Unitil
Unitil Service Corp.

February 26, 2010

BY E-MAIL

Debra A. Howland, Executive Director and Secretary
New Hampshire Public Utilities Commission
21 S. Fruit Street, Suite 10
Concord, NH 03301-2429

Karen Geraghty, Administrative Director
Maine Public Utilities Commission
18 State House Station
101 Second Street
Hallowell, ME 04347

RE: NHPUC Docket No. DG 08-048
MPUC Docket No. 2008-155
Final Report – Granite State Gas Transmission Study

Dear Directors Howland and Geraghty:

Pursuant to the Settlement Agreements approved by the New Hampshire Public Utilities Commission ("NH Commission") in NHPUC Docket No. DG 08-048 and by the Maine Public Utilities Commission ("ME Commission") in MPUC Docket No. 2008-155, enclosed on behalf of Unitil Corporation ("Unitil") is the Final Report concerning the study of issues regarding the potential integration of Granite State Gas Transmission, Inc. and Northern Utilities, Inc.[1]

Please do not hesitate to contact me directly if you have any questions or concerns regarding this matter.

Sincerely,

/s/ Gary Epler
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Attorney for Northern Utilities, Inc.

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Chief Regulatory Counsel

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[1] The study is referenced in Article VII, paragraph 7.1 of the Settlement Agreement Stipulation in NHPUC Docket No. DG 08-048 and Section III, paragraph E.1 of the Stipulation in MPUC Docket No. 2008-155, and described in more detail in Attachment B to each Stipulation.

cc: Matthew Fossum, NHPUC Staff Attorney
Carol MacLennan, MPUC Hearing Officer
Meredith Hatfield, NH Consumer Advocate
Wayne Jortner, ME Office of Public Advocate

UNITIL CORPORATION

GRANITE STATE GAS TRANSMISSION STUDY
FINAL REPORT

February 26, 2010

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EXECUTIVE SUMMARY

Introduction and Summary of Findings

Pursuant to orders issued by the New Hampshire and Maine Public Utility Commissions approving the stipulations and settlement agreements allowing for Unitil Corporation's acquisition of Northern Utilities ("Northern"), Unitil agreed to conduct a study regarding, the potential integration and/or other reorganization of Granite State Gas Transmission, Inc. ("GSGT" or "Granite") and Northern.[1] The Granite Study was to be a collaborative process among the interested parties, including: Maine and New Hampshire Commission Staffs, the Public and Consumer Advocates for Maine and New Hampshire and Unitil.

This Report is a summary of the Granite Study, which was a comprehensive review of the issues, associated with the integration of Granite and Northern. The Granite Study included an evaluation of:

- The impacts on Granite if the Granite operating pressure was reduced and/or Granite was physically reconfigured;
- The costs associated with the Granite pipeline integrity management program; and
- Implications associated with gas supply, marketers/suppliers and legal/regulatory issues.

Based on the quantitative analysis and qualitative evaluations conducted for the Granite Study, which are discussed in detail in the body of this Report, and giving due consideration to a variety of factors including: system planning, cost, operations, management of gas supply, access for third party suppliers, reliability, safety, and the public interest, Unitil has determined that the most effective long-term solution for Northern's and Granite's customers is to continue to operate the GSGT pipeline as an integrated (i.e., continuous) pipeline at transmission pressures[2]. Therefore, Unitil has concluded that de-rating the pipeline and filing for an exemption from U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration ("PHMSA") regulation and Federal Energy Regulatory Commission ("FERC") jurisdiction is not the most effective long-term solution for Northern's and Granite's customers, nor would these customers be better served by modifying the physical, operational, regulatory and corporate structure necessary for state regulation of Granite.

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1 Attachment B to the Stipulation approved in the Maine Public Utility Commission Docket 2008-155 and to the Settlement Agreement and Stipulation in the New Hampshire Public Utility Commission Docket DG08-048.

2 Operating the GSGT pipeline as an integrated (i.e., continuous) pipeline at transmission pressures is referred to in the Granite Report as "Baseline 1 Scenario".

Study Approach and Structure

Given the range of issues to be considered for the Granite Study, a case study matrix was developed that provided a structural organization for the analysis. Unitil evaluated nine different scenarios based on two critical engineering issues: 1) the operating pressure of Granite (i.e., would Granite operate at transmission pressures, distribution pressures or some combination); and 2) the physical configuration of Granite (i.e., would Granite be operated as one continuous pipeline or would Granite be separated into two pipelines at either the Maine/New Hampshire border or at Little Bay Bridge[3]).

The following Executive Summary - Table 1 represents the case study combinations of operating pressure and physical configurations that were evaluated for this report:

Executive Summary – Table 1

Operating Pressure	Physical Configuration	Engineering Scenario[4]
Transmission	Integrated	Baseline 1, Baseline 2
Transmission	Split at the Border	Scenario 2
Transmission	Split at the Bridge	Scenario 13 A
Distribution	Integrated	Scenario 10
Distribution	Split at the Border	Scenario 3 A
Distribution	Split at the Bridge	Scenario 12
Hybrid/Combination	Integrated	Scenario 7
Hybrid/Combination	Split at the Border	Scenario 11 A
Hybrid/Combination	Split at the Bridge	Scenario 5

For each of the scenarios identified above, Unitil's assessment included: engineering costs associated with system reconfiguration and pressure changes; costs associated with integrity management compliance; implications with respect to gas supply and legal/regulatory issues; and impacts on marketers/suppliers.

Unitil developed a financial analysis model to arrange and organize capital costs and O&M expenses for each scenario in a manner that would allow for an economically valid comparison of all of the scenarios, based on the expected costs (e.g., system improvement capital costs, integrity management capital costs, O&M expenses, and regulatory expenses) and timing of those costs for each scenario. The financial analysis[5] model estimated annual revenue requirements for each

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3 As a result of a New Hampshire Department of Transportation project to expand the bridge that crosses Little Bay, Unitil evaluated certain options available to Granite to address the need for Granite to relocate the Granite pipeline from the current location on the existing Little Bay Bridge.

4 Please note that these scenario numbers are utilized in the "Granite State Gas Transmission de-rate analysis, REV L Details" document which was delivered by hard copy to the MPUC and NHPUC Engineering Staffs.

5 The financial analysis not only included the projected engineering and integrity management costs but also included: capital structure, cost of capital, tax rates, and depreciation.

scenario, based on the estimated capital costs and O&M expenses for that scenario. The financial analysis model summarized annual revenue requirements for each scenario on a net present value basis to allow for consistent comparisons over all scenarios. The financial analysis resulted in the following definitive observations and conclusions:

- The engineering costs and the integrity management costs are the key cost drivers in the analysis;
- All the scenarios where the Granite operating pressure was de-rated to distribution pressure were clearly the most expensive options;
- In three of the top five scenarios, Granite is operated at transmission pressures;
- The scenarios where the Granite system is reconfigured and separated at the New Hampshire and Maine border were more costly than if Granite remains as a continuous pipeline (i.e., Scenarios: Baseline 1, Baseline 2, and 7) or is separated at Little Bay Bridge (i.e., Scenarios: 13A and 5); and
- The net present value requirements of the top three scenarios (i.e., Scenarios: Baseline 1, 13A, and 5) are almost identical, as shown in Executive Summary – Table 2.

Executive Summary – Table 2

	Transmission Pipeline			Hybrid Pipeline	
Configuration	**Integrated**	**Integrated**	**Split at LBB**	**Integrated**	**Split at LBB**
Scenario	**Baseline 1**	**Baseline 2**	**Scenario 13A**	**Scenario 7**	**Scenario 5**
Cumulative Net Present Value: Revenue Requirement					
2020	$5,156,909	$5,278,843	$4,992,942	$6,996,976	$5,073,300
2030	$6,350,631	$6,650,262	$6,125,473	$8,487,063	$6,155,579
Rank of Cumulative Net Present Value: Revenue Requirement					
2020	3	4	1	5	2
2030	3	4	1	5	2

Although Baseline 1, Scenario 13A, and Scenario 5 are equivalent from a net present value perspective, Unitil's qualitative assessment included the consideration that Scenarios 13A and 5 would require the Granite pipeline to be separated at Little Bay Bridge. Separating Granite at Little Bay Bridge (or at the Maine / New Hampshire border) would lead to several major uncertainties, including the timing and construction of a new gate station and all the issues associated with land acquisition, permitting and negotiation with the Joint Facilities operator. In addition, if Granite was separated at Little Bay Bridge, reliability of service to Northern's customers could be impacted, because two different areas would be served exclusively from one gate station. Finally, Scenario 5 would require that Granite be operated at a combination of transmission and distribution pressures, which would likely reduce the operational flexibility and reliability of service to areas that are fed from the Granite segments that will be de-rated to distribution pressure. Therefore, Baseline 1 – the status quo scenario – represents the option with the fewest unknowns that may translate to risks that would affect cost, reliability, and operation of the pipeline.

The remainder of the Granite Report is presented in four sections:

I. Introduction – describes the purpose of the Granite Report and in addition outlines the collaborative process utilized by the interested parties;
II. GSGT Overview – provides an overview of Granite including customers and throughput;
III. Granite Study Process and Results – provides a detailed explanation of the analysis methodology utilized to evaluate the various GSGT scenarios including engineering/system costs, integrity management costs, impacts on gas supply/marketers, and legal/regulatory issues. In addition, the financial analysis utilized to compare the GSGT scenarios is discussed in detail; and
IV. Conclusions and Decision – provides a summary of the conclusions and decisions based on all the qualitative and quantitative analysis.

I. INTRODUCTION

This Granite Study has been prepared in compliance with orders issued by the New Hampshire and Maine Public Utility Commissions ("NHPUC" and "MPUC," collectively, the "PUCs") approving Unitil Corporation's acquisition of Northern Utilities, Inc. from NiSource.[6] In Attachment B to the Stipulation approved in MPUC Docket No. 2008-155 and to the Settlement Agreement and Stipulation approved in NHPUC Docket No. DG 08-048, Unitil agreed to "collaboratively conduct a study of issues regarding the potential integration and/or other reorganization of Granite and Northern, and to share all technical analyses, system models, economic evaluations, legal opinions, and findings produced by the study with stakeholders in New Hampshire and Maine, including the New Hampshire Commission Staff and the Office of the Consumer Advocate."[7]

Attachment B describes the following areas of inquiry to be addressed the Granite Study:

- Network planning – system impacts and construction requirements, reliability implications and costs associated with reducing the operating pressure, changing the MAOP[8], and/or splitting the pipeline at the border between Maine and New Hampshire ("state border") to change pipeline status from transmission to distribution
- Integrity Management Plan ("IMP")[9] costs – on-going capital and O&M costs associated with compliance with Integrity Management ("IM") requirements that would be avoided if the pipeline was de-rated
- Operational impacts – operational impacts and costs associated with reducing the operating pressure, changing the MAOP, and/or splitting the pipeline at the state border
- Supply contracts – costs, impacts, and/or loss of flexibility in contracting for supply, managing supply for both states and/or managing the exchange contract with Bay State Gas Company
- Marketers/suppliers – affect on customers, marketers, suppliers if the pipeline is integrated into Northern (impact on the availability of the pipeline for wholesale deliveries)
- Legal/regulatory – exemptions or determinations available to seek a jurisdictional change, decertification of the pipeline under PHMSA[10,11]

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6 The New Hampshire Public Utility Commission issued Order No. 24,906 Approving Settlement Agreement in Docket DG 08-048 on October 10, 2008, Joint Petition for Approval of Stock Acquisition. The Maine Public Utility Commission issued an Order Approving Stipulation with Conditions on October 22, 2008 in Docket 2008-155.

7 The language quoted is from the Settlement Agreement Stipulation in Docket No. DG 08-048. The language in Attachment B to the Stipulation in Docket 2008-155 omits "and/or other reorganization" and references the Maine Commission Staff and Public Advocate rather than their New Hampshire counterparts.

8 MAOP is the common abbreviation for Maximum Allowable Operating Pressure.

9 Integrity Management is discussed in Section III.C of this report.

The Commission Orders established that the deadline for the submission of the preliminary Granite Study was one year after the close of the Unitil acquisition of Northern or December 1, 2009. On November 24, 2009, the MPUC and NHPUC approved Unitil's request, on behalf of the collaborative stakeholders to extend the deadline for the submission of the Granite Study until January 11, 2010. On January 11, pursuant to consultation with all stakeholders, Unitil requested a second extension of the submission deadline, which was granted by the MPUC and NHPUC. In the MPUC Order approving the second extension, the MPUC set February 26, 2010 as the deadline for submission of the final report.

This Report is the result of a complex undertaking that required the coordination of several interdependent analyses involving many contributors from several functional areas. The Report is based on data and information that was available at the time it was prepared. The data, and therefore the analyses that employ the data, are subject to change. In addition, Unitil relied upon its business judgment, industry practice and knowledge to evaluate and address certain issues.

The Granite Study was a collaborative process among interested parties (i.e., Unitil, the Maine and New Hampshire Commission Staffs and the Public and Consumer Advocates for Maine and New Hampshire). Unitil conducted several conference calls and meetings to describe and discuss project status and interim results and findings. These meetings and/or conference calls are listed in Table I.1 below:

Table I.1: Granite Study Meeting Dates

Date of meeting / Conference Call	Participants
May 29, 2009	All parties
July 2, 2009	All parties
August 13, 2009	All parties
September 8, 2009	PUC, Unitil Engineers
September 23, 2009	PUC, Unitil Engineers
October 13, 2009	PUC, Unitil Engineers
October 14, 2009	All parties
November 10, 2009	All parties
January 5, 2010	PUC, Unitil Engineers
February 9, 2010	All parties

10 PHMSA is the acronym for U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration.

11 Maine Public Utility Commission Docket No. 2008-155, Order approving the Stipulation, Attachment B.

A full listing of the participants in the Granite Study process is provided in Appendix A. In addition to the meetings and calls described above, Unitil also developed and supported a web-site dedicated to the Granite Study. Where possible, the meeting and/or conference call materials as well as certain data response were posted to the web-site for participant access. In the event that any materials could not be posted to the Granite Study web-site, Unitil provided the information electronically and/or as hard copies. In addition, there were several telephone conversations and email exchanges between Unitil and the PUC Staff engineers which covered a variety of topics. Finally, a draft report was circulated to all the interested parties on January 14, 2010 and feedback was provided to Unitil at a meeting on February 9, 2010 that all parties attended.

II. GSGT OVERVIEW

Granite State Gas Transmission, Inc. ("GSGT"), a subsidiary of Unitil, is an interstate natural gas transmission pipeline company whose principal business is the provision of natural gas transportation services to its customers. GSGT[12] operates 87 miles[13] of underground natural gas transmission pipeline originating in Haverhill, Massachusetts, traversing the New Hampshire seacoast area and terminating near Portland, Maine. The pipeline provides access to primarily domestically produced natural gas supplies at Haverhill, Massachusetts, and primarily Canadian produced natural gas supplies at Westbrook, Maine and Newington, New Hampshire. Over the past six years, the throughput on GSGT has ranged from a high of 36.5 Bcf to a low of 26 Bcf, with an annual average of 32.5 Bcf.

GSGT provides its customers with interconnection to three major interstate natural gas pipelines: Portland Natural Gas Transmission System ("PNGTS"), Maritimes & Northeast Pipeline ("Maritimes" or "MNE"), and the El Paso Corporation's Tennessee Gas Pipeline ("TGP"). The GSGT pipeline's interconnection with PNGTS is at the Newington receipt point in New Hampshire with a receipt capacity of 50,000 dekatherms per day; with Maritimes at the Westbrook receipt point in Maine with a receipt capacity of 69,000 dekatherms per day; and with TGP at the Pleasant Street receipt point in Massachusetts with a receipt capacity of 35,800 dekatherms per day. In addition to the three connections with interstate pipelines, GSGT has approximately 30 delivery points located in New Hampshire and Maine.

The New Hampshire portion of the GSGT pipeline began operation in 1956 and was extended to Maine and Massachusetts in 1966. The initial New Hampshire segment of seven miles was constructed in the 1950s. Another 76 miles were constructed in the 1960s as the system was

12 Please see Appendix B for maps of the Granite pipeline.
13 The 87 miles of pipeline include 47 miles located in Maine, 39 miles in New Hampshire and less than one mile in Massachusetts.

extended through Maine.[14] During the 1990-2000 time period, approximately four miles of pipeline was replaced in New Hampshire. Of the 87 miles of GSGT pipeline, approximately 97% is comprised of pipeline that is equal to or less than ten inches in terms of diameter size; GSGT's maximum allowable operating pressure is 750 psig between the gate station in Haverhill, Massachusetts and the Forrest Street regulating station in Plaistow, New Hampshire and 492 psig from the Forrest Street regulating station in Plaistow, New Hampshire northward to the gate station in Westbrook, Maine.[15]

Another important part of the system considered in this study is the Northern Utilities pipeline that taps off GSGT at the Varney Brook meter station located in Dover, New Hampshire and continues in a northwesterly direction to Bartlett Street regulating station in Somersworth, New Hampshire ("Dover – Somersworth Hi-line").[16] This line (although owned and operated by Northern Utilities) has a significant impact on the GSGT engineering analysis because the upstream supply (i.e., GSGT) to the Dover – Somersworth Hi-line must maintain enough pressure such that a minimum pressure of approximately 175 psig is maintained at the end of the Dover – Somersworth Hi-line (i.e., Somersworth, New Hampshire) during peak hour conditions. There is currently no pressure regulation between GSGT and the Dover – Somersworth Hi-line, therefore this system floats, from a pressure perspective, with the GSGT system.[17]

GSGT derives its revenues principally from firm transportation services provided to its shippers, including Northern, its affiliated local distribution company. Table II.1 below is a summary of the major firm customers and the associated contract quantities.

Table II.1: Granite Customers

Customer	Contracted Demand
Northern	100,000 Dth
Bay State Gas	30,000 Dth
Shell Energy	3,850 Dth
Global Montello Group	3,500 Dth
National Gypsum	2,200 Dth

The GSGT interstate natural gas transmission pipeline system is regulated by the Federal Energy Regulatory Commission ("FERC") under the Natural Gas Act ("NGA"), the Natural Gas Policy Act of 1978, and the Energy Policy Act of 2005. The GSGT system operates under a FERC approved tariff that establishes rates, cost recovery mechanisms, and terms and conditions of service for its

14 Approximately 90% of GSGT was installed in the 1960s.
15 Please find in Appendix C the GSGT MAOP validation plan.
16 The Dover – Somersworth Hi-line has a MAOP of 500 psig.
17 Northern Utilities also has a direct connection to the Maritimes and Northeast Pipeline in Lewiston, Maine.

customers. GSGT revenues are principally derived from the pipeline's Firm Transportation ("FT") and Firm Transportation – No Notice ("FTNN") rate schedules. Both the FT and FTNN rates currently feature a FERC approved, maximum monthly demand reservation charge of $1.6666 per dekatherm, which equates to a maximum daily demand reservation charge of $0.0548 per dekatherm. These rates were determined as part of a stipulated proceeding, were approved by the FERC, and became effective May 1, 1998.

Interstate natural gas pipeline companies such as GSGT are also subject to regulation by the United States Department of Transportation ("DOT") as overseen by the DOT's Pipeline and Hazardous Material Safety Administration ("PHMSA"). PHMSA regulates the pipelines pursuant to the Natural Gas Pipeline Safety Act, which authorizes safety requirements in the design, construction, operations and maintenance of interstate natural gas transmission facilities.

III. GRANITE STUDY PROCESS AND RESULTS

A. Analytical Structure

To address the areas of inquiry of the Granite Report that are stated in Section I, Unitil developed several case studies with unique structural configurations and operational profiles that reflect the two critical engineering issues regarding this analysis: (1) the operating pressure of GSGT; and (2) the physical configuration of GSGT. The operating pressure alternatives that were considered include operating GSGT as a (a) transmission pipeline, (b) distribution pipeline, or (c) combination transmission pipeline on some segments and a distribution pipeline on the remaining segments ("Hybrid"). As described in Sections III.B, C, D, and E, the system pressure that GSGT operates determines (a) whether GSGT is subject to pipeline safety regulations issued and administered by the U.S. Department of Transportation and (b) the need to construct additional pipeline facilities to maintain reliable service to Northern Utilities and its customers.

The GSGT physical configuration alternatives were developed to allow for a thorough assessment of the long term impacts of (a) the existing situation; (b) modifications that might facilitate the granting of an exemption to FERC ratemaking jurisdiction (i.e. separating the GSGT pipeline at the New Hampshire and Maine borders); and (c) a bridge reconstruction project in New Hampshire that will require Granite to either relocate or separate the pipeline in that area (i.e., Little Bay Bridge). Therefore, Unitil analyzed three physical configurations for GSGT: (a) a continuous integrated pipeline, (b) a pipeline separated at the Maine/New Hampshire border, or (c) a pipeline separated at Little Bay, located on Route 16 in Newington, New Hampshire.[18,19]

The case studies in Table A.1 below represent the combinations of operating pressure and physical configuration that were considered for this report. These case studies were utilized to consider the operational and cost impacts of each defined case on: (a) engineering and construction plans, (b) integrity management, (c) regulatory filings and requirements, (d) gas supply planning, and (e) third party marketers.

For each of the nine case studies listed in Table A.1, the engineering cost analysis included the identification of changes, and the associated costs, to the GSGT system infrastructure that are required to allow GSGT to provide the current level of service while also accommodating system growth. The following section is a summary of the process that Unitil utilized to develop and analyze the GSGT infrastructure requirements, and associated cost, of the nine case studies.

Table A.1: Case Study Matrix

	GSGT System Pressure		
GSGT Configuration	Transmission Pressure Integrated Pipeline	Transmission Pressure Separated at ME/NH border	Transmission Pressure Separated at Little Bay
	Distribution Pressure Integrated Pipeline	Distribution Pressure Separated at ME/NH border	Distribution Pressure Separated at Little Bay
	Hybrid Integrated Pipeline	Hybrid Separated at ME/NH border	Hybrid Separated at Little Bay

B. Engineering Cost Analysis

For the Engineering cost analysis, Unitil identified any changes to GSGT system infrastructure and the associated costs of those changes in infrastructure that would be required to allow GSGT to provide service at current levels of demand and also accommodating a specified level of system growth for each of the nine case studies listed in Table A.1. The following section is a summary of the process that Unitil utilized to develop and analyze the nine operating profiles.

1. Preliminary Steps

The engineering analysis determined the infrastructure requirements and costs to reconfigure GSGT from the current operating configuration, an integrated system operated at transmission pressure, to

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18 As also described in the following sections, GSGT's physical configuration will determine the need to replace the current crossing at Little Bay, to accommodate the construction of a new bridge.

19 These are the primary, immediate implications of the GSGT's physical configurations; the following sections of this report describe and explain the major secondary effects of the GSGT's physical configurations.

the operating profiles listed in Table A.1. Specifically, the engineering analysis: (i) modeled the base operating profile for GSGT; (ii) developed alternative GSGT operating configurations; (iii) identified the necessary pipeline and facility improvements required for each operating configuration; and (iv) estimated the costs associated with the identified pipeline and facility improvements.

a. GSGT System Review

To verify the existing GSGT physical infrastructure, Until engineers researched historical documentation. Specifically, Unitil researched GSGT system records and maps to identify and document physical attributes of the GSGT pipeline and associated facilities including the pipeline diameter, regulator facilities[20] and the year the pipeline or facility was installed. Unitil also collected and reviewed actual 2009 GSGT system operating data including pressures and demands at various system points.

b. Network Model Design

Unitil utilized SynerGEE Gas Network Modeling and Analysis software to develop a hydraulic model of GSGT. The pipeline, regulator station, and natural gas quality attributes collected during the system review process were entered into SynerGEE. Additionally, industry standard attributes such as pipe roughness and efficiency were assigned to all pipe segments. The general flow equation was used with the Colebrook White friction equation for each pipeline segment. This equation was chosen because it predicts flow and pressure in both the partially turbulent and fully turbulent pipeline flow regions found in these types of pipelines.

c. Network Model Calibration and Validation Process

Prior to performing scenario analysis, Unitil Engineers first calibrated the hydraulic model to ensure its accuracy, by comparing the hydraulic model results to actual GSGT operating data. Specifically, Unitil calibrated the GSGT model by comparing the hydraulic model results to the actual measurements taken at certain GSGT facilities during the peak hour on the gas day of January 15, 2009. The model was calibrated, using an industry standard practice, by making minor adjustments to pipe roughness values so the theoretical results more closely represent the measured results. The calibrated model was then compared and validated to the results measured on the gas days of February 5th and December 17, 2009. The following metrics were measured and compared for the calibration and validation periods:

[20] Attributes of the regulator facilities include regulator model, orifice size, and set pressures.

- Estimated peak demand - the calculated peak hour demand was compared to the actual peak hour consumption for January 15 and February 5 and the 9:00AM hour on December 17th
- System load data at regulator stations - the modeled system load data were compared to actual loads as measured at GSGT gate station meters
- Flow and pressure data - the model flow and pressure results were compared to actual flows and pressure measured at the three gate stations supplying GSGT

Based on this process, Unitil determined that the Stoner model was appropriately calibrated because the model results were generally within +/- 5% of flow and pressure validation points as illustrated by the following Tables B.1 and B.2:[21]

Table B.1: Summary of Validation of Model Demands

Validation Date	Delivery Nodes Model Prediction vs. Actuals	Gate Stations Model Prediction vs. Actuals
January 15, 2009	+/-6%	+/-5%
February 5, 2009	+/-5%	+/-7.5%
December 17, 2009	+/-3%	+/-2%

21 Please note that the Unitil validation results are well within the 10% range recommended by the design engineers at GL Group (i.e., Stoner).

Table B.2: Summary of Validation of Model Pressures

Date	Time (hr)	Facility Name	Modeled Result (psig)	Measured Result (psig)	Difference in pressure (psid)	Percent difference (%)
1/15/2009	8:00	Eliot Meter Station	301	311	-9.6	-3.1
1/15/2009	8:00	Pease M&R	321	303	17.6	5.8
1/15/2009	8:00	Gosling Road M&R	323	321	1.9	0.6
1/15/2009	8:00	Nimble Hill M&R	317	318	-1.1	-0.3
1/15/2009	8:00	Biddeford Ind Park M&R	314	307	7.0	2.3
1/15/2009	8:00	Rail Road Ave M&R	317	313	3.8	1.2
1/15/2009	8:00	Larabree Road M&R	413	394	18.6	4.7
1/15/2009	8:00	Bartlett Street Reg Station	247	241	6.0	2.5
1/15/2009	8:00	Borthwick Ave Meter Station	322	308	14.2	4.6
1/15/2009	8:00	Gosling Road at Rte-16 Pressure	322	317	5.3	1.7
1/15/2009	8:00	Varney Brook Meter Station	301	293	7.9	2.7
2/5/2009	8:00	Eliot Meter Station	315	327	-11.8	-3.6
2/5/2009	8:00	Pease M&R	329	320	8.5	2.7
2/5/2009	8:00	Gosling Road M&R	331	338	-7.2	-2.1
2/5/2009	8:00	Nimble Hill M&R	326	340	-13.8	-4.0
2/5/2009	8:00	Biddeford Ind Park M&R	329	338	-8.6	-2.6
2/5/2009	8:00	Rail Road Ave M&R	332	347	-14.7	-4.2
2/5/2009	8:00	Payne Road M&R	356	357	-0.7	-0.2
2/5/2009	8:00	Larabree Road M&R	423	412	10.9	2.7
2/5/2009	8:00	Bartlett Street Reg Station	271	267	4.4	1.6
2/5/2009	8:00	Borthwick Ave Meter Station	330	325	4.7	1.4
2/5/2009	8:00	Gosling Road at Rte-16 Pressure	330	330	0.1	0.0
2/5/2009	8:00	Varney Brook Meter Station	315	321	-6.5	-2.0
12/17/2009	9:00	Eliot Meter Station	290	299	-8.9	-3.0
12/17/2009	9:00	Pease M&R	295	297	-2.5	-0.8
12/17/2009	9:00	Gosling Road M&R	296	296	-0.3	-0.1
12/17/2009	9:00	Nimble Hill M&R	293	290	2.9	1.0
12/17/2009	9:00	Biddeford Ind Park M&R	341	341	0.3	0.1
12/17/2009	9:00	Rail Road Ave M&R	348	350	-1.8	-0.5
12/17/2009	9:00	Payne Road M&R	396	393	3.4	0.9
12/17/2009	9:00	Larabree Road M&R	470	459	11.4	2.5
12/17/2009	9:00	Bartlett Street Reg Station	238	238	-0.5	-0.2
12/17/2009	9:00	Borthwick Ave Meter Station	296	294	1.7	0.6
12/17/2009	9:00	Gosling Road at Rte-16 Pressure	296	299	-3.5	-1.2
12/17/2009	9:00	Varney Brook Meter Station	287	287	0.3	0.1

d. GSGT Network Model

Following the network model validation process, Unitil Engineers developed peak hourly demands for those facilities serving Northern in the GSGT model. This was accomplished by using the Customer Management Module of the SynerGEE ("Stoner") Gas Modeling software ("CMM"). The CMM module[22] is used to develop the base load and use per effective degree day load for each individual customer in Northern's distribution systems. The daily loads are adjusted to represent the peak hour usage for each customer on an 80 effective degree day[23], in both New Hampshire and Maine. This was accomplished using an industry standard method[24] in which the peak hourly load is assumed to be 5% of the total daily load on an 80 EDD. These loads were then entered into separate distribution hydraulic models. The total cumulative demand at each GSGT delivery point, from the separate distribution hydraulic models, was then used in the independent GSGT hydraulic model to simulate the cumulative peak hourly demand at each GSGT facility supplying Northern. Large volume customers capable of using their total connected loads were assigned directly to their respective demand point, on the GSGT hydraulic model at their full load.

e. Forecast GSGT Flows/Pressures Under Design Day Conditions

After the design day peak hour loads were entered into the model, Unitil Engineers developed a forecast of GSGT operating metrics under design conditions[25]. Although system conditions experienced during a very cold winter day, for example with an effective degree day of 60 or 62, do not reflect design conditions (i.e., the peak hour of a 60 or 62 EDD does not reflect the peak hour of an 80 EDD) the actual experience on a very cold day will reflect the appropriate relationships between load and temperature at a time of design conditions.

In most of the scenarios that are described in the following sections of the GSGT Report, Unitil Engineers calculated the growth capability[26] of each scenario in a consistent manner by uniformly increasing the demand at each demand node until system instability occurred.[27]

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22 The CMM module is generally considered in the gas industry to be the most advanced method for deriving daily gas usage.

23 Effective degree days is a standard industry measure of the need for space heating that is highly correlated with a gas LDC's temperature sensitive load; effective degree days also include the influence of wind speed.

24 Until validated this industry standard approach by determining the percentage of the daily volume that flowed during the course of 24 hours for each hour at various GSGT stations. The study included flows from a 50 EDD to a 60 EDD. The results indicated that the 8:00AM period was consistently the peak flow hour and that the flow during the peak hour was consistently representative of approximately 5% of the daily flow.

25 "Design conditions" is a planning standard used by natural gas companies to reflect conditions of high demand that result from extremely cold weather. Design conditions are typically specified for an extreme day and for an extreme year or winter season. The specific level of design day and design winter effective degree days is typically determined through a statistical analysis to identify that value that would be expected to occur on a very infrequent basis, such as 1 time in 50 years, 1 time in 30 years, or some other appropriate standard of reliability.

26 Please find the Unitil GSGT growth analysis in Appendix D.

2. Structural Configuration Alternatives

a. The GSGT Crossing at the Border between Maine and New Hampshire

The GSGT pipeline crosses the Maine and New Hampshire border between Dover, New Hampshire and Eliot, Maine, at the Piscataqua River, which forms the state border in this area. The GSGT analysis considered separating the pipeline at the border, which could allow for a change in ratemaking jurisdiction from FERC to the NHPUC and the MPUC. This regulatory approach is discussed in Section III.G, Legal/Regulatory Analysis.

b. The GSGT Crossing at Little Bay

The New Hampshire Department of Transportation ("NH DOT") is planning to expand a bridge that crosses over Little Bay, which is located between Dover and Newington, New Hampshire. The Little Bay Bridge project[28] is in the detailed design phase as this report is being prepared. The Little Bay Bridge project includes the conversion of the existing bridge to four northbound lanes; the construction of a new bridge that will hold four southbound lanes; and the refurbishment of the existing General Sullivan Bridge for pedestrian activity. This construction project is set to begin in 2010 and last several years. To cross Little Bay, the GSGT pipeline is attached to the existing bridge. The NH DOT will require GSGT to move the pipeline from the existing bridge at some time during the bridge project. The options available to GSGT are to relocate to the new southbound bridge or to lay new pipeline under the Little Bay by directional drilling.

The GSGT analysis also considered separating the pipeline at Little Bay, which would allow GSGT to avoid the costs of replacing the current crossing at Little Bay.

3. Operating Pressure Alternatives

a. Transmission Pressure

The transmission pressure approach would consist of operating the pipeline at the same MAOP as currently experienced. Pipelines operating under transmission class, as defined by code, operate at 20% or greater specified minimum yield strength ("SMYS") of the pipeline, and would require Granite to continue with the current integrity management plan and schedule (i.e., assess the remaining high consequence areas ("HCAs") prior to December 17, 2012).[29]

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27 System growth capability required that GSGT maintain adequate inlet pressures to existing subordinate system stations.

28 NHS-027-1(37), NH Project No. 112386.

29 Please find in Appendix E the GSGT pipeline pressures at 20% SMYS.

b. Distribution Pressure

The distribution pressure approach would consist of decreasing the MAOP of the pipeline. Distribution pressures, as defined by code, must be less than 20% of SMYS. Distribution pressures would eliminate the transmission integrity management requirements but would still need to comply with the new distribution integrity management requirements.[30]

c. Hybrid Transmission and Distribution Pressure

The hybrid approach is intended to minimize the cost of complying with transmission integrity management requirements (i.e., completing all the HCA assessments by 2012) by operating selected segments of GSGT pipeline at distribution pressures, while continuing to operate the portions of the GSGT pipeline that are already in compliance with the integrity management requirements at transmission pressure.

4. Modeling Alternative Operating Profiles

a. Introduction

After the GSGT baseline operating profile under design conditions was determined, Unitil Engineers developed the alternative operating profiles, and modeled these different configurations utilizing a Stoner model. Specifically, Unitil developed operating profiles for each of the nine case study alternatives (including the baseline operating profile) that are represented in Table A.1.

b. Category 1: GSGT Operated as a Transmission System Facility

If GSGT is operated as a transmission pipeline, the Stoner model results and Unitil Engineering analyses indicate that limited infrastructure investments will be required for any of the three structural configurations: (a) an integrated system, (b) separated at the New Hampshire/Maine border or (c) separated at Little Bay in New Hampshire. In both of the reconfigured end states, in which the GSGT pipeline is separated at the New Hampshire/Maine border or at Little Bay in New Hampshire,[31] Unitil Engineers determined, based on the Stoner model, that a new gate station would be necessary for system reliability considerations. The reason for the new gate station would be to maintain two supply points (i.e., gate stations) on each section of the GSGT pipeline. First, two stations are required in any scenario where GSGT is separated to sustain deliveries during peak conditions. Secondly, two stations provide some redundancy in the event that a failure occurred at

30 Please note that as discussed later in this report, the costs associated with distribution integrity management have not been included in this report.

31 In all the scenarios that required a physical reconfiguration of GSGT (e.g., separation at Little Bay), Unitil included a new city gate station for system reliability. Unitil identified the most likely location for a new city gate station that would support GSGT and tie into the M&NE/PNGTS facilities.

one gate station. If the pipeline was separated at the border, Wells, Maine or Eliot, Maine (depending on the scenario) was determined to be the optimal location for the new gate station. If the pipeline was separated at Little Bay, Eliot, Maine was determined to be the optimal location for the new gate station. Either new gate station would be tied into the M&NE/PNGTS Joint Facilities.

c. Category 2: GSGT Operated as a Distribution System Facility

If GSGT is operated as a distribution pipeline, the Stoner model results and Unitil Engineering analyses indicate that significant infrastructure investments will be required for any of the three structural configurations. The additional infrastructure consists of replacing existing pipeline with larger diameter pipe, the addition of multiple regulating stations and other modifications to existing facilities. These modifications are required to reinforce the existing system to compensate for the reduction in deliverability capacity caused by reducing GSGT's operating pressure to distribution pressure. In addition to these significant additions to GSGT infrastructure, as described in Section 3.b above, the two structural configurations that involve separating the pipeline will require the construction of new gate stations.

d. Category 3: GSGT Operated as a Hybrid Transmission and Distribution Pipeline

If GSGT is operated as a hybrid (i.e., a combination of transmission and distribution pressures), the Stoner model results and Unitil Engineering analyses indicate that moderate infrastructure investments will be required to isolate the pipeline segments that would be operated at transmissions pressure from the segments that would be operated at distribution pressure. In addition to these moderate additions to GSGT infrastructure, as described in Section 3.b above, the two structural configurations that involve separating the pipeline will require the construction of a new gate station.

5. Estimate the Costs for Each Alternative Operating Profile

For each of the operating profiles or scenarios listed in Table A.1, (i.e., the base operating profile and the alternative operating profiles) Unitil estimated the costs of the required system modifications to GSGT infrastructure. The following is a list of the major infrastructure categories evaluated by Unitil:

- Abandon pipeline – the costs of preparing a section of the GSGT system to be taken out of service
- New gate station – the costs of constructing a new gate station on a reconfigured GSGT system (Depending on the scenario, the new station is located in Eliot or Wells, Maine)

- Ball valve regulator additions – the costs of adding low differential pressure regulator stations (herein after ball valve regulators) to control gas flows on a reconfigured GSGT system
- Pipeline replacement costs – the cost of replacing pipeline, to add capacity to a reconfigured GSGT system
- Little Bay Bridge Crossing – the costs of replacing the current GSGT crossing at Little Bay by directional boring, hanging a replacement pipeline on the new bridge, or separating the pipeline and constructing a new gate station. Unitil has estimated that the cost to replace the existing line, which is suspended underneath the bridge, with a new pipeline suspended under the new bridge would be approximately $2.4 million. If GSGT replaced the existing line, utilizing horizontal directional drill technology, the cost is estimated to be approximately $2.725 million. Based on current estimates, if the operating and maintenance costs associated with on-going inspections are included[32] in the analysis, the horizontal directional drill approach has the lowest net present value.[33] Finally, Unitil has estimated the cost to separate the pipeline and build a new gate station to be approximately $2.4 million.

6. The Collaborative Process Associated with the Engineering Analysis

As part of the Granite Study process, Unitil conducted several meetings with the engineering staffs of the New Hampshire and Maine PUCs to share and discuss interim work product. Specifically, Unitil and PUC engineers held four working sessions on the following dates:

- September 8, 2009
- September 23, 2009
- October 13, 2009
- January 5, 2010

Each meeting followed agendas that had been communicated prior to the meeting. The typical format for these meetings included a presentation by Unitil Engineers concerning the topics for that meeting followed by a question and answer session. In addition, Unitil responded to NHPUC and MPUC Engineering Staff data requests regarding certain topics, including:

- GSGT hourly deliveries

32 For purposes of the analysis, Unitil utilized the capital costs associated with each option (e.g., hanging a replacement pipeline on a steel bridge would have a capital cost of approximately $2.3 million).

33 Based on a memorandum from Process Pipeline Services, Inc the net present value, over a 30 year term, for installing the pipeline on a steel bridge, installing the pipeline on a concrete bridge and horizontal directional drill is approximately $1.863 million, $1.919 million and $1.861 million respectively. Please see Appendix F for the Process Pipeline Services, Inc. memorandum.

- Effective degree data
- Peak hour/factor calculations

The peak hour/factor calculation utilized by Unitil is the industry standard approach, as illustrated by GTI in its Gas Distribution Self Study course: "Peak hour data is determined from the peak day data by use of a factor based on system experience. This factor varies depending on the system load characteristics; it is most frequently in the range from 0.050 to 0.058. One hour equals 0.04167 of a day. Therefore the peak hour on the coldest day may be 20 to 40 percent higher than the average hour."[34] The Stoner CMM documentation confirms this definition of peak hour factor: "A global peak hour factor is set for the database (the default is 0.05)."[35]

In addition to the meetings identified above, Unitil also distributed work product to the MPUC and NHPUC Engineer Staffs on several occasions and participated in telephonic conversations and e-mail exchanges with the MPUC and NHPUC Engineering Staffs that focused on work product clarifications or data responses.

7. Engineering Analysis Results

As outlined above, Unitil organized the GSGT analysis first by operating pressure and then by physical configuration. The following Table B.3 is a summary of that organization with the appropriate engineering operating profile included:

Table B.3: Granite Study Scenarios

Category	Operating Pressure	Physical Configuration	Engineering Scenario[36]
1	Transmission	Integrated	Baseline 1, Baseline 2
1	Transmission	Split at the Border	Scenario 2
1	Transmission	Split at the Bridge	Scenario 13 A
2	Distribution	Integrated	Scenario 10
2	Distribution	Split at the Border	Scenario 3 A
2	Distribution	Split at the Bridge	Scenario 12
3	Hybrid	Integrated	Scenario 7
3	Hybrid	Split at the Border	Scenario 11 A
3	Hybrid	Split at the Bridge	Scenario 5

34 GTI Gas Distribution Self Study Course, p.111-22.
35 Stoner CMM 4.4.0, p. 66.
36 Please note that these scenario numbers are utilized in the Granite State Gas Transmission de-rate analysis, REV L Details document which was delivered by hard copy to the MPUC and NHPUC Engineering Staffs.

Based on the operating profiles and cost categories described above the following Tables B.4, B.5, and B.6 summarize the results of the engineering analysis.[37] These tables also show the growth potential for each scenario. Growth potential was determined by increasing the loads in the model to the point that system instability was reached.

Table B.4: Infrastructure Requirements and Costs, Category 1 - Operate at Transmission Pressures

Engineering System Improvements ($ millions)	Integrated – Baseline 1 and Baseline 2 Scenarios	Split at the Border - Scenario 2	Split at the Bridge - Scenario 13A
Abandon Pipeline	N/A	$0.197	$0.230
New Gate Station	N/A	$2.121	$2.121
Regulator Station Additions	N/A / $0.680	N/A	N/A
Ball Valve Additions	N/A	N/A	N/A
Pipeline Replacement Costs	N/A	N/A	N/A
Sub-total	N/A	$2.3	$2.35
Little Bay Bridge	$2.7	$2.7	N/A
Total	$2.7/$3.4	$5.0	$2.35
Growth Potential	20% / 40%	NH 50% ME 30%	70%

Table B.5: Infrastructure Requirements and Costs, Category 2 - Operate at Distribution Pressures

Engineering System Improvements ($ millions)	Integrated - Scenario 10	Border - Scenario 3A	Bridge - Scenario 12
Abandon Pipeline	N/A	$0.197	$0.230
New Gate Station	$2.121	$2.121	$2.121
Regulator Station Additions	$0.15	$0.151	$0.295
Ball Valve Additions	$2.60	$1.579	$2.637
Pipeline Replacement Costs	$5.50	$9.298	$5.831
Sub-total	$10.40	$13.3	$11.10
Little Bay Bridge	$2.7	$2.7	N/A
Total	$13.1	$16.1	$11.10
Growth Potential	No Growth	10%	No Growth

37 Please see Appendix G for the cost detail for each scenario.

Table B.6: Infrastructure Requirements and Costs, Category 3 - Operate at Hybrid Pressures

Engineering System Improvements ($ millions)	Integrated - Scenario 7	Border - Scenarios 11 and 11A	Bridge - Scenario 5
Abandon Pipeline	N/A	$0.197	$0.230
New Gate Station	$2.121	$2.121	$2.121
Regulator Station Additions	$0.19	$0.253	$0.186
Ball Valve Additions	$1.10	$1.456	$1.092
Pipeline Replacement Costs	$0.94	$2.308/$4.103	$0.937
Sub-total	$4.30	$6.3/$8.1	$4.56
Little Bay Bridge	$2.7	$2.7	N/A
Total	$7.1	$9.1/$10.9	$4.56
Growth Potential	35%	Up to 10%	35%

Discussion of Engineering Analysis Results

There are several critical observations concerning the engineering analysis results:

- The two lowest cost scenarios[38] are both in Category 1 (i.e., GSGT is operated at transmission pressures). These scenarios also have with significant growth potential.
- The highest cost scenarios are all Category 2 (i.e., GSGT is operated at distribution pressures). These scenarios also provide for the lowest system growth potential.
- One of the Category 3 scenarios (i.e., Hybrid) is the third lowest cost alternative, albeit $1 million higher than the second lowest cost alternative.

Therefore on the basis of the engineering analysis alone, the four lowest cost scenarios are: Scenario 13A, Baseline 1, Baseline 2, and Scenario 5. In addition to being low cost, compared to the other alternatives, these four scenarios also provide significant growth potential for GSGT.

C. Integrity Management Cost Analysis

1. Integrity Management Regulatory Structure

The U.S. Department of Transportation ("DOT") PHMSA is responsible for regulating the safety of design, construction, testing, operation, maintenance, and emergency response of U.S. oil and natural gas pipeline facilities. In 2003 PHMSA promulgated comprehensive Integrity Management

[38] The third scenario in Category 1, Scenario 13 A, is the fourth lowest cost scenario.

regulations ("Gas IM rule") (49 CFR 192, Subpart O) that apply to transmission pipelines. The Gas IM rule[39] required that operators of transmission pipelines: (1) begin performing a baseline assessment of pipeline segments located in High Consequence Areas[40] ("HCAs") by June 2004; (2) have completed 50% of the baseline assessment by December 2007, and (3) have completed the entire base line assessment by December 2012.[41] As part of the baseline assessment (internal inspection), transmission pipeline operators are required to identify anomalies, such as gouges, cracks, dents and areas of corrosion in the pipeline, and to correct these anomalies. Assessments of this nature are typically performed by a "smart pig", which is a pipeline inspection gauge that can be moved through lengths of pipeline, to take continuous measurements that can detect defects internal to the pipeline. In some situations, pigs can be used in a manner so that the flow of gas in the pipeline that is being measured is not interrupted. However, there are circumstances where the pipeline must be taken out of service in order to pig the pipeline. In addition to the baseline assessment that must be completed by 2012, the Gas IM rule also requires transmission pipeline operators to assess the condition of the pipeline every seven years.

On December 4, 2009, PHMSA issued comprehensive distribution IM regulations[42] (49CMR 192 Subpart P) to address distribution IM programs. No later than August 2, 2011, operators of distribution pipelines must develop and implement a distribution IM program, including a written integrity management plan that must address several IM program elements that are identified in the regulations. As described previously, the costs associated with distribution integrity management have been omitted from the analysis because it is difficult to develop accurate estimates at this time.

2. <u>GSGT IM Compliance-Related Activities to Date</u>

Granite State Gas Transmission is a transmission pipeline as defined by 49 CFR 192.3[43] and is therefore subject to PHMSA jurisdiction and to the Gas IM rule. In compliance with the Gas IM rule, GSGT has developed an IM plan to address the 41 HCAs that have been identified; 55,864 feet (10.580 miles) of GSGT pipeline are located in these HCAs. Table C.1 below summarizes the

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39 The compliance deadlines in the Gas IM rule were also included in the Pipeline Safety Improvement Act of 2002, which authorized the Gas IM rule.

40 The determination of a High Consequence Area is based on such considerations as (a) the density of buildings located along the route of a pipeline and the distance from those buildings to the pipeline, (b) outdoor places of public assembly located along the route of a pipeline and the distance from the place of assembly to the pipeline; and (c) buildings of four or more stories located along the route of the pipeline.

41 The deadline for completing 50% of the baseline assessment was set at 5 years after enactment of the Pipeline Safety Improvement Act of 2002 Act, or December 17, 2007 and the deadline for completing the entire baseline assessment will be 10 years after enactment of the Act, or December 17, 2012.

42 These regulations were authorized by the Pipeline Inspection, Protection, Enforcement, and Safety Act of 2006

43 49 CFR 192.3: "Transmission line means a pipeline, other than a gathering line, that: (1) Transports gas from a gathering line or storage facility to a distribution center, storage facility, or large volume customer that is not down-stream from a distribution center; (2) operates at a hoop stress of 20 percent or more of SMYS; or (3) transports gas within a storage field." Specified minimum yield strength ("SMYS") is the yield strength specified as a minimum in accordance with a listed specification.

current status of GSGT's baseline assessment activities; this table also shows the activities that remain to be completed prior to December 17, 2012.

Table C.1: Status of Granite State Gas Transmission Integrity Management Assessment

Years	Total HCA Assessed		Location
	Feet	Percent	
2003 - 2005	4,872	9%	New Hampshire
2006 - 2007	31,788	57%	Maine
2010 - 2011	19,204	34%	Maine: 3,199 feet (17% of total remaining) New Hampshire: 16,005 feet (83% of total remaining)
Total	55,864	100%	

Table C.2 below summarizes GSGT capital costs and operating expenses to comply with the Gas IM rule requirement that 50 percent of the baseline assessment had to be completed by December 2007.

Table C.2: Granite State Gas Transmission Integrity Management Costs to Date

	New Hampshire	Maine	GSGT Total
Total	$1,600,000	$4,300,000	$5,900,000

3. GSGT IM Compliance Activities to be Completed Prior to December 2012

a. Introduction

The IM-related activities that GSGT is required to complete prior to December 2012 will depend on the structural and operating characteristics of the GSGT pipeline as of 2012. The remaining GSGT IM compliance activities will be affected by the decisions made pursuant to this Granite Study, specifically, the miles of the GSGT pipeline that will operate at transmission pipeline pressures.

b. Impact of GSGT Status as Transmission Pipeline on IM Compliance

The Gas IM rules apply only to transmission pipelines. Therefore, concerning the 19,204 feet (3.64 miles) of GSGT pipeline that was not assessed prior to December 2007, GSGT would not be required to perform transmission IM assessment activities prior to 2012 or to perform ongoing assessments every seven years on any section that the MAOP is reduced to less than 20% SMYS so that its designation changes from transmission to distribution pipeline. That is, if the entire GSGT pipeline were to be derated to distribution pressure prior to December 2012, GSGT would not be required to perform a transmission IM assessment on the remaining 19,204 feet. Similarly, if portions of the GSGT pipeline were to be isolated by regulator stations and ball valve regulators and operated at distribution pressures prior to December 2012, GSGT would be required to perform transmission IM assessments only on that portion of the remaining 19,204 feet that continued to operate as a transmission pipeline.[44]

c. Impact on Transmission IM Compliance Related to the Continuity of the GSGT Pipeline

The cost of transmission IM compliance through 2012 or ongoing is not impacted by the configuration of the GSGT pipeline as (a) an integrated continuous pipeline; (b) separated at Little Bay; or (c) separated at the Maine / New Hampshire border because neither the GSGT segments at Little Bay nor at the state border are in HCAs. As a result, GSGT would not avoid any transmission IM costs if the pipeline was separated and the pipeline segments at Little Bay and border crossing segments were abandoned.

4. GSGT Capital and O&M Costs: Projects to be Completed Prior to 2012

a. GSGT Operated at Transmission Pipeline Pressure

Table C.3 below summarizes the capital and O&M costs of transmission IM compliance projects that must be completed prior to 2012, if GSGT is operated at transmission pipeline pressures, reflecting the considerations and assumptions that are discussed in Section C.3 above.

Table C.3: GSGT IM Compliance O&M and Capital Cost Estimates: Transmission Pipeline Pressure

	Capital Costs to Prepare GSGT for Assessment	O&M Costs to Conduct Assessment	Capital Costs to Repair Anomalies[45]
2010	$620,000	$200,000	$6,850
2011	$520,000	$385,000	$6,850
2012	$300,000	$570,000	$6,850
Total	$1,440,000	$1,155,000	$20,500

i. Portions of GSGT Operated as a Transmission or Distribution Pipeline

Table C.4 below summarizes the capital and O&M costs of transmission IM compliance projects that must be completed prior to 2012 if portions of the GSGT pipeline are derated to distribution

44 In preparing the engineering analyses, described in Section III.B, GSGT determined that it would not be cost effective to isolate and operate at distribution pressure all of the 19,204 feet that remained to be assessed for compliance with the Gas IM rule.

45 The cost of repairing anomalies was estimated based on GSGT's IM compliance experience prior to 2007. Specifically, anomalies identified per mile assessed and cost per anomaly repaired were calculated from historical data and applied to the miles of pipeline remaining to be assessed.

pressure and the remainder is operated as a transmission pipeline. These estimates reflect the considerations and assumptions that are discussed in Section III.C.3 above.

Table C.4: GSGT IM Compliance O&M and Capital Cost Estimates: Hybrid (i.e., Transmission and Distribution Pipeline Pressures)

	Capital Costs to Prepare GSGT for Assessment	O&M Costs to Conduct Assessment	Capital Costs to Repair Anomalies
2010	$205,000	$0	$5,500
2011	$330,000	$200,000	$5,500
2012	$0	$200,000	$5,500
Total	$535,000	$400,000	$16,501

5. GSGT Capital and O&M Costs: Seven Year Cycle IM Compliance

As explained in Section III.C.1, after the initial transmission IM assessment that must be completed by December 2012, GSGT will be required to re-assess every section of transmission pipeline at least as frequently as seven years after the prior assessment. Table C.5 below summarizes the ongoing capital and O&M costs of transmission IM compliance projects that must be completed every seven years, if GSGT is operated at transmission pipeline pressures. The table is structured to indicate the capital and O&M costs by year in the first seven-year cycle. These costs are assumed to recur every seven years after the year indicated in Table C.5.

Table C.5: GSGT Ongoing IM Compliance O&M and Capital Cost Estimates: Transmission Pipeline Pressures

	Capital Costs to Prepare GSGT for Assessment	O&M Costs to Conduct Assessment	Capital Costs to Repair Anomalies
2013	$0	$0	$4,286[46]
2014	$0	$200,000	$4,286
2015	$0	$0	$4,286
2016	$0	$0	$4,286
2017	$0	$200,000	$4,286
2018	$45,000	$385,000	$4,286
2019	$65,000	$570,000	$4,286
Total	$110,000	$1,355,000	$30,000

[46] If GSGT operates as a transmission pipeline, the maximum expected cost of repairing anomalies that are identified during each seven year cycle is $30,000.

Table C.6 below summarizes the ongoing capital and O&M costs of transmission IM compliance projects that must be completed every seven years if portions of the GSGT pipeline are derated to distribution pressure and the remainder is operated as a transmission pipeline. Similar to Table C.5, Table C.6 is structured to indicate the capital and O&M costs by year in the first seven-year cycle; these costs are assumed to recur every seven years after the year indicated in Table C.6.

Table C.6: GSGT Ongoing IM Compliance O&M and Capital Cost Estimates: Hybrid (i.e., Transmission and Distribution Pipeline Pressures)

	Capital Costs to Prepare GSGT for Assessment	O&M Costs to Conduct Assessment	Capital Costs to Repair Anomalies
2013	$0	$0	$3,043
2014	$0	$200,000	$3,043
2015	$0	$0	$3,043
2016	$0	$0	$3,043
2017	$0	$0	$3,043
2018	$0	$200,000	$3,043
2019	$0	$200,000	$3,043
Total	$0	$600,000	$21,300

6. GSGT Capital and O&M Costs: Annual IM Compliance

In addition to the ongoing compliance costs that GSGT will incur over seven year cycles, GSGT will also incur annual costs to perform an above-ground inspection of the pipeline from Westbrook, Maine to Haverhill, Massachusetts every three months. The annual cost of these patrols is estimated to be $4,800 per year if GSGT is operated as a transmission pipeline and $3,400 per year if GSGT is operated as a hybrid transmission and distribution pipeline.[47]

D. Replacement of Disbonded Pipeline

In addition to the transmission IM costs that are described and explained in Section III.C, above, GSGT has identified sections of pipe where the coating has separated from the steel pipeline. This condition is referred to in the industry as "disbonded" pipeline. Because disbonding interferes with cathodic protection, thereby causing increased risk of corrosion, GSGT has determined that these disbonded sections must be replaced under all circumstances, whether that section of the pipe is operated as a distribution or transmission pipeline. Because the disbonded pipe must be replaced in

47 $4,800 = ((40 hours/quarter) x $30/hour) x 4 quarters/year = $1,200 x 4 = 4,800.
$3,400 = 4,800 x 71%. The distance of GSGT pipeline to be surveyed in hybrid scenarios is approximately 71% of the distance to be surveyed in transmission scenarios.

all scenarios, the cost of replacing the disbonded pipe, estimated to be $4,750,000, is not included in Section III.H, Financial Model Analysis.

E. Gas Supply Cost Analysis

1. Review of Relevant Issues

Unlike the analysis of issues in other sections of this report, the issues related to gas supply do not directly impact GSGT. Any changes to the configuration of GSGT may have an impact on Northern Utilities, Inc.'s gas supplies, because gas supply decisions are made by local distribution companies. Therefore this section will address the gas supply issues from the perspective of Northern.

To review and evaluate the gas supply issues associated with the Granite Study scenarios, Unitil utilized the following process: (i) review the current capacity portfolio of Northern; (ii) identify the gas supply implications for Northern associated with the GSGT operational profiles (e.g., Transmission pressure – Separated at the Maine/New Hampshire border); and (iii) evaluate the need to revise current contracts or procedures to accommodate the different scenarios.

2. Current Situation

Northern has a 100,000 Dth contract for FT service on GSGT and Northern is the largest firm shipper on the pipeline. Because Northern interconnects with GSGT, Northern must also have transportation contracts with the pipelines that are immediately upstream of GSGT, which provides Northern with access to domestic and Canadian gas supplies and storage resources. Northern currently holds contracts with the following providers of firm transportation service[48] on pipelines upstream of Granite:[49]

- Tennessee Gas Pipeline
- Algonquin Gas Transmission
- Portland Natural Gas Transmission
- Texas Eastern Gas Transmission
- Iroquois Gas Transmission
- TransCanada Pipeline

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[48] Northern may also contract for storage service with certain of the identified pipelines.

[49] Prior to Order 636, which was implemented in 1993, GSGT held upstream transportation capacity for both Northern and Bay State. With implementation of Order 636, Northern and Bay State each received pro-rata shares of the capacity held by GSGT.

- Vector Pipeline

Northern's capacity portfolio, as currently configured, provides for firm delivery from upstream pipelines to GSGT at points located in Maine, New Hampshire, and Massachusetts. Specifically, TGP interconnects with GSGT at Haverhill, Massachusetts; PNGTS interconnects with GSGT at Newington, New Hampshire; and the Joint Facilities[50] interconnect with GSGT at Westbrook, Maine.

Northern's capacity portfolio was developed and is dispatched on an integrated basis. As a result, the Maine and New Hampshire divisions of Northern are served on a combined basis by supplies that are transported on upstream pipelines via Northern's capacity portfolio and delivered to GSGT interconnections, such as TGP at Haverhill, Massachusetts. Because Northern gas supplies and capacity portfolios are integrated, sales customers served by Northern's Maine and New Hampshire divisions have access to the same natural gas portfolio and associated costs. Also, service reliability is enhanced by the integration of Northern's gas supplies and capacity portfolios. For example, if a TGP compressor failed, which would most directly affect Northern's New Hampshire customers, Northern could arrange for additional deliveries from the Joint Facilities delivery point at Westbrook, Maine or from PNGTS at Newington, New Hampshire to augment the reduced TGP volumes.

3. <u>Gas Supply Implications</u>

To identify issues and associated implications resulting from the reconfiguration of GSGT (i.e., reduced operating pressure or physical separation), Unitil developed a list of issues to be addressed if the GSGT operating profiles changed from the current situation. The gas supply issues also include certain areas identified in the Stipulation, such as:

- The costs, impacts and/or loss of flexibility in:
  - Contracting for supply
  - Managing supply for both states
  - Managing the exchange agreement with Bay State[51]

In summary, the primary implications related to gas supply that would result from a physical separation of GSGT, are: (i) reduced overall flexibility in of the gas supply portfolio and therefore

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50 The Joint Facilities consist of approximately 100 miles of pipeline facilities from Westbrook, Maine to Dracut, Massachusetts. These facilities are jointly owned by PNGTS and MNE.

51 Attachment B to Settlement Agreement filed with (a) the NHPUC in Docket No. DG 08-048 and Docket No. DG 08-079; and (b) the MPUC in Docket No. 2008-155.

reduced reliability; (ii) increased external activities associated with the administration of the gas supply portfolio and therefore a loss in flexibility; and (iii) potential changes required to the operation of the Bay State Exchange Agreement. For this Study, Unitil did not attempt to quantify the cost impact of these main issues, but rather utilized a qualitative analysis.

4. Evaluation

For this analysis, Unitil defined the baseline for purposes of evaluating Gas Supply issues as the current GSGT configuration (i.e., Transmission pressure – Integrated Pipeline). The following list of issues is a result of differences from the Gas Supply baseline.

a. Gas Supply Reliability

The existing flexibility of Northern's gas supply portfolio will be reduced if GSGT is separated at either the Maine/New Hampshire border or at Little Bay Bridge. The current configuration of the GSGT system provides for a level of flexibility and redundancy that would be compromised by a separation at the border or at the bridge. As a result of either of these physical separations, Northern's Maine division[52] would only be served by supplies and capacity from the north, delivered to receipt points connected with the Joint Facilities. Granite would not be able to deliver supplies from the south to the Maine division. Northern's New Hampshire division would still be served from both the south and the north as a result of the TGP interconnection at Haverhill, Massachusetts and the PNGTS interconnection at Newington, New Hampshire. Although Northern may be able to replicate certain aspects of the integrated portfolio flexibility (i.e., transport gas from TGP to Newington, New Hampshire or Westbrook, Maine via the Joint Facilities), it would require additional pipeline activities (e.g., nominations and scheduling) and associated transportation costs.[53]

b. Gas Supply Flexibility

The administrative effort required to manage Northern's gas supply would increase if GSGT is separated at either the Maine/New Hampshire border or at Little Bay Bridge, because a GSGT separation would increase the complexity of gas supply and capacity contracting. This decrease in flexibility is illustrated by the following examples:

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52 If GSGT is separated at Little Bay Bridge certain segments of the New Hampshire division would be served by supplies and capacity from the north (e.g., the Westbrook, Maine city gate).

53 This discussion refers only to the physical delivery of gas supplies to the Maine and New Hampshire divisions; the allocation of gas costs between Maine and New Hampshire divisions, pursuant to settlements approved by the MPUC in Docket Nos. 2005-087 and 2005-273 and by the NHPUC in Docket DG 05-080 would not need to be modified.

- If GSGT was physically separated, the operational balancing agreements ("OBAs") held by GSGT would not provide the same level of flexibility as under the integrated portfolio and would require additional administration activity to replicate certain aspects of the current portfolio capability. Northern's overall gas supply flexibility would be reduced because the volume and associated imbalances from both divisions could not be combined and netted against each other. The following example illustrates the point:

  > Currently, GSGT is able to use OBA flexibility from each pipeline to balance the entire load across both areas. If GSGT was reconfigured (i.e., separated) the flexibility provided by the OBAs, under the existing portfolio, may to a certain extent be replicated. However, the process to replicate the existing OBA flexibility would require nominations on PNGTS or the Joint Facilities and that process is inherently more structured (i.e., rigid as the pipeline has certain schedules for revising nominations) than the current administration of the OBA.

- To compensate for the reduction in system reliability if GSGT were to be separated at the border or at the bridge, the construction of a new gate station would be required, located either at Wells, Maine or Eliot, Maine.[54] The new gate station would require new transportation contracts or revisions to existing transportation contracts. Specifically, if a new gate station was constructed at Wells, Maine or Eliot, Maine, Northern would be required to add the new gate station to its existing transportation contract as a new delivery point. In addition, a portion of the existing MDQ under certain contracts would need to be allocated to the new station. For example, Northern may need to allocate 10,000 Dth from a contract that delivers to Newington to the new point at Eliot, Maine. This reallocation may result in complicated negotiations with the parties because the Newington point is a PNGTS delivery point, whereas the Eliot, Maine point could be a Joint Facilities point. If Northern was not able to reallocate a portion of the MDQ from an existing contract to the new gate station, Northern would need to enter into a new contract for capacity or supply at Eliot, Maine, which may result in incremental gas costs to Northern and Northern's customers. In either situation, the additional delivery point or the incremental transportation contracts would increase the work load associated with daily nominations, scheduling and gas accounting.

c. <u>Bay State Exchange Agreement</u>

The Bay State Exchange Agreement may be impacted by a reconfiguration of the GSGT system because the ability to receive full volumes may be limited if the GSGT pipeline were separated at

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54 The new gate station would not increase gas supply portfolio reliability because the new station would access the same gas supplies as the Newington, New Hampshire or Westbrook, Maine stations.

either the state border or at Little Bay Bridge. The Bay State Exchange Agreement is not expected to continue indefinitely but a reconfiguration of GSGT may prompt an earlier termination. When the Exchange Agreement ends, Bay State would no longer contract with GSGT in order to deliver to Northern and GSGT would lose the associated revenues.

F. Marketer/Supplier

The discussion in this section of market participant issues will cover the areas in the Granite State stipulations related to Marketers/Suppliers, including an assessment of (a) the affect on customers, marketers and suppliers if the pipeline is integrated into Northern, and (b) whether the integration will affect the availability of the pipeline for wholesale deliveries.

To review and evaluate the market participant[55] issues, Unitil: (i) reviewed the current GSGT third-party shipper contracts; (ii) identified market participation implications associated with the various operational profiles (e.g., Transmission pressure – Separated at the Maine/New Hampshire border); and (iii) evaluated contract revisions or procedural changes.

1. Current Situation

Table F.1 is a summary of the current end users and marketers that utilize firm service on Granite:

Table F.1: Market Participants on Granite

Market Participant	MDQ (Dth)	Contract Expiration Date
National Gypsum	2,200	Evergreen
Global Montello Group	3,500	Evergreen
Shell Energy	3,850	2010
Bay State Gas	30,000	2010

As shown by Table F.1, the firm shippers on GSGT include marketers (Global Montello Group and Shell), end users (National Gypsum) and LDCs (Bay State Gas). In addition, all the firm shipper contracts are short-term agreements with certain shippers having evergreen options.

If GSGT is reconfigured GSGT/Northern may need to revise their tariff to reflect new operating conditions. In addition, certain shippers may need to realign their contracts to reflect the location of their customers.

55 Customer impact issues are discussed in Section III.H.5, Qualitative and Quantitative Assessment and Section IV, Conclusions and Recommendations.

2. Market Participant Implications

The primary issue impacting market participants is the realignment of third party contracts such that the shipper's GSGT delivery point is aligned with the location of the customer. In a scenario where GSGT is physically separated at either the Maine/New Hampshire border or Little Bay Bridge the third party contracts will need to reflect the location of their customer. For example, a GSGT shipper with a load in the Maine area will need to deliver to a designated GSGT receipt point in the Maine area.[56] Similarly a GSGT shipper with a load in the New Hampshire area will need to deliver to a designated GSGT receipt point in the New Hampshire area.[57] While the GSGT administrative process to change firm transportation contracts to reflect the appropriate receipt points is fairly straight forward, the impact on third parties could be more significant depending on the amount of capacity that those shippers hold on the upstream pipelines. For example, in the current situation a third-party marketer may deliver to any GSGT receipt point while the customer associated with that delivery is located in New Hampshire. In the scenarios where GSGT is separated at the Maine/New Hampshire border or Little Bay Bridge, a third-party marketer would need to restructure its upstream portfolio such that all volumes for New Hampshire customers were delivered to a Granite receipt point on the GSGT pipeline segment that is upstream of its New Hampshire customers.

In addition to the upstream changes that the third-party shippers may need to make to realign their contracts, the GSGT administrative work load would increase because scheduling, nomination, and gas accounting for both regions would need to be managed separately.

G. Regulatory/Legal Analysis

1. Introduction

Modifications to the configuration of the GSGT natural gas transmission facilities may allow for a change to the jurisdictional and regulatory framework under which the facilities are currently operated. The following section provides a summary of the applicable statutory provisions of the Natural Gas Act ("NGA") governing the Federal Energy Regulatory Commission's ("FERC") regulation of natural gas companies.

2. Applicable Statutory Provisions of the Natural Gas Act

GSGT is engaged in the transportation of natural gas in interstate commerce. It is therefore a "natural gas company" within the meaning of Section 2(6) of the Natural Gas Act (15 U.S.C. §

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56 Currently marketers are required to deliver to Westbrook, Maine for customers that are located in Maine.

57 Currently marketers may deliver to any GSGT point for customers that are located in New Hampshire.

717a(6)), and is subject to the regulatory jurisdiction of the Federal Energy Regulatory Commission by virtue of Section 1(b) of the Natural Gas Act (15 U.S.C. § 717(b)). Granite presently operates in three states and moves natural gas across two state boundaries.

a. Section 7(f) Service Area Determination

Section 7(f) of the NGA, 15 U.S.C. § 717f(f), grants FERC the authority to determine, either upon an application or its own motion, the service area of a natural gas company. The determination of a service area can apply to both intrastate and interstate facilities. Iowa Public Service Co., 50 FERC ¶ 61,390 (1990); Interstate Power Co., 47 FERC ¶ 61,347 (1989); Associated Natural Gas Co., *et al.*, 43 FERC ¶ 61,304 (1988). When a delivery within a Section 7(f) service area crosses a state line, jurisdiction over the transportation is granted to the state commission in the state in which the delivery is ultimately made. "Section 7(f) does not abandon the legal authority under which interstate transportation services may be performed but merely transfers it to the exclusive jurisdiction of the states." Interstate Power Co, 47 FERC at 62,230.

In reviewing a proposal under Section 7(f) for a service area determination, FERC generally looks at four factors: 1) does the company make sales for resale; 2) do state or local agencies regulate the company's rates; 3) does the company have an extensive transmission system; and 4) will authorization of the service area have a significant effect on neighboring distribution companies. Specifically, "[t]he Commission has long held that section 7(f) service area determinations are appropriate where the natural gas company was engaged primarily in the local distribution of natural gas but was subject to the Commission's jurisdictional oversight because its facilities crossed state lines." Iowa Public Service Co., 50 FERC at 62,218; see Interstate Power Co., 47 FERC at 62,229.

In a majority of the FERC decisions granting Section 7(f) service area determinations, the interstate portion of the subject systems has been relatively short. See Atmos Energy Corp., 90 FERC ¶ 61,264 (2000) (interstate portion of system extends 50-feet across state border); Wisconsin Public Service Corp., 78 FERC ¶ 61,354 (1997) (4-miles of transmission); Great Plains Natural Gas Co., 63 FERC ¶ 61,301 (1993) (65-miles of transmission); Wisconsin Gas Co., 59 FERC ¶ 61,352 (1992) (300-feet of transmission); Mountain Fuel Supply Co., 52 FERC ¶ 61,259 (1990) (11-miles of transmission); Iowa Illinois Gas & Elec. Co., 48 FERC ¶ 61,334 (1989) (14.75-miles of transmission); Interstate Power Co., 47 FERC ¶ 61,347 (1989) (2.25-miles of transmission).

b. Section 7(b) Abandonment

FERC will allow an abandonment under Section 7(b) if it finds that it is required by the public convenience and necessity. The FERC has discretion in making this determination and what it considers to be required by the public convenience and necessity will vary depending upon the specific circumstances.

c. Section 1(c) Hinshaw Amendment

Under section 1(c) of the NGA, known as the Hinshaw amendment, the NGA does not apply to a pipeline that engages in interstate sales or transportation of natural gas or to the facilities the pipeline uses for such transportation or sales, if it receives such natural gas from another person within or at the boundary of a state, the gas is ultimately consumed within that state, and the facilities, rates and services of the pipeline are subject to regulation by a state commission.

Pipelines exempt under NGA section 1(c) are commonly referred to as "Hinshaw pipelines." "Congress enacted the Hinshaw amendment because it recognized that when a pipeline operating in one state sells and transports gas within that state for consumption within that state, the pipeline's services, rates, and facilities are more appropriately a matter of local concern, regardless of whether the gas was produced in that state or delivered to the in-state pipeline by an interstate pipeline. By including regulation by a state authority as a criterion for the Hinshaw exemption, NGA section 1(c) avoids the possibility of a regulatory gap." Nornew Energy Supply, Inc., 121 FERC ¶ 61,019.

H. Financial Model Analysis

1. Overview

Sections III.B through III.G above describe and explain the quantitative costs, which are a combination of capital costs and O&M expenses associated with each of the scenarios that will be incurred throughout the period of the analysis. The scenarios are summarized in Table H.1, which is a copy of Table A.2.

Table H.1: Granite Study Scenarios

Category	Operating Pressure	Physical Configuration	Engineering Scenario[58]
1	Transmission	Integrated	Baseline 1, Baseline 2
1	Transmission	Split at the Border	Scenario 2
1	Transmission	Split at the Bridge	Scenario 13 A
2	Distribution	Integrated	Scenario 10
2	Distribution	Split at the Border	Scenario 3 A
2	Distribution	Split at the Bridge	Scenario 12
3	Hybrid	Integrated	Scenario 7
3	Hybrid	Split at the Border	Scenario 11 A
3	Hybrid	Split at the Bridge	Scenario 5

The Financial Analysis model was developed to arrange and organize capital costs and O&M expenses for each scenario in a manner that would allow for an economically valid comparison of all of the scenarios, based on the expected costs and the timing of those costs for each scenario. Inputs to the Financial Analysis model include quantifiable costs associated with each of the ten different scenarios, and appropriate financial parameters. The quantifiable cost inputs include the following capital and expense categories[59]:

- System improvement capital costs, which are described in Section III. B and listed in Tables B.1, B.2, and B.3.
- Integrity Management capital costs and O&M expenses, which are described in Section III.C and listed in Tables C.3, C.4, C.5, and C.6.
- Regulatory expenses, which are described in Section III.G.

Based on the scenario-specific estimated capital costs and O&M expenses, the financial model calculates annual revenue requirements according to standard regulated utility rate making conventions for each scenario. Finally, the financial model calculates the net present value of the annual incremental revenue requirements, and ranks each scenario according to the cumulative net present value as of every year between 2010 and 2075. The financial model is an analysis of forward-looking, incremental costs; the model does not include (1) capital spending that has occurred in the past or that will not be affected by the configuration of GSGT and (2) O&M spending that is related to GSGT ongoing operations.

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58 Please note that these scenario numbers are utilized in the "Granite State Gas Transmission de-rate analysis, REV L Details" document which was delivered by hard copy to the MPUC and NHPUC Engineering Staffs.

59 Estimates of the timing of each expense and capital cost, i.e. the year that the cost item would be incurred, were also inputs into the Financial Model.

2. Financial Model Parameters

a. Capital Structure

Table H.2 shows the Cost of Capital assumptions that were used in the Financial Model. The assumed capital structure, 45% equity and 55% debt is based on a long-term hypothetical capital structure; the assumed cost of equity provides for an adequate long-term return for equity holders; and the assumed cost of debt reflects historical long-term interest rates.

Table H.2: Assumed Cost of Capital

	Structure	Cost Rate	Weighted Cost
Debt	55.00%	7.50%	4.13%
Equity	45.00%	11.00%	4.95%
Total	100.00%		9.08%

b. Tax Rates

Table H.3 shows the tax rates assumptions were used in the Financial Model. The weighted State Income Tax rate is an average of the individual state tax rates, and the property tax rate was determined by an analysis of GSGT actual 2009 property taxes owed in Maine and New Hampshire.

Table H.3: Assumed Tax Rates

NH State Income Tax	8.50%
ME State Income Tax	8.93%
Weighted State Income Tax	8.72%
Federal Income Tax	34.00%
Effective Income Tax Rate	39.75%
Property Tax Rate (% of net plant)	1.71%

c. Additional Financial Model Parameters

The Financial Model also uses the following parameters:

- Depreciation rate (Pipe): 2.25%; or 44.4 years useful life
- Net salvage value: $0
- NPV Discount rate: 9.08%, equal to the assumed cost of capital
- For purposes of calculating tax depreciation and deferred income taxes, the MACRS tax deprecation period is assumed to be 15 years

3. Financial Analysis Results

The Financial Model calculates the cumulative NPV for each of the 10 scenarios that were analyzed. Appendix H provides summaries of the cumulative NPV revenue requirements by Scenario, and the ranking, based on the cumulative NPV Revenue Requirements of each scenario. The five lowest cost scenarios are summarized Table H.4 below, and represented graphically in Table H.5. The system improvement projects for each of the five lowest cost scenarios and the costs of those projects are provided in Table H.6. The Integrity Management capital costs and O&M expense for each of the five lowest cost scenarios are provided in Table H.7.

Table H.4: Lowest Cost Alternatives

	Transmission Pipeline			Hybrid Pipeline	
Configuration	**Integrated**	**Integrated**	**Split at LBB**	**Integrated**	**Split at LBB**
Scenario	**Baseline 1**	**Scenario Baseline 2**	**Scenario 13A**	**Scenario 7**	**Scenario 5**
Cumulative Net Present Value: Revenue Requirement					
2020	$5,156,909	$5,278,843	$4,992,942	$6,996,976	$5,073,300
2030	$6,350,631	$6,650,262	$6,125,473	$8,487,063	$6,155,579
2040	$6,856,099	$7,197,405	$6,614,994	$8,932,515	$6,494,760
2050	$6,983,867	$7,336,041	$6,739,566	$9,038,524	$6,579,464
2060	$7,033,618	$7,387,693	$6,789,206	$9,058,341	$6,598,541
Rank of Cumulative Net Present Value: Revenue Requirement					
2020	3	4	1	5	2
2030	3	4	1	5	2
2040	3	4	2	5	1
2050	3	4	2	5	1
2060	3	4	2	5	1

Table H.5: Lowest Cost Alternatives

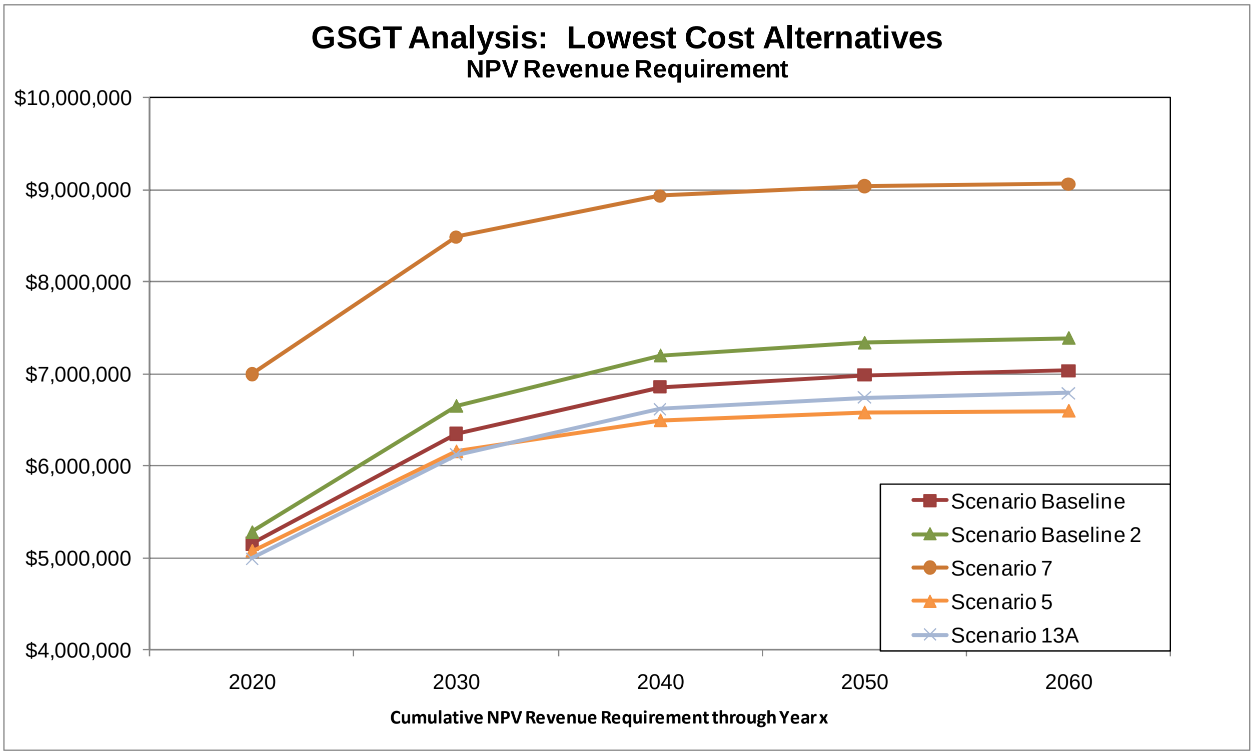

Table H.6: System Improvement Costs for Lowest Cost Alternatives

	Baseline 1	Baseline 2	Scenario 13 A	Scenario 7	Scenario 5
Separate at:	**N/A**	**N/A**	**LBB[60]**	**N/A**	**LBB**
Pressure	**Trans**	**Trans**	**Trans**	**Hybrid**	**Hybrid**
System Improvement Costs					
Abandon Pipeline	$-	$-	$229,798	$-	$229,798
New Gate Station	$-	$-	$2,120,800	$2,120,800	$2,120,800
Regulator Station Adjustments	$-	$679,140	$-	$185,735	$185,735
Ball Valve Regulator Additions	$-	$-	$-	$1,091,640	$1,091,640
Pipeline Replacement Costs	$-	$-	$-	$936,614	$936,614
Little Bay Bridge	$2,725,000	$2,725,000	$-	$2,725,000	$-
Total System Improvement	$2,725,000	$3,404,140	$2,350,598	$7,059,789	$4,564,587

60 "LBB" refers to Little Bay Bridge.

Table H.7: Integrity Management Costs for Lowest Cost Alternatives

	Baseline 1	Baseline 2	Scenario 13A	Scenario 7	Scenario 5
Separate at:	**N/A**	**N/A**	**LBB**	**N/A**	**LBB**
Pressure	**Trans**	**Trans**	**Trans**	**Hybrid**	**Hybrid**
Integrity Management Costs					
IM Capital: by 2012[61]	$1,460,550	$1,460,550	$1,460,550	$551,501	$551,501
IM Capital: 7 Year cycle[62]	$140,000	$140,000	$140,000	$21,300	$21,300
IM O&M by 2012	$1,155,000	$1,155,000	$1,155,000	$400,000	$400,000
IM O&M 7 Year cycle	$1,355,000	$1,355,000	$1,355,000	$600,000	$600,000
IM O&M: Annual	$4,800	$4,800	$4,800	$3,400	$3,400

d. Discussion of Financial Analysis Results

Unitil's decision making process, described in Section IV, Conclusions and Decision, considers a number of qualitative factors and an assessment of relative risks and rewards of the scenarios, in addition to the quantitative analyses that are provided in Appendix H and Table H.4. Although it is not appropriate to base a decision on the most effective long term solution for Northern's and Granite's customers solely on the quantitative results in Table H.4 and Appendix H, there are several meaningful observations that can be made about the scenarios, based on this analysis.

- Tables H.4 and H.5 demonstrate that the NPV revenue requirements of the top four scenarios, Baseline 1, Baseline 2, Scenario 13A and Scenario 5[63], are almost identical. The cumulative NPV revenue requirements of Scenario 5, Scenario 13A and Baseline 1 over any time period are within $400,000 of each other. This cumulative difference in NPV revenue requirements translates to a very small difference in annual revenue requirements; the average annual difference in Baseline 1 and Scenario 13A revenue requirements for the 10 years, 2010 to 2019 is less than $26,000 per year, not discounted for the time value of money.
- Appendix H confirms the information provided in Table B.5 that the distribution pressure scenarios are very high cost[64], in addition, Appendix H demonstrates that, the savings in IM compliance costs associated with the distribution scenarios does not offset the high system improvement costs that are associated with each of these distribution scenarios.

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61 IM capital costs to be incurred by 2012 include the following estimated cost to repair anomalies: (a) Transmission scenarios: $20.500; (b) Hybrid scenarios: $16,501.

62 IM capital costs to be incurred over every 7 year cycle include the following estimated cost to repair anomalies: (a) Transmission scenarios: $30,000; (b) Hybrid scenarios: $21,300.

63 The top four scenarios represent only three different outcomes for GSGT; Baseline 2 is a variation of Baseline 1, with additional growth potential.

64 In addition, Table B.5 shows that the distribution scenarios allow for little, if any growth potential.

- Table H.4 demonstrates that three of the top four scenarios, Baseline 1 Baseline 2, and Scenario 13A, involve operating GSGT at transmission pressure and the fourth scenario, Scenario 5, involves operating GSGT as a hybrid transmission and distribution pressure pipeline.
- Including the IM and regulatory costs does affect the rankings of the scenarios; Table H.8 below shows the top five scenarios, ranked by System Improvement costs and ranked by cumulative NPV revenue requirements as of 2030.

Table H.8: Comparison of Top-Ranked Scenarios

Rank	Based on System Improvement Costs	Based on Cumulative NPV at 2030
1	Scenario 13A	Scenario 13A
2	Baseline 1	Scenario 5
3	Baseline 2	Baseline 1
4	Scenario 5	Baseline 2
5	Scenario 2	Scenario 7

- Table H.4 also demonstrates that two of the top four scenarios, Baseline 1 and Baseline 2, involve configuring GSGT as an integrated pipeline and the other two scenarios, Scenarios 13A and 5 involve configuring GSGT as a pipeline separated at Little Bay Bridge.

The following Section IV, Conclusions and Decision, explains the process that Unitil used to combine the results of this quantitative analysis with other qualitative factors and considerations.

IV. Conclusion and Decision

A. Introduction

Attachment B of the Settlement Agreement and Stipulation approved in NHPUC Docket No. DG 08-048 states, at paragraph 4, that:

> Should this study lead to a conclusion that de-rating the pipeline and filing for an exemption from PHMSA regulation and FERC jurisdiction, or some other result, is the most effective long term solution for Northern's and Granite's customers, given due consideration to factors including planning, costs, operations, management of supply, access for third party suppliers, reliability, safety, and the public interest, Unitil agrees to propose an appropriate plan to the New Hampshire and Maine Public Utilities Commissions.

Attachment B of the Stipulation approved in MPUC Docket 2008-155 states, at paragraph 4, that:

> Should this study lead to a conclusion that de-rating the pipeline and filing for an exemption from PHMSA regulation and FERC jurisdiction is the most effective long term solution for Northern and Granite, given due consideration to factors including planning, costs, operations, management of supply, access for third party suppliers, reliability, safety, and the public interest, Unitil agrees to file an appropriate plan with the Maine and New Hampshire Public Utilities Commissions and, if consistent with the findings of the Commissions of Maine and New Hampshire, to cooperate in seeking approval of the plan from the federal agencies.

Giving due consideration to the analysis that is summarized in the preceding sections of this Report, and especially to factors including planning, costs, operations, management of gas supply, access for third party suppliers, reliability, safety, and the public interest, Unitil has determined that the most effective long term solution for Northern and Granite, and for Northern's and Granite's customers is to continue to operate the entire Granite pipeline at transmission pressure and as an integrated transmission pipeline (not separated at Little Bay Bridge or the state border). Unitil reached this decision because, of the three primary[65] scenarios that were essentially equivalent based on the Financial Analysis,[66] Baseline 1 - the status quo scenario – represents the option with the fewest unknowns that may translate to risks that would affect cost, reliability and operation of the pipeline. In particular, Scenario 5, which would require that GSGT operate as a hybrid transmission and distribution pipeline, combined with a separation of the pipeline at Little Bay, represents a radical departure from standard pipeline industry configurations and operations. As a result of this decision, Granite will continue to be subject to PHMSA transmission pipeline regulation.

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65 In this context, Baseline 2 is considered to be a secondary variation of Baseline 1, with additional growth potential resulting from a low cost system improvement, a change to a regulator station, which would be constructed in 2018.

66 Table H.4 shows that the cumulative NPV revenue requirements of Baseline1, Scenario 13A and Scenario 5 are very similar over the entire period of analysis.

Unitil's decision to continue to operate Granite as an integrated (uninterrupted) pipeline would preclude Granite from filing for abandonment of Granite's FERC certificate based on a changing of its configuration to two intrastate pipeline segments. Moreover, as the Granite Study has led Unitil to a conclusion that de-rating the pipeline and filing for an exemption from PHMSA regulation, or separating the pipeline at the border and seeking exemption from FERC regulation are not the most effective long term solutions for Northern and Granite or Northern's and Granite's customers, Unitil has not identified any other reasons which would justify a change in ratemaking jurisdiction for Granite. Accordingly, Granite will not seek to change its ratemaking jurisdiction from FERC to the NHPUC and MPUC, and Unitil will not propose such a plan to the New Hampshire and Maine Public Utility Commissions. Granite will continue to be rate-regulated by the FERC.

B. Basis for the Decision

As discussed in Section III.H, the financial analysis produces almost identical results for the three least cost scenarios, Baseline 1, and Scenarios 13 A and 5. However, in keeping with proper utility planning and the Northern Stipulation and Settlement Agreement, the most effective long term solution for Northern and Granite and for Northern's and Granite's customers must be decided by also including a number of factors such as operations, management of gas supply, access for third party suppliers, reliability, safety, and the public interest in the decision making process. The following is a summary of the additional factors that Unitil considered in reaching its final decision.

1. Construction and System Improvement Considerations

a. Issues Associated with Little Bay Bridge

Scenarios 13 A and 5 involve the separation of the pipeline at Little Bay, and the construction of a new gate station at Eliot, Maine. The major uncertainties associated with the new gate station include:

- Timing of the new gate station - The new gate station is likely to take 18 to 24 months, and will involve planning, permitting, obtaining land for the gate station and for the spur or lateral from a new Joint Facilities gate station to the new GSGT gate station.
- Reliability of Service - Careful coordination with the operator of the Joint Facilities; New Hampshire Department of Transportation; and Unitil construction crews will be necessary to ensure that service to GSGT and Northern customers is not interrupted when GSGT is required by NH DOT to be off the existing Little Bay Bridge.
- Costs of construction and land acquisition - The cost estimate assumes that land for a new gate station at Eliot, Maine is available that is in close proximity to both the Joint Facilities

and Granite pipelines. If that is not possible, there will be additional gate station costs to acquire land off the Joint Facilities right of way and to construct a lateral.

Baseline 1 involves the replacement of the current pipeline at Little Bay Bridge with a new segment that would be installed (a) on the new bridge at Little Bay, or (b) under the Little Bay, using directional boring. Due to the complex logistics and coordination required to safely maintain the existing GSGT pipeline and safely coordinate the new crossing, Unitil has determined that it would strongly prefer to either: (a) bore under Little Bay; or (b) separate the pipeline at Little Bay and construct a new gate station to avoid the potential risks to service reliability that would be associated with installing a pipeline segment on the new bridge. Although there are some risks associated with directional boring, based on recent experience in that area - the Joint Facilities installed a 30 inch pipeline in the same area by directional boring - Unitil believes that the risks are manageable, and that boring under the bridge is the preferred approach.

Finally, if GSGT was separated at Little Bay and operated as a hybrid distribution / transmission pipeline, two different areas, involving the towns of (a) Plaistow, East Kingston, Seabrook, Hampton, and Exeter and (b) Dover, Somersworth, and Rochester would be served exclusively from one gate station. Currently, all GSGT delivery points are served by two way feeds, which would allow for uninterrupted service in the event that a problem occurred at one of the gate stations or along the pipeline between one of the gate stations and these towns.

b. Issues Associated with Operating a Hybrid Transmission and Distribution Pipeline.

Scenario 5 involves the construction of new regulator stations so that some segments of the GSGT pipeline can be derated to distribution pressure. The logistics involved in derating segments of the pipeline from transmission to distribution pressure will be complicated, requiring well-executed timing of the overall effort and especially the construction of new regulator stations. In addition, operating a pipeline that consists of alternating segments at transmission and distribution pressures is not a common practice. Operating a pipeline that is configured in this manner will likely reduce the reliability of service to GSGT's and Northern's customers, especially to areas that are fed from the segments that will be derated to distribution pressure.

2. Gas Supply Considerations

As discussed in Section III.E, scenarios that involve separation of the GSGT pipeline, including the low-cost Scenarios 13A and 5, may result in reduced reliability and increased costs to administer gas nominations and deliveries.

3. Other Considerations

Unitil has also assessed the remaining "areas of inquiry" that are included in the GSGT Stipulations, including (a) marketer/supplier issues[67] and (b) qualitative factors associated with the regulatory/legal approaches.[68] Based on this assessment, Unitil does not believe that either of these considerations support a change from the status quo in light of the other factors discussed above.

C. Final Summary and Conclusion

To summarize Section IV.B, the Financial Analysis determined that the costs[69] of the three lowest cost scenarios, Baseline 1, Scenario 13A, and Scenario 5, were very similar. Taking into consideration the qualitative factors, and in particular the uncertainties and unknowns that are associated with the operations and configuration changes related to Scenario 13A and Scenario 5, Unitil sees no benefit, and several potentially significant costs to making these changes. Therefore, based on a full consideration of all factors included in the GSGT Study and summarized in this report, Unitil has determined that Baseline 1 is the best long term solution for Granite's and Northern's customers.

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67 Discussed in Section III.F.
68 Discussed in Section III.G.
69 As measured by cumulative NPV revenue requirements.

Appendix A:
Listing of the Participants in the Granite Study Process

Listing of the Participants in the Granite Study Process

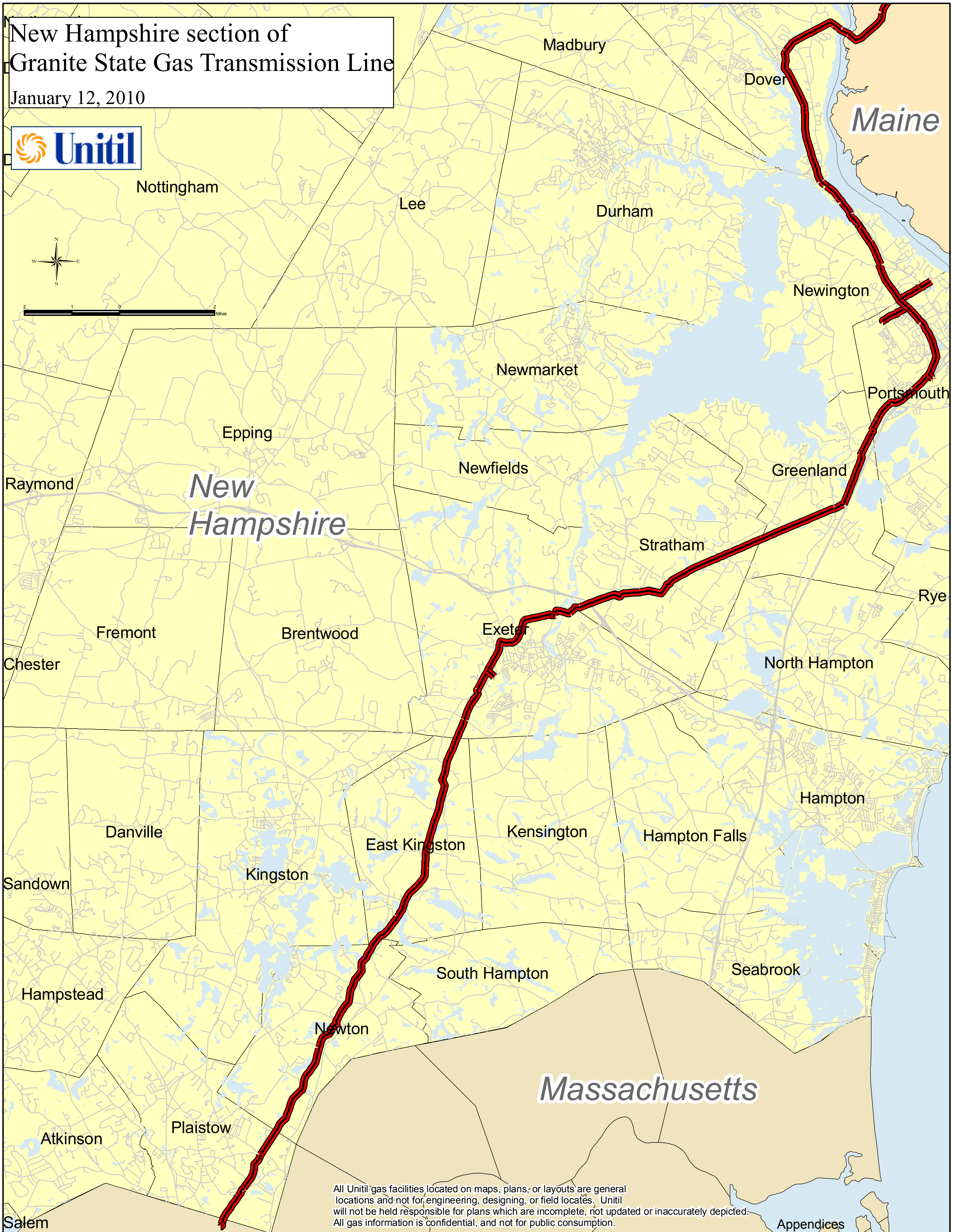
Contact	Title
Maine PUC	
Carol MacLennan	Senior Staff Attorney
Gary Farmer	Consultant to the Commission Staff
Thomas Austin	Senior Utility Analyst
Lucretia Smith	Utility Analyst
Gary Kenny	Gas Safety Manager
Christine R. Cook	Utility Analyst/Attorney
Maine Public Advocate Office	
Wayne R Jortner	Senior Counsel
William Black	Deputy Public Advocate
New Hampshire PUC	
Edward Damon	Staff Attorney
Stephen P. Frink	Assistant Director, Gas & Water Division
Matthew Fossum	Hearings Examiner
Randy Knepper	Director, Safety Division
Robert Wyatt	Utility Analyst
New Hampshire OCA	
Ken Traum	Assistant Consumer Advocate

Appendix B:
Granite Pipeline Maps


All Unitil gas facilities located on maps, plans, or layouts are general
locations and not for engineering, designing, or field locates. Unitil
will not be held responsible for plans which are incomplete, not updated or inaccurately depicted.
All gas information is confidential, and not for public consumption.
Falmouth
Gorham
Westbrook
Portland
South Portland
Scarborough
Cape Elizabeth
Saco
Old Orchard Beach
Maine
Biddeford
Arundel
Sanford
Kennebunk
North Berwick
Wells
South Berwick
Eliot
Kittery
New Hampshire
N
W
E
S
Unitil
January 12, 2010
Maine section of
Granite State Gas Transmission Line
3
1.5
0
3
Miles

New Hampshire section of Granite State Gas Transmission Line

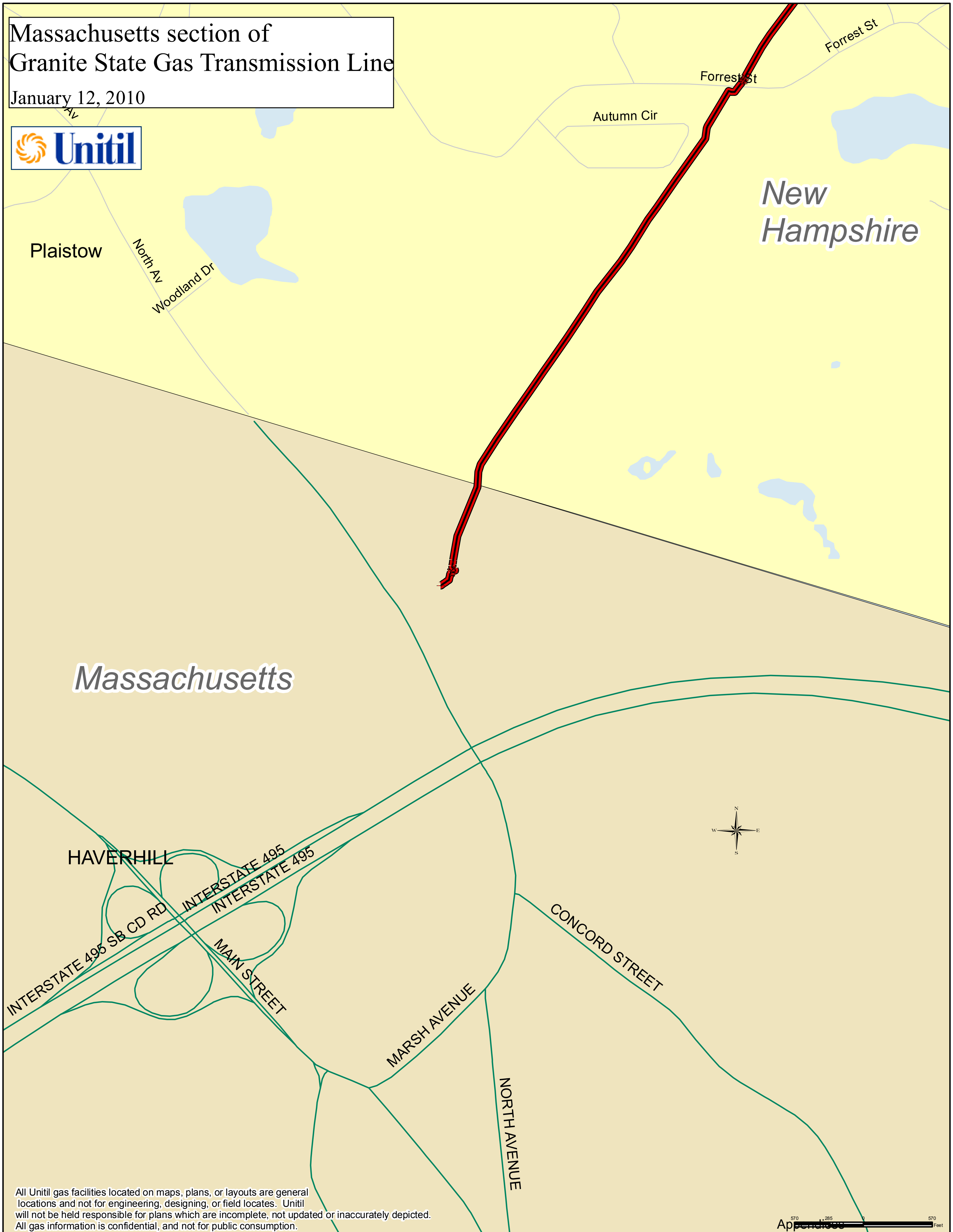
January 12, 2010



All Unitil gas facilities located on maps, plans, or layouts are general locations and not for engineering, designing, or field locates. Unitil will not be held responsible for plans which are incomplete, not updated or inaccurately depicted. All gas information is confidential, and not for public consumption.

Massachusetts section of Granite State Gas Transmission Line

January 12, 2010



All Unitil gas facilities located on maps, plans, or layouts are general locations and not for engineering, designing, or field locates. Unitil will not be held responsible for plans which are incomplete, not updated or inaccurately depicted. All gas information is confidential, and not for public consumption.

Appendix C:
Granite MAOP Validation Plan

Written By: Tim Bickford

Contributors: Lynn Best
Mark Dupuis

Revision: 1
Date: 12/17/09

Abstract:

Granite State Gas Transmission (GSGT) has a defined Maximum Allowable Operating Pressure (MAOP) of 492 PSIG. The former owner and operator of the GSGT, Columbia Gas Transmission (NiSource), reorganized and implemented a documentation process that established this MAOP for all GSGT mainline pipe segments in MA, NH and ME, all GSGT lateral lines in NH and ME and for all GSGT facility inventory in MA, NH and ME.

The following plan outlines the procedures required to validate the current MAOP of the 87-mile long Granite State Gas Transmission (GSGT) interstate pipeline system in its current operational configuration as defined by Columbia Gas Transmission (NiSource). The procedures, as defined in this plan, will apply to all GSGT mainline piping components for each system segment in MA, NH and ME, all GSGT lateral lines in NH and ME and all above ground pressure containing components at facilities in MA, NH and ME. The procedures, as defined in this plan, are to be used exclusively for the validation of the GSGT interstate pipeline system MAOP based on the requirements as defined in CFR-192.619 (a)(4).

Objectives:

1. ***Organize detailed records which validate the MAOP of the GSGT mainline pipe segments in MA, NH and ME.***

2. ***Organize detailed records which validate the MAOP of the GSGT lateral lines in NH and ME.***

3. ***Organize detailed records which validate the MAOP of pressure containing components at GSGT facilities in MA, NH and ME.***

4. ***Evaluate all records that confirm the MAOP, as defined by the former owner, Columbia Gas Transmission (NiSource), are accurate and confirm the integrity and completeness of the available data used in this determination.***

5. ***Organize data for review and recording using an interim format until the development of an information integration and management system has been completed*** **(See GSGT MAOP Validation & Data Management-PLAN 2).** ***This report will compile the data in a excel spreadsheet format with supporting documentation attached as supporting "Appendices".***

MAOP Validation Plan Process:

1) **GSGT Mainline MAOP**-Organize the detailed records which validate the current, defined MAOP of the GSGT mainline pipeline segments in MA, NH and ME. The process will consist of utilizing the following procedure to ascertain the required data;

   i. Review all information and organize for input into the spreadsheet. The following record systems will be utilized to acquire the required information:

      a. GSGT system paper records
      b. GSGT pig run records
      c. NU paper records located in Portsmouth
      d. Old Engineering records located in Portsmouth
      e. Old Engineering records located in Portland
      f. Micro Film records located in Portland
      g. Pertinent records transferred to Unitil from Columbia Gas Transmission Company
      h. Pertinent records from former FERC attorney Tom Brosnan
      i. Pertinent archived records stored at the FERC
      j. Pertinent archived records stored at the NH PUC
      k. Pertinent records from retired employees (i.e. Don Gilman tapping log book)
      l. Pertinent electronic records from Historical Maximo system and or current CMS system
      m. Pertinent records from former engineering firms (*i.e. Stone and Webster, CHI, NorthStar, Smith and Norington*)

   ii. Create a spreadsheet to document the validated data as obtained in step i and as noted;

      - Segment starting location-as noted by station number
      - Segment ending location-as noted by station number
      - Details (size, wall, yield, installation date, test pressure and duration, etc)
      - MAOP (Current maximum allowable operating pressure of the segment)
      - MAOP basis (basis in which the MAOP was established)
      - MOP (Current maximum operating pressure of the segment)
      - MOP basis (basis in which the MOP was established)

2) **<u>GSGT Lateral Lines MAOP</u>**-Organize the detailed records which validate the current, defined MAOP of the GSGT lateral line segments in NH and ME. The process will consist of utilizing the following procedure to ascertain the required data;

   i. Review all information available and organize for input into the spreadsheet. The following record systems will be utilized to acquire the required information:
      a. GSGT system paper records
      b. GSGT pig run records
      c. NU paper records located in Portsmouth
      d. Old Engineering records located in Portsmouth
      e. Old Engineering records located in Portland
      f. Micro Film records located in Portland
      g. Pertinent records transferred to Unitil from Columbia Gas Transmission Company
      h. Pertinent records from former FERC attorney Tom Brosnan
      i. Pertinent archived records stored at the FERC
      j. Pertinent archived records stored at the NH PUC
      k. Pertinent records from retired employees (i.e. Don Gilman tapping log book)
      l. Pertinent electronic records from Historical Maximo system and or current CMS system
      m. Pertinent records from former engineering firms (*i.e. Stone and Webster, CHI, NorthStar, Smith and Norington*)

   ii. Create a spreadsheet to document the validated data as obtained in step i and as noted;

      - Lateral segment starting location-as noted by station number
      - Lateral segment ending location-as noted by station number
      - Lateral segment name
      - Details (size, wall, yield, installation date, test pressure and duration, etc)
      - MAOP (Current maximum allowable operating pressure of the segment)
      - MAOP basis (basis in which the MAOP was established)
      - MOP (Current maximum operating pressure of the segment)
      - MOP basis (basis in which the MOP was established)

3) **<u>GSGT Lateral Facility Inventory and Components MAOP</u>**-Organize the detailed records which validate the current, defined MAOP of the GSGT facility inventory and components in MA, NH and ME. The process will consist of utilizing the following procedure to ascertain the required data;

   i. Review all information available and organize for input into the spreadsheet. The following record systems will be utilized to acquire the required information:
      a. GSGT system paper records
      b. GSGT pig run records
      c. NU paper records located in Portsmouth
      d. Old Engineering records located in Portsmouth
      e. Old Engineering records located in Portland
      f. Micro Film records located in Portland
      g. Pertinent records transferred to Unitil from Columbia Gas Transmission Company
      h. Pertinent records from former FERC attorney Tom Brosnan
      i. Pertinent archived records stored at the FERC
      j. Pertinent archived records stored at the NH PUC
      k. Pertinent records from retired employees (i.e. Don Gilman tapping log book)
      l. Pertinent electronic records from Historical Maximo system and or current CMS system
      m. Pertinent records from former engineering firms (*i.e. Stone and Webster, CHI, NorthStar, Smith and Norington*)

   ii. Create a spreadsheet to document the validated data as obtained in step i and as noted;

      - Facility name
      - Facility ID number (MS = Metering station , RS = Regulator station)
      - Details (size, wall, yield, installation date, test pressure and duration, etc)
      - Valve type*
      - Regulators (type & size)
      - Meters (type & size)
      - Flanges (size, class)
      - Pipe (size & length)
      - Facility station and MP number
      - Location (station number)

**** Category for valves also identifies (Strainers, filters, heaters, controls, Etc)***

MAOP Validation Analysis Process & Final Report:

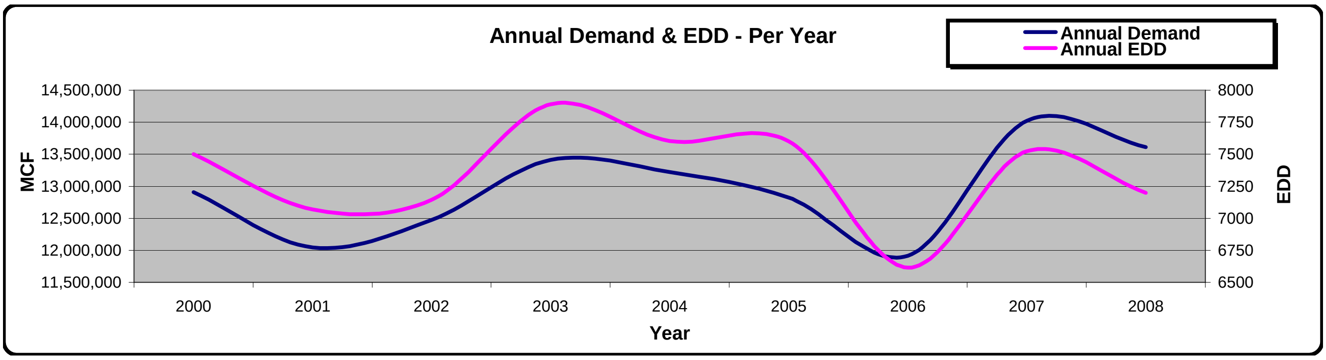
Information that has been logged into the spreadsheet will be formatted such that the MAOP for any specific GSGT mainline pipeline segment, lateral line segment or facility component can be easily ascertained. In addition, the stated MAOP of any specific mainline pipeline segment, lateral line segment or facility component, as defined on the spread sheet, will be corroborated with reference to the appropriate documentation, which will be attached to the final report as an "Appendix" and to specific requirements as defined in CFR-192.619 (a)(4). This validation process will provide final confirmation that the stated maximum allowable operating pressure of 492 PSIG for the Granite State Gas Transmission system, in its current operational configuration, is valid.

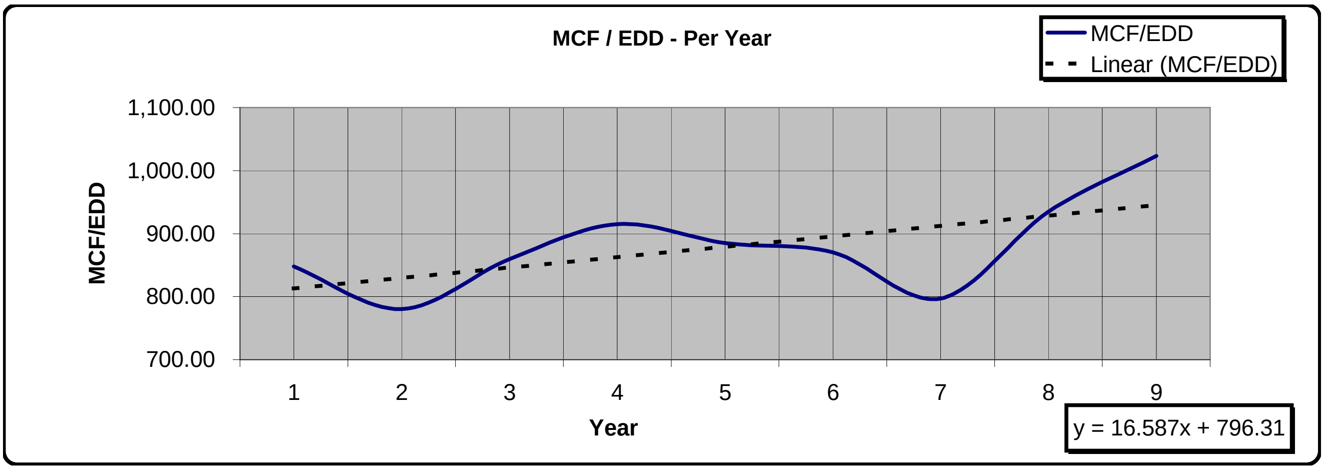
Appendix D:
Unitil GSGT Growth Analysis

Unitil	GSGT / NU Growth Study - 2000-2009 (REV-1)	Gas Engineering

By:	*Tim Bickford*
Date:	*10/26/09*
Revision:	*1*

Year	Westbrook	Newington	Haverhill	Cotton Rd	Lewiston LNG	Port-LPGA	Daily Base	Annual Base	DD	EDD	TOTAL Demand	Demd-base	MCF/EDD
2000	6,646,602	2,251,160	3,967,311		33,121	8,006	17,886	6,546,276	6839	7500	12,906,200	6,359,924	847.99
2001	6,256,696	1,059,356	4,714,680		13,542	40	17,885	6,528,025	6485	7069	12,044,314	5,516,289	780.35
2002	5,980,803	1,539,405	4,928,825		17,636	4,390	17,343	6,330,195	6558	7144	12,471,059	6,140,864	859.58
2003	7,571,998	2,372,306	3,414,008		50,914	4,897	16,975	6,195,875	7248	7891	13,414,123	7,218,248	914.74
2004	6,923,729	3,286,492	2,989,660		22,454	163	17,739	6,492,474	6961	7603	13,222,498	6,730,024	885.18
2005	7,643,185	2,465,443	2,679,114		34,747	159	17,014	6,210,110	6991	7600	12,822,648	6,612,538	870.07
2006	6,242,480	2,801,050	2,854,778		18,133	-	18,205	6,644,825	6113	6614	11,916,441	5,271,616	797.04
2007	7,521,211	2,692,644	3,605,816	177,975	20,806	-	19,135	6,984,275	6914	7524	14,018,452	7,034,177	934.90
2008	5,932,029	1,857,103	4,637,368	1,154,638	31,894	-	17,063	6,245,058	6661	7200	13,613,032	7,367,974	1,023.33





Actual Growth Per EDD					Trend line Growth Per EDD			
Year	Year No.	MCF/EDD	MCF/EDD Dif	% Growth	Year	MCF / DD	MCF/EDD Dif	% Growth
2000	1	848			2000	**813**		
2001	2	780	(67.64)	-8.0%	2001	**829**	17	2.0%
2002	3	860	79.23	10.2%	2002	**846**	17	2.0%
2003	4	915	55.16	6.4%	2003	**863**	17	2.0%
2004	5	885	(29.56)	-3.2%	2004	**879**	17	1.9%
2005	6	870	(15.11)	-1.7%	2005	**896**	17	1.9%
2006	7	797	(73.03)	-8.4%	2006	**912**	17	1.9%
2007	8	935	137.86	17.3%	2007	**929**	17	1.8%
2008	9	1,023	88.43	9.5%	2008	**946**	17	1.8%
			Average	**2.8%**			**Average**	**1.9%**

Appendix E:
GSGT Pipeline Pressures at 20% SMYS

GSGT pipe segment pressures at 20% SMYS
9/16/2009

Pipe Name	Nominal Diameter (in)	Internal Diameter (in)	Outside Diameter (in)	Wall Thickness (in)	SMYS psi	Length (ft)	Current MAOP	Calculated Max pressure at 20% SMYS
Pi445	8	8.249	8.625	0.188	24000	1214	492	209
Pi58	8	8.249	8.625	0.188	24000	218	492	209
Pi59	8	8.249	8.625	0.188	24000	304	492	209
Pi104	8	8.313	8.625	0.156	35000	9481	492	253
Pi108	8	8.313	8.625	0.156	35000	1363	492	253
Pi115	8	8.313	8.625	0.156	35000	1732	492	253
Pi118	8	8.313	8.625	0.156	35000	398	492	253
Pi122	8	8.313	8.625	0.156	35000	43	492	253
Pi131	8	8.313	8.625	0.156	35000	2288	492	253
Pi134	8	8.313	8.625	0.156	35000	484	492	253
Pi135	8	8.313	8.625	0.156	35000	344	492	253
Pi139	8	8.313	8.625	0.156	35000	2015	492	253
Pi142	8	8.313	8.625	0.156	35000	755	492	253
Pi144	8	8.313	8.625	0.156	35000	3306.02	492	253
Pi148	8	8.313	8.625	0.156	35000	255	492	253
Pi149	8	8.313	8.625	0.156	35000	26	492	253
Pi151	8	8.313	8.625	0.156	35000	1345	492	253
Pi161	8	8.313	8.625	0.156	35000	5686	492	253
Pi162	8	8.313	8.625	0.156	35000	26	492	253
Pi165	8	8.313	8.625	0.156	35000	507	492	253
Pi168	8	8.313	8.625	0.156	35000	200	492	253
Pi172	8	8.313	8.625	0.156	35000	45	492	253
Pi174	8	8.313	8.625	0.156	35000	32	492	253
Pi176	8	8.313	8.625	0.156	35000	6373	492	253
Pi182	8	8.313	8.625	0.156	35000	4325	492	253
Pi185	8	8.313	8.625	0.156	35000	11103	492	253
Pi186	8	8.313	8.625	0.156	35000	494	492	253
Pi189	8	8.313	8.625	0.156	35000	1023	492	253
Pi194	8	8.313	8.625	0.156	35000	1291	492	253
Pi195	8	8.313	8.625	0.156	35000	341	492	253
Pi199	8	8.313	8.625	0.156	35000	1596	492	253
Pi200	8	8.313	8.625	0.156	35000	1193	492	253
Pi205	8	8.313	8.625	0.156	35000	3740	492	253
Pi206	8	8.313	8.625	0.156	35000	244	492	253
Pi210	8	8.313	8.625	0.156	35000	5011	492	253
Pi234	8	8.313	8.625	0.156	35000	70	492	253
Pi241	8	8.313	8.625	0.156	35000	712	492	253
Pi245	8	8.313	8.625	0.156	35000	428	492	253
Pi249	8	8.313	8.625	0.156	35000	32	492	253
Pi253	8	8.313	8.625	0.156	35000	611	492	253
Pi264	8	8.313	8.625	0.156	35000	81	492	253
Pi355	8	8.313	8.625	0.156	35000	8376	492	253
Pi427	8	8.313	8.625	0.156	35000	243	492	253
Pi495	8	8.313	8.625	0.156	35000	4401	492	253
Pi500	8	8.313	8.625	0.156	35000	3273	492	253
Pi54	8	8.313	8.625	0.156	35000	25496	492	253
Pi55	8	8.313	8.625	0.156	35000	6980	492	253
Pi556	8	8.313	8.625	0.156	35000	184.93	492	253

Pi62	8	8.313	8.625	0.156	35000	5358	492	253
Pi64	8	8.313	8.625	0.156	35000	8048	492	253
Pi640	8	8.313	8.625	0.156	35000	431.8	492	253
Pi66	8	8.313	8.625	0.156	35000	24189	492	253
Pi68	8	8.313	8.625	0.156	35000	4238	492	253
Pi69	8	8.313	8.625	0.156	35000	6455.5	492	253
Pi71	8	8.313	8.625	0.156	35000	20978	492	253
Pi76	8	8.313	8.625	0.156	35000	25710	492	253
Pi78	8	8.313	8.625	0.156	35000	1735	492	253
Pi79	8	8.313	8.625	0.156	35000	6238	492	253
Pi91	8	8.313	8.625	0.156	35000	501	492	253
Pi95	8	8.313	8.625	0.156	35000	23	492	253
Pi97	8	8.313	8.625	0.156	35000	1240	492	253
Pi99	8	7.981	8.625	0.156	35000	1190	492	253
Pi31	6	6.249	6.625	0.188	24000	3427	492	272
Pi11	10	10.312	10.75	0.219	35000	13770	492	285
Pi14	10	10.312	10.75	0.219	35000	17768	492	285
Pi15	10	10.312	10.75	0.219	35000	1535	492	285
Pi154	10	10.312	10.75	0.219	35000	1306	492	285
Pi155	10	10.312	10.75	0.219	35000	2147	492	285
Pi158	10	10.312	10.75	0.219	35000	410	492	285
Pi16	10	10.312	10.75	0.219	35000	6635	492	285
Pi2	10	10.312	10.75	0.219	35000	892	750	285
Pi20	10	10.312	10.75	0.219	35000	15383	492	285
Pi25	10	10.312	10.75	0.219	35000	2157	492	285
Pi3	10	10.312	10.75	0.219	35000	3751	750	285
Pi32	10	10.312	10.75	0.219	35000	11351	492	285
Pi41	10	10.312	10.75	0.219	35000	5900	492	285
Pi45	10	10.312	10.75	0.219	35000	5977	492	285
Pi6	10	10.312	10.75	0.219	35000	4156	492	285
Pi73	10	10.312	10.75	0.219	35000	2086	492	285
Pi121	8	8.313	8.625	0.156	42000	320	492	304
Pi109	8	8.249	8.625	0.188	35000	86	492	305
Pi110	8	8.249	8.625	0.188	35000	287	492	305
Pi126	8	8.249	8.625	0.188	35000	1514	492	305
Pi130	8	8.249	8.625	0.188	35000	577	492	305
Pi150	8	8.249	8.625	0.188	35000	331	492	305
Pi153	8	8.249	8.625	0.188	35000	1182	492	305
Pi21	8	8.249	8.625	0.188	35000	2829	492	305
Pi211	8	8.249	8.625	0.188	35000	1756	492	305
Pi215	8	8.249	8.625	0.188	35000	3872	492	305
Pi222	8	8.249	8.625	0.188	35000	1097	492	305
Pi223	8	8.249	8.625	0.188	35000	74	492	305
Pi225	8	8.249	8.625	0.188	35000	2052	492	305
Pi229	8	8.249	8.625	0.188	35000	3077	492	305
Pi284	8	8.249	8.625	0.188	35000	7269	492	305
Pi371	8	8.249	8.625	0.188	35000	1720	492	305
Pi373	8	8.249	8.625	0.188	35000	2282	492	305
Pi43	8	8.249	8.625	0.188	35000	2000	492	305
Pi436	8	8.249	8.625	0.188	35000	6623	492	305
Pi46	8	8.249	8.625	0.188	35000	1186	492	305
Pi48	8	8.249	8.625	0.188	35000	2262	492	305
Pi51	8	8.249	8.625	0.188	35000	428	492	305

Pi52	8	8.249	8.625	0.188	35000	2611	492	305
Pi53	8	8.249	8.625	0.188	35000	8936	492	305
Pi125	8	7.981	8.625	0.322	24000	348	492	358
Pi127	8	7.981	8.625	0.322	24000	31	492	358
Pi35	8	7.981	8.625	0.322	24000	803	492	358
Pi38	8	7.981	8.625	0.322	24000	1865	492	358
Pi42	8	7.981	8.625	0.322	24000	23921	492	358
Pi424	8	7.981	8.625	0.322	24000	103	492	358
Pi105	8	8.249	8.625	0.188	42000	17	492	366
Pi239	8	8.249	8.625	0.188	42000	20	492	366
Pi251	8	8.249	8.625	0.188	42000	7	492	366
Pi255	8	8.249	8.625	0.188	42000	17	492	366
Pi1	6	6.249	6.625	0.188	35000	612	492	397
Pi102	6	6.249	6.625	0.188	35000	5887	492	397
Pi74	6	6.249	6.625	0.188	35000	5562	500	397
Pi94	6	6.249	6.625	0.188	35000	214	500	397
Pi266	8	8.125	8.625	0.25	35000	1290	492	406
Pi96	6	6.249	6.625	0.188	42000	2119	500	477
Pi28	4	4.026	4.5	0.237	24000	991	492	506
Pi36	4	4.026	4.5	0.237	24000	140	492	506
Pi103	8	7.981	8.625	0.322	35000	86	492	523
Pi116	8	7.981	8.625	0.322	35000	21	492	523
Pi220	8	7.981	8.625	0.322	35000	1126	492	523
Pi227	8	7.981	8.625	0.322	35000	650	492	523
Pi23	8	7.981	8.625	0.322	35000	2416	492	523
Pi237	8	7.981	8.625	0.322	35000	540	492	523
Pi258	8	7.981	8.625	0.322	35000	1721	492	523
Pi277	8	7.981	8.625	0.322	35000	5897	492	523
Pi302	8	7.981	8.625	0.322	35000	1304	492	523
Pi47	8	7.981	8.625	0.322	35000	136	492	523
Pi63	8	7.981	8.625	0.322	35000	160	492	523
Pi98	8	7.981	8.625	0.322	35000	540	492	523
Pi88	8	8.071	8.625	0.277	42000	1331	500	540
Pi89	8	8.071	8.625	0.277	42000	16830.06	500	540
Pi90	8	8.071	8.625	0.277	42000	380	500	540
Pi82	12	11.996	12.75	0.375	46000	793	500	541
Pi10	10	10.02	10.75	0.365	42000	37	492	570
Pi111	10	10.02	10.75	0.365	42000	34	492	570
Pi112	10	10.02	10.75	0.365	42000	5	492	570
Pi13	10	10.02	10.75	0.365	42000	25	492	570
Pi159	10	10.02	10.75	0.365	42000	12	492	570
Pi17	10	10.02	10.75	0.365	42000	8	492	570
Pi19	10	10.02	10.75	0.365	42000	27	492	570
Pi24	10	10.02	10.75	0.365	42000	21	492	570
Pi26	10	10.02	10.75	0.365	42000	17	492	570
Pi30	10	10.02	10.75	0.365	42000	12	492	570
Pi321	10	10.02	10.75	0.365	42000	1573	492	570
Pi33	10	10.02	10.75	0.365	42000	90	492	570
Pi39	10	10.02	10.75	0.365	42000	5	492	570
Pi4	10	10.02	10.75	0.365	42000	74	750	570
Pi40	10	10.02	10.75	0.365	42000	5	492	570
Pi44	10	10.02	10.75	0.365	42000	5	492	570
Pi5	10	10.02	10.75	0.365	42000	51	492	570

Pi7	10	10.02	10.75	0.365	42000	6	492	570
Pi37	24	23.012	24	0.5	70000	486	492	583
Pi12	12	12.126	12.75	0.312	60000	4397	492	587
Pi18	12	12.126	12.75	0.312	60000	145	492	587
Pi440	12	12.126	12.75	0.312	60000	2165	492	587
Pi56	12	12.126	12.75	0.312	60000	10	492	587
Pi9	12	12.126	12.75	0.312	60000	1281	492	587
Pi50	12	12	12.75	0.375	52000	946	492	612
Pi57	12	12	12.75	0.375	52000	2613	492	612
Pi61	12	12	12.75	0.375	52000	711	492	612
Pi100	8	7.981	8.625	0.322	42000	13	492	627
Pi101	8	7.981	8.625	0.322	42000	183	492	627
Pi106	8	7.981	8.625	0.322	42000	9	492	627
Pi107	8	7.981	8.625	0.322	42000	40	492	627
Pi113	8	7.981	8.625	0.322	42000	25	492	627
Pi114	8	7.981	8.625	0.322	42000	7	492	627
Pi119	8	7.981	8.625	0.322	42000	34	492	627
Pi123	8	7.981	8.625	0.322	42000	67	492	627
Pi124	8	7.981	8.625	0.322	42000	10	492	627
Pi129	8	7.981	8.625	0.322	42000	175	492	627
Pi133	8	7.981	8.625	0.322	42000	35	492	627
Pi136	8	7.981	8.625	0.322	42000	128	492	627
Pi138	8	7.981	8.625	0.322	42000	149	492	627
Pi140	8	8.313	8.625	0.322	42000	33	492	627
Pi141	8	7.981	8.625	0.322	42000	16	492	627
Pi145	8	7.981	8.625	0.322	42000	6	492	627
Pi146	8	7.981	8.625	0.322	42000	25	492	627
Pi147	8	7.981	8.625	0.322	42000	8	492	627
Pi152	8	7.981	8.625	0.322	42000	15	492	627
Pi160	8	7.981	8.625	0.322	42000	12	492	627
Pi164	8	7.981	8.625	0.322	42000	1527	492	627
Pi166	8	7.981	8.625	0.322	42000	14	492	627
Pi167	8	7.981	8.625	0.322	42000	20	492	627
Pi170	8	7.981	8.625	0.322	42000	20	492	627
Pi173	8	7.981	8.625	0.322	42000	5	492	627
Pi179	8	7.981	8.625	0.322	42000	28	492	627
Pi181	8	7.981	8.625	0.322	42000	15	492	627
Pi183	8	7.981	8.625	0.322	42000	10	492	627
Pi191	8	7.981	8.625	0.322	42000	415	492	627
Pi192	8	7.981	8.625	0.322	42000	4	492	627
Pi196	8	7.981	8.625	0.322	42000	16	492	627
Pi197	8	7.981	8.625	0.322	42000	2	492	627
Pi201	8	7.981	8.625	0.322	42000	11	492	627
Pi203	8	7.981	8.625	0.322	42000	21	492	627
Pi207	8	7.981	8.625	0.322	42000	17	492	627
Pi213	8	7.981	8.625	0.322	42000	31	492	627
Pi217	8	7.981	8.625	0.322	42000	5	492	627
Pi22	8	7.981	8.625	0.322	42000	23	492	627
Pi232	8	7.981	8.625	0.322	42000	7	492	627
Pi243	8	7.981	8.625	0.322	42000	8	492	627
Pi247	8	7.981	8.625	0.322	42000	6	492	627
Pi260	8	7.981	8.625	0.322	42000	14	492	627
Pi262	8	7.981	8.625	0.322	42000	16	492	627

Pi267	8	7.981	8.625	0.322	42000	12	492	627
Pi34	8	7.981	8.625	0.322	42000	23	492	627
Pi372	8	7.981	8.625	0.322	42000	1450	492	627
Pi49	8	7.981	8.625	0.322	42000	64	492	627
Pi513	8	7.981	8.625	0.322	42000	40	492	627
Pi65	8	7.981	8.625	0.322	42000	1000	492	627
Pi67	8	7.981	8.625	0.322	42000	288	492	627
Pi70	8	7.981	8.625	0.322	42000	10.01	492	627
Pi75	8	7.981	8.625	0.322	42000	863	492	627
Pi81	8	7.981	8.625	0.322	42000	18	492	627
Pi83	8	7.981	8.625	0.322	42000	2096	492	627
Pi84	8	7.981	8.625	0.322	42000	11	492	627
Pi85	8	7.981	8.625	0.322	42000	16	492	627
Pi86	8	7.981	8.625	0.322	42000	26	492	627
Pi92	8	7.981	8.625	0.322	42000	7869	500	627
Pi93	8	7.981	8.625	0.322	42000	13	492	627
Pi156	10	10.02	10.75	0.365	52000	3	492	706
Pi157	10	10.02	10.75	0.365	52000	19	492	706
Pi77	10	10.312	10.75	0.365	52000	790	492	706
Pi29	10	7.981	8.625	0.365	42000	6	492	711
Pi60	12	11.75	12.75	0.5	52000	128	492	816
Pi27	4	4.026	4.5	0.237	42000	398	492	885
Pi8	4	4.026	4.5	0.237	42000	151	492	885

GSGT pipe segment pressures at 20% SMYS
9/16/2009

Pipe Name	Nominal Diameter (in)	Internal Diameter (in)	Outside Diameter (in)	Wall Thickness (in)	SMYS psi	Length (ft)	Current MAOP	Calculated Max pressure at 20% SMYS
Pi1	6	6.249	6.625	0.188	35000	612	492	397
Pi10	10	10.02	10.75	0.365	42000	37	492	570
Pi100	8	7.981	8.625	0.322	42000	13	492	627
Pi101	8	7.981	8.625	0.322	42000	183	492	627
Pi102	6	6.249	6.625	0.188	35000	5887	492	397
Pi103	8	7.981	8.625	0.322	35000	86	492	523
Pi104	8	8.313	8.625	0.156	35000	9481	492	253
Pi105	8	8.249	8.625	0.188	42000	17	492	366
Pi106	8	7.981	8.625	0.322	42000	9	492	627
Pi107	8	7.981	8.625	0.322	42000	40	492	627
Pi108	8	8.313	8.625	0.156	35000	1363	492	253
Pi109	8	8.249	8.625	0.188	35000	86	492	305
Pi11	10	10.312	10.75	0.219	35000	13770	492	285
Pi110	8	8.249	8.625	0.188	35000	287	492	305
Pi111	10	10.02	10.75	0.365	42000	34	492	570
Pi112	10	10.02	10.75	0.365	42000	5	492	570
Pi113	8	7.981	8.625	0.322	42000	25	492	627
Pi114	8	7.981	8.625	0.322	42000	7	492	627
Pi115	8	8.313	8.625	0.156	35000	1732	492	253
Pi116	8	7.981	8.625	0.322	35000	21	492	523
Pi118	8	8.313	8.625	0.156	35000	398	492	253
Pi119	8	7.981	8.625	0.322	42000	34	492	627
Pi12	12	12.126	12.75	0.312	60000	4397	492	587
Pi121	8	8.313	8.625	0.156	42000	320	492	304
Pi122	8	8.313	8.625	0.156	35000	43	492	253
Pi123	8	7.981	8.625	0.322	42000	67	492	627
Pi124	8	7.981	8.625	0.322	42000	10	492	627
Pi125	8	7.981	8.625	0.322	24000	348	492	358
Pi126	8	8.249	8.625	0.188	35000	1514	492	305
Pi127	8	7.981	8.625	0.322	24000	31	492	358
Pi129	8	7.981	8.625	0.322	42000	175	492	627
Pi13	10	10.02	10.75	0.365	42000	25	492	570
Pi130	8	8.249	8.625	0.188	35000	577	492	305
Pi131	8	8.313	8.625	0.156	35000	2288	492	253
Pi133	8	7.981	8.625	0.322	42000	35	492	627
Pi134	8	8.313	8.625	0.156	35000	484	492	253
Pi135	8	8.313	8.625	0.156	35000	344	492	253
Pi136	8	7.981	8.625	0.322	42000	128	492	627
Pi138	8	7.981	8.625	0.322	42000	149	492	627
Pi139	8	8.313	8.625	0.156	35000	2015	492	253
Pi14	10	10.312	10.75	0.219	35000	17768	492	285
Pi140	8	8.313	8.625	0.322	42000	33	492	627
Pi141	8	7.981	8.625	0.322	42000	16	492	627
Pi142	8	8.313	8.625	0.156	35000	755	492	253
Pi144	8	8.313	8.625	0.156	35000	3306.02	492	253
Pi145	8	7.981	8.625	0.322	42000	6	492	627
Pi146	8	7.981	8.625	0.322	42000	25	492	627
Pi147	8	7.981	8.625	0.322	42000	8	492	627

Pi148	8	8.313	8.625	0.156	35000	255	492	253
Pi149	8	8.313	8.625	0.156	35000	26	492	253
Pi15	10	10.312	10.75	0.219	35000	1535	492	285
Pi150	8	8.249	8.625	0.188	35000	331	492	305
Pi151	8	8.313	8.625	0.156	35000	1345	492	253
Pi152	8	7.981	8.625	0.322	42000	15	492	627
Pi153	8	8.249	8.625	0.188	35000	1182	492	305
Pi154	10	10.312	10.75	0.219	35000	1306	492	285
Pi155	10	10.312	10.75	0.219	35000	2147	492	285
Pi156	10	10.02	10.75	0.365	52000	3	492	706
Pi157	10	10.02	10.75	0.365	52000	19	492	706
Pi158	10	10.312	10.75	0.219	35000	410	492	285
Pi159	10	10.02	10.75	0.365	42000	12	492	570
Pi16	10	10.312	10.75	0.219	35000	6635	492	285
Pi160	8	7.981	8.625	0.322	42000	12	492	627
Pi161	8	8.313	8.625	0.156	35000	5686	492	253
Pi162	8	8.313	8.625	0.156	35000	26	492	253
Pi164	8	7.981	8.625	0.322	42000	1527	492	627
Pi165	8	8.313	8.625	0.156	35000	507	492	253
Pi166	8	7.981	8.625	0.322	42000	14	492	627
Pi167	8	7.981	8.625	0.322	42000	20	492	627
Pi168	8	8.313	8.625	0.156	35000	200	492	253
Pi17	10	10.02	10.75	0.365	42000	8	492	570
Pi170	8	7.981	8.625	0.322	42000	20	492	627
Pi172	8	8.313	8.625	0.156	35000	45	492	253
Pi173	8	7.981	8.625	0.322	42000	5	492	627
Pi174	8	8.313	8.625	0.156	35000	32	492	253
Pi176	8	8.313	8.625	0.156	35000	6373	492	253
Pi179	8	7.981	8.625	0.322	42000	28	492	627
Pi18	12	12.126	12.75	0.312	60000	145	492	587
Pi181	8	7.981	8.625	0.322	42000	15	492	627
Pi182	8	8.313	8.625	0.156	35000	4325	492	253
Pi183	8	7.981	8.625	0.322	42000	10	492	627
Pi185	8	8.313	8.625	0.156	35000	11103	492	253
Pi186	8	8.313	8.625	0.156	35000	494	492	253
Pi189	8	8.313	8.625	0.156	35000	1023	492	253
Pi19	10	10.02	10.75	0.365	42000	27	492	570
Pi191	8	7.981	8.625	0.322	42000	415	492	627
Pi192	8	7.981	8.625	0.322	42000	4	492	627
Pi194	8	8.313	8.625	0.156	35000	1291	492	253
Pi195	8	8.313	8.625	0.156	35000	341	492	253
Pi196	8	7.981	8.625	0.322	42000	16	492	627
Pi197	8	7.981	8.625	0.322	42000	2	492	627
Pi199	8	8.313	8.625	0.156	35000	1596	492	253
Pi2	10	10.312	10.75	0.219	35000	892	750	285
Pi20	10	10.312	10.75	0.219	35000	15383	492	285
Pi200	8	8.313	8.625	0.156	35000	1193	492	253
Pi201	8	7.981	8.625	0.322	42000	11	492	627
Pi203	8	7.981	8.625	0.322	42000	21	492	627
Pi205	8	8.313	8.625	0.156	35000	3740	492	253
Pi206	8	8.313	8.625	0.156	35000	244	492	253
Pi207	8	7.981	8.625	0.322	42000	17	492	627
Pi21	8	8.249	8.625	0.188	35000	2829	492	305

Pi210	8	8.313	8.625	0.156	35000	5011	492	253
Pi211	8	8.249	8.625	0.188	35000	1756	492	305
Pi213	8	7.981	8.625	0.322	42000	31	492	627
Pi215	8	8.249	8.625	0.188	35000	3872	492	305
Pi217	8	7.981	8.625	0.322	42000	5	492	627
Pi22	8	7.981	8.625	0.322	42000	23	492	627
Pi220	8	7.981	8.625	0.322	35000	1126	492	523
Pi222	8	8.249	8.625	0.188	35000	1097	492	305
Pi223	8	8.249	8.625	0.188	35000	74	492	305
Pi225	8	8.249	8.625	0.188	35000	2052	492	305
Pi227	8	7.981	8.625	0.322	35000	650	492	523
Pi229	8	8.249	8.625	0.188	35000	3077	492	305
Pi23	8	7.981	8.625	0.322	35000	2416	492	523
Pi232	8	7.981	8.625	0.322	42000	7	492	627
Pi234	8	8.313	8.625	0.156	35000	70	492	253
Pi237	8	7.981	8.625	0.322	35000	540	492	523
Pi239	8	8.249	8.625	0.188	42000	20	492	366
Pi24	10	10.02	10.75	0.365	42000	21	492	570
Pi241	8	8.313	8.625	0.156	35000	712	492	253
Pi243	8	7.981	8.625	0.322	42000	8	492	627
Pi245	8	8.313	8.625	0.156	35000	428	492	253
Pi247	8	7.981	8.625	0.322	42000	6	492	627
Pi249	8	8.313	8.625	0.156	35000	32	492	253
Pi25	10	10.312	10.75	0.219	35000	2157	492	285
Pi251	8	8.249	8.625	0.188	42000	7	492	366
Pi253	8	8.313	8.625	0.156	35000	611	492	253
Pi255	8	8.249	8.625	0.188	42000	17	492	366
Pi258	8	7.981	8.625	0.322	35000	1721	492	523
Pi26	10	10.02	10.75	0.365	42000	17	492	570
Pi260	8	7.981	8.625	0.322	42000	14	492	627
Pi262	8	7.981	8.625	0.322	42000	16	492	627
Pi264	8	8.313	8.625	0.156	35000	81	492	253
Pi266	8	8.125	8.625	0.25	35000	1290	492	406
Pi267	8	7.981	8.625	0.322	42000	12	492	627
Pi27	4	4.026	4.5	0.237	42000	398	492	885
Pi277	8	7.981	8.625	0.322	35000	5897	492	523
Pi28	4	4.026	4.5	0.237	24000	991	492	506
Pi284	8	8.249	8.625	0.188	35000	7269	492	305
Pi29	10	7.981	8.625	0.365	42000	6	492	711
Pi3	10	10.312	10.75	0.219	35000	3751	750	285
Pi30	10	10.02	10.75	0.365	42000	12	492	570
Pi302	8	7.981	8.625	0.322	35000	1304	492	523
Pi31	6	6.249	6.625	0.188	24000	3427	492	272
Pi32	10	10.312	10.75	0.219	35000	11351	492	285
Pi321	10	10.02	10.75	0.365	42000	1573	492	570
Pi33	10	10.02	10.75	0.365	42000	90	492	570
Pi34	8	7.981	8.625	0.322	42000	23	492	627
Pi35	8	7.981	8.625	0.322	24000	803	492	358
Pi355	8	8.313	8.625	0.156	35000	8376	492	253
Pi36	4	4.026	4.5	0.237	24000	140	492	506
Pi37	24	23.012	24	0.5	70000	486	492	583
Pi371	8	8.249	8.625	0.188	35000	1720	492	305
Pi372	8	7.981	8.625	0.322	42000	1450	492	627

Pi373	8	8.249	8.625	0.188	35000	2282	492	305
Pi38	8	7.981	8.625	0.322	24000	1865	492	358
Pi39	10	10.02	10.75	0.365	42000	5	492	570
Pi4	10	10.02	10.75	0.365	42000	74	750	570
Pi40	10	10.02	10.75	0.365	42000	5	492	570
Pi41	10	10.312	10.75	0.219	35000	5900	492	285
Pi42	8	7.981	8.625	0.322	24000	23921	492	358
Pi424	8	7.981	8.625	0.322	24000	103	492	358
Pi427	8	8.313	8.625	0.156	35000	243	492	253
Pi43	8	8.249	8.625	0.188	35000	2000	492	305
Pi436	8	8.249	8.625	0.188	35000	6623	492	305
Pi44	10	10.02	10.75	0.365	42000	5	492	570
Pi440	12	12.126	12.75	0.312	60000	2165	492	587
Pi445	8	8.249	8.625	0.188	24000	1214	492	209
Pi45	10	10.312	10.75	0.219	35000	5977	492	285
Pi46	8	8.249	8.625	0.188	35000	1186	492	305
Pi47	8	7.981	8.625	0.322	35000	136	492	523
Pi48	8	8.249	8.625	0.188	35000	2262	492	305
Pi49	8	7.981	8.625	0.322	42000	64	492	627
Pi495	8	8.313	8.625	0.156	35000	4401	492	253
Pi5	10	10.02	10.75	0.365	42000	51	492	570
Pi50	12	12	12.75	0.375	52000	946	492	612
Pi500	8	8.313	8.625	0.156	35000	3273	492	253
Pi51	8	8.249	8.625	0.188	35000	428	492	305
Pi513	8	7.981	8.625	0.322	42000	40	492	627
Pi52	8	8.249	8.625	0.188	35000	2611	492	305
Pi53	8	8.249	8.625	0.188	35000	8936	492	305
Pi54	8	8.313	8.625	0.156	35000	25496	492	253
Pi55	8	8.313	8.625	0.156	35000	6980	492	253
Pi556	8	8.313	8.625	0.156	35000	184.93	492	253
Pi56	12	12.126	12.75	0.312	60000	10	492	587
Pi57	12	12	12.75	0.375	52000	2613	492	612
Pi58	8	8.249	8.625	0.188	24000	218	492	209
Pi59	8	8.249	8.625	0.188	24000	304	492	209
Pi6	10	10.312	10.75	0.219	35000	4156	492	285
Pi60	12	11.75	12.75	0.5	52000	128	492	816
Pi61	12	12	12.75	0.375	52000	711	492	612
Pi62	8	8.313	8.625	0.156	35000	5358	492	253
Pi63	8	7.981	8.625	0.322	35000	160	492	523
Pi64	8	8.313	8.625	0.156	35000	8048	492	253
Pi640	8	8.313	8.625	0.156	35000	431.8	492	253
Pi65	8	7.981	8.625	0.322	42000	1000	492	627
Pi66	8	8.313	8.625	0.156	35000	24189	492	253
Pi67	8	7.981	8.625	0.322	42000	288	492	627
Pi68	8	8.313	8.625	0.156	35000	4238	492	253
Pi69	8	8.313	8.625	0.156	35000	6455.5	492	253
Pi7	10	10.02	10.75	0.365	42000	6	492	570
Pi70	8	7.981	8.625	0.322	42000	10.01	492	627
Pi71	8	8.313	8.625	0.156	35000	20978	492	253
Pi73	10	10.312	10.75	0.219	35000	2086	492	285
Pi74	6	6.249	6.625	0.188	35000	5562	500	397
Pi75	8	7.981	8.625	0.322	42000	863	492	627
Pi76	8	8.313	8.625	0.156	35000	25710	492	253

Pi77	10	10.312	10.75	0.365	52000	790	492	706
Pi78	8	8.313	8.625	0.156	35000	1735	492	253
Pi79	8	8.313	8.625	0.156	35000	6238	492	253
Pi8	4	4.026	4.5	0.237	42000	151	492	885
Pi81	8	7.981	8.625	0.322	42000	18	492	627
Pi82	12	11.996	12.75	0.375	46000	793	500	541
Pi83	8	7.981	8.625	0.322	42000	2096	492	627
Pi84	8	7.981	8.625	0.322	42000	11	492	627
Pi85	8	7.981	8.625	0.322	42000	16	492	627
Pi86	8	7.981	8.625	0.322	42000	26	492	627
Pi88	8	8.071	8.625	0.277	42000	1331	500	540
Pi89	8	8.071	8.625	0.277	42000	16830.06	500	540
Pi9	12	12.126	12.75	0.312	60000	1281	492	587
Pi90	8	8.071	8.625	0.277	42000	380	500	540
Pi91	8	8.313	8.625	0.156	35000	501	492	253
Pi92	8	7.981	8.625	0.322	42000	7869	500	627
Pi93	8	7.981	8.625	0.322	42000	13	492	627
Pi94	6	6.249	6.625	0.188	35000	214	500	397
Pi95	8	8.313	8.625	0.156	35000	23	492	253
Pi96	6	6.249	6.625	0.188	42000	2119	500	477
Pi97	8	8.313	8.625	0.156	35000	1240	492	253
Pi98	8	7.981	8.625	0.322	35000	540	492	523
Pi99	8	7.981	8.625	0.156	35000	1190	492	253

Appendix F:
Process Pipeline Services, Inc. Memorandum

Process Pipeline Services, Inc.
42 Winter Street Unit #2
Pembroke, MA 02359

Ph: (781) 829-0524
Fax: (781) 829-0527

December 14, 2009

PPS Project Number UN-1410

Mr. Roger Barham
Senior Gas Engineer
Unitil Service Corporation
325 West Rd
Portsmouth, NH 03801

RE: Opinion of Probable Transmission Pipeline Construction Costs – NHDOT's Proposed Little Bay Bridge

Roger:

This document outlines Process Pipeline Services, Inc.'s (PPS) opinion of probable costs for the relocation of Unitil's Granite State Gas Transmission (GSGT) transmission line crossing the Little Bay. Three construction methods were considered:

1) Installation on a proposed steel superstructure bridge;
2) Installation on a proposed concrete superstructure bridge;
3) Installation via horizontal directional drilling (HDD).

A net present value (NPV) analysis was performed such that the operating and maintenance (O&M) costs could be included in the comparison. Based on the information and assumptions described below, all of the methods were relatively close in cost with the HDD method being the most cost effective as well as being the preferred installed solution.

Background

NHDOT is proposing a significant roadway improvement that includes the widening of the Little Bay Bridge, which connects Route 16 from Newington to Dover, NH. The project is known as NHS-027-1(37), N.H. Project No. 11238L, Spaulding Turnpike (NH Route 16). The existing bridge, which has a total of 4 lanes: 2 southbound and 2 northbound, will be converted to 4 northbound lanes. A new bridge will be constructed next to the existing bridge, and it will hold 4 southbound lanes. Additionally, the existing General Sullivan Bridge will be refurbished and opened as a pedestrian/bicycle bridge.

GSGT has a natural gas transmission pipeline located underneath the westerly breakdown lane of the existing bridge. The transmission line is bidirectional and travels from Plaistow, NH to Portland, ME. The segment in the area of the proposed construction consists of 8", 10" and 12" pipe. On the Newington (southerly) side, the 12" transmission pipeline is located on the westerly side of the General Sullivan Bridge abutment, where it transitions from belowground to aboveground. The pipeline remains aboveground while crossing underneath the General Sullivan Bridge. It remains belowground until it reaches the existing Little Bay Bridge. Before transitioning aboveground the pipe is reduced to 10" and remains 10" across the bridge. The pipe then increases to 12" as it sweeps around to the easterly side and along Hilton Drive in Dover.

During the construction process the existing pipeline will have to be removed. Given the criticality of the transmission pipeline and the duration of the bridge's construction, it is understood that except for short durations of time, the pipeline must remain in service. This will be accomplished by a combination of temporary and permanent relocations.

Little Bay Bridge Construction

The construction of the new bridge will begin in 2010 with the installation of the abutments. The new abutments will be located between the existing Spaulding Turnpike Bridge and the existing General Sullivan Bridge.

The bridge's superstructure will be either steel or concrete and will be decided by NHDOT as part of their construction bid process. Whichever is chosen, it is understood that if the replacement transmission pipeline is to be on the new bridge, its installation will be dictated by the proposed bridge's construction schedule, which currently has the pipeline being installed in 2012.

Both bridge superstructure options present unique design challenges for a proposed transmission pipeline crossing. Both bridge options consist of nine (9) spans ranging in width from a maximum of 275-feet to a minimum of 150-feet. The proposed steel superstructure provides pier and intermediate cross frames for supports of the proposed transmission line. The approximate available opening has been identified as 1'-10", see NHDOT bridge sheet 4 of 12 titled 'Typical Bridge Sections and Details'. Spans 1 and 9 of the steel superstructure consist of intermediate cross frame spacing that exceeds the recommended pipe support spacing of 22 feet by 6 inches. The proposed spacing of 22'-6" will require further analysis when more information is available but it is likely that it will be acceptable.

Due to the preliminary state of the plans, PPS was unable to determine how the supports for the transmission line would be attached to the concrete super structure option. NHDOT bridge sheet 9 of 12 titled 'Framing Plan and Girder Elevations (1 of 3) it would appear that the maximum distance between the proposed concrete diaphragm and intermediate steel cross frame is 54'-6" within Spans 1 and 2. With a recommended pipe support spacing of 22-feet it would be necessary to install two (2) pipe supports between the diaphragm and cross frame. If this superstructure is chosen by NHDOT, they would have to incorporate provisions for these additional supports in the design of their pre-stressed concrete beams.

Once the new bridge is completed, the existing bridge will undergo a major overhaul. NHDOT has communicated that this overhaul will require the existing transmission pipeline to be removed.

Construction Conflicts

The construction conflicts were covered in detail under a separate cover and are reviewed here for consistency. This review begins with the southern-most limits of the project.

Basin No. 1590

A gravel wetland/extended detention basin is being installed on the Newington side just south of the existing General Sullivan Bridge. Its location is in direct conflict with the existing GSGT pipeline. Approximately, 470-feet of 10" pipe will need to be installed before the detention basin can be constructed. The opinion of probable installation cost is $105,500. This work is estimated to begin in 2010.

Southerly Abutment

The existing transmission pipeline is approximately 30 feet from the edge of the proposed abutment. The current plans do not provide limits of excavation. However, NHDOT has identified that the area may incur approximately 20 to 30 feet of additional fill for a temporary staging area for a 400 to 500 ton crane. Given the limit space in the area, it is assumed that additional means protecting the existing pipeline will need to be designed and installed before the abutment construction begins in 2010.

Northerly Abutment

The transmission pipeline comes off of the bridge and heads westerly for approximately 40 feet, which places it approximately 30 from the edge of the proposed abutment. The transmission pipeline then goes down the slope and heads easterly within Hilton Drive, which is slated for full depth reconstruction and relocation. This proposed work will require the pipeline to be relocated from close to the 10" pipe riser coming off the bridge to station 63+10 on Hilton Drive, Dover. The opinion of probable installation cost is $62,500. This relocation will have to be completed before the abutment construction begins in 2010.

Dover 42" RCP and Basin No. 922

The installation of a 42" RCP drain and a gravel wetland/extended detention basin is in close proximity to and may be in direct conflict with the transmission pipeline from station 920+20 to 924+80 or 73+00 to station 77+00 Hilton Drive.

Additional Cover and Sound Wall

From station 922+50 to 933+50, considerable fill and the installation of a sound wall may require the relocation of the transmission pipeline. Combining this section with the conflict at basin 922, the length of pipe to be relocated becomes approximately 1600 feet of 8" pipe. An opinion of probable cost has not been developed and the timing of the necessary construction is not yet known.

Crossing Relocations

Three methods for re-crossing the Little Bay with a natural gas pipeline were considered: installation on a steel bridge; installation on a concrete bridge; and, horizontal directional drilling of the bay.

<u>Bridge Crossings – General</u>
A steel transmission pipeline on the 1,639 foot long span would require to be allowed to move over 16 inches to allow for expansion and contraction due to ambient temperature changes. It is anticipated that "piggable" expansion joints will be installed to allow for expansion and contraction while still allowing for the passage of an internal inspection tool.

Cross frames will need to be installed between the girders at spacing of 22 feet or less. Each of the cross frames will have a pipe support installed. It is expected that the supports and the transmission pipeline will be installed using a truck mounted under-bridge-access-platform, which will give the workers access from the bridge deck.

It is expected that the pipeline will come off of the bridge before the abutments similar to the existing installation.

A bridge crossing would require inspection for external corrosion every 3 years.

<u>Crossing on the Proposed Steel Bridge</u>
A steel superstructure would consist of steel girders placed on 8 piers to create 9 spans, which would range from 150 feet to 275 feet. A total 85 cross frames will connect the girders at spacing of 22'-6" or less. It is likely that this spacing will be adequate and that no additional supports will be required.

<u>Crossing on the Proposed Concrete Bridge</u>
A concrete superstructure would consist of steel girders placed on 8 piers to create 9 spans, which would range from 150 feet to 275 feet. A total of 18 cross frames and 20 concrete diaphragms are currently designed to connect the girders. It is assumed that an adequately sized hole will be provided in the concrete diaphragm for the 10" pipe. Coordination with NHDOT's bridge designers would be required so that additional supports can be designed into the concrete girders.

<u>Crossing via HDD</u>
An HDD crossing typically begins with preliminary engineering, subsurface investigation, and pipe stress analysis to confirm the HDD installation loads and operating stresses will not exceed the maximum allowable stress. Site survey is usually required to understand the property lines, wetland boundaries and other property issued. It may be necessary to obtain temporary and/or permanent land rights based on the layout of the drill rig, exit hole, and lay down of the pre-welded pipe. Ideally, the pipe is pre-welded, inspected and coated, such that the entire length is ready once the drill hole is ready. It is better for the pull-through process to proceed without stopping.

A typical lesson learned from HDD projects is that it is worth the extra expense to perform and accurate and extensive site investigation. Such thorough pre-construction analysis can prove to be invaluable during the bidding and construction process. Another lesson learned is that evaluating HDD contractors based solely on price or placing the risk entirely on the contractor is not advisable. It is better to control the thoroughness of the upfront design and share the risks of needing additional attempts with the HDD contractor. The all-or-nothing nature of directional drilling makes the cost of repeated attempts too great and to obtain a reasonable price level the risk should be shared.

Opinions of Probable Costs

The following opinions of probable costs of construction and maintenance do not include permitting, wetland mitigation, special environmental investigations, and temporary or permanent easements. The costs are meant to be used as a comparison to each other and it is recommended that designs and investigations are completed before estimates are compiled.

Construction

The table below summarizes the opinions of probable costs for the three crossing options.

Construction Method	Probable Cost	Year
Installation on a Steel Bridge	$2,325,000	2012
Installation on a Concrete Bridge	$2,400,000	2012
Horizontal Directional Drill	$2,725,000	2013

Operating & Maintenance

It is understood that the transmission pipeline will be required to be internally inspected at least once every 7 years. Also, due to the elevation change in the pipeline risers at the abutments and because of the fittings used for the expansion and contraction loops, there is great risk that an inspection tool (pig) would probably get stuck on the bridge no matter what the design. It is also assumed that direct assessment of a pipeline on the new bridge will be infeasible, however, the pipeline will allow for tethered inspection.

Conversely, a transmission pipeline installed by directional bore will not have any incremental O&M costs because it is expected that it can be included with segments to the south and to the north in a single tool run.

Inspection Method	Probable Cost	Frequency
External Corrosion Inspection	$25,000	3 yr
Tethered Internal Inspection (Bridge)	$80,000	7 yr
Incremental Cost of Internal Inspection (HDD)	$0	7 yr

Net Present Value

The following net present value calculations are based on the timing of the permanent construction costs and the cost and frequency of the required O&M. Costs related to the conflicts and the removal of the pipe from the existing Little Bay and the General Sullivan Bridges are not included because the costs would be the same and are required for all re-crossing scenarios. Affects of depreciation were not calculated.

Assumptions

Cost of Capital	10%	
Term	30	Yrs

Results

Construction Method	NPV
Installation on a Steel Bridge	$1,862,607
Installation on a Concrete Bridge	$1.918,956
Horizontal Directional Drill	$1,861,212

Recommendations

The HDD method may have inherent installation cost risks related to obtaining land rights and achieving a successful drill hole. However, a transmission pipeline installed on a highway bridge has many installed cost risks, such as lack of rights, increasing maintenance costs, increasing limitations on the hours maintenance can be performed, and increased consequences of a pipeline failure. It is for these reasons and the fact that most new crossings of waterways by transmission pipelines are installed by HDD, it is recommended that Unitil pursue an HDD crossing of the Little Bay.

Sincerely,

Mark D. Wood, P.E.
Principal Engineer

Appendix G:
Cost Detail for Scenarios

Scenario	1 & 2	Date	10/21/2009	Rev:	2

[1] 80-EDD Peak hour model. Abandon Piscataqua River crossing at NH/ME State border, add new Gate Station in southern Maine and operate at minimum supply pressures in order to sustain the system demand to the point where system instability begins. [2] 80-EDD Peak hour model. Abandon Piscataqua River crossing at NH/ME State border, add new Gate Station in southern Maine and operate at maximum supply pressures.

No.	Description	Cost	Comments
1	Pipeline Integrity - Year 2010	$ -	
2	Pipeline Integrity - Year 2011	$ -	
3	Pipeline Integrity - Year 2012	$ -	
4	Abandon Pipeline - Year 1	$ 197,104	
5	Eliot Gate - Year 1	$ 2,120,800.00	
	TOTAL	**$ 2,317,904.35**	

Notes:

1) FERC costs associated with this scenario are not included in the estimates
2) Base Costs - No Overheads included in the estimates
3) Estimates assume that all new GSGT regulator stations will be built on existing ROW and that no land acquisition is required
4) Estimates made with a degree of knowledge and confidence that the estimated figures fall within reasonable ranges of values
5) Should this scenario be implemented, firm quotes will be ascertained, based on the engineering design plan for each sub-scenario

Scenario	1 & 2	Date	10/21/2009	Rev:	2	**Abandon Pipeline - Year 1**	

Description	**Cost**	**Assumption #**	**Comments**
Engineering Design and planning	$ 20,000		Based on 160 Engineering hours ($125 per hour)
Project Management	$ 12,000		Based on 160 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 8,800		Based on 50 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 20,000		Based on 50 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ 2,000		Based on 20 hours 2-man crew + tapping equipment ($50 per hour - in house)
Pipeline materials	$ 5,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Contraction materials / Civil site work	$ 3,500		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 7,500		Based on 50 hours 3-man crew ($50 per hour - in house) - Needed to man valves and site inspection
Pig receivers	$ 80,000		One required at each location. Based on a cost of $50,000 per unit ($10,000 includes installation by fabrication contactor.
Gas Loss	$ 386		Based on $10 per DTH
Abandon Eliot Meter Station	$ 20,000	1	Based on best estimate ($20,000)
TOTAL	$ 179,186		
10% Cont	**$ 197,104**		

Assumptions	
1	This estimate does not include the reuse of materials or re-stocking of parts and components into inventory

Scenario	1 & 2	Date	Rev:	2	Eliot Gate - Year 1

Description	Cost	Assumption #	Comments
Preliminary Engineering and design	$ 20,000		Based on past practice - Preliminary engineering only (includes bid package)
Project Management	$ 45,000		Third Party project manager based on 3 months of on and off site project management $(75 per hour at 600 hours total)
Project Inspector	$ 33,000		Based on 600 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector.
Design Build and Install	$ 1,300,000	1	Based on Cotton Road Gate Station - Includes pipeline tap and environmental permitting and civil site work
Hot tap on M&N	$ 250,000		Based on best estimate
Land acquisition	$ 250,000		Best estimate
GSGT Crews	$ 30,000		Based on one man for project duration (600 hours at $50/hour)
TOTAL	$ 1,928,000.00		
10% Cont	**$ 2,120,800.00**		

Assumptions	
1	Assumes design build

Scenario	3A	Date	10/27/2009	Rev:	2

(80-EDD Peak hour model) - Abandon Piscataqua River crossing at NH/ME State border, declassify ALL pipeline segments to distribution class and implement the minimum amount of system improvements (if required) to accommodate 10% system growth while operating prudently.

No.	Description	Cost	Comments
1	Abandon Forrest Street pressure regulator station in Plaistow, NH	$ 42,075	New Hampshire
2	Replace 3,377 of existing 8-inch pipeline on Gosling Rd in Newington, NH with 12-inch	$ 936,614	New Hampshire
3	Abandon Pipeline across Piscataqua River NH/ME - Year 1 - New Hampshire Portion	$ 98,552	New Hampshire (Cost assumed to be 50/50 NH & ME)
4	Install ball valve regulator station on Gosling Rd / Spaulding Tpk interconnect feeding south - Newington, NH	$ 363,880	New Hampshire
5	Install ball valve regulator station on Spaulding Tpk just south of Nimble Hill Road - Newington, NH	$ 363,880	New Hampshire
6	Replace 6,562' of existing 6-inch pipeline from Varney Brk Mtr Sta to north of Applevale Lat Dover, NH	$ 1,616,534	New Hampshire
7	Replace 5,245' of existing 8-inch pipeline on Spldg Tpk from Gosling Road just south of Nimble Hill Road Newington, NH	$ 1,293,474	New Hampshire
8	Abandon Varney Brook Meter Station	$ 66,825	New Hampshire
9	Modify Pressure regulator station at Borthwick Ave M&R station with new Ball Valve Regs.	$ 42,240	New Hampshire
	TOTAL	**$ 4,824,073**	

No.	Description	Cost	Comments
10	Replace 21,000 of existing 8-inch pipeline from Westbrook Gate to Payne Road Station with 8-inch	$ 5,451,325	Maine
11	Install ball valve regulator station just south of Payne Road Station feeding south	$ 377,080	Maine
12	Abandon Pipeline across Piscataqua River NH/ME - Year 1 - Maine Portion	$ 98,552	Maine (Cost assumed to be 50/50 NH & ME)
13	Wells Gate - Year 1	$ 2,120,800	Maine
	TOTAL	**$ 8,047,757**	

No.	Description	Cost	Comments
14	Install pressure regulators at Haverhill Gate station in Haverhill, MA	$ 473,660	Massachusetts
	TOTAL	**$ 473,660**	

GRAND TOTAL $ 13,345,490

Notes:

1) FERC costs associated with this scenario are not included in the estimates
2) Base Costs - No Overheads included in the estimates
3) Estimates assume that all new GSGT regulator stations will be built on existing ROW and that no land acquisition is required
4) Estimates made with a degree of knowledge and confidence that the estimated figures fall within reasonable ranges of values
5) Should this scenario be implemented, firm quotes will be ascertained, based on the engineering design plan for each sub-scenario

Scenario	3A	Date	10/27/2009	Rev:	2	Abandon Forrest Street pressure regulator station in Plaistow, NH

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 6,250		Based on 50 Engineering hours ($125 per hour)
Project Management	$ 3,750		Based on 50 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 2,750		Based on 50 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 20,000	1	Based on 50 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
Pipeline materials	$ 2,000	2	Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Contraction materials / Civil site work	$ 1,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 2,500		Based on 50 hours 1-man crew ($50 per hour - in house) - Needed to man valves and site inspection
TOTAL	$ 38,250		
10% Cont	**$ 42,075**		

Assumptions	
1	Assumes that pressure from Haverhill Gate Station will be lowered to 492 PSIG or less during abandonment when Forrest Street station will be on bypass.
2	This estimate does not include the reuse of materials or re-stocking of parts and components into inventory

Scenario	3A	Date	10/27/2009	Rev:	2	Install pressure regulators at Haverhill Gate station in Haverhill, MA

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 12,000		Based on 160 Engineering hours ($75 per hour) Includes Cad design drawing
Project Management	$ 12,000		Based on 160 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 6,600		Based on 120 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 88,000		Based on 160 hours 5-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
Regulators	$ 72,000	1	Assumes four 6" Beckers - With extensions - Buried
Valves - Below ground	$ 40,000		Assumes five 8" Full Port Delta Ball Valves ANSI-300
Valves - Controls line valves	$ 4,000		Assumes four 2" Full Port Delta Ball Valves ANSI-300
Pre Heat System	$ 100,000		Assumes four 2" Full Port Delta Ball Valves ANSI-300
Piping Materials	$ 25,000		Flanges, tees, elbows, reducers, etc
Regulated Bypass set-up	$ 20,000		Set up station with bypass regulator during construction
Misc Materials	$ 20,000		Tubing, Fittings, Filters, Strainers
Telemeter	$ 15,000		Based on best estimate
NU Crews	$ 16,000		Based on 160 hours 2-man crew ($50 per hour - in house)
TOTAL	$ 430,600		
10% Cont	**$ 473,660**		

Assumptions	
1	Assumes station to be built on existing ROW - No land costs

Scenario	3A	Date	10/27/2009	Rev:	2	Replace 3,377 of existing 8-inch pipeline on Gosling Rd in Newington, NH with 12-inch

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 16,885		Based on best estimate
Environmental Planning and permitting	$ 20,262	1	Assumes environmental firm assessment
Project Management	$ 12,664		Based on ($75 per hour) assumes contractor project manager
Project Inspector	$ 9,287		Based on ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 270,160	2	Based $800/hr per crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ -	3	Tapping
Pipeline materials	$ 155,342		Pipe
Construction materials / Civil site work	$ 100,000	4	Gravel, sand, paving saw cut, etc.
Railroad crossing (directional drill)	$ 84,000		Drill under tracks
Misc Materials	$ 13,508		Tees, elbows, reducers, TOL's, insulating kits, etc.
Paving	$ 90,000		100% pavement - Based on current contractor pricing
Misc	$ 37,147		Misc.(x-ray, sand blast, appoxy coat, pipe delivery)
GSGT / NU Crews	$ 16,885		Based on 2 person crew ($100 per hour - in house)
Traffic Control	$ 25,328		Based on best estimate - Two officers at $75/hour
TOTAL	$ 851,467		
10% Cont	**$ 936,614**		

Assumptions	
1	Stream Crossing on Gosling Road and Oil tank farm at Schiller. Assumes no environmental issues will be identified
2	Assumes ledge removal & hydro test
3	Assumes tapping crew will not ne required. Line can be shut down
4	Siginificant amount of construction matierals required

Scenario	3A	Date	10/27/2009	Rev:	2	Install ball valve regulator station on Gosling Rd / Spaulding Tpk interconnect feeding south - Newington, NH

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 20,000		Based on 160 Engineering hours ($125 per hour) Includes Cad design drawing
Environmental Planning and permitting	$ 5,000		Assumes environmental firm assessment
Project Management	$ 12,000		Based on 160 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 8,800		Based on 160 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 64,000	1	Based on 160 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ 8,000		Based on 160 hours 2-man crew + tapping equipment ($50 per hour - in house)
Pipeline materials	$ 15,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Regulators	$ 72,000		Assumes four 6" Beckers - With extensions - Buried
Valves - below ground	$ 40,000		Assumes five 8" Full Port Delta Ball Valves ANSI-300
Valves - Controls line valves	$ 4,000		Assumes four 2" Full Port Delta Ball Valves ANSI-300
Misc Materials	$ 20,000		Flanges, tees, elbows, reducers, TOL's, insulating kits, etc.
Telemeters	$ 15,000		Based on best estimate
Contraction materials / Civil site work	$ 7,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 16,000		Based on 160 hours 2-man crew ($50 per hour - in house)
Traffic Control	$ 24,000		Based on 160 project hours at $75 per hour State Police two troopers
TOTAL	$ 330,800		
10% Cont	**$ 363,880**		

Assumptions	
1	Pressure test included in cost

Scenario	3A	Date	10/27/2009	Rev:	2	Install ball valve regulator station on Spaulding Tpk just south of Nimble Hill Road - Newington, NH

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 20,000		Based on 160 Engineering hours ($125 per hour) Includes Cad design drawing
Environmental Planning and permitting	$ 5,000		Assumes environmental firm assessment
Project Management	$ 12,000		Based on 160 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 8,800		Based on 160 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 64,000	1	Based on 160 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ 8,000		Based on 160 hours 2-man crew + tapping equipment ($50 per hour - in house)
Pipeline materials	$ 15,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Regulators	$ 72,000		Assumes four 6" Beckers - With extensions - Buried
Valves - below ground	$ 40,000		Assumes five 8" Full Port Delta Ball Valves ANSI-300
Valves - Controls line valves	$ 4,000		Assumes four 2" Full Port Delta Ball Valves ANSI-300
Misc Materials	$ 20,000		Flanges, tees, elbows, reducers, TOL's, insulating kits, etc.
Telemeters	$ 15,000		Based on best estimate
Contraction materials / Civil site work	$ 7,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 16,000		Based on 160 hours 2-man crew ($50 per hour - in house)
Traffic Control	$ 24,000		Based on 160 project hours at $75 per hour State Police two troopers
TOTAL	$ 330,800		
10% Cont	**$ 363,880**		

Assumptions	
1	Pressure test included in cost

Scenario	3A	Date	10/27/2009	Rev:	2	**Replace 5,245' of existing 8-inch pipeline on Spldg Tpk from Gosling Road just south of Nimble Hill Road Newingotn, NH with 12-inch**

Description	**Cost**	**Assumption #**	**Comments**
Engineering Design and planning	$ 26,225		Based on best estimate
Environmental Planning and permitting	$ 31,470		Assumes environmental firm assessment
Project Management	$ 19,669		Based on ($75 per hour) assumes contractor project manager
Project Inspector	$ 14,424		Based on ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 629,400	1	Based on 4-person crew(s) $800/hr (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ 6,250		Based on 2-man crew + tapping equipment ($125 per hour - in house)
Pipeline materials	$ 241,270		Pipe
Contraction materials / Civil site work	$ 36,715		Gravel, sand, saw-cut, paving, loam & seed etc.
Misc Materials	$ 20,980		Tees, elbows, reducers, TOL's, insulating kits, etc.
ROW and Land Rights	$ 26,225	2	
Misc	$ 57,695		Misc.(x-ray, sand blast, appoxy coat, pipe delivery)
NU Crews	$ 26,225		Based on 2 person crew ($100 per hour - in house)
Traffic Control	$ 39,338		Based on $75 per hour (local police)
TOTAL	$ 1,175,885		
10% Cont	**$ 1,293,474**		

Assumptions	
1	Assumes ledge removal & hydro test
2	This does not include temporary land space for construction. This cost would be extra

Scenario	3A	Date	10/27/2009	Rev:	2	Replace 6,562 of existing 6-inch pipeline from Varney Bark Mtr. Sta to north of Applevale Lat Dover, NH with 12-inch

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 32,810		Based on best estimate
Environmental Planning and permitting	$ 39,372	1	Assumes environmental firm assessment
Project Management	$ 24,608		Based ($75 per hour) assumes contractor project manager
Project Inspector	$ 18,046		Based on ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 787,440	2	Based on 4-person crew(s) 800/hr (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ 6,250		Based on 2-man crew + tapping equipment ($125 per hour - in house)
Pipeline materials	$ 301,852		Pipe
Contraction materials / Civil site work	$ 45,934		Gravel, sand, saw-cut, paving, loam & seed etc.
Misc Materials	$ 26,248		Tees, elbows, reducers, TOL's, insulating kits, etc.
ROW and Land Rights	$ 32,810	3	
Misc.	$ 72,182		Misc.(x-ray, sand blast, appoxy coat, pipe delivery)
NU Crews	$ 32,810		Based on 2-man crew ($100 per hour - in house)
Traffic Control	$ 49,215	4	Based on $75 per hour (local police)
TOTAL	$ 1,469,576		
10% Cont	**$ 1,616,534**		

Assumptions	
1	Significant amount of marsh and wet lands
2	Assumes ledge removal & hydro test
3	This does not include temporary land space for construction. This cost would be extra
4	Assumes that Dover Point Road can be "open cut"

Scenario	3A	Date	10/27/2009	Rev:	2	Modify Pressure regulator station at Borthwick Ave M&R station with new Ball Valve Regs.

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 2,500		Based on 20 Engineering hours ($125 per hour) Includes Cad design drawing
Project Management	$ 2,250		Based on 30 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 1,650		Based on 30 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Regulators	$ 24,000	1	Replace two existing 4" 900TE regs with two 4" Becker "Globe" valve regulators
Misc Materials	$ 4,000		Tubing, Fittings, Filters, etc
NU Crews	$ 4,000		Based on 40 hours 2-man crew ($50 per hour - in house)
TOTAL	$ 38,400		
10% Cont	**$ 42,240**		

Assumptions	
1	Assumes that existing two 4" ANSI-300 Grove 900 TE regulators can be replaced (size for size) with 4" Becker Globe Valve Regulators

Scenario	3A	Date	10/27/2009	Rev:	2	Replace 21,000 of existing 8-inch pipeline from Westbrook Gate to Payne Road Station with 8-inch

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 105,000		Based on best estimate
Environmental Planning and permitting	$ 126,000	1	Assumes environmental firm assessment
Project Management	$ 52,500		Based on ($75 per hour) assumes contractor project manager
Project Inspector	$ 38,500		Based on ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 2,240,000	2	Based on 4-person crew(s) $800/hr (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ 6,250		Based on 2-man crew + tapping equipment ($125 per hour - in house)
Pipeline materials	$ 798,000		Pipe
Misc Materials	$ 84,000		Tees, elbows, fittings, etc
ROW and Land Rights	$ 105,000	3	Property owner issues
Four directional drills	$ 760,000		Per existing construction contractor contract
Construction materials / Civil site work	$ 147,000		Estimated (Gravel, Stone, Loam Seed, paving etc)
Misc.	$ 231,000		Misc.(x-ray, sand blast, appoxy coat, pipe delivery)
NU Crews	$ 105,000		Based on 3-man crew ($150 per hour - in house)
Traffic Control	$ 157,500		Based on $75 per hour (local police)
TOTAL	$ 4,955,750		
10% Cont	**$ 5,451,325**		

Assumptions	
1	Marsh and wet lands
2	Assumes ledge removal & hydro test
3	This does not include temporary land space for construction. This cost would be extra

Scenario	3A	Date	10/27/2009	Rev:	2	Install ball valve regulator station just south of Payne Road Station feeding south

Description	Cost		Assumption #	Comments
Engineering Design and planning	$	20,000		Based on 160 Engineering hours ($125 per hour) Includes Cad design drawing
Environmental Planning and permitting	$	5,000		Assumes environmental firm assessment
Project Management	$	12,000		Based on 160 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$	8,800		Based on 160 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$	64,000	1	Based on 160 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$	8,000		Based on 160 hours 2-man crew + tapping equipment ($50 per hour - in house)
Pipeline materials	$	15,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Regulators	$	72,000		Assumes four 6" Beckers - With extensions - Buried
Valves - Below ground	$	40,000		Assumes five 8" Full Port Delta Ball Valves ANSI-300
Valves - Controls line valves	$	4,000		Assumes four 2" Full Port Delta Ball Valves ANSI-300
Misc Materials	$	20,000		Based on best estimate (includes enclosures for Beckers)
Misc Materials	$	12,000		Flanges, tees, elbows, reducers, TOL's, insulating kits, etc.
Telemeters	$	15,000		Based on best estimate
Contraction materials / Civil site work	$	7,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$	16,000		Based on 160 hours 2-man crew ($50 per hour - in house)
Traffic Control	$	24,000		Based on 160 project hours at $75 per hour State Police two troopers
TOTAL	$	342,800		
10% Cont	**$**	**377,080**		

Assumptions	
1	Pressure test included in cost

Scenario	3A	Date	10/27/2009	Rev:	2	**Abandon Varney Brook Meter Station**

Description	**Cost**	**Assumption #**	**Comments**
Engineering Design and planning	$ 6,250		Based on 50 Engineering hours ($125 per hour)
Project Management	$ 3,750		Based on 50 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 2,750		Based on 50 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Environmental Planning and permitting	$ 20,000	1	Based on best estimate
Project Contractor	$ 20,000		Based on 50 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
Pipeline materials	$ 2,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Contraction materials / Civil site work	$ 1,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 5,000		Based on 100 hours 1-man crew ($50 per hour - in house) - Needed to man valves and site inspection
TOTAL	$ 60,750		
10% Cont	**$ 66,825**		

Assumptions	
1	Major wetland area. Station is on a peninsula surrounded by wetlands

Scenario	3A	Date	10/27/2009	Rev:	2	Abandon Pipeline across Piscataqua River NH/ME - Year 1 - New Hampshire Portion

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 20,000		Based on 160 Engineering hours ($125 per hour)
Project Management	$ 12,000		Based on 160 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 8,800		Based on 50 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 20,000		Based on 50 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ 2,000		Based on 20 hours 2-man crew + tapping equipment ($50 per hour - in house)
Pipeline materials	$ 5,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Contraction materials / Civil site work	$ 3,500		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 7,500		Based on 50 hours 3-man crew ($50 per hour - in house) - Needed to man valves and site inspection
Pig receivers	$ 80,000		One required at each location. Based on a cost of $50,000 per unit ($10,000 includes installation by fabrication contactor.
Gas Loss	$ 386		Based on $10 per DTH
Abandon Eliot Meter Station	$ 20,000	1	Based on best estimate ($20,000)
TOTAL	$ 179,186		
10% Cont	**$ 197,104**		

Assumptions	
1	This estimate does not include the reuse of materials or re-stocking of parts and components into inventory

Scenario	3A	Date	Rev:	2	Wells Gate - Year 1

Description	Cost	Assumption #	Comments
Preliminary Engineering and design	$ 20,000		Based on past practice - Preliminary engineering only (includes bid package)
Project Management	$ 45,000		Third Party project manager based on 3 months of on and off site project management $(75 per hour at 600 hours total)
Project Inspector	$ 33,000		Based on 600 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector.
Design Build and Install	$ 1,300,000	1	Based on Cotton Road Gate Station - Includes pipeline tap and environmental permitting and civil site work
Hot tap on M&N	$ 250,000		Based on best estimate
Land acquisition	$ 250,000		Best estimate
GSGT Crews	$ 30,000		Based on one man for project duration (600 hours at $50/hour)
TOTAL	$ 1,928,000.00		
10% Cont	**$ 2,120,800.00**		

Assumptions	
1	Assumes design build firm will provide all utilities services required

Scenario	3	Date	10/27/2009	Rev:	3

(80-EDD Peak hour model) - Abandon Piscataqua River crossing at NH/ME State border, declassify ALL pipeline segments to distribution class and implement the minimum amount of system improvements (if required) to sustain the system demand to the point where system instability begins.

No.	Description	Cost	Comments
1	Abandon Forrest Street pressure regulator station in Plaistow, NH	$ 42,075	New Hampshire
2	Install ball valve regulator station on PEASE lateral in Newington, NE	$ 359,480	New Hampshire
3	Replace 3,377 of existing 8-inch pipeline on Gosling Rd in Newington, NH with 12-inch	$ 936,614	New Hampshire
4	Abandon Pipeline - Year 1 - New Hampshire Portion	$ 98,552	New Hampshire (Cost assumed to be 50/50 NH & ME)
5	Install ball valve regulator station on Gosling Rd / Spaulding Tpk interconnect - Newington, NH	$ 363,880	New Hampshire
6	Install ball valve regulator station on Spaulding Tpk at Bean Hill - Newington, NH	$ 363,880	New Hampshire
7	Replace 4,500 of existing 6-inch pipeline from Varney Brk Mtr Sta to south of Applevale Lat Dover, NH	$ 892,788	New Hampshire
8	Abandon Varney Brook Meter Station	$ 66,825	New Hampshire
9	Modify Pressure regulator station at Borthwick Ave M&R station with new Ball Valve Regs.	$ 42,240	New Hampshire
	TOTAL	**$ 3,166,333**	

No.	Description	Cost	Comments
10	Modify Pressure regulator station at Payne Road M&R station with new Ball Valve Regs.	$ 335,060	Maine
11	Replace 11,496 of existing 8-inch pipeline from Westbrook Gate to North of Blueberry Rd Station with 12-inch	$ 3,650,055	Maine
12	Install ball valve regulator station 1,297-feet north of Blueberry Road Station	$ 377,080	Maine
13	Abandon Pipeline - Year 1 - Maine Portion	$ 98,552	Maine (Cost assumed to be 50/50 NH & ME)
14	Wells Gate - Year 1	$ 2,120,800	Maine
	TOTAL	**$ 6,581,547**	

No.	Description	Cost	Comments
15	Install pressure regulators at Haverhill Gate station in Haverhill, MA	$ 473,660	Massachusetts
	TOTAL	**$ 473,660**	

GRAND TOTAL $ 10,221,541

Notes:

1) FERC costs associated with this scenario are not included in the estimates
2) Base Costs - No Overheads included in the estimates
3) Estimates assume that all new GSGT regulator stations will be built on existing ROW and that no land acquisition is required
4) Estimates made with a degree of knowledge and confidence that the estimated figures fall within reasonable ranges of values
5) Should this scenario be implemented, firm quotes will be ascertained, based on the engineering design plan for each sub-scenario

Scenario	3	Date	10/27/2009	Rev:	3	Abandon Forrest Street pressure regulator station in Plaistow, NH

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 6,250		Based on 50 Engineering hours ($125 per hour)
Project Management	$ 3,750		Based on 50 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 2,750		Based on 50 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 20,000	1	Based on 50 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
Pipeline materials	$ 2,000	2	Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Contraction materials / Civil site work	$ 1,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 2,500		Based on 50 hours 1-man crew ($50 per hour - in house) - Needed to man valves and site inspection
TOTAL	$ 38,250		
10% Cont	**$ 42,075**		

Assumptions	
1	Assumes that pressure from Haverhill Gate Station will be lowered to 492 PSIG or less during abandonment when Forrest Street station will be on bypass.
2	This estimate does not include the reuse of materials or re-stocking of parts and components into inventory

Scenario	3	Date	10/27/2009	Rev:	3	Install pressure regulators at Haverhill Gate station in Haverhill, MA

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 12,000		Based on 160 Engineering hours ($75 per hour) Includes Cad design drawing
Project Management	$ 12,000		Based on 160 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 6,600		Based on 120 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 88,000		Based on 160 hours 5-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
Regulators	$ 72,000	1	Assumes four 6" Beckers - With extensions - Buried
Valves - Below ground	$ 40,000		Assumes five 8" Full Port Delta Ball Valves ANSI-300
Valves - Controls line valves	$ 4,000		Assumes four 2" Full Port Delta Ball Valves ANSI-300
Pre Heat System	$ 100,000		Assumes four 2" Full Port Delta Ball Valves ANSI-300
Piping Materials	$ 25,000		Flanges, tees, elbows, reducers, etc
Regulated Bypass set-up	$ 20,000		Set up station with bypass regulator during construction
Misc Materials	$ 20,000		Tubing, Fittings, Filters, Strainers
Telemeter	$ 15,000		Based on best estimate
NU Crews	$ 16,000		Based on 160 hours 2-man crew ($50 per hour - in house)
TOTAL	$ 430,600		
10% Cont	**$ 473,660**		

Assumptions	
1	Assumes station to be built on existing ROW - No land costs

Scenario	3	Date	10/27/2009	Rev:	3	Install ball valve regulator station on PEASE lateral in Newington, NE

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 20,000		Based on 160 Engineering hours ($125 per hour) Includes Cad design drawing
Environmental Planning and permitting	$ 5,000		Assumes environmental firm assessment
Project Management	$ 12,000		Based on 160 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 8,800		Based on 160 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 64,000	1	Based on 160 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ 4,000		Based on 80 hours 2-man crew + tapping equipment ($50 per hour - in house)
Pipeline materials	$ 15,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Regulators	$ 72,000		Assumes four 6" Beckers - With extensions - Buried
Valves - Below ground	$ 40,000		Assumes five 8" Full Port Delta Ball Valves ANSI-300
Valves - Controls line valves	$ 4,000		Assumes four 2" Full Port Delta Ball Valves ANSI-300
Misc Materials	$ 20,000		Based on best estimate (includes enclosures for Beckers)
Telemeters	$ 15,000		Based on best estimate
Contraction materials / Civil site work	$ 7,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 16,000		Based on 160 hours 2-man crew ($50 per hour - in house)
Traffic Control	$ 24,000		Based on 160 project hours at $75 per hour State Police two troopers
TOTAL	$ 326,800		
10% Cont	**$ 359,480**		

Assumptions	
1	Pressure test included in cost

Scenario	3	Date	10/27/2009	Rev:	3	Replace 3,377 of existing 8-inch pipeline on Gosling Rd in Newington, NH with 12-inch

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 16,885		Based on best estimate
Environmental Planning and permitting	$ 20,262	1	Assumes environmental firm assessment
Project Management	$ 12,664		Based on ($75 per hour) assumes contractor project manager
Project Inspector	$ 9,287		Based on ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 270,160	2	Based $800/hr per crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ -	3	Tapping
Pipeline materials	$ 155,342		Pipe
Construction materials / Civil site work	$ 100,000	4	Gravel, sand, paving saw cut, etc.
Railroad crossing (directional drill)	$ 84,000		Drill under tracks
Misc Materials	$ 13,508		Tees, elbows, reducers, TOL's, insulating kits, etc.
Paving	$ 90,000		100% pavement - Based on current contractor pricing
Misc	$ 37,147		Misc.(x-ray, sand blast, appoxy coat, pipe delivery)
GSGT / NU Crews	$ 16,885		Based on 2 person crew ($100 per hour - in house)
Traffic Control	$ 25,328		Based on best estimate - Two officers at $75/hour
TOTAL	$ 851,467		
10% Cont	**$ 936,614**		

Assumptions	
1	Stream Crossing on Gosling Road and Oil tank farm at Schiller. Assumes no environmental issues will be identified
2	Assumes ledge removal & hydro test
3	Assumes tapping crew will not ne required. Line can be shut down
4	Significant amount of construction materials required

Scenario	3	Date	10/27/2009	Rev:	3	Install ball valve regulator station on Gosling Rd / Spaulding Tpk interconnect - Newing, NH

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 20,000		Based on 160 Engineering hours ($125 per hour) Includes Cad design drawing
Environmental Planning and permitting	$ 5,000		Assumes environmental firm assessment
Project Management	$ 12,000		Based on 160 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 8,800		Based on 160 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 64,000	1	Based on 160 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ 8,000		Based on 160 hours 2-man crew + tapping equipment ($50 per hour - in house)
Pipeline materials	$ 15,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Regulators	$ 72,000		Assumes four 6" Beckers - With extensions - Buried
Valves - below ground	$ 40,000		Assumes five 8" Full Port Delta Ball Valves ANSI-300
Valves - Controls line valves	$ 4,000		Assumes four 2" Full Port Delta Ball Valves ANSI-300
Misc Materials	$ 20,000		Flanges, tees, elbows, reducers, TOL's, insulating kits, etc.
Telemeters	$ 15,000		Based on best estimate
Contraction materials / Civil site work	$ 7,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 16,000		Based on 160 hours 2-man crew ($50 per hour - in house)
Traffic Control	$ 24,000		Based on 160 project hours at $75 per hour State Police two troopers
TOTAL	$ 330,800		
10% Cont	**$ 363,880**		

Assumptions	
1	Pressure test included in cost

Scenario	3	Date	10/27/2009	Rev:	3	Install ball valve regulator station on Spaulding Tpk at Bean Hill - Newington, NH

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 20,000		Based on 160 Engineering hours ($125 per hour) Includes Cad design drawing
Environmental Planning and permitting	$ 5,000		Assumes environmental firm assessment
Project Management	$ 12,000		Based on 160 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 8,800		Based on 160 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 64,000	1	Based on 160 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ 8,000		Based on 160 hours 2-man crew + tapping equipment ($50 per hour - in house)
Pipeline materials	$ 15,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Regulators	$ 72,000		Assumes four 6" Beckers - With extensions - Buried
Valves - below ground	$ 40,000		Assumes five 8" Full Port Delta Ball Valves ANSI-300
Valves - Controls line valves	$ 4,000		Assumes four 2" Full Port Delta Ball Valves ANSI-300
Misc Materials	$ 20,000		Flanges, tees, elbows, reducers, TOL's, insulating kits, etc.
Telemeters	$ 15,000		Based on best estimate
Contraction materials / Civil site work	$ 7,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 16,000		Based on 160 hours 2-man crew ($50 per hour - in house)
Traffic Control	$ 24,000		Based on 160 project hours at $75 per hour State Police two troopers
TOTAL	$ 330,800		
10% Cont	**$ 363,880**		

Assumptions	
1	Pressure test included in cost

Scenario	3	Date	10/27/2009	Rev:	3	Replace 4,500 of existing 6-inch pipeline from Varney Bark Mr. Sta to south of Applevale Lat Dover, NH with 12-inch

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 22,500		Based on best estimate
Environmental Planning and permitting	$ 27,000	1	Assumes environmental firm assessment
Project Management	$ 16,875		Based on ($75 per hour) assumes contractor project manager
Project Inspector	$ 12,375		Based on ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 360,000	2	Based on 4-person crew(s) (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ 5,000		Based on 2-man crew + tapping equipment ($125 per hour - in house)
Pipeline materials	$ 207,000		Pipe
Contraction materials / Civil site work	$ 31,500		Gravel, sand, saw-cut, paving, loam & seed etc.
Misc Materials	$ 18,000		Tees, elbows, reducers, TOL's, insulating kits, etc.
ROW and Land Rights	$ 22,500	3	Best estimate
Misc.	$ 49,500		Misc.(x-ray, sand blast, appoxy coat, pipe delivery)
NU Crews	$ 22,500		Based on 2-man crew ($100 per hour - in house)
Traffic Control	$ 16,875	4	Based on $75 per hour (local police)
TOTAL	$ 811,625		
10% Cont	**$ 892,788**		

Assumptions	
1	Significant amount of marsh and wet lands
2	Assumes ledge removal & hydro test
3	This does not include temporary land space for construction. This cost would be extra
4	Assumes that Dover Point Road can be "open cut"

Scenario	3	Date	10/27/2009	Rev:	3	Modify Pressure regulator station at Borthwick Ave M&R station with new Ball Valve Regs.

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 2,500		Based on 20 Engineering hours ($125 per hour) Includes Cad design drawing
Project Management	$ 2,250		Based on 30 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 1,650		Based on 30 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Regulators	$ 24,000	1	Replace two existing 4" 900TE regs with two 4" Becker "Globe" valve regulators
Misc Materials	$ 4,000		Tubing, Fittings, Filters, etc
NU Crews	$ 4,000		Based on 40 hours 2-man crew ($50 per hour - in house)
TOTAL	$ 38,400		
10% Cont	**$ 42,240**		

Assumptions	
1	Assumes that existing two 4" ANSI-300 Grove 900 TE regulators can be replaced (size for size) with 4" Becker Globe Valve Regulators

Scenario	3	Date	10/27/2009	Rev:	3	Modify Pressure regulator station at Payne Road M&R station with new Ball Valve Regs.

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 20,000		Based on 160 Engineering hours ($125 per hour) Includes Cad design drawing
Project Management	$ 12,000		Based on 160 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 6,600		Based on 120 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 88,000	1	Based on 160 hours 5-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
Regulators	$ 82,000		Assumes four 6" Beckers
Valves -	$ -		Use existing
Valves - Controls line valves	$ -		Use existing
Piping Materials	$ 25,000		Flanges, tees, elbows, reducers, etc
Regulated Bypass set-up	$ 20,000		Set up station with bypass regulator during construction
Misc Materials	$ 20,000		Tubing, Fittings, Filters, Strainers
Telemeter	$ 15,000		Based on best estimate
NU Crews	$ 16,000		Based on 160 hours 2-man crew ($50 per hour - in house)
TOTAL	$ 304,600		
10% Cont	**$ 335,060**		

Assumptions	
1	Assumes the removal of existing equipment at Payne Road station and the use of existing building for modified station

Scenario	3	Date	10/27/2009	Rev:	3	Replace 11,496 of existing 8-inch pipeline from Westbrook Gate to North of Blueberry Rd Station with 12-inch

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 57,480		Based on best estimate
Environmental Planning and permitting	$ 68,976	1	Assumes environmental firm assessment
Project Management	$ 43,110		Based on ($75 per hour) assumes contractor project manager
Project Inspector	$ 31,614		Based on ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 1,839,360	2	Based on 4-person crew(s) $800/hr (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ 12,500		Based on 2-man crew + tapping equipment ($125 per hour - in house)
Pipeline materials	$ 528,816		Pipe
Misc Materials	$ 45,984		Tees, elbows, fittings, etc
ROW and Land Rights	$ 57,480	3	Property owner issues
Two directional drills	$ 380,000		Per existing construction contractor contract
Construction materials / Civil site work	$ 80,472		Estimated (Gravel, Stone, Loam Seed, paving etc)
NU Crews	$ 86,220		Based on 3-man crew ($150 per hour - in house)
Traffic Control	$ 86,220		$75 per hour (local police)
TOTAL	$ 3,318,232		
10% Cont	**$ 3,650,055**		

Assumptions	
1	Marsh and wet lands
2	Assumes ledge removal & hydro test
3	This does not include temporary land space for construction. This cost would be extra

Scenario	3	Date	10/27/2009	Rev:	3	Install ball valve regulator station 1,297-feet north of Blueberry Road Station

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 20,000		Based on 160 Engineering hours ($125 per hour) Includes Cad design drawing
Environmental Planning and permitting	$ 5,000		Assumes environmental firm assessment
Project Management	$ 12,000		Based on 160 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 8,800		Based on 160 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 64,000	1	Based on 160 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ 8,000		Based on 160 hours 2-man crew + tapping equipment ($50 per hour - in house)
Pipeline materials	$ 15,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Regulators	$ 72,000		Assumes four 6" Beckers - With extensions - Buried
Valves - Below ground	$ 40,000		Assumes five 8" Full Port Delta Ball Valves ANSI-300
Valves - Controls line valves	$ 4,000		Assumes four 2" Full Port Delta Ball Valves ANSI-300
Misc Materials	$ 20,000		Based on best estimate (includes enclosures for Beckers)
Misc Materials	$ 12,000		Flanges, tees, elbows, reducers, TOL's, insulating kits, etc.
Telemeters	$ 15,000		Based on best estimate
Contraction materials / Civil site work	$ 7,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 16,000		Based on 160 hours 2-man crew ($50 per hour - in house)
Traffic Control	$ 24,000		Based on 160 project hours at $75 per hour State Police two troopers
TOTAL	$ 342,800		
10% Cont	**$ 377,080**		

Assumptions	
1	Pressure test included in cost

Scenario	3	Date	10/27/2009	Rev:	3	Abandon Varney Brook Meter Station

Description	**Cost**	**Assumption #**	**Comments**
Engineering Design and planning	$ 6,250		Based on 50 Engineering hours ($125 per hour)
Project Management	$ 3,750		Based on 50 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 2,750		Based on 50 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Environmental Planning and permitting	$ 20,000	1	Based on best estimate
Project Contractor	$ 20,000		Based on 50 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
Pipeline materials	$ 2,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Contraction materials / Civil site work	$ 1,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 5,000		Based on 100 hours 1-man crew ($50 per hour - in house) - Needed to man valves and site inspection
TOTAL	$ 60,750		
10% Cont	**$ 66,825**		

Assumptions	
1	Major wetland area. Station is on a peninsula surrounded by wetlands

Scenario	3	Date	10/27/2009	Rev:	3	Abandon Pipeline - Year 1 - New Hampshire Portion		

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 20,000		Based on 160 Engineering hours ($125 per hour)
Project Management	$ 12,000		Based on 160 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 8,800		Based on 50 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 20,000		Based on 50 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ 2,000		Based on 20 hours 2-man crew + tapping equipment ($50 per hour - in house)
Pipeline materials	$ 5,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Contraction materials / Civil site work	$ 3,500		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 7,500		Based on 50 hours 3-man crew ($50 per hour - in house) - Needed to man valves and site inspection
Pig receivers	$ 80,000		One required at each location. Based on a cost of $50,000 per unit ($10,000 includes installation by fabrication contactor.
Gas Loss	$ 386		Based on $10 per DTH
Abandon Eliot Meter Station	$ 20,000	1	Based on best estimate ($20,000)
TOTAL	$ 179,186		
10% Cont	**$ 197,104**		

Assumptions	
1	This estimate does not include the reuse of materials or re-stocking of parts and components into inventory

Scenario	3	Date	Rev:	3	Wells Gate - Year 1	

Description	Cost	Assumption #	Comments
Preliminary Engineering and design	$ 20,000		Based on past practice - Preliminary engineering only (includes bid package)
Project Management	$ 45,000		Third Party project manager based on 3 months of on and off site project management $(75 per hour at 600 hours total)
Project Inspector	$ 33,000		Based on 600 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector.
Design Build and Install	$ 1,300,000	1	Based on Cotton Road Gate Station - Includes pipeline tap and environmental permitting and civil site work
Hot tap on M&N	$ 250,000		Based on best estimate
Land acquisition	$ 250,000		Best estimate
GSGT Crews	$ 30,000		Based on one man for project duration (600 hours at $50/hour)
TOTAL	$ 1,928,000.00		
10% Cont	**$ 2,120,800.00**		

Assumptions	
1	Assumes design build firm will provide all utilities services required

Scenario	4&5	Date	10/27/2009	Rev:	2

(80-EDD Peak hour model) (Derate portions of the system that require future pipeline integrity work while maintaining transmission classification of those segments that have had the pipeline integrity requirements satisfied – disconnecting pipeline over the Little Bay Bridge in Newington, NH - to the point where system instability begins.

No.	Description	Cost	Comments
1	Perform all required pipeline integrity work from Varney Brk Mtr Sta in Dover, NH to Piscataqua River.	$ -	New Hampshire - Cost to provided by operations
2	Replace 3,377 of existing 8-inch pipeline on Gosling Rd in Newington, NH with 12-inch	$ 936,614	New Hampshire
3	Abandon Pipeline crossing the Little Bay Bridge in Newington, NH	$ 229,798	New Hampshire (Cost assumed to be 50/50 NH & ME)
4	Install ball valve regulator station at the Varney Brook Meter Station in Dover, NH (feeding north 397 PSIG)	$ 363,880	New Hampshire
5	Install ball valve regulator station at the Varney Brook Meter Station in Dover, NH (feeding south 250 PSIG)	$ 363,880	New Hampshire
6	Install ball valve regulator station at the Newfield's Road meter and regulator station in Exeter, NH (feeding north 250 PSIG	$ 363,880	New Hampshire
7	Abandon Varney Brook Meter Station	$ 66,825	New Hampshire
8	Abandon Borthwick Ave meter and regulator station in Portsmouth, NH	$ 118,910	New Hampshire
	TOTAL	**$ 2,443,787**	

No.	Description	Cost	Comments
9	Perform all required pipeline integrity work Meeting House Rd in Wells, ME to Piscataqua River.		Maine - Cost to provided by operations
10	Eliot Gate - Year 1	$ 2,120,800	Maine
	TOTAL	**$ 2,120,800**	

GRAND TOTAL $ 4,564,587

Notes:
1) FERC costs associated with this scenario are not included in the estimates
2) Base Costs - No Overheads included in the estimates
3) Estimates assume that all new GSGT regulator stations will be built on existing ROW and that no land acquisition is required
4) Estimates made with a degree of knowledge and confidence that the estimated figures fall within reasonable ranges of values
5) Should this scenario be implemented, firm quotes will be ascertained, based on the engineering design plan for each sub-scenario

Scenario	4&5	Date	10/27/2009	Rev:	2	Replace 3,377 of existing 8-inch pipeline on Gosling Rd in Newington, NH with 12-inch

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 16,885		Based on best estimate
Environmental Planning and permitting	$ 20,262	1	Assumes environmental firm assessment
Project Management	$ 12,664		Based on ($75 per hour) assumes contractor project manager
Project Inspector	$ 9,287		Based on ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 270,160	2	Based $800/hr per crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ -	3	Tapping
Pipeline materials	$ 155,342		Pipe
Construction materials / Civil site work	$ 100,000	4	Gravel, sand, paving saw cut, etc.
Railroad crossing (directional drill)	$ 84,000		Drill under tracks
Misc Materials	$ 13,508		Tees, elbows, reducers, TOL's, insulating kits, etc.
Paving	$ 90,000		100% pavement - Based on current contractor pricing
Misc	$ 37,147		Misc.(x-ray, sand blast, appoxy coat, pipe delivery)
GSGT / NU Crews	$ 16,885		Based on 2 person crew ($100 per hour - in house)
Traffic Control	$ 25,328		Based on best estimate - Two officers at $75/hour
TOTAL	$ 851,467		
10% Cont	**$ 936,614**		

Assumptions	
1	Stream Crossing on Gosling Road and Oil tank farm at Schiller. Assumes no environmental issues will be identified
2	Assumes ledge removal & hydro test
3	Assumes tapping crew will not ne required. Line can be shut down
4	Significant amount of construction materials required

Scenario	4&5	Date	10/27/2009	Rev:	2	Install ball valve regulator station at the Newfield's Road meter and regulator station in Exeter, NH (feeding north 250 PSIG)

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 20,000		Based on 160 Engineering hours ($125 per hour) Includes Cad design drawing
Environmental Planning and permitting	$ 5,000		Assumes environmental firm assessment
Project Management	$ 12,000		Based on 160 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 8,800		Based on 160 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 64,000	1	Based on 160 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ 8,000		Based on 160 hours 2-man crew + tapping equipment ($50 per hour - in house)
Pipeline materials	$ 15,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Regulators	$ 72,000		Assumes four 6" Beckers - With extensions - Buried
Valves - below ground	$ 40,000		Assumes five 8" Full Port Delta Ball Valves ANSI-300
Valves - Controls line valves	$ 4,000		Assumes four 2" Full Port Delta Ball Valves ANSI-300
Misc Materials	$ 20,000		Flanges, tees, elbows, reducers, TOL's, insulating kits, etc.
Telemeters	$ 15,000		Based on best estimate
Contraction materials / Civil site work	$ 7,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 16,000		Based on 160 hours 2-man crew ($50 per hour - in house)
Traffic Control	$ 24,000		Based on 160 project hours at $75 per hour State Police two troopers
TOTAL	$ 330,800		
10% Cont	**$ 363,880**		

Assumptions	
1	Pressure test included in cost

Scenario	4&5	Date	10/27/2009	Rev:	2	Install ball valve regulator station at the Varney Brook Meter Station in Dover, NH (feeding north 397 PSIG)

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 20,000		Based on 160 Engineering hours ($125 per hour) Includes Cad design drawing
Environmental Planning and permitting	$ 5,000		Assumes environmental firm assessment
Project Management	$ 12,000		Based on 160 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 8,800		Based on 160 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 64,000	1	Based on 160 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ 8,000		Based on 160 hours 2-man crew + tapping equipment ($50 per hour - in house)
Pipeline materials	$ 15,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Regulators	$ 72,000		Assumes four 6" Beckers - With extensions - Buried
Valves - below ground	$ 40,000		Assumes five 8" Full Port Delta Ball Valves ANSI-300
Valves - Controls line valves	$ 4,000		Assumes four 2" Full Port Delta Ball Valves ANSI-300
Misc Materials	$ 20,000		Flanges, tees, elbows, reducers, TOL's, insulating kits, etc.
Telemeters	$ 15,000		Based on best estimate
Contraction materials / Civil site work	$ 7,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 16,000		Based on 160 hours 2-man crew ($50 per hour - in house)
Traffic Control	$ 24,000		Based on 160 project hours at $75 per hour State Police two troopers
TOTAL	$ 330,800		
10% Cont	**$ 363,880**		

Assumptions	
1	Pressure test included in cost

Scenario	4&5	Date	10/27/2009	Rev:	2	Install ball valve regulator station at the Varney Brook Meter Station in Dover, NH (feeding south 250 PSIG)

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 20,000		Based on 160 Engineering hours ($125 per hour) Includes Cad design drawing
Environmental Planning and permitting	$ 5,000		Assumes environmental firm assessment
Project Management	$ 12,000		Based on 160 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 8,800		Based on 160 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 64,000	1	Based on 160 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ 8,000		Based on 160 hours 2-man crew + tapping equipment ($50 per hour - in house)
Pipeline materials	$ 15,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Regulators	$ 72,000		Assumes four 6" Beckers - With extensions - Buried
Valves - below ground	$ 40,000		Assumes five 8" Full Port Delta Ball Valves ANSI-300
Valves - Controls line valves	$ 4,000		Assumes four 2" Full Port Delta Ball Valves ANSI-300
Misc Materials	$ 20,000		Flanges, tees, elbows, reducers, TOL's, insulating kits, etc.
Telemeters	$ 15,000		Based on best estimate
Contraction materials / Civil site work	$ 7,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 16,000		Based on 160 hours 2-man crew ($50 per hour - in house)
Traffic Control	$ 24,000		Based on 160 project hours at $75 per hour State Police two troopers
TOTAL	$ 330,800		
10% Cont	**$ 363,880**		

Assumptions	
1	Pressure test included in cost

Scenario	4&5	Date	10/27/2009	Rev:	2	**Abandon Borthwick Ave meter and regulator station in Portsmouth, NH**		
Description						**Cost**	**Assumption #**	**Comments**
Engineering Design and planning						$ 12,500		Based on 100 Engineering hours ($125 per hour)
Project Management						$ 9,000		Based on 120 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector						$ 6,600		Based on 120 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Environmental Planning and permitting						$ 20,000	1	Based on best estimate
Project Contractor						$ 48,000		Based on 120 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
Pipeline materials						$ 2,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Contraction materials / Civil site work						$ 4,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews						$ 6,000		Based on 120 hours 1-man crew ($50 per hour - in house) - Needed to man valves and site inspection
					TOTAL	$ 108,100		
					10% Cont	**$ 118,910**		

Assumptions	
1	Wetland area. Station is on a peninsula surrounded by wetlands

Scenario	4&5	Date	10/27/2009	Rev:	2	Abandon Varney Brook Meter Station		
Description						**Cost**	**Assumption #**	**Comments**
Engineering Design and planning						$ 6,250		Based on 50 Engineering hours ($125 per hour)
Project Management						$ 3,750		Based on 50 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector						$ 2,750		Based on 50 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Environmental Planning and permitting						$ 20,000	1	Based on best estimate
Project Contractor						$ 20,000		Based on 50 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
Pipeline materials						$ 2,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Contraction materials / Civil site work						$ 1,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews						$ 5,000		Based on 100 hours 1-man crew ($50 per hour - in house) - Needed to man valves and site inspection
					TOTAL	$ 60,750		
					10% Cont	**$ 66,825**		

Assumptions	
1	Major wetland area. Station is on a peninsula surrounded by wetlands

Scenario	4&5	Date	10/27/2009	Rev:	2	Abandon Pipeline crossing the Little Bay Bridge in Newington, NH

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 20,000		Based on 160 Engineering hours ($125 per hour)
Project Management	$ 12,000		Based on 160 Project manager hours ($75 per hour) assumes contractor project manager
Environmental planning and special permitting	$ 30,000	1	Based on best estimate
Project Inspector	$ 2,750		Based on 50 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 20,000		Based on 50 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ 4,000		Based on 40 hours 2-man crew + tapping equipment ($50 per hour - in house)
Pipeline materials	$ 7,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Contraction materials / Civil site work	$ 5,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 7,500		Based on 50 hours 3-man crew ($50 per hour - in house) - Needed to man valves and site inspection
Remove pipe from existing bridge	$ 100,000		Based on best estimate - Assumes contractor lump sum price to remove pipe from bridge
Gas Loss	$ 657		Based on $10 per DTH
TOTAL	$ 208,907		
10% Cont	**$ 229,798**		

Assumptions	
1	Assumes special environmental permitting (i.e. marine environmental impact, water way patrolling and vessel control)

Scenario	4&5	Date	Rev:	2	Eliot Gate - Year 1		
Description					**Cost**	**Assumption #**	**Comments**
Preliminary Engineering and design					$ 20,000		Based on past practice - Preliminary engineering only (includes bid package)
Project Management					$ 45,000		Third Party project manager based on 3 months of on and off site project management $(75 per hour at 600 hours total)
Project Inspector					$ 33,000		Based on 600 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector.
Design Build and Install					$ 1,300,000	1	Based on Cotton Road Gate Station - Includes pipeline tap and environmental permitting and civil site work
Hot tap on M&N					$ 250,000		Based on best estimate
Land acquisition					$ 250,000		Best estimate
GSGT Crews					$ 30,000		Based on one man for project duration (600 hours at $50/hour)
				TOTAL	$ 1,928,000.00		
				10% Cont	**$ 2,120,800.00**		

Assumptions	
1	Assumes design build firm will provide all utilities services required

Scenario	6&7	Date	10/27/2009	Rev:	2

(80-EDD Peak hour model) (Derate portions of the system that require future pipeline integrity work while maintaining transmission classification of those segments that have had the pipeline integrity requirements satisfied - Maintaining pipeline over the Little Bay Bridge in Newington, NH - to the point where system instability begins.)

No.	Description	Cost		Comments
1	Perform all required pipeline integrity work from Varney Brk Mtr Sta in Dover, NH to Piscataqua River.	$	-	New Hampshire - Cost to provided by operations
2	Replace 3,377 of existing 8-inch pipeline on Gosling Rd in Newington, NH with 12-inch	$	936,614	New Hampshire
3	Install ball valve regulator station at the Varney Brook Meter Station in Dover, NH (feeding north 397 PSIG)	$	363,880	New Hampshire
4	Install ball valve regulator station at the Varney Brook Meter Station in Dover, NH (feeding south 250 PSIG)	$	363,880	New Hampshire
5	Install ball valve regulator station at the Newfield's Road meter and regulator station in Exeter, NH (feeding north 250 PSIG	$	363,880	New Hampshire
6	Abandon Varney Brook Meter Station	$	66,825	New Hampshire
7	Abandon Borthwick Ave meter and regulator station in Portsmouth, NH	$	118,910	New Hampshire
	TOTAL	**$**	**2,213,989**	

No.	Description	Cost		Comments
8	Perform all required pipeline integrity work Meeting House Rd in Wells, ME to Piscataqua River.			Maine - Cost to provided by operations
9	Eliot Gate - Year 1	$	2,120,800	Maine
	TOTAL	**$**	**2,120,800**	
	GRAND TOTAL	**$**	**4,334,789**	

Notes:
1) FERC costs associated with this scenario are not included in the estimates
2) Base Costs - No Overheads included in the estimates
3) Estimates assume that all new GSGT regulator stations will be built on existing ROW and that no land acquisition is required
4) Estimates made with a degree of knowledge and confidence that the estimated figures fall within reasonable ranges of values
5) Should this scenario be implemented, firm quotes will be ascertained, based on the engineering design plan for each sub-scenario

Scenario	6&7	Date	10/27/2009	Rev:	2	Replace 3,377 of existing 8-inch pipeline on Gosling Rd in Newington, NH with 12-inch

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 16,885		Based on best estimate
Environmental Planning and permitting	$ 20,262	1	Assumes environmental firm assessment
Project Management	$ 12,664		Based on ($75 per hour) assumes contractor project manager
Project Inspector	$ 9,287		Based on ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 270,160	2	Based $800/hr per crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ -	3	Tapping
Pipeline materials	$ 155,342		Pipe
Construction materials / Civil site work	$ 100,000	4	Gravel, sand, paving saw cut, etc.
Railroad crossing (directional drill)	$ 84,000		Drill under tracks
Misc Materials	$ 13,508		Tees, elbows, reducers, TOL's, insulating kits, etc.
Paving	$ 90,000		100% pavement - Based on current contractor pricing
Misc	$ 37,147		Misc.(x-ray, sand blast, appoxy coat, pipe delivery)
GSGT / NU Crews	$ 16,885		Based on 2 person crew ($100 per hour - in house)
Traffic Control	$ 25,328		Based on best estimate - Two officers at $75/hour
TOTAL	$ 851,467		
10% Cont	**$ 936,614**		

Assumptions	
1	Stream Crossing on Gosling Road and Oil tank farm at Schiller. Assumes no environmental issues will be identified
2	Assumes ledge removal & hydro test
3	Assumes tapping crew will not ne required. Line can be shut down
4	Significant amount of construction materials required

Scenario	6&7	Date	10/27/2009	Rev:	2	Install ball valve regulator station at the Newfield's Road meter and regulator station in Exeter, NH (feeding north 250 PSIG)

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 20,000		Based on 160 Engineering hours ($125 per hour) Includes Cad design drawing
Environmental Planning and permitting	$ 5,000		Assumes environmental firm assessment
Project Management	$ 12,000		Based on 160 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 8,800		Based on 160 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 64,000	1	Based on 160 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ 8,000		Based on 160 hours 2-man crew + tapping equipment ($50 per hour - in house)
Pipeline materials	$ 15,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Regulators	$ 72,000		Assumes four 6" Beckers - With extensions - Buried
Valves - below ground	$ 40,000		Assumes five 8" Full Port Delta Ball Valves ANSI-300
Valves - Controls line valves	$ 4,000		Assumes four 2" Full Port Delta Ball Valves ANSI-300
Misc Materials	$ 20,000		Flanges, tees, elbows, reducers, TOL's, insulating kits, etc.
Telemeters	$ 15,000		Based on best estimate
Contraction materials / Civil site work	$ 7,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 16,000		Based on 160 hours 2-man crew ($50 per hour - in house)
Traffic Control	$ 24,000		Based on 160 project hours at $75 per hour State Police two troopers
TOTAL	$ 330,800		
10% Cont	**$ 363,880**		

Assumptions	
1	Pressure test included in cost

Scenario	6&7	Date	10/27/2009	Rev:	2	Install ball valve regulator station at the Varney Brook Meter Station in Dover, NH (feeding north 397 PSIG)

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 20,000		Based on 160 Engineering hours ($125 per hour) Includes Cad design drawing
Environmental Planning and permitting	$ 5,000		Assumes environmental firm assessment
Project Management	$ 12,000		Based on 160 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 8,800		Based on 160 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 64,000	1	Based on 160 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ 8,000		Based on 160 hours 2-man crew + tapping equipment ($50 per hour - in house)
Pipeline materials	$ 15,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Regulators	$ 72,000		Assumes four 6" Beckers - With extensions - Buried
Valves - below ground	$ 40,000		Assumes five 8" Full Port Delta Ball Valves ANSI-300
Valves - Controls line valves	$ 4,000		Assumes four 2" Full Port Delta Ball Valves ANSI-300
Misc Materials	$ 20,000		Flanges, tees, elbows, reducers, TOL's, insulating kits, etc.
Telemeters	$ 15,000		Based on best estimate
Contraction materials / Civil site work	$ 7,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 16,000		Based on 160 hours 2-man crew ($50 per hour - in house)
Traffic Control	$ 24,000		Based on 160 project hours at $75 per hour State Police two troopers
TOTAL	$ 330,800		
10% Cont	**$ 363,880**		

Assumptions	
1	Pressure test included in cost

Scenario	6&7	Date	10/27/2009	Rev:	2	Install ball valve regulator station at the Varney Brook Meter Station in Dover, NH (feeding south 250 PSIG)

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 20,000		Based on 160 Engineering hours ($125 per hour) Includes Cad design drawing
Environmental Planning and permitting	$ 5,000		Assumes environmental firm assessment
Project Management	$ 12,000		Based on 160 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 8,800		Based on 160 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 64,000	1	Based on 160 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ 8,000		Based on 160 hours 2-man crew + tapping equipment ($50 per hour - in house)
Pipeline materials	$ 15,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Regulators	$ 72,000		Assumes four 6" Beckers - With extensions - Buried
Valves - below ground	$ 40,000		Assumes five 8" Full Port Delta Ball Valves ANSI-300
Valves - Controls line valves	$ 4,000		Assumes four 2" Full Port Delta Ball Valves ANSI-300
Misc Materials	$ 20,000		Flanges, tees, elbows, reducers, TOL's, insulating kits, etc.
Telemeters	$ 15,000		Based on best estimate
Contraction materials / Civil site work	$ 7,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 16,000		Based on 160 hours 2-man crew ($50 per hour - in house)
Traffic Control	$ 24,000		Based on 160 project hours at $75 per hour State Police two troopers
TOTAL	$ 330,800		
10% Cont	**$ 363,880**		

Assumptions	
1	Pressure test included in cost

Scenario	6&7	Date	10/27/2009	Rev:	2	**Abandon Borthwick Ave meter and regulator station in Portsmouth, NH**

Description	**Cost**	**Assumption #**	**Comments**
Engineering Design and planning	$ 12,500		Based on 100 Engineering hours ($125 per hour)
Project Management	$ 9,000		Based on 120 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 6,600		Based on 120 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Environmental Planning and permitting	$ 20,000	1	Based on best estimate
Project Contractor	$ 48,000		Based on 120 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
Pipeline materials	$ 2,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Contraction materials / Civil site work	$ 4,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 6,000		Based on 120 hours 1-man crew ($50 per hour - in house) - Needed to man valves and site inspection
TOTAL	$ 108,100		
10% Cont	**$ 118,910**		

Assumptions	
1	Wetland area. Station is on a peninsula surrounded by wetlands

Scenario	6&7	Date	10/27/2009	Rev:	2	**Abandon Varney Brook Meter Station**		

Description	**Cost**	**Assumption #**	**Comments**
Engineering Design and planning	$ 6,250		Based on 50 Engineering hours ($125 per hour)
Project Management	$ 3,750		Based on 50 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 2,750		Based on 50 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Environmental Planning and permitting	$ 20,000	1	Based on best estimate
Project Contractor	$ 20,000		Based on 50 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
Pipeline materials	$ 2,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Contraction materials / Civil site work	$ 1,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 5,000		Based on 100 hours 1-man crew ($50 per hour - in house) - Needed to man valves and site inspection
TOTAL	$ 60,750		
10% Cont	**$ 66,825**		

Assumptions	
1	Major wetland area. Station is on a peninsula surrounded by wetlands

Scenario	6&7	Date	Rev:	2	Eliot Gate - Year 1	
Description					**Cost**	**Assumption #**	**Comments**
Preliminary Engineering and design					$ 20,000		Based on past practice - Preliminary engineering only (includes bid package)
Project Management					$ 45,000		Third Party project manager based on 3 months of on and off site project management $(75 per hour at 600 hours total)
Project Inspector					$ 33,000		Based on 600 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector.
Design Build and Install					$ 1,300,000	1	Based on Cotton Road Gate Station - Includes pipeline tap and environmental permitting and civil site work
Hot tap on M&N					$ 250,000		Based on best estimate
Land acquisition					$ 250,000		Best estimate
GSGT Crews					$ 30,000		Based on one man for project duration (600 hours at $50/hour)
				TOTAL	$ 1,928,000.00		
				10% Cont	**$ 2,120,800.00**		

Assumptions	
1	Assumes design build firm will provide all utilities services required

Scenario	10	Date	10/27/2009	Rev:	2

(80-EDD Peak hour model) - (Declassify ALL pipeline segments to distribution class and implement the minimum amount of system improvements (if required) to sustain the system demand to the point where system instability begins. Piscataqua River and Little Bay Bridge crossings remain active)

No.	Description	Cost		Comments
1	Abandon Forrest Street pressure regulator station in Plaistow, NH	$	42,075	New Hampshire
2	Install ball valve regulator station on PEASE lateral in Newington, NE	$	359,480	New Hampshire
3	Replace 3,377 of existing 8-inch pipeline on Gosling Rd in Newington, NH with 12-inch	$	936,614	New Hampshire
4	Install ball valve regulator station at Varney Brook Meter station (feeds north to ME at 250 PSIG)	$	363,880	New Hampshire
5	Install ball valve regulator station on Gosling Rd / Spaulding Tpk interconnect - Newington, NH (feed south)	$	363,880	New Hampshire
6	Install ball valve regulator station on Spaulding Tpk at Bean Hill - Newington, NH	$	363,880	New Hampshire
7	Replace 4,500 of existing 6-inch with 12-inch pipeline from Varney Brk Mtr Sta to south of Applevale Lat Dover, NH	$	892,788	New Hampshire
8	Abandon Varney Brook Meter Station	$	66,825	New Hampshire
9	Modify Pressure regulator station at Borthwick Ave M&R station with new Ball Valve Regs.	$	42,240	New Hampshire
	TOTAL	**$**	**3,431,661**	

No.	Description	Cost		Comments
10	Modify Pressure regulator station at Payne Road M&R station with new Ball Valve Regs.	$	335,060	Maine
11	Replace 11,496 of existing 8-inch pipeline from Westbrook Gate to North of Blueberry Rd Station with 12-inch	$	3,650,055	Maine
12	Install ball valve regulator station 1,297-feet north of Blueberry Road Station	$	377,080	Maine
14	Wells Gate - Year 1	$	2,120,800	Maine
	TOTAL	**$**	**6,482,995**	

No.	Description	Cost		Comments
15	Install pressure regulators at Haverhill Gate station in Haverhill, MA	$	473,660	Massachusetts
	TOTAL	**$**	**473,660**	

GRAND TOTAL $ 10,388,316

Notes:

1) FERC costs associated with this scenario are not included in the estimates
2) Base Costs - No Overheads included in the estimates
3) Estimates assume that all new GSGT regulator stations will be built on existing ROW and that no land acquisition is required
4) Estimates made with a degree of knowledge and confidence that the estimated figures fall within reasonable ranges of values
5) Should this scenario be implemented, firm quotes will be ascertained, based on the engineering design plan for each sub-scenario

Scenario	10	Date	10/27/2009	Rev:	2	Abandon Forrest Street pressure regulator station in Plaistow, NH

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 6,250		Based on 50 Engineering hours ($125 per hour)
Project Management	$ 3,750		Based on 50 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 2,750		Based on 50 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 20,000	1	Based on 50 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
Pipeline materials	$ 2,000	2	Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Contraction materials / Civil site work	$ 1,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 2,500		Based on 50 hours 1-man crew ($50 per hour - in house) - Needed to man valves and site inspection
TOTAL	$ 38,250		
10% Cont	**$ 42,075**		

Assumptions	
1	Assumes that pressure from Haverhill Gate Station will be lowered to 492 PSIG or less during abandonment when Forrest Street station will be on bypass.
2	This estimate does not include the reuse of materials or re-stocking of parts and components into inventory

Scenario	10	Date	10/27/2009	Rev:	2	Install pressure regulators at Haverhill Gate station in Haverhill, MA

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 12,000		Based on 160 Engineering hours ($75 per hour) Includes Cad design drawing
Project Management	$ 12,000		Based on 160 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 6,600		Based on 120 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 88,000		Based on 160 hours 5-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
Regulators	$ 72,000	1	Assumes four 6" Beckers - With extensions - Buried
Valves - Below ground	$ 40,000		Assumes five 8" Full Port Delta Ball Valves ANSI-300
Valves - Controls line valves	$ 4,000		Assumes four 2" Full Port Delta Ball Valves ANSI-300
Pre Heat System	$ 100,000		Assumes four 2" Full Port Delta Ball Valves ANSI-300
Piping Materials	$ 25,000		Flanges, tees, elbows, reducers, etc
Regulated Bypass set-up	$ 20,000		Set up station with bypass regulator during construction
Misc Materials	$ 20,000		Tubing, Fittings, Filters, Strainers
Telemeter	$ 15,000		Based on best estimate
NU Crews	$ 16,000		Based on 160 hours 2-man crew ($50 per hour - in house)
TOTAL	$ 430,600		
10% Cont	**$ 473,660**		

Assumptions	
1	Assumes station to be built on existing ROW - No land costs

Scenario	10	Date	10/27/2009	Rev:	2	Install ball valve regulator station on PEASE lateral in Newington, NE

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 20,000		Based on 160 Engineering hours ($125 per hour) Includes Cad design drawing
Environmental Planning and permitting	$ 5,000		Assumes environmental firm assessment
Project Management	$ 12,000		Based on 160 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 8,800		Based on 160 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 64,000	1	Based on 160 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ 4,000		Based on 80 hours 2-man crew + tapping equipment ($50 per hour - in house)
Pipeline materials	$ 15,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Regulators	$ 72,000		Assumes four 6" Beckers - With extensions - Buried
Valves - Below ground	$ 40,000		Assumes five 8" Full Port Delta Ball Valves ANSI-300
Valves - Controls line valves	$ 4,000		Assumes four 2" Full Port Delta Ball Valves ANSI 300
Misc Materials	$ 20,000		Based on best estimate (includes enclosures for Beckers)
Telemeters	$ 15,000		Based on best estimate
Contraction materials / Civil site work	$ 7,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 16,000		Based on 160 hours 2-man crew ($50 per hour - in house)
Traffic Control	$ 24,000		Based on 160 project hours at $75 per hour State Police two troopers
TOTAL	$ 326,800		
10% Cont	**$ 359,480**		

Assumptions	
1	Pressure test included in cost

Scenario	10	Date	10/27/2009	Rev:	2	Replace 3,377 of existing 8-inch pipeline on Gosling Rd in Newington, NH with 12-inch

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 16,885		Based on best estimate
Environmental Planning and permitting	$ 20,262	1	Assumes environmental firm assessment
Project Management	$ 12,664		Based on ($75 per hour) assumes contractor project manager
Project Inspector	$ 9,287		Based on ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 270,160	2	Based $800/hr per crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ -	3	Tapping
Pipeline materials	$ 155,342		Pipe
Construction materials / Civil site work	$ 100,000	4	Gravel, sand, paving saw cut, etc.
Railroad crossing (directional drill)	$ 84,000		Drill under tracks
Misc Materials	$ 13,508		Tees, elbows, reducers, TOL's, insulating kits, etc.
Paving	$ 90,000		100% pavement - Based on current contractor pricing
Misc	$ 37,147		Misc.(x-ray, sand blast, appoxy coat, pipe delivery)
GSGT / NU Crews	$ 16,885		Based on 2 person crew ($100 per hour - in house)
Traffic Control	$ 25,328		Based on best estimate - Two officers at $75/hour
TOTAL	$ 851,467		
10% Cont	**$ 936,614**		

Assumptions	
1	Stream Crossing on Gosling Road and Oil tank farm at Schiller. Assumes no environmental issues will be identified
2	Assumes ledge removal & hydro test
3	Assumes tapping crew will not ne required. Line can be shut down
4	Significant amount of construction materials required

Scenario	10	Date	10/27/2009	Rev:	2	Install ball valve regulator station on Gosling Rd / Spaulding Tpk interconnect - Newing, NH (feed South)

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 20,000		Based on 160 Engineering hours ($125 per hour) Includes Cad design drawing
Environmental Planning and permitting	$ 5,000		Assumes environmental firm assessment
Project Management	$ 12,000		Based on 160 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 8,800		Based on 160 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 64,000	1	Based on 160 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ 8,000		Based on 160 hours 2-man crew + tapping equipment ($50 per hour - in house)
Pipeline materials	$ 15,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Regulators	$ 72,000		Assumes four 6" Beckers - With extensions - Buried
Valves - below ground	$ 40,000		Assumes five 8" Full Port Delta Ball Valves ANSI-300
Valves - Controls line valves	$ 4,000		Assumes four 2" Full Port Delta Ball Valves ANSI-300
Misc Materials	$ 20,000		Flanges, tees, elbows, reducers, TOL's, insulating kits, etc.
Telemeters	$ 15,000		Based on best estimate
Contraction materials / Civil site work	$ 7,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 16,000		Based on 160 hours 2-man crew ($50 per hour - in house)
Traffic Control	$ 24,000		Based on 160 project hours at $75 per hour State Police two troopers
TOTAL	$ 330,800		
10% Cont	**$ 363,880**		

Assumptions	
1	Pressure test included in cost

Scenario	10	Date	10/27/2009	Rev:	2	Install ball valve regulator station at Varney Brook Meter station (feeds north to ME at 250 PSIG)

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 20,000		Based on 160 Engineering hours ($125 per hour) Includes Cad design drawing
Environmental Planning and permitting	$ 5,000		Assumes environmental firm assessment
Project Management	$ 12,000		Based on 160 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 8,800		Based on 160 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 64,000	1	Based on 160 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ 8,000		Based on 160 hours 2-man crew + tapping equipment ($50 per hour - in house)
Pipeline materials	$ 15,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Regulators	$ 72,000		Assumes four 6" Beckers - With extensions - Buried
Valves - below ground	$ 40,000		Assumes five 8" Full Port Delta Ball Valves ANSI-300
Valves - Controls line valves	$ 4,000		Assumes four 2" Full Port Delta Ball Valves ANSI-300
Misc Materials	$ 20,000		Flanges, tees, elbows, reducers, TOL's, insulating kits, etc.
Telemeters	$ 15,000		Based on best estimate
Contraction materials / Civil site work	$ 7,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 16,000		Based on 160 hours 2-man crew ($50 per hour - in house)
Traffic Control	$ 24,000		Based on 160 project hours at $75 per hour State Police two troopers
TOTAL	$ 330,800		
10% Cont	**$ 363,880**		

Assumptions	
1	Pressure test included in cost

Scenario	10	Date	10/27/2009	Rev:	2	Install ball valve regulator station on Spaulding Tpk at Bean Hill - Newington, NH

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 20,000		Based on 160 Engineering hours ($125 per hour) Includes Cad design drawing
Environmental Planning and permitting	$ 5,000		Assumes environmental firm assessment
Project Management	$ 12,000		Based on 160 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 8,800		Based on 160 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 64,000	1	Based on 160 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ 8,000		Based on 160 hours 2-man crew + tapping equipment ($50 per hour - in house)
Pipeline materials	$ 15,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Regulators	$ 72,000		Assumes four 6" Beckers - With extensions - Buried
Valves - below ground	$ 40,000		Assumes five 8" Full Port Delta Ball Valves ANSI-300
Valves - Controls line valves	$ 4,000		Assumes four 2" Full Port Delta Ball Valves ANSI-300
Misc Materials	$ 20,000		Flanges, tees, elbows, reducers, TOL's, insulating kits, etc.
Telemeters	$ 15,000		Based on best estimate
Contraction materials / Civil site work	$ 7,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 16,000		Based on 160 hours 2-man crew ($50 per hour - in house)
Traffic Control	$ 24,000		Based on 160 project hours at $75 per hour State Police two troopers
TOTAL	$ 330,800		
10% Cont	**$ 363,880**		

Assumptions	
1	Pressure test included in cost

Scenario	10	Date	10/27/2009	Rev:	2	Replace 4,500 of existing 6-inch with 12-inch pipeline from Varney Bark Mr. Sta to south of Applevale Lat Dover, NH

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 22,500		Based on best estimate
Environmental Planning and permitting	$ 27,000	1	Assumes environmental firm assessment
Project Management	$ 16,875		Based on ($75 per hour) assumes contractor project manager
Project Inspector	$ 12,375		Based on ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 360,000	2	Based on 4-person crew(s) (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ 5,000		Based on 2-man crew + tapping equipment ($125 per hour - in house)
Pipeline materials	$ 207,000		Pipe
Contraction materials / Civil site work	$ 31,500		Gravel, sand, saw-cut, paving, loam & seed etc.
Misc Materials	$ 18,000		Tees, elbows, reducers, TOL's, insulating kits, etc.
ROW and Land Rights	$ 22,500	3	Best estimate
Misc.	$ 49,500		Misc.(x-ray, sand blast, appoxy coat, pipe delivery)
NU Crews	$ 22,500		Based on 2-man crew ($100 per hour - in house)
Traffic Control	$ 16,875	4	Based on $75 per hour (local police)
TOTAL	$ 811,625		
10% Cont	**$ 892,788**		

Assumptions	
1	Significant amount of marsh and wet lands
2	Assumes ledge removal & hydro test
3	This does not include temporary land space for construction. This cost would be extra
4	Assumes that Dover Point Road can be "open cut"

Scenario	10	Date	10/27/2009	Rev:	2	Modify Pressure regulator station at Borthwick Ave M&R station with new Ball Valve Regs.

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 2,500		Based on 20 Engineering hours ($125 per hour) Includes Cad design drawing
Project Management	$ 2,250		Based on 30 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 1,650		Based on 30 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Regulators	$ 24,000	1	Replace two existing 4" 900TE regs with two 4" Becker "Globe" valve regulators
Misc Materials	$ 4,000		Tubing, Fittings, Filters, etc
NU Crews	$ 4,000		Based on 40 hours 2-man crew ($50 per hour - in house)
TOTAL	$ 38,400		
10% Cont	**$ 42,240**		

Assumptions	
1	Assumes that existing two 4" ANSI-300 Grove 900 TE regulators can be replaced (size for size) with 4" Becker Globe Valve Regulators

Scenario	10	Date	10/27/2009	Rev:	2	Modify Pressure regulator station at Payne Road M&R station with new Ball Valve Regs.

Description	Cost		Assumption #	Comments
Engineering Design and planning	$	20,000		Based on 160 Engineering hours ($125 per hour) Includes Cad design drawing
Project Management	$	12,000		Based on 160 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$	6,600		Based on 120 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$	88,000	1	Based on 160 hours 5-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
Regulators	$	82,000		Assumes four 6" Beckers
Valves -	$	-		Use existing
Valves - Controls line valves	$	-		Use existing
Piping Materials	$	25,000		Flanges, tees, elbows, reducers, etc
Regulated Bypass set-up	$	20,000		Set up station with bypass regulator during construction
Misc Materials	$	20,000		Tubing, Fittings, Filters, Strainers
Telemeter	$	15,000		Based on best estimate
NU Crews	$	16,000		Based on 160 hours 2-man crew ($50 per hour - in house)
TOTAL	$	304,600		
10% Cont	**$**	**335,060**		

Assumptions	
1	Assumes the removal of existing equipment at Payne Road station and the use of existing building for modified station

Scenario	10	Date	10/27/2009	Rev:	2	Replace 11,496 of existing 8-inch pipeline from Westbrook Gate to North of Blueberry Rd Station with 12-inch

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 57,480		Based on best estimate
Environmental Planning and permitting	$ 68,976	1	Assumes environmental firm assessment
Project Management	$ 43,110		Based on ($75 per hour) assumes contractor project manager
Project Inspector	$ 31,614		Based on ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 1,839,360	2	Based on 4-person crew(s) $800/hr (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ 12,500		Based on 2-man crew + tapping equipment ($125 per hour - in house)
Pipeline materials	$ 528,816		Pipe
Misc Materials	$ 45,984		Tees, elbows, fittings, etc
ROW and Land Rights	$ 57,480	3	Property owner issues
Two directional drills	$ 380,000		Per existing construction contractor contract
Construction materials / Civil site work	$ 80,472		Estimated (Gravel, Stone, Loam Seed, paving etc)
NU Crews	$ 86,220		Based on 3-man crew ($150 per hour - in house)
Traffic Control	$ 86,220		$75 per hour (local police)
TOTAL	$ 3,318,232		
10% Cont	**$ 3,650,055**		

Assumptions	
1	Marsh and wet lands
2	Assumes ledge removal & hydro test
3	This does not include temporary land space for construction. This cost would be extra

Scenario	10	Date	10/27/2009	Rev:	2	Install ball valve regulator station 1,297-feet north of Blueberry Road Station

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 20,000		Based on 160 Engineering hours ($125 per hour) Includes Cad design drawing
Environmental Planning and permitting	$ 5,000		Assumes environmental firm assessment
Project Management	$ 12,000		Based on 160 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 8,800		Based on 160 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 64,000	1	Based on 160 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ 8,000		Based on 160 hours 2-man crew + tapping equipment ($50 per hour - in house)
Pipeline materials	$ 15,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Regulators	$ 72,000		Assumes four 6" Beckers - With extensions - Buried
Valves - Below ground	$ 40,000		Assumes five 8" Full Port Delta Ball Valves ANSI-300
Valves - Controls line valves	$ 4,000		Assumes four 2" Full Port Delta Ball Valves ANSI-300
Misc Materials	$ 20,000		Based on best estimate (includes enclosures for Beckers)
Misc Materials	$ 12,000		Flanges, tees, elbows, reducers, TOL's, insulating kits, etc.
Telemeters	$ 15,000		Based on best estimate
Contraction materials / Civil site work	$ 7,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 16,000		Based on 160 hours 2-man crew ($50 per hour - in house)
Traffic Control	$ 24,000		Based on 160 project hours at $75 per hour State Police two troopers
TOTAL	$ 342,800		
10% Cont	**$ 377,080**		

Assumptions	
1	Pressure test included in cost

Scenario	10	Date	10/27/2009	Rev:	2	**Abandon Varney Brook Meter Station**

Description	**Cost**	**Assumption #**	**Comments**
Engineering Design and planning	$ 6,250		Based on 50 Engineering hours ($125 per hour)
Project Management	$ 3,750		Based on 50 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 2,750		Based on 50 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Environmental Planning and permitting	$ 20,000	1	Based on best estimate
Project Contractor	$ 20,000		Based on 50 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
Pipeline materials	$ 2,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Contraction materials / Civil site work	$ 1,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 5,000		Based on 100 hours 1-man crew ($50 per hour - in house) - Needed to man valves and site inspection
TOTAL	$ 60,750		
10% Cont	**$ 66,825**		

Assumptions	
1	Major wetland area. Station is on a peninsula surrounded by wetlands

Scenario	10	Date	Rev:	2	Wells Gate - Year 1	

Description	Cost	Assumption #	Comments
Preliminary Engineering and design	$ 20,000		Based on past practice - Preliminary engineering only (includes bid package)
Project Management	$ 45,000		Third Party project manager based on 3 months of on and off site project management $(75 per hour at 600 hours total)
Project Inspector	$ 33,000		Based on 600 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector.
Design Build and Install	$ 1,300,000	1	Based on Cotton Road Gate Station - Includes pipeline tap and environmental permitting and civil site work
Hot tap on M&N	$ 250,000		Based on best estimate
Land acquisition	$ 250,000		Best estimate
GSGT Crews	$ 30,000		Based on one man for project duration (600 hours at $50/hour)
TOTAL	$ 1,928,000.00		
10% Cont	**$ 2,120,800.00**		

Assumptions	
1	Assumes design build firm will provide all utilities services required

Scenario	11A	Date	10/27/2009	Rev:	2

(Derate portions of the system that require future pipeline integrity work while maintaining transmission classification of those segments that have had the pipeline integrity requirements satisfied - Maintaining the pipeline over the Little Bay Bridge in Newington, NH and abandoning Piscataqua River crossing at the NH/ME State border in order to sustain a total system future load growth of 10%, based on an 80EDD peak hour, while operating prudently.)

No.	Description	Cost	Comments
1	Replace 3,377 of existing 8-inch pipeline on Gosling Rd in Newington, NH with 12-inch	$ 936,614	New Hampshire
2	Install ball valve regulator station at the Gosling Road Spaulding Tpk interconnect (feeding north 305 PSIG)	$ 363,880	New Hampshire
3	Install ball valve regulator station at the Gosling Road Spaulding Tpk interconnect (feeding south 250 PSIG)	$ 363,880	New Hampshire
4	Replace 11,149 of existing 6-inch pipeline from Varney Bark Mtr. Sta to the Cocheco River in Dover, NH with 12-inch	$ 3,166,426	New Hampshire
5	Install ball valve regulator station at the Newfield's Road meter and regulator station in Exeter, NH (feeding north 250 PSIG)	$ 363,880	New Hampshire
6	Abandon Varney Brook Meter Station	$ 66,825	New Hampshire
7	Abandon Pipeline across Piscataqua River NH/ME - Year 1 - New Hampshire Portion	$ 98,552	New Hampshire Portion
8	Abandon Borthwick Ave meter and regulator station in Portsmouth, NH	$ 118,910	New Hampshire
	TOTAL	**$ 5,478,967**	

No.	Description	Cost	Comments
9	Abandon the Eliot Meter station in Eliot, ME	$ 66,825	Maine
10	Abandon Pipeline across Piscataqua River NH/ME - Year 1 - Maine Portion	$ 98,552	Maine Portion
11	Install ball valve regulator station at the new Wells Gate Station (feeding south 250 PSIG)	$ 363,880	Maine
12	Wells Gate - Year 1	$ 2,120,800	Maine
	TOTAL	**$ 2,650,057**	

GRAND TOTAL $ 8,129,024

Notes:

1) FERC costs associated with this scenario are not included in the estimates
2) Base Costs - No Overheads included in the estimates
3) Estimates assume that all new GSGT regulator stations will be built on existing ROW and that no land acquisition is required
4) Estimates made with a degree of knowledge and confidence that the estimated figures fall within reasonable ranges of values
5) Should this scenario be implemented, firm quotes will be ascertained, based on the engineering design plan for each sub-scenario

Scenario	11A	Date	10/27/2009	Rev:	2	Replace 3,377 of existing 8-inch pipeline on Gosling Rd in Newington, NH with 12-inch

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 16,885		Based on best estimate
Environmental Planning and permitting	$ 20,262	1	Assumes environmental firm assessment
Project Management	$ 12,664		Based on ($75 per hour) assumes contractor project manager
Project Inspector	$ 9,287		Based on ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 270,160	2	Based $800/hr per crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ -	3	Tapping
Pipeline materials	$ 155,342		Pipe
Construction materials / Civil site work	$ 100,000	4	Gravel, sand, paving saw cut, etc.
Railroad crossing (directional drill)	$ 84,000		Drill under tracks
Misc Materials	$ 13,508		Tees, elbows, reducers, TOL's, insulating kits, etc.
Paving	$ 90,000		100% pavement - Based on current contractor pricing
Misc	$ 37,147		Misc.(x-ray, sand blast, appoxy coat, pipe delivery)
GSGT / NU Crews	$ 16,885		Based on 2 person crew ($100 per hour - in house)
Traffic Control	$ 25,328		Based on best estimate - Two officers at $75/hour
TOTAL	$ 851,467		
10% Cont	**$ 936,614**		

Assumptions	
1	Stream Crossing on Gosling Road and Oil tank farm at Schiller. Assumes no environmental issues will be identified
2	Assumes ledge removal & hydro test
3	Assumes tapping crew will not ne required. Line can be shut down
4	Significant amount of construction materials required

Scenario	11A	Date	10/27/2009	Rev:	2	Install ball valve regulator station at the Newfield's Road meter and regulator station in Exeter, NH (feeding north 250 PSIG)

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 20,000		Based on 160 Engineering hours ($125 per hour) Includes Cad design drawing
Environmental Planning and permitting	$ 5,000		Assumes environmental firm assessment
Project Management	$ 12,000		Based on 160 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 8,800		Based on 160 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 64,000	1	Based on 160 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ 8,000		Based on 160 hours 2-man crew + tapping equipment ($50 per hour - in house)
Pipeline materials	$ 15,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Regulators	$ 72,000		Assumes four 6" Beckers - With extensions - Buried
Valves - below ground	$ 40,000		Assumes five 8" Full Port Delta Ball Valves ANSI-300
Valves - Controls line valves	$ 4,000		Assumes four 2" Full Port Delta Ball Valves ANSI-300
Misc Materials	$ 20,000		Flanges, tees, elbows, reducers, TOL's, insulating kits, etc.
Telemeters	$ 15,000		Based on best estimate
Contraction materials / Civil site work	$ 7,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 16,000		Based on 160 hours 2-man crew ($50 per hour - in house)
Traffic Control	$ 24,000		Based on 160 project hours at $75 per hour State Police two troopers
TOTAL	$ 330,800		
10% Cont	**$ 363,880**		

Assumptions	
1	Pressure test included in cost

Scenario	11A	Date	10/27/2009	Rev:	2	Install ball valve regulator station at the new Wells Gate Station (feeding south 250 PSIG)

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 20,000		Based on 160 Engineering hours ($125 per hour) Includes Cad design drawing
Environmental Planning and permitting	$ 5,000		Assumes environmental firm assessment
Project Management	$ 12,000		Based on 160 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 8,800		Based on 160 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 64,000	1	Based on 160 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ 8,000		Based on 160 hours 2-man crew + tapping equipment ($50 per hour - in house)
Pipeline materials	$ 15,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Regulators	$ 72,000		Assumes four 6" Beckers - With extensions - Buried
Valves - below ground	$ 40,000		Assumes five 8" Full Port Delta Ball Valves ANSI-300
Valves - Controls line valves	$ 4,000		Assumes four 2" Full Port Delta Ball Valves ANSI-300
Misc Materials	$ 20,000		Flanges, tees, elbows, reducers, TOL's, insulating kits, etc.
Telemeters	$ 15,000		Based on best estimate
Contraction materials / Civil site work	$ 7,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 16,000		Based on 160 hours 2-man crew ($50 per hour - in house)
Traffic Control	$ 24,000		Based on 160 project hours at $75 per hour State Police two troopers
TOTAL	$ 330,800		
10% Cont	**$ 363,880**		

Assumptions	
1	Pressure test included in cost

Scenario	11A	Date	10/27/2009	Rev:	2	Install ball valve regulator station at the new Wells Gate Station (feeding south 250 PSIG)

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 20,000		Based on 160 Engineering hours ($125 per hour) Includes Cad design drawing
Environmental Planning and permitting	$ 5,000		Assumes environmental firm assessment
Project Management	$ 12,000		Based on 160 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 8,800		Based on 160 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 64,000	1	Based on 160 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ 8,000		Based on 160 hours 2-man crew + tapping equipment ($50 per hour - in house)
Pipeline materials	$ 15,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Regulators	$ 72,000		Assumes four 6" Beckers - With extensions - Buried
Valves - below ground	$ 40,000		Assumes five 8" Full Port Delta Ball Valves ANSI-300
Valves - Controls line valves	$ 4,000		Assumes four 2" Full Port Delta Ball Valves ANSI-300
Misc Materials	$ 20,000		Flanges, tees, elbows, reducers, TOL's, insulating kits, etc.
Telemeters	$ 15,000		Based on best estimate
Contraction materials / Civil site work	$ 7,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 16,000		Based on 160 hours 2-man crew ($50 per hour - in house)
Traffic Control	$ 24,000		Based on 160 project hours at $75 per hour State Police two troopers
TOTAL	$ 330,800		
10% Cont	**$ 363,880**		

Assumptions	
1	Pressure test included in cost

Scenario	11A	Date	10/27/2009	Rev:	2	Install ball valve regulator station at the Varney Brook Meter Station in Dover, NH (feeding north 305 PSIG)

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 20,000		Based on 160 Engineering hours ($125 per hour) Includes Cad design drawing
Environmental Planning and permitting	$ 5,000		Assumes environmental firm assessment
Project Management	$ 12,000		Based on 160 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 8,800		Based on 160 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 64,000	1	Based on 160 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ 8,000		Based on 160 hours 2-man crew + tapping equipment ($50 per hour - in house)
Pipeline materials	$ 15,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Regulators	$ 72,000		Assumes four 6" Beckers - With extensions - Buried
Valves - below ground	$ 40,000		Assumes five 8" Full Port Delta Ball Valves ANSI-300
Valves - Controls line valves	$ 4,000		Assumes four 2" Full Port Delta Ball Valves ANSI-300
Misc Materials	$ 20,000		Flanges, tees, elbows, reducers, TOL's, insulating kits, etc.
Telemeters	$ 15,000		Based on best estimate
Contraction materials / Civil site work	$ 7,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 16,000		Based on 160 hours 2-man crew ($50 per hour - in house)
Traffic Control	$ 24,000		Based on 160 project hours at $75 per hour State Police two troopers
TOTAL	$ 330,800		
10% Cont	**$ 363,880**		

Assumptions	
1	Pressure test included in cost

Scenario	11A	Date	10/27/2009	Rev:	2	**Abandon Borthwick Ave meter and regulator station in Portsmouth, NH**

Description	**Cost**	**Assumption #**	**Comments**
Engineering Design and planning	$ 12,500		Based on 100 Engineering hours ($125 per hour)
Project Management	$ 9,000		Based on 120 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 6,600		Based on 120 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Environmental Planning and permitting	$ 20,000	1	Based on best estimate
Project Contractor	$ 48,000		Based on 120 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
Pipeline materials	$ 2,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Contraction materials / Civil site work	$ 4,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 6,000		Based on 120 hours 1-man crew ($50 per hour - in house) - Needed to man valves and site inspection
TOTAL	$ 108,100		
10% Cont	**$ 118,910**		

Assumptions	
1	Wetland area. Station is on a peninsula surrounded by wetlands

Scenario	11A	Date	10/27/2009	Rev:	2	Abandon Varney Brook Meter Station		
Description						**Cost**	**Assumption #**	**Comments**
Engineering Design and planning						$ 6,250		Based on 50 Engineering hours ($125 per hour)
Project Management						$ 3,750		Based on 50 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector						$ 2,750		Based on 50 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Environmental Planning and permitting						$ 20,000	1	Based on best estimate
Project Contractor						$ 20,000		Based on 50 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
Pipeline materials						$ 2,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Contraction materials / Civil site work						$ 1,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews						$ 5,000		Based on 100 hours 1-man crew ($50 per hour - in house) - Needed to man valves and site inspection
					TOTAL	$ 60,750		
					10% Cont	**$ 66,825**		

Assumptions	
1	Major wetland area. Station is on a peninsula surrounded by wetlands

Scenario	11A	Date	10/22/2009	Rev:	1	Abandon Pipeline across Piscataqua River NH/ME - Year 1

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 20,000		Based on 160 Engineering hours ($125 per hour)
Project Management	$ 12,000		Based on 160 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 8,800		Based on 50 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 20,000		Based on 50 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ 2,000		Based on 20 hours 2-man crew + tapping equipment ($50 per hour - in house)
Pipeline materials	$ 5,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Contraction materials / Civil site work	$ 3,500		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 7,500		Based on 50 hours 3-man crew ($50 per hour - in house) - Needed to man valves and site inspection
Pig receivers	$ 80,000		One required at each location. Based on a cost of $50,000 per unit ($10,000 includes installation by fabrication contactor.
Gas Loss	$ 386		Based on $10 per DTH
Abandon Eliot Meter Station	$ 20,000	1	Based on best estimate ($20,000)
TOTAL	$ 179,186		
10% Cont	**$ 197,104**		

Assumptions	
1	This estimate does not include the reuse of materials or re-stocking of parts and components into inventory

Scenario	11A	Date	10/22/2009	Rev:	1	**Abandon Eliot Meter Station**		
Description						**Cost**	**Assumption #**	**Comments**
Engineering Design and planning						$ 6,250		Based on 50 Engineering hours ($125 per hour)
Project Management						$ 3,750		Based on 50 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector						$ 2,750		Based on 50 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Environmental Planning and permitting						$ 20,000	1	Based on best estimate
Project Contractor						$ 20,000		Based on 50 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
Pipeline materials						$ 2,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Contraction materials / Civil site work						$ 1,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews						$ 5,000		Based on 100 hours 1-man crew ($50 per hour - in house) - Needed to man valves and site inspection
					TOTAL	$ 60,750		
					10% Cont	**$ 66,825**		

Assumptions	
1	Wetland area.

Scenario	11A	Date	10/21/2009	Rev:	1	Replace 11,149 of existing 6-inch pipeline from Varney Bark Mtr. Sta to the Cocheco River in Dover, NH with 12-inch

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 55,745		Based on best estimate
Environmental Planning and permitting	$ 66,894	1	Assumes environmental firm assessment
Project Management	$ 41,809		Based on ($75 per hour) assumes contractor project manager
Project Inspector	$ 30,660		Based on ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 1,783,840	2	Based $800/hr per crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ 5,000		Based on 2-man crew + tapping equipment ($125 per hour - in house)
Pipeline materials	$ 512,854		Pipe
Contraction materials / Civil site work	$ 78,043		Gravel, sand, saw-cut, paving, loam & seed etc.
Misc Materials	$ 44,596		Tees, elbows, reducers, TOL's, insulating kits, etc.
ROW and Land Rights	$ 55,745	3	Best estimate
Misc.	$ 122,639		Misc. (Drills etc)
NU / GSGT Crews	$ 55,745		Based on 2-man crew ($100 per hour - in house)
Traffic Control	$ 25,000	4	Based on best estimate
TOTAL	$ 2,878,570		
10% Cont	**$ 3,166,426**		

Assumptions	
1	Significant amount of marsh and wet lands
2	Assumes ledge removal & hydro test
3	This does not include temporary land space for construction. This cost would be extra
4	Assumes that Dover Point Road can be "open cut"

Scenario	11A	Date	Rev:	2	Wells Gate - Year 1

Description	Cost	Assumption #	Comments
Preliminary Engineering and design	$ 20,000		Based on past practice - Preliminary engineering only (includes bid package)
Project Management	$ 45,000		Third Party project manager based on 3 months of on and off site project management $(75 per hour at 600 hours total)
Project Inspector	$ 33,000		Based on 600 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector.
Design Build and Install	$ 1,300,000	1	Based on Cotton Road Gate Station - Includes pipeline tap and environmental permitting and civil site work
Hot tap on M&N	$ 250,000		Based on best estimate
Land acquisition	$ 250,000		Best estimate
GSGT Crews	$ 30,000		Based on one man for project duration (600 hours at $50/hour)
TOTAL	$ 1,928,000.00		
10% Cont	**$ 2,120,800.00**		

Assumptions	
1	Assumes design build firm will provide all utilities services required

Scenario	11	Date	10/27/2009	Rev:	2

(80-EDD Peak hour model) - (Derate portions of the system that require future pipeline integrity work while maintaining transmission classification of those segments that have had the pipeline integrity requirements satisfied - Maintaining pipeline over the Little Bay Bridge in Newington, NH and abandoning Piscataqua River crossing at NH/ME State border)

No.	Description	Cost		Comments
1	Replace 3,377 of existing 8-inch pipeline on Gosling Rd in Newington, NH with 12-inch	$	936,614	New Hampshire
2	Install ball valve regulator station at the Gosling Road Spaulding Tpk interconnect (feeding north 305 PSIG)	$	363,880	New Hampshire
3	Install ball valve regulator station at the Gosling Road Spaulding Tpk interconnect (feeding south 250 PSIG)	$	363,880	New Hampshire
4	Replace 5,562' of existing 6-inch pipeline from Varney Brk Mtr Sta to Applevale Lat Dover, NH	$	1,371,234	New Hampshire
5	Install ball valve regulator station at the Newfield's Road meter and regulator station in Exeter, NH (feeding north 250 PSIG)	$	363,880	New Hampshire
6	Abandon Varney Brook Meter Station	$	66,825	New Hampshire
7	Abandon Pipeline across Piscataqua River NH/ME - Year 1 - New Hampshire Portion	$	98,552	New Hampshire Portion
8	Abandon Borthwick Ave meter and regulator station in Portsmouth, NH	$	118,910	New Hampshire
	TOTAL	**$**	**3,683,774**	

No.	Description	Cost		Comments
9	Abandon the Eliot Meter station in Eliot, ME	$	66,825	Maine
10	Abandon Pipeline across Piscataqua River NH/ME - Year 1 - Maine Portion	$	98,552	Maine Portion
11	Install ball valve regulator station at the new Wells Gate Station (feeding south 250 PSIG)	$	363,880	Maine
12	Wells Gate - Year 1	$	2,120,800	Maine
	TOTAL	**$**	**2,650,057**	
	GRAND TOTAL	**$**	**6,333,832**	

Notes:
1) FERC costs associated with this scenario are not included in the estimates
2) Base Costs - No Overheads included in the estimates
3) Estimates assume that all new GSGT regulator stations will be built on existing ROW and that no land acquisition is required
4) Estimates made with a degree of knowledge and confidence that the estimated figures fall within reasonable ranges of values
5) Should this scenario be implemented, firm quotes will be ascertained, based on the engineering design plan for each sub-scenario

Scenario	11	Date	10/27/2009	Rev:	2	Replace 3,377 of existing 8-inch pipeline on Gosling Rd in Newington, NH with 12-inch

Description	**Cost**	**Assumption #**	**Comments**
Engineering Design and planning	$ 16,885		Based on best estimate
Environmental Planning and permitting	$ 20,262	1	Assumes environmental firm assessment
Project Management	$ 12,664		Based on ($75 per hour) assumes contractor project manager
Project Inspector	$ 9,287		Based on ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 270,160	2	Based $800/hr per crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ -	3	Tapping
Pipeline materials	$ 155,342		Pipe
Construction materials / Civil site work	$ 100,000	4	Gravel, sand, paving saw cut, etc.
Railroad crossing (directional drill)	$ 84,000		Drill under tracks
Misc Materials	$ 13,508		Tees, elbows, reducers, TOL's, insulating kits, etc.
Paving	$ 90,000		100% pavement - Based on current contractor pricing
Misc	$ 37,147		Misc.(x-ray, sand blast, appoxy coat, pipe delivery)
GSGT / NU Crews	$ 16,885		Based on 2 person crew ($100 per hour - in house)
Traffic Control	$ 25,328		Based on best estimate - Two officers at $75/hour
TOTAL	$ 851,467		
10% Cont	**$ 936,614**		

Assumptions	
1	Stream Crossing on Gosling Road and Oil tank farm at Schiller. Assumes no environmental issues will be identified
2	Assumes ledge removal & hydro test
3	Assumes tapping crew will not ne required. Line can be shut down
4	Significant amount of construction materials required

Scenario	11	Date	10/27/2009	Rev:	2	Install ball valve regulator station at the Newfield's Road meter and regulator station in Exeter, NH (feeding north 250 PSIG)

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 20,000		Based on 160 Engineering hours ($125 per hour) Includes Cad design drawing
Environmental Planning and permitting	$ 5,000		Assumes environmental firm assessment
Project Management	$ 12,000		Based on 160 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 8,800		Based on 160 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 64,000	1	Based on 160 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ 8,000		Based on 160 hours 2-man crew + tapping equipment ($50 per hour - in house)
Pipeline materials	$ 15,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Regulators	$ 72,000		Assumes four 6" Beckers - With extensions - Buried
Valves - below ground	$ 40,000		Assumes five 8" Full Port Delta Ball Valves ANSI-300
Valves - Controls line valves	$ 4,000		Assumes four 2" Full Port Delta Ball Valves ANSI-300
Misc Materials	$ 20,000		Flanges, tees, elbows, reducers, TOL's, insulating kits, etc.
Telemeters	$ 15,000		Based on best estimate
Contraction materials / Civil site work	$ 7,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 16,000		Based on 160 hours 2-man crew ($50 per hour - in house)
Traffic Control	$ 24,000		Based on 160 project hours at $75 per hour State Police two troopers
TOTAL	$ 330,800		
10% Cont	**$ 363,880**		

Assumptions	
1	Pressure test included in cost

Scenario	11	Date	10/27/2009	Rev:	2	Install ball valve regulator station at the new Wells Gate Station (feeding south 250 PSIG)

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 20,000		Based on 160 Engineering hours ($125 per hour) Includes Cad design drawing
Environmental Planning and permitting	$ 5,000		Assumes environmental firm assessment
Project Management	$ 12,000		Based on 160 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 8,800		Based on 160 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 64,000	1	Based on 160 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ 8,000		Based on 160 hours 2-man crew + tapping equipment ($50 per hour - in house)
Pipeline materials	$ 15,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Regulators	$ 72,000		Assumes four 6" Beckers - With extensions - Buried
Valves - below ground	$ 40,000		Assumes five 8" Full Port Delta Ball Valves ANSI-300
Valves - Controls line valves	$ 4,000		Assumes four 2" Full Port Delta Ball Valves ANSI-300
Misc Materials	$ 20,000		Flanges, tees, elbows, reducers, TOL's, insulating kits, etc.
Telemeters	$ 15,000		Based on best estimate
Contraction materials / Civil site work	$ 7,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 16,000		Based on 160 hours 2-man crew ($50 per hour - in house)
Traffic Control	$ 24,000		Based on 160 project hours at $75 per hour State Police two troopers
TOTAL	$ 330,800		
10% Cont	**$ 363,880**		

Assumptions	
1	Pressure test included in cost

Scenario	11	Date	10/27/2009	Rev:	2	Install ball valve regulator station at the new Wells Gate Station (feeding south 250 PSIG)

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 20,000		Based on 160 Engineering hours ($125 per hour) Includes Cad design drawing
Environmental Planning and permitting	$ 5,000		Assumes environmental firm assessment
Project Management	$ 12,000		Based on 160 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 8,800		Based on 160 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 64,000	1	Based on 160 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ 8,000		Based on 160 hours 2-man crew + tapping equipment ($50 per hour - in house)
Pipeline materials	$ 15,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Regulators	$ 72,000		Assumes four 6" Beckers - With extensions - Buried
Valves - below ground	$ 40,000		Assumes five 8" Full Port Delta Ball Valves ANSI-300
Valves - Controls line valves	$ 4,000		Assumes four 2" Full Port Delta Ball Valves ANSI-300
Misc Materials	$ 20,000		Flanges, tees, elbows, reducers, TOL's, insulating kits, etc.
Telemeters	$ 15,000		Based on best estimate
Contraction materials / Civil site work	$ 7,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 16,000		Based on 160 hours 2-man crew ($50 per hour - in house)
Traffic Control	$ 24,000		Based on 160 project hours at $75 per hour State Police two troopers
TOTAL	$ 330,800		
10% Cont	**$ 363,880**		

Assumptions	
1	Pressure test included in cost

Scenario	11	Date	10/27/2009	Rev:	2	Install ball valve regulator station at the Varney Brook Meter Station in Dover, NH (feeding north 305 PSIG)

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 20,000		Based on 160 Engineering hours ($125 per hour) Includes Cad design drawing
Environmental Planning and permitting	$ 5,000		Assumes environmental firm assessment
Project Management	$ 12,000		Based on 160 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 8,800		Based on 160 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 64,000	1	Based on 160 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ 8,000		Based on 160 hours 2-man crew + tapping equipment ($50 per hour - in house)
Pipeline materials	$ 15,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Regulators	$ 72,000		Assumes four 6" Beckers - With extensions - Buried
Valves - below ground	$ 40,000		Assumes five 8" Full Port Delta Ball Valves ANSI-300
Valves - Controls line valves	$ 4,000		Assumes four 2" Full Port Delta Ball Valves ANSI-300
Misc Materials	$ 20,000		Flanges, tees, elbows, reducers, TOL's, insulating kits, etc.
Telemeters	$ 15,000		Based on best estimate
Contraction materials / Civil site work	$ 7,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 16,000		Based on 160 hours 2-man crew ($50 per hour - in house)
Traffic Control	$ 24,000		Based on 160 project hours at $75 per hour State Police two troopers
TOTAL	$ 330,800		
10% Cont	**$ 363,880**		

Assumptions	
1	Pressure test included in cost

Scenario	11	Date	10/27/2009	Rev:	2	**Abandon Borthwick Ave meter and regulator station in Portsmouth, NH**

Description	**Cost**	**Assumption #**	**Comments**
Engineering Design and planning	$ 12,500		Based on 100 Engineering hours ($125 per hour)
Project Management	$ 9,000		Based on 120 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 6,600		Based on 120 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Environmental Planning and permitting	$ 20,000	1	Based on best estimate
Project Contractor	$ 48,000		Based on 120 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
Pipeline materials	$ 2,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Contraction materials / Civil site work	$ 4,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 6,000		Based on 120 hours 1-man crew ($50 per hour - in house) - Needed to man valves and site inspection
TOTAL	$ 108,100		
10% Cont	**$ 118,910**		

Assumptions	
1	Wetland area. Station is on a peninsula surrounded by wetlands

Scenario	11	Date	10/27/2009	Rev:	2	**Abandon Varney Brook Meter Station**

Description	**Cost**	**Assumption #**	**Comments**
Engineering Design and planning	$ 6,250		Based on 50 Engineering hours ($125 per hour)
Project Management	$ 3,750		Based on 50 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 2,750		Based on 50 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Environmental Planning and permitting	$ 20,000	1	Based on best estimate
Project Contractor	$ 20,000		Based on 50 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
Pipeline materials	$ 2,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Contraction materials / Civil site work	$ 1,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 5,000		Based on 100 hours 1-man crew ($50 per hour - in house) - Needed to man valves and site inspection
TOTAL	$ 60,750		
10% Cont	**$ 66,825**		

Assumptions	
1	Major wetland area. Station is on a peninsula surrounded by wetlands

Scenario	11	Date	10/22/2009	Rev:	1	Abandon Pipeline across Piscataqua River NH/ME - Year 1

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 20,000		Based on 160 Engineering hours ($125 per hour)
Project Management	$ 12,000		Based on 160 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 8,800		Based on 50 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 20,000		Based on 50 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ 2,000		Based on 20 hours 2-man crew + tapping equipment ($50 per hour - in house)
Pipeline materials	$ 5,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Contraction materials / Civil site work	$ 3,500		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 7,500		Based on 50 hours 3-man crew ($50 per hour in house) - Needed to man valves and site inspection
Pig receivers	$ 80,000		One required at each location. Based on a cost of $50,000 per unit ($10,000 includes installation by fabrication contactor.
Gas Loss	$ 386		Based on $10 per DTH
Abandon Eliot Meter Station	$ 20,000	1	Based on best estimate ($20,000)
TOTAL	$ 179,186		
10% Cont	**$ 197,104**		

Assumptions	
1	This estimate does not include the reuse of materials or re-stocking of parts and components into inventory

Scenario	11	Date	10/22/2009	Rev:	1	Abandon Eliot Meter Station		
Description						**Cost**	**Assumption #**	**Comments**
Engineering Design and planning						$ 6,250		Based on 50 Engineering hours ($125 per hour)
Project Management						$ 3,750		Based on 50 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector						$ 2,750		Based on 50 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Environmental Planning and permitting						$ 20,000	1	Based on best estimate
Project Contractor						$ 20,000		Based on 50 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
Pipeline materials						$ 2,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Contraction materials / Civil site work						$ 1,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews						$ 5,000		Based on 100 hours 1-man crew ($50 per hour - in house) - Needed to man valves and site inspection
					TOTAL	$ 60,750		
					10% Cont	**$ 66,825**		

Assumptions	
1	Wetland area.

Scenario	11	Date	10/21/2009	Rev:	1	Replace 5,562 of existing 6-inch pipeline from Varney Bark Mtr. Sta to Applevale Lat Dover, NH with 12-inch

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 27,810		Based on best estimate
Environmental Planning and permitting	$ 33,372	1	Assumes environmental firm assessment
Project Management	$ 20,858		Based ($75 per hour) assumes contractor project manager
Project Inspector	$ 15,296		Based on ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 667,440	2	Based on 4-person crew(s) 800/hr (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ 6,250		Based on 2-man crew + tapping equipment ($125 per hour - in house)
Pipeline materials	$ 255,852		Pipe
Contraction materials / Civil site work	$ 38,934		Gravel, sand, saw-cut, paving, loam & seed etc.
Misc Materials	$ 22,248		Tees, elbows, reducers, TOL's, insulating kits, etc.
ROW and Land Rights	$ 27,810	3	
Misc.	$ 61,182		Misc.(x-ray, sand blast, appoxy coat, pipe delivery)
NU Crews	$ 27,810		Based on 2-man crew ($100 per hour - in house)
Traffic Control	$ 41,715	4	Based on $75 per hour (local police)
TOTAL	$ 1,246,576		
10% Cont	**$ 1,371,234**		

Assumptions	
1	Significant amount of marsh and wet lands
2	Assumes ledge removal & hydro test
3	This does not include temporary land space for construction. This cost would be extra
4	Assumes that Dover Point Road can be "open cut"

Scenario	11	Date	Rev:	2	Wells Gate - Year 1	

Description	Cost	Assumption #	Comments
Preliminary Engineering and design	$ 20,000		Based on past practice - Preliminary engineering only (includes bid package)
Project Management	$ 45,000		Third Party project manager based on 3 months of on and off site project management $(75 per hour at 600 hours total)
Project Inspector	$ 33,000		Based on 600 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector.
Design Build and Install	$ 1,300,000	1	Based on Cotton Road Gate Station - Includes pipeline tap and environmental permitting and civil site work
Hot tap on M&N	$ 250,000		Based on best estimate
Land acquisition	$ 250,000		Best estimate
GSGT Crews	$ 30,000		Based on one man for project duration (600 hours at $50/hour)
TOTAL	$ 1,928,000.00		
10% Cont	**$ 2,120,800.00**		

Assumptions	
1	Assumes design build firm will provide all utilities services required

Scenario	12	Date	10/27/2009	Rev:	2

(80-EDD Peak hour model) (Disconnect the pipeline crossing the Little Bay Bridge in Newington, NH and maintain the Piscataqua River crossing at NH/ME State border, declassify ALL pipeline segments to distribution class and implement the minimum amount of system improvements (if required) to operate prudently.

No.	Description	Cost		Comments
1	Abandon Forrest Street pressure regulator station in Plaistow, NH	$	42,075	New Hampshire
2	Replace 3,377 of existing 8-inch pipeline on Gosling Rd in Newington, NH with 12-inch	$	936,614	New Hampshire
3	Install ball valve regulator station on PEASE lateral in Newington, NE	$	359,480	New Hampshire
4	Install ball valve regulator station at the Varney Brook Meter Station in Dover, NH (feeding north 397 PSIG)	$	363,880	New Hampshire
5	Install ball valve regulator station at the Varney Brook Meter Station in Dover, NH (feeding south 305 PSIG)	$	363,880	New Hampshire
6	Abandon Varney Brook Meter Station	$	66,825	New Hampshire
7	Abandon Borthwick Ave meter and regulator station in Portsmouth, NH	$	118,910	New Hampshire
8	Abandon Pipeline crossing the Little Bay Bridge in Newington, NH	$	229,798	New Hampshire
9	Replace 6,980 of existing 8-inch (0.156 WT with 8-inch (0.322 WT) From Varney Brook Mtr Station to Piscataqua River	$	1,280,008	New Hampshire
	TOTAL	**$**	**3,761,470**	

No.	Description	Cost		Comments
10	Modify Pressure regulator station at Payne Road M&R station with new Ball Valve Regs.	$	335,060	Maine
11	Replace 11,496 of existing 8-inch pipeline from Westbrook Gate to North of Blueberry Rd Station with 8-inch	$	2,632,379	Maine
12	Abandon Eliot Meter Station	$	66,825	Maine
13	Install ball valve regulator station at the new Eliot Gate Station (feeding north 250 PSIG)	$	363,880	Maine
14	Replace 5,358 of existing 8-inch (0.156 WT with 8-inch (0.322 WT) From the new Eliot Gate Station to the Piscataqua River	$	982,494	Maine
15	Install ball valve regulator station 1,297-feet north of Blueberry Road Station	$	377,080	Maine
16	Eliot Gate - Year 1	$	2,120,800	Maine
	TOTAL	**$**	**6,878,518**	

No.	Description	Cost		Comments
17	Install pressure regulators at Haverhill Gate station in Haverhill, MA	$	473,660	Massachusetts
	TOTAL	**$**	**473,660**	

GRAND TOTAL $ 11,113,647

Notes:
1) FERC costs associated with this scenario are not included in the estimates
2) Base Costs - No Overheads included in the estimates
3) Estimates assume that all new GSGT regulator stations will be built on existing ROW and that no land acquisition is required
4) Estimates made with a degree of knowledge and confidence that the estimated figures fall within reasonable ranges of values
5) Should this scenario be implemented, firm quotes will be ascertained, based on the engineering design plan for each sub-scenario

Scenario	12	Date	10/27/2009	Rev:	2	Abandon Forrest Street pressure regulator station in Plaistow, NH

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 6,250		Based on 50 Engineering hours ($125 per hour)
Project Management	$ 3,750		Based on 50 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 2,750		Based on 50 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 20,000	1	Based on 50 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
Pipeline materials	$ 2,000	2	Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Contraction materials / Civil site work	$ 1,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 2,500		Based on 50 hours 1-man crew ($50 per hour - in house) - Needed to man valves and site inspection
TOTAL	$ 38,250		
10% Cont	**$ 42,075**		

Assumptions	
1	Assumes that pressure from Haverhill Gate Station will be lowered to 492 PSIG or less during abandonment when Forrest Street station will be on b
2	This estimate does not include the reuse of materials or re-stocking of parts and components into inventory

Scenario	12	Date	10/27/2009	Rev:	2	Install pressure regulators at Haverhill Gate station in Haverhill, MA

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 12,000		Based on 160 Engineering hours ($75 per hour) Includes Cad design drawing
Project Management	$ 12,000		Based on 160 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 6,600		Based on 120 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 88,000		Based on 160 hours 5-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
Regulators	$ 72,000	1	Assumes four 6" Beckers - With extensions - Buried
Valves - Below ground	$ 40,000		Assumes five 8" Full Port Delta Ball Valves ANSI-300
Valves - Controls line valves	$ 4,000		Assumes four 2" Full Port Delta Ball Valves ANSI-300
Pre Heat System	$ 100,000		Assumes four 2" Full Port Delta Ball Valves ANSI-300
Piping Materials	$ 25,000		Flanges, tees, elbows, reducers, etc
Regulated Bypass set-up	$ 20,000		Set up station with bypass regulator during construction
Misc Materials	$ 20,000		Tubing, Fittings, Filters, Strainers
Telemeter	$ 15,000		Based on best estimate
NU Crews	$ 16,000		Based on 160 hours 2-man crew ($50 per hour - in house)
TOTAL	$ 430,600		
10% Cont	**$ 473,660**		

Assumptions	
1	Assumes station to be built on existing ROW - No land costs

Scenario	12	Date	10/22/2009	Rev:	1	Replace 3,377 of existing 8-inch pipeline on Gosling Rd in Newington, NH with 12-inch

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 16,885		Based on best estimate
Environmental Planning and permitting	$ 20,262	1	Assumes environmental firm assessment
Project Management	$ 12,664		Based on ($75 per hour) assumes contractor project manager
Project Inspector	$ 9,287		Based on ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 270,160	2	Based $800/hr per crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ -	3	Tapping
Pipeline materials	$ 155,342		Pipe
Construction materials / Civil site work	$ 100,000	4	Gravel, sand, paving saw cut, etc.
Railroad crossing (directional drill)	$ 84,000		Drill under tracks
Misc Materials	$ 13,508		Tees, elbows, reducers, TOL's, insulating kits, etc.
Paving	$ 90,000		100% pavement - Based on current contractor pricing
Misc	$ 37,147		Misc.(x-ray, sand blast, appoxy coat, pipe delivery)
GSGT / NU Crews	$ 16,885		Based on 2 person crew ($100 per hour - in house)
Traffic Control	$ 25,328		Based on best estimate - Two officers at $75/hour
TOTAL	$ 851,467		
10% Cont	**$ 936,614**		

Assumptions	
1	Stream Crossing on Gosling Road and Oil tank farm at Schiller. Assumes no environmental issues will be identified
2	Assumes ledge removal & hydro test
3	Assumes tapping crew will not ne required. Line can be shut down
4	Significant amount of construction materials required

Scenario	12	Date	10/21/2009	Rev:	2	Install ball valve regulator station on PEASE lateral in Newington, NE

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 20,000		Based on 160 Engineering hours ($125 per hour) Includes Cad design drawing
Environmental Planning and permitting	$ 5,000		Assumes environmental firm assessment
Project Management	$ 12,000		Based on 160 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 8,800		Based on 160 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 64,000	1	Based on 160 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ 4,000		Based on 80 hours 2-man crew + tapping equipment ($50 per hour - in house)
Pipeline materials	$ 15,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Regulators	$ 72,000		Assumes four 6" Beckers - With extensions - Buried
Valves - Below ground	$ 40,000		Assumes five 8" Full Port Delta Ball Valves ANSI-300
Valves - Controls line valves	$ 4,000		Assumes four 2" Full Port Delta Ball Valves ANSI-300
Misc Materials	$ 20,000		Based on best estimate (includes enclosures for Beckers)
Telemeters	$ 15,000		Based on best estimate
Contraction materials / Civil site work	$ 7,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 16,000		Based on 160 hours 2-man crew ($50 per hour - in house)
Traffic Control	$ 24,000		Based on 160 project hours at $75 per hour State Police two troopers
TOTAL	$ 326,800		
10% Cont	**$ 359,480**		

Assumptions	
1	Pressure test included in cost

Scenario	12	Date	10/21/2009	Rev:	1	Install ball valve regulator station at the Varney Brook Meter Station in Dover, NH (feeding south 305 PSIG)

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 20,000		Based on 160 Engineering hours ($125 per hour) Includes Cad design drawing
Environmental Planning and permitting	$ 5,000		Assumes environmental firm assessment
Project Management	$ 12,000		Based on 160 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 8,800		Based on 160 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 64,000	1	Based on 160 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ 8,000		Based on 160 hours 2-man crew + tapping equipment ($50 per hour - in house)
Pipeline materials	$ 15,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Regulators	$ 72,000		Assumes four 6" Beckers - With extensions - Buried
Valves - below ground	$ 40,000		Assumes five 8" Full Port Delta Ball Valves ANSI-300
Valves - Controls line valves	$ 4,000		Assumes four 2" Full Port Delta Ball Valves ANSI-300
Misc Materials	$ 20,000		Flanges, tees, elbows, reducers, TOL's, insulating kits, etc.
Telemeters	$ 15,000		Based on best estimate
Contraction materials / Civil site work	$ 7,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 16,000		Based on 160 hours 2-man crew ($50 per hour - in house)
Traffic Control	$ 24,000		Based on 160 project hours at $75 per hour State Police two troopers
TOTAL	$ 330,800		
10% Cont	**$ 363,880**		

Assumptions	
1	Pressure test included in cost

Scenario	12	Date	10/21/2009	Rev:	1	Install ball valve regulator station at the Varney Brook Meter Station in Dover, NH (feeding north 397 PSIG)

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 20,000		Based on 160 Engineering hours ($125 per hour) Includes Cad design drawing
Environmental Planning and permitting	$ 5,000		Assumes environmental firm assessment
Project Management	$ 12,000		Based on 160 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 8,800		Based on 160 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 64,000	1	Based on 160 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ 8,000		Based on 160 hours 2-man crew + tapping equipment ($50 per hour - in house)
Pipeline materials	$ 15,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Regulators	$ 72,000		Assumes four 6" Beckers - With extensions - Buried
Valves - below ground	$ 40,000		Assumes five 8" Full Port Delta Ball Valves ANSI-300
Valves - Controls line valves	$ 4,000		Assumes four 2" Full Port Delta Ball Valves ANSI-300
Misc Materials	$ 20,000		Flanges, tees, elbows, reducers, TOL's, insulating kits, etc.
Telemeters	$ 15,000		Based on best estimate
Contraction materials / Civil site work	$ 7,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 16,000		Based on 160 hours 2-man crew ($50 per hour - in house)
Traffic Control	$ 24,000		Based on 160 project hours at $75 per hour State Police two troopers
TOTAL	$ 330,800		
10% Cont	**$ 363,880**		

Assumptions	
1	Pressure test included in cost

Scenario	12	Date	10/21/2009	Rev:	1	**Abandon Varney Brook Meter Station**

Description	**Cost**	**Assumption #**	**Comments**
Engineering Design and planning	$ 6,250		Based on 50 Engineering hours ($125 per hour)
Project Management	$ 3,750		Based on 50 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 2,750		Based on 50 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Environmental Planning and permitting	$ 20,000	1	Based on best estimate
Project Contractor	$ 20,000		Based on 50 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
Pipeline materials	$ 2,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Contraction materials / Civil site work	$ 1,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 5,000		Based on 100 hours 1-man crew ($50 per hour - in house) - Needed to man valves and site inspection
TOTAL	$ 60,750		
10% Cont	**$ 66,825**		

Assumptions	
1	Major wetland area. Station is on a peninsula surrounded by wetlands

Scenario	12	Date	10/21/2009	Rev:	1	**Abandon Borthwick Ave meter and regulator station in Portsmouth, NH**

Description	**Cost**	**Assumption #**	**Comments**
Engineering Design and planning	$ 12,500		Based on 100 Engineering hours ($125 per hour)
Project Management	$ 9,000		Based on 120 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 6,600		Based on 120 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Environmental Planning and permitting	$ 20,000	1	Based on best estimate
Project Contractor	$ 48,000		Based on 120 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
Pipeline materials	$ 2,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Contraction materials / Civil site work	$ 4,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 6,000		Based on 120 hours 1-man crew ($50 per hour - in house) - Needed to man valves and site inspection
TOTAL	$ 108,100		
10% Cont	**$ 118,910**		

Assumptions	
1	Wetland area.

Scenario	12	Date	10/21/2009	Rev:	1	Abandon Pipeline crossing the Little Bay Bridge in Newington, NH

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 20,000		Based on 160 Engineering hours ($125 per hour)
Project Management	$ 12,000		Based on 160 Project manager hours ($75 per hour) assumes contractor project manager
Environmental planning and special permitting	$ 30,000	1	Based on best estimate
Project Inspector	$ 2,750		Based on 50 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 20,000		Based on 50 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ 4,000		Based on 40 hours 2-man crew + tapping equipment ($50 per hour - in house)
Pipeline materials	$ 7,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Contraction materials / Civil site work	$ 5,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 7,500		Based on 50 hours 3-man crew ($50 per hour - in house) - Needed to man valves and site inspection
Remove pipe from existing bridge	$ 100,000		Based on best estimate - Assumes contractor lump sum price to remove pipe from bridge
Gas Loss	$ 657		Based on $10 per DTH
TOTAL	$ 208,907		
10% Cont	**$ 229,798**		

Assumptions	
1	Assumes special environmental permitting (i.e. marine environmental impact, water way patrolling and vessel control)

Scenario	12	Date	10/27/2009	Rev:	2	Replace 5,358 of existing 8-inch (0.156 WT with 8-inch (0.322 WT) From the new Eliot Gate Station to the Piscataqua River

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 26,790		Based on best estimate
Environmental Planning and permitting	$ 32,148		Assumes environmental firm assessment
Project Management	$ 13,395		Based on ($75 per hour) assumes contractor project manager
Project Inspector	$ 9,823		Based on ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 428,640	1	Based on 4-person crew(s) $800/hr (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ 6,250		Based 2-man crew + tapping equipment ($125 per hour - in house)
Pipeline materials	$ 203,604		Pipe
Construction materials / Civil site work	$ 37,506		Gravel, sand, paving saw cut, etc.
Misc Materials	$ 21,432		Tees, elbows, reducers, TOL's, insulating kits, etc.
Paving	$ 10,000	2	Based on best estimate
Misc	$ 58,938		Misc.(x-ray, sand blast, appoxy coat, pipe delivery)
GSGT / NU Crews	$ 17,860		Based on 2-man crew ($100 per hour - in house)
Traffic Control	$ 26,790		Based on $75 per hour (local police)
TOTAL	$ 893,176		
10% Cont	**$ 982,494**		

Assumptions	
1	Assumes ledge removal & hydro test
2	Open Cut Dover Point Road

Scenario	12	Date	10/27/2009	Rev:	2	Replace 6,980 of existing 8-inch (0.156 WT with 8-inch (0.322 WT) From Varney Brook Mtr Station to Piscataqua River

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 34,900		Based on best estimate
Environmental Planning and permitting	$ 41,880		Assumes environmental firm assessment
Project Management	$ 17,450		Based on ($75 per hour) assumes contractor project manager
Project Inspector	$ 12,797		Based on ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 558,400	1	Based on 4-person crew(s) $800/hr (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ 6,250		Based 2-man crew + tapping equipment ($125 per hour - in house)
Pipeline materials	$ 265,240		Pipe
Construction materials / Civil site work	$ 48,860		Gravel, sand, paving saw cut, etc.
Misc Materials	$ 27,920		Tees, elbows, reducers, TOL's, insulating kits, etc.
Paving	$ 15,000	2	Based on best estimate
Misc	$ 76,780		Misc.(x-ray, sand blast, appoxy coat, pipe delivery)
GSGT / NU Crews	$ 23,267		Based on 2-man crew ($100 per hour - in house)
Traffic Control	$ 34,900		Based on $75 per hour (local police)
TOTAL	$ 1,163,643		
10% Cont	**$ 1,280,008**		

Assumptions	
1	Assumes ledge removal & hydro test
2	Open Cut Dover Point Road

Scenario	12	Date	10/21/2009	Rev:	2	Modify Pressure regulator station at Payne Road M&R station with new Ball Valve Regs.

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 20,000		Based on 160 Engineering hours ($125 per hour) Includes Cad design drawing
Project Management	$ 12,000		Based on 160 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 6,600		Based on 120 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 88,000	1	Based on 160 hours 5-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
Regulators	$ 82,000		Assumes four 6" Beckers
Valves -	$ -		Use existing
Valves - Controls line valves	$ -		Use existing
Piping Materials	$ 25,000		Flanges, tees, elbows, reducers, etc
Regulated Bypass set-up	$ 20,000		Set up station with bypass regulator during construction
Misc Materials	$ 20,000		Tubing, Fittings, Filters, Strainers
Telemeter	$ 15,000		Based on best estimate
NU Crews	$ 16,000		Based on 160 hours 2-man crew ($50 per hour - in house)
TOTAL	$ 304,600		
10% Cont	**$ 335,060**		

Assumptions	
1	Assumes the removal of existing equipment at Payne Road station and the use of existing building for modified station

Scenario	12	Date	10/21/2009	Rev:	2	**Replace 11,496 of existing 8-inch pipeline from Westbrook Gate to North of Blueberry Rd Station with 8-inch**

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 57,480		Based on best estimate
Environmental Planning and permitting	$ 68,976		Assumes environmental firm assessment
Project Management	$ 28,740		Based on ($75 per hour) assumes contractor project manager
Project Inspector	$ 21,076		Based on ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 1,226,240	1	Based on 4-person crew(s) $800/hr (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ 10,000		Based 2-man crew + tapping equipment ($125 per hour - in house)
Pipeline materials	$ 436,848		Pipe
Construction materials / Civil site work	$ 80,472		Gravel, sand, paving saw cut, etc.
Misc Materials	$ 45,984		Tees, elbows, reducers, TOL's, insulating kits, etc.
Directional Drilling	$ 160,000		Directional Drills
Paving	$ 35,000	2	Based on best estimate
Misc	$ 126,456		Misc.(x-ray, sand blast, appoxy coat, pipe delivery)
GSGT / NU Crews	$ 38,320		Based on 2-man crew ($100 per hour - in house)
Traffic Control	$ 57,480		Based on $75 per hour (local police)
TOTAL	$ 2,393,072		
10% Cont	**$ 2,632,379**		

Assumptions	
1	Marsh and wet lands
2	Assumes ledge removal & hydro test
3	This does not include temporary land space for construction. This cost would be extra

Scenario	12	Date	10/21/2009	Rev:	2	Install ball valve regulator station 1,297-feet north of Blueberry Road Station

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 20,000		Based on 160 Engineering hours ($125 per hour) Includes Cad design drawing
Environmental Planning and permitting	$ 5,000		Assumes environmental firm assessment
Project Management	$ 12,000		Based on 160 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 8,800		Based on 160 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 64,000	1	Based on 160 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ 8,000		Based on 160 hours 2-man crew + tapping equipment ($50 per hour - in house)
Pipeline materials	$ 15,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Regulators	$ 72,000		Assumes four 6" Beckers - With extensions - Buried
Valves - Below ground	$ 40,000		Assumes five 8" Full Port Delta Ball Valves ANSI-300
Valves - Controls line valves	$ 4,000		Assumes four 2" Full Port Delta Ball Valves ANSI-300
Misc Materials	$ 20,000		Based on best estimate (includes enclosures for Beckers)
Misc Materials	$ 12,000		Flanges, tees, elbows, reducers, TOL's, insulating kits, etc.
Telemeters	$ 15,000		Based on best estimate
Contraction materials / Civil site work	$ 7,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 16,000		Based on 160 hours 2-man crew ($50 per hour - in house)
Traffic Control	$ 24,000		Based on 160 project hours at $75 per hour State Police two troopers
TOTAL	$ 342,800		
10% Cont	**$ 377,080**		

Assumptions	
1	Pressure test included in cost

Scenario	12	Date	10/22/2009	Rev:	1	**Abandon Eliot Meter Station**

Description	**Cost**	**Assumption #**	**Comments**
Engineering Design and planning	$ 6,250		Based on 50 Engineering hours ($125 per hour)
Project Management	$ 3,750		Based on 50 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 2,750		Based on 50 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Environmental Planning and permitting	$ 20,000	1	Based on best estimate
Project Contractor	$ 20,000		Based on 50 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
Pipeline materials	$ 2,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Contraction materials / Civil site work	$ 1,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 5,000		Based on 100 hours 1-man crew ($50 per hour - in house) - Needed to man valves and site inspection
TOTAL	$ 60,750		
10% Cont	**$ 66,825**		

Assumptions	
1	Major wetland area.

Scenario	12	Date	10/22/2009	Rev:	1	Install ball valve regulator station at the new Eliot Gate Station (feeding north 250 PSIG)

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 20,000		Based on 160 Engineering hours ($125 per hour) Includes Cad design drawing
Environmental Planning and permitting	$ 5,000		Assumes environmental firm assessment
Project Management	$ 12,000		Based on 160 Project manager hours ($75 per hour) assumes contractor project manager
Project Inspector	$ 8,800		Based on 160 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 64,000	1	Based on 160 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ 8,000		Based on 160 hours 2-man crew + tapping equipment ($50 per hour - in house)
Pipeline materials	$ 15,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Regulators	$ 72,000		Assumes four 6" Beckers - With extensions - Buried
Valves - below ground	$ 40,000		Assumes five 8" Full Port Delta Ball Valves ANSI-300
Valves - Controls line valves	$ 4,000		Assumes four 2" Full Port Delta Ball Valves ANSI-300
Misc Materials	$ 20,000		Flanges, tees, elbows, reducers, TOL's, insulating kits, etc.
Telemeters	$ 15,000		Based on best estimate
Contraction materials / Civil site work	$ 7,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 16,000		Based on 160 hours 2-man crew ($50 per hour - in house)
Traffic Control	$ 24,000		Based on 160 project hours at $75 per hour State Police two troopers
TOTAL	$ 330,800		
10% Cont	**$ 363,880**		

Assumptions	
1	Pressure test included in cost

Scenario	12	Date	Rev:	2	Eliot Gate - Year 1

Description	Cost	Assumption #	Comments
Preliminary Engineering and design	$ 20,000		Based on past practice - Preliminary engineering only (includes bid package)
Project Management	$ 45,000		Third Party project manager based on 3 months of on and off site project management $(75 per hour at 600 hours total)
Project Inspector	$ 33,000		Based on 600 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector.
Design Build and Install	$ 1,300,000	1	Based on Cotton Road Gate Station - Includes pipeline tap and environmental permitting and civil site work
Hot tap on M&N	$ 250,000		Based on best estimate
Land acquisition	$ 250,000		Best estimate
GSGT Crews	$ 30,000		Based on one man for project duration (600 hours at $50/hour)
TOTAL	$ 1,928,000.00		
10% Cont	**$ 2,120,800.00**		

Assumptions	
1	Assumes design build firm will provide all utilities services required

Scenario	13 & 13A	Date	10/23/2009	Rev:	2

(80-EDD Peak hour model) - (Maintain Piscataqua River crossing at NH/ME State border, add new Gate Station in southern Maine, abandon the 8-inch pipe from Nimble Hill Road Station in Newington, NH to the Dover Point station in Dover, NH, including the 10-inch pipe spanning Little Bay, suspended on the Little Bay Bridge in Newington, NH and operate at maximum pipeline supply pressures.) [2] (Determine system growth potential by maintaining Piscataqua River crossing at NH/ME State border, add new Gate Station in southern Maine, abandon the 8-inch pipe from Nimble Hill Road Station in Newington, NH to the Dover Point station in Dover, NH, including the 10-inch pipe spanning Little Bay, suspended on the Little Bay Bridge in Newington, NH and operate at maximum supply pressures to the point where system instability begins.)

No.	Description	Cost	Comments
1	Pipeline Integrity - Year 2010	$ -	New Hampshire
2	Pipeline Integrity - Year 2011	$ -	New Hampshire
3	Pipeline Integrity - Year 2012	$ -	New Hampshire
1	Abandon Pipeline crossing the Little Bay Bridge in Newington, NH	$ 229,798	New Hampshire
	TOTAL	**$ 229,798**	

No.	Description	Cost	Comments
1	Pipeline Integrity - Year 2010	$ -	Maine
2	Pipeline Integrity - Year 2011	$ -	Maine
3	Pipeline Integrity - Year 2012	$ -	Maine
1	Eliot Gate - Year 1	$ 2,120,800	Maine
	TOTAL	**$ 2,120,800**	

GRAND TOTAL $ 2,350,598

Notes:

1) FERC costs associated with this scenario are not included in the estimates
2) Base Costs - No Overheads included in the estimates
3) Estimates made with a degree of knowledge and confidence that the estimated figures fall within reasonable ranges of values
4) Should this scenario be implemented, firm quotes will be ascertained, based on the engineering design plan for each sub-scenario

Scenario	13 & 13A	Date	10/21/2009	Rev:	1	Abandon Pipeline crossing the Little Bay Bridge in Newington, NH

Description	Cost	Assumption #	Comments
Engineering Design and planning	$ 20,000		Based on 160 Engineering hours ($125 per hour)
Project Management	$ 12,000		Based on 160 Project manager hours ($75 per hour) assumes contractor project manager
Environmental planning and special permitting	$ 30,000	1	Based on best estimate
Project Inspector	$ 2,750		Based on 50 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector
Project Contractor	$ 20,000		Based on 50 hours 4-man crew (heavy construction equipment required i.e. excavator, dump truck, etc) includes welder
NU tapping crew	$ 4,000		Based on 40 hours 2-man crew + tapping equipment ($50 per hour - in house)
Pipeline materials	$ 7,000		Based on approximate current cost (Mueller fittings, tees, blow-down stack, caps, nipples, TOL's etc)
Contraction materials / Civil site work	$ 5,000		Estimated (Gravel, Stone, Loam, Seed etc)
GSGT Crews	$ 7,500		Based on 50 hours 3-man crew ($50 per hour - in house) - Needed to man valves and site inspection
Remove pipe from existing bridge	$ 100,000		Based on best estimate - Assumes contractor lump sum price to remove pipe from bridge
Gas Loss	$ 657		Based on $10 per DTH
TOTAL	$ 208,907		
10% Cont	**$ 229,798**		

Assumptions	
1	Assumes special environmental permitting (i.e. marine environmental impact, water way patrolling and vessel control)

Scenario	13 & 13A	Date	Rev:	2	Eliot Gate - Year 1

Description	Cost	Assumption #	Comments
Preliminary Engineering and design	$ 20,000		Based on past practice - Preliminary engineering only (includes bid package)
Project Management	$ 45,000		Third Party project manager based on 3 months of on and off site project management $(75 per hour at 600 hours total)
Project Inspector	$ 33,000		Based on 600 Project pipeline inspector hours ($55 per hour) assumes contractor pipeline inspector.
Design Build and Install	$ 1,300,000	1	Based on Cotton Road Gate Station - Includes pipeline tap and environmental permitting and civil site work
Hot tap on M&N	$ 250,000		Based on best estimate
Land acquisition	$ 250,000		Best estimate
GSGT Crews	$ 30,000		Based on one man for project duration (600 hours at $50/hour)
TOTAL	$ 1,928,000.00		
10% Cont	**$ 2,120,800.00**		

Assumptions	
1	Assumes design build firm will provide all utilities services required

Appendix H:
Summaries of the Cumulative NPV Revenue Requirements by Scenario

Pressure	Transmission Pressure				Distribution Pressure			Hybrid Transmission and Distribution		
Configuration	Integrated	Integrated	Split at Border	Split at LBB	Integrated	Split at Border	Split at LBB	Integrated	Split at Border	Split at LBB
Scenario	Baseline 1	Baseline 2	Scenario 2	Scenario 13A	Scenario 10	Scenario 3A	Scenario 12	Scenario 7	Scenario 11A	Scenario 5
2020	$5,156,909	$5,278,843	$7,226,850	$4,992,942	$10,880,616	$13,480,983	$9,368,103	$6,996,976	$10,291,884	$5,073,300
2030	$6,350,631	$6,650,262	$8,799,403	$6,125,473	$13,023,814	$16,107,492	$11,184,482	$8,487,063	$12,402,089	$6,155,579
2040	$6,856,099	$7,197,405	$9,403,591	$6,614,994	$13,582,316	$16,791,942	$11,657,817	$8,932,515	$13,009,139	$6,494,760
2050	$6,983,867	$7,336,041	$9,551,150	$6,739,566	$13,694,280	$16,929,155	$11,752,707	$9,038,524	$13,147,544	$6,579,464
2060	$7,033,618	$7,387,693	$9,601,589	$6,789,206	$13,698,169	$16,933,920	$11,756,003	$9,058,341	$13,168,486	$6,598,541
2070	$7,055,803	$7,409,887	$9,623,752	$6,811,394	$13,698,049	$16,933,774	$11,755,901	$9,067,328	$13,177,439	$6,607,551

Pressure	Transmission Pressure				Distribution Pressure			Hybrid Transmission and Distribution		
Configuration	Integrated	Integrated	Split at Border	Split at LBB	Integrated	Split at Border	Split at LBB	Integrated	Split at Border	Split at LBB
Scenario	Baseline 1	Baseline 2	Scenario 2	Scenario 13A	Scenario 10	Scenario 3A	Scenario 12	Scenario 7	Scenario 11A	Scenario 5
2020	3	4	6	1	11	13	9	5	10	2
2030	3	4	7	1	11	13	9	5	10	2
2040	3	4	7	2	11	13	9	5	10	1
2050	3	4	7	2	11	13	9	5	10	1
2060	3	4	7	2	11	13	9	5	10	1
2070	3	4	7	2	11	13	9	5	10	1