinforced concrete and structural steel;

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

- Outlet (Draft-tube) Classification – Category B, a lengthy constructed tailrace channel will require remediation.

Therefore the following tasks have been considered in the demolition planning and costs derivation exercise:

- Install silt, debris and environmental containments, temporary security fencing (chain-link), silt fence, silt curtain and oil boom.
- Removal of accessible lubricating oil and previously undrained closed-system cooling water (for recycling).
- Removal of small machinery and turbo generator mechanical and electrical controls including but not limited to compressors and tanks, governors and related pressure tanks, bearing cooling systems and filters and related piping, throttle linkage components, electrical and communications cables and miscellaneous smaller equipment and piping.
- Removal of HVAC equipment and localized heating units for areas within the building and for those heaters strategically placed to provide assistance for turbo-generator operation.
- Installation of a granular and relatively water-tight earth-fill cofferdam at the draft-tube outlet and tailrace.
- Removal of main turbo-generator components such as Exciter; top frame; Rotor and Generator Shaft; Speed Ring, Wicket Gates, shafts and related parts; Turbine Shaft, Head-cover and Turbine; and Stator can be facilitated with the existing powerhouse overhead Bridge Crane, although a temporary power source and connection for the crane may be required. Those components can then be set aside as required for salvage and disposal once the roof structure is removed.
- Removal of Roofing, Sheathing, support structure and related miscellaneous parts and components. Set aside, stockpile for salvage and disposal.
- Remove overhead Bridge Crane and stockpiled turbo-generator main components, sort and stockpile at site for salvage and disposal.
- Demolish exterior superstructure walls and related components, stockpile demolition material for disposal.
- Remove and demolish generator floor reinforced concrete slab and related exterior support walls at that level. Stockpile demolition material for disposal.
- Remove head gates and related equipment and components and demolish intake structure.
- Remove and demolish turbine floor reinforced concrete slab and interior/exterior walls at that level. Stockpile demolition material for disposal.
- Remove exposed interior steel parts; including throat ring, steel draft-tube parts and other related miscellaneous items. Stockpile and sort for salvage and disposal.
- Remove reinforced concrete foundation substructure. Stockpile debris for disposal.
- Remove buried services including the on-site sewage disposal system, sanitary pumps and piping, any freshwater piping and equipment.

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SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

- Disposal of construction and demolition debris – truck selected materials to a designated construction debris disposal facility, while suitable other materials, such as pulverized concrete devoid of rebar and embedded metals, can be buried at site.
- Deliver or sell stockpiled salvage material.
- Infill foundation substructure excavation with compacted granular material and selected clean demolition debris to the tailrace cofferdam. The cofferdam can remain once graded to match site. Provide erosion protection as required.
- Improve site surface drainage as required.
- Place topsoil, sods/hydro-seed, miscellaneous rudimentary landscaping as may be required for public safety and to facilitate surface drainage requirements.
- Once it is drained, remediate the tailrace channel with clean gravel and crushed stone, as well as clean fill as required. Grade surfaces, hydro-seed and/plant trees or other vegetation to return this area to a near natural state.
- Gravel woods roads in the area should remain in place to facilitate ground-search rescue and fire-fighting activities.

The bulk of costs associated with the decommissioning exercise include building demolition and related materials disposal, and site protection and remediation post demolition.

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

c) **Big Falls Development**

At the Big Falls Development (Mersey No. 5 and 6), also completed in about 1929, inflow from Lower Lake Falls tailrace is collected and diverted to the powerhouse gated intake structure and turbo generators and to the approximately 1000 foot long tailrace channel where outflow is re-diverted back to the original riverbed alignment.

The Big Falls Development utilizes two vertically oriented turbo-generators, each with a 4.5 MW, for a total of 9 MW generating capacity from approximately 58 feet of head.

Turbo-generators are fed directly from the lake forebay via a newly redesigned and constructed dual concrete intake structure which is integrally connected with the powerhouse. Each generating unit has its own concrete intake chamber, and lower draft-tube outlet to the tailrace channel. Original (pre-reconstruction) configuration of the intake chamber at this site was very similar to that found at Lower Lake Falls.

The powerhouse incorporates a generator floor and support structure over a heavy turbine floor and related support structure. The pressurized intake chamber is found below the turbine floor, while the draft tube outlet and building substructure are located beneath the intake chamber. The head cover for each unit is located at the Turbine floor.

Access to the powerhouse is via a 200 foot-long bridge over the spillway channel and a half mile long gravelled access road from River Road about 15 miles northwest of Milton.

Demolition planning for this facility will consider that the intake chambers will be dewatered and all electrical and communications equipment directly related to transmission will be removed by others. It is also assumed that there will be no outstanding asbestos abatement or other hazardous materials or environmental issues at this site that would adversely affect demolition planning. Note that there is ample material laydown area available at site.

Although not in the water course following site infrastructure removals, due to the structural configuration, most of the powerhouse substructure will require removal.

There appears to be adequate space at site for disposal of clean materials by burying.

Following demolition planning categorizations apply to the Big Falls facility:

- Intake Classification - Category C, concrete intake structure is integral with the powerhouse structure;
- Architectural Classification – Category B, reinforced concrete and structural steel;

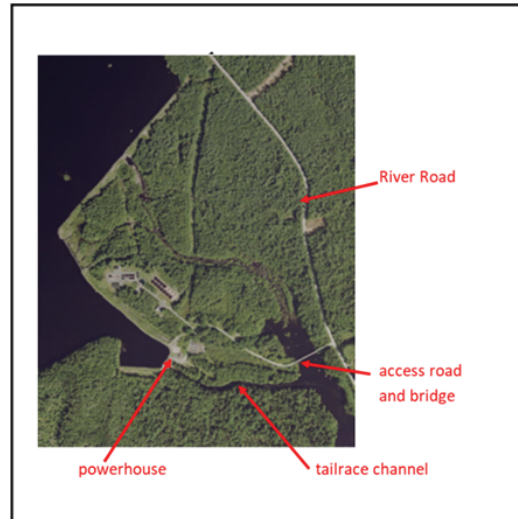


Photo 13: Big Falls Development

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

- Outlet (Draft-tube) Classification – Category B, a lengthy constructed tailrace channel will require remediation.

Therefore the following tasks have been considered in the demolition planning and costs derivation exercise:

- Install silt, debris and environmental containments, temporary security fencing (chain-link), silt fence, silt curtain and oil boom.
- Removal of accessible lubricating oil and previously undrained closed-system cooling water (for recycling).
- Removal of small machinery and turbo generator mechanical and electrical controls including but not limited to compressors and tanks, governors and related pressure tanks, bearing cooling systems and filters and related piping, throttle linkage components, electrical and communications cables and miscellaneous smaller equipment and piping.
- Removal of HVAC equipment and localized heating units for areas within the building and for those heaters strategically placed to provide assistance for turbo-generator operation.
- Installation of a granular and relatively water-tight earth-fill cofferdam at the draft-tube outlet and tailrace.
- Removal of main turbo-generator components such as Exciter; top frame; Rotor and Generator Shaft; Speed Ring, Wicket Gates, shafts and related parts; Turbine Shaft, Head-cover and Turbine; and Stator can be facilitated with the existing powerhouse overhead Bridge Crane, although a temporary power source and connection for the crane may be required. Those components can then be set aside as required for salvage and disposal once the roof structure is removed.
- Removal of Roofing, Sheathing, support structure and related miscellaneous parts and components. Set aside, stockpile for salvage and disposal.
- Remove overhead Bridge Crane and stockpiled turbo-generator main components, sort and stockpile at site for salvage and disposal.
- Demolish exterior superstructure walls and related components, stockpile demolition material for disposal.
- Remove and demolish generator floor reinforced concrete slab and related exterior support walls at that level. Stockpile demolition material for disposal.
- Remove head gates and related equipment and components and demolish reconfigured intake structure.
- Remove and demolish turbine floor reinforced concrete slab and interior/exterior walls at that level. Stockpile demolition material for disposal.
- Remove exposed interior steel parts; including throat ring, steel draft-tube parts and other related miscellaneous items. Stockpile and sort for salvage and disposal.
- Remove reinforced concrete foundation substructure. Stockpile debris for disposal.
- Remove buried services including the on-site sewage disposal system, sanitary pumps and piping, any freshwater piping and equipment.

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SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

- Disposal of construction and demolition debris – truck selected materials to a designated construction debris disposal facility, while suitable other materials, such as pulverized concrete devoid of rebar and embedded metals, can be buried at site.
- Deliver or sell stockpiled salvage material.
- Infill foundation substructure excavation with compacted granular material and selected demolition debris to the tailrace cofferdam. The cofferdam can remain once graded to match site. Provide erosion protection as required.
- Improve site surface drainage as required.
- Place topsoil, sods/hydro-seed, miscellaneous rudimentary landscaping as may be required for public safety and to facilitate surface drainage requirements.
- Once it is drained, remediate the lengthy tailrace channel with clean gravel and crushed stone, as well as clean fill as required. Grade surfaces, hydro-seed and/plant trees or other vegetation to return this area to a near natural state.
- Gravel woods roads in the area should remain in place to facilitate ground-search rescue and fire-fighting activities.

The bulk of costs associated with the decommissioning exercise include building demolition and related materials disposal, and site protection and remediation post demolition.

d) Lower Great Brook Development

At the Lower Great Brook Development (Mersey No. 7 and 8), completed in about 1955, inflow from the Big Falls tailrace re-enters the river some distance upstream of the Lower Great Brook Facility and is channelled through the integral powerhouse intake structure and turbo generators and to the draft tubes which deposit the water directly back into the Mersey River.

The Lower Great Brook facility dam and powerhouse arrangement straddles the Mersey River, the powerhouse and dam are located in the main alignment of the river, they directly impound the river, no river diversion is found at this site.

Lower Great Brook Development utilizes two vertically oriented turbo-generators, each with a 2.26 MW, for a total of 4.56 MW generating capacity from about 22 feet of head.

Turbo-generators are fed directly from the river forebay via a dual gated concrete intake structure which is integral with the powerhouse structure. Each generating unit has its own concrete intake

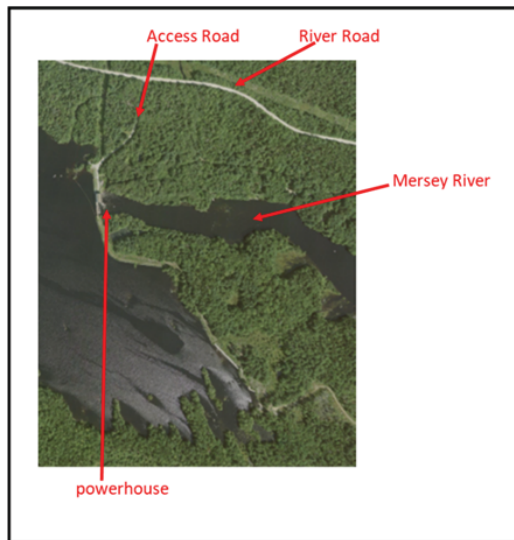


Photo 14: Lower Great Brook Development

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SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

chamber, and lower draft-tube outlet to the tailrace channel. The head gates are located inside the powerhouse structure in a configuration which is remarkably similar to what is utilized at Tusket.

The powerhouse incorporates concrete mounts on the main floor for the stator and generator support while the head covers are accessed from the main floor which serves as the turbine floor. Therefore, the pressurized intake chamber is found directly below the main floor, while the draft tube outlet and building substructure are located beneath the intake chamber.

Access to the powerhouse is via an 800 foot long gravelled driveway access located about 6 miles west of Milton via gravel topped River Road.

Demolition planning for this facility will consider that the intake chambers will be dewatered and all electrical and communications equipment directly related to transmission will be removed by others. It is also assumed that there will be no outstanding asbestos abatement or other hazardous materials or environmental issues at this site that would adversely affect demolition planning. Note that there is some material laydown area available at site, more can be cleared and constructed if necessary.

Due to its position in the main Mersey River powerhouse, demolitions will require an extensive cofferdam arrangement.

Since the powerhouse is within the original Mersey River alignment, and that alignment and construction likely involved considerable rock excavation, a remediated site arrangement may include a short river diversion to avoid potential erosion and local flooding problems associated with having the river flow through a filled area located in the original river alignment.

Following demolition planning categorizations apply to the Lower Great Brook facility:

- Intake Classification - Category C, concrete intake structure is integral with the powerhouse structure;
- Architectural Classification – Category B, reinforced concrete and structural steel;
- Outlet (Draft-tube) Classification – Category A, the generation station discharges flow directly into the Mersey River. There is no tailrace channel at this development.

Therefore the following tasks have been considered in the demolition planning and costs derivation exercise:

- Construct additional material lay-down area as required.
- Install silt, debris and environmental containments, temporary security fencing (chain-link), silt fence, silt curtain and oil boom.
- Removal of accessible lubricating oil and previously undrained closed-system cooling water (for recycling).
- Removal of small machinery and turbo generator mechanical and electrical controls including but not limited to compressors and tanks, governors and related pressure tanks, bearing cooling systems and filters and related piping, throttle linkage components, electrical and communications cables and miscellaneous smaller equipment and piping.

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SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

- Removal of HVAC equipment and localized heating units for areas within the building and for those heaters strategically placed to provide assistance for turbo-generator operation.
- Installation of a significant granular and relatively water-tight earth-fill cofferdam at the draft-tube outlet and around the powerhouse as required to hold back the waters of the Mersey River during demolition and removals.
- Removal of main turbo-generator components such as Exciter; top frame; Rotor and Generator Shaft; Speed Ring, Wicket Gates, shafts and related parts; Turbine Shaft, Head-cover and Turbine; and Stator can be facilitated with the existing powerhouse overhead Bridge Crane, although a temporary power source and connection for the crane may be required. Those components can then be set aside as required for salvage and disposal once the roof structure is removed. Also remove head gates and related operating equipment, all of which is located inside the confines of the powerhouse.
- Removal of Roofing, Sheathing, support structure and related miscellaneous parts and components. Set aside, stockpile for salvage and disposal.
- Remove overhead Bridge Crane and stockpiled turbo-generator main components, sort and stockpile at site for salvage and disposal.
- Demolish exterior walls and related components, stockpile demolition material for disposal.
- Remove and demolish generator support pedestals and main reinforced concrete floor slab. Stockpile demolition material for disposal.
- Demolish intake structure.
- Remove exposed interior steel parts; including throat ring, steel draft-tube parts and other related miscellaneous items. Stockpile and sort for salvage and disposal.
- Remove reinforced concrete foundation substructure. This powerhouse is considered to be located "in-stream". Stockpile debris for disposal.
- Remove any buried services including any freshwater piping and equipment.
- Disposal of construction and demolition debris – truck selected materials to a designated construction debris disposal facility, while suitable other materials, such as pulverized concrete devoid of rebar and embedded metals, can be buried at site.
- Deliver or sell stockpiled salvage material.
- Infill foundation substructure excavation with compacted clean granular material inside the cofferdam structure. The cofferdam can remain once graded to match site. Significant erosion protection will be required.
- Improve site surface drainage as required.
- Place topsoil, sods/hydro-seed, miscellaneous rudimentary landscaping as may be required for public safety and to facilitate surface drainage requirements.
- Once it is drained, remediate the tailrace with clean gravel and crushed stone, as well as clean fill as required. Grade surfaces, hydro-seed and/plant trees or other vegetation to return this area to a near natural state.

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

- Gravel woods roads in the area should remain in place to facilitate ground-search rescue and fire-fighting activities.

The bulk of costs associated with the decommissioning exercise include building demolition and related materials disposal, and site protection and remediation post demolition.

Note that we have identified material salvage as an item herein, the actual value of that salvage will be small in consideration of resources required (men and equipment, cranes) to remove, sort, stockpile and move these materials to a suitable salvage facility. However, since there are multiple units at this site, it appears that there may be a small net benefit to salvaging turbo-generator parts and related miscellaneous metals. Mobilization and transportation costs can be shared between units, lowering the per-unit salvage costs.

e) Deep Brook Development

At the Deep Brook Development (Mersey No. 9 and 10), completed in about 1950, inflow from Lower Great Brook and the Mersey River is diverted at the Deep Brook Diversion Dam to the Deep Brook Head Pond, across and northeast of River Road, where it is channelled through a gated concrete intake structure and two reinforced concrete penstock conduits to the reinforced concrete intake chambers below the powerhouse main floor. Generators are supported from concrete pedestals and are accessed via a half-deck mezzanine structure. Head covers are accessed from the main floor. Each generating unit has its own concrete intake chamber, and lower draft-tube outlet to the tailrace channel. Flow exits the powerhouse draft tubes to a constructed tailrace channel which collects and carries water back to the original river alignment approximately southeast of River Road.

Deep Brook Development utilizes two vertically oriented turbo-generators, each with about a 4.5 MW generating capacity, for a total generating capacity of about 9.0 MW from about 46 feet of head.

Access to the powerhouse is via an approximately 700 foot long gravelled driveway access located about a mile northwest of Milton via River Road.

Demolition planning for this facility will consider that the intake chambers will be dewatered and all electrical and communications equipment directly related to transmission will be removed by others. It is also assumed that there will be no outstanding asbestos abatement or other hazardous materials or environmental issues at this site that would adversely affect demolition planning. Note that there is ample material laydown area available at site, but additional laydown area in closer proximity to the powerhouse can be cleared and constructed as necessary.

There appears to be adequate space at site to allow for some debris disposal by burying.

The tailrace channel is wide and deep at Deep Brook. A significant cofferdam will be required.

Following demolition planning categorizations apply to the Deep Brook facility:

- Intake Classification - Category B, the facility features twin buried reinforced concrete intake penstocks;
- Architectural Classification – Category B, reinforced concrete and structural steel;

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SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

- Outlet (Draft-tube) Classification – Category B, a lengthy and broad constructed tailrace channel will require significant remediation.

Therefore the following tasks have been considered in the demolition planning and costs derivation exercise:

- Construct additional material lay-down area as required.
- Install silt, debris and environmental containments, temporary security fencing (chain-link), silt fence, silt curtain and oil boom.
- Removal of accessible lubricating oil and previously undrained closed-system cooling water (for recycling).
- Removal of small machinery and turbo generator mechanical and electrical controls including but not limited to compressors and tanks, governors and related pressure tanks, bearing cooling systems and filters and related piping, throttle linkage components, electrical and communications cables and miscellaneous smaller equipment and piping.
- Removal of HVAC equipment and localized heating units for areas within the building and for those heaters strategically placed to provide assistance for turbo-generator operation.
- Installation of a significant granular and relatively water-tight earth-fill cofferdam at the draft-tube outlet and tailrace.
- Removal of main turbo-generator components such as Exciter; top frame; Rotor and Generator Shaft; Speed Ring, Wicket Gates, shafts and related parts; Turbine Shaft, Head-cover and Turbine; and Stator can be facilitated with the existing powerhouse overhead Bridge Crane, although a temporary power source and connection for the crane may be required. Those components can then be set aside as required for salvage and disposal once the roof structure is removed.
- Removal of Roofing, Sheathing, support structure and related miscellaneous parts and components. Set aside, stockpile for salvage and disposal.
- Remove overhead Bridge Crane and stockpiled turbo-generator main components, sort and stockpile at site for salvage and disposal.
- Demolish exterior walls and related components, stockpile demolition material for disposal.
- Remove and demolish generator pedestals and main floor reinforced concrete slab and related exterior support walls at that level. Stockpile demolition material for disposal.
- Remove exposed interior steel parts; including throat ring, steel draft-tube parts and other related miscellaneous items. Stockpile and sort for salvage and disposal.
- Remove reinforced concrete foundation substructure. Stockpile for disposal.
- Remove buried services including any freshwater piping and equipment.
- Disposal of construction and demolition debris – truck selected materials to a designated construction debris disposal facility, while suitable other materials, such as pulverized concrete devoid of rebar and embedded metals, can be buried at site.
- Deliver or sell stockpiled salvage material.

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SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

- Infill foundation substructure excavation with compacted granular material and selected demolition debris to the tailrace cofferdam. The cofferdam can remain once graded to match site. Provide erosion protection as required.
- Improve site surface drainage as required.
- Place topsoil, sods/hydro-seed, miscellaneous rudimentary landscaping as may be required for public safety and to facilitate surface drainage requirements.
- Once it is drained, remediate the half mile long and 150 foot wide tailrace with clean gravel and crushed stone, as well as clean fill as required. Grade surfaces, hydro-seed and/plant trees or other vegetation to return this area to a near natural state.
- Gravel woods roads in the area should remain in place to facilitate ground-search rescue and fire-fighting activities.

The bulk of costs associated with the decommissioning exercise include building demolition and related materials disposal, and site protection and remediation post demolition.

f) Cowie Falls Development

At the Cowie Falls Development (Mersey No. 11 and 12), completed in about 1938, inflow from Deep Brook and the Mersey River is channelled through the gated integral powerhouse intake structure and turbo generators and to the tailrace channel at what appears to be the original Mersey River alignment.

Cowie Falls Development utilizes two vertically oriented turbo-generators, each with approximately 3.6 MW generating capacity for a total of 7.2 MW from approximately 42 feet of head.

Turbo-generators are fed directly from the lake forebay via a dual concrete gated intake structure which is integral with the powerhouse. Each generating unit has its own concrete intake chamber, and lower draft-tube outlet to the tailrace channel. The intake at Cowie Falls is very similar in configuration to what is installed at Upper Lake Falls.

The powerhouse incorporates a generator floor and support structure over a heavy turbine floor and related support structure. The pressurized intake chamber is found below the turbine floor, while the draft tube outlet and building substructure are located beneath the intake chamber. The head cover for each unit is accessed from the Turbine floor.

Access to the powerhouse is via an approximately 1500 foot long gravelled driveway access located in Milton via Trunk Highway Rte. 8.

Demolition planning for this facility will consider that the intake chambers will be dewatered and all electrical and communications equipment directly related to transmission will be removed by others. It is also assumed that there will be no outstanding asbestos abatement or other hazardous materials or environmental issues at this site that would adversely affect demolition planning. Note that there is ample material laydown area available at site.

Since the powerhouse is located on the original Mersey River alignment, and that alignment and construction likely involved considerable rock excavation, the original alignment may no longer be suitable for the Mersey River. A remediated site arrangement may include a short river

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SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

diversion past the powerhouse location to avoid potential erosion and local flooding problems associated with having the river flow through a filled area located in the original river alignment.

Following demolition planning categorizations apply to the Cowie Falls facility:

- Intake Classification - Category C, concrete intake structure is integral with the powerhouse structure;
- Architectural Classification – Category B, reinforced concrete and structural steel;
- Outlet (Draft-tube) Classification – Category B, since the Mersey River may require some realignment, part of the tailrace channel will require significant remediation.

Therefore the following tasks have been considered in the demolition planning and costs derivation exercise:

- Install silt, debris and environmental containments, temporary security fencing (chain-link), silt fence, silt curtain and oil boom.
- Removal of accessible lubricating oil and previously undrained closed-system cooling water (for recycling).
- Removal of small machinery and turbo generator mechanical and electrical controls including but not limited to compressors and tanks, governors and related pressure tanks, bearing cooling systems and filters and related piping, throttle linkage components, electrical and communications cables and miscellaneous smaller equipment and mechanical controls and piping.
- Removal of HVAC equipment and localized heating units for areas within the building and for those heaters strategically placed to provide assistance for turbo-generator operation.
- Installation of a granular and relatively water-tight earth-fill cofferdam at the draft-tube outlet and tailrace.
- Removal of main turbo-generator components such as Exciter; top frame; Rotor and Generator Shaft; Speed Ring, Wicket Gates, shafts and related parts; Turbine Shaft, Head-cover and Turbine; and Stator can be facilitated with the existing powerhouse overhead Bridge Crane, although a temporary power source and connection for the crane may be required. Those components can then be set aside as required for salvage and disposal once the roof structure is removed.
- Removal of Roofing, Sheathing, support structure and related miscellaneous parts and components. Set aside, stockpile for salvage and disposal.
- Remove overhead Bridge Crane and stockpiled turbo-generator main components, sort and stockpile at site for salvage and disposal.
- Demolish superstructure exterior walls and related components, stockpile demolition material for disposal.
- Remove and demolish generator floor reinforced concrete slab and related exterior support walls at that level. Stockpile demolition material for disposal.
- Remove head gates and related equipment and components and demolish intake structure.
- Remove and demolish turbine floor reinforced concrete slab and interior/exterior walls at that level. Stockpile demolition material for disposal.

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SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

- Remove exposed interior steel parts; including throat ring, steel draft-tube parts and other related miscellaneous items. Stockpile and sort for salvage and disposal.
- Remove reinforced concrete foundation substructure. This powerhouse will be considered to be located “in-stream” upon site infrastructure removals. Stockpile debris for disposal.
- Remove buried services including any freshwater piping and equipment.
- Disposal of construction and demolition debris – truck selected materials to a designated construction debris disposal facility, while suitable other materials, such as pulverized concrete devoid of rebar and embedded metals, can be buried at site.
- Deliver or sell stockpiled salvage material.
- Construct new powerhouse/tailrace diversion.
- Infill foundation substructure excavation with compacted clean granular material to the tailrace cofferdam. The cofferdam can remain once graded to match site. Significant erosion protection will be required.
- Improve site surface drainage as required.
- Place topsoil, sods/hydro-seed, miscellaneous rudimentary landscaping as may be required for public safety and to facilitate surface drainage requirements.
- Once it is drained, remediate the tailrace with clean gravel and crushed stone, as well as clean fill as required. Grade surfaces, hydro-seed and/plant trees or other vegetation to return this area to a near natural state.
- Gravel woods roads in the area should remain in place to facilitate ground-search rescue and fire-fighting activities.

The bulk of costs associated with the decommissioning exercise include building demolition and related materials disposal, and site protection and remediation post demolition.

REDACTED (CONFIDENTIAL INFORMATION REMOVED)

REDACTED Hydro Asset Study Appendix C Page 81 of 143

Nova Scotia Power Hydro Production
Site Decommissioning Estimate Summary for Asset Retirement Obligations (ARO) Study
Mersey Hydro Electric Generation System

Upper Lake Falls Development		
Item Description	Estimated Decommissioning Costs	Assumptions/Notes
SITE REMEDIATIONS		
Site Remediation Issues	\$465,700.00	Tailrace to be remediated, diversion may be required.
Site Access Removals	\$5,000.00	Regrade driveway.
Site Services Removals	\$10,000.00	Remove site sewage disposal system at this location.
BUILDINGS & STRUCTURES		
Powerhouse & Related Auxiliary Structures Removals	\$552,800.00	Includes roof structure removal, removal of superstructure walls, partial removal of sub-structure; infilling of the powerhouse and an estimate of off-site disposal costs. Separate Generator and Turbine floors at this location.
Auxiliary Buildings Removals (not associated with Production Plant)	\$0.00	N/A
BOILERS & AUXILIARIES		
Boilers & Auxiliaries - NOT APPLICABLE	\$0.00	N/A
TURBINES, GENERATORS & AUXILIARIES		
Turbo Generator Removals	\$58,100.00	Two vertical turbo-generator units.
Turbo Generator Control Removals	\$17,000.00	Includes disassembly and removal of governor systems, pumps, servos and associated piping.
ELECTRICAL		
On-Site Distribution Lines Removals	\$3,000.00	Interior and exterior at powerhouse.
Electrical Power Systems Removals	\$16,000.00	Powerhouse
Other Auxiliary Systems and Equipment Removals	\$6,000.00	Powerhouse
Electrical Control and Communication	\$10,000.00	Powerhouse
COMMON SERVICES		
Building Ventilation & Heating Removals	\$4,000.00	Limited HVAC at this site.
Plant Operating Equipment Removals	\$45,000.00	Includes head gates and tailrace gates.
GENERAL AND DISTRIBUTED		
Field Facilities & Decommissioning (Mobilization incl)	\$30,000.00	
Estimated Administration & Overhead Expenses	\$136,931.20	
SALVAGE		
Scrap Metals - General (Inc. Turbine)	-\$400.00	Allowance
General Parts	-\$2,400.00	Allowance
Insulated Wire and Cables No. 1	-\$2,400.00	Allowance
Insulated Wire and Cables No. 2	-\$2,400.00	Allowance
ENGINEERING & PROJECT MANAGEMENT		
Engineering & Project Management	\$146,712.00	
Site Decommissioning Estimate Subtotal Upper Lake Falls Development \$1,498,643.20		
Notes: 1. Transmission cable, substations and related transformers to be removed by others in preparation for general demolition. 2. HST is additional to stated estimated costs.		

Figure 13

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Nova Scotia Power Hydro Production
Site Decommissioning Estimate Summary for Asset Retirement Obligations (ARO) Study
Mersey River Hydro Electric Generation System

Lower Lake Falls Development		
Item Description	Estimated Decommissioning Costs	Assumptions/Notes
SITE REMEDIATIONS		
Site Remediation Issues	\$370,400.00	1500 ft long tailrace to be remediated.
Site Access Removals	\$1,500.00	Remove short driveway, access bridges to remain.
Site Services Removals	\$10,000.00	Remove site sewage disposal system at this location.
BUILDINGS & STRUCTURES		
Powerhouse & Related Auxiliary Structures Removals	\$522,800.00	Includes roof structure removal, removal of superstructure walls, partial removal of sub-structure; infilling of the powerhouse and an estimate of off-site disposal costs. Separate Generator and Turbine floors at this location
Auxiliary Buildings Removals (not associated with Production Plant)	\$0.00	N/A
BOILERS & AUXILIARIES		
Boilers & Auxiliaries - NOT APPLICABLE	\$0.00	N/A
TURBINES, GENERATORS & AUXILIARIES		
Turbo Generator Removals	\$58,100.00	Two vertical turbo-generator units.
Turbo Generator Control Removals	\$17,000.00	Includes disassembly and removal of governor systems, pumps, servos and associated piping.
ELECTRICAL		
On-Site Distribution Lines Removals	\$3,000.00	Interior and exterior at powerhouse.
Electrical Power Systems Removals	\$16,000.00	Powerhouse
Other Auxiliary Systems and Equipment Removals	\$6,000.00	Powerhouse
Electrical Control and Communication	\$10,000.00	Powerhouse
COMMON SERVICES		
Building Ventilation & Heating Removals	\$4,000.00	Limited HVAC at this site.
Plant Operating Equipment Removals	\$35,800.00	Includes head gates and tailrace gates.
GENERAL AND DISTRIBUTED		
Field Facilities & Decommissioning (Mobilization incl)	\$30,000.00	
Estimated Administration & Overhead Expenses	\$121,475.20	
SALVAGE		
Scrap Metals - General (Inc. Turbine)	-\$400.00	Allowance
General Parts	-\$2,400.00	Allowance
Insulated Wire and Cables No. 1	-\$2,400.00	Allowance
Insulated Wire and Cables No. 2	-\$2,400.00	Allowance
ENGINEERING & PROJECT MANAGEMENT		
Engineering & Project Management	\$130,152.00	
Site Decommissioning Estimate Subtotal Lower Lake Falls Development \$1,328,627.20		
Notes: 1. Transmission cable, substations and related transformers to be removed by others in preparation for general demolition. 2. HST is additional to stated estimated costs.		

Figure 14

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**Nova Scotia Power Hydro Production
Site Decommissioning Estimate Summary for Asset Retirement Obligations (ARO) Study
Mersey River Hydro Electric Generation System**

Big Falls Development		
Item Description	Estimated Decommissioning Costs	Assumptions/Notes
SITE REMEDIATIONS		
Site Remediation Issues	\$392,400.00	1000 ft long tailrace to be remediated.
Site Access Removals	\$4,000.00	Remove short driveway, access bridge to remain.
Site Services Removals	\$10,000.00	Remove site sewage disposal system at this location.
BUILDINGS & STRUCTURES		
Powerhouse & Related Auxiliary Structures Removals	\$672,800.00	Includes roof structure removal, removal of superstructure walls, partial removal of sub-structure; infilling of the powerhouse and an estimate of off-site disposal costs. Separate Generator and Turbine floors at this location.
Auxiliary Buildings Removals (not associated with Production Plant)	\$5,000.00	Remove auxiliary buildings.
BOILERS & AUXILIARIES		
Boilers & Auxiliaries - NOT APPLICABLE	\$0.00	N/A
TURBINES, GENERATORS & AUXILIARIES		
Turbo Generator Removals	\$58,100.00	Two vertical turbo-generator units.
Turbo Generator Control Removals	\$17,000.00	Includes disassembly and removal of governor systems, pumps, servos and associated piping.
ELECTRICAL		
On-Site Distribution Lines Removals	\$3,000.00	Interior and exterior at powerhouse.
Electrical Power Systems Removals	\$16,000.00	Powerhouse
Other Auxiliary Systems and Equipment Removals	\$6,000.00	Powerhouse
Electrical Control and Communication	\$10,000.00	Powerhouse
COMMON SERVICES		
Building Ventilation & Heating Removals	\$4,000.00	Limited HVAC at this site.
Plant Operating Equipment Removals	\$43,200.00	Includes head gates and tailrace gates.
GENERAL AND DISTRIBUTED		
Field Facilities & Decommissioning (Mobilization incl)	\$30,000.00	
Estimated Administration & Overhead Expenses	\$142,408.00	
SALVAGE		
Scrap Metals - General (Inc. Turbine)	-\$400.00	Allowance
General Parts	-\$2,400.00	Allowance
Insulated Wire and Cables No. 1	-\$2,400.00	Allowance
Insulated Wire and Cables No. 2	-\$2,400.00	Allowance
ENGINEERING & PROJECT MANAGEMENT		
Engineering & Project Management	\$152,580.00	
Site Decommissioning Estimate Subtotal Big Falls Development \$1,558,888.00		
Notes: 1. Transmission cable, substations and related transformers to be removed by others in preparation for general demolition. 2. HST is additional to stated estimated costs.		

Figure 15

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Nova Scotia Power Hydro Production
Site Decommissioning Estimate Summary for Asset Retirement Obligations (ARO) Study
Mersey River Hydro Electric Generation System

Lower Great Brook Development		
Item Description	Estimated Decommissioning Costs	Assumptions/Notes
SITE REMEDIATIONS		
Site Remediation Issues	\$685,900.00	Large cofferdam required at this site to isolate work area from the Mersey River.
Site Access Removals	\$20,000.00	Remove driveway.
Site Services Removals	\$0.00	No site sewage disposal system at this location.
BUILDINGS & STRUCTURES		
Powerhouse & Related Auxiliary Structures Removals	\$406,800.00	Includes roof structure removal, removal of superstructure walls, partial removal of sub-structure; infilling of the powerhouse and an estimate of off-site disposal costs.
Auxiliary Buildings Removals (not associated with Production Plant)	\$0.00	No auxiliary buildings at this location.
BOILERS & AUXILIARIES		
Boilers & Auxiliaries - NOT APPLICABLE	\$0.00	N/A
TURBINES, GENERATORS & AUXILIARIES		
Turbo Generator Removals	\$58,100.00	Two vertical turbo-generator units.
Turbo Generator Control Removals	\$17,000.00	Includes disassembly and removal of governor systems, pumps, servos and associated piping.
ELECTRICAL		
On-Site Distribution Lines Removals	\$3,000.00	Interior and exterior at powerhouse.
Electrical Power Systems Removals	\$16,000.00	Powerhouse
Other Auxiliary Systems and Equipment Removals	\$6,000.00	Powerhouse
Electrical Control and Communication	\$10,000.00	Powerhouse
COMMON SERVICES		
Building Ventilation & Heating Removals	\$5,200.00	Limited HVAC at this site.
Plant Operating Equipment Removals	\$28,900.00	Includes head gates and tailrace gates.
GENERAL AND DISTRIBUTED		
Field Facilities & Decommissioning (Mobilization incl)	\$30,000.00	
Estimated Administration & Overhead Expenses	\$144,132.80	
SALVAGE		
Scrap Metals - General (Inc. Turbine)	-\$400.00	Allowance
General Parts	-\$2,000.00	Allowance
Insulated Wire and Cables No. 1	-\$2,000.00	Allowance
Insulated Wire and Cables No. 2	-\$2,000.00	Allowance
ENGINEERING & PROJECT MANAGEMENT		
Engineering & Project Management	\$154,428.00	
Site Decommissioning Estimate Subtotal Lower Great Brook Development \$1,579,060.80		
Notes: 1. Transmission cable, substations and related transformers to be removed by others in preparation for general demolition. 2. HST is additional to stated estimated costs.		

Figure 16

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Nova Scotia Power Hydro Production
Site Decommissioning Estimate Summary for Asset Retirement Obligations (ARO) Study
Mersey River Hydro Electric Generation System

Deep Brook Development		
Item Description	Estimated Decommissioning Costs	Assumptions/Notes
SITE REMEDIATIONS		
Site Remediation Issues	\$1,121,900.00	Very broad tailrace, about 1/2 mile long to be remediated.
Site Access Removals	\$8,000.00	Remove driveway.
Site Services Removals	\$0.00	No site sewage disposal system at this location.
BUILDINGS & STRUCTURES		
Powerhouse & Related Auxiliary Structures Removals	\$442,800.00	Includes roof structure removal, removal of superstructure walls, partial removal of sub-structure; infilling of the powerhouse and an estimate of off-site disposal costs.
Auxiliary Buildings Removals (not associated with Production Plant)	\$0.00	No auxilliary buildings at this site.
BOILERS & AUXILIARIES		
Boilers & Auxiliaries - NOT APPLICABLE	\$0.00	N/A
TURBINES, GENERATORS & AUXILIARIES		
Turbo Generator Removals	\$58,100.00	Two vertical turbo-generator units.
Turbo Generator Control Removals	\$17,000.00	Includes disassembly and removal of governor systems, pumps, servos and associated piping.
ELECTRICAL		
On-Site Distribution Lines Removals	\$3,000.00	Interior and exterior at powerhouse.
Electrical Power Systems Removals	\$16,000.00	Powerhouse
Other Auxiliary Systems and Equipment Removals	\$6,000.00	Powerhouse
Electrical Control and Communication	\$10,000.00	Powerhouse
COMMON SERVICES		
Building Ventilation & Heating Removals	\$5,200.00	Limited HVAC at this site.
Plant Operating Equipment Removals	\$20,300.00	Includes tailrace gates.
GENERAL AND DISTRIBUTED		
Field Facilities & Decommissioning (Mobilization incl)	\$30,000.00	
Estimated Administration & Overhead Expenses	\$194,689.60	
SALVAGE		
Scrap Metals - General (Inc. Turbine)	-\$400.00	Allowance
General Parts	-\$2,400.00	Allowance
Insulated Wire and Cables No. 1	-\$2,400.00	Allowance
Insulated Wire and Cables No. 2	-\$2,400.00	Allowance
ENGINEERING & PROJECT MANAGEMENT		
Engineering & Project Management	\$208,596.00	
Site Decommissioning Estimate Subtotal Deep Brook Development \$2,133,985.60		
Notes: 1. Transmission cable, substations and related transformers to be removed by others in preparation for general demolition. 2. HST is additional to stated estimated costs.		

Figure 17

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Nova Scotia Power Hydro Production
Site Decommissioning Estimate Summary for Asset Retirement Obligations (ARO) Study
Mersey River Hydro Electric Generation System

Cowie Falls Development		
Item Description	Estimated Decommissioning Costs	Assumptions/Notes
SITE REMEDIATIONS		
Site Remediation Issues	\$546,400.00	New diversion may be required.
Site Access Removals	\$30,000.00	Remove driveway.
Site Services Removals	\$0.00	No site sewage disposal system at this location.
BUILDINGS & STRUCTURES		
Powerhouse & Related Auxiliary Structures Removals	\$552,800.00	Includes roof structure removal, removal of superstructure walls, partial removal of sub-structure; infilling of the powerhouse and an estimate of off-site disposal costs.
Auxiliary Buildings Removals (not associated with Production Plant)	\$0.00	No auxiliary buildings at this location.
BOILERS & AUXILIARIES		
Boilers & Auxiliaries - NOT APPLICABLE	\$0.00	N/A
TURBINES, GENERATORS & AUXILIARIES		
Turbo Generator Removals	\$58,100.00	Two vertical turbo-generator units.
Turbo Generator Control Removals	\$17,000.00	Includes disassembly and removal of governor systems, pumps, servos and associated piping.
ELECTRICAL		
On-Site Distribution Lines Removals	\$3,000.00	Interior and exterior at powerhouse.
Electrical Power Systems Removals	\$16,000.00	Powerhouse
Other Auxiliary Systems and Equipment Removals	\$6,000.00	Powerhouse
Electrical Control and Communication	\$10,000.00	Powerhouse
COMMON SERVICES		
Building Ventilation & Heating Removals	\$5,200.00	Limited HVAC at this site.
Plant Operating Equipment Removals	\$45,000.00	Includes head gates and tailrace gates.
GENERAL AND DISTRIBUTED		
Field Facilities & Decommissioning (Mobilization incl)	\$30,000.00	
Estimated Administration & Overhead Expenses	\$147,784.00	
SALVAGE		
Scrap Metals - General (Inc. Turbine)	-\$400.00	Allowance
General Parts	-\$2,400.00	Allowance
Insulated Wire and Cables No. 1	-\$2,400.00	Allowance
Insulated Wire and Cables No. 2	-\$2,400.00	Allowance
ENGINEERING & PROJECT MANAGEMENT		
Engineering & Project Management	\$158,340.00	
Site Decommissioning Estimate Subtotal Cowie Falls Development \$1,618,024.00		
Notes: 1. Transmission cable, substations and related transformers to be removed by others in preparation for general demolition. 2. HST is additional to stated estimated costs.		

Figure 18

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

8. Nictaux Hydro Electric System

Nictaux Development is one of three conventional stand-alone hydro-electric developments that discharge water from South Mountain watersheds into the Annapolis River or other tributaries to the Annapolis River and the Annapolis Basin. The other two such developments are located at Paradise and at Lequille. A fourth development, the Annapolis Tidal Power Generation Station, is also on the Annapolis River but is outside the scope of this study.

Each of these three facilities are located on their own tributary rivers, have their own watersheds and are fed via pipelines/buried penstock pipes from impoundment head ponds and storage reservoirs located in the upper reaches of the South Mountain in the Annapolis Valley area.

These developments were constructed in the 1950's and 1960's by the Nova Scotia Power Commission and Nova Scotia Light and Power Company, precursors to NSPI.

a) Nictaux Development

In 1954 the Nictaux Development was completed at Nictaux Falls at the toe of the South Mountain at Nictaux Falls, Annapolis County, south of and across the Annapolis River from Middleton. The Nictaux Development harnesses about 380 feet of head to provide about 6.8 MW of generation capacity from a single vertical turbo-generator unit. This plant replaced an older facility at this site which utilized a much smaller head pond and much less head.

The powerhouse can be accessed about three miles south of Middleton off Trunk Highway Route 10 via Nictaux Falls Road and Torbrook Road in Nictaux Falls.

Demolition planning for this facility will consider that the intake penstock pipeline will be dewatered and removed by others, all electrical and communications equipment directly related to transmission will be removed by others and that there are no outstanding asbestos abatement or other hazardous materials or environmental issues at this site that would adversely affect demolition planning. Note that there is very limited material laydown area at site.

There is limited room at site to bury concrete debris.

Following demolition planning categorizations apply to the Nictaux facility:

- Intake Classification - Category B, penstock pipe is buried below ground;

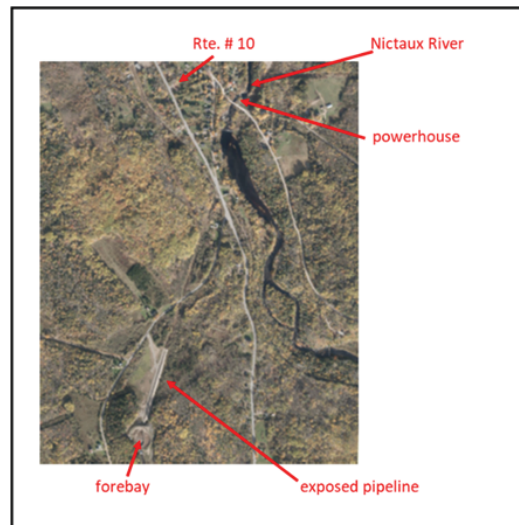


Photo 15: Nictaux Development

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

- Architectural Classification – Category A, reinforced concrete, steel and masonry;
- Outlet (Draft-tube) Classification – Category A, the draft tube discharges flow directly into the Nictaux River.

Therefore the following tasks have been considered in the demolition planning and costs derivation exercise:

- Install silt, debris and environmental containments, temporary security fencing (chain-link), silt fence, silt curtain and oil boom.
- Removal of accessible lubricating oil and previously undrained closed-system cooling water (for recycling).
- Removal of small machinery and turbo generator mechanical and electrical controls including but not limited to compressors and tanks, governors and related pressure tanks, bearing cooling systems and filters and related piping, throttle linkage components, electrical and communications cables and miscellaneous smaller equipment and piping.
- Removal of HVAC equipment and localized heating units for areas within the building and for those heaters strategically placed to provide assistance for turbo-generator operation.
- Installation of a granular and relatively water-tight earth-fill cofferdam at the draft-tube outlet and tailrace.
- Removal of main turbo-generator components such as Exciter; top frame; Rotor and Generator Shaft; Speed Ring, Wicket Gates, shafts and related parts; Turbine Shaft, Head-cover and Turbine; and Stator can be facilitated with the existing powerhouse overhead Bridge Crane, although a temporary power source and connection for the crane may be required. Those components can then be set aside as required for salvage and disposal once the roof structure is removed.
- Removal of Roofing, Sheathing, and support trusses, structural steel and related miscellaneous parts and components. Set aside, stockpile for salvage and disposal or remove directly from site.
- Remove overhead Bridge Crane and stockpiled turbo-generator main components, sort and stockpile at site for salvage and disposal or remove directly from site.
- Dismantle exterior walls and related components, stockpile demolition material for disposal or remove directly from site.
- Remove and demolish main floor reinforced concrete slab. Stockpile demolition material for disposal or remove directly from site.
- Remove exposed interior steel penstock, butterfly valve and related parts; also remove scroll case, throat ring, steel draft-tube parts and other related miscellaneous items. Stockpile and sort for salvage and disposal.
- Remove reinforced concrete foundation substructure. The powerhouse outlet is “in-stream”. Stockpile debris for disposal or remove directly from site.
- Disposal of construction and demolition debris – truck to a designated construction debris disposal facility.

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

- Deliver or sell stockpiled salvage material.
- Infill foundation substructure excavation with compacted clean granular material to the tailrace cofferdam. The cofferdam can remain once graded to match site. Provide erosion protection as required.
- Improve site surface drainage as required.
- Place topsoil, sods/hydro-seed, miscellaneous rudimentary landscaping as may be required for public safety and to facilitate surface drainage requirements.

The bulk of the costs associated with the decommissioning exercise include building demolition and related materials disposal, and site protection and remediation post demolition.

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Nova Scotia Power Hydro Production
Site Decommissioning Estimate Summary for Asset Retirement Obligations (ARO) Study
Nictaux River Hydro Electric Generation System

Nictaux Development		
Item Description	Estimated Decommissioning Costs	Assumptions/Notes
SITE REMEDIATIONS		
Site Remediation Issues	\$217,950.00	
Site Access Removals	\$3,000.00	Includes re-grading at site access roads.
Site Services Removals	\$0.00	No site sewage disposal system at this location.
BUILDINGS & STRUCTURES		
Powerhouse & Related Auxiliary Structures Removals	\$217,650.00	Includes roof structure removal, removal of superstructure walls, partial removal of sub-structure; infilling of the powerhouse and an estimate of off-site disposal costs.
Auxiliary Buildings Removals (not associated with Production Plant)	\$0.00	No miscellaneous auxiliary structures at this site.
BOILERS & AUXILIARIES		
Boilers & Auxiliaries - NOT APPLICABLE	\$0.00	N/A
TURBINES, GENERATORS & AUXILIARIES		
Turbo Generator Removals	\$35,300.00	Single Vertical turbo-generator unit.
Turbo Generator Control Removals	\$8,500.00	Includes disassembly and removal of governor systems, pumps, servos and associated piping.
ELECTRICAL		
On-Site Distribution Lines Removals	\$3,500.00	Interior and exterior at powerhouse.
Electrical Power Systems Removals	\$9,000.00	Powerhouse
Other Auxiliary Systems and Equipment Removals	\$5,000.00	Powerhouse
Electrical Control and Communication	\$5,000.00	Powerhouse
COMMON SERVICES		
Building Ventilation & Heating Removals	\$5,200.00	Limited HVAC at this site.
Plant Operating Equipment Removals	\$6,750.00	
GENERAL AND DISTRIBUTED		
Field Facilities & Decommissioning (Mobilization incl)	\$30,000.00	
Estimated Administration & Overhead Expenses	\$61,247.20	
SALVAGE		
Scrap Metals - General (Inc. Turbine)	-\$500.00	Allowance
General Parts	-\$1,000.00	Allowance
Insulated Wire and Cables No. 1	-\$1,000.00	Allowance
Insulated Wire and Cables No. 2	-\$1,000.00	Allowance
ENGINEERING & PROJECT MANAGEMENT		
Engineering & Project Management	\$65,622.00	
Site Decommissioning Estimate Subtotal		
Nictaux Development		\$670,219.20
Notes:		
1. Transmission cable, substations and related transformers to be removed by others in preparation for general demolition.		
2. HST is additional to stated estimated costs.		

Figure 19

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

9. Paradise Development

Paradise Development is one of three conventional stand-alone hydro-electric developments that discharge water from South Mountain watersheds into the Annapolis River or other tributaries to the Annapolis River and the Annapolis Basin. The other two such developments are located at Nictaux and at Lequille. A fourth development, the Annapolis Tidal Power Generation Station is also on the Annapolis River but is outside the scope of this study.

Each of these three facilities are located on their own tributary rivers, have their own watersheds and are fed via pipelines and buried penstock pipes from impoundment head ponds and storage reservoirs located in the upper reaches of the South Mountain in the Annapolis Valley area.

These developments were constructed in the 1950's and 1960's by the Nova Scotia Power Commission and Nova Scotia Light and Power Company, precursors to NSPI.

a) Paradise Development

Completed in 1950 at Paradise Brook, at the toe of the South Mountain, across the Annapolis River and southwest of Paradise in Annapolis County, the Paradise plant provides about 5.0 MW from a single vertically oriented generating unit at about 463 feet of head.

The powerhouse can be accessed via a $\frac{3}{4}$ mile-long gravelled access road located off collector route 201, 3 miles southwest of Paradise.

Demolition planning for this facility will consider that the intake penstock pipeline will be dewatered and removed by others, all electrical and communications equipment directly related to transmission will be removed by others and that there are no outstanding asbestos abatement or other hazardous materials or environmental issues at this site that would adversely affect demolition planning. There is ample available material lay-down area at this site.

A lengthy tailrace channel comprising much of Paradise Brook will require remediation.

Following demolition planning categorizations apply to the Avon No. 2 facility:

- Intake Classification - Category B, penstock pipe is buried below ground;
- Architectural Classification – Category B, Reinforced concrete and structural steel;
- Outlet (Draft-tube) Classification – Category B, a lengthy tailrace channel will require significant remediation.

Therefore the following tasks have been considered in the demolition planning and costs derivation exercise:

- Install silt, debris and environmental containments, temporary security fencing (chain-link), silt fence, silt curtain and oil boom.
- Removal of accessible lubricating oil and previously undrained closed-system cooling water (for recycling).
- Removal of small machinery and turbo generator mechanical and electrical controls including but not limited to compressors and tanks, governors and related pressure tanks, bearing cooling systems and filters and related piping, throttle linkage components, electrical and communications cables and miscellaneous smaller equipment and piping.

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

- Removal of HVAC equipment and localized heating units for areas within the building and for those heaters strategically placed to provide assistance for turbo-generator operation.
- Installation of a granular and relatively water-tight earth-fill cofferdam at the draft-tube outlet and tailrace.
- Removal of main turbo-generator components such as Exciter; top frame; Rotor and Generator Shaft; Speed Ring, Wicket Gates, shafts and related parts; Turbine Shaft, Head-cover and Turbine; and Stator can be facilitated with the existing powerhouse overhead Bridge Crane, although a temporary power source and connection for the crane may be required. Those components can then be set aside as required for salvage and disposal once the roof structure is removed.
- Removal of Roofing, Sheathing, support structure and related miscellaneous parts and components. Set aside, stockpile for salvage and disposal.
- Remove overhead Bridge Crane and stockpiled turbo generator main components, sort and stockpile at site for salvage and disposal.
- Demolish exterior walls and related components, stockpile demolition material for disposal.
- Remove and demolish main floor reinforced concrete slab. Stockpile demolition material for disposal.
- Remove exposed interior steel penstock, main penstock gate valve and related parts; also remove scroll case, throat ring, steel draft-tube parts and other related miscellaneous items. Stockpile and sort for disposal and salvage.
- Remove reinforced concrete foundation substructure to a few feet below new finished grade elevation. Stockpile debris for disposal or remove directly from site.
- Remove auxiliary buildings and buried services including the on-site sewage disposal system, sanitary pumps and piping, any well and related freshwater piping and equipment.
- Disposal of construction and demolition debris, truck selected materials to a designated disposal facility, while suitable materials, such as pulverized concrete devoid of rebar and embedded metals can be buried at site.
- Deliver or sell stockpiled salvage material.
- Infill foundation substructure excavation with compacted granular material and selected demolition debris to the existing tailrace cofferdam structure. The cofferdam can remain once graded to match site.
- Improve site surface drainage as required.
- Place topsoil, sods/hydro-seed, miscellaneous rudimentary landscaping as may be required for public safety and to facilitate surface drainage requirements.
- Access and other gravel roads in the area should remain in place to facilitate ground-search rescue and fire-fighting activities.
- Once it is drained, remediate the roughly mile-long tailrace with clean gravel and crushed stone, as well as clean fill as required. Grade surfaces, hydro-seed and/plant trees or other vegetation to return this area to a near natural state.

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

The bulk of the costs associated with the decommissioning exercise include building demolition and related materials disposal, and site protection and remediation post demolition.

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Nova Scotia Power Hydro Production

Site Decommissioning Estimate Summary for Asset Retirement Obligations (ARO) Study

Paradise Hydro Electric Generation System

Paradise Development		
Item Description	Estimated Decommissioning Costs	Assumptions/Notes
SITE REMEDIATIONS		
Site Remediation Issues	\$297,800.00	Lengthy tailrace to be remediated.
Site Access Removals	\$5,000.00	Includes re-grading at site access roads.
Site Services Removals	\$10,000.00	Site sewage disposal system to be removed.
BUILDINGS & STRUCTURES		
Powerhouse & Related Auxiliary Structures Removals	\$222,650.00	Includes roof structure removal, removal of superstructure walls, partial removal of sub-structure; infilling of the powerhouse and an estimate of off-site disposal costs.
Auxiliary Buildings Removals (not associated with Production Plant)	\$5,000.00	Auxiliary structures at this site.
BOILERS & AUXILIARIES		
Boilers & Auxiliaries - NOT APPLICABLE	\$0.00	N/A
TURBINES, GENERATORS & AUXILIARIES		
Turbo Generator Removals	\$29,650.00	Single Vertical turbo-generator unit.
Turbo Generator Control Removals	\$8,500.00	Includes disassembly and removal of governor systems, pumps, servos and associated piping.
ELECTRICAL		
On-Site Distribution Lines Removals	\$3,500.00	Interior and exterior at powerhouse.
Electrical Power Systems Removals	\$9,000.00	Powerhouse
Other Auxiliary Systems and Equipment Removals	\$8,500.00	Powerhouse
Electrical Control and Communication	\$7,500.00	Powerhouse
COMMON SERVICES		
Building Ventilation & Heating Removals	\$5,200.00	Limited HVAC at this site.
Plant Operating Equipment Removals	\$10,750.00	
GENERAL AND DISTRIBUTED		
Field Facilities & Decommissioning (Mobilization incl)	\$30,000.00	
Estimated Administration & Overhead Expenses	\$73,141.60	
SALVAGE		
Scrap Metals - General (Inc. Turbine)	-\$500.00	Allowance
General Parts	-\$1,000.00	Allowance
Insulated Wire and Cables No. 1	-\$1,000.00	Allowance
Insulated Wire and Cables No. 2	-\$1,000.00	Allowance
ENGINEERING & PROJECT MANAGEMENT		
Engineering & Project Management	\$78,366.00	
Site Decommissioning Estimate Subtotal Paradise Development \$801,057.60		
Notes: 1. Transmission cable, substations and related transformers to be removed by others in preparation for general demolition. 2. HST is additional to stated estimated costs.		

Figure 20

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

10. Roseway River Hydro Electric System

At Roseway a single hydro-electric development powerhouse with two installed generating units has been constructed to harnesses the water of the Roseway River. Water is diverted from the river via a diversion dam and an approximately 800 foot long power canal. Water is discharged from the powerhouse into the Roseway River and its estuarial region via a constructed tailrace channel which is about a half mile long.

a) Roseway Development

The Roseway Development turbo-generators are fed via a twinned concrete headworks structure with separate dedicated gated inlets for each unit at the power canal forebay. Each unit is fed by its own penstock pipes, which remain partly exposed at the upstream walls of the powerhouse.

Unit No. 1 horizontally oriented Roseway turbo-generator was originally installed and commissioned in 1931 and was reconstructed in 1969. The unit features a now obsolete interconnected double rotor turbine system which splits the flow from the penstock and directs it to two separate turbines and scroll cases/draft-tubes located at each side of the centrally located generator unit. Although the unit is rated for 275 kW (0.275 MW) at approximately 25 feet of head, it has not regularly produced power for many years.

Unit No. 2 is a relatively small but more conventional vertically oriented unit that was originally installed at a previously decommissioned and abandoned powerhouse near Mahone Bay. This unit was moved to an expanded Roseway powerhouse in about 1949 where it has generated approximately 600 kW (0.6 MW) from 25 feet of head.

The powerhouse can be accessed via Trunk route 3 west of Shelburne, north on Upper Clyde Road about a half mile, and then east on Powerdam Road, which serves as an approximately 800 feet long gated paved access driveway.

Demolition planning for this facility will consider that the intake penstock pipelines will be dewatered and removed by others, all electrical and communications equipment directly related to transmission will be removed by others and that there are no outstanding asbestos abatement or other hazardous materials or environmental issues at this site that would adversely affect demolition planning. Note that there is some limited material laydown area available at site.

Clean masonry and concrete materials can be buried at site and utilized in backfilling of the powerhouse substructure.

Following demolition planning categorizations apply to the Roseway facility:

- Intake Classification - Category A, penstock pipes are partially exposed and above ground, although some site alterations have caused the pipes to be partly buried by accessway construction and improvements;
- Architectural Classification – Category A, reinforced concrete, some structural steel and masonry construction, some wood frame (also some wood-frame construction);
- Outlet (Draft-tube) Classification – Category B, the lengthy tailrace channel will require remediation to the original Roseway River alignment.

Therefore the following tasks have been considered in the demolition planning and costs derivation exercise:

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

- Construct additional material lay-down area as required.
- Install silt, debris and environmental containments, temporary security fencing (chain-link), silt fence, silt curtain and oil boom.
- Removal of accessible lubricating oil and previously undrained closed-system cooling water (for recycling).
- Removal of small machinery and turbo generator mechanical and electrical controls including but not limited to compressors and tanks, governors and related pressure tanks, bearing cooling systems and filters and related piping, throttle linkage components, electrical and communications cables and miscellaneous smaller equipment and piping.
- Removal of HVAC equipment and localized heating units for areas within the building and for those heaters strategically placed to provide assistance for turbo-generator operation.
- Installation of a granular and relatively water-tight earth-fill cofferdam at the draft-tube outlet and tailrace.
- Removal of main turbo-generator components such as Exciter; top frame; Rotor and Generator Shaft; Speed Ring, Wicket Gates, shafts and related parts; Turbine Shaft, Head-cover and Turbine; and Stator can be facilitated with the existing powerhouse overhead Bridge Crane, although a temporary power source and connection for the crane may be required. Those components can then be set aside as required for salvage and disposal once the roof structure is removed. Also remove head gates and related operating equipment, all of which is located inside the confines of the powerhouse.
- Removal of Roofing, Sheathing, support structure and related miscellaneous parts and components. Set aside, stockpile for salvage and disposal.
- Remove overhead crane components and stockpiled turbo-generator main components, sort and stockpile at site for salvage and disposal.
- Demolish exterior walls and related components, stockpile demolition material for disposal.
- Remove and demolish main floors reinforced concrete slabs. Stockpile demolition material for disposal.
- Remove exposed interior steel parts; including penstock parts, valving, throttling components, steel draft-tube parts and other related miscellaneous items. Stockpile and sort for salvage and disposal.
- Remove reinforced concrete foundation substructure to a few feet below new finished grade elevation. Stockpile debris for disposal.
- Remove buried services including the on-site sewage disposal system, sanitary pumps and piping, any freshwater piping and equipment.
- Disposal of construction and demolition debris – truck selected materials to a designated construction debris disposal facility, while suitable other materials, such as pulverized concrete devoid of rebar or embedded metals, can be buried at site.
- Deliver or sell stockpiled salvage material.
- Infill foundation substructure excavation with compacted granular material and selected demolition debris to the tailrace cofferdam. The cofferdam can remain once graded to match site. Provide erosion protection as required.

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

- Improve site surface drainage as required.
- Place topsoil, sods/hydro-seed, miscellaneous rudimentary landscaping as may be required for public safety and to facilitate surface drainage requirements.
- Once it is drained, remediate the tailrace with clean gravel and crushed stone, as well as clean fill as required. Grade surfaces, hydro-seed and/plant trees or other vegetation to return this area to a near natural state.
- Gravel woods roads in the area should remain in place to facilitate ground-search rescue and fire-fighting activities.

The bulk of costs associated with the decommissioning exercise include building demolition and related materials disposal and site protection and remediation post demolition.

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Nova Scotia Power Hydro Production
Site Decommissioning Estimate Summary for Asset Retirement Obligations (ARO) Study
Roseway River Hydro Electric Generation System

Roseway Development		
Item Description	Estimated Decommissioning Costs	Assumptions/Notes
SITE REMEDIATIONS		
Site Remediation Issues	\$210,250.00	800 ft long tailrace to be remediated.
Site Access Removals	\$6,000.00	Paved driveway to be removed.
Site Services Removals	\$10,000.00	Remove site sewage disposal system at this location.
BUILDINGS & STRUCTURES		
Powerhouse & Related Auxiliary Structures Removals	\$192,100.00	Includes roof structure removal, removal of superstructure walls, partial removal of sub-structure; infilling of the powerhouse and an estimate of off-site disposal costs.
Auxiliary Buildings Removals (not associated with Production Plant)	\$0.00	N/A
BOILERS & AUXILIARIES		
Boilers & Auxiliaries - NOT APPLICABLE	\$0.00	N/A
TURBINES, GENERATORS & AUXILIARIES		
Turbo Generator Removals	\$40,500.00	One vertical and one horizontal turbo-generator unit.
Turbo Generator Control Removals	\$5,000.00	Includes disassembly and removal of governor systems, pumps, servos and associated piping.
ELECTRICAL		
On-Site Distribution Lines Removals	\$3,000.00	Interior and exterior at powerhouse.
Electrical Power Systems Removals	\$9,000.00	Powerhouse
Other Auxiliary Systems and Equipment Removals	\$6,000.00	Powerhouse
Electrical Control and Communication	\$5,000.00	Powerhouse
COMMON SERVICES		
Building Ventilation & Heating Removals	\$5,200.00	Limited HVAC at this site.
Plant Operating Equipment Removals	\$6,500.00	
GENERAL AND DISTRIBUTED		
Field Facilities & Decommissioning (Mobilization incl)	\$30,000.00	
Estimated Administration & Overhead Expenses	\$59,197.60	
SALVAGE		
Scrap Metals - General (Inc. Turbine)	-\$200.00	Allowance
General Parts	-\$850.00	Allowance
Insulated Wire and Cables No. 1	-\$850.00	Allowance
Insulated Wire and Cables No. 2	-\$850.00	Allowance
ENGINEERING & PROJECT MANAGEMENT		
Engineering & Project Management	\$63,426.00	
Site Decommissioning Estimate Subtotal Roseway Development \$648,423.60		
Notes: 1. Transmission cable, substations and related transformers to be removed by others in preparation for general demolition. 2. HST is additional to stated estimated costs.		

Figure 21

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

11. Sheet Harbour Hydro Electric System

The Sheet Harbour Hydro Electric System consists of two hydro-electric developments and two powerhouses. Each development consists of three vertically oriented turbo-generating units that utilize water from lakes and rivers forming part of the East River of Sheet Harbour. The two powerhouses are associated with the upstream Malay Falls Development and the downstream Ruth Falls Development.

Sheet Harbour developments originally provided electricity to the Sheet Harbour area as an “island” system. In other words, Sheet harbour had electric power, but surrounding areas did not. That changed in the 1960’s and 1970’s as the modern power grid was developed and constructed by the Nova Scotia Power Commission.

a) Malay Falls Development

Work was completed on the first two units at Malay Falls in 1924, with a third unit coming on-line in 1954. The three vertically oriented turbo-generators each provide about 1.1 MW, which is developed from approximately 41 feet of head for a total of 3.3 MW. Inflow from Marshall Flowage and Malay Falls head pond and power canal is channelled through the Malay Falls intakes and draft tube, which discharges directly into the East River of Sheet Harbour.

The combined powerhouse incorporates a heavy generator floor and a large lower triple intake chamber, with gated inlets and chambering for each of the three turbo-generators. Support structure for the heavy generator floor which supports the stators (and also the shafts and turbines) is by way of a heavy reinforced concrete slab supported from stout reinforced concrete intake unit separation walls and the concrete substructure below. Head covers, wicket gate assemblies and operating assemblies (except for the actual governors) are submerged in the intake chambers, much like similarly configured units at Tusket.

Access to the powerhouse is located about 6 miles approximately north of Sheet Harbour via paved Collector Rte. 374 which roughly follows the East River, thence into Malay Falls via the dedicated paved loop road for that area. In addition to the powerhouse, there are several small support buildings and gravelled driveways at the site.

Demolition planning for this facility will consider that the power canal will be dewatered and in-filled by others involved in dam structure removals and related site remediations. All electrical and communications equipment directly related to transmission will be removed by others. It is also considered that there will be no outstanding asbestos abatement or other hazardous materials or environmental issues at this site that would adversely affect demolition planning. Note that there is ample material laydown area available at site.

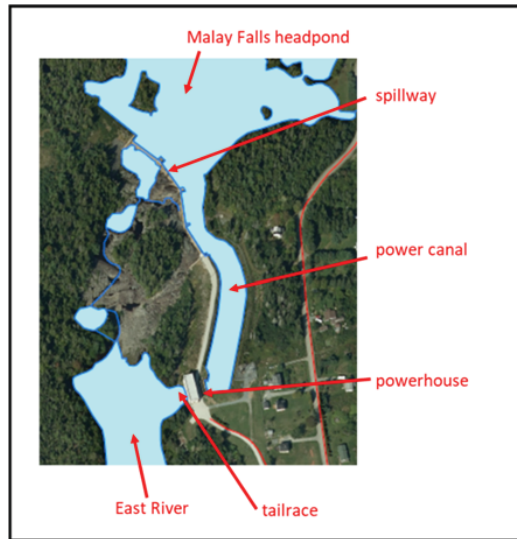


Photo 16: Malay Falls Development

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

Depending on bedrock conditions, there may be limited potential at this site for burying demolition generated materials.

Following demolition planning categorizations apply to the Malay Falls facility:

- Intake Classification - Category C, intake assemble and head gates are constructed integrally with the powerhouse;
- Architectural Classification – Category B, reinforced concrete and structural steel;
- Outlet (Draft-tube) Classification – Category A, the draft tube outflow discharges directly into the East River of Sheet Harbour.

Therefore the following tasks have been considered in the demolition planning and costs derivation exercise:

- Install silt, debris and environmental containments, temporary security fencing (chain-link), silt fence, silt curtain and oil boom.
- Removal of accessible lubricating oil and previously undrained closed-system cooling water (for recycling).
- Removal of small machinery and turbo generator mechanical and electrical controls including but not limited to compressors and tanks, governors and related pressure tanks, bearing cooling systems and filters and related piping, throttle linkage components, electrical and communications cables and miscellaneous smaller equipment and piping.
- Removal of HVAC equipment and localized heating units for areas within the building and for those heaters strategically placed to provide assistance for turbo-generator operation.
- Installation of a granular and relatively water-tight earth-fill cofferdam at the draft-tube outlet and tailrace.
- Removal of main turbo-generator components for three units such as Exciter; top frame; Rotor and Generator Shaft; Speed Ring, Wicket Gates, shafts and related parts; Turbine Shaft, Head-cover and Turbine; and Stator can be facilitated with the existing powerhouse overhead Bridge Crane, although a temporary power source and connection for the crane may be required. Those components can then be set aside as required for salvage and disposal once the roof structure is removed.
- Removal of Roofing, Sheathing, support structure and related miscellaneous parts and components. Set aside, stockpile for salvage and disposal.
- Remove overhead Bridge Crane and stockpiled turbo-generator main components, sort and stockpile at site for salvage and disposal.
- Demolish superstructure exterior walls and related components, stockpile demolition material for disposal.
- Remove head gates and related operating mechanisms, and demolish intake structure.
- Remove and demolish generator floor reinforced concrete slab and related exterior and interior support walls at that level, as well as the concrete intake chambers. Stockpile demolition material for disposal.

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

- Remove exposed interior steel parts; including throat ring, head cover, steel draft-tube parts and other related miscellaneous items. Stockpile and sort for salvage and disposal. This powerhouse outlets directly to the East River of Sheet Harbour and is considered to be “in-stream”.
- Remove and demolish submerged turbine floor and related substructure mass concrete and substructure interior/exterior walls at that level. Stockpile demolition material for disposal.
- Remove auxiliary buildings such as administration trailer, storage barn, and garage, and miscellaneous structures and buried services including the on-site sewage disposal system, sanitary pumps and piping, well and any freshwater piping and equipment.
- Disposal of construction and demolition debris – truck to a designated construction debris disposal facility.
- Deliver or sell stockpiled salvage material.
- Infill foundation substructure excavation with compacted clean granular material to the tailrace cofferdam. The tailrace cofferdam can remain once graded to match site. Large sized rock fill may be required in this application. Provide erosion protection as required. Note that due to its depth, the power canal must be filled in to prevent the river from assuming that alignment through the powerhouse location.
- Improve site surface drainage as required.
- Place topsoil, sods/hydro-seed, miscellaneous rudimentary landscaping as may be required for public safety and to facilitate surface drainage requirements.

The bulk of costs associated with the decommissioning exercise include building demolition and related materials disposal, and site protection and remediation post demolition.

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

b) Ruth Falls Development

The first two Ruth Falls Development units were completed in 1927, with a follow-on third unit installed and completed in about 1936. Units No. 1 and 2 each provide about 2.2 MW of generation capacity, while Unit 3 has an output capacity of about 2.85 MW. This provides a total output of about 7.25 MW at Ruth Falls. The three vertically oriented units are fed water from the Ruth Falls power canal forebay and a penstock blasted through the hillside bedrock which provides about 109 feet of head. The penstock is trifurcated below ground at the rear of the powerhouse. Outflow from the units discharges directly into the estuarial waters of the East River of Sheet Harbour.

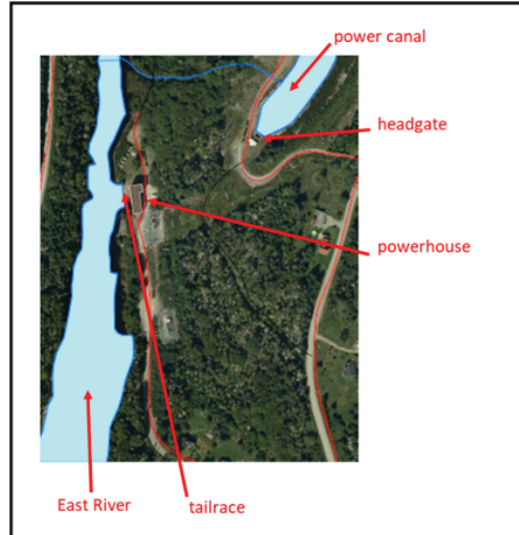


Photo 17: Ruth Falls Development

A heavy generator floor and related support structure are configured over a turbine (basement) floor and related support substructure at Ruth Falls. The units are fed through the trifurcated penstock and dedicated butterfly valves arrangement to form plate steel scroll cases. The head cover for each unit is accessed from the turbine floor area. The concrete draft tube arrangement discharges directly to the East River of Sheet Harbour at tidewater level.

Access to the powerhouse is via gravel topped Ruth Falls Road which is located approximately one mile and a half north of Sheet Harbour on paved East River Road.

Demolition planning for this facility will consider that the power canal forebay is dewatered and possibly in-filled, and that the intake penstock is dewatered and in-filled. All electrical and communications equipment directly related to transmission will be removed by others. It is also assumed that there will be no outstanding asbestos abatement or other hazardous materials or environmental issues at this site that would adversely affect demolition planning. Note that there is some limited material laydown area available at this site.

There is very little potential for burying demolition debris at this site due to the close proximity of bedrock with the surface. Existing DFO facilities at this site will remain. A significant cofferdam may be required to assist in substructure removals. Erosion protection and height adequate to handle tidal influences will be necessary.

Following demolition planning categorizations apply to the Ruth Falls facility:

- Intake Classification - Category B, buried penstock;
- Architectural Classification – Category B, reinforced concrete and structural steel;
- Outlet (Draft-tube) Classification – Category A, the draft tubes discharge directly into the East River of Sheet Harbour.

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

Therefore the following tasks have been considered in the demolition planning and costs derivation exercise:

- Install silt, debris and environmental containments, temporary security fencing (chain-link), silt fence, silt curtain and oil boom.
- Removal of accessible lubricating oil and previously undrained closed-system cooling water (for recycling).
- Removal of small machinery and turbo generator mechanical and electrical controls including but not limited to compressors and tanks, governors and related pressure tanks, bearing cooling systems and filters and related piping, throttle linkage components, electrical and communications cables and miscellaneous smaller equipment and piping.
- Removal of HVAC equipment and localized heating units for areas within the building and for those heaters strategically placed to provide assistance for turbo-generator operation.
- Installation of a granular and relatively water-tight earth-fill cofferdam at the draft-tube outlet.
- Removal of main turbo-generator components for three units such as Exciter; top frame; Rotor and Generator Shaft; Speed Ring, Wicket Gates, shafts and related parts; Turbine Shaft, Head-cover and Turbine; and Stator can be facilitated with the existing powerhouse overhead Bridge Crane, although a temporary power source and connection for the crane may be required. Those components can then be set aside as required for salvage and disposal once the roof structure is removed.
- Removal of Roofing, Sheathing, support structure and related miscellaneous parts and components. Set aside, stockpile for salvage and disposal.
- Remove overhead Bridge Crane and stockpiled turbo-generator main components, sort and stockpile at site for salvage and disposal.
- Demolish exterior superstructure walls and related components, stockpile demolition material for disposal.
- Remove and demolish generator floor reinforced concrete slab and related exterior support walls at that level. Stockpile demolition material for disposal.
- Remove and demolish turbine floor and related reinforced concrete substructure. Stockpile demolition material for disposal.
- Remove exposed interior steel parts; including steel penstocks, penstock liners and butterfly valves, scroll case, throat ring, steel draft-tube parts and other related miscellaneous items. Stockpile and sort for salvage and disposal. This powerhouse outlets directly to the tidal marine estuary of the East River of Sheet Harbour and is considered to be "in-stream".
- Remove buried services including the on-site sewage disposal system, sanitary pumps and piping, well(s) and any freshwater piping and equipment and any auxiliary buildings associated with hydro production activities.
- Disposal of construction and demolition debris – truck to a designated construction debris disposal facility.
- Deliver or sell stockpiled salvage material.

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

- Infill foundation substructure excavation with compacted clean granular material to the tailrace cofferdam. The cofferdam can remain once graded to match site. Provide erosion protection as required.
- Improve site surface drainage as required.
- Place topsoil, sods/hydro-seed, miscellaneous rudimentary landscaping as may be required for public safety and to facilitate surface drainage requirements.
- Once it is drained, remediation will be required at the draft tube tailrace outlets with clean gravel and crushed stone as required. Erosion protection will be required. Grade surfaces, hydro-seed and/plant trees or other vegetation to return this area to a near natural state.
- Access road and related driveways to remain to assist in fire-fighting and search and rescue activities.

The bulk of costs associated with the decommissioning exercise include building demolition and related materials disposal, and site protection and remediation post demolition.

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Nova Scotia Power Hydro Production
Site Decommissioning Estimate Summary for Asset Retirement Obligations (ARO) Study
Sheet Harbour Hydro Electric Generation System

Malay Falls Development		
Item Description	Estimated Decommissioning Costs	Assumptions/Notes
SITE REMEDIATIONS		
Site Remediation Issues	\$290,000.00	Plant outlets directly to East River of Sheet Harbour. Significant cofferdam and erosion protection will be required along with some tailrace channel remediation. Power Canal will require at least partial infilling.
Site Access Removals	\$6,000.00	Remove asphalt and re-grade driveways.
Site Services Removals	\$14,000.00	Remove site sewage disposal system and freshwater supply at this location.
BUILDINGS & STRUCTURES		
Powerhouse & Related Auxiliary Structures Removals	\$397,500.00	Includes roof structure removal, removal of superstructure walls, partial removal of sub-structure; infilling of the powerhouse and an estimate of off-site disposal costs. Turbine floor at this location is submerged in intake chamber.
Auxiliary Buildings Removals (not associated with Production Plant)	\$25,000.00	Remove multiple base-camp buildings.
BOILERS & AUXILIARIES		
Boilers & Auxiliaries - NOT APPLICABLE	\$0.00	N/A
TURBINES, GENERATORS & AUXILIARIES		
Turbo Generator Removals	\$89,000.00	Three vertical turbo-generator units.
Turbo Generator Control Removals	\$25,500.00	Includes disassembly and removal of governor systems, pumps, servos and associated piping.
ELECTRICAL		
On-Site Distribution Lines Removals	\$4,500.00	Interior and exterior at powerhouse.
Electrical Power Systems Removals	\$20,000.00	Powerhouse
Other Auxiliary Systems and Equipment Removals	\$8,000.00	Powerhouse
Electrical Control and Communication	\$14,000.00	Powerhouse
COMMON SERVICES		
Building Ventilation & Heating Removals	\$5,200.00	Limited HVAC at this site.
Plant Operating Equipment Removals	\$46,000.00	Includes head gates and tailrace gates.
GENERAL AND DISTRIBUTED		
Field Facilities & Decommissioning (Mobilization incl)	\$30,000.00	
Estimated Administration & Overhead Expenses	\$109,166.40	
SALVAGE		
Scrap Metals - General (Inc. Turbine)	-\$200.00	Allowance
General Parts	-\$3,000.00	Allowance
Insulated Wire and Cables No. 1	-\$2,500.00	Allowance
Insulated Wire and Cables No. 2	-\$2,500.00	Allowance
ENGINEERING & PROJECT MANAGEMENT		
Engineering & Project Management	\$116,964.00	
Site Decommissioning Estimate Subtotal Malay Falls Development \$1,192,630.40		
Notes: 1. Transmission cable, substations and related transformers to be removed by others in preparation for general demolition. 2. HST is additional to stated estimated costs.		

Figure 22

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Nova Scotia Power Hydro Production
Site Decommissioning Estimate Summary for Asset Retirement Obligations (ARO) Study
Sheet Harbour Hydro Electric Generation System

Ruth Falls Development		
Item Description	Estimated Decommissioning Costs	Assumptions/Notes
SITE REMEDIATIONS		
Site Remediation Issues	\$290,000.00	Plant outlets directly to estuarial region of East River of Sheet Harbour. Significant cofferdam and erosion protection will be required. Penstock will require a concrete bulkhead arrangement and/or infilling.
Site Access Removals	\$7,500.00	Remove asphalt and re-grade access, parking area.
Site Services Removals	\$10,000.00	Remove site sewage disposal system and well system at this location.
BUILDINGS & STRUCTURES		
Powerhouse & Related Auxiliary Structures Removals	\$402,000.00	Includes roof structure removal, removal of superstructure walls, partial removal of sub-structure; infilling of the powerhouse and an estimate of off-site disposal costs. Separate Generator and Turbine floors at this location.
Auxiliary Buildings Removals (not associated with Production Plant)	\$1,500.00	Shed removal.
BOILERS & AUXILIARIES		
Boilers & Auxiliaries - NOT APPLICABLE	\$0.00	N/A
TURBINES, GENERATORS & AUXILIARIES		
Turbo Generator Removals	\$89,000.00	Three vertical turbo-generator units.
Turbo Generator Control Removals	\$25,500.00	Includes disassembly and removal of governor systems, pumps, servos and associated piping.
ELECTRICAL		
On-Site Distribution Lines Removals	\$4,500.00	Interior and exterior at powerhouse.
Electrical Power Systems Removals	\$20,000.00	Powerhouse
Other Auxiliary Systems and Equipment Removals	\$8,000.00	Powerhouse
Electrical Control and Communication	\$14,000.00	Powerhouse
COMMON SERVICES		
Building Ventilation & Heating Removals	\$5,200.00	Limited HVAC at this site.
Plant Operating Equipment Removals	\$46,000.00	Includes head gates and tailrace gates.
GENERAL AND DISTRIBUTED		
Field Facilities & Decommissioning (Mobilization incl)	\$30,000.00	
Estimated Administration & Overhead Expenses	\$106,758.40	
SALVAGE		
Scrap Metals - General (Inc. Turbine)	-\$800.00	Allowance
General Parts	-\$3,500.00	Allowance
Insulated Wire and Cables No. 1	-\$2,500.00	Allowance
Insulated Wire and Cables No. 2	-\$2,500.00	Allowance
ENGINEERING & PROJECT MANAGEMENT		
Engineering & Project Management	\$114,384.00	
Site Decommissioning Estimate Subtotal Ruth Falls Development \$1,165,042.40		
Notes: 1. Transmission cable, substations and related transformers to be removed by others in preparation for general demolition. 2. HST is additional to stated estimated costs.		

Figure 23

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

12. Sissiboo River Hydro Electric System

There are three hydro-electric developments that comprise the Sissiboo River Hydro-Electric Generation System. These developments discharge water into the Sissiboo River which in turn flows into St. Mary's Bay.

Fourth Lake is located at the top (upstream) of the system. Water flows through the single Fourth Lake turbo-generator and from there makes its way along the Sissiboo River and into the Sissiboo head pond where water is channelled through the single Sissiboo Falls plant generating unit. From the Sissiboo powerhouse water is directed to the Weymouth Head pond and thence through the two generating units located in the Weymouth powerhouse. Water is discharged from the Weymouth powerhouse into the Sissiboo River a few miles south of Weymouth.

These developments were constructed in the 1960's and 1980's by the Nova Scotia Power Commission and NSPI.

a) Fourth Lake Development

Completed in 1983, the Fourth Lake Development harnesses approximately 70 feet of head and provides 3.0 MW of electrical generation capacity from a relatively small horizontally oriented single turbo-generator. (Configuration of this unit closely resembles a ship's bow thruster.)

The powerhouse can be accessed via paved local collector roads and gravelled woods roads and is located approximately 20 miles east of Weymouth near New France.

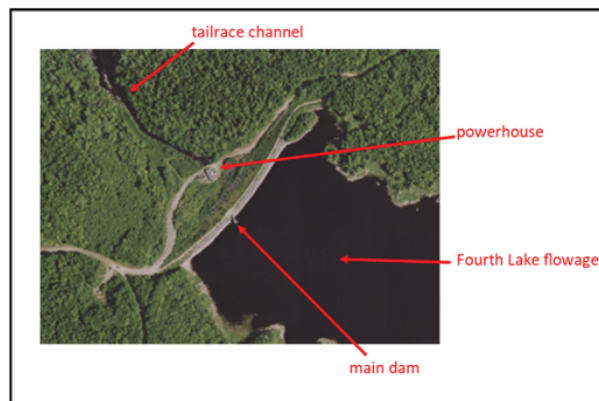


Photo 18: Fourth Lake Development

Constructed below grade, the powerhouse is fed by a steel lined penstock buried in the main earthen dam.

Demolition planning for this facility will consider that the intake penstock pipeline will be dewatered and removed by others, all electrical and communications equipment directly related to transmission will be removed by others and that there are no outstanding asbestos abatement or other hazardous materials or environmental issues at this site that would adversely affect demolition planning. There is some limited material laydown area at site. However, if more laydown area is needed, such space can be cleared of vegetation and constructed.

Following demolition planning categorizations apply to the Fourth Lake facility:

- Intake Classification - Category B, buried penstock;
- Architectural Classification – Category B, reinforced concrete and structural steel;
- Outlet (Draft-tube) Classification – Category A, draft tube and tailrace empty directly into Third Lake Rip (appears to match alignment of original streambed) and flow makes its way from there to Third Lake.

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

Therefore the following tasks have been considered in the demolition planning and costs derivation exercise:

- Construct additional material lay-down area as required.
- Install silt, debris and environmental containments, temporary security fencing (chain-link), silt fence, silt curtain and oil boom.
- Removal of accessible lubricating oil and previously undrained closed-system cooling water (for recycling).
- Removal of small machinery and turbo generator mechanical and electrical controls including but not limited to compressors and tanks, governors and related pressure tanks, bearing cooling systems and filters and related piping, throttle linkage components, electrical and communications cables and miscellaneous smaller equipment and piping.
- Removal of HVAC equipment and localized heating units for areas within the building and for those heaters strategically placed to provide assistance for turbo-generator operation.
- Installation of a granular and relatively water-tight earth-fill cofferdam at the draft-tube outlet and tailrace.
- Removal of the compact turbine components, the generator and related components can be facilitated with the existing powerhouse overhead Bridge Crane, although a temporary power source and connection for the crane may be required. Those components can then be removed from the compact powerhouse and stockpiled outside by an all-terrain mobile crane for planned salvage and disposal.
- Removal of roofing, sheathing, support structure and related miscellaneous parts and components. Set aside, stockpile for salvage and disposal.
- Remove overhead Bridge Crane, sort and stockpile at site for salvage and disposal.
- Excavate and demolish exterior walls and related component and sub-structure. Stockpile demolition material for disposal. This powerhouse will probably be located “in-stream” upon removal of site infrastructure.
- Remove and demolish main floor reinforced concrete slab and related miscellaneous substructure components. Stockpile demolition material for disposal.
- Remove exposed interior steel penstock, by-pass piping, by-pass butterfly valve and related parts; also remove steel draft-tube parts and other related miscellaneous items. Stockpile and sort for salvage and disposal.
- Remove buried services including site sewage disposal system and related piping, as well as any freshwater piping and equipment.
- Disposal of construction and demolition debris – truck selected material to a designated construction debris disposal facility, while suitable other material, such as pulverized concrete devoid of rebar and embedded metals, can be buried at site.
- Deliver or sell stockpiled salvage material.

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

- Backfill and infill foundation substructure and draft-tube excavation with compacted clean granular material to the tailrace cofferdam. The cofferdam can remain once graded to match site. Provide erosion protection as required.
- Once it is drained, remediate and in-fill the tailrace with clean gravel and crushed stone and well as clean fill as required. Grade surfaces, hydro-seed and/plant trees or other vegetation to return this area to a near natural state.
- Improve site surface drainage as required.
- Place topsoil, sods/hydro-seed, miscellaneous rudimentary landscaping as may be required for public safety and to facilitate surface drainage requirements.
- Gravel woods roads in the area should remain in place to facilitate ground-search rescue and fire-fighting activities.

The bulk of costs associated with the decommissioning exercise include building demolition and related materials disposal, and site protection and remediation post demolition.

b) Sissiboo Falls Development

Completed in 1961 at Sissiboo Falls, located approximately 12 miles east of Weymouth via Sissiboo Road. The plant provides 6.0 MW from about 87 feet of head from a relatively large single vertically oriented turbo-generator unit.

The powerhouse is located at the right side (looking downstream) of the Sissiboo spillway channel and Sissiboo River at the base of the Sissiboo Falls gravity dam and spillway. It is fed via an exposed penstock from the main dam intake structure.

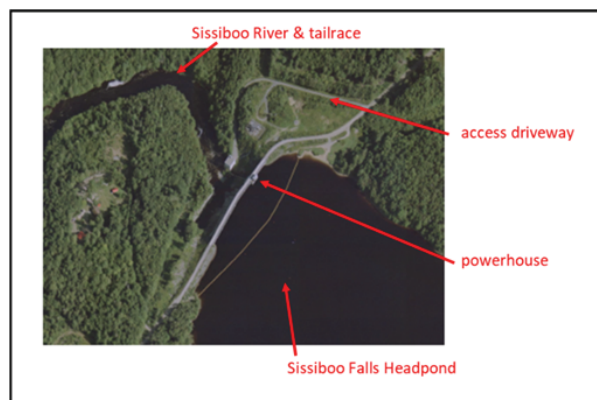


Photo 19: Sissiboo Falls Development

Demolition planning for this facility will consider that the intake penstock pipeline will be dewatered and removed by others, all electrical and communications equipment directly related to transmission will be removed by others and that there are no outstanding asbestos abatement or other hazardous material or environmental issues at this site that would adversely affect demolition planning. There is limited available material lay-down area at this site.

If demolition generated material is to be buried at site, the burial work should not be in close proximity of the river.

A significant cofferdam will be required due to close proximity to the spillway channel and Sissaboo River.

Following demolition planning categorizations apply to the Sissiboo Falls facility:

- Intake Classification - Category A, penstock pipe is exposed above ground;

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

- Architectural Classification – Category B, reinforced concrete and structural steel;
- Outlet (Draft-tube) Classification – Category A, the draft-tube discharges flow directly into the Sissiboo River.

Therefore the following tasks have been considered in the demolition planning and costs derivation exercise:

- Install silt, debris and environmental containments, temporary security fencing (chain-link), silt fence, silt curtain and oil boom.
- Removal of accessible lubricating oil and previously undrained closed-system cooling water (for recycling).
- Removal of small machinery and turbo generator mechanical and electrical controls including but not limited to compressors and tanks, governors and related pressure tanks, bearing cooling systems and filters and related piping, throttle linkage components, electrical and communications cables and miscellaneous smaller equipment and piping.
- Removal of HVAC equipment and localized heating units for areas within the building and for those heaters strategically placed to provide assistance for turbo-generator operation.
- Installation of a granular and relatively water-tight earth-fill cofferdam at the draft-tube outlet and around the left side of the powerhouse. Provide erosion protection against extreme river flow as required.
- Removal of main turbo-generator components such as Exciter; top frame; Rotor and Generator Shaft; Speed Ring, Wicket Gates, shafts and related parts; Turbine Shaft, Head-cover and Turbine; and Stator can be facilitated with the existing powerhouse overhead Bridge Crane, although a temporary power source and connection for the crane may be required. Those components can then be set aside as required inside or outside the powerhouse for salvage and disposal.
- Removal of Roofing, Sheathing, support structure and related miscellaneous parts and components. Set aside, stockpile for salvage and disposal.
- Remove overhead Bridge Crane and stockpiled turbo generator main components, as required, sort and stockpile at site for salvage and disposal.
- Demolish exterior walls and related components, stockpile demolition material for disposal.
- Remove and demolish main floor reinforced concrete slab. Stockpile demolition material for disposal.
- Remove exposed interior steel penstock, also remove scroll case, throat ring, steel draft-tube parts and other related miscellaneous items. Stockpile and sort for disposal and salvage.
- Remove reinforced concrete foundation substructure. This powerhouse is located “in-stream”.
- Remove buried services including an on-site sewage disposal system, sanitary pumps and piping, any well and related freshwater piping and equipment.
- Disposal of construction and demolition debris, truck selected material to a designated disposal facility, while suitable other materials, such as pulverized concrete devoid of rebar and embedded metals, can be buried at site.
- Deliver or sell stockpiled salvage material.

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

- Infill foundation substructure excavation with compacted clean granular material to the existing tailrace cofferdam structure. The cofferdam can remain once graded to match site. Provide erosion protection.
- Improve site surface drainage as required.
- Place topsoil, sods/hydro-seed, miscellaneous rudimentary landscaping as may be required for public safety and to facilitate surface drainage requirements.
- Remove gravel access road driveway to powerhouse.

The bulk of costs associated with the decommissioning exercise include building demolition and related materials disposal and site protection/remediation post demolition.

c) Weymouth Falls Development

The Weymouth Development consists of two similar vertical turbo-generators in a shared powerhouse structure, known as Weymouth No. 1 and Weymouth No. 2. The generating units are somewhat similar to the single Sissiboo turbo-generator.

The No.1 plant was completed in 1961 at Weymouth Falls, located about 3 miles east of Weymouth via Sissiboo Road. Construction and commissioning was completed on the adjoining Weymouth No. 2 in about 1967. The plant provides about 9.0 MW from each unit for a total of 18 MW from about 122 feet of head.

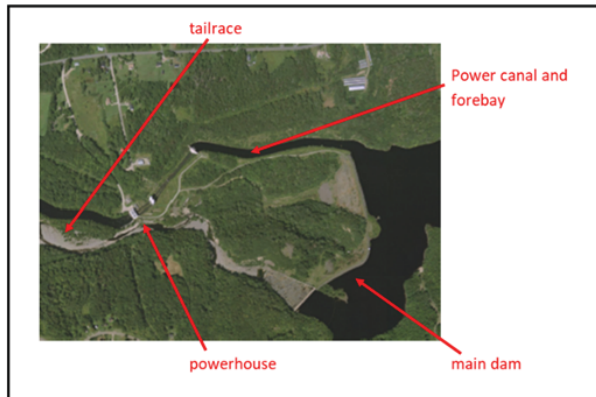


Photo 20: Weymouth Falls Development

Fed by twin pipelines from the power canal intake structure, the development is characterised by two large bowl surge tanks at the rear of the powerhouse at the penstock pipes.

The development incorporates a significant diversion at the power canal and intake, and a similar tailrace diversion. The powerhouse tailrace and the spillway channel converge in the Sissiboo river alignment about 2000 feet downstream of the powerhouse. Considerable remediation work will be required to restore the tailrace channel.

Demolition planning for this facility will consider that the intake penstock pipeline will be dewatered and removed by others, all electrical and communications equipment directly related to transmission will be removed by others and that there are no outstanding asbestos abatement or other hazardous materials or environmental issues at this site that would adversely affect demolition planning. There is some significant available material lay-down area at this site.

Following demolition planning categorizations apply to the Weymouth facility:

- Intake Classification - Category A, penstock pipe is exposed above ground;
- Architectural Classification – Category B, reinforced concrete and structural steel;

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

- Outlet (Draft-tube) Classification – Category B, the draft tube discharges into a lengthy tailrace channel that will require significant remediation.

Therefore the following tasks have been considered in the demolition planning and costs derivation exercise:

- Install silt, debris and environmental containments, temporary security fencing (chain-link), silt fence, silt curtain and oil boom.
- Removal of accessible lubricating oil and previously undrained closed-system cooling water (for recycling).
- Removal of small machinery and turbo generator mechanical and electrical controls including but not limited to compressors and tanks, governors and related pressure tanks, bearing cooling systems and filters and related piping, throttle linkage components, electrical and communications cables and miscellaneous smaller equipment and piping.
- Removal of HVAC equipment and localized heating units for areas within the building and for those heaters strategically placed to provide assistance for turbo-generator operation.
- Installation of a granular and relatively water-tight earth-fill cofferdam at the draft-tube outlet. Provide over-topping and erosion protection against extreme tides as required.
- Removal of main turbo-generator components for both units such as Exciter; top frame; Rotor and Generator Shaft; Speed Ring, Wicket Gates, shafts and related parts; Turbine Shaft, Head-cover and Turbine; and Stator can be facilitated with the existing powerhouse overhead Bridge Crane, although a temporary power source and connection for the crane may be required. Those components can then be set aside as required inside or outside the powerhouse for salvage and disposal.
- Removal of Roofing, Sheathing, support structure and related miscellaneous parts and components. Set aside, stockpile for salvage and disposal.
- Remove overhead Bridge Crane and stockpiled turbo generator main components for both units, as required, sort and stockpile at site for salvage and disposal.
- Demolish exterior walls and related components, stockpile demolition material for disposal.
- Remove and demolish main floor reinforced concrete slab. Stockpile demolition material for disposal.
- Remove exposed interior steel penstocks, also remove scroll cases, throat rings, steel draft-tube parts and other related miscellaneous items. Stockpile and sort for disposal and salvage.
- Remove reinforced concrete foundation substructure to a few feet below new finished grade elevation.
- Remove buried services including an on-site sewage disposal system, sanitary pumps and piping, any well and related freshwater piping and equipment.
- Disposal of construction and demolition debris, truck selected materials to a designated disposal facility, while suitable other materials, such as pulverized concrete devoid of rebar and embedded metals, can be buried at site.
- Deliver or sell stockpiled salvage material.

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

- Infill foundation substructure excavation with compacted granular material and selected demolition debris to the existing tailrace cofferdam structure. The cofferdam can remain once graded to match site. Provide erosion protection as required.
- Improve site surface drainage as required.
- Place topsoil, sods/hydro-seed, miscellaneous rudimentary landscaping as may be required for public safety and to facilitate surface drainage requirements.
- Existing access road driveway to powerhouse, intake and main dam, spillway can remain to aid in fire-fighting and ground search rescue.
- Once it is drained, remediate the almost half-mile long tailrace as required to the high-water tidal mark with clean gravel and crushed stone, as well as clean fill as required. Grade surfaces, hydro-seed and/plant trees or other vegetation to return this area to a near natural state.

The bulk of costs associated with the decommissioning exercise include building demolition and related materials disposal and site protection and remediation post demolition.

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Nova Scotia Power Hydro Production
Site Decommissioning Estimate Summary for Asset Retirement Obligations (ARO) Study
Sissaboo River Hydro Electric Generation System

Fourth Lake Development		
Item Description	Estimated Decommissioning Costs	Assumptions/Notes
SITE REMEDIATIONS		
Site Remediation Issues	\$309,950.00	Remediate Tailrace
Site Access Removals	\$0.00	N/A
Site Services Removals	\$0.00	No site sewage disposal system at this site.
BUILDINGS & STRUCTURES		
Powerhouse & Related Auxiliary Structures Removals	\$189,950.00	Includes roof structure removal, removal of superstructure walls, partial removal of sub-structure; infilling of the powerhouse and an estimate of off-site disposal costs.
Auxiliary Buildings Removals (not associated with Production Plant)	\$0.00	No auxiliary structures at this site
BOILERS & AUXILIARIES		
Boilers & Auxiliaries - NOT APPLICABLE	\$0.00	N/A
TURBINES, GENERATORS & AUXILIARIES		
Turbo Generator Removals	\$19,750.00	Single Vertical turbo-generator unit.
Turbo Generator Control Removals	\$7,500.00	Includes disassembly and removal of governor systems, pumps, servos and associated piping.
ELECTRICAL		
On-Site Distribution Lines Removals	\$3,000.00	Interior and exterior at powerhouse.
Electrical Power Systems Removals	\$9,000.00	Powerhouse
Other Auxiliary Systems and Equipment Removals	\$3,000.00	Powerhouse
Electrical Control and Communication	\$5,000.00	Powerhouse
COMMON SERVICES		
Building Ventilation & Heating Removals	\$5,200.00	Limited HVAC at this site.
Plant Operating Equipment Removals	\$7,500.00	
GENERAL AND DISTRIBUTED		
Field Facilities & Decommissioning (Mobilization incl)	\$30,000.00	
Estimated Administration & Overhead Expenses	\$66,063.20	
SALVAGE		
Scrap Metals - General (Inc. Turbine)	-\$250.00	Allowance
General Parts	-\$750.00	Allowance
Insulated Wire and Cables No. 1	-\$750.00	Allowance
Insulated Wire and Cables No. 2	-\$750.00	Allowance
ENGINEERING & PROJECT MANAGEMENT		
Engineering & Project Management	\$70,782.00	
Site Decommissioning Estimate Subtotal Fourth Lake Development \$724,195.20		
Notes: 1. Transmission cable, substations and related transformers to be removed by others in preparation for general demolition. 2. HST is additional to stated estimated costs.		

Figure 24

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Nova Scotia Power Hydro Production
Site Decommissioning Estimate Summary for Asset Retirement Obligations (ARO) Study
Sissiboo River Hydro Electric Generation System

Sissiboo Falls Development		
Item Description	Estimated Decommissioning Costs	Assumptions/Notes
SITE REMEDIATIONS		
Site Remediation Issues	\$629,700.00	Large cofferdam required to isolate powerhouse from river.
Site Access Removals	\$10,000.00	Remove driveway
Site Services Removals	\$12,000.00	Remove site sewage disposal system at this location
BUILDINGS & STRUCTURES		
Powerhouse & Related Auxiliary Structures Removals	\$279,600.00	Includes roof structure removal, removal of superstructure walls, partial removal of sub-structure; infilling of the powerhouse and an estimate of off-site disposal costs.
Auxiliary Buildings Removals (not associated with Production Plant)	\$0.00	No auxilliary structures at this site.
BOILERS & AUXILIARIES		
Boilers & Auxiliaries - NOT APPLICABLE	\$0.00	N/A
TURBINES, GENERATORS & AUXILIARIES		
Turbo Generator Removals	\$45,300.00	Single Vertical turbo-generator unit.
Turbo Generator Control Removals	\$8,500.00	Includes disassembly and removal of governor systems, pumps, servos and associated piping.
ELECTRICAL		
On-Site Distribution Lines Removals	\$3,500.00	Interior and exterior at powerhouse.
Electrical Power Systems Removals	\$12,000.00	Powerhouse
Other Auxiliary Systems and Equipment Removals	\$5,000.00	Powerhouse
Electrical Control and Communication	\$6,000.00	Powerhouse
COMMON SERVICES		
Building Ventilation & Heating Removals	\$5,200.00	Limited HVAC at this site.
Plant Operating Equipment Removals	\$15,500.00	
GENERAL AND DISTRIBUTED		
Field Facilities & Decommissioning (Mobilization incl)	\$30,000.00	
Estimated Administration & Overhead Expenses	\$118,977.60	
SALVAGE		
Scrap Metals - General (Inc. Turbine)	-\$500.00	Allowance
General Parts	-\$1,200.00	Allowance
Insulated Wire and Cables No. 1	-\$1,200.00	Allowance
Insulated Wire and Cables No. 2	-\$1,200.00	Allowance
ENGINEERING & PROJECT MANAGEMENT		
Engineering & Project Management	\$127,476.00	
Site Decommissioning Estimate Subtotal Sissiboo Falls Development \$1,304,653.60		
Notes: 1. Transmission cable, substations and related transformers to be removed by others in preparation for general demolition. 2. HST is additional to stated estimated costs.		

Figure 25

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Nova Scotia Power Hydro Production
Site Decommissioning Estimate Summary for Asset Retirement Obligations (ARO) Study
Sissaboo River Hydro Electric Generation System

Weymouth Falls Development		
Item Description	Estimated Decommissioning Costs	Assumptions/Notes
SITE REMEDIATIONS		
Site Remediation Issues	\$511,650.00	Considerable tailrace channel remediation.
Site Access Removals	\$0.00	N/A
Site Services Removals	\$12,000.00	Remove site sewage disposal system at this location.
BUILDINGS & STRUCTURES		
Powerhouse & Related Auxiliary Structures Removals	\$397,500.00	Includes roof structure removal, removal of superstructure walls, partial removal of sub-structure; infilling of the powerhouse and an estimate of off-site disposal costs.
Auxiliary Buildings Removals (not associated with Production Plant)	\$10,000.00	Remove auxiliary structures at this site.
BOILERS & AUXILIARIES		
Boilers & Auxiliaries - NOT APPLICABLE	\$0.00	N/A
TURBINES, GENERATORS & AUXILIARIES		
Turbo Generator Removals	\$90,600.00	Two vertical turbo-generator units.
Turbo Generator Control Removals	\$17,000.00	Includes disassembly and removal of governor systems, pumps, servos and associated piping.
ELECTRICAL		
On-Site Distribution Lines Removals	\$3,500.00	Interior and exterior at powerhouse.
Electrical Power Systems Removals	\$17,500.00	Powerhouse
Other Auxiliary Systems and Equipment Removals	\$9,000.00	Powerhouse
Electrical Control and Communication	\$10,500.00	Powerhouse
COMMON SERVICES		
Building Ventilation & Heating Removals	\$10,400.00	Limited HVAC at this site.
Plant Operating Equipment Removals	\$17,000.00	
GENERAL AND DISTRIBUTED		
Field Facilities & Decommissioning (Mobilization incl)	\$30,000.00	
Estimated Administration & Overhead Expenses	\$127,304.80	
SALVAGE		
Scrap Metals - General (Inc. Turbine)	-\$1,000.00	Allowance
General Parts	-\$2,400.00	Allowance
Insulated Wire and Cables No. 1	-\$2,400.00	Allowance
Insulated Wire and Cables No. 2	-\$2,400.00	Allowance
ENGINEERING & PROJECT MANAGEMENT		
Engineering & Project Management	\$136,398.00	
Site Decommissioning Estimate Subtotal Weymouth Falls Development \$1,392,152.80		
Notes: 1. Transmission cable, substations and related transformers to be removed by others in preparation for general demolition. 2. HST is additional to stated estimated costs.		

Figure 26

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

13. St. Margaret's Bay Hydro Electric System

The St. Margaret's Bay Hydro Electric System consists of three hydro-electric developments and two powerhouses. Each development consists of two vertically oriented turbo-generating units that utilize water from two main lake and river systems. The Coon Pond Development and the Sandy Lake Development share a powerhouse structure at the upper end of Mill Lake, while the Tidewater Development collects and generates from the Sandy Lake and Coon Pond outflows.

St. Margaret's Bay Developments were originally constructed by predecessors of the Nova Scotia Light and Power (NSLP) as a more powerful and reliable motive power source for electric tram cars that were becoming active in the city of Halifax in the early 1900's. Horse-drawn tram service in Halifax had its start the 1860's and, within 30 years, that service began transitioning to electric powered tram service. However, by the 1920's, with the primitive and worn electric tram fleet facing replacement, it became obvious that more electrical generating capacity would be required to operate a fully electric and "modern" tram system. Therefore, in the early 1900's, work was started on construction of the nearby St. Margaret's Bay Hydro Electric Generating System.

Work was completed at Coon Pond and Tidewater in 1922, with the completion of the Sandy Lake Development in 1928, bringing overall system capacity to about 10.7 MW. The "modern" Birney tram car fleet operated in the city from about 1923 to about 1949, upon which they were replaced by electric trolley buses. Those electric trolley busses were replaced with a diesel bus fleet in about 1969 when the city took over ownership and operation of transit services in Halifax.

a) Coon Pond and Sandy Lake Developments

Coon Pond Development was completed in about 1922 and provided about 1.25 MW from each of its two vertically oriented turbo-generator units. Inflow from the Pockwock Lake system is channelled through Coon Pond and a pipeline to the Coon Pond Development units, which develop approximately 162 feet of head. Note that in recent years only one of the Coon Pond units has been available for service.

At the Sandy Lake side of the power house, completed in about 1928, two vertical units each provide approximately 2.1 MW from 125 feet of head via a pipeline penstock from the Sandy Lake head pond.

The combined powerhouse incorporates a generator floor and support structure over a heavy turbine floor and concrete substructure and related support structure. The intakes for both Coon Pond and Sandy Lake units utilize bifurcated penstocks with main line butterfly valves and formed plate steel scroll case arrangements. The head covers for Coon Pond units are accessed from the generator floor, while the head covers for Sandy Lake units are located at and accessed from the Turbine floor.

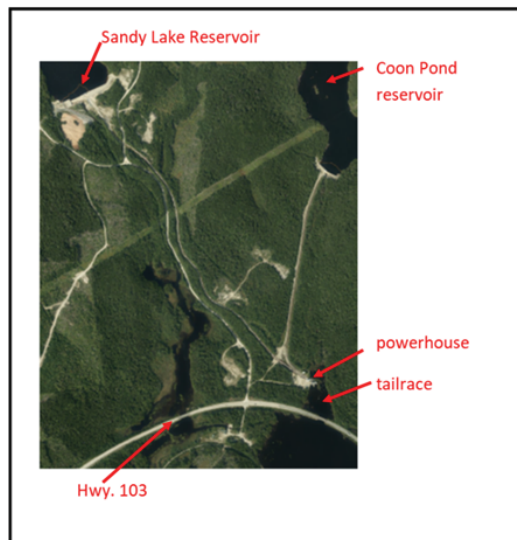


Photo 21: Coon Pond & Sandy Lake Development

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

Powerhouse and surge tanks are visible from Highway 103. Access to the powerhouse is via existing gravel topped Bowater's Roads in the Tantallon vicinity which cross Highway 103, 2 miles west of Exit 5 via an approximately 800 foot long gated and gravelled driveway located 150 feet north of the highway.

Outflow from Coon Pond and Sandy Lake developments discharge the downstream Tidewater Development. The head pond and lake will be removed by others, as with other system head ponds.

Demolition planning for this facility will consider that the intake pipelines will be dewatered and all electrical and communications equipment directly related to transmission will be removed by others. It is also assumed that there will be no outstanding asbestos abatement or other hazardous materials or environmental issues at this site that would adversely affect demolition planning. Note that there is ample material laydown area available at site.

There appears to be ample room at site for burying demolition generated debris, but granite bedrock is close to the surface. Therefore, it may not be practical to consider buried disposals at this site.

As discovered during previous renovations activities at the powerhouse, concrete utilized in the superstructure and substructure construction is in very good condition, does not demonstrate any effects of degradation by alkali aggregate reactivity and is very hard and durable. Therefore, concrete demolition will be a considerable undertaking at this site.

Following demolition planning categorizations apply to the Coon Pond and Sandy Lake facility:

- Intake Classification - Category A, penstock pipe is exposed above ground;
- Architectural Classification – Category B, reinforced concrete and structural steel;
- Outlet (Draft-tube) Classification – Category B, since outflow forms Mill Lake, once outflow is gone, the tailrace area and the former lake will require significant remediation and restoration.

Therefore the following tasks have been considered in the demolition planning and costs derivation exercise:

- Install silt, debris and environmental containments, temporary security fencing (chain-link), silt fence, silt curtain and oil boom.
- Removal of accessible lubricating oil and previously undrained closed-system cooling water (for recycling).
- Removal of small machinery and turbo generator mechanical and electrical controls including but not limited to compressors and tanks, governors and related pressure tanks, bearing cooling systems and filters and related piping, throttle linkage components, electrical and communications cables and miscellaneous smaller equipment and piping.
- Removal of HVAC equipment and localized heating units for areas within the building and for those heaters strategically placed to provide assistance for turbo-generator operation.
- Installation of a granular and relatively water-tight earth-fill cofferdam at the draft-tube outlet and tailrace.

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

- Removal of main turbo-generator components for all four units, such as Exciter; top frame; Rotor and Generator Shaft; Speed Ring, Wicket Gates, shafts and related parts; Turbine Shaft, Head-cover and Turbine; and Stator can be facilitated with the existing powerhouse overhead Bridge Crane, although a temporary power source and connection for the crane may be required. Those components can then be set aside as required for salvage and disposal once the roof structure is removed.
- Removal of Roofing, Sheathing, support structure and related miscellaneous parts and components. Set aside, stockpile for salvage and disposal.
- Remove overhead Bridge Crane and stockpiled turbo-generator main components, sort and stockpile at site for salvage and disposal.
- Demolish superstructure exterior walls and related components, stockpile demolition material for disposal.
- Remove and demolish generator floor reinforced concrete slab and related exterior support walls at that level. Stockpile demolition material for disposal.
- Remove and demolish turbine floor mass concrete and related substructure and interior/exterior walls at that level. Stockpile demolition material for disposal.
- Remove exposed interior steel parts; including penstock and butterfly valves, scroll case and throat ring, head cover, steel draft-tube parts and other related miscellaneous items. Stockpile and sort for salvage and disposal.
- Remove buried services including the on-site sewage disposal system, sanitary pumps and piping, any freshwater piping and equipment.
- Disposal of construction and demolition debris – truck to a construction debris disposal facility located close to Halifax.
- Deliver or sell stockpiled salvage material.
- Infill foundation substructure excavation with compacted granular material and selected demolition debris to the tailrace cofferdam. The cofferdam can remain once graded to match site. Provide erosion protection as required.
- Improve site surface drainage as required.
- Place topsoil, sods/hydro-seed, miscellaneous rudimentary landscaping as may be required for public safety and to facilitate surface drainage requirements.
- Once it is drained, remediate and infill the tailrace as and where required (and to at least Highway #103 limits) with clean gravel and crushed stone, and clean fill as required. Grade surfaces, hydro-seed and/plant trees or other vegetation to return this area to a near natural state.
- Gravel woods roads in the area should remain in place to facilitate ground-search rescue and fire-fighting activities.

The bulk of costs associated with the decommissioning exercise include building demolition and related materials disposal, and site protection and remediation post demolition.

b) Tidewater Development

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

The Tidewater Development was completed in 1922 and provides 2.0 MW of generation capacity from each of its two vertically oriented turbo-generator units which develop that power from approximately 95 feet of head fed from Mill Lake head pond. Outflow from the units discharges directly into the marine waters of St. Margaret's Bay at tidewater elevation.

A generator floor and related support structure are configured over a turbine (basement) floor and related support substructure at Tidewater. The penstock pipes are fed through a bifurcated penstock and butterfly valves to formed plate steel scroll cases. The head cover for each unit is accessed from the generator floor.

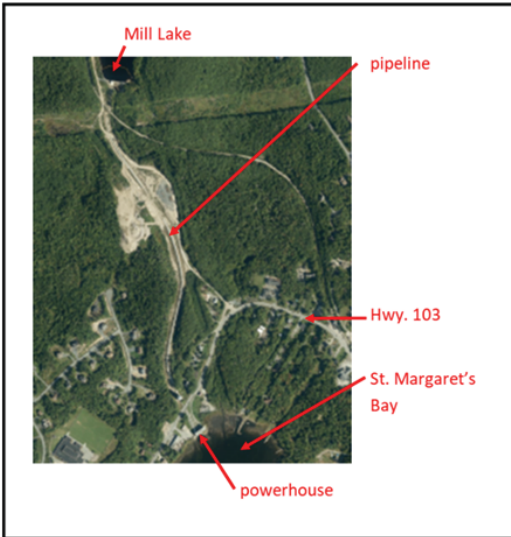


Photo 22: Tidewater Development

Access to the powerhouse is via two gravel topped driveways off Trunk Route 3 about a mile west from Collector Road 213.

Demolition planning for this facility will consider that the intake pipeline is dewatered and all electrical and communications equipment directly related to transmission will be removed by others. It is also taken into consideration that there will be no outstanding asbestos abatement or other hazardous materials or environmental issues at this site that would adversely affect demolition planning. Note that there is significant material laydown area available at this site.

Although there is ample laydown area at this site, due to expected close proximity of bedrock to the surface, there may be limited opportunity to dispose of demolition generated materials by burying.

Following demolition planning categorizations apply to the Tidewater facility:

- Intake Classification - Category A, penstock pipes are exposed above ground;
- Architectural Classification – Category B, reinforced concrete and structural steel;
- Outlet (Draft-tube) Classification – Category A, the draft tubes discharge directly into the Head of St. Margaret's Bay.

Therefore the following tasks have been considered in the demolition planning and costs derivation exercise:

- Install silt, debris and environmental containments, temporary security fencing (chain-link), silt fence, silt curtain and oil boom.
- Removal of accessible lubricating oil and previously undrained closed-system cooling water (for recycling).
- Removal of small machinery and turbo generator mechanical and electrical controls including but not limited to compressors and tanks, governors and related pressure tanks, bearing cooling systems and

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

filters and related piping, throttle linkage components, electrical and communications cables and miscellaneous smaller equipment and piping.

- Removal of HVAC equipment and localized heating units for areas within the building and for those heaters strategically placed to provide assistance for turbo-generator operation.
- Installation of a granular and relatively water-tight earth-fill cofferdam at the draft-tube outlet.
- Removal of main turbo-generator components such as Exciter; top frame; Rotor and Generator Shaft; Speed Ring, Wicket Gates, shafts and related parts; Turbine Shaft, Head-cover and Turbine; and Stator can be facilitated with the existing powerhouse overhead Bridge Crane, although a temporary power source and connection for the crane may be required. Those components can then be set aside as required for salvage and disposal once the roof structure is removed.
- Removal of Roofing, Sheathing, support structure and related miscellaneous parts and components. Set aside, stockpile for salvage and disposal.
- Remove overhead Bridge Crane and stockpiled turbo-generator main components, sort and stockpile at site for salvage and disposal.
- Demolish exterior superstructure walls and related components, stockpile demolition material for disposal.
- Remove and demolish generator floor reinforced concrete slab and related exterior support walls at that level. Stockpile demolition material for disposal.
- Remove and demolish turbine floor reinforced concrete slab and related concrete substructure. The outlet for this powerhouse is at the shoreline of a marine estuary. Therefore it is considered to be "in-stream". Stockpile demolition material for disposal.
- Remove exposed interior steel parts; including steel penstocks and butterfly valves, throat ring, steel draft-tube parts and other related miscellaneous items. Stockpile and sort for salvage and disposal.
- Remove buried services including the on-site sewage disposal system, sanitary pumps and piping, any freshwater piping and equipment and auxiliary buildings associated with hydro production activities.
- Disposal of construction and demolition debris – truck to a construction debris disposal facility located near Halifax.
- Deliver or sell stockpiled salvage material.
- Infill foundation substructure excavation with compacted clean granular material to the tailrace cofferdam. The cofferdam can remain once graded to match site. Provide erosion protection as required.
- Improve site surface drainage as required.
- Place topsoil, sods/hydro-seed, miscellaneous rudimentary landscaping as may be required for public safety and to facilitate surface drainage requirements.
- Once it is drained, remediation will be required at the draft tube tailrace outlets with clean gravel and crushed stone as required. Grade surfaces, hydro-seed and/plant trees or other vegetation to return this area to a near natural state.
- Remove access driveways.

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The bulk of costs associated with the decommissioning exercise include building demolition and related materials disposal and site protection and remediation post demolition.

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Nova Scotia Power Hydro Production
Site Decommissioning Estimate Summary for Asset Retirement Obligations (ARO) Study
St. Margaret's Bay Hydro Electric Generation System

Coon Pond & Sandy Lake Development		
Item Description	Estimated Decommissioning Costs	Assumptions/Notes
SITE REMEDIATIONS		
Site Remediation Issues	\$509,300.00	Large tailrace area to be remediated.
Site Access Removals	\$3,500.00	Remove driveway.
Site Services Removals	\$10,000.00	Remove site sewage disposal system at this location.
BUILDINGS & STRUCTURES		
Powerhouse & Related Auxiliary Structures Removals	\$489,000.00	Includes roof structure removal, removal of superstructure walls, partial removal of sub-structure; infilling of the powerhouse and an estimate of off-site disposal costs.
Auxiliary Buildings Removals (not associated with Production Plant)	\$0.00	No auxiliary buildings at this location.
BOILERS & AUXILIARIES		
Boilers & Auxiliaries - NOT APPLICABLE	\$0.00	N/A
TURBINES, GENERATORS & AUXILIARIES		
Turbo Generator Removals	\$146,000.00	Four vertical turbo-generator units.
Turbo Generator Control Removals	\$34,000.00	Includes disassembly and removal of governor systems, pumps, servos and associated piping.
ELECTRICAL		
On-Site Distribution Lines Removals	\$3,000.00	Interior and exterior at powerhouse.
Electrical Power Systems Removals	\$25,000.00	Powerhouse
Other Auxiliary Systems and Equipment Removals	\$10,000.00	Powerhouse
Electrical Control and Communication	\$12,000.00	Powerhouse
COMMON SERVICES		
Building Ventilation & Heating Removals	\$7,500.00	Limited HVAC at this site.
Plant Operating Equipment Removals	\$36,000.00	
GENERAL AND DISTRIBUTED		
Field Facilities & Decommissioning (Mobilization incl)	\$30,000.00	
Estimated Administration & Overhead Expenses	\$147,313.60	
SALVAGE		
Scrap Metals - General (Inc. Turbine)	-\$500.00	Allowance
General Parts	-\$2,700.00	Allowance
Insulated Wire and Cables No. 1	-\$2,700.00	Allowance
Insulated Wire and Cables No. 2	-\$2,700.00	Allowance
ENGINEERING & PROJECT MANAGEMENT		
Engineering & Project Management	\$157,836.00	
Site Decommissioning Estimate Subtotal Coon Pond & Sandy Lake Development \$1,611,849.60		
Notes: 1. Transmission cable, substations and related transformers to be removed by others in preparation for general demolition. 2. HST is additional to stated estimated costs.		

Figure 27

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Site Decommissioning Estimate Summary for Asset Retirement Obligations (ARO) Study

St. Margaret's Bay Hydro Electric Generation System

Tidewater Development		
Item Description	Estimated Decommissioning Costs	Assumptions/Notes
SITE REMEDIATIONS		
Site Remediation Issues	\$281,900.00	Discharges directly into Head of St. Margaret's Bay marine estuary.
Site Access Removals	\$15,000.00	Remove two driveways.
Site Services Removals	\$10,000.00	Remove freshwater supply and site sewage disposal system at this locations.
BUILDINGS & STRUCTURES		
Powerhouse & Related Auxiliary Structures Removals	\$252,750.00	Includes roof structure removal, removal of superstructure walls, partial removal of sub-structure; infilling of the powerhouse and an estimate of off-site disposal costs.
Auxiliary Buildings Removals (not associated with Production Plant)	\$10,000.00	Remove administration building and garage structure auxiliary buildings at this location.
BOILERS & AUXILIARIES		
Boilers & Auxiliaries - NOT APPLICABLE	\$0.00	N/A
TURBINES, GENERATORS & AUXILIARIES		
Turbo Generator Removals	\$70,600.00	Two vertical turbo-generator units.
Turbo Generator Control Removals	\$17,000.00	Includes disassembly and removal of governor systems, pumps, servos and associated piping.
ELECTRICAL		
On-Site Distribution Lines Removals	\$3,000.00	Interior and exterior at powerhouse.
Electrical Power Systems Removals	\$25,000.00	Powerhouse
Other Auxiliary Systems and Equipment Removals	\$10,000.00	Powerhouse
Electrical Control and Communication	\$12,000.00	Powerhouse
COMMON SERVICES		
Building Ventilation & Heating Removals	\$5,200.00	Limited HVAC at this site.
Plant Operating Equipment Removals	\$21,000.00	
GENERAL AND DISTRIBUTED		
Field Facilities & Decommissioning (Mobilization incl)	\$30,000.00	
Estimated Administration & Overhead Expenses	\$85,506.40	
SALVAGE		
Scrap Metals - General (Inc. Turbine)	-\$400.00	Allowance
General Parts	-\$2,000.00	Allowance
Insulated Wire and Cables No. 1	-\$2,000.00	Allowance
Insulated Wire and Cables No. 2	-\$2,000.00	Allowance
ENGINEERING & PROJECT MANAGEMENT		
Engineering & Project Management	\$91,614.00	
Site Decommissioning Estimate Subtotal		
Tidewater Development	\$934,170.40	
Notes:		
1. Transmission cable, substations and related transformers to be removed by others in preparation for general demolition.		
2. HST is additional to stated estimated costs.		

Figure 28

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SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

14. Tusket River Hydro Electric System

At the Tusket River Hydro Electric System there is one hydro-electric development with a single powerhouse that discharges water into the Tusket River and its estuarial region. This plant is known as the Tusket Development.

At the Tusket Development water is diverted to a power canal by a diversion dam and spillway structure from Lake Vaughan at Tusket Falls and is discharged into a constructed tailrace channel approximately 1600 feet long which is at tidewater level.

a) Tusket Development

The Tusket Development utilizes three vertically oriented turbo-generators which are fed directly from the power canal forebay via a triple intake structure.

The powerhouse structure incorporates a generator floor and support structure over a heavy turbine floor and related support structure. The pressurized intake chamber is found below the turbine floor, while the draft tube outlet and building substructure are located beneath the intake chamber.

The powerhouse incorporates an unfinished fourth unit intake and substructure which is currently utilized to assist with downstream fish passage at the site. There is no powerhouse superstructure associated with this feature. Therefore, concrete superstructure demolitions will be necessary for the portion of the powerhouse incorporating the three turbo-generators and the generator floor, but demolition work for the turbine floor concrete substructure and intake chambers will be for four units.

Tusket Development was constructed in 1929. It has three installed turbo-generators, each producing about 725 kW (0.725 MW) for a total of about 2.175 MW from about 22 feet of head. There is no fabricated metal scroll case arrangement in the intake area, but a head cover and wicket gates control assembly are installed instead on a raised concrete curb just above intake floor level, which provides a means for controlling flow past each of the turbines and associated throat-rings to the draft tube and into the tailrace channel.

The powerhouse can be accessed via the paved Raynardton Road, which is approximately two miles northeast from its intersection with Hwy 103, and a gravelled access (Bennys Lane) that runs west from Raynardton Road for about 1000 feet to the powerhouse. Bennys Lane loops back about a half-mile where it reconnects with Raynardton Road at the power canal inlet and diversion dam at Lake Vaughan.

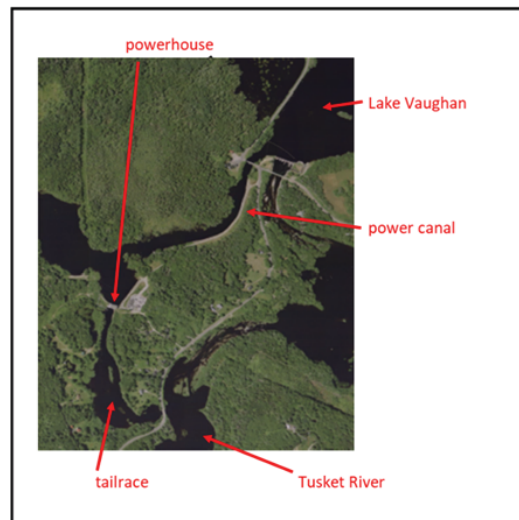


Photo 23: Tusket Development

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Demolition planning for this facility will consider that the intake structure and forebay will be dewatered, and all electrical and communications equipment directly related to transmission will be removed by others. It will also be assumed that there are no outstanding asbestos abatement or other hazardous materials or environmental issues at this site that would adversely affect demolition planning. Note that there is some material laydown area available at site, but that more laydown area can be cleared.

Although not in the water course after demolition, the powerhouse structural configuration will require most of the substructure to be removed during the demolition exercise.

Following demolition planning categorizations apply to the Tusket facility:

- Intake Classification - Category C, concrete intake structure is integral with the powerhouse structure;
- Architectural Classification – Category B, reinforced concrete and structural steel;
- Outlet (Draft-tube) Classification – Category B, the tailrace channel will require remediation to the original Tusket River alignment.

Therefore the following tasks have been considered in the demolition planning and costs derivation exercise:

- Construct additional material lay-down area as required.
- Install silt, debris and environmental containments, temporary security fencing (chain-link), silt fence, silt curtain and oil boom.
- Removal of accessible lubricating oil and previously undrained closed-system cooling water (for recycling).
- Removal of small machinery and turbo generator mechanical and electrical controls including but not limited to compressors and tanks, governors and related pressure tanks, bearing cooling systems and filters and related piping, throttle linkage components, electrical and communications cables and miscellaneous smaller equipment and piping.
- Removal of HVAC equipment and localized heating units for areas within the building and for those heaters strategically placed to provide assistance for turbo-generator operation.
- Installation of a granular and relatively water-tight earth-fill cofferdam at the draft-tube outlet and tailrace. This structure will have to be adequate to withstand tidal influences.
- Removal of main turbo-generator components such as Exciter; top frame; Rotor and Generator Shaft; Speed Ring, Wicket Gates, shafts and related assembly and parts; Turbine Shaft, Head-cover and Turbine; and Stator can be facilitated with the existing powerhouse overhead Bridge Crane, although a temporary power source and connection for the crane may be required. Those components can then be set aside as required for salvage and disposal once the roof structure is removed. Also remove head gates and related operating equipment, all of which is located inside the confines of the powerhouse.
- Removal of roofing, sheathing, support structure and related miscellaneous parts and components. Set aside, stockpile for salvage and disposal.
- Remove overhead Bridge Crane and stockpiled turbo-generator main components, sort and stockpile at site for salvage and disposal.

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SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

- Demolish exterior walls and related components, stockpile demolition material for disposal.
- Remove and demolish generator floor reinforced concrete slab and related exterior support walls at that level. Stockpile demolition material for disposal.
- Demolish concrete intake structure.
- Remove and demolish turbine floor reinforced concrete slab and interior/exterior walls at that level. Stockpile demolition material for disposal.
- Remove exposed interior steel parts; including throat ring, steel draft-tube parts and other related miscellaneous items. Stockpile and sort for salvage and disposal.
- Remove reinforced concrete foundation substructure to at least the draft tube level. Stockpile debris for disposal.
- Remove buried services including the on-site sewage disposal system, sanitary pumps and piping, any freshwater piping and equipment.
- Disposal of construction and demolition debris – truck selected material to a designated construction debris disposal facility, while suitable other materials, such as pulverized concrete devoid of rebar or embedded metals, can be buried at site.
- Deliver or sell stockpiled salvage material.
- Infill foundation substructure excavation with compacted granular material and selected demolition debris to the tailrace cofferdam. The cofferdam can remain once graded to match site. Provide erosion protection as required.
- Improve site surface drainage as required.
- Place topsoil, sods/hydro-seed, miscellaneous rudimentary landscaping as may be required for public safety and to facilitate surface drainage requirements.
- Once it is drained, remediate the tailrace with clean gravel and crushed stone, as well as clean fill as required. Grade surfaces, hydro-seed and/plant trees or other vegetation to return this area to a near natural state.
- Gravel woods roads in the area should remain in place to facilitate ground-search rescue and fire-fighting activities.

The bulk of costs associated with the decommissioning exercise include building demolition and related materials disposal and site protection and remediation post demolition.

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**Nova Scotia Power Hydro Production
Site Decommissioning Estimate Summary for Asset Retirement Obligations (ARO) Study
Tusket Hydro Electric Generation System**

Tusket Development		
Item Description	Estimated Decommissioning Costs	Assumptions/Notes
SITE REMEDIATIONS		
Site Remediation Issues	\$610,100.00	1600 ft long tailrace to be remediated
Site Access Removals	\$0.00	N/A
Site Services Removals	\$10,000.00	Remove site sewage disposal system at this location.
BUILDINGS & STRUCTURES		
Powerhouse & Related Auxiliary Structures Removals	\$699,250.00	Includes roof structure removal, removal of superstructure walls, partial removal of sub-structure; infilling of the powerhouse and an estimate of off-site disposal costs.
Auxiliary Buildings Removals (not associated with Production Plant)	\$1,000.00	Remove steel structure over unit four downstream fish passage.
BOILERS & AUXILIARIES		
Boilers & Auxiliaries - NOT APPLICABLE	\$0.00	N/A
TURBINES, GENERATORS & AUXILIARIES		
Turbo Generator Removals	\$94,500.00	Three vertical turbo-generator units.
Turbo Generator Control Removals	\$25,300.00	Includes disassembly and removal of governor systems, pumps, servos and associated piping.
ELECTRICAL		
On-Site Distribution Lines Removals	\$3,500.00	Interior and exterior at powerhouse.
Electrical Power Systems Removals	\$24,000.00	Powerhouse
Other Auxiliary Systems and Equipment Removals	\$17,500.00	Powerhouse
Electrical Control and Communication	\$11,500.00	Powerhouse
COMMON SERVICES		
Building Ventilation & Heating Removals	\$5,200.00	Limited HVAC at this site.
Plant Operating Equipment Removals	\$27,900.00	
GENERAL AND DISTRIBUTED		
Field Facilities & Decommissioning (Mobilization incl)	\$30,000.00	
Estimated Administration & Overhead Expenses	\$174,692.00	
SALVAGE		
Scrap Metals - General (Inc. Turbine)	-\$1,500.00	Allowance
General Parts	-\$3,600.00	Allowance
Insulated Wire and Cables No. 1	-\$3,600.00	Allowance
Insulated Wire and Cables No. 2	-\$3,600.00	Allowance
ENGINEERING & PROJECT MANAGEMENT		
Engineering & Project Management	\$187,170.00	
Site Decommissioning Estimate Subtotal		
Tusket Development	\$1,909,312.00	
Notes:		
1. Transmission cable, substations and related transformers to be removed by others in preparation for general demolition.		
2. HST is additional to stated estimated costs.		

Figure 29

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SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

15. Wreck Cove Hydro Electric System

The Wreck Cove Hydro Electric Generating System is made up two hydro-electric developments, Gisborne and Wreck Cove that collect and harness a portion of the water resources of the Cape Breton Highlands. This system is by far the largest hydro generation asset in Nova Scotia, with the Wreck Cove Development producing more electricity than all other Nova Scotia hydro-electric generation assets combined.

The base camp site for the system is located about a mile inland from the Cabot Trail about 20 miles approximately south of Ingonish.

a) Gisborne Development

Gisborne Development was constructed and commissioned in about 1982 a few years after completion and commissioning of the Wreck Cove Development, as an add-on to the system, enabling generation from the differential head between Gisborne Flowage and Wreck Cove Flowage storages.

At Gisborne, water from Gisborne flowage (which also serves as Gisborne head pond) is directed to the powerhouse via a buried steel penstock pipe. The powerhouse's horizontally oriented turbo-generator produces approximately 3.5 MW of power from 62 feet of head and discharges into Wreck Cove Flowage. Water is then directed to the main Wreck Cove Powerhouse via tunnel to the submerged concrete intake structure in Surge Lake.

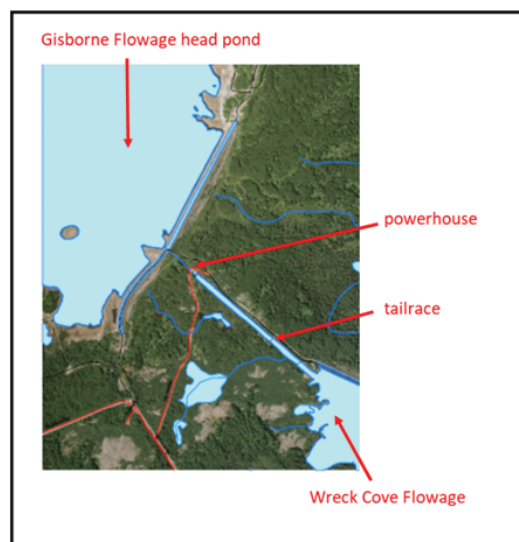


Photo 24: Gisborne Development

This site was originally a piped sluiceway upon commissioning of the main Wreck Cove powerhouse, which enabled the controlled transfer of water from the higher Gisborne reservoir to the Wreck Cove Flowage. When the powerhouse was constructed the controlled transfer of stored water was maintained as a flow by-pass feature and incorporated into the design of the mostly below-grade reinforced concrete powerhouse structure.

Note that the Gisborne reservoir is formed by a diversion dam. Once infrastructure is removed, the reservoir will revert to its original configuration and will drain to the west, away from Gisborne and Wreck Cove Flowage.

The reinforced concrete generator/turbine floor of the powerhouse is integral with the outlet draft tube and powerhouse substructure.

Demolition planning for this facility will consider that the intake penstock will be dewatered and removed and that water is removed from Gisborne Lake, and system flow patterns have been restored to original routings. (This will negate the requirement for an upstream cofferdam during demolition work). All electrical and communications equipment directly related to transmission

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SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

will be removed by others. It is also assumed that there will be no outstanding asbestos abatement or other hazardous materials or environmental issues at this site that would adversely affect demolition planning. Note that there is limited material laydown area available at this site and that some additional lay-down area may have to be constructed or prepared.

Since the powerhouse is built mostly below grade in a gorge between two reservoirs, machine access to the work area will be more difficult than at most other powerhouse sites. As a result, it may be necessary to employ larger cranes and smaller demolition equipment to better facilitate access. However, it may be possible to catty out only a partial substructure at this site since the powerhouse will no longer be considered to be "in-stream".

Note that though the powerhouse is a relatively small structure a considerable cofferdam may be required at the powerhouse access to enable safe substructure removals. Once the powerhouse substructure is removed, selected demolition material deemed suitable for disposal by burying at or near site will be so disposed. Other material will be disposed off-site at a suitably recognized disposal facility. The location of the powerhouse will then be filled with appropriate material generated from quarry facilities at or near the site.

Following demolition planning categorizations apply to the Gisborne facility:

- Intake Classification - Category B, a buried intake penstock is located at the rear of the structure;
- Architectural Classification – Category B, reinforced concrete and structural steel;
- Outlet (Draft-tube) Classification – Category B, draft tube outlet discharges into a constructed 2000 foot long channel leading to Wreck Cove Flowage.

Therefore the following tasks have been considered in the demolition planning and costs derivation exercise:

- Install silt, debris and environmental containments, temporary security fencing (chain-link), silt fence, silt curtain and oil boom.
- Removal of accessible lubricating oil and previously undrained closed-system cooling water (for recycling).
- Removal of small machinery and turbo generator mechanical and electrical controls including but not limited to compressors and tanks, governors and related pressure tanks, bearing cooling systems and filters and related piping, throttle linkage components, electrical and communications cables and miscellaneous smaller equipment and piping.
- Removal of HVAC equipment and localized heating units for areas within the building and for those heaters strategically placed to provide assistance for turbo-generator operation.
- Installation of a granular and relatively water-tight earth-fill cofferdam at the draft-tube outlet and tailrace channel.
- Removal of main turbo-generator components such as Exciter; and Generator assembly; Wicket Gates and related parts; Turbine Shaft, Head-cover and Turbine can be facilitated with the existing powerhouse overhead Bridge Crane, although a temporary power source and connection for the crane may be required. Those components can then be set aside as required for salvage and disposal once the roof structure is removed.

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- Disassembly of Roofing, Sheathing and related miscellaneous parts and components. Set aside, stockpile for salvage and disposal.
- Remove overhead Bridge Crane and stockpiled turbo-generator main components, sort and stockpile at site for salvage and disposal.
- Excavation at and disassembly of exterior concrete walls and related components, stockpile demolition material for disposal.
- Remove and demolish main floor reinforced concrete slab and related reinforced concrete substructure. Stockpile demolition material for disposal.
- Remove buried services and any freshwater piping and equipment.
- Disposal of construction and demolition debris – truck to a designated construction debris disposal facility.
- Deliver or sell stockpiled salvage material.
- Infill foundation substructure excavation with compacted granular material and selected demolition debris to the tailrace cofferdam. The cofferdam can remain once graded to match site. Provide erosion protection as required.
- Infill and remediate the tailrace channel with granular site generated material, grade as necessary, place topsoil and plant trees, hydro-seed or plant other appropriate vegetation as required.
- Improve site surface drainage as required.
- Place topsoil, sods/hydro-seed, miscellaneous rudimentary landscaping over the entire powerhouse site as may be required for public safety and to facilitate surface drainage requirements.
- Remove powerhouse access road/driveway, but maintain other gravel roadways in the area for firefighting, and for search and rescue purposes.

The bulk of costs associated with the decommissioning exercise include building demolition and related materials disposal, and site protection and remediation post demolition.

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SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

b) Wreck Cove Development

Wreck Cove Development was completed and commissioned in 1978 and consists of two large vertically oriented turbo-generators each producing about 105 MW from as much as 1200 feet of head, which is fed from Surge Lake head pond located at the top of the mountain.

The powerhouse is accessed from the Wreck Cove Base camp via the powerhouse entry portal and a 1600 foot access tunnel that opens into a man-made cavern in which the powerhouse has been constructed. A very steep 1600 foot long concrete lined penstock was bored into the mountain from Surge Lake to the powerhouse as a means to convey water to the turbo-generators. The penstock bifurcates to provide direct flow to each of the large vertically oriented turbo-generator units. Outflow from the two units is via a one-mile long tailrace tunnel to the Atlantic Ocean.

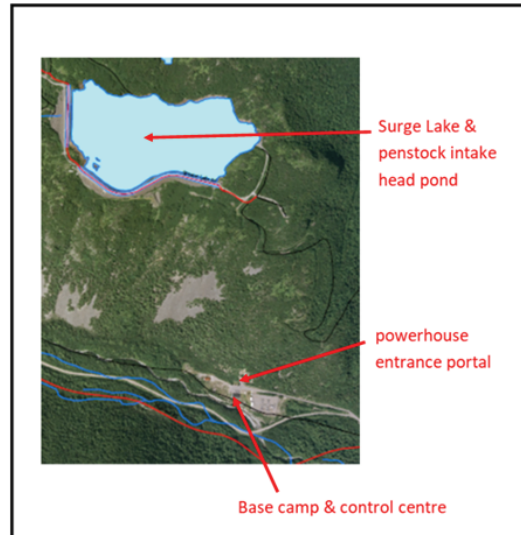


Photo 25: Wreck Cove Development

A significant HVAC system has been employed at this site to ensure adequate air flow to and from the powerhouse in all conditions.

The main Wreck Cove powerhouse is very large in comparison to other facilities in the NSPI hydro inventory. Due to its length and ample diameter, the access tunnel is normally traversed by motor vehicle. At the end of the tunnel the powerhouse opens up at the main or top floor of the facility. Generators are located below the reinforced concrete main floor of the powerhouse and are supported from reinforced concrete structures that extend from the lower Turbine Floor and which are ultimately supported from bedrock. At the reinforced concrete Turbine Floor, located below the Generator floor, there is access to the exterior and interior of the scroll cases and penstock, including the interior of the main line spherical valves. Also at that level the head cover and 39 inch diameter generator shaft is accessible. Below the Turbine floor is the draft-tube access floor, where spherical valves exteriors are can be accessed. Draft-tubes are accessed through steel access manholes at that level.

Demolition planning for this facility will consider that Surge Lake and the intake penstock will be dewatered and that system flow patterns have been restored to original routings. All electrical and communications equipment directly related to transmission will be removed by others. It is also assumed that there will be no outstanding asbestos abatement or other hazardous materials or environmental issues at this site that would adversely affect demolition planning. Note that there is ample material laydown area available at this site, but that parts and equipment will require partial disassembly to enable removals through the access tunnel.

Once machinery and equipment has been removed from the main powerhouse, HVAC systems can be removed and the facility can be abandoned. Because of the manner in which the

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powerhouse has been constructed it will be impractical to attempt to demolish and remove interior structural components and infill the facility with granular or other materials. Rather, it will be more practical to close and secure the three possible main entry points located at: the Main Tunnel access; the penstock; and the Tailrace Tunnel outlet. At each of those locations a heavy concrete (and possibly steel) bulkhead can be constructed to bar unauthorized entry post abandonment. The access and penstock tunnels openings bulkheads can be further infilled with rock fill. The tailrace outlet tunnel concrete portal should be removed to reduce potential hazards to the public, and then the new tailrace bulkhead can also be buried in rock fill. Note that it may be necessary to provide some sort of long-term venting for the abandoned facility.

Following demolition planning categorizations apply to the Wreck Cove facility:

- Intake Classification - Category B, a buried intake penstock is located at the rear of the structure;
- Architectural Classification – Category C, Other. The powerhouse, penstock and tailrace have been hewn from the mountain bedrock.
- Outlet (Draft-tube) Classification – Category A, although a lengthy tailrace tunnel is employed at this site, that tunnel discharges directly into the Atlantic Ocean. Since the tailrace tunnel will be blocked off and not be removed, and a significant cofferdam will not be required, Category A will apply.

Therefore the following tasks have been considered in the demolition planning and costs derivation exercise:

- Install silt, debris and environmental containments, temporary security fencing (chain-link), a silt curtain and an oil boom in the tailrace tunnel, silt curtain and silt fences as and where necessary during tailrace portal removal and infilling.
- Removal of lubricating oil and previously undrained closed-system cooling water (for recycling).
- Removal of small machinery and turbo generator mechanical and electrical controls including but not limited to compressors and tanks, governors and related pressure tanks, bearing cooling systems and filters and related piping, throttle linkage components, electrical and communications cables and miscellaneous smaller equipment and piping.
- Removal of main turbo-generator components for each turbo generator such as Exciter; Rotor poles and Windings; Rotor Hub, Generator Shaft; Speed Ring, Wicket Gates and related parts; Turbine Shaft, Head-cover and Turbine; Stator, Cooling System and steel draft-tube stop logs can be facilitated with the existing powerhouse overhead bridge crane and other lift devices, although a temporary power source and connection for the crane may be required. Those components can then be stockpiled outside the powerhouse as required for further disassembly, salvage and disposal. Larger components can be cut into smaller pieces for easier handling.
- Remove overhead Bridge Crane, other lifting devices and stockpiled turbo-generator and other related mechanical components, sort and stockpiled outside the powerhouse at site for salvage and disposal.
- Removal of HVAC system equipment and ducting.
- Remove buried sewage disposal services and any freshwater piping and equipment.

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

- Remove auxiliary buildings. This will include all buildings at the base camp including the main office and control centre and garage, structures which may otherwise remain at the original site construction base camp, such as maintenance garages and houses along the main site paved access road from the Cabot Trail.
- Disposal of construction and demolition debris – truck to a designated construction debris disposal facility.
- Deliver or sell stockpiled salvage material.
- Place topsoil, sods/hydro-seed, miscellaneous rudimentary landscaping as may be required for public safety and to facilitate surface drainage requirements.
- Improve site surface drainage at the base camp location as required and improve or remove the paved base camp access road. Other roads should remain in place and accessible for firefighting and ground search and rescue purposes.

The bulk of costs associated with the decommissioning exercise include building demolition and related materials disposal, and site protection and remediation post demolition.

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Nova Scotia Power Hydro Production

Site Decommissioning Estimate Summary for Asset Retirement Obligations (ARO) Study

Wreck Cove Hydro Electric Generation System

Gisborne Development		
Item Description	Estimated Decommissioning Costs	Assumptions/Notes
SITE REMEDIATIONS		
Site Remediation Issues	\$283,000.00	Outlet discharges directly to tailrace channel which leads to Wreck Cove Flowage. Gisborne flowage out-flow will be redirected to original natural alignment, tailrace channel remediation required.
Site Access Removals	\$0.00	N/A
Site Services Removals	\$0.00	No site sewage disposal system at this location.
BUILDINGS & STRUCTURES		
Powerhouse & Related Auxiliary Structures Removals	\$159,200.00	Includes roof structure removal, removal of superstructure walls, excavation and partial removal of sub-structure including by-pass sluice; infilling of the powerhouse with site generated granular material and an estimate of off-site disposal costs.
Auxiliary Buildings Removals (not associated with Production Plant)	\$0.00	N/A
BOILERS & AUXILIARIES		
Boilers & Auxiliaries - NOT APPLICABLE	\$0.00	N/A
TURBINES, GENERATORS & AUXILIARIES		
Turbo Generator Removals	\$20,000.00	One horizontal turbo-generator unit.
Turbo Generator Control Removals	\$5,500.00	Includes disassembly and removal of governor systems, pumps, servos and associated piping.
ELECTRICAL		
On-Site Distribution Lines Removals	\$3,000.00	Interior and exterior at powerhouse.
Electrical Power Systems Removals	\$9,000.00	Powerhouse
Other Auxiliary Systems and Equipment Removals	\$3,000.00	Powerhouse
Electrical Control and Communication	\$5,000.00	Powerhouse
COMMON SERVICES		
Building Ventilation & Heating Removals	\$7,500.00	Limited HVAC at this site.
Plant Operating Equipment Removals	\$7,500.00	
GENERAL AND DISTRIBUTED		
Field Facilities & Decommissioning (Mobilization incl)	\$30,000.00	
Estimated Administration & Overhead Expenses	\$59,662.40	
SALVAGE		
Scrap Metals - General (Inc. Turbine)	-\$350.00	Allowance
General Parts	-\$500.00	Allowance
Insulated Wire and Cables No. 1	-\$500.00	Allowance
Insulated Wire and Cables No. 2	-\$500.00	Allowance
ENGINEERING & PROJECT MANAGEMENT		
Engineering & Project Management	\$63,924.00	
Site Decommissioning Estimate Subtotal Gisborne Development		\$654,436.40
Notes:		
1. Transmission cable, substations and related transformers to be removed by others in preparation for general demolition.		
2. HST is additional to stated estimated costs.		

Figure 30

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Nova Scotia Power Hydro Production
Site Decommissioning Estimate Summary for Asset Retirement Obligations (ARO) Study
Wreck Cove Hydro Electric Generation System

Wreck Cove Development		
Item Description	Estimated Decommissioning Costs	Assumptions/Notes
SITE REMEDIATIONS		
Site Remediation Issues	\$327,500.00	Plan outlets directly to Gulf of St. Lawrence and Cabot Strait. Some oil booms may be required at tailrace tunnel, erosion protection for exposed structures and infill. Base camp returned to brownfield site, some hydro-seeding.
Site Access Removals	\$85,000.00	Remove asphalt and re-grade selected access roads and parking area(s).
Site Services Removals	\$20,000.00	Remove site sewage disposal system and domestic water supply system at this location.
BUILDINGS & STRUCTURES		
Powerhouse & Related Auxiliary Structures Removals	\$776,000.00	Includes removal of secondary interior structures and components, construction of reinforced concrete vented bulkheads at the entrance tunnel portal and at the tailrace tunnel outlet portal and selected internal concrete nfilling as necessary.
Auxiliary Buildings Removals (not associated with Production Plant)	\$60,000.00	Remove auxilliary buildings including administration centre, garages, houses and miscellaneous structures.
BOILERS & AUXILIARIES		
Boilers & Auxiliaries - NOT APPLICABLE	\$0.00	N/A
TURBINES, GENERATORS & AUXILIARIES		
Turbo Generator Removals	\$132,000.00	Two vertical turbo-generator units, includes removals of rotor parts turbine and shafts, bearings, stator, supports and cooling water systems.
Turbo Generator Control Removals	\$65,500.00	Includes disassembly and removal of governor systems, pumps, servos and associated piping, spherical valves and related miscellaneous valves and piping.
ELECTRICAL		
On-Site Distribution Lines Removals	\$15,000.00	Interior and exterior at powerhouse.
Electrical Power Systems Removals	\$40,000.00	Powerhouse
Other Auxiliary Systems and Equipment Removals	\$16,000.00	Powerhouse
Electrical Control and Communication	\$20,000.00	Powerhouse
COMMON SERVICES		
Building Ventilation & Heating Removals	\$67,000.00	Extensive HVAC at this site including ducting in entrance tunnel including but not limited to removal of draft-tube gates and related operating mechanism, powerhouse overhead crane(s) and removal of tailrace tunnel outlet portal gate.
Plant Operating Equipment Removals	\$80,600.00	
GENERAL AND DISTRIBUTED		
Field Facilities & Decommissioning (Mobilization incl)	\$30,000.00	
Estimated Administration & Overhead Expenses	\$194,275.20	
SALVAGE		
Scrap Metals - General (Inc. Turbine)	-\$5,000.00	Allowance
General Parts	-\$50,000.00	Allowance
Insulated Wire and Cables No. 1	-\$15,000.00	Allowance
Insulated Wire and Cables No. 2	-\$15,000.00	Allowance
ENGINEERING & PROJECT MANAGEMENT		
Engineering & Project Management	\$208,152.00	
Site Decommissioning Estimate Subtotal Wreck Cove Development \$2,052,027.20		
Notes: 1. Transmission cable, substations and related transformers to be removed by others in preparation for general demolition. 2. HST is additional to stated estimated costs.		

Figure 31

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

V. POWERHOUSE DEMOLITIONS SUMMARY AND CONCLUSIONS

Decommissioning of NSPI Hydro Production powerhouses will be an endeavor which will depend heavily on efficient coordination of various trades including but not limited to heavy-lift contractors, HVAC specialists, mechanics and electricians. Detailed planning and scheduling will be necessary for the project.

Construction of structural enhancements may be required as part of the decommissioning exercise. Some of these features may remain in place post decommissioning, while others may be temporary and will be removed. The following is a summary of the decommissioning costs:

Nova Scotia Power Hydro Production Site Decommissioning Estimate Summary for Asset Retirement Obligations (ARO) Study HYDRO SYSTEM DECOMMISSIONING COSTS BY SYSTEMS & DEVELOPMENTS			
2018-10-14			
NSPI HYDRO SYSTEM	NSPI HYDRO DEVELOPMENT AREA	Decommissioning Costs/Development	Decommissioning Costs/Hydro System
Avon River Hydro System	Avon No. 1 Development	\$ 890,993.60	
	Avon No. 2 Development	\$ 862,380.40	\$ 1,753,374.00
Bear River Hydro System	Ridge Development	\$ 647,242.40	
	Gulch Development	\$ 904,668.80	\$ 1,551,911.20
Black River Hydro System	Methals Development	\$ 696,299.20	
	Hollow Bridge Development	\$ 589,523.20	
	Lumsden Development	\$ 695,783.20	
	Hell's Gate Development	\$ 1,024,892.00	
	White Rock Development	\$ 1,024,892.00	\$ 4,031,389.60
Dickie Brook Hydro System	Dickie Brook Development	\$ 764,331.60	\$ 764,331.60
Fall River Hydro System	Fall River Development	\$ 388,698.40	\$ 388,698.40
Lequille Hydro System	Lequille Development	\$ 1,117,681.60	\$ 1,117,681.60
Mersey River Hydro System	Upper Lake Falls Development	\$ 1,498,643.20	
	Lower Lake Falls Development	\$ 1,328,627.20	
	Big Falls Development	\$ 1,558,888.00	
	Lower Great Brook Development	\$ 1,579,060.80	
	Deep Brook Development	\$ 2,133,985.60	
	Cowie Falls Development	\$ 1,618,024.00	\$ 9,717,228.80
Nictaux Hydro System	Nictaux Development	\$ 670,219.20	\$ 670,219.20
Paradise Hydro System	Paradise Development	\$ 801,057.60	\$ 801,057.60
Roseway River Hydro System	Roseway Development	\$ 648,423.60	\$ 648,423.60
Sheet Harbour Hydro System	Malay Falls Development	\$ 1,192,630.40	
	Ruth Falls Development	\$ 1,165,042.40	\$ 2,357,672.80
Sissiboo River Hydro System	Fourth Lake Development	\$ 724,195.20	
	Sissiboo Falls Development	\$ 1,304,653.60	
	Weymouth Falls Development	\$ 1,392,152.80	\$ 3,421,001.60
St. Margaret's Bay Hydro System	Coon Pond & Sandy Lake Development	\$ 1,611,849.60	
	Tidewater Development	\$ 934,170.40	\$ 2,546,020.00
Tusket River Hydro System	Tusket Development	\$ 1,909,312.00	\$ 1,909,312.00
Wreck Cove Hydro System	Gisborne Development	\$ 654,436.40	
	Wreck Cove Development	\$ 2,052,027.20	\$ 2,706,463.60
	Total	\$ 34,384,785.60	\$ 34,384,785.60

Note: For more detailed summary of decommissioning costs - see individual development summaries (Figures 1-31).

Figure 32: Hydro System Decommissioning Costs – By Systems and Developments

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

VI. APPENDICES

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

Appendix 1 - BIO Sketch J. B. Yates, P. Eng.

Since the early 1980's, J. B. Yates, P. Eng. has developed a wide range of experience in structural, heavy civil and multi-disciplinary engineering projects encompassing concept development, design, construction planning and supervision, and investigations and reporting.

Those projects have involved new construction, condition assessments, repairs and enhancements at: hydro-electric facilities, thermal generation facilities and related infrastructure; offshore oil production platforms and fabrication plants; marine facilities (Wharves, Jetties and Bridges); rail infrastructure improvements projects; activities at operational military bases (including remote sensing and detection arrays, explosive storage facilities and general marine infrastructure); buildings and foundations; roads and highways; water, sewer and storm drainage systems; and other related infrastructures including but not necessarily limited to design of reinforced concrete, masonry, structural steel, timber/wood and earthen structures.

Past Experience

Mr. Yates has over 30 of years of experience in Civil and Structural engineering and related disciplines for infrastructure such as dam and water control infrastructure and powerhouses, bridges, wharfs and marine structures. Mr. Yates has made significant contributions to projects including the Strait Crossing (bridge linking PEI to the mainland), Hibernia off-shore oil development and the Cohasset-Panuke off shore oil development at Sable Island, as well as rail structures and related infrastructure engineering.

He has been heavily involved in civil and mechanical related assessments, maintenance, improvements and rehabilitation planning for over 40 Hydro Electric and Thermal Generating Sites for Nova Scotia Power, Emera Energy, Minas Basin Pulp and Power and Berwick Electric in Nova Scotia and for Nalcor in Newfoundland and Labrador. Work has been carried out on similar infrastructure for Halifax Water, NSBI and the Nova Scotia Department of Transportation and Infrastructure Renewal (TIR).

In marine areas, Mr. Yates has been lead engineer for assessments of the IEL wharf and Sheet Harbour Industrial Port wharf for NSBI; Pier 9 assessments and repairs for the Halifax Port Corporation, NSPI Tufts Cove Seawall and cooling water intakes; assessment and refurbishment planning for the Adams and Knickle Wharf in Lunenburg; a newly reconstructed pier for the Lunenburg Yacht Club; and design of a new wharf and boathouse substructure for Mr. R. Risley in Chester. As well he has carried out design and implementation planning for repairs to hurricane damaged marine infrastructure in various Caribbean locals.

Mr. Yates has worked for several major engineering consulting firms in Nova Scotia in a senior project engineering capacity as engineering lead and as a project manager. Mr. Yates has been Principal of J. B. Yates Engineering Limited since 1996.

Education and Technical Affiliations:

Mr. Yates graduated from Technical University of Nova Scotia (Nova Scotia Technical College) in 1981, with a Bachelor Engineering (Civil). Mr. Yates received Professional Engineer status in 1983.

NOVA SCOTIA POWER INC. - HYDRO PRODUCTION
SITE DECOMMISSIONING ESTIMATE SUMMARY FOR ASSET RETIREMENT OBLIGATIONS (ARO) STUDY (By System)

A fully registered member of Engineers Nova Scotia (formerly the Association of Professional Engineers of Nova Scotia) since 1983, Mr. Yates has been a member of the American Concrete Institute and is a member of the Canadian Dam Association and served as Canadian Dam Association Board representative for Nova Scotia from 1996 to 2000.

APPENDIX 2 - CV

JAMES B. YATES, P.ENG.

SENIOR STRUCTURAL/CIVIL ENGINEER

Education:

Bachelor of Engineering, Civil, Technical University of Nova Scotia, 1981

Professional Associations:

Association of Professional Engineers of Nova Scotia

Canadian Dam Association (including member of National Executive Board, Nova Scotia Representative from 1997 to 2002).

Career:

1996 to present: J.B. Yates Engineering Limited

1990 - 1996: Vaughan Engineering Associates Limited

1988 - 1990: O'Halloran Campbell Consultants Ltd.

1986 - 1988: Triton Engineering Ltd.

1983 - 1986: J.D. Koppernaes Engineering Ltd.

1981 - 1983: Canadian British Consultants Ltd. (CBCL Ltd.)

Experience:

Over Thirty Years of Experience in a wide range of structural, heavy civil, mechanical and multi-disciplinary engineering projects encompassing design, assessments, construction planning and supervision, investigations, evaluations and repairs and improvements including derivation of cost estimates for: hydroelectric and thermal generation powerhouses and related facilities across Nova Scotia; marine facilities (wharves and jetties) and support infrastructure; offshore oil production platforms and fabrication plants; roads and highways; water, sewer and storm drainage systems; fisheries enhancement facilities (fish ladders, passages and barriers); and related infrastructure. Experience with industrial, commercial, and residential buildings structures includes: design of building structures, building envelope and sub-structure design; condition assessments and engineering evaluations, design of repairs and construction management. Mr. Yates has extensive experience with design of reinforced concrete, masonry, structural steel, wood-frame, timber and earthen structures.

Work History: Major responsibilities have included design development, technical support, coordination and services during construction for the following projects:

Industrial and Power Projects:

- For Nova Scotia Power Inc.: Engineering design, evaluation, construction cost estimates derivation and construction management for implementation of improvements and repairs to hydroelectric assets including but not limited to turbo-generators (and related structural and mechanical components), earthen, concrete and timber dams and spillways; intake (head-works, head-gates) structures and associated operating machinery; various sluiceways and related gates (including overhauls in 2004 and 2005 of Annapolis Causeway sluice gates) and related machinery; life extension projects for steel, fibreglass and wood pipelines and penstocks, and surge tanks condition assessments and remediations; powerhouse substructures, superstructures and related infrastructure; power canals; access roads and related items; environmental remediations/improvements including fisheries enhancement projects for over fifty generation units at over thirty hydroelectric developments.
- Inspections condition assessments, remediations designs for various main-line penstock butterfly (and similar) valves for NSPI, Minas Basin Pulp and Power and Berwick Electric.
- Lead Engineer for the rehabilitation and reconstruction of Parson's Dam for Minas Basin Pulp and Power in St. Croix, Nova Scotia. This project included the installation of vertical post tensioned steel anchor bars of various lengths (up to about 100 feet) installed through the crest of the concrete gravity dam and into the underlying bedrock strata.
- Dam Safety Review for the St. Croix River Hydroelectric Generating System for Minas Basin Pulp and Power.
- A system-wide head-gate study for Nova Scotia Power's Hydro Production Department.

JAMES B. YATES, P.ENG.

SENIOR STRUCTURAL/CIVIL ENGINEER

- Design of replacement pipeline and penstock for Berwick Electric's hydroelectric generating station.
- Design of remediations and repairs to Middle River dam and sluiceway for the Nova Scotia Department of Transportation and Infrastructure Renewal.
- Lead engineer on development and installation of intake maintenance bulkhead gates for head works at Nalcor's Star Lake Hydro Electric Development in Newfoundland and Labrador.
- Provision of mechanical and structural engineering support and assistance for major generation unit overhauls carried out by NSPI Hydro Production from 1994 to 2012.
- Various condition assessments and reporting for dams, spillways and related component infrastructure for NSPI, NSTIR, NSLands, Minas Basin Pulp and Power and Nalcor including work associated with Dam Safety Reviews.
- Investigations and assessments and design of repairs including remedy of water infiltration issues for various buildings including hydroelectric powerhouses, thermal generation power stations and ancillary structures for NSPI's Hydro Production division at over 40 locations across Nova Scotia.
- Engineering for civil and structural components of Nova Scotia Power's 150 MW Trenton 6 Generating Station, including C.W. intake, fly-ash system supports, coal stockpiles material handling, site building foundations, site buried services and others.
- Boiler support structure engineering at Nova Scotia Power's Pt. Aconi Generating Station during construction.
- Harbour-front remediations, cooling water intake reconstruction, consolidation of buried services infrastructure network and upgrading of marine fuel offloading facility for Nova Scotia Power Inc.'s 350 MW Tuft's Cove thermal generation station.
- Design of a structural base and installation of a 500-tonne press for HMC Dockyard's Ship Repair Unit.
- Assessment of Imperial oil refinery heating plant brick and masonry smoke stack and design of repairs.
- Macan thermal electric generating station brick stack assessment and reporting.
- Structural and civil designs for various of fish plants and their components and related infrastructure at various locations in Nova Scotia.
- Engineering for three submerged (underwater) degaussing ranges for HMC ships in and around Halifax Harbour for D.N.D.
- Design of a "cable float" work platform to be used in conjunction with Synchro-lift ship lifting and maintenance facility for HMC Dockyard.
- Lead Engineer on assessment of existing and design for new explosive blast protection barrier structures for the Canadian Military in Halifax Nova Scotia.
- Design and construction supervision for repairs and improvements (and new construction) for dozens of fish passage and related infrastructure located in Nova Scotia.

Marine and Offshore Facilities:

- Site investigations and design for improvements/repairs and improvements for various marine facilities and related components or infrastructure in Antigua, St. Kitts, Grenada and St. Lucia, West Indies.
- Investigations, conceptual designs and engineering support and construction cost estimates for rehabilitation of hurricane battered container port and cruise ship jetty facilities at St. John's Antigua W.I., Basseterre St. Kitts W.I., and Vieux Fort St. Lucia W.I.
- Assessment of and preliminary engineering for improvements to Adams and Knickle Wharf in Lunenburg, Nova Scotia.
- Condition assessment for Liverpool Harbour breakwater for NS Lands.
- Pier 9/9A Repairs, Halifax Port Corporation.
- Fairview Cove Container Terminal Infrastructure Assessment for Halifax Port Corporation.
- Wharf rehabilitation and general waterfront development/improvements for Louisbourg, N.S.
- IEL Wharf structural analysis, Woodside, N.S.
- Design for a new public access wharf facility adjacent the IEL Wharf in Woodside, N.S. for the N.S.

JAMES B. YATES, P.ENG.

SENIOR STRUCTURAL/CIVIL ENGINEER

Department of Economic Development.

- Assessments of Port of Sheet Harbour Industrial Park wharf.
- Provision of engineering for development of the assembly yard for Strait Crossing Inc. in Borden PEI in support of construction of the Confederation Bridge linking PEI to New Brunswick.
- Engineering Manager and Fabrication Planner for Utility Shaft Modules Fabrication and Load-out, for Hibernia Offshore Oil Development Project.
- Lead Design Engineer for Deck Erection Supports for Cohasset Panuke Offshore Oil Development Project topsides modules fabrication and load-out.
- Analysis and derivation of required measures to correct dimensional distortions experienced during fabrication of the Cohasset Panuke topsides modules.
- Planning of fabrication yard layout, module movements and crane lifting operations for Cohasset Panuke topsides modules for M&M Offshore Ltd.
- Lead Engineer for computation of weight control and three dimensional centres of gravity data necessary for engineering of crane lifts for components and finished Cohasset Panuke topsides modules for M&M Offshore Ltd.

Building Projects:

- Design for piled foundations and steel superstructure for Metal fabrication plant for Woodside Fabricators Ltd.
- Structural evaluations for various buildings on Saint Mary's University Campus, and design of required remediation.
- Various residential inspections and assessments for Atlantic Home Warranty Program.
- Gunnery support training facility and related infrastructure for HMC Dockyard, Halifax.
- Various structural assessments and design for structural component additions at several N.S. schools for the provincial Department of Education and/or related school boards.
- Various pre-engineered steel building foundation designs for J.L. Nichols Contracting.
- Major structural and architectural enhancements for Royal Canadian Legion, Caen Branch 164, Eastern Passage, Nova Scotia.
- Structural design for Rita's Tea Room, Big Pond, Nova Scotia
- Various building modifications, Ship Repair Unit, CFB Halifax.
- Addition to Forbes' Chev Olds, Dartmouth, N.S. (now MacPhee Ford)
- Structural modifications and addition to Inn on the Lake, N.S.
- Operations and Maintenance Manual draft for CFB Halifax MARCOM building.
- Design and construction supervision of an industrial building at Woodside Industrial Park.
- Building assessments and building envelope inspections at Main Street, Tacoma Drive and Fielding Avenue for First Mutual Properties.
- Structural assessments and engineering for heritage and other structures and sets associated with filming and production of "The Scarlet Letter" motion picture in Shelburne, Nova Scotia.
- Structural and mechanical engineering support for sets and props associated with "The Sea Wolf" motion picture, filmed in Halifax.

Other Civil Projects:

- Seven kilometres of Trans-Canada Highway at Salt Springs, N.S.
- Rehabilitations for North Mountain Roadway in Highlands National Park, Cape Breton, N.S.
- Various new and existing municipal projects including water transmission and distribution systems; trunk sanitary sewers and treatment facilities throughout the Halifax Regional Municipality (including components of the Halifax Harbour Clean-up).
- Victoria Street Reconstruction, Town of Amherst.