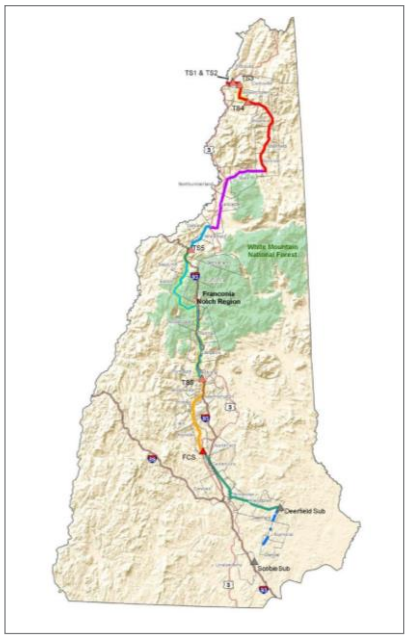
Proactive by Design

THE NORTHERN PASS TRANSMISSION PROJECT

Decommissioning Plan and Opinion of Probable Costs

July 21, 2016
File No. 04.0190502.00



THE NORTHERN PASS

PREPARED FOR:

EVERSOURCE ENERGY

GZA GeoEnvironmental, Inc.
5 Commerce Park North, Suite 201 | Bedford, NH 03110-6984
603-623-3600

27 Offices Nationwide
www.gza.com

TABLE OF CONTENTS

APPENDICES

1.0 BACKGROUND

The Northern Pass Transmission Project (NPT) includes the construction of 192 miles of new transmission lines to carry Hydro-Québec's hydroelectric power from the Canadian border to New Hampshire and New England. From the Québec, Canada/New Hampshire border 158-miles of 320kV direct current (DC) transmission lines will be installed extending to a converter terminal in Franklin, New Hampshire. The northern and central portions of the NPT alignment include 60 miles of transmission lines that will be installed underground. At the Franklin converter terminal, the power will be converted to alternating current (AC) and the transmission lines will continue overhead as AC power along an additional 34 miles of 345kV transmission lines to the existing Deerfield, New Hampshire Substation. Upgrades to the Deerfield and Scobie Pond Substations were not considered in this Decommissioning Plan or Opinion of Probable Cost (OPC) other than the installation of 10 new structures supporting transmission to Scobie Pond.

Aboveground transmission lines associated with the NPT will be installed in a new right-of-way (ROW) or corridor and existing Eversource ROWs and includes relocating certain existing Eversource AC lines to new locations within these existing ROWs to support construction of the NPT. Aboveground transmission lines will transition to 60 miles of underground line through sensitive scenic areas in the vicinity of the White Mountain National Forest, Franconia Notch, the Rocks Estate, and along the Appalachian Trail. In general, underground transmission lines will follow the alignment of local and State roadways.

Based on review of construction and permitting drawings provided to GZA, the major overhead transmission components of the 132 miles of overhead NPT transmission alignment included in the project consist of 731 Lattice Steel Towers (LSTs) bearing on drilled shafts or grillage foundations, 460 Tubular Steel Pole (TSPs) structures either directly embedded or bearing on drilled shaft foundations, a total of 396 miles of overhead aluminum alloy conductor (AAAC) cables, 216 miles of aluminum conductor steel-reinforced (ACSR) cables, associated insulators and jumper assemblies, approximately 130 miles of overhead static wire (OHSW), 130 miles of alumacore optical ground wire (OPGW), and grounding systems associated with certain structures. Six transition stations consisting of towers and underground enclosures are planned to support transition from aboveground to underground line. Permitting plans indicate that 16 percent of the towers are located in jurisdictional wetland areas with the remaining towers located on uplands.

The 60-mile underground transmission alignment generally consists of a two 8-inch-diameter direct-buried conduits holding approximately 120 total miles of HVDC XLPE cable and three 2-inch-diameter conduits housing a total of approximately 60 miles of Fiber Optic cable and temperature sensing cable. The underground transmission line is accessible by 39 6-foot-high by 30-foot-long by 10-foot-wide concrete enclosures. The underground transmission includes approximately 4.9 miles of line directionally drilled under water, road or railroad crossings at 52 separate locations and accessible by 104 enclosures. Directionally drilled underground transmission sections are installed in a casing (size currently unknown) with conduit spacers.

The Franklin Terminal will serve to convert the NPT power from DC to AC. The terminal consists of an approximately 320,000-square-foot yard surrounded by an 8-foot chain-link and barbed wire security fence and includes both gravel surfaces and concrete equipment and building pads. Existing site conditions at the terminal location consist of an approximately 20-foot grade change. The area is leveled by both cuts and fills to establish the terminal footprint. Improvements to the terminal area include two infiltration basins and drainage swales, piping, and structures. The area is accessed by paved and gravel access roads with steel guard-rails and two vehicle and one pedestrian gate. Details of the electrical equipment at the substation have not been provided at

the time this Decommissioning Plan was prepared; however, the equipment is understood to be similar to a conventional open-air substation.

This Decommissioning Plan and associated OPC has been prepared to assist with meeting the requirements the State of New Hampshire Site Evaluation Committee rule Site 301.08 (c) (2) and is limited to only new structures and components within the propose right of way that are associated with the 320kV and 345kV NPT between the Québec, Canada/New Hampshire border and the Franklin Terminal and ten new structures between the Deerfield, New Hampshire Substation and the Scobie Pond Substation in Londonderry.

2.0 GENERAL ASSUMPTIONS

This Decommissioning Plan and associated OPC are based on the following general assumptions:

- All transformers will be transported from the Site for recycling;
- As required by the State of New Hampshire Site Evaluation Committee, all below-ground infrastructure at overhead transmission line support locations shall be removed to a depth of at least 48 inches below grade;
- All underground infrastructure at depths greater than 48 inches below finished grade shall be abandoned in place;
- At the time of decommissioning, other transmission lines may be present in sections of the NPT ROW which may require de-energization to facilitate NPT decommissioning;
- Underground transmission lines within the disturbed area adjacent to State and local highways will be decommissioned by accessing and removing the cables via existing accessible concrete splice enclosures, conduits will be capped in the enclosures and remain in place, concrete enclosures will be removed to at least 48 inches below grade and backfilled with sand or gravel. Inaccessible, soil backfilled splice locations will be abandoned in-place as constructed;
- Underground transmission lines passing under waterways will be accessed via the adjacent concrete access enclosures, cables will be removed and the conduits will be grouted in-place. Enclosures will be demolished to 4 feet below grade;
- The access routes, site conditions, and wetland areas detailed in the provided construction and permit drawings will be similar at the time of decommissioning;
- Re-grading of ROW access roads will be limited to meet the approximate general pre-construction grades and drainage conditions. No import and limited off-site transfer of gravels will be required;
- Relocation or re-establishment of utility or third party communication systems incorporated into this project after its construction are not included;
- Relocation of Eversource AC lines are not included as these are part of a networked transmission system;

- No Salvage value is included in the OPC;
- Equipment design drawings for the Franklin Terminal have not been provided; therefore, general assumptions have been made based on available information;
- No provisions for facility disconnects or outage-related delays. Assumes all systems are de-energized at time of decommissioning;
- All costs presented in the OPC are in 2016 dollars and no provision for cost escalation or adjustment are included; and
- GZA's OPC should be considered a Class 3 Estimate as defined by the American Association of Cost Engineers Cost Estimate Classification System and is subject to limitations included in **Appendix D**.

3.0 STAGES OF DECOMMISSIONING

Decommissioning of the NPT will include:

1. Access planning and permitting similar to the approach utilized during construction;
2. Sequenced removal of the conductor cables, insulators, ground and static wires, guy wires, concrete enclosures, structures and foundations;
3. Plugging of under waterway, highway, or railway directionally drilled conduits;
4. Off-site transport of materials for salvage or disposal; and
5. Restoration.

The project will be performed in accordance with established electric utility practices, best management practices, final engineering plans, NPT specifications, and the conditions specified in certificates and permits obtained for the Project. We have assumed that conventional overhead and underground electric transmission line construction techniques will be used during decommissioning activities. The work will be sequenced to minimize impacts and a progression of activities that will generally proceed as follows:

<u>Overhead Structure Locations</u>

- Installation of soil erosion and sediment controls;
- Access improvement and maintenance;
- Remove conductor and OPGW;
- Remove OHSW;
- Remove structures;
- Remove grounding system and guy wiring (where present);

- Remove foundations (where present) to 48 inches below grade, if required; and
- Restoration of the ROW.

Underground Lines

- Installation of soil erosion and sediment controls (if required);
- Access improvement and maintenance (if required);
- Access cables at concrete splice enclosures;
- Remove conductors, Fiber Optic cable and temperature sensing cable;
- Cut and cap PVC conduits at concrete splice enclosures;
- Access and grout directionally drilled conduits under waterways, railways and highways;
- Remove concrete splice enclosures and backfill; and
- Restoration of the ROW.

Certain activities including removal of conductors, OPGW, and OHSW will require careful planning and sequencing to protect and stabilize structures during decommissioning. Given that several line and road crossings exist, additional temporary structures or planning will be required for completion of work in these locations. Safe working practices and protocols will be a significant component of the project and will need to be addressed as part of any activities performed as part of NPT decommissioning.

4.0 SPECIFIC COMPONENTS OF THE DECOMMISSIONING PROCESS

4.1 ENGINEERING, DESIGN, AND PERMITTING

Pre-construction engineering, design, and permitting will be required prior to initiation of any decommissioning activities. During pre-construction planning, details of accessing the work areas, sequencing of construction activities, and permitting of regulated work would be performed and an updated decommissioning study would be required to sufficiently address the regulations and standards at that time. For the purposes of GZA's OPC, we have assumed costs for engineering, design, and permitting based on a percentage of construction.

4.2 OVERHEAD TRANSMISSION LINE DECOMMISSIONING

4.2.1 Site Access, Work Areas, and Pull Pads

Mowing and maintenance of the ROW will take place prior to construction as part of routine vegetation management activities. Work areas for the removal, processing of materials, and off-site transport of the overhead transmission line components will consist of access roads, work pads at each tower location, pull pads, and material laydown and staging areas both within the ROW and at designated off-site locations. Access to the overhead 320kV and 345kV transmission lines for decommissioning is assumed to follow the approach currently proposed for construction as presented in the permitting plans prepared for construction of the NPT. The ROW will be accessed at road crossings and where required through designated private roads. Consistent with the current permitting approach, disturbance to wetland areas will be avoided or limited. Where necessary in upland areas, temporary gravel or crushed stone roads will be installed to improve access for construction equipment; however, the necessity for installation of temporary roadways is anticipated to be limited.

Similar to the methods used during construction, work areas of approximately 100 feet by 120 feet within straightaways and approximately 100 feet by 250 feet at alignment corners will be established at each structure location. As needed, temporary gravel or crushed stone improvements will be made at the designated work areas to allow for level work pads for construction equipment; however, the necessity of additional improvements at the upland structure locations is anticipated to be minimal, as site work will have been performed during NPT construction and maintenance activities will have occurred during the active use of the lines. In wetland areas, timber mats will be used to establish temporary work pads to minimize impacts. Best Management Practices will be utilized for the protection of wetland resources and other sensitive habitats or species.

Accessway improvement and maintenance will be carried out in compliance with the conditions and approvals of the appropriate federal, State, and local regulatory agencies. Exposed soils on accessways will be wetted and stabilized as necessary throughout decommissioning activities to suppress dust generation. Temporary construction entrances/exits will be used at accessway entrances to public roadways to clean the tires of construction vehicles and minimize the migration of soils off site.

Pull pads will be constructed to facilitate line removal. Pull pads are typically rectangular areas located approximately 300 feet ahead and behind structure locations and are approximately 50 feet in width. For the purposes of this Decommission Plan and OPC, we have assumed locations for pulling equipment will generally be established at approximately 1-mile spacing and will be set up at a 1 vertical:3 horizontal (1V:3H) distance or greater from the highest cable attachment point on the pulling structure. In certain locations for the project, work pads are located off center or pull pad sites will be shifted to avoid potential impacts to environmentally sensitive areas.

GZA's OPC assumes that a single layer of matting will be placed as shown on permitting plans. Costs savings may be realized by staggering and periodically relocating timber mat placement during decommissioning work to minimize rental costs.

4.2.2 Sequencing of Transmission Line Removal

In general, decommissioning activities will be in reverse of the construction using conventional overhead electric transmission line construction techniques. Following establishment of access roads, preparation of laydown areas, and installation of work pads and pull pads, removal of the structures will be systematically performed in a phased approach as generally detailed below.

4.2.2.1 Conductor and Cable Removal

Upon setup of work pad and accessing the work areas, removal of the NPT transmission lines will begin with the installation of pulley blocks where necessary to facilitate AAAC and ACSR conductor and OPGW removal. Worker access to unclip conductors and cables will be accomplished through use of a bucket truck or helicopter. Removal may include the use of stringing blocks and pulling ropes or controlled lowering to ground. Cable reels and pullers will be used at pull pad locations. Collected cable can then be removed from the collapsible reel and containerized into roll-off containers for recycling or transported to staging area on reel trailers.

OHSW and support guy wiring (where present) will remain in place on the towers until the towers are prepared for dismantling to maintain tower stability. OHSW will then be removed by the same methods used to collect the ACSR and ACSS conductor cables and OPGW.

Several transmission line and road crossings will be encountered during the NPT decommissioning project and additional planning and sequencing will be required for these locations. Removal of the 320kV and 345kV lines in areas of roadways and utility crossing will likely require temporary support at line intersections to maintain safe working areas and minimize disruption to other active transmission lines. To maintain safety during the NPT line removal, transmission cables will be cut at major road crossings prior to any conductor or line removal.

4.2.2.2 Insulator Removal

It is anticipated that insulators and associated hardware will be removed at the time of accessing the cables for removal. Insulator and metal hardware will be segregated and transported off site for recycling.

4.2.2.3 Structure Removals

Steel structures installed as part of the NPT construction are constructed of four-legged LSTs or 1-pole monopoles, 2-pole braced, or 3-pole unbraced arrangement TSPs. LSTs are generally constructed of 2 to 4 bolted sections and are founded on drilled shafts or grillage foundations. TSPs are generally constructed in 2 to 3 slip friction fit or bolted connections and are founded either by being directly buried into the ground or bearing on drilled shafts.

Structures will be removed by controlled dismantling with the use of a crane and crews working from platforms or bucket trucks. Following the removal of the ACSR and ACSS conductor, OPGW and OHSW, guy wires will be cut and the cross-arms and bracing (where present) will be removed. During disassembly, slip friction fit pole structures may be separated using hydraulic jacks, and bolted sections will be disassembled using conventional tools or torch cutting as needed. Steel sections will then be further disassembled and processed to recyclable size by cutting or torching either at the tower location work pad or at a general material management/laydown area. Material processed to size for transport will be transported off-site to a facility for recycling.

Guy wires and anchors will be cut or torch cut at 48 inches below existing grade or to top of bedrock, whichever is shallower. Limited excavation will be required to access buried guy wires during the decommissioning process.

4.2.2.4 Foundation Removal

Drilled shaft foundations for LSTs consist of an individual drilled shaft at each leg of the tower. Drilled shafts for TSPs consist of a single drilled shaft for each pole in the assembly and range from 5.5 feet to 9 feet in diameter. Drilled shafts have a 1-foot reveal and generally extend to bear on till or bedrock 12 to 40 feet below ground surface. To meet SEC requirements, drilled shafts will be removed to 48 inches below ground surface. Removal of drilled shafts will involve excavating to the proper depth of removal around the base of the foundation, chipping out the concrete, and then torching or cutting the reinforcing steel and anchor bolts as necessary.

Grillage foundations are used for a portion of the LSTs. Grillage steel will be removed to a depth of 48 inches below ground surface by excavating to the proper depth and torching or cutting the steel. Grillage pads bearing on soil are installed at depths of 5 to 8 feet below ground surface. These concrete pads will be abandoned in place. Where grillage pads are installed on rock within 48 inches of the ground surface, the

pads will be removed by chipping the concrete. Rock anchors will be removed by cutting or torching within 48 inches of the ground surface or at bedrock surface, whichever is shallower.

The removal of full length of direct-embedded TSPs may be possible; however, the OPC assumes that excavation around the poles and torch cutting may be required. If required, excavation along direct buried poles will be performed to allow for removal of the pole to the required depth of 48 inches.

Foundation removal excavations will be backfilled with excavated soils or sand or gravel borrow. Backfill will be compacted to limit settlement at former foundation locations.

4.2.3 Grounding System Removal

Detail of the NPT grounding system are not known at the time of this estimate; however, this estimate assumes that grounding wires will be present at upland tower locations. It is assumed that the grounding wires are installed at a depth of less than 4 feet below grade at each structure. During decommissioning, the grounding system associated with the structures will be removed by trenching, removal, and backfill.

Restoration of disturbed areas will be completed as described in **Section 4.8** below.

4.3 UNDERGROUND TRANSMISSION LINE REMOVAL

4.3.1 Cable Removal and Conduit Capping

Underground cables will be accessed via existing accessible splice enclosures. Conduits will be cut in the enclosures and the cables will be removed onto collapsible reels and transferred to trucks or roll-off containers for transport to off-site recycling. To limit unnecessary disturbance to roadways, underground transmission conduits and protective concrete caps will remain in place. In each accessible splice enclosure, the conduits will be cut near-flush with the concrete enclosure wall and capped with a mechanical cap or plugged with a minimum of 12 inches of hydraulic cement.

4.3.2 Directionally Drilled Conduit Plugging

Where NPT underground transmission lines are installed by directional drilling under sensitive areas such as waterways, highways, or railways. Cables will be accessed and removed as discussed above; however, in these areas the casing and conduits will be grouted. If the void space in the casings are grouted or otherwise filled during installation, then no grouting of casing during decommissioning will be required. Following the removal of the cables, conduit will be cut near-flush with the enclosure walls and the casing and conduits will be grouted. Grouting will be performed using a termie-pipe to the extent possible and grout will be installed from both ends of a section.

4.3.3 Enclosure Removal

Accessible concrete enclosures will be removed to approximately 48 inches below ground surface by chipping the concrete walls, torching or cutting rebar and removing debris with common excavation equipment. To maintain the integrity of conduits abandoned in place, enclosure walls will not be removed below the highest elevation conduit in passing through the enclosure. Enclosure bottoms will be perforated to allow drainage. Enclosures will be backfilled and the area restored as described in **Section 4.8** below.

4.4 TRANSITION STATION REMOVALS

Transitions stations consist of transition towers with underlying enclosures to allow the transmission line to transition from overhead to underground. These areas are protected with a chain-linked barbed-wire fence. Removal of these stations will be conducted in a manner similar to the processes described above for overhead and underground transmission lines. In addition, fencing and ancillary equipment associated with the transition stations will be removed and transported off site.

4.5 FRANKLIN TERMINAL REMOVAL

Detailed plans of the Franklin Terminal were unavailable during the development of this OPC. Therefore, for the purpose of this Decommissioning Plan and OPC, it is assumed that upon removal of the NPT transmission lines, the Franklin Terminal will also not be utilized by a public or private utility. Consistent with SEC requirements, the terminal will be removed including control house(s), electronic components, slabs and foundations and site improvements such as drainage structures. Equipment will be electrically disconnected and made safe for removal. Equipment containing oils and other liquids will be drained prior to removal and the contents will be disposed of at an approved facility. Structures, transformers, breakers, buswork, and other metal structures will also be disassembled and removed. Control house(s) and generator system, if present, will be dismantled and components will be removed and salvaged. Concrete slabs and foundations will be removed to approximately 48-inches feet below grade. All debris will be removed from the site. The site will be re-graded to meet the approximate pre-construction grading and drainage conditions. Access roads to the area will remain to allow site monitoring and future access. Partial off-site removal of gravel borrow used to construct the terminal may be required to meet the re-grading objectives. The terminal area will be revegetated upon completion of decommissioning activities.

4.6 RECYCLING AND MATERIAL MANAGEMENT

This Decommissioning Plan and associated OPC assumes that materials will be segregated and recycled to the greatest extent possible. No salvage or disposal costs are included in the OPC with the exception of small asphalt quantities. Tower steel, conductors, wires, insulators, and miscellaneous metal will be separated and transported off site for recycling. Insulators will be recycled, provided a local facility is available to accept this material. The OPC assumes concrete removed from the foundations will be processed for off-site re-use and gravels will be transported for re-use at cost.

It is anticipated that several staging areas will be required to support the decommissioning of the NPT transmission lines. Cables will be collected onto collapsing reels at pull pads or roadside work areas and placed in roll-off containers at each pull pad or work area location. Insulators, concrete, and other miscellaneous debris may be transported by construction equipment, truck, or roll-off container from the tower work pads, pull pad areas, or road-side work area to a central material staging location prior to off-site disposal.

GZA's OPC has assumed that steel structures will be processed within the designated work pad area and that limited pole or structure storage will be required.

4.7 HAZARDOUS MATERIAL MANAGEMENT

No known hazardous materials are present along the NPT transmission lines. Detailed plans of the Franklin Terminal are unavailable during the development of this OPC; however, is it anticipated that the terminal may

contain lubricating and fuel oils and universal wastes. All oils and liquids will be drained from equipment and tanks, containerized, characterized, and transported off site to a licensed disposal facility. Universal wastes such as lights, switches, thermostats, batteries, or refrigerants that may be present at the Franklin Terminal will be collected for proper off-site disposal prior to decommissioning of the terminal.

Petroleum fueling, hydraulic, and lubricating products associated with construction equipment being used during decommissioning activities are anticipated to be present within the ROW during the construction. As part of the preparation for decommissioning, an environmental protection plan will be prepared for the management of these materials and compliance with applicable regulations.

4.8 RESTORATION

4.8.1 Overhead Transmission Line ROW

All construction debris from the removed structures and foundations will be removed from the ROW. Restoration activities within the ROW will occur as work progresses by backfilling the pole and foundation to meet the existing grade. Upland structure foundation locations will be backfilled with sand or gravel. Wetland foundation holes will be backfilled with wetland soils. The disturbed areas will be seeded with an approved native seed mix.

It is anticipated that during decommissioning, existing roads and work pads will be utilized in upland areas and wetland areas will be protected with temporary timber matting and erosion and sediment controls. Upland areas requiring temporary gravel or crushed stone access road or working pad improvements will be regraded during site restoration as necessary.

During decommissioning planning, permitting agencies will be consulted regarding their input on restoration efforts for the ROW. Agencies may request that the ROW be stabilized but remain open. For the purposes of this Decommissioning Plan and OPC it is assumed that access road gravels will be re-worked to approach conditions similar to pre-construction grading and drainage conditions. Off-site site transport of work pad and access road gravels from of upland areas will be limited. For the purpose of this Decommissioning Plan and OPC we have assumed that up to 1,000 cubic yards of borrow will be transported from the ROW to a re-use area within 5 miles. No additional disturbance or restoration to areas within the ROW other than restoration of access roads and work pads is proposed.

Upon removal of the Franklin Terminal including the terminal surrounding area, and drainage improvements, the area shall be regraded to conditions similar to pre-construction. Removal of gravel borrow placed during the construction of the terminal will likely be required. Access roadways to the site will remain provide future access.

Placement of 3 inches of loam is proposed for disturbed areas at the Franklin Terminal and ROW access roads and gravel work pads in order to provide sufficient nutrients for vegetation to re-establish in these areas. Restoration of disturbed areas will consist of mulching and seeding with a native grass mix, slope mix, or native wetland mix as appropriate. Erosion and sediment control devices will be removed following the completion of work and establishment of vegetation in each work area as required by permit. Natural successional growth will be allowed for full restoration of vegetation in the ROW and, therefore, may take several years to accomplish and may be dependent on the current use and requirements of the ROW at that time.

4.8.2 Underground Transmission Line ROW

Underground transmission lines will be accessed at existing concrete splice enclosures. Upon removal of cables and vaults to a minimum 48 inches below ground surface, enclosure bottoms will be perforated to promote drainage and the enclosures will be backfilled to meet surrounding grades. In paved areas the former splice enclosures will be backfilled with sand or gravel, meeting New Hampshire Department of Transportation (NHDOT) requirements for pavement subgrade, subbase and base materials accordingly. Former splice enclosures located in roadway shoulders will be backfilled with compacted sand or gravel, meeting the requirements for roadway shoulders. Bituminous asphalt pavement disturbed during the removal of the splice enclosures will be repaired by saw cutting the edges and placement of hot-mix asphalt meeting NHDOT requirements for the roadway type and subgrade. Backfill and asphalt materials will be designed to meet and placed under the compaction, material testing, and inspection requirements of NHDOT.

4.9 LOGISTICS, WORK HOURS, AND TRAFFIC CONTROL

Work hours and traffic control will be in accordance with local requirements. A written plan for work hours, trucking routes, and traffic control noting local regulations will likely be developed during the pre-construction planning stage. A review of local noise and construction ordinances and lane closure requirement will be conducted during the project planning and permitting. No construction equipment, vehicle, or tool will be allowed to operate at the NPT decommissioning site outside of the times authorized by applicable permitting agencies.

Traffic control at road crossings may be required but costs have not been included in the OPC.

Truck routes for the off-site transport of waste and recyclables will be coordinated with local agencies and will be designed to minimize the impacts to residential neighborhoods and schools.

5.0 OPINION OF PROBABLE COSTS

GZA's OPC for decommissioning of the NPT, associated Franklin Terminal, and associated appurtenances is $99,935,719 and is detailed in Appendix A. GZA's OPC is based on review of the construction and permitting plans provided by Eversource and their consultant Burns & McDonnell, discussions with contractors familiar with this type of construction, local average cost data, industry cost averages, RSMeans 2016 Costworks Data, and our experience with oversight of construction related to transmission line projects. The OPC includes a 20 -percent cost contingency for cost overruns that regularly occur during construction but cannot be ascertained when an operation is being reviewed.

A summary of Construction and Permit Drawings reviewed as part of the development of this Decommissioning Plan and associated OPC is included in **Appendix B**.

*In general, the decommissioning approach presented herein is designed to maximize the recycling of all NPT components. Although the Site Evaluation Committee rule 301.08(c) does not allow salvage to be included in the base OPC, during decommissioning the individual project components will be recycled or salvaged to the maximum extent possible. The estimate value of salvaged materials for decommissioning of the NPT is $2,977,577. A breakdown of estimated salvage values based on current market pricing is summarized in **Appendix C**.*

6.0 FINANCIAL ASSURANCES

NPT's Application to the Site Evaluation Committee discusses the Applicant's financial capability to construct, operate, maintain, and decommission the Project at pp. 50-54. Volume II of the Application contains the pre-filed testimony of Michael J. Ausere, which addresses the financial assurances for decommissioning provided by the Transmission Service Agreement.

7.0 PREPARER'S STATEMENT AND QUALIFICATIONS

This Decommissioning Plan and associated OPC has been prepared under the direction of John C. Murphy, CCM, CHMM. Mr. Murphy is a Certified Construction Manager and Certified Hazardous Materials Manager and with over 29 years of experience in remediation, demolition, and facility decommissioning projects throughout the United States. Mr. Murphy is a Senior Principal at GZA and in this capacity he is responsible for overall management and oversight of a variety of projects and personnel. His experience includes construction management, cost estimating, schedule control and design in the environmental, building, demolition, and heavy construction industries. Mr. Murphy's resume is included in **Appendix E**.

John C. Murphy CCM, CHMM
Senior Principal

Appendix A - Opinion of Probable Costs Estimate

Northern Pass Opinion of Probable Costs
Summary

Task	Decommissioning Cost Estimate	Quantity	Unit	Total
Project Management/Logistics	$ 1,286,400.00	1	LS	$1,286,400
Wetland Matting/Access	$ 15,063,759.62	1	LS	$15,063,760
AAAC Wire Removal - DC	$ 1,096,012.12	1	LS	$1,096,012
ACRS Wire Removal - AC	$ 939,060.04	1	LS	$939,060
OPGW Removal	$ 1,068,299.60	1	LS	$1,068,300
OHSW Removal	$ 1,068,299.60	1	LS	$1,068,300
Underground Wire Removal	$ 142,982.75	1	LS	$142,983
Grouting of Underground Crossings	$ 7,099,799.45	1	LS	$7,099,799
Franklin Converter Station Removal	$ 1,233,908.44	1	LS	$1,233,908
Enclosure Removal	$ 370,163.69	39	EACH	$14,436,384
Restoration Upland Access Roads	$ 10,454,464.80	1	LS	$10,454,465
LST/grillage, <100' tower	$ 19,453.81	162	EACH	$3,151,517
LST/grillage, >100' tower	$ 23,344.57	48	EACH	$1,120,539
LST/drilled shaft, <100' Tower	$ 22,967.83	452	EACH	$10,381,459
LST/drilled shaft, >100' Tower	$ 27,561.40	69	EACH	$1,901,736
TSPs with one pole/drilled shaft, <100'	$ 15,256.13	161	EACH	$2,456,237
TSPs with one pole/drilled shaft, >100'	$ 18,307.36	89	EACH	$1,629,355
TSPs with two poles/direct embed, <100'	$ 21,953.26	120	EACH	$2,634,391
TSPs with two poles/direct embed, >100'	$ 26,343.91	23	EACH	$605,910
TSPs with three poles/drilled shaft, <100'	$ 27,819.73	56	EACH	$1,557,905
TSPs with three poles/drilled shaft, >100'	$ 33,383.68	11	EACH	$367,220
Transition Stations/Drilled Shafts/Enclosure	$ 63,509.62	6	EACH	$381,058
	Estimated Decommission Costs			$80,076,698
	Engineering, Design and Permitting	4%		$3,203,068
	Subtotal			$83,279,766
	Contingency	20%		$16,655,953
		ESTIMATED COSTS		**$99,935,719**

Notes: Estimates are based upon review of available pre-construction and permitting plans. Actual costs will vary.
Costs are provided for planning purposes only and should be considered a Class 3 Estimates as defined by AACE.

GZA

THE NORTHERN PASS

Northern Pass Transmission Decommissioning - Project Management/Logistics

NPT Opinion of Probable Costs

NPT - Project Management

Data Release : Year 2016 Quarter 2

Unit Cost Estimate

Quantity	Description	Crew	Daily Output	Labor Hours	Unit	Material	Labor	Equipment	Total	Ext. Mat.	Ext. Labor	Ext. Equip.	Ext. Total	Mat. O&P	Labor O&P	Equip. O&P	Total O&P	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P	Labor Type	CCI Location	Notes
104	Field personnel, project manager, maximum		0	0	Week	$ -	$ 2,675.00	$ -	$ 2,675.00	$ -	$ 278,200.00	$ -	$ 278,200.00	$ -	$ 4,100.00	$ -	$ 4,100.00	$ -	$ 426,400.00	$ -	$ 426,400.00	STD	NEW HAMPSHIRE / MANCHESTER (031)	Assumes 2 years construction management
4	Mobilization Estimate		0	0	Ea.	$ 20,000.00	$ -	$ -	$ 20,000.00	$ 80,000.00	$ -	$ -	$ 80,000.00	$ 25,000.00	$ -	$ -	$ 25,000.00	$ 100,000.00	$ -	$ -	$ 100,000.00	USER	NEW HAMPSHIRE / MANCHESTER (031)	Estimated costs for mobilization
48	Misc. Expenses per month		0	0	Ea.	$ 5,000.00	$ -	$ -	$ 5,000.00	$ 240,000.00	$ -	$ -	$ 240,000.00	$ 5,000.00	$ -	$ -	$ 5,000.00	$ 240,000.00	$ -	$ -	$ 240,000.00	USER	NEW HAMPSHIRE / MANCHESTER (031)	Estimated Costs per month
208	Field personnel, field engineer, maximum		0	0	Week	$ -	$ 1,625.00	$ -	$ 1,625.00	$ -	$ 338,000.00	$ -	$ 338,000.00	$ -	$ 2,500.00	$ -	$ 2,500.00	$ -	$ 520,000.00	$ -	$ 520,000.00	STD	NEW HAMPSHIRE / MANCHESTER (031)	Assumes 2 engineers for 2 years of construction
Total									**$ 29,300.00**	**$ 320,000.00**	**$ 616,200.00**	**$ -**	**$ 936,200.00**				**$ 36,600.00**	**$ 340,000.00**	**$ 946,400.00**	**$ -**	**$ 1,286,400.00**			

Note: Cost Data obtained from RSMeans Cost Works - 2016 Q2 Data. OPC estimate, actual costs will vary.

Northern Pass Transmission Decommissioning - Wetland Matting

Opinion of Probable Costs

NPT - Wetland Matting

CA Border to Deerfield
New Hampshire

Data Release : Year 2016 Quarter 2

Unit Cost Estimate

Quantity	Description	Crew	Daily Output	Labor Hours	Unit	Material	Labor	Equipment	Total	Ext. Mat.	Ext. Labor	Ext. Equip.	Ext. Total	Mat. O&P	Labor O&P	Equip. O&P	Total O&P	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P	Labor Type	CCI Location	Notes
2000000	Purchase Mats. Assumes 12 by 20 Mat		0	0	S.F.	$ 5.25	$ -	$ -	$ 5.25	$ 10,500,000.00	$ -	$ -	$ 10,500,000.00	$ 6.30	$ -	$ -	$ 6.30	$ 12,600,000.00	$ -	$ -	$ 12,600,000.00	USER	NEW HAMPSHIRE / CONCORD (032-033)	Purchase 2,000,000 SF of mats. $4.25 sf to purchase + $1.00 Transport
48	Rented truck, flatbed, GVW = 20,000 Lbs, Incl. Hourly Oper. Cost.		0	0	Month	$ -	$ -	$ 3,902.10	$ 3,902.10	$ -	$ -	$ 187,300.80	$ 187,300.80	$ -	$ -	$ 4,292.31	$ 4,292.31	$ -	$ -	$ 206,030.88	$ 206,030.88	STD	NEW HAMPSHIRE / CONCORD (032-033)	
520	Crane crew, daily use for small jobs, 55-ton truck-mounted hydraulic crane, portal to portal	A3K	1	16	Day	$ -	$ 741.83	$ 1,618.65	$ 2,360.48	$ -	$ 385,751.60	$ 841,698.00	$ 1,227,449.60	$ -	$ 1,134.00	$ -	$ 1,134.00	$ -	$ 589,680.00	$ -	$ 589,680.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	
48	Rent crane truck mounted, hydraulic, 55 ton capacity, Incl. Hourly Oper. Cost.		0	0	Month	$ -	$ -	$ 15,257.12	$ 15,257.12	$ -	$ -	$ 732,341.76	$ 732,341.76	$ -	$ -	$ 16,782.83	$ 16,782.83	$ -	$ -	$ 805,575.94	$ 805,575.94	STD	NEW HAMPSHIRE / CONCORD (032-033)	
520	Mobilization or demobilization, delivery charge for equipment, hauled on 50-ton capacity towed trailer	B34V	1	24	Ea.	$ -	$ 1,086.75	$ 1,030.05	$ 2,116.80	$ -	$ 565,110.00	$ 535,626.00	$ 1,100,736.00	$ -	$ 1,653.75	$ -	$ 1,653.75	$ -	$ 859,950.00	$ -	$ 859,950.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	Mat hauling
14	Line towers & fixtures, restoration & seeding	B10D	4	3	Acre	$ 374.00	$ 118.44	$ 446.36	$ 938.80	$ 5,236.00	$ 1,658.16	$ 6,249.04	$ 13,143.20	$ -	$ 180.20	$ -	$ 180.20	$ -	$ 2,522.80	$ -	$ 2,522.80	STD	NEW HAMPSHIRE / CONCORD (032-033)	
Total									**$ 24,580.55**	**$ 10,505,236.00**	**$ 952,519.76**	**$ 2,303,215.60**	**$ 13,760,971.36**				**$ 24,049.39**	**$ 12,600,000.00**	**$ 1,452,152.80**	**$ 1,011,606.82**	**$ 15,063,759.62**			

Note: Cost Data obtained from RSMeans Cost Works - 2016 Q2 Data. OPC estimate, actual costs will vary.

THE NORTHERN PASS

Northern Pass Transmission Decommissioning - Franklin Converter Terminal

Opinion of Probable Costs

NPT - Converter Terminal Removal

Franklin
New Hampshire

Data Release : Year 2016 Quarter 2

Unit Cost Estimate

Quantity	Description	Crew	Daily Output	Labor Hours	Unit	Material	Labor	Equipment	Total	Ext. Mat.	Ext. Labor	Ext. Equip.	Ext. Total	Mat. O&P	Labor O&P	Equip. O&P	Total O&P	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P	Labor Type	CCI Location	Notes
8	Rent excavator diesel hydraulic crawler mounted 1-1/2 CY capacity, Incl. Hourly Oper. Cost.		0	0	Week	$ -	$ -	$ 5,048.23	$ 5,048.23	$ -	$ -	$ 40,385.84	$ 40,385.84	$ -	$ -	$ 5,553.05	$ 5,553.05	$ -	$ -	$ 44,424.40	$ 44,424.40	STD	NEW HAMPSHIRE / CONCORD (032-033)	
12	Removal of Transformers No liquid disposal, transport of site		0	0	Ea.	$ -	$ 200.00	$ 400.00	$ 600.00	$ -	$ 2,400.00	$ 4,800.00	$ 7,200.00	$ -	$ 220.00	$ -	$ 220.00	$ -	$ 2,640.00	$ -	$ 2,640.00	USER	NEW HAMPSHIRE / CONCORD (032-033)	Assumes 12 transformers
100	Transport Substation equipment off site, each trip Estimated at two trucks per day for 50 days, 25-mile round trip. Not including liquid Disposal.		0	0	Ea.	$ -	$ 225.00	$ 850.00	$ 1,075.00	$ -	$ 22,500.00	$ 85,000.00	$ 107,500.00	$ -	$ 250.00	$ -	$ 250.00	$ -	$ 25,000.00	$ -	$ 25,000.00	USER	NEW HAMPSHIRE / CONCORD (032-033)	
22300	Building footings and foundations demolition, floors, concrete slab on grade, concrete, rod reinforced, 6" thick, excludes disposal costs and dump fees	B13L	3600	0	S.F.	$ -	$ 0.23	$ 0.56	$ 0.79	$ -	$ 5,129.00	$ 12,488.00	$ 17,617.00	$ -	$ 0.34	$ 0.62	$ 0.96	$ -	$ 7,582.00	$ 13,826.00	$ 21,408.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	Exterior slabs and misc. foundations associated with station
1042	Clean concrete disposal savings, unit cost credit, excludes handling, packaging, or disposal costs		0	0	Ton	$ -	$ -	$ -	$ 62.00	$ -	$ -	$ -	$ 64,604.00	$ -	$ -	$ -	$ 62.00	$ -	$ -	$ -	$ 64,604.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	
32	Field personnel, general purpose laborer, average		0	0	Week	$ -	$ 1,525.00	$ -	$ 1,525.00	$ -	$ 48,800.00	$ -	$ 48,800.00	$ -	$ 2,325.00	$ -	$ 2,325.00	$ -	$ 74,400.00	$ -	$ 74,400.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	4 laborers for 4 weeks
8	Field personnel, superintendent, minimum		0	0	Week	$ -	$ 1,975.00	$ -	$ 1,975.00	$ -	$ 15,800.00	$ -	$ 15,800.00	$ -	$ 3,050.00	$ -	$ 3,050.00	$ -	$ 24,400.00	$ -	$ 24,400.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	
12	Rent loader, skid steer, wheeled, 1 CY 78 HP, diesel, Incl. Hourly Oper. Cost.		0	0	Week	$ -	$ -	$ 1,548.02	$ 1,548.02	$ -	$ -	$ 18,576.24	$ 18,576.24	$ -	$ -	$ 1,702.82	$ 1,702.82	$ -	$ -	$ 20,433.84	$ 20,433.84	STD	NEW HAMPSHIRE / CONCORD (032-033)	
12	Rent skid steer attachment, forks, Incl. Hourly Oper. Cost.		0	0	Week	$ -	$ -	$ 117.52	$ 117.52	$ -	$ -	$ 1,410.24	$ 1,410.24	$ -	$ -	$ 129.27	$ 129.27	$ -	$ -	$ 1,551.24	$ 1,551.24	STD	NEW HAMPSHIRE / CONCORD (032-033)	
750	Selective demolition, chain link fences & gates, gates, cantilever, to 40' width	B6	80	0.3	L.F.	$ -	$ 12.30	$ 4.48	$ 16.78	$ -	$ 9,225.00	$ 3,360.00	$ 12,585.00	$ -	$ 18.75	$ 4.95	$ 23.70	$ -	$ 14,062.50	$ 3,712.50	$ 17,775.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	Fence removal around substation
750000	Building demolition, small buildings or single buildings, steel, includes 20-mile haul, excludes salvage, foundation demolition or dump fees	B3	14800	0	C.F.	$ -	$ 0.14	$ 0.17	$ 0.31	$ -	$ 105,000.00	$ 127,500.00	$ 232,500.00	$ -	$ 0.21	$ 0.19	$ 0.40	$ -	$ 157,500.00	$ 142,500.00	$ 300,000.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	Assumes irregular shaped 250-foot by 250-foot by 12-foot steel framed building
62500	Building footings and foundations demolition, floors, concrete slab on grade, concrete, wire mesh reinforced, 6" thick, excludes disposal costs and dump fees	B13L	3200	0.01	S.F.	$ -	$ 0.26	$ 0.63	$ 0.89	$ -	$ 16,250.00	$ 39,375.00	$ 55,625.00	$ -	$ 0.39	$ 0.70	$ 1.09	$ -	$ 24,375.00	$ 43,750.00	$ 68,125.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	Building slab and foundation removal
2540	Selective demolition, chain link fences & gates, fence, 12' high	B6	400	0.06	L.F.	$ -	$ 2.46	$ 0.89	$ 3.35	$ -	$ 6,248.40	$ 2,260.60	$ 8,509.00	$ -	$ 3.75	$ 0.99	$ 4.74	$ -	$ 9,525.00	$ 2,514.60	$ 12,039.60	STD	NEW HAMPSHIRE / CONCORD (032-033)	Remove fence around station
20	Field personnel, general purpose laborer, average		0	0	Week	$ -	$ 1,525.00	$ -	$ 1,525.00	$ -	$ 30,500.00	$ -	$ 30,500.00	$ -	$ 2,325.00	$ -	$ 2,325.00	$ -	$ 46,500.00	$ -	$ 46,500.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	4 laborers for 4 weeks
10	Field personnel, superintendent, maximum		0	0	Week	$ -	$ 2,475.00	$ -	$ 2,475.00	$ -	$ 24,750.00	$ -	$ 24,750.00	$ -	$ 3,800.00	$ -	$ 3,800.00	$ -	$ 38,000.00	$ -	$ 38,000.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	
5000	Cycle hauling(wait, load, travel, unload or dump & return) time per cycle, excavated or borrow, loose cubic yards, 15-minute wait/load/unload, 8 C.Y. truck, cycle 8 miles, 15 MPH, excludes loading equipment	B34A	80	0.1	L.C.Y.	$ -	$ 4.26	$ 5.10	$ 9.36	$ -	$ 21,300.00	$ 25,500.00	$ 46,800.00	$ -	$ 6.45	$ 5.64	$ 12.09	$ -	$ 32,250.00	$ 28,200.00	$ 60,450.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	5000 CY of gravel transported off site. No disposal fees
8	Rent front end loader, 4WD, art. frame, diesel, 1.75 - 2 CY 130 HP, Incl. Hourly Oper. Cost.		0	0	Week	$ -	$ -	$ 2,221.97	$ 2,221.97	$ -	$ -	$ 17,775.76	$ 17,775.76	$ -	$ -	$ 2,444.17	$ 2,444.17	$ -	$ -	$ 19,553.36	$ 19,553.36	STD	NEW HAMPSHIRE / CONCORD (032-033)	
3500	Disposal of substation equipment. Includes Disposal at solid waste landfill per ton		0	0	Ton	$ 18.00	$ -	$ 5.00	$ 23.00	$ 63,000.00	$ -	$ 17,500.00	$ 80,500.00	$ 21.00	$ -	$ 5.00	$ 26.00	$ 73,500.00	$ -	$ 17,500.00	$ 91,000.00	USER	NEW HAMPSHIRE / CONCORD (032-033)	Disposal of station equipment as non hazardous materials - Assumes acceptable at Rochester NH Landfill. No salvage included in estimate. Includes Transportation
30	Loader Operator - 8 hours per day		0	0	Day	$ -	$ 393.20	$ -	$ 393.20	$ -	$ 11,796.00	$ -	$ 11,796.00	$ -	$ 594.80	$ -	$ 594.80	$ -	$ 17,844.00	$ -	$ 17,844.00	USER	NEW HAMPSHIRE / CONCORD (032-033)	equipment costs covered under 015433204650
60	Skid Steer Operator - 8 hours per day		0	0	Day	$ -	$ 393.20	$ -	$ 393.20	$ -	$ 23,592.00	$ -	$ 23,592.00	$ -	$ 594.80	$ -	$ 594.80	$ -	$ 35,688.00	$ -	$ 35,688.00	USER	NEW HAMPSHIRE / CONCORD (032-033)	
60	Excavator Operator - 8 hours per day		0	0	Day	$ -	$ 408.80	$ -	$ 408.80	$ -	$ 24,528.00	$ -	$ 24,528.00	$ -	$ 618.40	$ -	$ 618.40	$ -	$ 37,104.00	$ -	$ 37,104.00	USER	NEW HAMPSHIRE / CONCORD (032-033)	
32	Crane crew, daily use for small jobs, 100-ton truck-mounted hydraulic crane, portal to portal	A3M	1	16	Day	$ -	$ 741.83	$ 2,329.88	$ 3,071.71	$ -	$ 23,738.56	$ 74,556.16	$ 98,294.72	$ -	$ 1,134.00	$ 2,575.13	$ 3,709.13	$ -	$ 36,288.00	$ 82,404.16	$ 118,692.16	STD	NEW HAMPSHIRE / CONCORD (032-033)	
1200	Selective demolition, rip-rap & rock lining, slope protection broken stone	B13	62	0.9	C.Y.	$ -	$ 36.90	$ 11.87	$ 48.77	$ -	$ 44,280.00	$ 14,244.00	$ 58,524.00	$ -	$ 56.09	$ 13.05	$ 69.14	$ -	$ 67,308.00	$ 15,660.00	$ 82,968.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	Includes removal/regrading of Forebays, spillways, sediment traps, stabilized outlets, check dams, stone berms and stabilized slopes

THE NORTHERN PASS

Northern Pass Transmission Decommissioning - Franklin Converter Terminal

Opinion of Probable Costs

NPT - Converter Terminal Removal

Franklin
New Hampshire

Data Release : Year 2016 Quarter 2

Unit Cost Estimate

Quantity	Description	Crew	Daily Output	Labor Hours	Unit	Material	Labor	Equipment	Total	Ext. Mat.	Ext. Labor	Ext. Equip.	Ext. Total	Mat. O&P	Labor O&P	Equip. O&P	Total O&P	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P	Labor Type	CCI Location	Notes
2	Utility removal, remove existing catch basin or manhole, masonry, excludes hauling	B6	4	6	Ea.	$ -	$ 246.00	$ 89.76	$ 335.76	$ -	$ 492.00	$ 179.52	$ 671.52	$ -	$ 373.92	$ -	$ 373.92	$ -	$ 747.84	$ -	$ 747.84	STD	NEW HAMPSHIRE / CONCORD (032-033)	
1000	Utility removal, pipe, sewer/water, 12" diameter, remove, excludes excavation, hauling	B6	175	0.14	L.F.	$ -	$ 5.61	$ 2.05	$ 7.66	$ -	$ 5,610.00	$ 2,050.00	$ 7,660.00	$ -	$ 8.56	$ -	$ 8.56	$ -	$ 8,560.00	$ -	$ 8,560.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	Underdrain removal
Total									**$ 22,886.32**	**$ 63,000.00**	**$ 441,938.96**	**$ 486,961.36**	**$ 1,056,504.32**				**$ 27,899.04**	**$ 73,500.00**	**$ 659,774.34**	**$ 436,030.10**	**$ 1,233,908.44**			

Note: Cost Data obtained from RSMeans Cost Works - 2016 Q2 Data. OPC estimate, actual costs will vary.

Northern Pass Transmission Decommissioning - Upland Access Road and Work Pad Restoration

Opinion of Probable Costs

NPT - Access Road and Work Pad Restoration

CA Border to Deerfield
New Hampshire

Data Release : Year 2016 Quarter 2

Unit Cost Estimate

Quantity	Description	Crew	Daily Output	Labor Hours	Unit	Material	Labor	Equipment	Total	Ext. Mat.	Ext. Labor	Ext. Equip.	Ext. Total	Mat. O&P	Labor O&P	Equip. O&P	Total O&P	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P	Labor Type	CCI Location	Notes
410	Seeding, mechanical seeding, 215 lb./acre	B66	1.5	5.33	Acre	$ 469.28	$ 262.26	$ 172.66	$ 904.20	$ 192,404.80	$ 107,526.60	$ 70,790.60	$ 370,722.00	$ 515.37	$ 395.40	$ 189.33	$ 1,100.10	$ 211,301.70	$ 162,114.00	$ 77,625.30	$ 451,041.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	2,035,062 square feet of road and WTG pad reclamation 47 acres
660	Hauling, heavy, dust control, includes loading	B59	0.5	16	Day	$ -	$ 679.65	$ 981.00	$ 1,660.65	$ -	$ 448,569.00	$ 647,460.00	$ 1,096,029.00	$ -	$ 1,034.25	$ 1,079.10	$ 2,113.35	$ -	$ 682,605.00	$ 712,206.00	$ 1,394,811.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	120 days of dust control during road rehabilitation
0	Soil preparation, structural soil mixing, tilling topsoil, 6" deep, 20 HP tractor, disk harrow\	B66	270	0.03	M.S.F.	$ -	$ 1.46	$ 0.96	$ 2.42	$ -	$ -	$ -	$ -	$ -	$ 2.20	$ 1.05	$ 3.25	$ -	$ -	$ -	$ -	STD	NEW HAMPSHIRE / CONCORD (032-033)	Road reclamation based on 2036 MSF and assumes soil mixing to 8 to 12 inches below grade
0	Soils for earthwork, borrow, spread with 200 HP dozer, includes load at pit and haul, round trip, excludes compaction, for 5-mile haul, add	B34B	200	0.04	C.Y.	$ -	$ 1.70	$ 3.38	$ 5.08	$ -	$ -	$ -	$ -	$ -	$ 2.57	$ 3.73	$ 6.30	$ -	$ -	$ -	$ -	STD	NEW HAMPSHIRE / CONCORD (032-033)	Estimate assumes 1/2 road area borrow fill and seed
660	Rent backhoe-loader wheel type 112 HP, 1-1/2 CY capacity, Incl. Hourly Oper. Cost.		0	0	Day	$ -	$ -	$ 943.72	$ 943.72	$ -	$ -	$ 622,855.20	$ 622,855.20	$ -	$ -	$ 1,038.09	$ 1,038.09	$ -	$ -	$ 685,139.40	$ 685,139.40	STD	NEW HAMPSHIRE / CONCORD (032-033)	Does not include operator costs. Operator costs are in line 015433200471
132	Field personnel, general purpose laborer, average		0	0	Week	$ -	$ 1,525.00	$ -	$ 1,525.00	$ -	$ 201,300.00	$ -	$ 201,300.00	$ -	$ 2,325.00	$ -	$ 2,325.00	$ -	$ 306,900.00	$ -	$ 306,900.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	Assumes 1 week per mile of overhead alignment
75	Field personnel, superintendent, maximum		0	0	Week	$ -	$ 2,475.00	$ -	$ 2,475.00	$ -	$ 185,625.00	$ -	$ 185,625.00	$ -	$ 3,800.00	$ -	$ 3,800.00	$ -	$ 285,000.00	$ -	$ 285,000.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	
660	Heavy Equipment Operator - 8-hour day		0	0	Day	$ -	$ 408.80	$ -	$ 408.80	$ -	$ 269,808.00	$ -	$ 269,808.00	$ -	$ 618.40	$ -	$ 618.40	$ -	$ 408,144.00	$ -	$ 408,144.00	USER	NEW HAMPSHIRE / CONCORD (032-033)	Heavy Equipment Operator - Backhoe. Re-grading
164000	Soils for earthwork, screened loam borrow, spread with 200 H.P. dozer, includes load at pit and haul, 2 miles round trip, excludes compaction	B15	600	0.05	C.Y.	$ 25.62	$ 2.06	$ 4.54	$ 32.22	$ 4,201,680.00	$ 337,840.00	$ 744,560.00	$ 5,284,080.00	$ 28.00	$ 3.11	$ 5.00	$ 36.11	$ 4,592,000.00	$ 510,040.00	$ 820,000.00	$ 5,922,040.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	
1000	Cycle hauling(wait, load, travel, unload or dump & return) time per cycle, excavated or borrow, loose cubic yards, 10-minute wait/load/unload, 8 C.Y. truck, cycle 8 miles, 30 MPH, excludes loading equipment	B34A	144	0.06	L.C.Y.	$ -	$ 2.36	$ 2.84	$ 5.20	$ -	$ 2,360.00	$ 2,840.00	$ 5,200.00	$ -	$ 3.58	$ 3.13	$ 6.71	$ -	$ 3,580.00	$ 3,130.00	$ 6,710.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	
132	Rent dozer, crawler, torque converter, diesel 200 HP, Incl. Hourly Oper. Cost.		0	0	Week	$ -	$ -	$ 6,850.41	$ 6,850.41	$ -	$ -	$ 904,254.12	$ 904,254.12	$ -	$ -	$ 7,535.45	$ 7,535.45	$ -	$ -	$ 994,679.40	$ 994,679.40	STD	NEW HAMPSHIRE / CONCORD (032-033)	
Total									**$ 14,812.70**	**$ 4,394,084.80**	**$ 1,553,028.60**	**$ 2,992,759.92**	**$ 8,939,873.32**				**$ 18,582.76**	**$ 4,803,301.70**	**$ 2,358,383.00**	**$ 3,292,780.10**	**$ 10,454,464.80**			

Note: Cost Data obtained from RSMeans Cost Works - 2016 Q2 Data. OPC estimate, actual costs will vary.

Northern Pass Transmission Decommissioning - ACSR Conductor Removal - Overhead

Opinion of Probable Costs

NPT - ACSR Removal - Overhead

Franklin to Deerfield
New Hampshire

Data Release : Year 2016 Quarter 2

Unit Cost Estimate

Quantity	Description	Crew	Daily Output	Labor Hours	Unit	Material	Labor	Equipment	Total	Ext. Mat.	Ext. Labor	Ext. Equip.	Ext. Total	Mat. O&P	Labor O&P	Equip. O&P	Total O&P	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P	Labor Type	CCI Location	Notes
14	Field personnel, superintendent, average		0	0	Week	$ -	$ 2,175.00	$ -	$ 2,175.00	$ -	$ 30,450.00	$ -	$ 30,450.00	$ -	$ 3,350.00	$ -	$ 3,350.00	$ -	$ 46,900.00	$ -	$ 46,900.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	
60	Field personnel, general purpose laborer, average		0	0	Week	$ -	$ 1,525.00	$ -	$ 1,525.00	$ -	$ 91,500.00	$ -	$ 91,500.00	$ -	$ 2,325.00	$ -	$ 2,325.00	$ -	$ 139,500.00	$ -	$ 139,500.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	
218	Overhead line conductors & devices, ground wire, disposal of surplus material	R5	41.74	2.11	Mile	$ -	$ 86.29	$ 34.34	$ 120.63	$ -	$ 18,811.22	$ 7,486.12	$ 26,297.34	$ -	$ 130.28	$ 38.26	$ 168.54	$ -	$ 28,401.04	$ 8,340.68	$ 36,741.72	STD	NEW HAMPSHIRE / CONCORD (032-033)	
218	Overhead line conductors & devices, underbuilt circuits, material handling & spotting	R7	5.65	8.5	W.Mile	$ -	$ 283.41	$ 36.30	$ 319.71	$ -	$ 61,783.38	$ 7,913.40	$ 69,696.78	$ -	$ 435.69	$ 39.73	$ 475.42	$ -	$ 94,980.42	$ 8,661.14	$ 103,641.56	STD	NEW HAMPSHIRE / CONCORD (032-033)	6 conductors - 218 mi of conductor wire.
218	Overhead line conductors & devices, disposal of surplus material, high voltage conductors, with trailer-mounted reel stands	R7	13.71	3.5	Mile	$ -	$ 115.90	$ 14.96	$ 130.86	$ -	$ 25,266.20	$ 3,261.28	$ 28,527.48	$ -	$ 178.51	$ 16.43	$ 194.94	$ -	$ 38,915.18	$ 3,581.74	$ 42,496.92	STD	NEW HAMPSHIRE / CONCORD (032-033)	
32	Rent trailer with cable pulling rig, for high voltage line work, Incl. Hourly Oper. Cost.		0	0	Week	$ -	$ -	$ 11,480.84	$ 11,480.84	$ -	$ -	$ 367,386.88	$ 367,386.88	$ -	$ -	$ 12,628.92	$ 12,628.92	$ -	$ -	$ 404,125.44	$ 404,125.44	STD	NEW HAMPSHIRE / CONCORD (032-033)	
40	Mobilization or demobilization, delivery charge for equipment, hauled on 3-ton-capacity towed trailer	A3Q	2.67	3	Ea.	$ -	$ 138.92	$ 66.22	$ 205.14	$ -	$ 5,556.80	$ 2,648.80	$ 8,205.60	$ -	$ 210.74	$ 73.08	$ 283.82	$ -	$ 8,429.60	$ 2,923.20	$ 11,352.80	STD	NEW HAMPSHIRE / CONCORD (032-033)	Assumes 40 Pull Pad locations
56	Selective demolition, rubbish handling, dumpster, 40 C.Y., 10-ton capacity, weekly rental, includes one dump per week, cost to be added to demolition cost		0	0	Week	$ 775.00	$ -	$ -	$ 775.00	$ 43,400.00	$ -	$ -	$ 43,400.00	$ 850.00	$ -	$ -	$ 850.00	$ 47,600.00	$ -	$ -	$ 47,600.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	Assume 4 40CY roll-off rentals for 15 weeks
30	Lifting and hoisting equipment rental; aerial lift truck, 2 persons, 80', Incl. Hourly Oper. Cost.		0	0	Week	$ -	$ -	$ 3,233.38	$ 3,233.38	$ -	$ -	$ 97,001.40	$ 97,001.40	$ -	$ -	$ 3,556.72	$ 3,556.72	$ -	$ -	$ 106,701.60	$ 106,701.60	STD	NEW HAMPSHIRE / CONCORD (032-033)	342 structures. Assumes blocking 5 per day - total of approx. 14 weeks also includes road crossing work.
Total									**$ 19,965.56**	**$ 43,400.00**	**$ 233,367.60**	**$ 485,697.88**	**$ 762,465.48**				**$ 23,833.36**	**$ 47,600.00**	**$ 357,126.24**	**$ 534,333.80**	**$ 939,060.04**			

Note: Cost Data obtained from RSMeans Cost Works - 2016 Q2 Data. OPC estimate, actual costs will vary.

Northern Pass Transmission Decommissioning - AAAC Conductor Removal - Overhead

Opinion of Probable Costs

NPT - AAAC Removal - Overhead

CA Border to Deerfield
New Hampshire

Data Release : Year 2016 Quarter 2

Unit Cost Estimate

Quantity	Description	Crew	Daily Output	Labor Hours	Unit	Material	Labor	Equipment	Total	Ext. Mat.	Ext. Labor	Ext. Equip.	Ext. Total	Mat. O&P	Labor O&P	Equip. O&P	Total O&P	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P	Labor Type	CCI Location	Notes
25	Field personnel, superintendent, average		0	0	Week	$ -	$ 2,175.00	$ -	$ 2,175.00	$ -	$ 54,375.00	$ -	$ 54,375.00	$ -	$ 3,350.00	$ -	$ 3,350.00	$ -	$ 83,750.00	$ -	$ 83,750.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	
50	Field personnel, general purpose laborer, average		0	0	Week	$ -	$ 1,525.00	$ -	$ 1,525.00	$ -	$ 76,250.00	$ -	$ 76,250.00	$ -	$ 2,325.00	$ -	$ 2,325.00	$ -	$ 116,250.00	$ -	$ 116,250.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	
396	Overhead line conductors & devices, ground wire, disposal of surplus material	R5	41.74	2.11	Mile	$ -	$ 86.29	$ 34.34	$ 120.63	$ -	$ 34,170.84	$ 13,598.64	$ 47,769.48	$ -	$ 130.28	$ 38.26	$ 168.54	$ -	$ 51,590.88	$ 15,150.96	$ 66,741.84	STD	NEW HAMPSHIRE / CONCORD (032-033)	
396	Overhead line conductors & devices, underbuilt circuits, material handling & spotting	R7	5.65	8.5	W.Mile	$ -	$ 283.41	$ 36.30	$ 319.71	$ -	$ 112,230.36	$ 14,374.80	$ 126,605.16	$ -	$ 435.69	$ 39.73	$ 475.42	$ -	$ 172,533.24	$ 15,733.08	$ 188,266.32	STD	NEW HAMPSHIRE / CONCORD (032-033)	6 conductors - 577,600 LF or 109 miles of conductor wire
396	Overhead line conductors & devices, disposal of surplus material, high voltage conductors, with trailer-mounted reel stands	R7	13.71	3.5	Mile	$ -	$ 115.90	$ 14.96	$ 130.86	$ -	$ 45,896.40	$ 5,924.16	$ 51,820.56	$ -	$ 178.51	$ 16.43	$ 194.94	$ -	$ 70,689.96	$ 6,506.28	$ 77,196.24	STD	NEW HAMPSHIRE / CONCORD (032-033)	
25	Rent trailer with cable pulling rig, for high voltage line work, Incl. Hourly Oper. Cost.		0	0	Week	$ -	$ -	$ 11,480.84	$ 11,480.84	$ -	$ -	$ 287,021.00	$ 287,021.00	$ -	$ -	$ 12,628.92	$ 12,628.92	$ -	$ -	$ 315,723.00	$ 315,723.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	
136	Mobilization or demobilization, delivery charge for equipment, hauled on 3-ton-capacity towed trailer	A3Q	2.67	3	Ea.	$ -	$ 138.92	$ 66.22	$ 205.14	$ -	$ 18,893.12	$ 9,005.92	$ 27,899.04	$ -	$ 210.74	$ 73.08	$ 283.82	$ -	$ 28,660.64	$ 9,938.88	$ 38,599.52	STD	NEW HAMPSHIRE / CONCORD (032-033)	Assumes 136 Pull Pad locations
100	Selective demolition, rubbish handling, dumpster, 40 C.Y., 10-ton capacity, weekly rental, includes one dump per week, cost to be added to demolition cost		0	0	Week	$ 775.00	$ -	$ -	$ 775.00	$ 77,500.00	$ -	$ -	$ 77,500.00	$ 850.00	$ -	$ -	$ 850.00	$ 85,000.00	$ -	$ -	$ 85,000.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	Assume 4 40CY roll-off rentals for 25 weeks
35	Lifting and hoisting equipment rental; aerial lift truck, 2 persons, 80', Incl. Hourly Oper. Cost.		0	0	Week	$ -	$ -	$ 3,233.38	$ 3,233.38	$ -	$ -	$ 113,168.30	$ 113,168.30	$ -	$ -	$ 3,556.72	$ 3,556.72	$ -	$ -	$ 124,485.20	$ 124,485.20	STD	NEW HAMPSHIRE / CONCORD (032-033)	855 structures. Assumes blocking 5 per day - total of approx. 35 weeks also includes road crossing work.
Total									**$ 19,965.56**	**$ 77,500.00**	**$ 341,815.72**	**$ 443,092.82**	**$ 862,408.54**				**$ 23,833.36**	**$ 85,000.00**	**$ 523,474.72**	**$ 487,537.40**	**$ 1,096,012.12**			

Note: Cost Data obtained from RSMeans Cost Works - 2016 Q2 Data. OPC estimate, actual costs will vary.

Northern Pass Transmission Decommissioning - OPGW Removal - Overhead

Opinion of Probable Costs

NPT - OPGW Removal - Overhead

CA Border to Deerfield
New Hampshire

Data Release : Year 2016 Quarter 2

Unit Cost Estimate

Quantity	Description	Crew	Daily Output	Labor Hours	Unit	Material	Labor	Equipment	Total	Ext. Mat.	Ext. Labor	Ext. Equip.	Ext. Total	Mat. O&P	Labor O&P	Equip. O&P	Total O&P	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P	Labor Type	CCI Location	Notes
12	Field personnel, superintendent, average		0	0	Week	$ -	$ 2,175.00	$ -	$ 2,175.00	$ -	$ 26,100.00	$ -	$ 26,100.00	$ -	$ 3,350.00	$ -	$ 3,350.00	$ -	$ 40,200.00	$ -	$ 40,200.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	
36	Field personnel, general purpose laborer, average		0	0	Week	$ -	$ 1,525.00	$ -	$ 1,525.00	$ -	$ 54,900.00	$ -	$ 54,900.00	$ -	$ 2,325.00	$ -	$ 2,325.00	$ -	$ 83,700.00	$ -	$ 83,700.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	
130	Overhead line conductors & devices, ground wire, disposal of surplus material	R5	41.74	2.11	Mile	$ -	$ 86.29	$ 34.34	$ 120.63	$ -	$ 11,217.70	$ 4,464.20	$ 15,681.90	$ -	$ 130.28	$ 38.26	$ 168.54	$ -	$ 16,936.40	$ 4,973.80	$ 21,910.20	STD	NEW HAMPSHIRE / CONCORD (032-033)	
130	Overhead line conductors & devices, underbuilt circuits, material handling & spotting	R7	5.65	8.5	W.Mile	$ -	$ 283.41	$ 36.30	$ 319.71	$ -	$ 36,843.30	$ 4,719.00	$ 41,562.30	$ -	$ 435.69	$ 39.73	$ 475.42	$ -	$ 56,639.70	$ 5,164.90	$ 61,804.60	STD	NEW HAMPSHIRE / CONCORD (032-033)	1 OPGW Line - 130 miles
130	Overhead line conductors & devices, disposal of surplus material, high voltage conductors, with trailer-mounted reel stands	R7	13.71	3.5	Mile	$ -	$ 115.90	$ 14.96	$ 130.86	$ -	$ 15,067.00	$ 1,944.80	$ 17,011.80	$ -	$ 178.51	$ 16.43	$ 194.94	$ -	$ 23,206.30	$ 2,135.90	$ 25,342.20	STD	NEW HAMPSHIRE / CONCORD (032-033)	
48	Rent trailer with cable pulling rig, for high voltage line work, Incl. Hourly Oper. Cost.		0	0	Week	$ -	$ -	$ 11,480.84	$ 11,480.84	$ -	$ -	$ 551,080.32	$ 551,080.32	$ -	$ -	$ 12,628.92	$ 12,628.92	$ -	$ -	$ 606,188.16	$ 606,188.16	STD	NEW HAMPSHIRE / CONCORD (032-033)	
134	Mobilization or demobilization, delivery charge for equipment, hauled on 3-ton-capacity towed trailer	A3Q	2.67	3	Ea.	$ -	$ 138.92	$ 66.22	$ 205.14	$ -	$ 18,615.28	$ 8,873.48	$ 27,488.76	$ -	$ 210.74	$ 73.08	$ 283.82	$ -	$ 28,239.16	$ 9,792.72	$ 38,031.88	STD	NEW HAMPSHIRE / CONCORD (032-033)	Assumes 135 Pull Pad locations
24	Selective demolition, rubbish handling, dumpster, 40 C.Y., 10-ton capacity, weekly rental, includes one dump per week, cost to be added to demolition cost		0	0	Week	$ 775.00	$ -	$ -	$ 775.00	$ 18,600.00	$ -	$ -	$ 18,600.00	$ 850.00	$ -	$ -	$ 850.00	$ 20,400.00	$ -	$ -	$ 20,400.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	Approx. 130 miles. Assume 4 40CY roll-off rental for 6 weeks
48	Lifting and hoisting equipment rental; aerial lift truck, 2 persons, 80', Incl. Hourly Oper. Cost.		0	0	Week	$ -	$ -	$ 3,233.38	$ 3,233.38	$ -	$ -	$ 155,202.24	$ 155,202.24	$ -	$ -	$ 3,556.72	$ 3,556.72	$ -	$ -	$ 170,722.56	$ 170,722.56	STD	NEW HAMPSHIRE / CONCORD (032-033)	1197 structures. Assumes blocking 5 per day - total of approx. 48 weeks also includes road crossing work
Total									**$ 19,965.56**	**$ 18,600.00**	**$ 162,743.28**	**$ 726,284.04**	**$ 907,627.32**				**$ 23,833.36**	**$ 20,400.00**	**$ 248,921.56**	**$ 798,978.04**	**$ 1,068,299.60**			

Note: Cost Data obtained from RSMeans Cost Works - 2016 Q2 Data. OPC estimate, actual costs will vary.

Northern Pass Transmission Decommissioning - OHSW Removal

Opinion of Probable Costs

NPT - OHSW Removal - Overhead

CA Border to Deerfield, NH
New Hampshire

Data Release : Year 2016 Quarter 2

Unit Cost Estimate

Quantity	Description	Crew	Daily Output	Labor Hours	Unit	Material	Labor	Equipment	Total	Ext. Mat.	Ext. Labor	Ext. Equip.	Ext. Total	Mat. O&P	Labor O&P	Equip. O&P	Total O&P	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P	Labor Type	CCI Location	Notes
12	Field personnel, superintendent, average		0	0	Week	$ -	$ 2,175.00	$ -	$ 2,175.00	$ -	$ 26,100.00	$ -	$ 26,100.00	$ -	$ 3,350.00	$ -	$ 3,350.00	$ -	$ 40,200.00	$ -	$ 40,200.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	
36	Field personnel, general purpose laborer, average		0	0	Week	$ -	$ 1,525.00	$ -	$ 1,525.00	$ -	$ 54,900.00	$ -	$ 54,900.00	$ -	$ 2,325.00	$ -	$ 2,325.00	$ -	$ 83,700.00	$ -	$ 83,700.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	
130	Overhead line conductors & devices, ground wire, disposal of surplus material	R5	41.74	2.11	Mile	$ -	$ 86.29	$ 34.34	$ 120.63	$ -	$ 11,217.70	$ 4,464.20	$ 15,681.90	$ -	$ 130.28	$ 38.26	$ 168.54	$ -	$ 16,936.40	$ 4,973.80	$ 21,910.20	STD	NEW HAMPSHIRE / CONCORD (032-033)	
130	Overhead line conductors & devices, underbuilt circuits, material handling & spotting	R7	5.65	8.5	W.Mile	$ -	$ 283.41	$ 36.30	$ 319.71	$ -	$ 36,843.30	$ 4,719.00	$ 41,562.30	$ -	$ 435.69	$ 39.73	$ 475.42	$ -	$ 56,639.70	$ 5,164.90	$ 61,804.60	STD	NEW HAMPSHIRE / CONCORD (032-033)	1 OHSW Line - 130 miles
130	Overhead line conductors & devices, disposal of surplus material, high voltage conductors, with trailer-mounted reel stands	R7	13.71	3.5	Mile	$ -	$ 115.90	$ 14.96	$ 130.86	$ -	$ 15,067.00	$ 1,944.80	$ 17,011.80	$ -	$ 178.51	$ 16.43	$ 194.94	$ -	$ 23,206.30	$ 2,135.90	$ 25,342.20	STD	NEW HAMPSHIRE / CONCORD (032-033)	
48	Rent trailer with cable pulling rig, for high voltage line work, Incl. Hourly Oper. Cost.		0	0	Week	$ -	$ -	$ 11,480.84	$ 11,480.84	$ -	$ -	$ 551,080.32	$ 551,080.32	$ -	$ -	$ 12,628.92	$ 12,628.92	$ -	$ -	$ 606,188.16	$ 606,188.16	STD	NEW HAMPSHIRE / CONCORD (032-033)	
134	Mobilization or demobilization, delivery charge for equipment, hauled on 3-ton-capacity towed trailer	A3Q	2.67	3	Ea.	$ -	$ 138.92	$ 66.22	$ 205.14	$ -	$ 18,615.28	$ 8,873.48	$ 27,488.76	$ -	$ 210.74	$ 73.08	$ 283.82	$ -	$ 28,239.16	$ 9,792.72	$ 38,031.88	STD	NEW HAMPSHIRE / CONCORD (032-033)	Assumes 135 Pull Pad locations
24	Selective demolition, rubbish handling, dumpster, 40 C.Y., 10-ton capacity, weekly rental, includes one dump per week, cost to be added to demolition cost		0	0	Week	$ 775.00	$ -	$ -	$ 775.00	$ 18,600.00	$ -	$ -	$ 18,600.00	$ 850.00	$ -	$ -	$ 850.00	$ 20,400.00	$ -	$ -	$ 20,400.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	Approx. 130 miles. Assume 4 40CY roll-off rental for 6 weeks
48	Lifting and hoisting equipment rental; aerial lift truck, 2 persons, 80', Incl. Hourly Oper. Cost.		0	0	Week	$ -	$ -	$ 3,233.38	$ 3,233.38	$ -	$ -	$ 155,202.24	$ 155,202.24	$ -	$ -	$ 3,556.72	$ 3,556.72	$ -	$ -	$ 170,722.56	$ 170,722.56	STD	NEW HAMPSHIRE / CONCORD (032-033)	1197 structures. Assumes blocking 5 per day - total of approx. 48 weeks also includes road crossing work.
Total									**$ 19,965.56**	**$ 18,600.00**	**$ 162,743.28**	**$ 726,284.04**	**$ 907,627.32**				**$ 23,833.36**	**$ 20,400.00**	**$ 248,921.56**	**$ 798,978.04**	**$ 1,068,299.60**			

Note: Cost Data obtained from RSMeans Cost Works - 2016 Q2 Data. OPC estimate, actual costs will vary.

GZA

THE NORTHERN PASS

Northern Pass Transmission Decommissioning - Underground Wiring Removal

Opinion of Probable Costs

NPT - Wire Removal Underground

CA Border to Deerfield
New Hampshire

Data Release : Year 2016 Quarter 2

Unit Cost Estimate

Quantity	Description	Crew	Daily Output	Labor Hours	Unit	Material	Labor	Equipment	Total	Ext. Mat.	Ext. Labor	Ext. Equip.	Ext. Total	Mat. O&P	Labor O&P	Equip. O&P	Total O&P	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P	Labor Type	CCI Location	Notes
7700	Excavating, trench or continuous footing, common earth, 1/2 C.Y. excavator, 1' to 4' deep, excludes sheeting or dewatering	B11M	200	0.08	B.C.Y.	$ -	$ 3.51	$ 1.94	$ 5.45	$ -	$ 27,027.00	$ 14,938.00	$ 41,965.00	$ -	$ 5.32	$ 2.14	$ 7.46	$ -	$ 40,964.00	$ 16,478.00	$ 57,442.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	Assumes 2 foot trench, 2 foot depth - 52000 LF of Line. Assume Centerpoise is present for 75% of line for total of 39000 feet of trenching
22	Field personnel, general purpose laborer, average		0	0	Week	$ -	$ 1,525.00	$ -	$ 1,525.00	$ -	$ 33,550.00	$ -	$ 33,550.00	$ -	$ 2,325.00	$ -	$ 2,325.00	$ -	$ 51,150.00	$ -	$ 51,150.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	2 laborers to size centerpoise
11	Selective demolition, rubbish handling, dumpster, 40 C.Y., 10-ton capacity, weekly rental, includes one dump per week, cost to be added to demolition cost		0	0	Week	$ 775.00	$ -	$ -	$ 775.00	$ 8,525.00	$ -	$ -	$ 8,525.00	$ 850.00	$ -	$ -	$ 850.00	$ 9,350.00	$ -	$ -	$ 9,350.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	Assumes 5 40 CY Dumpsters for Centerpoise Recycling- Based on 1000 feet removal per day
7700	Excavating, trench backfill, 1 C.Y. bucket, minimal haul, front end loader, wheel mounted, excludes dewatering	B10R	400	0.03	L.C.Y.	$ -	$ 1.38	$ 0.74	$ 2.12	$ -	$ 10,626.00	$ 5,698.00	$ 16,324.00	$ -	$ 2.10	$ 0.80	$ 2.90	$ -	$ 16,170.00	$ 6,160.00	$ 22,330.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	
2.5	Line towers & fixtures, restoration & seeding	B10D	4	3	Acre	$ 374.00	$ 118.44	$ 446.36	$ 938.80	$ 935.00	$ 296.10	$ 1,115.90	$ 2,347.00	$ 413.60	$ 180.20	$ 490.50	$ 1,084.30	$ 1,034.00	$ 450.50	$ 1,226.25	$ 2,710.75	STD	NEW HAMPSHIRE / CONCORD (032-033)	Approx. 2.5 acres based on 53,000 LF trench 2 foot width
Total									**$ 3,246.37**	**$ 9,460.00**	**$ 71,499.10**	**$ 21,751.90**	**$ 102,711.00**				**$ 4,269.66**	**$ 10,384.00**	**$ 108,734.50**	**$ 23,864.25**	**$ 142,982.75**			

Note: Cost Data obtained from RSMeans Cost Works - 2016 Q2 Data. OPC estimate, actual costs will vary.

Northern Pass Transmission Decommissioning - Underground Enclosure Removal

Opinion of Probable Costs

NPT - Underground Enclosures

CA Border to Deerfield
New Hampshire

Data Release : Year 2016 Quarter 2

Unit Cost Estimate

Quantity	Description	Crew	Daily Output	Labor Hours	Unit	Material	Labor	Equipment	Total	Ext. Mat.	Ext. Labor	Ext. Equip.	Ext. Total	Mat. O&P	Labor O&P	Equip. O&P	Total O&P	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P	Labor Type	CCI Location	Notes
20	Field personnel, superintendent, average		0	0	Week	$ -	$ 2,175.00	$ -	$ 2,175.00	$ -	$ 43,500.00	$ -	$ 43,500.00	$ -	$ 3,350.00	$ -	$ 3,350.00	$ -	$ 67,000.00	$ -	$ 67,000.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	
40	Field personnel, general purpose laborer, average		0	0	Week	$ -	$ 1,525.00	$ -	$ 1,525.00	$ -	$ 61,000.00	$ -	$ 61,000.00	$ -	$ 2,325.00	$ -	$ 2,325.00	$ -	$ 93,000.00	$ -	$ 93,000.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	2 laborers for 3 days
1440	Building footings and foundations demolition, add for disposal, up to 5 miles, excludes disposal costs and dump fees	B30	220	0.11	C.Y.	$ -	$ 4.92	$ 10.74	$ 15.66	$ -	$ 7,084.80	$ 15,465.60	$ 22,550.40	$ -	$ 7.43	$ 11.82	$ 19.25	$ -	$ 10,699.20	$ 17,020.80	$ 27,720.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	Assume 8 cy per tower for concrete demolition. Average diameter 7 ft, 1 ft reveal plus 4 ft bgs. 4 foundations. Assume enclosure 10' x 20' 1 ft thick walls with cap. removed to 4' bgs Approx. 10 cy concrete
2600	Fill by borrow and utility bedding, for pipe and conduit, sand, dead or bank, excludes compaction	B6	150	0.16	L.C.Y.	$ 18.78	$ 6.55	$ 2.39	$ 27.72	$ 48,828.00	$ 17,030.00	$ 6,214.00	$ 72,072.00	$ 20.66	$ 10.00	$ 2.63	$ 33.29	$ 53,716.00	$ 26,000.00	$ 6,838.00	$ 86,554.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	Assumes 30'x10'x6' backfill materials per location. Assumes 39 locations
3900	Fill by borrow and utility bedding, for pipe and conduit, compacting bedding in trench	A1D	90	0.09	E.C.Y.	$ -	$ 3.32	$ 0.39	$ 3.71	$ -	$ 12,948.00	$ 1,521.00	$ 14,469.00	$ -	$ 5.07	$ 0.43	$ 5.50	$ -	$ 19,773.00	$ 1,677.00	$ 21,450.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	Compaction to surrounding grade
39	Flexible pavement patches, roadway, light traffic, hot asphalt haul truck, 8 C.Y. truck per day	B34A	1	8	Day	$ -	$ 339.48	$ 407.12	$ 746.60	$ -	$ 13,239.72	$ 15,877.68	$ 29,117.40	$ -	$ 511.68	$ 451.26	$ 962.94	$ -	$ 19,955.52	$ 17,599.14	$ 37,554.66	STD	NEW HAMPSHIRE / CONCORD (032-033)	
39	Mobilization or demobilization, delivery charge for equipment, hauled on 40-ton-capacity towed trailer	B34N	2	8	Ea.	$ -	$ 354.38	$ 367.88	$ 722.26	$ -	$ 13,820.82	$ 14,347.32	$ 28,168.14	$ -	$ 538.65	$ 407.12	$ 945.77	$ -	$ 21,007.35	$ 15,877.68	$ 36,885.03	STD	NEW HAMPSHIRE / CONCORD (032-033)	
Total									**$ 5,215.95**	**$ 48,828.00**	**$ 168,623.34**	**$ 53,425.60**	**$ 270,876.94**				**$ 7,641.75**	**$ 53,716.00**	**$ 257,435.07**	**$ 59,012.62**	**$ 370,163.69**			

Note: Cost Data obtained from RSMeans Cost Works - 2016 Q2 Data. OPC estimate, actual costs will vary.

Northern Pass Transmission Decommissioning - Underground Crossing

Opinion of Probable Costs

NPT - Directionally Drilled Casing Grouting

CA Border to Deerfield
New Hampshire

Data Release : Year 2016 Quarter 2

Unit Cost Estimate

Quantity	Description	Crew	Daily Output	Labor Hours	Unit	Material	Labor	Equipment	Total	Ext. Mat.	Ext. Labor	Ext. Equip.	Ext. Total	Mat. O&P	Labor O&P	Equip. O&P	Total O&P	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P	Labor Type	CCI Location	Notes
11	Field personnel, general purpose laborer, average		0	0	Week	$ -	$ 1,525.00	$ -	$ 1,525.00	$ -	$ 16,775.00	$ -	$ 16,775.00	$ -	$ 2,325.00	$ -	$ 2,325.00	$ -	$ 25,575.00	$ -	$ 25,575.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	
75	Field personnel, superintendent, maximum		0	0	Week	$ -	$ 2,475.00	$ -	$ 2,475.00	$ -	$ 185,625.00	$ -	$ 185,625.00	$ -	$ 3,800.00	$ -	$ 3,800.00	$ -	$ 285,000.00	$ -	$ 285,000.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	
660	Heavy Equipment Operator - 8-hour day		0	0	Day	$ -	$ 408.80	$ -	$ 408.80	$ -	$ 269,808.00	$ -	$ 269,808.00	$ -	$ 618.40	$ -	$ 618.40	$ -	$ 408,144.00	$ -	$ 408,144.00	USER	NEW HAMPSHIRE / CONCORD (032-033)	Heavy Equipment Operator - Backhoe
11	Rent dozer, crawler, torque converter, diesel 200 HP, Incl. Hourly Oper. Cost.		0	0	Week	$ -	$ -	$ 6,850.41	$ 6,850.41	$ -	$ -	$ 75,354.51	$ 75,354.51	$ -	$ -	$ 7,535.45	$ 7,535.45	$ -	$ -	$ 82,889.95	$ 82,889.95	STD	NEW HAMPSHIRE / CONCORD (032-033)	
62825	Structural concrete, ready mix, flowable fill, structural, 140 psi, includes ash, Portland cement Type I, aggregate, sand and water, delivered, excludes all additives and treatments		0	0	C.Y.	$ 89.04	$ -	$ -	$ 89.04	$ 5,593,938.00	$ -	$ -	$ 5,593,938.00	$ 98.50	$ -	$ -	$ 98.50	$ 6,188,262.50	$ -	$ -	$ 6,188,262.50	STD	NEW HAMPSHIRE / CONCORD (032-033)	
52	Rent pump concrete truck-mounted 4" line 80' boom, Incl. Hourly Oper. Cost.		0	0	Day	$ -	$ -	$ 1,062.03	$ 1,062.03	$ -	$ -	$ 55,225.56	$ 55,225.56	$ -	$ -	$ 1,168.23	$ 1,168.23	$ -	$ -	$ 60,747.96	$ 60,747.96	STD	NEW HAMPSHIRE / CONCORD (032-033)	Assumes one day to grout each directionally drilled location from both sides
52	Mobilization or demobilization, delivery charge for equipment, hauled on 40-ton-capacity towed trailer	B34N	2	8	Ea.	$ -	$ 354.38	$ 367.88	$ 722.26	$ -	$ 18,427.76	$ 19,129.76	$ 37,557.52	$ -	$ 538.65	$ 407.12	$ 945.77	$ -	$ 28,009.80	$ 21,170.24	$ 49,180.04	STD	NEW HAMPSHIRE / CONCORD (032-033)	
Total									**$ 13,132.54**	**$ 5,593,938.00**	**$ 490,635.76**	**$ 149,709.83**	**$ 6,234,283.59**				**$ 16,491.35**	**$ 6,188,262.50**	**$ 746,728.80**	**$ 164,808.15**	**$ 7,099,799.45**			

Note: Cost Data obtained from RSMeans Cost Works - 2016 Q2 Data. OPC estimate, actual costs will vary.

THE NORTHERN PASS

Northern Pass Transmission Decommissioning - Transition Stations

Opinion of Probable Costs

NPT - Transition Stations

CA Border to Deerfield
New Hampshire

Data Release : Year 2016 Quarter 2

Unit Cost Estimate

Quantity	Description	Crew	Daily Output	Labor Hours	Unit	Material	Labor	Equipment	Total	Ext. Mat.	Ext. Labor	Ext. Equip.	Ext. Total	Mat. O&P	Labor O&P	Equip. O&P	Total O&P	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P	Labor Type	CCI Location	Notes
1	Field personnel, superintendent, average		0	0	Week	$ -	$ 2,175.00	$ -	$ 2,175.00	$ -	$ 2,175.00	$ -	$ 2,175.00	$ -	$ 3,350.00	$ -	$ 3,350.00	$ -	$ 3,350.00	$ -	$ 3,350.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	
6	Field personnel, general purpose laborer, average		0	0	Week	$ -	$ 1,525.00	$ -	$ 1,525.00	$ -	$ 9,150.00	$ -	$ 9,150.00	$ -	$ 2,325.00	$ -	$ 2,325.00	$ -	$ 13,950.00	$ -	$ 13,950.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	2 laborers for 3 days
3	Rent excavator diesel hydraulic crawler mounted 2 CY capacity, Incl. Hourly Oper. Cost.		0	0	Day	$ -	$ -	$ 1,579.61	$ 1,579.61	$ -	$ -	$ 4,738.83	$ 4,738.83	$ -	$ -	$ 1,737.57	$ 1,737.57	$ -	$ -	$ 5,212.71	$ 5,212.71	STD	NEW HAMPSHIRE / CONCORD (032-033)	Per day to excavate and remove drilled shaft to 4' bgs
3	Rent excavator attachment, grapples, Incl. Hourly Oper. Cost.		0	0	Day	$ -	$ -	$ 210.52	$ 210.52	$ -	$ -	$ 631.56	$ 631.56	$ -	$ -	$ 231.57	$ 231.57	$ -	$ -	$ 694.71	$ 694.71	STD	NEW HAMPSHIRE / CONCORD (032-033)	
0.8	Overhead line conductors & devices, disposal of surplus material, high voltage conductors, with trailer-mounted reel stands	R7	13.71	3.5	Mile	$ -	$ 115.90	$ 14.96	$ 130.86	$ -	$ 92.72	$ 11.97	$ 104.69	$ -	$ 178.51	$ 16.43	$ 194.94	$ -	$ 142.81	$ 13.14	$ 155.95	STD	NEW HAMPSHIRE / CONCORD (032-033)	Assumes .10 miles of misc. expenses for up to 6 conductors
42	Building footings and foundations demolition, add for disposal, up to 5 miles, excludes disposal costs and dump fees	B30	220	0.11	C.Y.	$ -	$ 4.92	$ 10.74	$ 15.66	$ -	$ 206.64	$ 451.08	$ 657.72	$ -	$ 7.43	$ 11.82	$ 19.25	$ -	$ 312.06	$ 496.44	$ 808.50	STD	NEW HAMPSHIRE / CONCORD (032-033)	Assume 8 cy per tower for concrete demolition. Average diameter 7 ft, 1 ft reveal plus 4 ft bgs. 4 foundations. Assume enclosure 10' x 20' 1 ft thick walls with cap. removed to 4' bgs Approx. 10 cy concrete
200	Selective demolition, torch cutting, steel, 1" thick plate	E25	333	0.02	L.F.	$ 0.80	$ 1.31	$ 0.03	$ 2.14	$ 160.00	$ 262.00	$ 6.00	$ 428.00	$ 0.87	$ 2.21	$ 0.04	$ 3.12	$ 174.00	$ 442.00	$ 8.00	$ 624.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	100 feet. Assumes 8' diam poles x4. 2 cuts per pole
2	Crane crew, daily use for small jobs, 55-ton truck-mounted hydraulic crane, portal to portal	A3K	1	16	Day	$ -	$ 741.83	$ 1,618.65	$ 2,360.48	$ -	$ 1,483.66	$ 3,237.30	$ 4,720.96	$ -	$ 1,134.00	$ 1,765.80	$ 2,899.80	$ -	$ 2,268.00	$ 3,531.60	$ 5,799.60	STD	NEW HAMPSHIRE / CONCORD (032-033)	
2	Rent crane truck mounted, hydraulic, 55-ton capacity, Incl. Hourly Oper. Cost.		0	0	Day	$ -	$ -	$ 1,441.68	$ 1,441.68	$ -	$ -	$ 2,883.36	$ 2,883.36	$ -	$ -	$ 1,585.85	$ 1,585.85	$ -	$ -	$ 3,171.70	$ 3,171.70	STD	NEW HAMPSHIRE / CONCORD (032-033)	
2	Lifting and hoisting equipment rental; aerial lift truck, 2 persons, 80', Incl. Hourly Oper. Cost.		0	0	Day	$ -	$ -	$ 938.03	$ 938.03	$ -	$ -	$ 1,876.06	$ 1,876.06	$ -	$ -	$ 1,031.83	$ 1,031.83	$ -	$ -	$ 2,063.66	$ 2,063.66	STD	NEW HAMPSHIRE / CONCORD (032-033)	
2	Rent trailer, platform, flush deck 3 axle, 75 ton, Incl. Hourly Oper. Cost.		0	0	Day	$ -	$ -	$ 308.43	$ 308.43	$ -	$ -	$ 616.86	$ 616.86	$ -	$ -	$ 339.27	$ 339.27	$ -	$ -	$ 678.54	$ 678.54	STD	NEW HAMPSHIRE / CONCORD (032-033)	
55	Fill by borrow and utility bedding, for pipe and conduit, sand, dead or bank, excludes compaction	B6	150	0.16	L.C.Y.	$ 18.78	$ 6.55	$ 2.39	$ 27.72	$ 1,032.90	$ 360.25	$ 131.45	$ 1,524.60	$ 20.66	$ 10.00	$ 2.63	$ 33.29	$ 1,136.30	$ 550.00	$ 144.65	$ 1,830.95	STD	NEW HAMPSHIRE / CONCORD (032-033)	
55	Fill by borrow and utility bedding, for pipe and conduit, compacting bedding in trench	A1D	90	0.09	E.C.Y.	$ -	$ 3.32	$ 0.39	$ 3.71	$ -	$ 182.60	$ 21.45	$ 204.05	$ -	$ 5.07	$ 0.43	$ 5.50	$ -	$ 278.85	$ 23.65	$ 302.50	STD	NEW HAMPSHIRE / CONCORD (032-033)	
420	Selective demolition, chain link fences & gates, gates, cantilever, to 40' width	B6	80	0.3	L.F.	$ -	$ 12.30	$ 4.48	$ 16.78	$ -	$ 5,166.00	$ 1,881.60	$ 7,047.60	$ -	$ 18.75	$ 4.95	$ 23.70	$ -	$ 7,875.00	$ 2,079.00	$ 9,954.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	
28800	Building demolition, large urban projects, steel, includes 20-mile haul, excludes foundation demolition, dump fees	B8	21500	0	C.F.	$ -	$ 0.13	$ 0.15	$ 0.28	$ -	$ 3,744.00	$ 4,320.00	$ 8,064.00	$ -	$ 0.20	$ 0.17	$ 0.37	$ -	$ 5,760.00	$ 4,896.00	$ 10,656.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	Assumes 40'x60'x12' steel building
240	Building footings and foundations demolition, floors, concrete slab on grade, concrete, rod reinforced, 6" thick, excludes disposal costs and dump fees	B13L	3600	0	S.F.	$ -	$ 0.23	$ 0.56	$ 0.79	$ -	$ 55.20	$ 134.40	$ 189.60	$ -	$ 0.34	$ 0.62	$ 0.96	$ -	$ 81.60	$ 148.80	$ 230.40	STD	NEW HAMPSHIRE / CONCORD (032-033)	
200	Building footings and foundations demolition, remove concrete footing, 1'-6" thick, 2' wide, excludes disposal costs and dump fees	B13L	250	0.06	L.F.	$ -	$ 3.29	$ 8.04	$ 11.33	$ -	$ 658.00	$ 1,608.00	$ 2,266.00	$ -	$ 4.97	$ 8.83	$ 13.80	$ -	$ 994.00	$ 1,766.00	$ 2,760.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	
2	Excavator Operator - 8 hours per day		0	0	Ea.	$ -	$ 418.00	$ -	$ 418.00	$ -	$ 836.00	$ -	$ 836.00	$ -	$ 633.20	$ -	$ 633.20	$ -	$ 1,266.40	$ -	$ 1,266.40	USER	NEW HAMPSHIRE / CONCORD (032-033)	
Total									**$ 11,166.02**	**$ 1,192.90**	**$ 24,372.07**	**$ 22,549.92**	**$ 48,114.89**				**$ 14,429.02**	**$ 1,310.30**	**$ 37,270.72**	**$ 24,928.60**	**$ 63,509.62**			

Note: Cost Data obtained from RSMeans Cost Works - 2016 Q2 Data. OPC estimate, actual costs will vary.

THE NORTHERN PASS

Northern Pass Transmission Decommissioning - Single Pole TSP on Drilled Shaft

Opinion of Probable Costs

NPT - TSPs Single-pole configuration on drilled shaft

CA Border to Deerfield
New Hampshire

Data Release : Year 2016 Quarter 2

Unit Cost Estimate

Quantity	Description	Crew	Daily Output	Labor Hours	Unit	Material	Labor	Equipment	Total	Ext. Mat.	Ext. Labor	Ext. Equip.	Ext. Total	Mat. O&P	Labor O&P	Equip. O&P	Total O&P	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P	Labor Type	CCI Location	Notes
0.5	Field personnel, superintendent, average		0	0	Week	$ -	$ 2,175.00	$ -	$ 2,175.00	$ -	$ 1,087.50	$ -	$ 1,087.50	$ -	$ 3,350.00	$ -	$ 3,350.00	$ -	$ 1,675.00	$ -	$ 1,675.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	
0.8	Field personnel, general purpose laborer, average		0	0	Week	$ -	$ 1,525.00	$ -	$ 1,525.00	$ -	$ 1,220.00	$ -	$ 1,220.00	$ -	$ 2,325.00	$ -	$ 2,325.00	$ -	$ 1,860.00	$ -	$ 1,860.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	2 laborers for 2 days
2	Rent excavator diesel hydraulic crawler mounted 2 CY capacity, Incl. Hourly Oper. Cost.		0	0	Day	$ -	$ -	$ 1,579.61	$ 1,579.61	$ -	$ -	$ 3,159.22	$ 3,159.22	$ -	$ -	$ 1,737.57	$ 1,737.57	$ -	$ -	$ 3,475.14	$ 3,475.14	STD	NEW HAMPSHIRE / CONCORD (032-033)	Per day to excavate and remove drilled shaft to 4' bgs
2	Rent excavator attachment, grapples, Incl. Hourly Oper. Cost.		0	0	Day	$ -	$ -	$ 210.52	$ 210.52	$ -	$ -	$ 421.04	$ 421.04	$ -	$ -	$ 231.57	$ 231.57	$ -	$ -	$ 463.14	$ 463.14	STD	NEW HAMPSHIRE / CONCORD (032-033)	
0.6	Overhead line conductors & devices, disposal of surplus material, high voltage conductors, with trailer-mounted reel stands	R7	13.71	3.5	Mile	$ -	$ 115.90	$ 14.96	$ 130.86	$ -	$ 69.54	$ 8.98	$ 78.52	$ -	$ 178.51	$ 16.43	$ 194.94	$ -	$ 107.11	$ 9.86	$ 116.96	STD	NEW HAMPSHIRE / CONCORD (032-033)	Assumes .10 miles of misc. expenses for up to 6 conductors
8	Building footings and foundations demolition, add for disposal, up to 5 miles, excludes disposal costs and dump fees	B30	220	0.11	C.Y.	$ -	$ 4.92	$ 10.74	$ 15.66	$ -	$ 39.36	$ 85.92	$ 125.28	$ -	$ 7.43	$ 11.82	$ 19.25	$ -	$ 59.44	$ 94.56	$ 154.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	Assume 8 cy per tower for concrete demolition. Average diameter 7 ft, 1 ft reveal plus 4 ft bgs. Single pole foundation
50	Selective demolition, torch cutting, steel, 1" thick plate	E25	333	0.02	L.F.	$ 0.80	$ 1.31	$ 0.03	$ 2.14	$ 40.00	$ 65.50	$ 1.50	$ 107.00	$ 0.87	$ 2.21	$ 0.04	$ 3.12	$ 43.50	$ 110.50	$ 2.00	$ 156.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	Assumes average pole height of less than 100 feet. Assumes 8' diam pole. 2 cuts per pole
1	Crane crew, daily use for small jobs, 55-ton truck-mounted hydraulic crane, portal to portal	A3K	1	16	Day	$ -	$ 741.83	$ 1,618.65	$ 2,360.48	$ -	$ 741.83	$ 1,618.65	$ 2,360.48	$ -	$ 1,134.00	$ 1,765.80	$ 2,899.80	$ -	$ 1,134.00	$ 1,765.80	$ 2,899.80	STD	NEW HAMPSHIRE / CONCORD (032-033)	
1	Rent crane truck mounted, hydraulic, 55 ton-capacity, Incl. Hourly Oper. Cost.		0	0	Day	$ -	$ -	$ 1,441.68	$ 1,441.68	$ -	$ -	$ 1,441.68	$ 1,441.68	$ -	$ -	$ 1,585.85	$ 1,585.85	$ -	$ -	$ 1,585.85	$ 1,585.85	STD	NEW HAMPSHIRE / CONCORD (032-033)	
1	Lifting and hoisting equipment rental; aerial lift truck, 2 persons, 80', Incl. Hourly Oper. Cost.		0	0	Day	$ -	$ -	$ 938.03	$ 938.03	$ -	$ -	$ 938.03	$ 938.03	$ -	$ -	$ 1,031.83	$ 1,031.83	$ -	$ -	$ 1,031.83	$ 1,031.83	STD	NEW HAMPSHIRE / CONCORD (032-033)	
1	Rent trailer, platform, flush deck 3 axle, 75 ton, Incl. Hourly Oper. Cost.		0	0	Day	$ -	$ -	$ 308.43	$ 308.43	$ -	$ -	$ 308.43	$ 308.43	$ -	$ -	$ 339.27	$ 339.27	$ -	$ -	$ 339.27	$ 339.27	STD	NEW HAMPSHIRE / CONCORD (032-033)	
6	Fill by borrow and utility bedding, for pipe and conduit, sand, dead or bank, excludes compaction	B6	150	0.16	L.C.Y.	$ 18.78	$ 6.55	$ 2.39	$ 27.72	$ 112.68	$ 39.30	$ 14.34	$ 166.32	$ 20.66	$ 10.00	$ 2.63	$ 33.29	$ 123.96	$ 60.00	$ 15.78	$ 199.74	STD	NEW HAMPSHIRE / CONCORD (032-033)	
6	Fill by borrow and utility bedding, for pipe and conduit, compacting bedding in trench	A1D	90	0.09	E.C.Y.	$ -	$ 3.32	$ 0.39	$ 3.71	$ -	$ 19.92	$ 2.34	$ 22.26	$ -	$ 5.07	$ 0.43	$ 5.50	$ -	$ 30.42	$ 2.58	$ 33.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	
2	Heavy Equipment Operator - 8 hours per day		0	0	Day	$ -	$ 418.00	$ -	$ 418.00	$ -	$ 836.00	$ -	$ 836.00	$ -	$ 633.20	$ -	$ 633.20	$ -	$ 1,266.40	$ -	$ 1,266.40	USER	NEW HAMPSHIRE / CONCORD (032-033)	
Total									**$ 11,136.84**	**$ 152.68**	**$ 4,118.95**	**$ 8,000.13**	**$ 12,271.76**				**$ 14,390.19**	**$ 167.46**	**$ 6,302.87**	**$ 8,785.81**	**$ 15,256.13**			
																		20% adjustment applied to poles over 100 ft			**$ 18,307.36**			

Note: Cost Data obtained from RSMeans Cost Works - 2016 Q2 Data. OPC estimate, actual costs will vary.

Northern Pass Transmission Decommissioning - Two-Pole TSP Direct Embed

Opinion of Probable Costs

NPT - TSPs 2-pole configuration direct embed

CA Border to Deerfield
New Hampshire

Data Release : Year 2016 Quarter 2

Unit Cost Estimate

Quantity	Description	Crew	Daily Output	Labor Hours	Unit	Material	Labor	Equipment	Total	Ext. Mat.	Ext. Labor	Ext. Equip.	Ext. Total	Mat. O&P	Labor O&P	Equip. O&P	Total O&P	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P	Labor Type	CCI Location	Notes
1	Field personnel, superintendent, average		0	0	Week	$ -	$ 2,175.00	$ -	$ 2,175.00	$ -	$ 2,175.00	$ -	$ 2,175.00	$ -	$ 3,350.00	$ -	$ 3,350.00	$ -	$ 3,350.00	$ -	$ 3,350.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	
1	Field personnel, general purpose laborer, average		0	0	Week	$ -	$ 1,525.00	$ -	$ 1,525.00	$ -	$ 1,525.00	$ -	$ 1,525.00	$ -	$ 2,325.00	$ -	$ 2,325.00	$ -	$ 2,325.00	$ -	$ 2,325.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	2 laborers for 2 days
1	Rent excavator diesel hydraulic crawler mounted 2 CY capacity, Incl. Hourly Oper. Cost.		0	0	Day	$ -	$ -	$ 1,579.61	$ 1,579.61	$ -	$ -	$ 1,579.61	$ 1,579.61	$ -	$ -	$ 1,737.57	$ 1,737.57	$ -	$ -	$ 1,737.57	$ 1,737.57	STD	NEW HAMPSHIRE / CONCORD (032-033)	Per day to excavate and remove drilled shaft to 4' bgs
0.8	Overhead line conductors & devices, disposal of surplus material, high voltage conductors, with trailer-mounted reel stands	R7	13.71	3.5	Mile	$ -	$ 115.90	$ 14.96	$ 130.86	$ -	$ 92.72	$ 11.97	$ 104.69	$ -	$ 178.51	$ 16.43	$ 194.94	$ -	$ 142.81	$ 13.14	$ 155.95	STD	NEW HAMPSHIRE / CONCORD (032-033)	Assumes .10 miles of misc. expenses for up to 6 conductors
150	Selective demolition, torch cutting, steel, 1" thick plate	E25	333	0.02	L.F.	$ 0.80	$ 1.31	$ 0.03	$ 2.14	$ 120.00	$ 196.50	$ 4.50	$ 321.00	$ 0.87	$ 2.21	$ 0.04	$ 3.12	$ 130.50	$ 331.50	$ 6.00	$ 468.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	less than 100 feet. Assumes 8' diam poles x2. 3 cuts per pole
2	Crane crew, daily use for small jobs, 55-ton truck-mounted hydraulic crane, portal to portal	A3K	1	16	Day	$ -	$ 741.83	$ 1,618.65	$ 2,360.48	$ -	$ 1,483.66	$ 3,237.30	$ 4,720.96	$ -	$ 1,134.00	$ 1,765.80	$ 2,899.80	$ -	$ 2,268.00	$ 3,531.60	$ 5,799.60	STD	NEW HAMPSHIRE / CONCORD (032-033)	
2	Rent crane truck mounted, hydraulic, 55-ton capacity, Incl. Hourly Oper. Cost.		0	0	Day	$ -	$ -	$ 1,441.68	$ 1,441.68	$ -	$ -	$ 2,883.36	$ 2,883.36	$ -	$ -	$ 1,585.85	$ 1,585.85	$ -	$ -	$ 3,171.70	$ 3,171.70	STD	NEW HAMPSHIRE / CONCORD (032-033)	
2	Lifting and hoisting equipment rental; aerial lift truck, 2 persons, 80', Incl. Hourly Oper. Cost.		0	0	Day	$ -	$ -	$ 938.03	$ 938.03	$ -	$ -	$ 1,876.06	$ 1,876.06	$ -	$ -	$ 1,031.83	$ 1,031.83	$ -	$ -	$ 2,063.66	$ 2,063.66	STD	NEW HAMPSHIRE / CONCORD (032-033)	
2	Rent trailer, platform, flush deck 3 axle, 75 ton, Incl. Hourly Oper. Cost.		0	0	Day	$ -	$ -	$ 308.43	$ 308.43	$ -	$ -	$ 616.86	$ 616.86	$ -	$ -	$ 339.27	$ 339.27	$ -	$ -	$ 678.54	$ 678.54	STD	NEW HAMPSHIRE / CONCORD (032-033)	
12	Structural excavation for minor structures, bank measure, for spread and mat footings, elevator pits, and small building foundations, clay, till or blasted rock, 2 C.Y. bucket, machine excavation, hydraulic backhoe	B12C	175	0.09	B.C.Y.	$ -	$ 4.06	$ 6.57	$ 10.63	$ -	$ 48.72	$ 78.84	$ 127.56	$ -	$ 6.16	$ 7.26	$ 13.42	$ -	$ 73.92	$ 87.12	$ 161.04	STD	NEW HAMPSHIRE / CONCORD (032-033)	Excavate around pole to cut x2 poles
20	Fill by borrow and utility bedding, for pipe and conduit, sand, dead or bank, excludes compaction	B6	150	0.16	L.C.Y.	$ 18.78	$ 6.55	$ 2.39	$ 27.72	$ 375.60	$ 131.00	$ 47.80	$ 554.40	$ 20.66	$ 10.00	$ 2.63	$ 33.29	$ 413.20	$ 200.00	$ 52.60	$ 665.80	STD	NEW HAMPSHIRE / CONCORD (032-033)	4x8x8 excavation. x2
20	Fill by borrow and utility bedding, for pipe and conduit, compacting bedding in trench	A1D	90	0.09	E.C.Y.	$ -	$ 3.32	$ 0.39	$ 3.71	$ -	$ 66.40	$ 7.80	$ 74.20	$ -	$ 5.07	$ 0.43	$ 5.50	$ -	$ 101.40	$ 8.60	$ 110.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	
2	Heavy Equipment Operator- 8 hours per day		0	0	Ea.	$ -	$ -	$ 418.00	$ 418.00	$ -	$ -	$ 836.00	$ 836.00	$ -	$ -	$ 633.20	$ 633.20	$ -	$ -	$ 1,266.40	$ 1,266.40	USER	NEW HAMPSHIRE / CONCORD (032-033)	
Total							**$ 10,921.29**	**$ 495.60**	**$ 5,719.00**	**$ 11,180.10**	**$ 17,394.70**				**$ 14,152.79**	**$ 543.70**	**$ 8,792.63**	**$ 12,616.93**	**$ 21,953.26**					
																		20% adjustment applied to poles over 100 ft			**$ 26,343.91**			

Note: Cost Data obtained from RSMeans Cost Works - 2016 Q2 Data. OPC estimate, actual costs will vary.

Northern Pass Transmission Decommissioning - Three-Pole TSP on Drilled Shafts

Opinion of Probable Costs

NPT - TSPs 3-pole configuration on drilled shafts

CA Border to Deerfield
New Hampshire

Data Release : Year 2016 Quarter 2

Unit Cost Estimate

Quantity	Description	Crew	Daily Output	Labor Hours	Unit	Material	Labor	Equipment	Total	Ext. Mat.	Ext. Labor	Ext. Equip.	Ext. Total	Mat. O&P	Labor O&P	Equip. O&P	Total O&P	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P	Labor Type	CCI Location	Notes
1	Field personnel, superintendent, average		0	0	Week	$ -	$ 2,175.00	$ -	$ 2,175.00	$ -	$ 2,175.00	$ -	$ 2,175.00	$ -	$ 3,350.00	$ -	$ 3,350.00	$ -	$ 3,350.00	$ -	$ 3,350.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	
1.2	Field personnel, general purpose laborer, average		0	0	Week	$ -	$ 1,525.00	$ -	$ 1,525.00	$ -	$ 1,830.00	$ -	$ 1,830.00	$ -	$ 2,325.00	$ -	$ 2,325.00	$ -	$ 2,790.00	$ -	$ 2,790.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	2 laborers for 3 days
2	Rent excavator diesel hydraulic crawler mounted 2 CY capacity, Incl. Hourly Oper. Cost.		0	0	Day	$ -	$ -	$ 1,579.61	$ 1,579.61	$ -	$ -	$ 3,159.22	$ 3,159.22	$ -	$ -	$ 1,737.57	$ 1,737.57	$ -	$ -	$ 3,475.14	$ 3,475.14	STD	NEW HAMPSHIRE / CONCORD (032-033)	Per day to excavate and remove drilled shaft to 4' bgs
2	Rent excavator attachment, grapples, Incl. Hourly Oper. Cost.		0	0	Day	$ -	$ -	$ 210.52	$ 210.52	$ -	$ -	$ 421.04	$ 421.04	$ -	$ -	$ 231.57	$ 231.57	$ -	$ -	$ 463.14	$ 463.14	STD	NEW HAMPSHIRE / CONCORD (032-033)	
0.8	Overhead line conductors & devices, disposal of surplus material, high voltage conductors, with trailer-mounted reel stands	R7	13.71	3.5	Mile	$ -	$ 115.90	$ 14.96	$ 130.86	$ -	$ 92.72	$ 11.97	$ 104.69	$ -	$ 178.51	$ 16.43	$ 194.94	$ -	$ 142.81	$ 13.14	$ 155.95	STD	NEW HAMPSHIRE / CONCORD (032-033)	Assumes .10 miles of misc. expenses for up to 6 conductors
24	Building footings and foundations demolition, add for disposal, up to 5 miles, excludes disposal costs and dump fees	B30	220	0.11	C.Y.	$ -	$ 4.92	$ 10.74	$ 15.66	$ -	$ 118.08	$ 257.76	$ 375.84	$ -	$ 7.43	$ 11.82	$ 19.25	$ -	$ 178.32	$ 283.68	$ 462.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	Assume 8 cy per tower for concrete demolition. Average diameter 7 ft, 1 ft reveal plus 4 ft bgs. 3 pole foundations.
150	Selective demolition, torch cutting, steel, 1" thick plate	E25	333	0.02	L.F.	$ 0.80	$ 1.31	$ 0.03	$ 2.14	$ 120.00	$ 196.50	$ 4.50	$ 321.00	$ 0.87	$ 2.21	$ 0.04	$ 3.12	$ 130.50	$ 331.50	$ 6.00	$ 468.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	Assumes average pole height of less than 100 feet. Assumes 8' diam poles x3. 2 cuts per pole
3	Crane crew, daily use for small jobs, 55-ton truck-mounted hydraulic crane, portal to portal	A3K	1	16	Day	$ -	$ 741.83	$ 1,618.65	$ 2,360.48	$ -	$ 2,225.49	$ 4,855.95	$ 7,081.44	$ -	$ 1,134.00	$ 1,765.80	$ 2,899.80	$ -	$ 3,402.00	$ 5,297.40	$ 8,699.40	STD	NEW HAMPSHIRE / CONCORD (032-033)	
2	Rent crane truck mounted, hydraulic, 55-ton capacity, Incl. Hourly Oper. Cost.		0	0	Day	$ -	$ -	$ 1,441.68	$ 1,441.68	$ -	$ -	$ 2,883.36	$ 2,883.36	$ -	$ -	$ 1,585.85	$ 1,585.85	$ -	$ -	$ 3,171.70	$ 3,171.70	STD	NEW HAMPSHIRE / CONCORD (032-033)	
2	Lifting and hoisting equipment rental; aerial lift truck, 2 persons, 80', Incl. Hourly Oper. Cost.		0	0	Day	$ -	$ -	$ 938.03	$ 938.03	$ -	$ -	$ 1,876.06	$ 1,876.06	$ -	$ -	$ 1,031.83	$ 1,031.83	$ -	$ -	$ 2,063.66	$ 2,063.66	STD	NEW HAMPSHIRE / CONCORD (032-033)	
2	Rent trailer, platform, flush deck 3 axle, 75 ton, Incl. Hourly Oper. Cost.		0	0	Day	$ -	$ -	$ 308.43	$ 308.43	$ -	$ -	$ 616.86	$ 616.86	$ -	$ -	$ 339.27	$ 339.27	$ -	$ -	$ 678.54	$ 678.54	STD	NEW HAMPSHIRE / CONCORD (032-033)	
20	Fill by borrow and utility bedding, for pipe and conduit, sand, dead or bank, excludes compaction	B6	150	0.16	L.C.Y.	$ 18.78	$ 6.55	$ 2.39	$ 27.72	$ 375.60	$ 131.00	$ 47.80	$ 554.40	$ 20.66	$ 10.00	$ 2.63	$ 33.29	$ 413.20	$ 200.00	$ 52.60	$ 665.80	STD	NEW HAMPSHIRE / CONCORD (032-033)	
20	Fill by borrow and utility bedding, for pipe and conduit, compacting bedding in trench	A1D	90	0.09	E.C.Y.	$ -	$ 3.32	$ 0.39	$ 3.71	$ -	$ 66.40	$ 7.80	$ 74.20	$ -	$ 5.07	$ 0.43	$ 5.50	$ -	$ 101.40	$ 8.60	$ 110.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	
2	Heavy equipment Operators- 8 hours per day		0	0	Ea.	$ -	$ 418.00	$ -	$ 418.00	$ -	$ 836.00	$ -	$ 836.00	$ -	$ 633.20	$ -	$ 633.20	$ -	$ 1,266.40	$ -	$ 1,266.40	USER	NEW HAMPSHIRE / CONCORD (032-033)	
Total									**$ 11,136.84**	**$ 495.60**	**$ 7,671.19**	**$ 14,142.32**	**$ 22,309.11**				**$ 14,390.19**	**$ 543.70**	**$ 11,762.43**	**$ 15,513.60**	**$ 27,819.73**			
																		20% adjustment applied to poles over 100 ft			**$ 33,383.68**			

Note: Cost Data obtained from RSMeans Cost Works - 2016 Q2 Data. OPC estimate, actual costs will vary.

Northern Pass Transmission Decommissioning - LST on Drilled Shafts

Opinion of Probable Costs

NPT - LST on Drilled Shafts

CA Border to Deerfield
New Hampshire

Data Release : Year 2016 Quarter 2

Unit Cost Estimate

Note: Cost Data obtained from RSMeans Cost Works - 2016 Q2 Data. OPC estimate, actual costs will vary.

Quantity	Description	Crew	Daily Output	Labor Hours	Unit	Material	Labor	Equipment	Total	Ext. Mat.	Ext. Labor	Ext. Equip.	Ext. Total	Mat. O&P	Labor O&P	Equip. O&P	Total O&P	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P	Labor Type	CCI Location	Notes
1	Mobilization or demobilization, crane, truck-mounted, over 75 ton, (with chase vehicle)	A3E	2.5	6.4	Ea.	$ -	$ 288.23	$ 61.31	$ 349.54	$ -	$ 288.23	$ 61.31	$ 349.54	$ -	$ 434.70	$ 67.69	$ 502.39	$ -	$ 434.70	$ 67.69	$ 502.39	STD	NEW HAMPSHIRE / CONCORD (032-033)	
1	Field personnel, superintendent, average		0	0	Week	$ -	$ 2,175.00	$ -	$ 2,175.00	$ -	$ 2,175.00	$ -	$ 2,175.00	$ -	$ 3,350.00	$ -	$ 3,350.00	$ -	$ 3,350.00	$ -	$ 3,350.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	
2	Field personnel, general purpose laborer, average		0	0	Week	$ -	$ 1,525.00	$ -	$ 1,525.00	$ -	$ 3,050.00	$ -	$ 3,050.00	$ -	$ 2,325.00	$ -	$ 2,325.00	$ -	$ 4,650.00	$ -	$ 4,650.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	2 laborers for 2 days
2	Rent excavator attachment, grapples, Incl. Hourly Oper. Cost.		0	0	Day	$ -	$ -	$ 210.52	$ 210.52	$ -	$ -	$ 421.04	$ 421.04	$ -	$ -	$ 231.57	$ 231.57	$ -	$ -	$ 463.14	$ 463.14	STD	NEW HAMPSHIRE / CONCORD (032-033)	
0.6	Overhead line conductors & devices, disposal of surplus material, high voltage conductors, with trailer-mounted reel stands	R7	13.71	3.5	Mile	$ -	$ 115.90	$ 14.96	$ 130.86	$ -	$ 69.54	$ 8.98	$ 78.52	$ -	$ 178.51	$ 16.43	$ 194.94	$ -	$ 107.11	$ 9.86	$ 116.96	STD	NEW HAMPSHIRE / CONCORD (032-033)	Assumes .10 miles of misc. expenses for up to 6 conductors
200	Cutting, steel, to 1" thick, by hand, incl prep, torch cutting & grinding, excl staging	E25	200	0.04	L.F.	$ 0.84	$ 2.16	$ 0.06	$ 3.06	$ 168.00	$ 432.00	$ 12.00	$ 612.00	$ 0.92	$ 3.65	$ 0.06	$ 4.63	$ 184.00	$ 730.00	$ 12.00	$ 926.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	Assumes average structure height of 100 ft requires up to 48 cuts of 6" steel
2	Crane crew, daily use for small jobs, 55-ton truck-mounted hydraulic crane, portal to portal	A3K	1	16	Day	$ -	$ 741.83	$ 1,618.65	$ 2,360.48	$ -	$ 1,483.66	$ 3,237.30	$ 4,720.96	$ -	$ 1,134.00	$ 1,765.80	$ 2,899.80	$ -	$ 2,268.00	$ 3,531.60	$ 5,799.60	STD	NEW HAMPSHIRE / CONCORD (032-033)	
2	Rent crane truck mounted, hydraulic, 55-ton capacity, Incl. Hourly Oper. Cost.		0	0	Day	$ -	$ -	$ 1,441.68	$ 1,441.68	$ -	$ -	$ 2,883.36	$ 2,883.36	$ -	$ -	$ 1,585.85	$ 1,585.85	$ -	$ -	$ 3,171.70	$ 3,171.70	STD	NEW HAMPSHIRE / CONCORD (032-033)	
2	Lifting and hoisting equipment rental; aerial lift truck, 2 persons, 80', Incl. Hourly Oper. Cost.		0	0	Day	$ -	$ -	$ 938.03	$ 938.03	$ -	$ -	$ 1,876.06	$ 1,876.06	$ -	$ -	$ 1,031.83	$ 1,031.83	$ -	$ -	$ 2,063.66	$ 2,063.66	STD	NEW HAMPSHIRE / CONCORD (032-033)	
12	Fill by borrow and utility bedding, for pipe and conduit, sand, dead or bank, excludes compaction	B6	150	0.16	L.C.Y.	$ 18.78	$ 6.55	$ 2.39	$ 27.72	$ 225.36	$ 78.60	$ 28.68	$ 332.64	$ 20.66	$ 10.00	$ 2.63	$ 33.29	$ 247.92	$ 120.00	$ 31.56	$ 399.48	STD	NEW HAMPSHIRE / CONCORD (032-033)	Assumes 3 cy per foundation x4 = 12 cy
12	Fill by borrow and utility bedding, for pipe and conduit, compacting bedding in trench	A1D	90	0.09	E.C.Y.	$ -	$ 3.32	$ 0.39	$ 3.71	$ -	$ 39.84	$ 4.68	$ 44.52	$ -	$ 5.07	$ 0.43	$ 5.50	$ -	$ 60.84	$ 5.16	$ 66.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	
10	Building footings and foundations demolition, add for disposal, up to 5 miles, excludes disposal costs and dump fees	B30	220	0.11	C.Y.	$ -	$ 4.92	$ 10.74	$ 15.66	$ -	$ 49.20	$ 107.40	$ 156.60	$ -	$ 7.43	$ 11.82	$ 19.25	$ -	$ 74.30	$ 118.20	$ 192.50	STD	NEW HAMPSHIRE / CONCORD (032-033)	Assumes 4' diam shaft. x4
2	Heavy Equipment Operator - 8 hours per day		0	0	Day	$ 418.00	$ -	$ -	$ 418.00	$ 836.00	$ -	$ -	$ 836.00	$ 633.20	$ -	$ -	$ 633.20	$ 1,266.40	$ -	$ -	$ 1,266.40	USER	NEW HAMPSHIRE / CONCORD (032-033)	
Total									**$ 9,599.26**	**$ 1,229.36**	**$ 7,666.07**	**$ 8,640.81**	**$ 17,536.24**				**$ 12,817.25**	**$ 1,698.32**	**$ 11,794.95**	**$ 9,474.57**	**$ 22,967.83**			
																		20% adjustment applied to towers over 100 ft			**$ 27,561.40**			

Note: Cost Data obtained from RSMeans Cost Works - 2016 Q2 Data. OPC estimate, actual costs will vary.

Northern Pass Transmission Decommissioning - LST on Grillage

Opinion of Probable Costs

NPT - Structure - LST Grillage

New Hampshire

Data Release : Year 2016 Quarter 2

Unit Cost Estimate

Quantity	Description	Crew	Daily Output	Labor Hours	Unit	Material	Labor	Equipment	Total	Ext. Mat.	Ext. Labor	Ext. Equip.	Ext. Total	Mat. O&P	Labor O&P	Equip. O&P	Total O&P	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P	Labor Type	CCI Location	Notes
1	Mobilization or demobilization, crane, truck-mounted, over 75 ton, (with chase vehicle)	A3E	2.5	6.4	Ea.	$ -	$ 288.23	$ 61.31	$ 349.54	$ -	$ 288.23	$ 61.31	$ 349.54	$ -	$ 434.70	$ 67.69	$ 502.39	$ -	$ 434.70	$ 67.69	$ 502.39	STD	NEW HAMPSHIRE / CONCORD (032-033)	
1	Field personnel, superintendent, average		0	0	Week	$ -	$ 2,175.00	$ -	$ 2,175.00	$ -	$ 2,175.00	$ -	$ 2,175.00	$ -	$ 3,350.00	$ -	$ 3,350.00	$ -	$ 3,350.00	$ -	$ 3,350.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	
1	Field personnel, general purpose laborer, average		0	0	Week	$ -	$ 1,525.00	$ -	$ 1,525.00	$ -	$ 1,525.00	$ -	$ 1,525.00	$ -	$ 2,325.00	$ -	$ 2,325.00	$ -	$ 2,325.00	$ -	$ 2,325.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	2 laborers for 2 days
2	Rent excavator attachment, grapples, Incl. Hourly Oper. Cost.		0	0	Day	$ -	$ -	$ 210.52	$ 210.52	$ -	$ -	$ 421.04	$ 421.04	$ -	$ -	$ 231.57	$ 231.57	$ -	$ -	$ 463.14	$ 463.14	STD	NEW HAMPSHIRE / CONCORD (032-033)	
0.6	Overhead line conductors & devices, disposal of surplus material, high voltage conductors, with trailer-mounted reel stands	R7	13.71	3.5	Mile	$ -	$ 115.90	$ 14.96	$ 130.86	$ -	$ 69.54	$ 8.98	$ 78.52	$ -	$ 178.51	$ 16.43	$ 194.94	$ -	$ 107.11	$ 9.86	$ 116.96	STD	NEW HAMPSHIRE / CONCORD (032-033)	Assumes .10 miles of misc. expenses for up to 6 conductors
72	Cutting, steel, to 1" thick, by hand, incl prep, torch cutting & grinding, excl staging	E25	200	0.04	L.F.	$ 0.84	$ 2.16	$ 0.06	$ 3.06	$ 60.48	$ 155.52	$ 4.32	$ 220.32	$ 0.92	$ 3.65	$ 0.06	$ 4.63	$ 66.24	$ 262.80	$ 4.32	$ 333.36	STD	NEW HAMPSHIRE / CONCORD (032-033)	Assumes average structure height of 100 ft requires up to 144 cuts of 6" steel
20	Selective demolition, torch cutting, steel, 1" thick plate	E25	333	0.02	L.F.	$ 0.80	$ 1.31	$ 0.03	$ 2.14	$ 16.00	$ 26.20	$ 0.60	$ 42.80	$ 0.87	$ 2.21	$ 0.04	$ 3.12	$ 17.40	$ 44.20	$ 0.80	$ 62.40	STD	NEW HAMPSHIRE / CONCORD (032-033)	Torch cut grillage below grade. Assumes grillage foundation greater than 5 ft bgs
2	Crane crew, daily use for small jobs, 55-ton truck-mounted hydraulic crane, portal to portal	A3K	1	16	Day	$ -	$ 741.83	$ 1,618.65	$ 2,360.48	$ -	$ 1,483.66	$ 3,237.30	$ 4,720.96	$ -	$ 1,134.00	$ 1,765.80	$ 2,899.80	$ -	$ 2,268.00	$ 3,531.60	$ 5,799.60	STD	NEW HAMPSHIRE / CONCORD (032-033)	
2	Rent crane truck mounted, hydraulic, 55-ton capacity, Incl. Hourly Oper. Cost.		0	0	Day	$ -	$ -	$ 1,441.68	$ 1,441.68	$ -	$ -	$ 2,883.36	$ 2,883.36	$ -	$ -	$ 1,585.85	$ 1,585.85	$ -	$ -	$ 3,171.70	$ 3,171.70	STD	NEW HAMPSHIRE / CONCORD (032-033)	
2	Lifting and hoisting equipment rental; aerial lift truck, 2 persons, 80', Incl. Hourly Oper. Cost.		0	0	Day	$ -	$ -	$ 938.03	$ 938.03	$ -	$ -	$ 1,876.06	$ 1,876.06	$ -	$ -	$ 1,031.83	$ 1,031.83	$ -	$ -	$ 2,063.66	$ 2,063.66	STD	NEW HAMPSHIRE / CONCORD (032-033)	
8	Fill by borrow and utility bedding, for pipe and conduit, sand, dead or bank, excludes compaction	B6	150	0.16	L.C.Y.	$ 18.78	$ 6.55	$ 2.39	$ 27.72	$ 150.24	$ 52.40	$ 19.12	$ 221.76	$ 20.66	$ 10.00	$ 2.63	$ 33.29	$ 165.28	$ 80.00	$ 21.04	$ 266.32	STD	NEW HAMPSHIRE / CONCORD (032-033)	Assumes 2 cy per foundation x4 = 8 cy
8	Fill by borrow and utility bedding, for pipe and conduit, compacting bedding in trench	A1D	90	0.09	E.C.Y.	$ -	$ 3.32	$ 0.39	$ 3.71	$ -	$ 26.56	$ 3.12	$ 29.68	$ -	$ 5.07	$ 0.43	$ 5.50	$ -	$ 40.56	$ 3.44	$ 44.00	STD	NEW HAMPSHIRE / CONCORD (032-033)	
24	Structural excavation for minor structures, bank measure, for spread and mat footings, elevator pits, and small building foundations, clay, till or blasted rock, 2 C.Y. bucket, machine excavation, hydraulic backhoe	B12C	175	0.09	B.C.Y.	$ -	$ 4.06	$ 6.57	$ 10.63	$ -	$ 97.44	$ 157.68	$ 255.12	$ -	$ 6.16	$ 7.26	$ 13.42	$ -	$ 147.84	$ 174.24	$ 322.08	STD	NEW HAMPSHIRE / CONCORD (032-033)	Excavate to access grillage legs at 4 foundations.
1	Heavy Equipment Operator - 8 hours per day		0	0	Day	$ -	$ 418.00	$ -	$ 418.00	$ -	$ 418.00	$ -	$ 418.00	$ -	$ 633.20	$ -	$ 633.20	$ -	$ 633.20	$ -	$ 633.20	USER	NEW HAMPSHIRE / CONCORD (032-033)	
Total									**$ 9,596.37**	**$ 226.72**	**$ 6,317.55**	**$ 8,672.89**	**$ 15,217.16**				**$ 12,814.54**	**$ 248.92**	**$ 9,693.41**	**$ 9,511.49**	**$ 19,453.81**			
																		20% adjustment applied to towers over 100 ft			**$ 23,344.57**			

Note: Cost Data obtained from RSMeans Cost Works - 2016 Q2 Data. OPC estimate, actual costs will vary.

THE NORTHERN PASS

Appendix B - Summary of Construction Drawings

The following drawings were used in the preparation of the Opinion of Probable Costs for the Northern Pass Transmission Project. These drawings will be furnished upon request.

- SEC Filing Application:
  - Appendix 1, *Proposed Plan & Profile*, prepared by Burns & McDonnell, dated October 6, 2015.
  - Appendix 1, *Proposed Structure Designs*, prepared by Burns & McDonnell, dated May 1, 2015 with various revision dates through May 29, 2016.
  - Appendix 6d, *Site Development Plans, Proposed Franklin Converter Station*, prepared by Burns & McDonnell, dated October 1, 2015.
  - Appendix 9, *Petition for Aerial Road Crossings, and Underground Installations in State Maintained Public Highways,* prepared by The Law Office of Mark P. Hodgdon, PLLC, dated October 16, 2015.
  - Appendix 47, *NHDES Wetlands & US Army Corps of Engineers, Section 404/10 Permit Application Plans*, prepared by Normandeau Associates, Inc., dated October 8, 2015.
- *Staking Table_RFP Rev E_* prepared for project bidding, revision date October 9, 2015.
- *Typical Foundations*, drawing Nos. FDN-01-001 through FND-05-001, prepared by Burns & McDonnell, dated May 1, 2015.
- *Northern Pass Project Overview with Sections* figure, prepared by Normandeau Associates, Inc. and publically available.

Appendix C - Decommissioning Salvage Value Estimates

Decommissioning Salvage Value Estimates

NPT Decommissioning Plan and Opinion of Probable Costs

NPT - CA Border to Deerfield, NH

Poles and Towers					
Description	**Quantity**	**Total Weight**	**Units**	**Estimated Salvage Value**	**Total**
LST-01	105	592	Tons	$ 135.00	$ 79,896.71
LST-02	338	2206	Tons	$ 135.00	$ 297,852.93
LST-03	48	396	Tons	$ 135.00	$ 53,482.61
LST-04	12	86	Tons	$ 135.00	$ 11,590.16
LST-05	15	146	Tons	$ 135.00	$ 19,746.59
LST-06	68	772	Tons	$ 135.00	$ 104,187.67
LST-07	17	222	Tons	$ 135.00	$ 30,020.76
LST-08	68	640	Tons	$ 135.00	$ 86,462.10
LST-09	8	96	Tons	$ 135.00	$ 12,964.66
LST-11	13	262	Tons	$ 135.00	$ 35,347.59
LST-13	39	442	Tons	$ 135.00	$ 59,685.66
Trans	6	60	Tons	$ 135.00	$ 8,100.00
TSP-01	12	95	Tons	$ 135.00	$ 12,874.21
TSP-02	40	372	Tons	$ 135.00	$ 50,251.46
TSP-03	11	195	Tons	$ 135.00	$ 26,369.82
TSP-04	2	40	Tons	$ 135.00	$ 5,455.96
TSP-05	135	1189	Tons	$ 135.00	$ 160,528.84
TSP-06	8	84	Tons	$ 135.00	$ 11,397.51
TSP-07	29	589	Tons	$ 135.00	$ 79,448.58
TSP-08	2	48	Tons	$ 135.00	$ 6,425.26
TSP-09	9	383	Tons	$ 135.00	$ 51,681.24
TSP-10	1	19	Tons	$ 135.00	$ 2,546.57
TSP-11	13	80	Tons	$ 135.00	$ 10,739.12
TSP-12	74	516	Tons	$ 135.00	$ 69,644.21
TSP-13	10	92	Tons	$ 135.00	$ 12,398.06
TSP-14	4	32	Tons	$ 135.00	$ 4,283.11
TSP-15	8	94	Tons	$ 135.00	$ 12,752.17
TSP-16	26	517	Tons	$ 135.00	$ 69,818.36
TSP-17	7	189	Tons	$ 135.00	$ 25,536.87
TSP-18	33	377	Tons	$ 135.00	$ 50,870.97
TSP-19	10	239	Tons	$ 135.00	$ 32,198.78
TSP-33	26	412	Tons	$ 135.00	$ 55,570.25
				Total Tower and Pole	**$ 1,550,128.76**
Wire and Insulators					
Description	**Total Length (LF) / Count**	**Total Weight (tons)**	**Units**	**Estimated Salvage Value**	**Total**
ACSR	1,148,950	1,173	Tons	$ 300.00	$ 351,923.41
AAAC	2,726,265	2,784	Tons	$ 330.00	$ 918,560.51
OPGW	1,003,604	204	Tons	$ 247.50	$ 50,547.76
OHSW	1,003,604	225	Tons	$ 135.00	$ 30,416.72
Tempered Glass Insulators	7,600	513	Tons	$ 10.00	$ 76,000.00
				Wire and Insulator Total	**$ 1,427,448.40**
				TOTAL	**$ 2,977,577.16**

Notes:

1. Pole and Tower weights are based on "staking table" information. "Trans" poles weights are estimated.
2. Typical wire weights based on available data.
3. Steel and conductor salvage pricing provided by Schnitzer Steel Industries on 5/4/2016.
4. OPGW scrap pricing not available but assumes current aluminum wire scrap value adjusted by 25%.
5. Estimated 7,600 insulators with average weight of 135 pounds per insulator string.
6. Salvage market is variable and actual values will vary.
7. Equipment details regarding Franklin Terminal equipment were not provided to GZA. No salvage included for any equipment to be installed at Franklin Terminal.

Appendix D – Limitations

USE OF REPORT

1. GZA GeoEnvironmental, Inc. (GZA) prepared this Opinion of Probable Costs (OPC) on behalf of, and for the exclusive use of our Client at the stated time for the stated purpose(s) and location(s) identified in the Estimate. Use of this Estimate, in whole or in part, at other locations, or for other purposes, may lead to inappropriate conclusions; and we do not accept any responsibility for the consequences of such use(s).

STANDARD OF CARE

2. GZA's findings and conclusions are based on the work conducted as part of the Scope of Services set forth in the OPC and/or proposal, and reflect our professional judgment. These findings and conclusions must be considered not as scientific or engineering certainties, but rather as our professional opinions concerning the limited data gathered during the course of our work.

3. GZA's services were performed using the degree of skill and care ordinarily exercised by qualified professionals performing the same type of services at the same time, under similar conditions, and at the same or a similar property. No warranty, expressed or implied, is made.

4. Basis of Opinion of Cost. Unless otherwise stated, our opinions of cost are only for comparative and general planning purposes and are based on 2016 Dollars. These opinions are based on the limited data and the conditions and assumptions described in the Estimate. The cost estimates may involve approximate quantity evaluations and are not intended to be sufficiently accurate to develop construction bids, or to predict the actual cost of work addressed in the OPC. Further, since we have no control over when the work will take place nor the labor and material costs required to plan and execute the anticipated work, our cost opinions were made by relying on our experience, the experience of others, and other sources of readily available information. Actual costs may vary over time and could be significantly more, or less, than stated in the Estimate.

5. Cost opinions presented in the Estimate are based on a combination of sources and may include published RS Means Cost Data; past bid documents; cost data from federal, state or local transportation agency web sites; discussions with experienced contractors; and GZA's experience. GZA did not attempt to independently verify the accuracy or completeness of all information reviewed or received during the course of this evaluation. Actual costs will likely vary depending on the quality of materials and installation; manufacturer of the materials or equipment; field conditions; geographic location; access restrictions; phasing of the work; subcontractors mark-ups; quality of the contractor(s); project management exercised; and the availability of time to thoroughly solicit competitive pricing. In view of these limitations, the costs presented in the Estimate should be considered "order of magnitude" and used for budgeting and comparison purposes only. Detailed quantity and cost estimating should be performed by experienced professional cost estimators to evaluate actual costs. The opinions of cost in the Estimate should not be interpreted as a bid or offer to perform the work. Unless stated otherwise, all costs are based on present value.

6. The opinion of costs are based only on the quantity and/or cost items identified in the Estimate, and should not be assumed to include other costs such as legal, administrative, permitting or others. The Estimate also does not include any costs with respect to third-party claims, fines, penalties, or other charges which may be assessed against any responsible party because of either the existence of present conditions or the future existence or discovery of any such conditions.

Appendix E – Qualifications

RESUME

John C. Murphy, CCM, CHMM

Senior Principal

Summary of Experience

Mr. Murphy is a Certified Construction Manager and leads GZA's Construction Management and Demolition practice. Mr. Murphy's expertise includes pre-design, design, procurement, construction, and post-construction activities on a variety of environmental, energy, building, heavy construction, demolition, and facility closures projects throughout the United States. Mr. Murphy has specialized experience with work sequencing, scheduling, waste minimization, logistics and the management of hazardous materials, asbestos, lead, mold, polychlorinated biphenyls (PCBs) in buildings and site structures. He also has significant experience with site development, remediation and design as well as installation of specialty groundwater and soil treatment systems, containment structures and caps. Relevant project experience includes:

Relevant Project Experience

Principal in-Charge, Decommissioning Plan and Opinion of Probable Costs, MVRP 345KV and 115KV Line, Confidential Client, Southern New Hampshire. GZA was retained to prepare a Decommissioning Plan and Opinion of Probable Costs for The Merrimack Valley Reliability Project (MVRP) which includes the planned construction of an approximately 18-mile segment of new 345 kV and the relocation of a portion of an existing 115 kV electric transmission lines within an existing right-of-way located in southern New Hampshire. Work was performed to support requirements of the New Hampshire Siting and Evaluation Committee and included a detailed cost estimate and an analysis of salvage values for the project.

Principal in-Charge, Reclamation Cost Estimate, Milford I & II Windfarm and 345KVA gen tie, SunEdison, Beaver, Utah. GZA was retained to prepare a Reclamation Cost Estimate to meet the requirements of federal Bureau of Land Management (BLM) policy IM-2015-138 regarding financial assurance. The entire Milford I & II Wind Farm development is comprised of 165 WTGs, 4 permanent MET towers, electrical collector lines, electrical transmission lines, a substation, and an Operations and Maintenance building. The development encompasses an area of approximately 40 square miles of public, Utah Schools and Institutional Lands Administration lands, and BLM-managed lands. .

The Wind Farm components that are on BLM-managed lands include: 62 WTGs, 4 permanent MET towers, 88 miles of 346kva electrical collector lines, electrical transmission lines, a substation, and certain access roads. GZA prepared a detailed reclamation cost estimate which included analysis of salvage and long-term monitoring costs.

Principal in-Charge, Demolition and Clean-Up of Fire Damaged Battery Storage Building at 30 Mega-watt Windfarm, Confidential Client, Kahuku, Hawaii. Responsible for overall coordination, planning and management of a fixed price demolition and clean-up of a battery storage building that served a 30 Mega-Watt windfarm damaged in a catastrophic fire. The structure consisted of a steel-framed high-bay building with concrete slab which housed approximately 12,000 lead acid batteries in use at the facility. Lead debris was present in the form of hazardous ash, molten lead, and burnt lead batteries plates still remaining in the racks. Prior to on-site demolition and clean-up activities, GZA conducted a pre-demolition asbestos

Education

B.S., 1988, Mechanical Engineering Technology, Wentworth Institute of Technology
A.S., 1986, Mechanical Design Engineering, Wentworth Institute of Technology

Registrations & Certificates

Certified Construction Manager- #3612
Certified Hazardous Materials Manager, Certificate – #16064
Engineer-in Training – New Hampshire, #3714
International Code Council UST Decommissioning Certified – #1089615-26

Affiliations

- Association of General Contractors
- Construction Management Association of America
- National Demolition Association
- Member, Salvation Army Advisory Board

Areas of Specialization

- Construction Management
- Cost Control
- Facility Closures / Demolition
- Building Assessments
- Hazardous Materials Management
- Asbestos, Lead and Mold Management
- Storage Tank Management
- Soil & Groundwater Remediation

John C. Murphy, CCM, CHMM

Senior Principal

survey, developed a Demolition and Clean-Up Work Plan and obtained approval from the regulatory agency, obtained a demolition permit, coordinated subcontractors, characterized waste streams, coordinated recycling and disposal facilities, and established work areas and site controls. Work included segregation, removal, and containerization of hazardous materials and non-hazardous materials remaining in the building as well as complete decontamination and removal of the building structure. The clean-up design was focused on waste minimization and maximizing the percentage of materials suitable for recycling through labor intensive waste segregation. Segregated materials were containerized in accordance with applicable shipping regulations and transported off-site for disposal. Following demolition of the structure, the surface of the slab and surrounding soils were remediated to meet regulatory requirements.

Technical Principal, Public Service of New Hampshire, Natural Resources and Construction Support for Transmission Line Projects in New Hampshire. Responsible for providing constructability review to support ongoing natural resources data collection, wetlands and shoreland permitting, environmental compliance monitoring, agency negotiations and resolution, and wetland mitigation and restoration design and implementation oversight.

Technical Principal, Public Service Company of New Hampshire, Responsible for providing constructability review V182 Line Uprate, Concord to Franklin, New Hampshire. Responsible for natural resource identification, documentation, impact permitting and environmental compliance through construction of an approximately 23-mile section of the existing V182 transmission line corridor from the Garvins Substation in Bow to the Webster Substation in Webster, New Hampshire. Work associated with this project is ongoing and is being provided to support the thermal uprate of the existing 115 kilovolt (kV) Transmission Line.

Principal in-Charge, Demolition Planning and Procurement, North Campus Academic Center Project, Dartmouth College, Dartmouth, New Hampshire. Responsible for overall coordination and management of pre-design, assessment, final design and procurement for the demolition of the Gilman building and Dana building including the Gilman/Dana Connector and portions of the Gilman/Remsen Connector located on College Street at the North Campus of Dartmouth College. The project includes a 62,740 square-foot Gilman building, 27,100-square-foot Dana building, a 700-square-foot Dana-Gilman connector, a 1,110-square-foot Dana-Remsen connector, concrete and gravel sidewalks, paved parking, and landscaped areas. Work included full facility assessment, project sequencing demolition plan and specification development and management of procurement process on behalf of Dartmouth College.

Principal in-Charge, Former Manufactured Gas Plant, Liberty Utilities, Concord, New Hampshire. Responsible for completion of a supplemental site investigation (SSI), data gap investigations, Initial Response Action (IRA), and historic structure maintenance activities for this former manufactured gas plant (MGP) site. MGP byproducts including light and dense non-aqueous phase liquids (LNAPLs and DNAPLs) are present at the site, and a dissolved-phase volatile organic compound (VOC) plume extends off site.

Work included the completion of subsurface investigations to delineate dissolved-phase and DNAPL contamination, as well as the evaluation and summary of work performed by others that included storm water sampling, subsurface explorations, groundwater sampling, and an evaluation of subsurface MGP structures. GZA developed work plans for an IRA to remove liquid and sludge contained within the subsurface structures, and completed a soil vapor migration study. GZA also developed a 3-dimensional numerical model of site vicinity stratigraphy and DNAPL. The model provided insight into the distribution and historic movement of DNAPL within the subsurface.

Principal in-Charge, Siding and Roofing Removal and Confidential Client, Avanel, New Jersey. Responsible for overall coordination and management of pre-design, assessment, final design, and procurement for the removal and replacement of asbestos siding and roofing coated with PCB paint at an operating industrial facility that produces food grade sodium silicate based products. Paint containing PCBs at varying concentrations had previously been identified on approximately 250,000 square feet of asbestos (transite) siding and roofing throughout the facility. As Construction Manager as Agent, GZA designed and implemented a remedial strategy to comply with a state mandated source removal of PCBs from the paint on the siding.

Principal in-Charge, Demolition Planning and Procurement, PQ Corporation, Plant 1 Demolition. Responsible for providing comprehensive engineering and construction management services to PQ Corporation at one of its active manufacturing Sites in New Jersey as the

John C. Murphy, CCM, CHMM

Senior Principal

company complies with Industrial Site Recovery Act (ISRA) and New Jersey Department of Environmental Protection (NJDEP) requirements. As part of the ISRA process, PQ Corporation decided to demolish the portion of the plant no longer in use. GZA provided pre-demolition asbestos-containing material (ACM), PCB, lead paint, and hazardous material surveys of the Plant 1 buildings. GZA developed technical specifications to address the abatement of ACM, PCBs, and hazardous materials, the planned approach for demolition of site structures, utilities, and site work required to meet the needs of PQ. GZA prepared a Soil Erosion and Sediment Control Plan and prepared a PCB Work Plan. GZA was retained as Construction Management as Agent to manage the demolition and Site restoration Project.

Principal in- Charge, Construction of GE Aviation Welcome Center and Site Entrance, Hooksett, New Hampshire. Responsible for design-build construction of the new Site entrance and construction of a new GE Hooksett Welcome Center. The new Site entrance and Welcome Center was constructed at the location of an existing secondary access drive to the main facility. The location of the secondary access drive was redesigned to accommodate the Welcome Center and is the new main entrance into the facility and the check-in/out of employees and visitors upon arrival and departure. The new Site entrance includes a 3-lane entrance with a 90-foot automated slide gate and a 2-lane exit with a 45-foot automated slide gate. The ADA compliant Welcome Center building includes a guard station, waiting area, bathroom, telecommunication closet, and a utility room. Sidewalks around the Welcome Center are equipped with an automated snowmelt system. GZA performed as Construction Manager at Risk for all phases of the project including permitting, civil design, building design, earthwork, utilities, footings and foundation, building structure, interior and exterior finishes, building and Site electrical, mechanical, fire alarm, sprinkler system, fencing and slide gates, and demolition of the former guard shack.

Principal in Charge, Building Demolition and Renovation, Former Dorr Woolen Mill Complex, Newport, New Hampshire. Mr. Murphy was responsible for environmental permitting, design, local plan approval and demolition activities associated with the complete demolition and removal of 250,000 square feet of the 300,000-square-foot Former Dorr Woolen Mill Complex located in Newport, New Hampshire. Approximately 50,000 square feet of the facility were separated from the demolished portion of the facility and renovated for re-occupancy by the current owner. The work was performed on a firm fixed price basis with an accelerated schedule. Work included performing a demolition level asbestos and hazardous materials survey and development of a demolition design plan to address utility capping and rerouting, abatement and demolition phasing, and renovation coordination activities to facilitate relocation of existing on-site personnel from the buildings being demolished to the newly renovated space. GZA presented its demolition and renovation plans to the Town of Newport Planning board and secured all Town approvals for the project. In addition, GZA secured wetland, shoreland protection, alteration of terrain, and construction stormwater permits for the project.

Work included removal and characterization of hazardous materials remaining in the buildings, removal of asbestos-containing materials, and demolition and processing of all building materials. GZA performed inventory and management of salvageable materials within all buildings. Following demolition, the former basement and foundation areas were backfilled with recycled crushed brick and concrete from the buildings as well as imported fill, graded, and compacted. All disturbed areas were final graded, loamed, and seeded. Work also included closure of an existing raceway below the facility which was formerly used to convey water from the adjacent Sugar River through the facility for process operations.

Technical Principal, Former MGP, Pawtucket, Rhode Island. Responsible providing constructability review and support to complete design and construction management services for the decommissioning and demolition (D&D) of Gas Holders Nos. 7 and 8 at the former Tidewater MGP facility located in Pawtucket, Rhode Island. The location of the gas holders was adjacent to sensitive receptors including an apartment complex, charter school, and private residences. Gas Holders Nos. 7 and 8 measured approximately 130 and 175 feet in diameter, respectively and were both 30 feet in height. The approximate gas storage capacity of Holder Nos. 7 and 8 was 1,000,000 and 3,000,000 cubic feet, respectively.

D&D activities included evaluation of treatment and discharge options for accumulated stormwater in the gas holders; preparation of D&D design plans and specifications; contractor procurement; permitting; storm water removal, treatment, and discharge; implementation of perimeter air monitoring system; and construction management of abatement and demolition of the gas holders.

John C. Murphy, CCM, CHMM

Senior Principal

The Tidewater gas holder D&D project was completed within an aggressive schedule and on budget with no change orders.

Principal-in -Charge, Facility Upgrades, G&K Services, Manchester, New Hampshire. Responsible for overall management of a design-build contract to install two Ellis VOC stripper/washer-extractors at G&K's Manchester, New Hampshire towel wash plant. To support the new VOC stripper/washer-extractor installation, numerous infrastructure upgrades were required not only to support the new washers, but also to increase the efficiency and productivity of the entire washing process. Infrastructure upgrades included retrofitting the existing drain system including existing wastewater trenches; construction of a floor sump in the concrete slab; installation of shaker screen, 75 BHP steam generating boiler, heat exchanger, stack economizer, soap system, and chemical totes with automated level controls; building structure renovations; earthwork, foundation, and installation of a new hazardous materials storage building; and installation and/or relocation of electrical, network, compressed air, hot and cold water, natural gas, high pressure steam, wastewater, and condensate return lines. As part of our design work, GZA provided G&K with building renovation, mechanical, and electrical engineered plans for all systems supporting the towel wash plant upgrades and obtained permits, authorizations, and approvals for completion of the work. A requirement of our contract for construction services was an aggressive schedule and detailed work sequencing that included no impact to facility operations. Completion of all building structural renovations, mechanical piping and connections, electrical conduit, wiring and connections, and new equipment rigging and installation were performed with essentially no interruption to the facility with required shut-down connections performed outside of the facilities normal working hours (nights and weekends).

Principal in Charge, Demolition and Soil & Groundwater Remediation, Former Sanmina Facility, Derry, New Hampshire. Responsible for the relocation of an existing groundwater treatment system consisting of 3 bedrock and 12 overburden extraction wells including installation of new underground piping and conduit and construction of a new treatment building. Completed demolition activities associated with complete demolition of an existing approximately 126,000-square-foot, 2-story former plating facility. Work included removal and characterization of hazardous materials remaining in the buildings, removal of asbestos-containing materials, and demolition and processing of all building materials including removal of foundations and footings. Following demolition, the former basement and foundation areas were backfilled with imported fill, graded, and compacted. Work also included the excavation and disposal of approximately 1,300 tons of contaminated concrete and 3,500 tons of contaminated soil.

Principal in Charge, Building Demolition, The Salvation Army, Dorchester, Massachusetts. Responsible for design and demolition activities associated with the complete demolition and removal of an existing 21,000-square-foot, 1-story industrial building; 9,500-square-foot, 1-story industrial building; and six multi-family, apartment buildings located in an urban setting. Work included removal and characterization of hazardous materials remaining in the buildings, removal of asbestos-containing materials, and demolition and processing of all buildings including removal of foundations and footings. Following demolition, former basement and foundation areas were backfilled with imported fill, graded, and compacted. Work also included excavation, removal and disposal of three underground solvent and gasoline tanks and one No. 6 oil tank located in a below grade vault. Contaminated soil associated with releases from the tanks was excavated and disposed of off-site. Approximately 180 tons of lead-impacted soil were also excavated and disposed of off site.

Project Manager/Estimator, Facility Closures, Defense Fuel Supply Center (DFSP-Newington, DFSP-Casco Bay, and DFSP-Searsport). Responsible for the development of fixed price costs for competitively bid facility closure programs for three military bulk fuel storage and transportation facilities managed by the Department of Defense and located in the Northeastern United States. GZA was awarded the contract as best value to the government. DFSP-Newington includes a marine fuel pier, a multi-acre bulk fuel storage terminal consisting of six underground storage tanks with a total capacity of approximately 15.4 million gallons, and a 3-mile-long pipeline system to Pease Air Force Base. DFSP-Casco Bay includes a marine fuel pier, a 67-acre bulk fuel storage terminal consisting of 14 aboveground fixed-roof storage tanks with a total capacity of approximately 39.5 million gallons, and a 12-mile-long pipeline system to Brunswick Naval Air Station. DFSP-Searsport includes a marine fuel pier, a 52-acre bulk fuel storage terminal consisting of nine aboveground fixed-roof storage tanks with a total capacity of approximately 37.8 million gallons, and a 200-mile-long

John C. Murphy, CCM, CHMM

Senior Principal

pipeline system to Bangor Air National Guard Facility and Loring Air Force Base.

Principal in Charge, Building Demolition, The Salvation Army, Utica, New York. Due to a structural failure of the roof on a 100,000-square-foot warehouse, GZA was retained to perform overall Demolition of the warehouse and adjacent 3-story former residence building. Work included performing a demolition level asbestos and hazardous materials survey and subsequent abatement of identified materials. Given the extended period of time that had elapsed since the roof collapse, abatement of significant amounts of pigeon guano was required to protect worker health & safety during site activities. Upon completion of abatement activities, a complex building separation was performed where the building tied into an occupied adjacent structure and the entire building was demolished. Site work included removal of all utilities. The site was graded and left in a "parking lot" ready condition.

Principal in Charge, Environmental Services, The Salvation Army, Various Locations. Mr. Murphy is responsible for overall coordination of investigation and remedial work at all client-owned facilities in the Northeast. Facilities range from single-family residences to multi-story commercial buildings to 100-acre summer camps. GZA performed environmental inspections at over 2,300 facilities and ranked environmental risk based on our observations of lead, asbestos, tanks and water intrusion issues. An Internet based application was developed by GZA that catalogued our visits, findings and rankings. At the completion of the studies, GZA Identified 125 "priority" sites that required immediate action. As follow-on to our initial study, GZA was tasked with remediation at these priority sites. This work involves generation of work plans, bid administration and construction management at these sites. To date work has involved asbestos, lead, mold, aboveground and underground storage tank removal, water intrusion, and contaminated soils. In addition to abatement and remediation, GZA is responsible for restoration of disturbed building or Site surfaces.

Principal in Charge, Beede Waste Oil Superfund Site, Plaistow, New Hampshire. Responsible for cost estimating and management of this fixed price competitively bid remedial action. Work included installation of two separate vacuum enhanced dual phase extraction systems capable of removal groundwater and light non-aqueous phase liquid (LNAPL) from 143 extraction well locations. Approximately 1 mile of heat fused aboveground polypropylene piping was installed to transport LNAPL and groundwater from three-separate on-site plume locations to the treatment systems. In addition, an existing interceptor trench was extended to capture LNAPL migrating into Kelly Brook at the down gradient edge of the Site. This remedial action is considered a Non Time Critical Removal Action (NTCRA) by EPA and is designed to contain the existing on-site plumes and stop off-site migration to adjacent surface water.

Senior Project Manager, Rushton Street Landfill, Sanford, Maine. Responsible for management of two separate fixed priced competitively bid projects at the Former Rushton Street Landfill. In an effort to minimize clean water from leaching through the existing landfill and further contaminating a tributary of the Mousam River located down gradient, GZA installed a 60-foot-deep, 1,000-foot-long soil/bentonite cut-off wall to slow infiltration of clean water. In addition, under a separate contract, GZA installed nine extraction wells, pumps and controls capable of by-pass pumping approximately 125 gallons per minute of clean groundwater around the landfill. It is expected that the project will produce a 50-75 percent improvement in water quality in the tributary. This unique approach saved the Town of Sanford approximately $4.0 million dollars and was developed after a $6.3 million plan was abandoned in 1996.

Senior Project Manager, Various Hazardous Toxic and Radioactive Waste sites. Stone & Webster Engineering Corporation was awarded a 4-year $50 million dollar contract to provide environmental remedial construction services to the United States Army Corps of Engineers - New England Division for work at hazardous, toxic or radioactive waste sites throughout New England, New York and New Jersey. GZA was a primary subcontractor to Stone & Webster for the work. Mr. Murphy was responsible for managing all aspects of a $15 million dollar, 4-year subcontract. Task orders issued to GZA involved remedial action activities associated with the sites described below.

- PCB Soil Removal Action, Former Hope Island Naval Air Station, Portsmouth, Rhode Island
- EPA Asbestos Removal Action, Former Johns-Manville Asbestos Superfund Site, Nashua, New Hampshire
- Power Plant Assessment, Evaluation, Abatement and Demolition, Building 108, Former Charlestown Naval Shipyard, Boston, Massachusetts

John C. Murphy, CCM, CHMM

Senior Principal

- Mercury-Contaminated Wetland Sediment Removal, Nyanza Chemical Waste Dump Superfund Site, Ashland, Massachusetts
- Facility Decontamination Sampling, Building 105, Former Charlestown Navy Yard, Boston, Massachusetts
- Asbestos Survey, Campbell School, Bourne, Massachusetts

Project Manager, Sludge Sampling, Confidential Client, Concord, Massachusetts. Provided on-site supervision during removal of 20,000 pounds of sludge from a mixed waste (radioactive and chemical waste) lagoon. Sample was obtained through an existing Hypalon liner and placed into Department of Transportation-approved containers for shipment to a facility for the recovery of metals. Sampling of sludge required design and construction of innovative large-scale sampler.

Professional Development

US Army Corps of Engineers, Construction Quality Management for Contractors

Remediation of Hazardous Waste Sites, Center for Professional Advancement

Construction Dewatering, Northeastern University

OSHA 29 CFR 1910.120 (e)(3) HAZWOPER Initial Training (40 Hours)

OSHA 29 CFR 1910.120 (e)(8) HAZWOPER Refresher Training (8 Hours/Annual)

OSHA 29 CFR 1910.120 (e)(4) HAZWOPER Management and Supervisor Training (8 Hours)

Factory-Certified, Level B Safety Equipment, North

Factory-Certified, Underground Storage Tank Installer, Total Containment

Owens Corning Fiberglass Tanks

GZA GeoEnvironmental, Inc.