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June 15, 2012

VIA ELECTRONIC FILING AND PERSONAL DELIVERY

Public Utility Commission of Oregon
550 Capitol Street, NE, Suite 215
Post Office Box 2148
Salem, Oregon 97308-2148

Attention: Filing Center

Re: UG 221 – Reply Testimony
Application of NW Natural for a General Rate Revision

Enclosed please find an original and five (5) copies of Reply Testimony and supporting Exhibits of Northwest Natural Gas Company, dba NW Natural ("NW Natural" or "Company).

Please call me if you have questions.

Sincerely,

NW NATURAL

/s/ Mark R. Thompson

Mark R. Thompson
Manager, Rates & Regulatory Affairs

enclosures

NW Natural

CERTIFICATE OF SERVICE

I hereby certify that I served the foregoing REPLY TESTIMONY AND SUPPORTING EXHIBITS OF NW NATURAL in docket UG 221, upon each party listed in the Service List by electronic mail and, where paper service is not waived, by U.S. mail, postage prepaid.

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DATED at Portland, Oregon, this 15th day of June, 2012

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UG 221
REPLY TESTIMONY OF NW NATURAL

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BEFORE THE

PUBLIC UTILITY COMMISSION OF OREGON

UG 221

NW Natural

Reply Testimony of David Anderson

POLICY
EXHIBIT 1800

June 15, 2012

EXHIBIT 1800 – REPLY TESTIMONY – POLICY

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I. INTRODUCTION AND SUMMARY

Q. Are you the same David Anderson who filed direct testimony in this proceeding on behalf of Northwest Natural Gas Company ("NW Natural" or the "Company")?

A. Yes, as Exhibit NWN/200.

Q. What is the purpose of your reply testimony?

A. In this testimony I will:

- Update the Company's request for a rate increase in this case,
- Respond to the testimony of Commission Staff witness Judy Johnson,
- Summarize the positions presented by the parties in their opening testimony (the parties that filed opening testimony include Commission Staff ("Staff"), Citizens' Utility Board (CUB), Northwest Industrial Gas Users (NWIGU), a witness sponsored jointly by NWIGU-CUB, and the NW Energy Coalition (the "Coalition"),
- Discuss the financial and risk implications to the Company of the parties' positions,
- Revise the Company's requested return on equity (ROE), and
- Introduce the Company's reply witnesses.

Q. Has the Company's request changed since it filed its direct case?

A. Yes. The Company is now requesting an increase of $35.9 million to base rates. This represents a $20.9 million increase to current rate levels, including decoupling amounts, because approximately $15 million is currently and, for the last three years has been collected through the decoupling deferral.

Q. Please explain how the decoupling deferral of $15 million relates to the request in this case.

A. Present base rates being charged to customers today are set too low to recover the Company's pre-rate case revenue requirement. Present base rates are set too low because they are based on a use–per-customer level that is higher than customers' actual use per customer. The decoupling mechanism adjusts for this deficiency, and amounts are deferred to bring revenues up to the level that makes up for the lower use-per-customer actually experienced. This amount has been about $15 million per year for the last few years. That is, present base rates are too low by about $15 million, but because of the decoupling mechanism, customers are already paying this $15 million in their current bills, but not through base rates.

The requested revenue requirement increase of $35.9 million is measured from present base rate levels, and therefore does not include the $15 million customers are currently paying through the decoupling mechanism.

Q. What are the implications for this case of the $15 million decoupling deferral?

A. From a customer perspective, a $15 million revenue requirement increase will result in no change to what customers are paying over current rate levels. From the Company's perspective, any revenue requirement increase less than $15 million results in a reduction in revenues and cash flows.

Q. What is the percentage increase resulting from the Company's updated request?

A. Measured from present base rate levels, the $35.9 million increase is 5.1%. Measured from current rate levels including decoupling, the $20.9 million increase is a 3.0% increase.

Q. Why has the Company reduced its request?

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A. The decrease results from two factors. First, the Company and parties to the case have resolved several issues raised by the parties through a Partial Stipulation. Second, the Company has updated its requested ROE and cost of debt, and eliminated a double-counting of deferred taxes related to the Company's pension proposal. These changes are discussed in the reply testimony of Natasha Siores, Exhibit NWN/1900. The Company has also updated its payroll expense, and other related expenses, to reflect a lower number of full-time employees than reflected in its direct case filing. This change is discussed in the reply testimonies of John Sohl, Exhibit NWN/2300, and Lea Anne Doolittle, Exhibit NWN/2400.

II. RESPONSE TO THE TESTIMONY OF JUDY JOHNSON

Q. What issues does Staff witness Judy Johnson discuss in her opening testimony?[1]

A. Ms. Johnson provides a general overview of the Company and the Staff filings, and also discusses environmental cost recovery.

Q. What portions of Ms. Johnson's testimony do you address?

A. I will address her discussion of NW Natural's financial condition and the timing of the Company's general rate case filing.

Q. Was Ms. Johnson's discussion of the reasons for NW Natural's filing, and the drivers of its requested rate increase, accurate?

A. Generally yes. Ms. Johnson summarizes the reasons the Company is requesting an increase to rates. She also asserts that the main driver of the filing was the expiration of the Company's Weather Adjusted Rate Mechanism (WARM) and decoupling

1 Staff/200.

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mechanism. Both of these factors suggested the need for the Company to file a general rate case.

Q. Is Ms. Johnson's statement that the Company has demonstrated strong financials and earnings since its last general rate case correct?

A. Generally, yes. Since its last general rate case, the Company has experienced some years demonstrating strong financials and earnings and some years less so. That said, I have four concerns with Ms. Johnson's discussion on this topic. First, she uses a table comparing Allowed ROE with Earned ROE to support her statements. Staff's Earned ROE data includes Weighted Average Cost of Gas (WACOG) gains and losses in some years. WACOG gains and losses are not predictable, not repeatable and are driven by issues beyond the Company's control. As a result, inclusion of these amounts distorts the underlying financial results of the Company. Also, because this case deals only with base rates, the relevant comparison of allowed and earned ROEs should be calculated without WACOG savings or losses.

Second, Ms. Johnson's use of percentages masks the actual dollar amount of the underlying earnings differences. I have added to Ms. Johnson's table the actual earnings values, taken from my original testimony, which demonstrates that these amounts are smaller than Staff or the Commission may expect, reflecting the relatively small size of NW Natural.

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	Staff/200 Table ROE [1]	Excluding WACOG Sharing ROE as filed [2]	Operating Income exceeding 10.2% ($000's)
2003	8.91%	8.06%	$0
2004	9.82%	9.49%	$0
2005	10.02%	9.77%	$0
2006	10.26%	10.31%	$567
2007	10.15%	10.17%	$0
2008	9.59%	10.91%	$3,790
2009	11.22%	9.36%	$0
2010	11.10%	10.95%	$3,490

1 Staff's ROEs reflect Staff's proposed pro-forma adjustments after original filing
2 Staff's ROEs prior to 2008 exclude WACOG sharing; it is included for 2008 and thereafter

Third, Ms. Johnson's opening testimony implies that the Company has been able to earn its allowed ROE because of the protections afforded by ratemaking mechanisms. Of course, supportive regulation has been important to the Company's financial stability. However, Ms. Johnson unfairly omits any mention of the management actions that were also required to maintain NW Natural's financial health. In particular, as discussed in my direct testimony, over the past several years, the Company has focused intensely on limiting costs, and as a part of the effort, has implemented significant personnel reductions. In addition, NW Natural has actively taken advantage of the Company's credit rating to refinance outstanding debt, which has provided substantial reductions to interest costs. But for these management actions, the Company's financial status would have been very different, and the Company could not have stayed out of a general rate case for nine years-- and indeed, could not have lived up to the terms of the Rate Case Moratorium to which the Company was committed for the last four years.

Lastly, while the results Ms. Johnson cites are backward-looking, Ms. Johnson seems to imply that such results will continue in the future despite the poor economic

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conditions we continue to experience. As demonstrated in the Company's direct application, and the reply testimony NW Natural is now filing, current and future costs and requirements are increasing for the Company, and these are the drivers of the rate increase requested in this case.

Q. Are there aspects of this case that may make it somewhat unique for the Commission?

A. Yes. Since its last general rate case, the Company made several difficult decisions, including reductions of FTEs, and managed its costs effectively. This resulted in some significant changes in the Company and in its O&M levels over that time period. This swing in O&M that occurred may make this case unique in certain ways, and in certain ways has the potential to hurt the Company because many of Staff's and the other parties' adjustments rely on models or averaging that can produce results that are skewed inappropriately by this past down-dip. The Company strongly believes, however, that by managing its costs, it made the right decisions, not only for itself, but for its customers as well. Indeed, if it had not managed its costs as it did, the Company's requested rate increase would be much larger than it is. In short, the Company made some hard decisions to manage its labor and other costs. It may not have been the easiest path but it was the right path.

III. POSITIONS OF THE PARTIES

Q. Please summarize Staff's overall proposal from their opening testimony.

A. Staff originally proposed $54.4 million of adjustments to our proposed $43.7 million increase, resulting in a recommended $10.7 million decrease to present base rate revenues. Staff's proposal reflected an approximate $25.7 million decrease to current

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revenue levels including decoupling. As a result of the proposed stipulation, Staff's remaining proposed decrease is approximately a $4 million decrease from the Company's proposed increase, or a $1.3 million decrease from present base rate revenues. This represents a $16 million reduction to current revenue levels including decoupling.

Q. What remaining items make up Staff's adjustments to the Company's proposed revenue requirement increase?

A. Staff's proposals include an ROE of 9.2% (compared to the Company's original request of 10.3%); three changes to the Company's cost of debt; the disallowance of costs associated with two sections of the Mid-Willamette Valley Feeder (MWVF); rejection of the Company's proposal regarding pensions, and reductions to the Company's proposed level of FTEs and labor expenses.

Q. Has Staff proposed any adjustments that do not affect the Company's requested increase?

A. Yes. Staff also proposes that: the Company's shareholders absorb 10% of all costs related to its environmental clean-up obligations; carrying costs on environmental deferral balances be reduced to the Modified Blended Treasury Rate; the System Integrity Program be eliminated; and that dramatic changes be made to the existing Interstate Storage Service sharing percentages. Finally, Staff recommends a complete change to the Company's existing decoupling mechanism that would eliminate the Company's ability to fully recover its fixed costs.

Q. Please summarize the issues raised by NWIGU-CUB.

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A. Many of the issues raised by the NWIGU-CUB witness were settled as part of the Partial Stipulation. The disputes remaining include these parties' recommended rejection of the Company's pension cost recovery proposal; proposed reductions to the Company's proposed FTE levels and labor-related expenses; elimination of recovery of certain deferred taxes related to an Oregon state tax rate change; a change to the Operations & Maintenance (O&M) and capital cost split; and a proposal to have shareholders bear 50% of the cost of environmental remediation and reducing carrying costs to the modified treasury rate.

Q. Did CUB present separate opening testimony?

A. Yes, CUB opposes the Company's proposed new rate design for residential customers, opposes the Company's request to raise reconnect charges, and recommends that working gas inventory be removed from rate base.

Q. Similarly, did NWIGU also present separate testimony?

A. Yes. NWIGU's opening testimony discusses the Company's Long Run Incremental Cost study and its rate spread proposal, and other rate design issues related to industrial customers.

Q. What was presented in the opening testimony of the Coalition?

A. The Coalition also proposed that the Commission reject NW Natural's proposed new rate design for residential customers and discussed the Company's existing decoupling mechanism.

IV. POTENTIAL IMPACTS OF THE PARTIES' PROPOSALS

Q. What are the potential impacts of the parties' proposals.

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A. Collectively, the parties' proposals would impose financial harm on the Company and increase its risk profile.

Q. What are the financial implications of the parties' proposals?

A. The parties' proposals, if adopted in whole by the Commission, would have serious immediate and ongoing negative impacts on the Company.

Q. What do you mean by immediate financial impacts?

A. Several of Staff's proposals, and one of NWIGU-CUB's proposals, could require immediate write-offs by the Company of potentially tens of millions of dollars of already-incurred and prudent costs. In addition, the reduced revenues and associated reduction in cash flow will significantly affect the Company's credit metrics.

Q. Which proposals could require financial write-offs?

A. Three of Staff's proposals could require immediate write-offs: their proposals for sharing of environmental remediation costs; for disallowing the costs associated with the MWVF; and denial of recovery of deferred tax changes resulting from the Oregon state tax rate change. NWIGU-CUB proposes an even more damaging sharing mechanism for the Company's environmental costs, which would result in a much larger write-off.

Q. Please explain the potential for a write-off of already-incurred environmental costs resulting from Staff's and NWIGU-CUB's proposals.

A. As of March 31, 2012, the Company has incurred $112 million (net of insurance recoveries) dealing with environmental matters related to legacy manufactured gas plants as described in the testimony of Alex Miller in Exhibits NWN/1500 and NWN/2600. Staff proposes that the Company's shareholders bear 10% of all environmental remediation costs associated with the manufactured gas plants—including those already

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incurred. As such, under Staff's proposal, the Company would be required to expense or write-off, immediately following a decision in this case, 10% of amounts already incurred--about $11 million. Under the NWIGU-CUB proposal, which would deny recovery of 50% of these expenditures, the immediate write-off could be as high as $56 million.

Q. Is there any uncertainty around these write-offs?

A. There is no uncertainty as to the need for a write-off if the Commission adopts either the Staff or NWIGU-CUB proposal. The amount may vary depending on factors such as expected insurance recoveries and the amount of additional spending between now and the decision.

Q. Is a write-off like this unusual?

A. Yes, because as Mr. Miller demonstrates, the Company would be writing off costs that all parties seem to agree have been prudently incurred. In addition, each future year would include a level of write off for amounts not recovered.

Q. What other areas may require immediate financial write-offs?

A. Staff claims that two segments of the Company's MWVF project are imprudent and should be excluded from rate base. In Exhibit NWN/2200, Grant Yoshihara explains why this project is required for continued safe and reliable service in the central part of the Company's service territory. If the Commission adopts Staff's proposal, the approximately $4.9 million spent on the project through April of this year, and any additional expenditures required to complete construction, will be expensed.

Q. What is the last proposal that could require a write-off?

A. Staff has proposed that the Commission deny the Company's recovery of costs associated with a change to its deferred tax balance resulting from a change in Oregon's

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state tax rate. The basis for its recommendation is Staff's belief that recovery of these costs would constitute retroactive ratemaking. Natasha Siores explains in her reply testimony (Exhibit NWN/1900) that Staff's argument is incorrect. At any rate, Commission adoption of Staff's proposal could require a write-off of about $2.7 million.

Q. How would the financial write-offs of incurred costs, or in the case of the state tax rate change issue, deferred taxes, affect the Company?

A. Such write-offs are a charge to earnings in the year taken. In addition, these are, for the most part, cash expenditures that the Company has already incurred that will never be recovered. Staff's proposals could result in a total pre-tax write-off of $18.6 million, or about 23% of proposed test year utility Net Operating Revenues. The NWIGU-CUB environmental sharing proposal increase the write-off to $68.6 million, or 84% of Net Operating Revenues. Total Company net income for its most recent fiscal year ended December 31, 2011 was approximately $64 million. Assuming an effective tax rate of approximately 40%, these write-offs would represent over 60 percent of these earnings. More importantly, the message sent by such disallowances to the financial community and the rating agencies may be even more harmful, as I will explain in my discussion of risk below.

Q. What would be the ongoing financial impacts of the parties' proposals?

A. Staff proposes a significant reduction to NW Natural's revenues in their case, $16 million from current rate levels including decoupling recoveries. NWIGU-CUB's additional proposals would result in a much larger reduction to revenues. Given the increased costs the Company is facing, if such a revenue reduction is ultimately approved by the Commission, the result will be a weaker Company, almost certainly with lower credit

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ratings, higher borrowing costs, less access to capital markets, less liquidity, higher working capital requirements, and a more difficult time responding to the challenges of the current environment.

Q. Why would the adoption of the parties' proposed revenue requirement reductions result in a weaker company?

A. For two reasons. First, many of the "typical" ratemaking adjustments remove from rates costs that cannot be avoided by a utility like NW Natural. For instance, Commission precedent disallows significant portions of employee incentive pay and other labor costs that are required to match market compensation—yet no one would argue that NW Natural could effectively run the Company without offering compensation at the market level. The same is true for many costs that cannot be avoided by the Company. It is true that all utilities must manage around these routine disallowances. However, it is also true that the exclusion of these costs from rates has a larger impact on a stand-alone local distribution company, such as NW Natural, than a subsidiary of a larger company, where some costs may be shared. Additionally, such adjustments have a larger impact on a gas LDC than on even a stand-alone electric utility, which has a generation function, over which to spread costs that do not exist for a gas LDC. For example, in 2011 NW Natural's labor percentage of total O&M was more than double that of PGE, and three times that of PacifiCorp.

Second Staff has proposed a dramatic reduction in allowed ROE—9.2% proposed by Staff compared to 10.2% currently authorized. Adoption of this proposal would set NW Natural's allowed ROE well below the average of recent cases in Oregon. By itself, this change would put stress on the Company's credit ratings from both a

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quantitative perspective by reducing credit ratios, and from the message it will send that a financially weaker utility is not as big of a concern in the Commission's balancing of interests.

Q. In addition to the revenue requirement impacts, what are the implications of parties' proposals for the risks faced by NW Natural?

A. While a significant revenue decrease, if adopted, would itself significantly add to the Company's risk, several proposals that do not impact the revenue requirement also would significantly increase the Company's risk profile. These include the sharing proposals and the near-elimination of carrying costs on environmental expenditures, a Staff decoupling proposal that does not reflect full cost recovery, elimination of the System Integrity Program (SIP) ratemaking mechanism, and changes to the Interstate Storage Service customer sharing percentages. In addition, the parties' proposals to remove pension cost recovery would lock in under-recovery of expenses for the long-term, and would also be viewed as increasing the Company's risk profile.

Q. What is the relevance of the Company's risk profile?

A. A company's risk profile is one of the major factors determining a company's bond rating. Even with the same level of credit statistics, such as interest coverage or debt ratios, two companies could have different credit ratings based on their risk profile. For a utility, the major factor in determining the risk profile is the regulatory environment in which it operates, and in particular whether the regulatory environment allows for the recovery of prudently incurred expenditures. NW Natural's risk profile and the environment in which we operate helps support its credit ratings even though its credit metrics are at the bottom end and in some cases below levels required for its rating. Adoption of many of the parties' proposals, such as imposing penalties on prudently incurred environmental costs--eliminating the Company's well-regarded SIP safety program, weakening its decoupling mechanism, and not addressing pension costs-- will be viewed as imposing heightened regulatory uncertainty. This increased uncertainty translates directly into increased risk—actually and as viewed by the financial markets and rating agencies.

Q. What is the overall potential impact of the parties' proposals?

A. The parties' proposals, if adopted by the Commission, will lead to immediate and ongoing negative financial consequences for the Company, requiring immediate write-offs to this year's earnings and write-offs to future earnings, lower current and future cash flow, weaker credit ratings, more expensive borrowing, less access to capital markets, lower liquidity and elevated working capital requirements and lesser ability to weather future financial challenges. Further, these likely higher future costs that would attend these risks are not reflected in the case, or in Staff's proposed ROE or borrowing costs.

V. REQUESTED ROE

Q. Is the Company revising its requested return on common equity?

A. Yes, the Company is reducing its request from 10.3% to 10.2%.

Q. Why is the Company decreasing its request?

A. The Company revised its ROE recommendation in response to Dr. Hadaway's reply testimony and updated ROE analysis. Dr. Hadaway's original DCF models produced a range of 9.6% to 10.3% percent. The Company requested an ROE at the high-end of Dr. Hadaway's range, 10.3%, based upon business risks specific to NW Natural, which I outlined in my direct testimony. The Company's recommendation also considered Dr.

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Hadaway's direct testimony that current market conditions undermine the usefulness and accuracy of traditional ROE estimation models.

In Dr. Hadaway's updated analysis, the DCF range narrowed to 9.6 percent to 10.0 percent. In sponsoring this update, Dr. Hadaway testified that current market conditions also undermine the traditional assumption that the best cost of equity estimate for the rate effective period can be found in the most recent data. Considering this testimony, the Company decided to recommend a 10.2% ROE, a number which acknowledges the results of Dr. Hadaway's updated analysis, but ultimately gives his original analysis more weight. In my opinion, Dr. Hadaway's original analysis more accurately estimates NW Natural's cost of equity in the rate effective period.

Q. Please comment on Staff's ROE recommendation of 9.2%.

A. Staff's recommendation, if adopted, would set one of the lowest ROE levels in the nation, reducing NW Natural's current allowed ROE by 100 basis points. Every 10 basis points equates to approximately $840,000 of revenue requirement and associated cash flow. Staff's proposed ROE would severely reduce revenues, cash flow and would negatively affect the Company's credit metrics.

In the past when traditional ROE models produced high estimates, this Commission moderated those results. Now when traditional ROE models are producing low estimates, consistency and fairness require that same moderated approach. The Commission should set NW Natural's ROE at a level that captures the risks and volatility present in current market conditions, accurately estimates the Company's cost of equity over the longer-term rate effective period, accounts for NW Natural's specific business risks, and produces sustainable financial metrics, All of these factors weigh in favor of

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NW Natural's ROE recommendation of 10.2% and against Staff's much lower ROE recommendation.

Q. How do the parties' revenue requirement adjustments impact your requested ROE?

A. My recommendation for a 10.2 ROE assumes that the Commission will not adopt the adjustments that would be most damaging to the Company's financial well-being. However, if the Commission were to adopt such positions—for example, if the Commission were to adopt one of the parties proposals that the Company share environmental remediation costs with customers—then the Commission should grant the Company a higher ROE to account for the increased risk to which the Company would be subjected.

VI. SUMMARY OF COMPANY'S REPLY TESTIMONY

Q. Please describe the reply testimony the Company is filing.

A. Exhibit NWN/1800 is my policy testimony.

- In **NWN/1900**, Natasha Siores explains that Staff's proposed revisions to the decoupling mechanism are inappropriate because they would not provide for full fixed cost recovery. She also explains that the Company continues to support its changes to WARM. Finally, she responds to Staff's and CUB's proposal to remove working gas inventory from rate base and Staff's and NWIGU-CUB's adjustment based on the change in the Oregon state income tax.
- In **NWN/2000**, Stephen Feltz updates the Company's cost of debt and explains why the costs of the interest rate hedge recommended for disallowance by Staff are prudent. He also explains why Staff and NWIGU-CUB's proposal to maintain the current ratemaking

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method for pensions results in an under-recovery of pension costs, and he provides additional options to fix the problem.

- In **NWN/2100**, Dr. Hadaway responds to Staff's ROE recommendation and updates his ROE analysis.
- In **NWN/2200**, Grant Yoshihara describes why the Mid-Willamette Valley Feeder is necessary for reliability and is prudent and explains why Staff's proposal to eliminate the SIP is unreasonable.
- In **NWN/ 2300**, John Sohl explains why Staff's and NWIGU-CUB's adjustments to payroll expenses are unreasonable and demonstrates that there is no need for a change in the capitalization ratio as proposed by NWIGU-CUB.
- In **NWN/2400**, Lea Anne Doolittle demonstrates the reasonableness of the Company's proposed FTE level. I want to emphasize that the Company has and continues to manage its costs, doing the right thing from a management and customer perspective, and is including the proposed FTE level that is appropriate for providing safe and reliable service.
- In **NWN/2500**, Russell Feingold responds to the criticism of the Company's LRIC study and its rate design proposals.
- In **NWN/2600**, C. Alex Miller responds to the parties' proposals for sharing and penalties regarding the Company's environmental obligations, and why it is not appropriate to reflect the Modified Blended Treasury Rate instead of the overall cost of capital on deferred balances not yet set for recovery.
- In **NWN/2700**, Keith White discusses Staff's proposals regarding its Mist operations and the sharing of Interstate Storage Service revenues.

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- In **NWN/2800**, Onita King discusses Staff's proposal to approve the Company's service window proposal contingent upon a service quality measure and discusses the parties' responses to the Company's tariff changes.

Q. Does this conclude your testimony?

A. Yes.

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BEFORE THE

PUBLIC UTILITY COMMISSION OF OREGON

UG 221

NW Natural

Reply Testimony of Natasha Siores

DECOUPLING/WARM
and
REVENUE REQUIREMENT ADJUSTMENTS
EXHIBIT 1900

June 15, 2012

EXHIBIT 1900 – REPLY TESTIMONY –DECOUPLING/WARM and REVENUE REQUIREMENT ADJUSTMENTS

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I. INTRODUCTION AND SUMMARY

Q. Are you the same Natasha Siores who filed direct testimony on behalf of Northwest Natural Gas Company ("NW Natural" or "the Company") in this docket?

A. Yes. My Exhibits NWN/300-312 and NWN/1200 support the Company's requested revenue requirement and rate adjustment mechanism revisions.

Q. What is the purpose of your reply testimony?

A. The purpose of my testimony is to respond to opening testimony of Commission Staff ("Staff"), the Citizens' Utility Board of Oregon (CUB) and the NW Energy Coalition ("Coalition") on the Company's decoupling mechanism; respond to Staff's opening testimony on the Company's proposed changes to its Weather Adjusted Rate Mechanism (WARM); respond to Staff's and CUB's proposal to exclude working gas inventory from rate base; and respond to the adjustment to miscellaneous revenues related to deferred tax balances proposed by Staff and jointly by CUB and the Northwest Industrial Gas Users (NWIGU).

Q. Please summarize your reply testimony.

A. In my testimony, I:

- Demonstrate that Staff's proposed changes to the Company's decoupling mechanism would prevent the Company from recovering its full fixed costs for new customers;
- Explain that the Company continues to support its proposed changes to WARM;
- Explain why Staff's and CUB's proposal to exclude working gas inventory from rate base is contrary to Commission precedent for all local distribution companies (LDC) in Oregon and inconsistent with standard ratemaking principles; and

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- Explain why the inclusion in Miscellaneous Revenues of the amortization of deferred tax balances resulting from a change in the Oregon state income tax rate does not constitute retroactive ratemaking and why these amounts should be reflected in rates in this case.

I also provide an updated revenue requirement as my Exhibit NWN/1903-1905 at tab “Exh 1903 Rev Increase”, that reflects: (a) the correction of an error in the filed case; (b) changes in position on payroll issues, as discussed in the reply testimony of John Sohl and Lea Anne Doolittle; (c) cost of capital and return on equity, as discussed in the reply testimony of Stephen P. Feltz, Samuel C. Hadaway and David Anderson; and (d) issues resolved by the parties in the Partial Stipulation filed concurrently with the Company’s Reply Testimony filing. These changes reduce total Company revenue requirement increase that was included in the Company’s direct case filing to $35.9 million.

II. <u>DECOUPLING</u>

Q. Did the Company propose changes to its current decoupling mechanism in its direct case filing?

A. Yes. As I explained in my direct testimony, the Company proposed modest changes to the mechanism. CUB and the Coalition agree with these changes, and do not propose any other changes to the mechanism.

Q. What does Staff propose with respect to the Company’s current decoupling mechanism?

A. Staff has proposed two fundamental changes to the mechanism: (1) changing the baseline used in the mechanism from a use-per-customer benchmark to a total use (weather-normalized) benchmark; and (2) adopting a New Service Rate to be applied to

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cumulative values of new meters in new service locations ("new customers/new services") when calculating the decoupling deferral. Staff also proposes a number of other minor changes to the mechanism.

Q. Staff provides over 50 pages of discussion on the decoupling mechanism and potential changes. Bottom line, what is the impact of Staff's proposed changes?

A. The bottom line is that Staff's proposal would ensure that the Company recovers less than its full fixed costs associated with new customers. This is because the New Service Rate proposed by Staff is calculated by taking the proposed annual customer-related long-run incremental cost **excluding** the cost of mains.

Q. Please explain Staff's proposal to change the decoupling benchmark.

A. Staff proposes to replace the existing use-per-customer benchmark in the current mechanism with a total volumes benchmark based on the volumes adopted in this proceeding. Each month, actual volumes (weather normalized) and benchmark volumes will be compared, with the variance resulting in a charge or credit deferred to customers.

Q. Please briefly describe the New Service Rate.

A. The New Service Rate is a monthly rate per cumulative new meters/new service locations that represents the cost to the Company of adding a new customer. The product of the New Service Rate times the number of new meters/new service locations is applied to the charge or credit resulting from comparing actual volumes with benchmark volumes to reflect the cost of new customers in the deferred amount. Importantly, this New Service Rate represents LRIC excluding mains and the monthly customer charge.

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Q. Why does Staff exclude mains cost from the New Service Rate?

A. Staff did not explicitly explain why mains cost was excluded from the New Service Rate. It can, however, reasonably be concluded that Staff presumes that most new customers should be assumed to be already connected to a main—"on main"—and that therefore they do not cause mains cost.[1] For this reason, Staff may have concluded that mains cost should not be included as an incremental fixed cost that is incurred when a new customer is added.

Q. Is it appropriate to exclude mains cost from the LRIC for new customers?

A. No. The mains cost included in the LRIC represent an average of main footage that includes conversion and new construction services. Thus, the mains cost in the LRIC already accounts for the fact that added customers may or may not have additional mains cost associated with them. Some new customers will cause the Company to install, for example, 150 feet of main, and some will not cause the Company to install any main. The LRIC mains cost reflects this fact.

In addition, as reiterated in the reply testimony of Russell Feingold (Exhibit NWN/2500), LRIC is caused by customers and not volumes; therefore, the full LRIC is the appropriate measure of the incremental fixed cost associated with an additional customer.

Q. Has the current decoupling mechanism allowed the Company the opportunity to recover full fixed costs associated with serving customers?

A. Yes. The current decoupling mechanism was originally approved in 2002 to allow the Company to recover only 90% of the margin difference arising when actual use per

1 Exhibit Staff/1300 at Storm/45

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customer varied from the baseline, meaning that the Company recovered only 90% of the fixed costs associated with adding new customers. The mechanism was revised in 2005 to allow the Company to defer and amortize 100% of the margin difference.[2] Therefore, since the time of its revision, the mechanism has allowed the Company the opportunity to recover its full fixed costs associated with serving customers, regardless of customer usage. If the intention is to deprive the Company of the opportunity to recover its full fixed costs, Staff should be clear about its goal.

Q. Can you demonstrate how Staff's proposal prevents the Company from recovering its fixed costs?

A. Yes. My Exhibit NWN/1901 shows how the current mechanism and Staff's proposed mechanism would operate given the simplified example where the Company's deferral baseline is based on one customer using 700 therms in the Test Year and one customer also using 700 therms is added in the following year. Under an appropriately-operating decoupling mechanism, this situation should result in the Company deferring nothing. This is because the per-customer volumes did not change, so the Company would have no reason to charge or credit customers.

Under the current mechanism, this is in fact the outcome. As lines 10 through 18 of Exhibit NWN/1901 shows, no changes in usage on a per-customer basis results in no charge or credit to customers.

Under Staff's proposal, however, even if per-customer volumes do not change, the Company will provide a credit to customers.

2 *Re. NW Natural Investigation Regarding Possible Continuation of Distribution Margin Normalization Tariff*, Docket UG 163, Order No. 05-934 at 2 (Aug. 25, 2005) (approving an all-party stipulation).

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Q. Please explain.

A. The operation of Staff's mechanism is shown on lines 21 through 33 of Exhibit NWN/1901. Line 26 shows Step 1 of Staff's mechanism, which compares actual total volumes with baseline total volumes. Because the Company's total volumes are higher due to adding one new customer, Step 1 results in a credit to customers.

Step 2 of Staff's mechanism is intended to compensate the Company for the cost of adding the new customer by applying the New Service Rate. As can be seen on Line 33, the line showing the total deferral amount after Steps 1 and 2 are added, Staff's mechanism would result in the Company providing a net credit to customers. This is because the New Service Rate is too low to reflect the fixed costs associated with adding the new customer.

Q. Besides the under-recovery of fixed costs, what other concerns do you have about moving from a use-per-customer benchmark to a total volumes benchmark?

A. The adoption of the proposed total volumes benchmark would introduce additional contention over the load forecast in future general rate cases. Currently, the Company estimates test year sales load by developing a use per customer and applying that to a customer forecast to derive total load. With the use of a forecasted test year, additional complexities arise if the customer counts at the beginning of the rate effective period vary significantly from the forecast, as total volumes will be the benchmark, and right from day one of the effective period there will be a "baked-in" difference of volumes. Under the current mechanism, the scrutiny remains on use per customer, and any variances in customer forecast in the Test Period have no impact on the decoupling deferral.

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Q. Do you agree with Staff's assertion that its proposed changes are necessary to remove the Company's "throughput" incentive—or, an incentive for the Company to sell its customers a greater volume of gas?

A. No. No such incentive exists under the existing mechanism. It is the underlying premise of the current mechanism that the Company should recover no more and no less than the margin associated with the use per customer assumed when rates were designed in the last general rate case. If actual weather normalized volumes exceed baseline volumes, customers receive a credit for the excess sales volumes. The Company does not profit from excess use per customer.

Q. Staff asserts that an incentive to add customers irrespective of the expected economic viability exists under the existing decoupling mechanism. Do you agree?

A. No. Under the terms of the decoupling stipulation, we are prohibited from altering our policies regarding new customers because of the decoupling mechanism. All new customers must pass an economic viability test and may require a construction contribution to pass the test. Decoupling helps ensure that fixed costs associated with any customer are recovered, regardless of their usage. Recovering the fixed costs associated with serving customers is not an incentive; it is a necessary element of just and reasonable rates.

Q. Staff provides Exhibit Staff/1303, which shows the operation of the current mechanism and the proposed mechanism under four scenarios. Do you have any comments on this exhibit?

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A. Exhibit Staff/1303 confirms that Staff's changes would result in the Company recovering less of its fixed costs than it would under the existing mechanism. In three of the scenarios (scenarios A, B, and D), where Staff assumed no growth or some growth in customers, the Company would experience a reduced decoupling deferral when compared to the current mechanism. In a situation of average growth, the Company would recover 23.8% less in fixed costs than under the current mechanism, in a situation of no growth, the Company would recover 6.7% less, and in a situation of slight growth, the Company would recover 14.4% less in scenarios A, B and D, respectively. Interestingly, in scenario C which assumed net declines in customer counts, the Company would recover 44.9% more. This is interesting because in that scenario, under Staff's proposed mechanism, the Company would be recovering costs for customers that it did not serve.

In short, the exhibit illustrates that Staff's proposed mechanism would always under-recover the Company's fixed costs unless customer counts decline, which historically has not been the case.

Q. Exhibit Staff/1300, Storm/39, provides eight objectives for the proposed changes to the decoupling mechanism. Please respond to each.

A. ***<u>Staff objective 1</u>***: *"Remove throughput incentive".*

Response: This is achieved under the existing mechanism, as no such incentive exists. If actual weather-normalized volumes exceed baseline volumes, customers receive a credit for the excess sales volumes.

<u>Staff objective 2</u>: *"Reduce dollar impact on rate payers under expected future conditions as compared with the current mechanism"*

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Response: Customers would pay less because Staff's proposal intends for the Company to recover less than full LRIC. The record in the decoupling docket shows that full cost recovery is the appropriate outcome of the decoupling mechanism. Staff's proposal amounts to no more than a suggestion that the Company should revert back to some sharing level.

<u>Staff objective 3</u>: "Stabilize margin revenues"

Response: Generally, margin revenue per customer, which covers the fixed costs associated with that customer, are stable under the existing mechanism.

<u>Staff objective 4</u>: "Allow for recovery of fixed costs independent of actual levels of weather-normalized volumes"

Response: This is achieved under the existing mechanism. Staff's proposal allows for recovery of less than full fixed costs.

<u>Staff objective 5</u>**:** "Make the mechanism and related calculations more transparent"

Response: The minor modifications proposed in the Company's direct testimony (Exhibit NWN/1200) will also provide for more transparent calculations. And the existing mechanism with or without Company-proposed modifications will be more simple than Staff's proposed changes. Further, making a fundamental modification to a mechanism that has been in place and monitored since 2002 is not likely to lead to greater transparency for Staff, the Company, or customers.

<u>Staff objective 6</u>: "Make it less difficult for Staff and Parties to review filings"

Response: The decoupling calculation is submitted to Staff for review **six times a year**: quarterly as part of the deferred accounting report, annually when the Company requests reauthorization of the decoupling deferral and annually again when the Company

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includes the decoupling deferral in rates during the PGA. The decoupling calculation has changed very little since implementation in 2002. Over the years, Staff and Parties have not indicated any difficulty in reviewing decoupling calculations, and the Company does not believe there is any difficulty in Staff's ability to review the mechanism that is inherent in the way the current mechanism operates, or that would be assisted by the changes proposed by Staff.

Staff objective 7**:** "Remove incentive to add customers irrespective of the expected economic viability"

Response: This is achieved under the existing mechanism. As mentioned above, under terms of the decoupling stipulation, the Company is prohibited from changing its practice in adding customers because of the decoupling mechanism. All new customers must pass an economic viability test which may require a construction contribution to pass the test. Decoupling helps ensure that fixed costs associated with any customer are recovered, regardless of their usage.

Staff objective 8: "Retain the flow-through of monies from NW Natural's decoupling customers to support energy efficiency and ETO activities."

Response: This is achieved under the existing mechanism.

Q Does the current decoupling mechanism already achieve all of these objectives?

A. Yes, as I explained in the previous question, all of the objectives are met with the current decoupling mechanism. Therefore, the only real change effected by Staff's proposal is to ensure that the Company recovers less than its fixed cost associated with serving customers.

Q. Would Staff's proposed changes also cause practical problems?

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A. Yes. Implementation of Staff's proposed changes would require the Company to create a new decoupling deferral procedure and make code changes in its customer information system to track and report the data. Further, Staff's proposal would impose a second step to the decoupling deferral calculation for the new customers/new services component proposed.

Q. Has Staff provided recommendations on the Company's proposed modifications to the decoupling mechanism?

A. Yes. Staff supports the following minor modifications proposed in the Company's direct testimony (Exhibit NWN/1200): (1) update relevant data and statistical parameters with values resulting from this proceeding and (2) remove the price elasticity adjustment. The Company's proposal to normalize usage in the month of May by the actual WARM effect attributable to May was addressed in Staff's opening testimony in Exhibit Staff/400, Phillips/8, but Staff did not provide a recommendation on the proposal.

Q. What other minor changes has Staff proposed?

A. Staff also proposes to: (1) fix the value of the margin rate per therm in the general rate case, to be updated in future general rate cases; and (2) change the annual deferral period to August through July.

Q. Do you agree with these two changes?

A. No. I do not agree with fixing the value of the margin rate per therm only in a general rate case. Typically, the margin rate per therm will change in between rate cases only due to capital tracking mechanisms that may be in effect and due to elasticity which has been proposed to be removed in this case. Having the margin rate per therm used in the decoupling deferral calculation reflect the margin in the underlying rate schedules of the

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decoupled customer classes provides better transparency of all components of the decoupling mechanism.

I also do not agree with the change in the annual deferral period to August through July. The main reason I proposed the change in the deferral period from October-September to November-October was because of the complexity caused by the October-September tracking period crossing over two different rate effective periods. The PGA effective year is November-October. Because the decoupling tracking period crosses two different PGA years, the use-per-customer baseline must incorporate two different 12-month baseline use-per-customer strings ("baseline use-per-customer string") from each PGA year because of the elasticity adjustment. The decoupling baseline string must incorporate the baseline use-per-customer string for 11 months from the current PGA year and 1 month from the previous PGA year. For example, the October 2011 through September 2012 decoupling tracking period would use the following baseline use-per-customer string derived from two different PGA years as follows:

		Residential Baseline UPC	Baseline source
October	2011	42.5	**2010-11** PGA
November	2011	86.9	2011-12 PGA
December	2011	123.0	2011-12 PGA
January	2012	121.7	2011-12 PGA
February	2012	95.8	2011-12 PGA
March	2012	79.0	2011-12 PGA
April	2012	54.9	2011-12 PGA
May	2012	33.7	2011-12 PGA
June	2012	17.2	2011-12 PGA
July	2012	14.1	2011-12 PGA
August	2012	14.1	2011-12 PGA
September	2012	16.9	2011-12 PGA
Oct - Sep Total		699.8	

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By changing the deferral period to match the PGA tracking period, calculating the baseline use-per-customer string would be much simpler and transparent. Staff need not be concerned that the deferral period would necessitate estimates of the decoupling deferral for inclusion in the PGA, as the Company (like the other LDCs filing PGAs) does not include forecasted or estimated deferrals for inclusion in the PGA. Typically, the Company and the other LDCs collectively choose a cutoff date of actuals through August or September as the deferral balances to include in the PGA. If the Company's proposal to change the deferral year to November-October were to be approved, the Company would include in the PGA only actual balances through August or September, with no deferrals estimated for future months. And again, with regard to having time to review the Company's calculations of the decoupling deferrals, by the time the PGA filing rolls around, the Company would have provided details of the decoupling calculations up to six times in twelve months, providing ample time for review.

Q. In your direct testimony you stated that the Company will continue to employ the public purpose charges to fund ETO programs as long as the final rate design adopted in this proceeding continues to remove the financial disincentive to the Company of encouraging increased energy efficiency for our customers. How does Staff's proposed decoupling mechanism address this financial disincentive?

A. The financial disincentive I referred to in my direct testimony arises from the fact that if customers decrease their usage through energy efficiency, the Company does not have the opportunity to recover its fixed costs associated with serving customers. The existing decoupling mechanism breaks the link between usage and cost recovery and thus removes the financial disincentive to encourage energy efficiency. While Staff's

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proposed mechanism continues to make the Company indifferent to usage of existing customers, the proposed mechanism goes a step farther by ensuring that the Company will recover less than its fixed costs whenever a new customer is added, regardless of total customer usage. Staff's proposed mechanism amounts to a fundamental shift in the existing mechanism in that the Company will not recover its fixed costs regardless of customer usage.

Q. Staff appears to imply that the Company would be required to continue funding to ETO programs as long as the tariff schedule pertaining to the decoupling mechanism is in place. Do you agree?

A. As stated in my direct testimony, the Company will continue to employ public purposes to fund ETO programs as long as the final rate design adopted in this case continues to remove the financial disincentive to the Company of encouraging increased energy efficiency for our customers. As my testimony explains, the Company has serious concerns about whether Staff's proposed mechanism continues to remove this financial disincentive.

Q. What is your overall assessment of Staff's proposed changes to the decoupling mechanism?

A. Staff's changes amount to a fundamental departure from the use-per-customer decoupling mechanism that has been in place, with the support of all parties, since 2002. While Staff provided a methodical assessment of the Company's current mechanism and thoughtful alternatives to the existing use–per-customer construct of the current decoupling mechanism, Staff's proposal ensures that fixed costs associated with serving customers will not be recovered and introduces additional complexity to the calculation

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and requires additional data compilation and reporting. The result is that complexity is unnecessarily added to an existing decoupling construct to which no Party has asserted is deficient in theory or in practice. Staff's proposal has the added detriment of ensuring that the Company will not have the opportunity to recover the fixed costs associated with serving customers. I recommend that the Company's existing decoupling mechanism, with the modifications and phasing proposed in my direct testimony, be retained for commercial customers and for residential customers until the new rate design is phased in or on an ongoing basis if the new rate design is not approved by the Commission.

III. WARM

Q. What did Staff propose with regard to the Company's recommended changes to the WARM program and what is the Company's response?

A. Staff summarizes the changes proposed by the Company in my direct testimony, namely to update normalized use per customer, normal heating degree days (HDDs) and statistical coefficients relating HDDs to therm usage, but makes no specific recommendation. With regard to removing the opt-out provision of WARM, Staff recommends that the opt-out provision be retained.

The Company continues to support its proposed changes as described in my direct testimony to update the relevant data and statistical parameters relevant to WARM that result from this general rate case proceeding and to remove the WARM opt-out provision. Doing so would keep the WARM components consistent with the outcome of this case and would facilitate a gradual transition to the Company's proposed rate design for customers in WARM.

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IV. WORKING GAS INVENTORY INCLUDED IN RATE BASE

Q. Please explain the gas inventory balance included in rate base[3].

A. The gas inventory included in rate base is stored gas (either underground or in tanks as LNG) and includes two components: cushion gas and working gas. Cushion gas, also referred to as permanent gas, is gas that is required to remain in the underground storage reservoir to ensure operational pressure is maintained. Working gas is gas that will flow in and out of the storage reservoir and is available to serve customer sales loads.

Q. What have Staff and CUB proposed with respect to the Company's working gas inventory that is included in rate base?

A. Staff and CUB propose that the Company remove its average working gas inventory from rate base, resulting in a $35.3 million reduction to rate base.

Q. Staff asserts that including working gas inventory in rate base is bad regulatory policy. What is your response?

A. Including working gas inventory in rate base is consistent with current Commission policy and is employed by the Company in both Oregon and Washington. It also appears to be standard practice throughout the region and the country, making Staff's position difficult to understand.

Q. Is the Company's inclusion of working gas inventory in rate base in this case consistent with the Company's treatment of working gas inventory in the past?

A. Yes. The Company included working gas inventory in rate base in its last general rate case, Docket UG 152, in the amount of $40.7 million, and in its 1998 general rate case,

3 Exhibit NWN/302 at line 21

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Docket UG 132, in the amount of $22 million. The Company's prior general rate cases also included working gas inventory in rate base. In addition, working gas inventory has been consistently included in rate base in the Company's results of operations. These results of operations are used as the basis for the Company's annual Purchased Gas Adjustment earnings test, which Staff reviews each year.

Q. Has any party ever objected to the Company's inclusion of working gas inventory in rate base prior to this rate case?

A. Not in my experience, and there are no Commission orders indicating that parties have previously objected to including working gas inventory in rate base.

Q. Do other Oregon LDCs include working gas inventory in rate base?

A. Yes. In Avista Corporation's ("Avista") recent rate case, Docket UG 201, Avista's rate base included gas inventory. Cascade Natural Gas Corporation ("Cascade") applies a working capital adjustment to rate base that includes working gas inventory.

In addition, all the LDCs in Washington, including NW Natural, include a working capital adjustment in rate base that includes working gas inventory.

Q. Has the Commission previously stated whether working gas inventory should be included in rate base?

A. Yes. The Commission has previously found that gas not withdrawn from storage during the year is an asset that should be in rate base.[4]

Q. Staff asserts that "it is uncommon for LDCs like NWN to include natural gas storage inventory . . . in rate base because it is not a capital investment." Do you agree?

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4 Re Cascade Natural Gas Corp., Docket UF 3246, Order No. 77-125 (Feb. 22, 1977).

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A. No. As I explain above, all LDCs in Oregon and Washington include working gas inventory in rate base. In addition, ratemaking guidance indicates that working gas inventory is generally considered to be a rate base item. See Exhibit NWN/1902.

Q. Why is it appropriate to include working gas inventory in rate base?

A. Shareholders must fund a level of working gas inventory sufficient to allow the utility to provide service, and "investors are entitled to an opportunity to earn a return on the total funds which they have committed to providing service."[5] This is the same reason that materials and supplies are included in rate base: because the utility must provide an inventory of necessary materials and supplies for normal operating purposes and shareholders are entitled to a return on this investment. Electric utilities include fuel stock in rate base for the same reason.[6] CUB's own opening testimony supports this analogy, stating that working gas "is essentially inventory that will either be sold to customers at the volumetric rate or will be sold in the wholesale market." Just as the Company includes a level of inventory of materials and supplies in rate base, it also includes working gas inventory in rate base.

In addition, including working gas inventory in rate base is consistent with NWIGU-CUB adjustments to remove customer-supplied capital from rate base. For example, NWIGU-CUB proposes reducing rate base to account for customer deposits and contributions in aid of construction because those funds are provided by customers. Similarly, because working gas inventory is funded by shareholders, working gas inventory should be included in rate base.

5 *Re Portland General Electric Co.*, UF 2176. Order No. 37112 (Mar. 10, 1960).

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Q. How do Staff and CUB justify removing working gas inventory from rate base?

A. Staff states that NW Natural uses storage primarily to ensure peak season reliability and that if carried out properly, the volume of gas held in storage each year to ensure reliable service should match the actual gas withdrawn each peak season. Similarly, CUB argues that the Company is already guaranteed to recover the cost of working gas inventory through the PGA, so there is no capital investment required to maintain the Company's working gas inventory.

Q. Do you agree with Staff's and CUB's arguments?

A. No. Their arguments incorrectly imply that the Company should allow its natural gas inventory to reach zero at some point doing the year. Such an assertion is impractical. On the contrary, there are at least two driving forces that explain why storage inventories might not reach zero at the end of a heating season: mild weather, which constrains the use of storage to meet demand, and the economics of storage gas versus winter purchases at market prices.

Q. Why would mild weather constrain the use of storage?

A. The largest storage facility used by the Company is Mist, which is physically connected to the Portland metro area and the thinly-populated North Coast region of Oregon. The peak deliverability of Mist was designed to be reached during cold weather, when loads in Portland and surrounding areas also rise significantly. Mild weather, which reduces demand, also limits the amount of gas that physically can be withdrawn from Mist.

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6 *See Re. Portland General Electric Co. Request for a General Rate Revision*, Docket UE 197, Order No. 08-601, Appendix A at 3 (Dec. 29, 2008); *Re. California-Pacific Utilities Co*., Docket UF 3275, Order No. 77-394 (June 13, 1977).

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The Company is in the process of improving the physical connection of Mist to other parts of its service territory down the Willamette Valley, which will improve this situation in the future.

Q. How do economics factor into the dispatch of storage inventories?

A. Storage gas, because it is purchased in the off-peak months, typically would be cheaper than spot market gas available for purchase during the heating season. However, that is not always the case, and when winter gas is cheaper than storage gas, the Company may elect to purchase the cheaper winter supplies. Over 90% of the gas cost savings flow back to customers, and this practice has been reviewed and upheld in prior PGA proceedings. The consequence, though, is that more storage gas may be carried over to the next heating season.

Q. Has gas the balance of working gas ever reached zero?

A. No. Historically, the gas in storage balance for working gas has never reached zero. From December 2003 through December 2011, the average system balance in working gas inventory was $60.9 million. The lowest balance during this time period was $14.7 million in April 2005, representing a balance of 30.3 million therms, and the highest balance was $106.7 million, representing a balance of 156.3 million therms.

Q. Does Staff have another argument related to including working gas inventory in rate base?

A. Yes. Staff also claims that it is inappropriate to place an average amount of storage gas into rate base because customers cannot review these costs in real time and the amount in rate base can only be changed in a future general rate case rather than the PGA.

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Q. Is it appropriate to include working gas inventory in the PGA and adjust the level annually?

A. No. To clarify, currently in the PGA, the Company, as do all LDCs, includes the cost of working storage gas estimated to serve load in the coming gas year in the commodity cost of gas making up each company's weighted average cost of gas (WACOG). Recovery of the cost of storage gas in WACOG represents the return <u>of</u> ratemaking component related to storage gas. The concept of the return <u>of</u> gas in storage is not at issue here. The storage gas that Staff proposes to exclude from rate base denies the Company recovery of the return <u>on</u> component of storage gas. This return on component in utility ratemaking is also referred to as carrying costs. So it is the recovery of the carrying costs on the gas in storage that Staff is proposing to deny by removing the working gas inventory from the Company's rate base.

As mentioned above, the return <u>on</u> component of working gas inventory has historically been allowed in the Company's rate base and thus been recovered through general rates. Staff's suggestion that the Company recover the carrying costs of working gas inventory through the PGA would be a new methodology that would introduce many complexities to the PGA process.

Q. What are these complexities?

A. While the full administrative impact of including carrying costs on storage gas in WACOG cannot be known at this time, the complexities that would likely be created would include:

1. Complicating the allocation of the gas cost portfolio between jurisdictions because the Company has carrying costs on storage gas allowed in general rates in Washington;

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2. Complicating the commodity PGA sharing deferral because the carrying costs on storage gas embedded in the WACOG should be excluded from the WACOG benchmark in the deferral;

3. Creating a lag in recovering carrying costs on storage injections because the PGA only considers storage withdrawals in the WACOG; and

4. Creating the need for a new unified process for calculating carrying costs and including them in WACOG which could be implemented by all three Oregon LDCs.

Q. Do Avista and Cascade include carrying costs on working gas inventory in their PGA mechanisms?

A. No. Like NW Natural, both Avista and Cascade include working gas inventory in rate base and adjust that amount in general rate cases. If the Commission is interested in exploring a policy change in how LDCs recover carrying costs on working gas inventory by moving recovery to the PGA, such a change should be investigated and applied to all LDCs.

Q. Has Staff or CUB objected to the level of working gas inventory that the Company included in the case?

A. No. Neither party has objected to the level of storage the Company included in the case, only the concept of including it in rate base. Staff has reviewed the Company's gas procurement policies each year during the PGA proceeding.

Q. What is your recommendation concerning working gas included in rate base in this case?

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A. Given that including working gas inventory in rate base is consistent with Commission precedent and standard regulatory treatment, and the level of this investment is undisputed, I recommend that the Commission reject Staff's proposed adjustment.

V. AMORTIZATION OF DEFERRED TAX BALANCES RELATED TO A CHANGE IN THE STATE INCOME TAX RATE

Q. Staff witness Deborah Garcia recommends that the Commission make an adjustment to NW Natural's revenue requirement related to a state tax law change (Staff/500). NWIGU-CUB makes a similar recommendation (NWIGU-CUB/100 Larkin). What are these proposals?

A. Staff and NWIGU-CUB propose removing from NW Natural's revenue requirement the Company's proposed amortization of a regulatory asset related to Oregon state tax rate changes that occurred effective with the 2009 tax year. Staff proposes a downward adjustment of $923,000 to the Company's revenue requirement. NWIGU-CUB proposes an upward adjustment of $896,000 to miscellaneous revenue, which decreases NW Natural's revenue requirement.

Q. Can you describe the costs included in the Company's Direct Case to which Staff and NWIGU-CUB are proposing an adjustment?

A. Staff and NWIGU-CUB are referring to NW Natural's inclusion of costs in its revenue requirement to recover the impact of a change in its deferred tax balances related to Oregon's Ballot Measure 67, which was signed into law by Governor Ted Kulongoski on July 20, 2009. That law provided for an increase in the corporate excise tax rate beginning in tax year 2009. This tax law change required NW Natural to increase its deferred tax liability by a net of $2.7 million.

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Q. How was the increase to deferred taxes reflected in NW Natural's books?

A. To recognize the increase, NW Natural booked a regulatory asset of $4.48 million, which represented the $2.7 million net change in its deferred tax balance, plus an appropriate gross up for taxes. This balance represents the amounts needed to be collected for taxes that will be paid in the future to the state of Oregon, but which have not yet been paid due to differences in taxable income and book income (*e.g.* due to such items as accelerated depreciation for tax purposes, which benefit ratepayers by reducing net rate base). When NW Natural collects such amounts from customers in advance of paying it to taxing authorities, it applies them as a reduction to rate base, to compensate customers for the time value of money. NW Natural collects such amounts from customers in this manner in accordance with tax normalization requirements.

In its filing, the Company is seeking to amortize this $4.48 million amount over a five-year period, to ensure that it collects an appropriate amount for taxes that the Company will pay in the future.

Q. Why did the Oregon state income tax changes require NW Natural to update its deferred tax balances?

A. NW Natural is governed by Financial Accounting Standard (FAS) 109. FAS 109 requires that companies adjust their deferred tax liabilities and assets in connection with changes in tax laws or rates. It also requires that a regulatory asset or liability be recognized for the probable future revenue recovery or revenue reduction stemming from the tax law or rate changes.

In short, FAS 109 ensures that utilities' financial statements recognize a deferred tax liability that, to the extent possible, accurately represents the tax rates that are

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expected to be in place at the time when the taxes are actually paid—in the future. In accordance with FAS 109, NW Natural recorded an increase in deferred tax liabilities to reflect the increase in state of Oregon income taxes resulting from the passage of Measure 67.

Q. Is there anything unusual about the collection of deferred taxes from customers, in light of the fact that those taxes (since they are deferred) will be paid in future periods?

A. No. It is standard practice, and in fact required under tax normalization principles, for a utility to include in rates its current tax expenses, plus deferred taxes (which arise because of differences between "book income" and "taxable income"). This practice ensures that over time the utility collects an appropriate amount for taxes, and that the utility's rates do not swing up and down due to changes in a utility's particular annual tax deductions. To the extent that the utility collects money from ratepayers for taxes that it will pay at some future date, the utility essentially passes on to customers the time value of that money through applying its accumulated deferred tax balances as a reduction to its rate base. These practices, together, ensure that the Company receives an appropriate amount from customers to pay its tax liabilities when due, and that it is not enriched or harmed by the timing differences that may exist between the time it collects money from customers and when it pays its taxes.

Q. Why do Staff and NWIGU-CUB oppose the Company's inclusion in rates of the recovery of the changes to deferred taxes resulting from Ballot Measure 67?

A. The first reason that NWIGU-CUB offers is that NW Natural's proposal is an "example of single issue ratemaking, where the Company has singled out an item and is requesting

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special cost recovery for this item."[7] They assert that it would be inappropriate "to now set aside this one single issue for future recovery."[8]

Q. Does NW Natural's recovery of the effect of updating its deferred taxes constitute "single issue ratemaking"?

A. No. It is unclear to the Company how its proposal to recover deferred tax balances in the context of a general rate case could be considered "single issue ratemaking." In this proceeding, the Commission has before it all aspects of NW Natural's ratemaking for consideration, and the recovery of an appropriate amount of deferred taxes is simply one of those issues under review.

Q. Do Staff and NWIGU-CUB offer other rationales for their proposed adjustment?

A. They also argue that NW Natural's recovery of the change in its deferred tax balance would constitute retroactive ratemaking. Staff characterizes NW Natural's filing as an effort to "selectively collect past expenses from customers while retaining the benefit of reduced expenses in other categories." Similarly, NWIGU-CUB assert that "[t]he Company is requesting that current ratepayers fund the cost for an event which occurred in a prior period outside the test year."[9]

Q. What is your response to these characterizations?

A. First, NW Natural's proposal does not result in selectively collecting "past expenses" from customers. By definition, NW Natural's deferred tax balances reflect the utility's costs of taxes that will be paid in the future. Characterizing NW Natural's change in deferred tax liability resulting from Measure 67 as a "past expense" is demonstrably incorrect when

7 NWIGU-CUB/100 Larkin/28
8 *Id.*
9 *Id.*

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one considers that disallowing such amounts from inclusion in customer rates would mean that NW Natural would be required to pay future taxes for which it would never have any recovery. Staff's and NWIGU-CUB's concern seems to be that if NW Natural's updated deferred tax balances were to be recovered in rates, then the Company would be recovering costs in excess of its current or future expenses. That is not the case, since the Company's recoveries of deferred taxes are for the payment of future taxes.

Second, Staff's and NWIGU-CUB's positions inappropriately seek to apply the concept of retroactive ratemaking to deferred taxes, when the very nature of deferred taxes is that they relate to future periods.

Q. Please explain further your statement that the parties inappropriately seek to apply the concept of retroactive ratemaking to deferred taxes.

A. The rule against retroactive ratemaking generally prohibits a public utility commission from setting future rates to allow a utility to recoup past losses or to refund to consumers excess utility profits. By their very nature, deferred taxes come about due to a timing mismatch between income as shown on a company's books, and income that is taxable by a state, local, or federal jurisdiction. To seek to apply principles of retroactive ratemaking to these amounts can be therefore problematic, and lead to absurd results. Financial accounting standards require the utility to update its estimate of future tax liabilities when tax rates change. This represents a change in estimate that is forward looking, not backward looking. The amounts of deferred tax liabilities were correctly stated when they were originally recognized in tax expense. A change in the statutory tax rate at a later date gives rise to the need to revalue the amount of deferred taxes to be paid in the future at the newly enacted rate.

For these reasons, commissions, as well as state and federal legislatures, have clarified that regulatory commissions should not treat the updating of deferred tax liabilities, or the collecting those liabilities from customers, as violating retroactive ratemaking principles.

Q. Can you offer examples of where regulatory commissions or state or federal bodies or legislatures have clarified that the recovery (or refund) of updated deferred tax amounts is not prohibited by the rule against retroactive ratemaking?

A. Yes. In Docket UM 55, this Commission adopted a stipulation in which NW Natural agreed to provide certain refunds to customers related to a 1986 federal tax law change. The stipulation provided that "[i]n the future, if there is a change in the federal income tax incremental rate . . . that results in the company's deferred tax accounts having been understated or overstated due to the amortization agreed to by the parties [in the stipulation], then the company may apply for, and the OPUC Staff and other parties agree to support, appropriate rate increases or decreases designed to restore its deferred tax balances to the necessary levels." Although this stipulation does not govern in this case, it shows that the Commission has endorsed the concept that future rates may need to be increased or decreased to account for updates to deferred tax amounts caused by tax rate changes that occurred in the past. To not apply this same standard to NW Natural in this case would be inconsistent rate treatment.

Other commissions have been more explicit in finding that such updates are allowed. For example, in Illinois, the commission issued an order that provides that updates to deferred tax balances for rate-setting purposes occurs *only* in subsequent rate cases, and not sooner. *Investigation into the* Appropriate *Accounting Treatment of*

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the Deferred Tax Reserve Resulting from Changes in Statutory Income Tax Rate, Illinois Commerce Commission, Order No. 83-0209.

The Internal Revenue Service (IRS) has also issued guidance intended to clarify that deferred tax true ups are not to be viewed as violating the rule against retroactive ratemaking. In 1995, it issued Coordinated Issue - Utility Industry Excess Deferred Taxes and Section 1341.[10] In that issuance, the IRS described that the Federal Energy Regulatory Commission (FERC), and state regulatory commissions do not, and should not seek to apply the rule against retroactive ratemaking to prevent utilities from updating deferred tax liability amounts to be collected from customers, even when the change that caused the update occurred in years prior to the utilities request to recover such amounts.

Referring to FERC precedent, the IRS explained that at no time is there absolute certainty that the amounts in a utility's deferred tax balances will be sufficient, or too much, to cover the taxes paid in the future. Such inaccuracies or imperfect matching, however, works out over time, and is not cause for disallowances or further adjustments. The IRS cites a quote from FERC Order No. 144, stating:

> The balance in the deferred tax reserve is . . . a residual of past tax costs over past tax payments and may or may not be sufficient to cover future tax payments over future tax costs, depending on the statutory tax rates in the future. Any excess or deficiency in the deferred tax reserve does not, however, result in a windfall to either shareholders or ratepayers since the balances will systematically be subject to a reconciliation in future rates.[11]

The IRS guidance goes on to explain that state regulatory bodies have taken an approach to deferred tax recoveries that generally waits until general rate proceedings

10 available online at http://www.irs.gov/businesses/article/0,,id=181906,00.html
11 *Id.*

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before updating rates for changes in deferred tax liabilities, and that such proceedings are used to ensure full recoveries of deferred tax amounts from customers. It states:

> State regulatory bodies appear to have taken a similar approach as that embraced by FERC. Excess deferred taxes have not caused retroactive rate adjustments nor refund orders *but rather have been subject to reconciliation in future ratemaking proceedings*.[12]

The guidance further quotes FERC to describe that it does not make sense to automatically require a contemporaneous change to rates, or a deferral order, in order for deferred tax balances to ultimately be trued up in customers' rates. FERC found that despite some parties' requests that FERC establish a method for returning over-accruals of a utilities future tax liability to ratepayers, the more appropriate path was to "delay[] consideration of any of these excess accruals until a utility's next rate application," so that "all parties may question the necessary adjustment" and so that the commission can fully explore the "complex questions" surrounding the appropriate adjustments (*e.g.* any netting effect that should be taken into account because of additional changes in tax rates that may have occurred).[13]

Finally, recently enacted legislation, Oregon Ballot Measure 967, provides additional support for the Commission in determining that the recovery of deferred taxes proposed in NW Natural's direct case is appropriate. It states:

> When establishing schedules and rates under ORS 757.210 for an electricity or natural gas utility, the Public Utility Commission shall act to balance the interests of the customers of the utility and the utility's investors by setting fair, just and reasonable rates that include amounts for income taxes. Subject to subsections (2) and (3) of this section, *amounts for income taxes included in rates are fair, just and reasonable if the rates include current and deferred*

12 *Id.* (emphasis added).
13 *Id.*

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> *income taxes and other related tax items that are based on estimated revenues derived from the regulated operations of the utility*. (emphasis added).

It also provides that in setting utilities' rates, the Commission must ensure that the income taxes included in rates are fair and reasonable and that such amounts may reflect considerations the Commission "deems relevant to protect the public interest." If NW Natural were disallowed amounts necessary to pay future tax expenses, such a result would not be fair and reasonable, or consistent with protecting the public interest.

In summary, Staff's and NWIGU-CUB's attempt to preclude NW Natural from collecting the correct amount of deferred taxes from customers is not supported by precedent, and would produce results that are at odds with the use of deferred tax accounting for regulated utilities.

Q. Does the Company have any alternatives to offer for how to deal with recovery of its deferred taxes?

A. The Company's main concern is with the recovery of its deferred taxes. NW Natural would be open to changing the amortization period for the amount Staff has focused on to something greater than the five years it proposed in its direct filing if that alleviates any concerns of the parties or the Commission.

VI. <u>UPDATED REVENUE REQUIREMENT EXHIBIT TO REFLECT CORRECTION OF AN ERROR AND CHANGES IN PROPOSAL</u>

Q. What updates and corrections is the Company proposing?

A. The Company proposes to change its original revenue increase request to reflect: (1) an all-parties Partial Stipulation of several issues which is filed concurrently with the Company's Reply Testimony; (2) the correction of pension contributions originally

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included in rate base, and (3) updates to several assumptions. The following table provides a summary of these changes:

		($millions)
Original Filed increase requested		**$43.7**
Stipulation		($7.4)
Increase after Stipulation		$36.3
<u>Updates and Corrections in Rebuttal</u>		
	Change ROE to 10.2%	($0.8)
	Change LTD rate to 6.07%	($1.0)
	Pension correction	$1.7
	Pension update	$0.6
	FTE's to 1,144 & true up incentive comp	($0.9)
Revised increase requested		**$35.9**

Q. Please describe the adjustment for the partial stipulation.

A. The partial stipulation was entered into by all active parties in the case and resolved several issues. The details of the agreements are included in the partial stipulation. The total impact of the agreement is reflected in column (a) of my Exhibit NWN/1903-1905 at tab "Exh 1904 Test Year Adjustments".

Q. Please explain the adjustment for the correction for pensions.

A. The correction of pension contributions is necessary because the amount of pension contributions included in rate base in the Company's original filing was <u>net</u> of tax. Because the deferred income tax balance (included as a reduction in the Company's rate base) reflected balances related to pension contributions, the taxes on these contributions were credited to rate base while the contributions were included net of tax, resulting in a double-counting of the subtraction of taxes related to these contributions. The Company had identified and disclosed this correction in the Company's response to

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Staff Data Request 365. This correction is included in column (b) of my Exhibit NWN/1903-1905 at tab "Exh 1904 Test Year Adjustments".

Q. Please explain the updates in other assumptions.

A. The update in ROE to 10.2% is discussed in the reply testimony of Sam Hadaway (Exhibit NWN/2100) and also in the reply testimony of David Anderson (Exhibit NWN/1800).

The update in the long term debt rate to 6.07% and the update to the pension contributions included in rate base is discussed in the testimony of Stephen Feltz. (See Exhibits NWN/2001 and NWN/2006.

The update to the full-time equivalent (FTE) employees and related true-up to incentive compensation is discussed in the reply testimony of John Sohl (Exhibit NWN/2300) and also in the reply testimony of Lea Anne Doolittle (Exhibit NWN/2400). This adjustment is shown in column (c) of my Exhibit NWN/1903-1905.

Q. Does this conclude your testimony?

A. Yes.

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BEFORE THE

PUBLIC UTILITY COMMISSION OF OREGON

UG 221

NW Natural

Exhibits of Natasha Siores

DECOUPLING/WARM
and
REVENUE REQUIREMENT ADJUSTMENTS
EXHIBITS 1901-1905

June 15, 2012

EXHIBITS 1901-1905 – DECOUPLING/WARM and REVENUE REQUIREMENT ADJUSTMENTS

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NW Natural
Oregon Jurisdictional Rate Case, Docket UG 221
Illustration of Staff Proposed Changes to Decoupling Mechanism

<u>Assumptions</u>
Test year - we have one customer using 700 therms.
Year 1- this is the first year after the rate case and we have added one more customer who also uses 700 therms. Year 1 is perfectly normal with respect to weather.
Rate design: $6 per month customer charge + 25¢ per therm (excluding gas costs).
LRIC is $247 including Mains cost; LRIC is $147 without Mains cost; making the New Service Rate $6.25 per month

(a)	(b)	(c) Oct	(d) Nov	(e) Dec	(f) Jan	(g) Feb	(h) Mar	(i) Apr	(j) May	(k) Jun	(l) Jul	(m) Aug	(n) Sep	(o) **Total**
1	Total volumes (test year)	40	90	120	120	100	80	50	30	20	15	15	20	**700**
2	Customers	1	1	1	1	1	1	1	1	1	1	1	1	
3	Use per Customer	40	90	120	120	100	80	50	30	20	15	15	20	**700**
4														
5	New volumes (year 1 after rates effective)	80	180	240	240	200	160	100	60	40	30	30	40	**1,400**
6	Customers	2	2	2	2	2	2	2	2	2	2	2	2	
7	Use per Customer	40	90	120	120	100	80	50	30	20	15	15	20	**700**
8														
9	**Existing Mechanism**													
10	Baseline use per customer from line 3	40	90	120	120	100	80	50	30	20	15	15	20	**700**
11	Customers	2	2	2	2	2	2	2	2	2	2	2	2	
12	Baseline volumes (Baseline use per customer * customers)	80	180	240	240	200	160	100	60	40	30	30	40	**1,400**
13														
14	<u>Deferral calculation:</u>													
15	Actual volumes from line 5	80	180	240	240	200	160	100	60	40	30	30	40	**1,400**
16	Baseline volumes from line 12	80	180	240	240	200	160	100	60	40	30	30	40	**1,400**
17	Volumes variance - line 15 less line 16	0	0	0	0	0	0	0	0	0	0	0	0	**0**
18	Decoupling deferral: line 17 * 25¢ per therm	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	**$0.00**
19														
20	**Proposed Mechanism**													
21	Baseline volumes from rate case from line 1	40	90	120	120	100	80	50	30	20	15	15	20	**700**
22	Actual volumes from line 5	80	180	240	240	200	160	100	60	40	30	30	40	**1,400**
23	Volumes variance - line 21 less line 22	(40)	(90)	(120)	(120)	(100)	(80)	(50)	(30)	(20)	(15)	(15)	(20)	**(700)**
24														
25	<u>Deferral Step I (Total Volumes Benchmark)</u>													
26	Decoupling deferral: line 23 * 25¢ per therm	($10.00)	($22.50)	($30.00)	($30.00)	($25.00)	($20.00)	($12.50)	($7.50)	($5.00)	($3.75)	($3.75)	($5.00)	**($175.00)**
27														
28	<u>Deferral Step II (New Service Rate)</u>													
29	New customers at new service locations	1	1	1	1	1	1	1	1	1	1	1	1	
30	New Service Rate	$6.25	$6.25	$6.25	$6.25	$6.25	$6.25	$6.25	$6.25	$6.25	$6.25	$6.25	$6.25	
31	Decoupling deferral: line 29 * line 30	$6.25	$6.25	$6.25	$6.25	$6.25	$6.25	$6.25	$6.25	$6.25	$6.25	$6.25	$6.25	**$75.00**
32														
33	Total decoupling deferral line 26 + line 31	($3.75)	($16.25)	($23.75)	($23.75)	($18.75)	($13.75)	($6.25)	($1.25)	$1.25	$2.50	$2.50	$1.25	**($100.00)**

This $100 refund to customers represents an under-recovery of the fixed cost of $247 associated with serving customers. This $100 essentially is the Mains cost removed from the LRIC used in the New Service Rate

ACCOUNTING FOR PUBLIC UTILITIES

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MATTHEW BENDER

CHAPTER 5

Working Capital Component of Rate Base

SYNOPSIS

The financial analyst's perspective of working capital reflects a measure of financial liquidity (i.e., the availability of cash on hand and other current assets that are readily convertible to cash that may be used to meet liabilities that must be paid in the current business cycle). This financial liquidity measure is based on a comparison of current assets to current liabilities at a point in time.

The ratemaking perspective of working capital is quite different. For ratemaking purposes, working capital is a measure of investor funding of daily operating expenditures and a variety of nonplant investments that are necessary to sustain ongoing operations of the utility. The ratemaking measure of working capital is designed to identify these ongoing funding requirements on average over a test year.

Regulatory commissions vary as to the identification of individual components of working capital; however, in general, the components are:

(1) fuel inventory;

(2) materials and supplies inventories;

(3) prepayments; and

(4) cash working capital.

These components are discussed in the sections below, with particular attention given to cash working capital, the most controversial item.

§ 5.01 Fuel Inventory

Determination of the fuel inventory component of working capital often parallels the method used for determining the plant investment component of rate base. For example, average balances during the year may be used in the case of an average-year rate base, and year-end balances may be used in the case of a year-end rate base. If the monthly balances are volatile, however, an average balance may be used in either situation. Also, the balance may be based on historic data or on forecasted data, depending on the test year approach in use (e.g., historic test year or projected test year).

On occasion, some regulatory commissions restrict the level of fuel inventory to a set number of days of supply. As an example, a commission may conclude that the level of coal inventory should be limited to 75 days of supply even though the actual quantity is 90 days. Such a restriction would be made only if the commission concludes the additional inventory supply is an imprudent management decision. Monetary levels are affected by a variety of conditions, including purchase contracts, alternative generating sources, effects of weather, transportation conditions, and a host of other factors. The investment in these inventories is most often substantial. Prudent management, therefore, will not maintain a larger fuel inventory investment than that required to assure a safe and dependable supply of fuel.

A commission should have to be absolutely convinced that a lower level of fuel inventory could be maintained without affecting the assured supply of fuel before it reduces the amounts allowed in the rate base from that which is actually maintained. A disallowance would almost certainly force the utility to lower its level of fuel inventory. If such a reduction is not consistent with sound operating conditions, the regulatory decision is contrary to the public's interest.

At the other end of the spectrum, some argue that the anticipated quantities of fuel stocks needed during the period the rates will be in effect should be allowed in the rate base. This position is theoretically valid on the basis that rates should be designed to recover costs as incurred (including the cost of financing fuel inventory). An even better measure would be to value the anticipated inventory level at a projected price throughout the period that the rates are anticipated to be in effect.

§ 5.02 Materials and Supplies

The measurement of the materials and supplies (M&S) inventory typically is the same as the fuel inventory component of rate base. A 13-month average is used if the balances are volatile, and forecasted amounts are used when the test year is based on projected data.

One issue raised by regulatory commissions from time to time in the determination of materials and supplies inventory involves attempts to segregate M&S inventories into the portion to be used for construction and the portion to be used for operations. It is argued that M&S inventory to be used for construction is similar to construction work in progress (CWIP) and, where CWIP investment is not allowed to earn a current return, M&S inventory for construction activities should also not be allowed to earn a current return. The problem with this approach is the potential loss of the utility's ability to recover the carrying costs on the construction related M&S inventories. It is generally recognized that any dollar of investment should earn either a current return through inclusion in the rate base or that the financing cost of the investment should

RATE CASE AND AUDIT MANUAL

Prepared by:

NARUC Staff Subcommittee
on Accounting and Finance

Summer 2003

Rate Case and Audit Manual Prepared by NARUC Staff
Subcommittee on Accounting and Finance (2003)

Rate Case and Audit Manual Prepared by NARUC Staff
Subcommittee on Accounting and Finance (2003)

Contributions-in-Aid of Construction/Customer Advances

Contributions-in-Aid of Construction (CIAC) and Customer Advances reduce the rate base as a source of non-investor supplied capital. CIAC and Customer Advances are payments made by customers generally to fund plant additions for new or expanded service. CIAC are generally non-refundable, whereas Customer Advances often have a provision allowing for refunds under specified circumstances. For certain of the utility industries (e.g., water and wastewater), it is common for the CIAC and Customer Advances to be contained in its own rate base account, whereas for other industries (e.g., electric and gas) it is common for these items to be netted against the plant costs associated with their payment. For telecommunications utilities, CIAC and Customer Advances are generally not an issue. Therefore, the auditor should be familiar with the accounting policy for the utility involved.

Additionally, the auditor should be familiar with the utility's line extension policy and any other tariffs that relate to the CIAC and Customer Advances and the level to which the utility may still have an obligation to refund these amounts. Furthermore, the auditor should determine whether any taxes or amortization expenses are associated with either the CIAC or Customer Advances, such as whether any of the funds are considered to be taxable income, or whether any of the funds include a gross-up for taxes.

Materials and Supplies and Purchasing Practices

The auditor should look for ways to determine the reasonableness of the materials and supplies (inventories) balance. For instance, one might ask for the utility's policy on spare parts inventory, and its ability to obtain materials and supplies on short notice. One might also ask about the purchasing practices of the utility, to determine whether it is using reasonable care in keeping its material and supply costs low. Additionally, the auditor may wish to look for anomalies in the month end balance during the period, to see if there is a need to normalize the balance included in rate base.

For utilities with fuel stocks (such as electric utility coal piles or natural gas storage), one may want to ask about balances and policies on determining the most efficient and effective inventory levels. For example, is it generally the policy to keep a certain number of days of coal stock on hand, with a review of that level if a strike is pending? Is the amount of natural gas stored dependent upon the price of that natural gas?

Accumulated Deferred Income Taxes

Accumulated Deferred Income Taxes are also treated as a reduction to rate base. See Income Taxes discussion below.

Regulatory Assets and Other Deferrals

The auditor should become familiar with the specific items in this account, including the nature of the entries, the dollar amounts, the reason for the deferrals, and whether or not regulatory approval has been obtained (or is needed) for the deferrals. In looking at the nature of the

NW Natural
Oregon Jurisdictional Rate Case Updated for reply & stipulation
Test Year Twelve Months Ended October 31, 2013
Increase in Revenue Requirement
($000)

		Test Year						
Line No.		Forecasted Test Year Results [a] (a)	Adjustments (b)	Test Year Adjusted (c)	Margin Change [b] (d)	Pension Change [c] (e)	Total Revenue Change (f = d+e)	Results @ 10.2% ROE (g)
	Operating Revenues							
1	Sale of Gas	$682,996	$0	$682,996	$30,998	$4,899	$35,897	$718,893
2	Transportation	12,871	0	12,871			0	12,871
3	Miscellaneous Revenues	3,429	494	3,923			0	3,923
4	Total Operating Revenues	699,296	494	699,790	30,998	4,899	35,897	735,687
	Operating Revenue Deductions							
5	Gas Purchased	395,039	0	395,039			0	395,039
6	Uncollectible Accrual for Gas Sales	2,110	0	2,110	96		96	2,206
7	Other Operating & Maintenance Expenses	118,219	(5,237)	112,982			0	112,982
8	Total Operating & Maintenance Expense	515,368	(5,237)	510,131	96	0	96	510,227
9	Federal Income Tax	18,280	1,888	20,168	9,739	0	9,739	29,907
10	State Excise	4,342	444	4,786	2,289	0	2,289	7,075
11	Property Taxes	19,604	0	19,604			0	19,604
12	Other Taxes	23,323	13	23,336	808		808	24,145
13	Depreciation & Amortization	60,094	(33)	60,060		4,899	4,899	64,960
14	Total Operating Revenue Deductions	641,012	(2,926)	638,086	12,932	4,899	17,832	655,918
15	Net Operating Revenues	58,284	3,419	61,703	18,066	0	18,066	79,769
	Average Rate Base							
16	Utility Plant in Service	$2,227,108	($14,513)	$2,212,595				$2,212,595
17	Accumulated Depreciation	(990,862)	409	(990,454)				(990,454)
18	Net Utility Plant	1,236,246	(14,104)	1,222,142	0	0	0	1,222,142
19	Pension	21,930	17,265	39,195			0	39,195
20	Aid in Advance of Construction	(1,994)	(5,380)	(7,375)			0	(7,375)
21	Gas Inventory	48,008	0	48,008			0	48,008
22	Materials & Supplies	7,422	(633)	6,790			0	6,790
23	Leasehold Improvements	1,155	0	1,155			0	1,155
24	Accumulated Deferred Income Taxes	(329,082)	0	(329,082)			0	(329,082)
25	Total Rate Base	983,685	(2,852)	980,833	0	0	0	980,833
26	Rate of Return	5.93%		6.29%				8.14%
27	Return on Common Equity	5.78%		6.51%				10.20%

[a] Reflects test year line items as filed in original case, with update to taxes only due to interest synch caused by change in assumption on ROE and interest on long term debt.

[b] Margin increase is calculated by multiplying Test Year Rate Base (line 25 column c) by the requested Rate of Return (lin 26 column g) and comparing the result to Test Year Operating Revenues (line 15 colmn c). The difference is then grossed up for tax and shown in line 1 of column d. Associated taxes and uncollectibles are calculated based on the revenue increase and the tax rates and uncollectible average as used in this model.

[c] This revenue increase represents collection of revenue to amortize pension related amounts as discussed in the direct testimony of Stephen Feltz.

6/15/2012

NW Natural
Oregon Jurisdictional Rate Case Updated for reply & stipulation
Test year Normalizing Adjustments
($000)

Line No.		Stipulation Adjustment (a)	Pension Correction & Update Adjustment (b)	FTE's Adjustment (c)	blank Adjustment (d)	blank Adjustment	blank Adjustment	blank Adjustment	Total Adjustments (e)
	Operating Revenues								
1	**Sale of Gas**	$0							$0
2	**Transportation**	0							0
3	**Miscellaneous Revenues**	494							494
4	**Total Operating Revenues**	494	0	0	0	0	0	0	494
	Operating Revenue Deductions								
5	**Gas Purchased**	0							0
6	**Uncollectible Accrual**	0	0	0	0	0	0	0	0
7	**Other Operating & Maintenance Expenses**	(4,419)		(818)					(5,237)
8	**Total Operating & Maintenance Expense**	(4,419)	0	(818)	0	0	0	0	(5,237)
9	**Federal Income Tax**	1,787	(169)	270	0	0	0	0	1,888
10	**State Excise**	420	(40)	64	0	0	0	0	444
11	**Property Taxes**								0
12	**Other Taxes**	13	0	0	0	0	0	0	13
13	**Depreciation & Amortization**	(25)		(9)					(33)
14	**Total Operating Revenue Deductions**	(2,224)	(209)	(492)	0	0	0	0	(2,926)
15	**Net Operating Revenues**	$2,718	$209	$492	$0	$0	$0	$0	$3,419
	Average Rate Base								
16	**Utility Plant in Service**	($14,194)		(319)					($14,513)
17	**Accumulated Depreciation**	409							409
18	**Net Utility Plant**	(13,785)	0	(319)	0	0	0	0	(14,104)
19	**Pension**		17,265						17,265
20	**CIAC, Customer Deposits & Injuries & Dama**	(5,380)							(5,380)
21	**Gas Inventory**	0							0
22	**Materials & Supplies**	(633)							(633)
23	**Leasehold Improvements**								0
24	**Accumulated Deferred Income Taxes**								0
25	**Total Rate Base**	($19,798)	$17,265	($319)	$0	$0	$0	$0	($2,852)
26	**Interest Coordination**	($601)	$524	($10)	$0	$0	$0	$0	($87)
27	**Total Revenue Requirement**	(7,418)	2,049	(888)	0	0	0	0	(6,257)

Northwest Natural Gas Company
Test year Normalizing Adjustments **Income Tax Calculations**
Oregon Jurisdictional Rate Case Updated for reply & stipulation
($000)

Line No.		Adjustment	Adjustment	Adjustment	Adjustment	Adjustment	Adjustment	Adjustment	Total Adjustments
1	**Book Revenues**	$494	$0	$0	$0	$0	$0	$0	$494
2	**Book Expenses before Deprec. & Int.**	(4,407)	0	(818)	0	0	0	0	(5,224)
3	**State Tax Depreciation**	(25)	0	(9)	0	0	0	0	(33)
4	**Interest Expense (Income)**	(601)	524	(10)	0	0	0	0	(87)
5	**Book/Tax Differences (Sched. M)**	0	0	0	0	0	0	0	0
6	**State Taxable Income**	5,526	(524)	836	0	0	0	0	5,838
7	**State Excise Tax [1]**	420	(40)	64	0	0	0	0	444
8	**State Tax Credit**	0	0	0	0	0	0	0	0
9	**Net State Income Tax**	420	(40)	64	0	0	0	0	444
10	**Excess Book(Tax) Deprec.**	0	0	0	0	0	0	0	0
11	**Other Sched. M Differences**	0	0	0	0	0	0	0	0
12	**Federal Taxable Income**	5,106	(484)	772	0	0	0	0	5,394
13	**Federal Income Tax [2]**	1,787	(169)	270	0	0	0	0	1,888
14	**ITC**	0	0	0	0	0	0	0	0
15	**Current Federal Tax**	1,787	(169)	270	0	0	0	0	1,888
16	**Deferred Income Tax - Federal**	0	0	0	0	0	0	0	0
17	**Deferred Income Tax - State**	0	0	0	0	0	0	0	0
18	**ITC Restored (Deferred)**	0	0	0	0	0	0	0	0
19	**Total Federal Tax**	1,787	(169)	270	0	0	0	0	1,888
20	**Total State Tax**	420	(40)	64	0	0	0	0	444

[1] Statutory State Excise Tax Rate: 7.60%
[2] Statutory Federal Income Tax Rate: 35.00%

NW Natural NWN/1905
Oregon Jurisdictional Rate Case Updated for reply & stipulation Siores/1
Proforma Cost of Capital and Revenue Sensitive Costs

	Weighted Average Cost of Capital	**% of Total Capital**	**Average Cost**	**Weighted Cost**
1	**Long Term Debt**	50.00%	6.070%	3.04%
2	**Common Stock**	50.00%	10.20%	5.10%
3	**Total**	100.00%		8.14%

Revenue Sensitive Costs

4	**Gas Sales**	97.67%
5	**Transportation**	1.84%
6	**Other**	0.56%
7	**Subtotal**	100.07%
8	**O & M - Uncollectible**	0.31%
9	**Franchise Taxes at**	2.36%
10	**OPUC Fee**	0.25%
11	**State Taxable Income**	97.15%
12	**State Income Tax**	7.38%
13	**Federal Taxable Income**	89.77%
14	**Federal Income Tax**	31.42%
15	**Utility Operating Income**	58.35%
16	**Total Revenue Sensitive Costs**	41.65%
17	**Net-to-gross factor**	171.38%
18	**Rate of Return on Equity**	10.20%
19	**Federal Tax Rate**	35.00%
20	**State Tax Rate**	7.60%
21	**Combined Tax Rate**	39.94%
22	**Franchise Fees**	2.358%
23	**Uncollectible Accounts**	0.308%
24	**Regulatory Fees**	0.250%
25	**Interest Coordination Factor**	3.035%

BEFORE THE

PUBLIC UTILITY COMMISSION OF OREGON

UG 221

NW Natural

Reply Testimony of Stephen P. Feltz

COST OF CAPITAL AND PENSIONS
EXHIBIT 2000

June 15, 2012

EXHIBIT 2000 – REPLY TESTIMONY – COST OF CAPITAL AND PENSIONS

Table of Contents

Rates & Regulatory Affairs
NW NATURAL
220 N.W. Second Avenue
Portland, Oregon 97209-3991
1-503-226-4211

I. INTRODUCTION AND SUMMARY

Q. Are you the same Stephen Feltz who filed direct testimony in this proceeding on behalf of Northwest Natural Gas Company ("NW Natural" or the "Company")?

A. Yes, as Exhibit NWN/400-411.

Q. What is the purpose of your reply testimony?

A. I respond to the adjustments proposed by:

(1) Matt Muldoon on behalf of Commission Staff ("Staff") regarding the Company's cost of capital; and

(2) Nick Cimmiyotti on behalf of Staff and Hugh Larkin Jr. on behalf of the Citizen's Utility Board of Oregon (CUB) and the Northwest Industrial Gas Users (NWIGU) related to the Company's proposal for recovery of pension costs.

II. COST OF CAPITAL

Q. Please summarize your reply testimony regarding cost of capital.

A. In my testimony on cost of capital issues, I:

- Explain that the Company has revised its plan to issue debt in the fourth quarter of 2012 from a $25 million, 30-year issuance to a $50 million, 30-year issuance, which is consistent with Staff's recommendation;
- Explain why the Commission should reject Staff's proposal to remove two long-term debt issuances that mature in 2014 and replace them with a new 10-year debt issuance; and
- Demonstrate that the Company's decision to enter into a financial interest rate hedge in 2007 was prudent based on what the Company knew or reasonably

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should have known at that time and explain that Staff has presented no reasonable basis for disallowing half of the costs associated with the hedge.

<u>Cost of Debt</u>

Q. What assumptions did the Company use in its direct case filing to determine the test year embedded cost of debt?

A. At the time of its direct case filing, the Company planned to issue $25 million of 30-year debt with an effective yield of 4.795 percent.

Q. Have the Company's plans changed since it filed its direct testimony?

A. Yes, the Company now plans to sell $50 million of 30-year debt late in the second quarter of 2012, either shortly before or after this reply testimony is filed.

Q. What coupon rate and effective yield is the Company forecasting?

A. Given the very recent volatility of the debt markets driven by the European debt crisis and macroeconomic trends in the U.S., it is difficult to forecast. That said, the Company expects the coupon rate to be in the 4.0 percent to 4.2 percent range.

Q. What is the Company proposing with respect to this debt issue?

A. The Company proposes including the actual costs of the issue in rates. For the purposes of this filing, the Company assumed a coupon rate of 4.2 percent. However, given that the actual coupon rate and other costs of issuance will be known well before the rate effective date in this proceeding, it will be straightforward to both confirm the final costs and include them in the final revenue requirement determination.

Q. Is the Company planning any other debt issues either before or during the test year?

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A. Yes, the Company's current financing plan includes issuing an additional $25 million of 10-year debt in the fourth quarter of 2012.

Q. Please describe your assumptions for the debt to be issued.

A. The Company has assumed a coupon rate of 4.20 percent, and an effective yield of 4.26 percent on the $50 million, 30-year debt issue, and a coupon rate of 3.33 percent, and an effective yield of 3.52 percent on the $25 million, 10-year debt issue.

Q. What adjustments does Staff propose to the Company's proposal?

A. Staff proposes three changes to the cost of debt included in the Company's direct case. First, Staff proposes to remove two long-term debt issues that mature in July and September of 2014 and has included in the test year embedded cost of debt replacement issues using new 10-year debt. Second, Staff proposes that the Company's 2012 debt issue be increased from $25 million to $50 million. Third, Staff proposes that the Company absorb half of a financial hedging loss.

Q. With respect to Staff's first proposal, do you agree with replacing the two debt issues that mature in late 2014?

A. No.

Q. What rationale did Staff witness Mr. Muldoon use to support his recommendation?

A. In opening testimony, Staff stated that using a ten-year replacement avoids adding to concentration in debt maturing in five to eight years and that a ten-year maturity takes advantage of historically low 10-year bond coupon rates. Staff also claims that such pro forma replacements are a well-established Commission practice. He cited one case in which this practice was reflected.

Q. Do you agree with this practice?

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A. Not in this case. The debt series that are at issue mature nine months and eleven months after the end of the test year, meaning that if Staff's proposal is adopted NW Natural will be under-recovering its embedded cost of debt for 21 and 23 months, respectively. These are not issues that become due shortly after the end of the test year. One of the two existing debt issues that matures in 2014 is not callable (i.e. redeemable) prior to maturity, and the other, if redeemed prior to maturity, would require that NW Natural pay the bondholder(s) an early redemption premium. Staff has not included any early redemption premium in their proposed cost of new financing. Further, it is not clear today when and how the Company would replace this debt. The Company's financing requirements would suggest NW Natural does not need the additional debt proceeds this year. And replacing this debt two years early would appear to be speculative, plus it would result in a negative interest rate carrying cost because it replaces very low short-term working capital debt balances. Ultimately, the timing and type of financing will depend on the Company's capital needs and conditions in the securities markets in 2014. For these reasons the pro forma replacement of these late-2014 debt series should not be adopted.

Q. With respect to Staff's second recommendation, it appears that you agree with Mr. Muldoon's recommendation to issue $50 million of debt this year instead of the $25 originally proposed by the Company.

A. Yes. Given the current low interest rate environment the Company now plans to issue at the top end of its financing target for 2012, which includes $50 million of 30 year debt plus an additional $25 million of 10 year debt, even though the driver of our original proposal to issue only $25 million, i.e. a lack of immediate need for more than $25 million

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this year, remains. The Company plans to issue in the private debt market, which will allow for a delayed take-down of the debt proceeds later this year at very little additional cost for the delay. With these changes, the revised embedded cost of debt is 6.07%. See my Exhibit NWN/2001.

Financial Hedge

Q. Please describe the adjustment Staff proposes related to the costs of a financial hedge the Company employed.

A. At Staff/1200, Muldoon/13-16, Staff recommends that the Company's expense of debt issuance be reduced (for purposes of establishing NW Natural's revenue requirement) by $5,048,000. This amount represents half of the amount that was paid by the Company to UBS Securities LLC related to a financial interest rate hedge that the Company entered into in 2007 in order to mitigate risk associated with swings that were occurring in corporate debt issuance interest rates.

Q. Did the Company have authorization to enter into the hedge to which Staff's adjustment relates?

A. Yes. The Company was authorized to enter into the transaction under OPUC Order No. 07-032 ("OPUC Order"), effective January 29, 2007, which approved the Company's use of interest rate derivatives such as interest rate swaps. Under the OPUC Order, the Company was limited to interest rate hedges not to exceed a notional amount of $200 million, or 30 percent of total outstanding debt. Further, the Company was required to maintain investment grade ratings from two nationally recognized bond rating agencies. The Company complied with these terms, and the interest rate hedge it entered into was within the parameters allowed by that OPUC Order.

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Under the OPUC Order, the Company was also required to file reports and supporting documentation regarding any hedge transaction entered into, including documentation demonstrating that the hedge transaction was prudent. The Company filed the required reports under Docket No. UF 4235 on February 20, 2008.

Q. Please describe interest rate swaps generally, and give context for why the Company was interested in an interest rate swap.

A. Interest rate swaps are transactions, generally between two parties, where those parties agree to make interest payments to each other calculated using a "notional" principle amount. This notional amount is an amount upon which the interest payments are calculated. Under an interest rate swap agreement, one party calculates their payment obligation at a fixed, agreed-to interest rate, and calculates their interest payment to be received at a variable rate from the other party. The net amount between "paying fixed" and "receiving variable" is the net cash settled and is considered the "swap payment". The party sending or receiving swap payments applies the proceeds, or losses, from the net exchange to the costs of a separate debt issuance once it is completed. The net effect of this swap transaction is to achieve an interest cost that is close to the effective rate that was hedged under the transaction as of the hedge date.

In the fall of 2007, the Company became interested in an interest rate swap because it was planning to make a significant future debt issuance, and because interest rates were reflecting substantial volatility. The Company was concerned that rising interest rates could harm the Company and its customers with higher interest costs when it made that future debt issuance.

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Q. Please explain the process the Company went through in evaluating and entering into the hedge.

A. This process was laid out in the reports the Company filed with Commission in February of 2008, in Docket UF 4235, detailing the transaction and the reasons it believed the transaction was a prudent approach to managing risks associated with volatile interest rates. In that report, the Company provided all correspondence with agents and counterparties related to the hedge, described its risk analysis, and stated:

> In the Company's 2007 financing strategy, the Company determined that it would need to issue debt out of our Medium Term Note ("MTN") program sometime around September 2008. * * * The Company was concerned about the current volatility of US interest rates and financial markets, as housing and, more recently, liquidity concerns roiled the credit markets. In September and October 2007, daily Treasury moves of 10+ bps had become increasingly common, and the Company was concerned that rising interest rates would negatively impact the Company's cost of capital for the identified debt issuance. At the same time, from early September to late September, 10-year Treasury rates had risen by 20 bps; then from late September to late October, 10-year US Treasury rates declined nearly 40 bps, constituting the lows for 2007 and dropping to levels not seen since 2005. The Company had identified both a need for issuing debt as well as for managing interest rate exposure due to market volatility. To assist the Company in obtaining protection against material adverse market events and provide opportunities to take advantage of favorable market conditions, the Company engaged in discussions with a number of potential counterparties.[1]

The Company went on to explain its discussions with a number of investment banks regarding the options for hedging interest rate risks. The Company described that after its inquiries regarding options, and consideration of those options, the Company determined that it would utilize a forward starting interest rate swap, "which hedges both

1 *See Report of Hedge Transaction and Documentation Supporting Prudency of Transaction*, Docket No. UF 4235 (Feb. 26, 2008).

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the benchmark treasury rate as well as the credit spread." *Id*. It explained that this tool provided "a number of advantages over pure Treasury locks, including: partial credit spread protection, . . . greater pricing transparency and more efficient execution than Treasury locks for longer forward periods, . . . simplification of accounting considerations . . . and a lower forward premium than the cost associated with Treasury locks." *Id*. The Company explained that once the desire for a forward swap was identified, the Company began "closely monitoring the 10-year swap rates," before ultimately determining that market conditions were favorable for a forward swap transaction on October 24, 2007. At that time, the Company obtained simultaneous bids from six investment banks, and determined to go with the lowest offer, from UBS Securities. *Id*. The Company entered into an interest rate swap with UBS, with a notional amount of $50 million, at a fixed interest rate of 5.083%. The Company explained its position stating:

> Given the market volatility and the Company's identified need for debt within the next year, the Forward Swap reduces the Company's risk with respect to cost of capital by protecting against increasing interest rates between now and then, avoiding any carrying costs for monies borrowed in advance of when the funds would be needed, and preventing the deterioration of certain debt to capital ratios that could adversely affect the Company's credit ratings.[2]

Q. Did the hedge have the effect that was intended?

A. No, the hedge did not mitigate against higher interest rates as the Company had anticipated and as was designed under the transaction.

Q. Why didn't the swap have the intended effect?

A. A pay-fixed interest rate swap is intended to effectively lock in a target interest rate for a future issuance of debt. However, the economic effectiveness of the hedge depends on

2 *Id*.

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the correlation between changes in the "swap rate" and changes in the expected interest rate on the underlying future bond issuance. The correlation between the AA swap rate and an AA utility bond rate (which would be similar to a NW Natural first mortgage bond rate) had historically been very close, and in fact has reverted to the historical relationship. However, after the Company entered into the financial swap, there was a significant, unexpected, and apparently unprecedented departure of these rates from each other. My Exhibit NWN/2002 demonstrates this departure, which is the fundamental reason the swap did not have the effect intended. Not only did the change in rates not correlate, they became inversely correlated, which is to say they moved in the opposite direction.

Q. Why didn't the Company know that the hedge would have the result it did?

A. In order for the Company to have known that such a result would occur, it would have needed to have information that no other party had at that time either. Specifically, it would have to been able to predict the financial crisis that occurred during 2008 and 2009, which caused an unexpected variance between the 10-year swap rate and the debt costs of AA utilities, and it would have to have foreseen that this would be the result of the financial crisis. These two rates had tracked each other ever since the Great Depression, and only diverged significantly from each other during the 2008-2009 financial crisis, which happened to be the period after inception of the financial swap the Company transacted.

Q. Is the fact that the Company paid UBS money under the swap also because the Company did not anticipate the results under the swap?

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A. No. The fact that the Company was required to pay UBS is not, in and of itself, a surprising result, and does not indicate that the swap was ineffective or a poor choice. The very nature of a swap is that there is a chance the fixed rate will be below the variable rate, and a chance that the fixed rate will be above the variable rate. A swap is intended to mitigate volatility, not to beat the market price or variable rate. In other words, the transaction was designed to mitigate interest rate risk and achieve a certain target level of interest cost even if the Company was required to pay UBS for a loss on the hedge. In effect, if the Company's loss on the hedge was higher, it should have been offset by interest cost savings from a lower rate on the actual bond issue.

Q. What reasons does Staff give for its proposal that the Company's cost of debt be reduced by half of the amount of the Company's loss on the hedge?

A. Staff offers four reasons. First, Staff says that the Company did not perform its own probabilistic risk analysis of the hedge or use an independent third party to conduct the risk analysis. Second, Staff says that the Company failed to deliver price and timing certainty at a cost proportional to the interest rate risk. Third, Staff argues that the Company's financial hedging policy is less stringent than FASB standards for whether a hedge is effective. Finally, Staff argues that there is limited transparency regarding the hedge transaction and accounting treatment.

Q. Why does Staff state that an independent or third party probabilistic risk analysis should have been conducted before the Company entered the hedge?

A. It is not clear why Staff believes that the Company should have conducted an independent or third party analysis. NW Natural does not believe that it is common practice for a utility to employ a third party to perform such an analysis. Instead, NW

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Natural, like other utilities, relied on the type of research and review that it believes to be prudent and reasonable—a careful and thorough review by the utility's financial management team and Treasurer.

It is important to note that a third party would have only the same information upon which NW Natural relied in performing an analysis. This would include whatever the market was reflecting, and in our case we used Bloomberg's reporting service and information that commercial and investment banks were providing to NW Natural at the time we were making our decision. The Company also was able to access all of this information and did review it as part of its decision making process. Additionally not all material from the investment banks was prepared specifically for NW Natural but was generic information and disseminated to their broader client base. Similar generic information was received from various counterparties and reviewed by the Company.

In response to discovery by the Company about whether Staff knew of any examples where utilities took a different approach, for example by hiring an independent third party to perform such a market analysis prior to entering into a financial hedge, Staff responded that it knew of "[n]othing specific at this time, that is part of the public record." See my Exhibit NWN/2003, Feltz/2, which is Staff's Response to NW Natural's Data Request 55. When specifically asked if Staff believed it was common practice for utilities to hire independent review of financial hedges before entering them, it did not provide an answer other than to explain that NW Natural did not conduct such a review and that Staff believes NW Natural should have conducted one. See, *e.g.* Staff Responses to NW Natural's Data Request 54 (NWN/2003, Feltz/1) and Data Request 47 (NWN/2004 CONFIDENTIAL).

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Q. What analysis did the Company perform before entering the hedge?

A. As described above, and as more fully detailed in the Company's filing in Docket UF 4235, the Company had discussions with several investment banks, and analyzed the various options for hedging interest rates. The Company's decision was made after several months of evaluating potential opportunities for hedging interest rates. The Company analyzed the pros and cons of various interest rate risk management tools, and determined that it would utilize an interest rate swap. The Company closely monitored swap rates, and entered into the swap at a time when swap rates were at the low for the year, and utilized the bank counterparty with the lowest rate offer in a competitive bid process at that time.

Q. If the Company had performed the risk analysis the Staff asserts you should have, would that assessment have prevented the losses on the hedge, or prevented the Company from entering into the hedge?

A. The Company understands that Staff believes it should have conducted a Monte Carlo, probabilistic analysis before it entered into the hedge. Such an analysis was not required under the OPUC Order, and the Company does not believe that such an analysis was otherwise necessary or that it would have shed any light on the future unprecedented market movements between swap rates and utility debt issuance rates.

For purposes of demonstrating why a Monte Carlo probabilistic analysis would not have altered the Company's actions, the Company has performed such an analysis, using Bloomberg information that was available at the inception of the swap. See my Exhibit NWN/2005. This analysis shows that within a 95% confidence band, the variances in the swap rate would have been expected to produce a maximum potential

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loss on the hedge transaction of $5.6 million, or a maximum potential gain of $7.8 million. However, either result would have still been expected to mitigate against any interest rate volatility if the swap rate and debt issuance rates had remained correlated. Thus, the analysis Staff asserts the Company should have conducted would have done nothing to predict the transaction's inability to deliver the expected results.

Q. What is Staff's argument with respect to the failure of the hedge?

A. Staff says that the Company failed to deliver price and timing certainty at a cost proportional to the interest rate risk.

Q. What is your response to Staff's position that the hedge losses should result in an adjustment because the hedge failed to deliver certainty at a cost proportional to the interest rate risk?

A. Again, Staff's assertions are essentially an argument that the Company should be penalized because the interest swap did not produce the intended effect of stabilizing the effective interest rate of the Company's debt issuance. However, Staff has not described any action by the Company that was deemed to be imprudent, or that the Company knew or should have known of the impending financial crisis, or that the crisis would result in an unprecedented market movement between swap rates and utility bond rates. The Commission should reject Staff's invitation to judge the prudency of the hedge on hindsight, and instead should review whether the Company's actions at the time were prudent, based on the information the Company had or could have had at the time, under the circumstances that prevailed at the time.

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Q. Staff also argues that the Company's hedging policy is less stringent than FASB accounting methods when determining whether a hedge is "effective." What is your response to Staff's position on this topic?

A. Staff's statements are not correct. The purpose of the FASB standard on hedge accounting, in part, is to set forth rules on how companies will determine whether a hedge transaction is effective. The FASB standard, however, is not designed to establish policy over a company's management decisions or to determine the appropriateness of such hedge transactions. In accounting terms, whether a hedge is "effective" or "highly effective" does not depend on whether the results of the transaction were favorable or achieved management's intent. Instead, the FASB standard under Generally Accepted Accounting Principles in the United States (U.S. GAAP) provides specific guidance on how to account for and report a company's hedge activities. NW Natural's practices have been, and continue to be, in accordance with U.S. GAAP.

NW Natural's hedge policy goes even further than such an accounting standard, including a requirement that the Company's objective is that all hedges are economically effective and reduce exposure to risk by producing the result of stabilizing volatility. The fact that this interest rate hedge resulted in a loss and did not meet its objective was, as described above, due to unprecedented and unexpected circumstances, and Staff's assertions that the cause of the swap's failure to produce the expected results is somehow due to the Company's standards being less stringent than the FASB standard is not supportable. And from an accounting perspective, NW Natural's interest rate hedge was highly effective in accordance with the FASB standard. This designation was specifically reviewed by our external auditor PwC.

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Q. Does Staff offer any other rationale for their proposed adjustment related to the hedge?

A. Staff states that there was limited transparency regarding the transaction and the accounting treatment.

Q. Is Staff correct that there was limited transparency regarding the transaction and accounting treatment?

A. No. In accordance with the OPUC Order, the Company filed over one hundred pages of documentation concerning the swap on February 20, 2008 in Docket No. UF 4235. The filing included the signed transaction specifying the terms of the arrangement, email communications on market updates, general market reports, and all competitive bidding tickets. Additionally, the accounting treatment for the hedge was disclosed in our 2009 annual filing with the SEC, which stated clearly that the Company had realized a $10.1 million loss on the hedge, and that it would be amortized to interest expense over the term of the debt. Further, in this general rate case, the Company has provided information such as board minutes, internal presentations and communications, calculations of the losses under the swap, and all other information available regarding the swap.

In any event, it is unclear why Staff believes that a lack of transparency related to the accounting of the hedge should result in Staff's proposed adjustment.

Q. What is the basis for Staff's recommendation that half of the hedge loss should be removed from NW Natural's cost of debt calculation?

A. It is unclear. When asked the basis for this calculation, Staff did not provide any details as to why a 50% disallowance would be appropriate. (See NWN/2004 CONFIDENTIAL).

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NW Natural assumes that Staff's proposal is based simply on its feeling that the Company's shareholders should split the costs with customers. Because the cost relates to financing investments on behalf of the customers, however, and because the Company has demonstrated that its decision to enter into the hedge was prudent, such a sharing of these costs between shareholders and customers would be inappropriate and unsupported.

Q. Are there any other aspects of Staff's proposal that you think the Commission should consider?

A. Yes. The Company did not enter into the hedge with the goal of "beating the market" or to speculate on future interest rate movements. The hedge was intended solely to reduce the uncertainty regarding the interest costs of a future debt issuance. If the Commission were to find that a portion of the hedge loss should be disallowed simply because it added to the Company's cost of debt, then the Company, and likely other utilities in Oregon, would probably avoid interest rate hedging in the future, and thereby remove what should be a tool for prudently managing risks to ratepayers and shareholders. Such an approach would not, in the Company's view, be consistent with prudent management of the utility's debt costs. Especially given that we are at historic lows in interest rates, it is more likely than not that interest rates will trend up over the next several years. In such an environment, it may be important for NW Natural and other utilities to use debt management tools, such as interest rate hedges, to guard against volatility and rising interest rates.

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III. PENSIONS

Q. Please summarize your reply testimony regarding pensions.

A. Since our last general rate case (2003), NW Natural has invested $122.5 million into its defined benefit pension plan for employees, including $28 million scheduled for this year. In addition, NW Natural is projected to contribute $102 million over the next five years, for a grand total amount of $224.5 million in pension contributions, or $202 million on an Oregon allocated basis. Over roughly this same time period, under the current FAS 87 ratemaking methodology, the Company is projected to "recover" approximately $111 million from Oregon customers, thereby creating a $91 million gap between Company contributions and customer recovery.[3] See my Exhibit NWN/2006 for details on the pension contribution amounts and FAS 87 expense collected amounts referred to above.

The reason for the significant and growing disparity between pension contributions and amounts recovered from customers is straightforward: the Pension Protection Act of 2006 (PPA) significantly changed the timing of pension contributions, and by doing so permanently altered the impact of differences between employer contributions and the recognition of FAS 87 expense. This fact, when combined with the recent market crash and historically low interest rates, created a situation where the Company has been forced to make regular and substantial contributions to its pension accounts. These large contributions have in turn significantly lowered the Company's FAS 87 expense—which is the basis for the Company's recovery mechanism. Under the current FAS 87 ratemaking methodology, once the balancing account turns negative, the

3 As discussed in my direct testimony, the customer "recovery" amount consists of FAS 87 collected in rates for O&M expense, plus FAS 87 collected in rates for amounts allocated to rate base capital accounts, plus FAS 87 deferrals in the pension balancing account which started in 2011.

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Company will be required to refund the credit balance to customers. Moreover, when FAS 87 is reset in a future general rate case, FAS 87 expense is likely to be negative, resulting in continuing refunds to customers.

To remedy this situation, the Company has proposed a simple mechanism by which it is allowed to add its excess pension contributions to rate base so that it can recover its investment—including financing costs. Specifically, the Company proposes to add to rate base its contributions to its pension accounts, minus the FAS 87 expense it includes in rates, and to amortize this amount over eight years.

Staff and NWIGU-CUB oppose the Company's recovery proposal, arguing that FAS 87 recovery is sufficient to compensate the Company for its pension costs. In addition, these parties raise arguments suggesting that the Company's proposed recovery mechanism cannot legally be adopted. However, it is significant that neither Staff nor NWIGU-CUB address the *actual numbers* presented by NW Natural that demonstrate that the Company will not in fact be allowed to recover its contributions to its pension funds. Just as significantly, neither Staff nor NWIGU-CUB suggest that the contributions were not prudently incurred.

In summary, FAS 87-based ratemaking methodology is broken and needs to be fixed. NW Natural is not trying to reach back and claim expenses related to prior periods. NW Natural is simply asking the Commission to adopt a mechanism that will allow the Company to recover the investments it has made that are working today and in the future to create customer benefits through lower FAS 87 pension expense.

Q. Please explain why the current FAS 87-based ratemaking recovery does not address the full costs of funding NW Natural's pension plan.

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A. As mentioned above, there are three factors which have resulted in the Company's under-recovery of its pension expenses under the FAS 87 ratemaking mechanism. The primary factor is the passage of the PPA, which, as discussed in my direct testimony, requires the Company to achieve 100% funding of its pension plans over a shorter period of time. When combined with the market crash of 2008 and historically low interest rates, the PPA has required the Company to make significant contributions in a very short period of time—contributions that will never be recovered under the current ratemaking construct.

Q. Please explain the impact of the market crash and low interest rates on the Company's pension costs.

A. Quite simply, the market crash reduced the value of the plan assets held in NW Natural's pension trust account by $63.3 million between year-end 2007 and year end 2008. At the same time, the accompanying low interest rates–which are persisting even today–significantly increase plan liabilities from $243 million at the end of 2007 to $363 million at the end of 2011–an increase of nearly 50% or $120 million.

Together these factors took NW Natural's pension fund from approximately *100% funded* at the end of 2007 to $*147 million underfunded* at year-end 2011, despite NW Natural having contributed over $55 million into the pension account between 2008 and 2011.

Q. What impact did the PPA have?

A. In order to answer this question, I need to review why FAS 87 was adopted in the first place, and how FAS 87 recovery operated *before* the PPA. Historically, cash contributions to pension funds reflected "lumpy" investments, which were made

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periodically to keep pension accounts reasonably well-funded to support the future payment of liabilities when due. The lumpy nature of these contributions raised concerns that, if recovered on a cash basis, contributions might be timed in such a way as to maximize rate case recoveries, and possibly result in a rate case recovery higher than the average that would be made during the rate effective period. Thus, under FAS 87, the objective was to provide a measure of net periodic pension cost (FAS 87 expense) that systematically accrued the expected pension cost over an expected period of active service of covered employees. And while the IRS did have in place certain funding rules governing when contributions would be made, those rules allowed utilities some flexibility and the employment of “smoothing techniques” that for the most part matched the timing of contributions with the timing of FAS 87 expense over a period of time.

However, as discussed above, the PPA now requires employers to move toward 100% funding of all pension plans. If a plan is underfunded (i.e. anything less than 100%), then the funding shortfall must be made up with contributions over a shorter time period than before PPA was enacted. The result is that much higher cash contributions are required today than would have been required when FAS 87-based ratemaking methodology was adopted.

Q. But why does this result in an under-recovery of costs?

A. Higher contributions directly result in lower FAS 87 expense due to investment returns on plan assets. Put simply, the shareholder contributions lower FAS 87 expense because the pension fund has more money invested in it to generate income, which is in turn used to reduce FAS 87 expense. This “feedback loop” between cash contributions and FAS 87 expense levels is magnified by accelerated funding requirements under PPA, and as

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a result, it is virtually impossible for NW Natural to ever recover its total pension costs using current FAS 87 expense recovery methodology.

And to make matters even worse, in NW Natural's case, eventually the FAS 87 balancing account will reach zero, at which time NW Natural will be required to refund amounts to ratepayers. Recently updated actuarial projections show the balancing account going to zero sometime around the year 2022, at which time NW Natural is expected to have recognized $105 million of pension contributions in excess of FAS 87 expense since the adoption of the FAS 87 accounting standard. This $105 million excess amount is commonly referred to as a "prepaid pension asset" under the FAS 87 accounting standard. To demonstrate this phenomenon, my Exhibit NWN/2006, provides projections of total FAS 87 expenses and recoveries through 2021, and compared with contributions in excess of collections, for that same time period.

Q. Doesn't the balancing account approved in UM 1475 resolve this under-recovery?

A. No it doesn't. The balancing account ensures recovery only of actual FAS 87 expense levels. It does not attempt to address the significant and additional costs the Company has incurred through its cash contributions.

Q. Please demonstrate the expected path of pension fund cash contributions and FAS 87 cost recovery based on today's expectations.

A. At our request, NW Natural's actuary prepared a projection to illustrate the expected path of pension contributions over the next 30 years. We also had the actuary prepare alternative projections to demonstrate that accumulated FAS 87 expense recovery under various scenarios does not rise to the level of pension contributions over this 30 year period, even under an aggressive assumption where expected long-term rate of return

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was equal to the risk-free FAS 87 discount rate. See my Exhibit NWN/2007 CONFIDENTIAL.

The following narrative provides a brief explanation of the various scenarios:

- Scenario 1. "Today's Expectation:" Contributions over the next six years (i.e. 2012-2017) will exceed FAS 87 expense each year. The cumulative difference will be $64 million, with $130 million in cumulative contributions minus $66 million in FAS 87 expense. After 2017, contributions will go to zero and FAS 87 expense will be negative. Under current FAS 87 ratemaking methodology, the pension balancing account is expected to reach zero by 2022, at which time FAS 87 expense will be negative $5 million, and according to current ratemaking a general rate case in 2022 would require NW Natural to include $5 million negative revenue requirement, adjusted for an Oregon allocation amount. In summary, NW Natural would never recover the $91 million contributed in excess of rate recoveries as of 2022 (See my Exhibit NWN/2006), and the cost to NW Natural would continue to grow because it would be required to include rate credits to customers due to negative FAS 87 expense amounts.
- Scenario 1a. "Today's Expectation with a Strong Market Recovery": We adjusted Scenario 1. to illustrate what would happen under a stronger market recovery. We increased the expected return on pension assets from 8 percent to 20 percent in years 2015 and 2016. As a result, contributions between 2012 and 2017 decreased by $17 million, from $130 million to $113 million, while FAS 87 expense decreased by $9 million, from $66 million to $57 million. However, by the year 2022, contributions would have decreased by the same $17 million, but

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the FAS 87 expense would have decreased by an additional $48 million, for a total decrease of $57 million since 2012, from $66 million to only $9 million. In summary, a strong market recovery in the next few years will only increase the difference between cumulative Company contributions and cumulative FAS 87 expenses.

- Scenario 2. "Expected Return Rate Equal to Discount Rate": This scenario sets the assumed asset return rate to be equal to the FAS 87 discount rate in year 2022. We set this assumption change in year 2022 because that is the year when FAS 87 balancing account is expected to be zero and pension assets are expected to exceed pension liabilities (i.e. a fully funded plan). This scenario illustrates how FAS 87 expense would be much higher in future years, as compared to Scenario 1., if the Company were simply to invest its pension assets in a very conservative asset portfolio, thereby reducing the volatility of future expenses. This also illustrates that the Company might be in a position to terminate (or freeze the plan), but said termination would require the Company to write-off its then current prepaid pension asset balance for accounting purposes. In 2022, the prepaid pension asset balance is expected to be $105 million, and under current FAS 87 ratemaking methodology the only way for NW Natural to recover its costs would be to seek rate recovery at the time. That, in effect, would require future ratepayers to pay the higher costs that currently are building up in the prepaid account.
- Scenario 2a. "Expected Return Rate Equal to Discount Rate, coupled with a Strong Market Recovery": This is the same as Scenario 2., but it includes the

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same strong market recovery in 2015 and 2016 that was illustrated in Scenario 1a. The results and conclusions of this scenario are mostly the same as illustrated in 1a., except that the prepaid balance ($134 million) is greater and, therefore, the FAS 87 expense charge would be materially higher in a plan termination scenario.

Exhibit NWN/2006 contains the back up for these calculations.

Q. Given the above, will the Company ever be able to recover its costs?

A. No, not if the current ratemaking methodology remains in place. As shown in the Exhibits referred to above, assuming actual FAS 87 expense is included in rates, the Company will never recover approximately $91 million in pension contributions allocated to Oregon after the balancing account reaches zero. And, the amount the Company will under-recover will continue to grow because it is expected that FAS 87 will be negative at the time the balancing account goes to zero, and under current ratemaking methodology the Company would have to credit or refund to customers the negative FAS 87 and balancing account amounts. This result is extremely problematic because the Company would not be able to, by law, withdraw funds from the overfunded plan as reimbursement for these cash outflows.

Q. How much has the Company under-recovered to date?

A. Since NW Natural's last general rate case, Docket UG 152, the Company has been recovering approximately $3,796,055 of pension expense in rates each year. This amount was calculated based the UG 152 parties' assumptions about the level of FAS 87 pension expense that the Company would incur during the rate effective period. As I further explained in my direct testimony, had circumstances been as anticipated, this

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amount might have been sufficient to address the Company's pension contributions. However, due to the circumstances discussed above, in the nearly ten years since the Commission issued its Order in UG 152, the Company's shareholders have invested an Oregon adjusted amount of $85,055,134 to its pension accounts through 2011—roughly $25 million more than have been recovered in Oregon rates from all sources. See Exhibit NWN/2006.

Q. Is this under-recovery unique to NW Natural?

A. No. Many utilities with defined-benefit pension plans, whether closed to new participants like NW Natural's plan or open to new entrants, are finding under-recovery an issue. As I will explain later in my testimony, some other jurisdictions are modifying their recovery mechanisms to allow a more appropriate recovery of pension costs.

Q. Please summarize the Company's proposal.

A. The Company's proposal in this general rate case addresses only that portion of pension costs that are not recovered through the FAS 87 ratemaking methodology–that is, the contributions in excess of those recovered through FAS 87. The amounts recovered through FAS 87 remain subject to the balancing account approved in UM 1475.

For the costs in excess of those recovered by FAS 87, because these contributions have been financed by the Company using its capital structure of equity and long-term debt, we propose to treat these un-recovered amounts like any other long term investment. That is, like any other rate base item, we propose to receive a return on and return of these investments. We specifically proposed adding the average unrecovered investor contribution amount during the test year, estimated at $39,195,005

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pre-tax, or $23,517,003 net of deferred taxes (amounts were updated for the most recent actuarial projection for the test period).

Q. What is the legal/policy basis for the proposal?

A. The Company proposal is entirely consistent with long-held regulatory principles where customers receive the benefits of monies contributed ahead of payment through an addition to rate base. Once a general rate case is filed, shareholders generally receive the recovery of prudently incurred investments through a return on rate base as well as an amortization of funds invested over an appropriate time period.

Q. Please summarize Staff's position.

A. Staff recommends against the Company's request. Staff does not dispute the fact that the Company was required to make the contributions to comply with federal law, or that the contributions were prudently made. Instead, Staff makes four arguments:

1. Staff suggests that the Company can recover a fair return on its contributions because it earns a return on amounts in the FAS 87 balancing account.
2. Staff suggests that the Commission cannot allow for the recovery of the costs associated with cash contributions to pension plans while the FAS 87 guidance is still in place.
3. Staff claims it would be retroactive ratemaking to allow the Company to recover past contributions.
4. Finally, Staff suggests that given that the Company earned its return on equity (ROE) over most of the past years, there is no need to "fix" FAS 87 as the rate-making standard.

Q. Do you agree with any of Staff's arguments against the Company's proposal?

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A. No.

Q. Please respond to Staff's first argument, that the Company can recover a fair return on its contributions because it earns a return on amounts in the balancing account.

A. Staff's argument is illustrative of its failure to recognize the gap between pension contributions and FAS 87 recovery. The FAS 87 balancing account was established to allow the Company to recover its *FAS 87 expense* over time. Thus, by allowing the Company to earn a return on positive balances, it achieves this goal. However, as I have demonstrated above, there is a large and growing gap between FAS 87 expense recovery and pension contributions. The balancing account ignores this difference entirely.

Q. Do you agree with Staff's argument that the Company's proposed recovery constitutes retroactive ratemaking?

A. This argument misconstrues the nature of the cash contributions the Company is seeking to address. As I explained in my direct testimony, prepaid pension assets (or cash contributions in excess of FAS 87 expense) are not accounting expenses and as such they are not reflected on the Company's income statement. Rather, they are pre-paid obligations—investments that must be financed by the Company like any other long-term asset—that will continue to exist in the pension fund trust account and that will work in customers' favor in an ongoing fashion to reduce future FAS 87 expense. Thus, it is no more akin to retroactive ratemaking to allow for the proposed recovery of projected balance of prepaid pension assets than it is to allow recovery of investment in pipes or storage facilities.

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Q. But shouldn't the Company have requested a deferred accounting order if it wished to add these investments to rate base at a later date.

A. No. Again, in making this argument, Staff seems to be treating the shareholders' investment in pension contributions as a current expense—which it is not. As described above, the pension investments are similar to a plant investment, which is rolled into rate base in a subsequent general rate case, with no need for a deferred accounting order.

I would also point out that if cash contributions in excess of FAS 87 expense were to be treated as expenses, then the appropriate treatment in this general rate case would be for the Company to estimate the contributions it will make in the test year—net of any FAS 87 on-going recovery—and build recovery of those investments into rates. The Company's actuary has estimated the contributions it will make during the Test year, and, if the Commission were to adopt this approach of recovery, the Company would suggest that the proposed O&M expense level in this case be increased by approximately $8.0 million (i.e. cash contributions minus FAS 87 recovery amounts during the test period). However, this treatment would merely change the ratemaking methodology from a FAS 87 basis to a cash basis, which we are not proposing but are willing to consider.

Q. Please respond to Staff's statement that it would not be "appropriate" for the Commission to allow the Company any recovery of pension expense other than FAS 87 while FAS 87 guidance is still in place.

A. It is not clear exactly what argument Staff is making. Staff may be arguing that the Commission *may not* depart from using FAS 87 as the sole recovery mechanism for pension costs. Or Staff may be suggesting simply that the Commission *should not* alter its historic policy of relying on FAS 87 for pension recovery. At any rate, neither

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argument presents a valid reason for the Commission to avoid taking action to address the problems NW Natural has identified in its testimony.

The fact that FAS 87 persists as an accounting standard does not limit the Commission's authority to craft a different and more appropriate and fair recovery mechanism. The Commission must, in carrying out its obligations, allow the Company the opportunity to recover its prudently incurred costs. In this case, there is no question that NW Natural's contributions to its pension funds have been prudently incurred and have benefitted, and will continue to benefit, customers. If the Commission finds–as it should–that basing the recovery mechanism on FAS 87 no longer allows the Company to recover its prudently incurred costs, there is no reason why the Commission cannot approve a better recovery mechanism.

Q. **Have other state public utility commissions crafted recovery mechanisms that attempt to address the gap between accelerated shareholder contributions and FAS 87 recovery?**

A. Yes. In my direct testimony I explained that a number of state public utility commissions have recognized the need to allow utilities to recover the costs of funding pension contributions that are not otherwise addressed by FAS 87 recovery mechanisms. Attached as my Exhibit NWN/2008, is a summary of utilities that receive recovery for pension contributions beyond FAS 87 expense.

Q. Staff argues that because earnings were acceptable in the years since 2003, there is no reason to fix the problem. Do you agree?

A. No, I do not. This position intentionally ignores the fact that, as described above, the cash contributions are pre-paid obligations and not expenses, and therefore do not show

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up on the income statement. Moreover, Staff's argument erroneously suggests that it is appropriate to apply an earnings test before prudently made shareholder investments are added to rate base—a suggestion that is inconsistent with Commission policy.

Q. What arguments does NWIGU-CUB make against the Company's pension proposal?

A. NWIGU-CUB makes three arguments. These parties make the same retroactive ratemaking argument as Staff. They also argue that ratepayers should not be responsible for cash contributions made when pension accounts are underfunded, because they do not receive the benefit when pension accounts are overfunded. Finally, NWIGU-CUB suggest that there is no reason to alter the current recovery mechanism because "as the market recovers, the value of the assets will rise and the additional contributions will no longer be required."

Q. You have already responded to the retroactive ratemaking argument. Please respond to NWIGU-CUB's argument that ratepayers do not receive the benefit when pension funds are overfunded.

A. NWIGU-CUB is completely wrong on that point. When pension accounts are overfunded, FAS 87 expense usually drops to a negative expense, which means that customers not only aren't paying any FAS 87 expense but instead they are getting a rate reduction. This occurred with NW Natural's pension account when in the 1998 Oregon rate case customers were credited with a negative $701,000 revenue requirement.

Q. And do shareholders also benefit when pension accounts are overfunded.

A. No. This is definitely a one-way street.

Q. Please explain.

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A. A negative revenue requirement for pension costs presumes that the Company is recovering cash from the overfunded pension account to cover the refunds. However, this is definitely not the case. When pension accounts are overfunded, shareholders are legally prohibited from withdrawing the value of the overfunding. That value remains in the account for the benefit of the pensioners and at the same time reduces FAS 87 expense to the benefit of ratepayers. So, ratepayers receive the benefit when pension funds are overfunded, and the Company's shareholders often pay for that benefit from prepaid contributions.

Q. What happens if the account is overfunded at the time when the account is terminated? At that point are shareholders allowed to retain the overfunded amounts?

A. No. Even when a Company terminates a pension account with an overfunded balance, the IRS requires the surplus be used for other qualified employee benefits. If the Company withdraws the surplus from an overfunded plan for other than qualified purposes, the withdrawal is subject to an immediate tax penalty of up to 90%. This seems to create a clear and significant incentive to use the surplus only for qualified purposes. In a sense, as stated above, the benefit of an overfunded plan is truly a one-way street for employees and ratepayers, and exactly the opposite of NWIGU-CUB's contention.

Q. Please respond to NWIGU-CUB's suggestion that the Commission need not worry about the Company's recovery of cash contributions because the market will turn around.

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A. If NWIGU-CUB are suggesting that the Company will ultimately recover the costs of its pension contributions when the market turns around, then, as I have explained, they are wrong (see my Exhibit NWN/2007, Scenarios 1a. and 2a., along with related discussion above). Remember that if the market recovers, it will not only benefit contributions but it will also benefit FAS 87 expense. In fact, this market recovery scenario disproportionately benefits ratepayers because a large part of the improvement in asset returns would be associated with contributions into pension assets made by Company investors, not ratepayers. Based on actuary projections, NW Natural is expected to contribute $102 million total over the next five years, excluding the $28 million contribution due this year. Over that same five year period, FAS 87 expense is expected to total $47 million, and prepaid assets are expected to grow to $87 million. Our estimates, as provided by the actuary, assume an average asset return of 8% annually, which in today's financial markets is considered a reasonable return.

On the other hand, NWIGU-CUB may be suggesting that the Commission should not worry about the Company's unrecovered pension contributions (i.e. prepaid balance) because at some point that unrecovered balance will stop growing. Given that the Test year balance allocated to Oregon is estimated today at $39.2 million and will continue to rise for a number of years, NWIGU-CUB's position is counter to a sound regulatory policy which would require the Company be allowed a reasonable opportunity to recover its prudent investments.

Q. If the Commission declines to accept the Company's proposal, are there other actions it could take to allow the Company to recover its pension investment?

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A. First, in order for the Company to recover the return "on" that investment, the rate base treatment that the Company proposes is necessary. With respect to the recovery "of" the investment amount, the Commission could revise the balancing account so that once the balance turns negative, the Company could suspend any refunds to customers and allow the negative account balance to grow until it equals the excess shareholder contributions. If this approach were adopted, the Commission should make an adjustment to future earnings tests to prevent such recovery of investment dollars from being counted as "income" for earnings test purposes, since these contribution amounts do not count as "expenses" for earnings test purposes when made.

Q. Does this conclude your testimony?

A. Yes it does.

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BEFORE THE

PUBLIC UTILITY COMMISSION OF OREGON

UG 221

NW Natural

Exhibits of Stephen P. Feltz

COST OF CAPITAL AND PENSIONS
EXHIBITS 2001 – 2008

June 15, 2012

EXHIBITS 2001-2008 – COST OF CAPITAL AND PENSIONS

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NORTHWEST NATURAL GAS COMPANY
EMBEDDED COST OF LONG-TERM DEBT CAPITAL AT
Pro-Forma PERIOD ENDED October 31, 2013

								Premium or Discou		Underwriter's Commission		Expense of Issue			Net Proceeds		Original	Cost of	Annual
ln. #	**Coupon Rate**	**Description of Issue**	**Date Issued**	**Maturity Date**	**Years to Maturity**	**Outstanding**	**Offered**	**Amount**	**Per $ 100 Principal Amount**	**Amount**	**Per $ 100 Principal Amount**	**Amount**		**Per $ 100 Principal Amount**	**Amount**	**Per $100 Principal Amount**	**Term to Maturity Yrs.**	**Money (Bond Table)**	**Cost Out-standing Debt**
		(a)	**(b)**	**(c)**		**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**		**(k)**	**(l)**	**(m)**	**(n)**	**(o)**	**(p)**
		Medium-Term Notes																	
		First Mortgage Bonds:																	
1	8.260%	8.260% Series	09/94	09/14	1.7	10,000,000	10,000,000	0	0.00	40,000	0.400	863,369	[1]	8.63	9,096,631	90.966	20	9.260%	926,000
2	3.950%	3.95 % Series	07/09	07/14	1.5	50,000,000	50,000,000	0	0.00	250,500	0.501	191,076		0.38	49,558,424	99.117	5	4.147%	2,073,500
3	4.700%	4.700% Series	06/05	06/15	2.5	40,000,000	40,000,000	0	0.00	250,000	0.625	91,898		0.23	39,658,102	99.145	10	4.809%	1,923,600
4	5.150%	5.150% Series	12/06	12/16	4.0	25,000,000	25,000,000	0	0.00	156,250	0.625	121,426		0.49	24,722,324	98.889	10	5.294%	1,323,622
5	7.000%	7.000% Series	08/97	08/17	4.6	40,000,000	40,000,000	0	0.00	300,000	0.750	75,600		0.19	39,624,400	99.061	20	7.089%	2,835,600
6	6.600%	6.600% Series	03/98	03/18	5.2	22,000,000	22,000,000	0	0.00	165,000	0.750	1,179,884	[2]	5.36	20,655,116	93.887	20	7.181%	1,579,820
7	8.310%	8.310% Series	09/94	09/19	6.7	10,000,000	10,000,000	0	0.00	40,000	0.400	1,071,757	[1]	10.72	8,888,243	88.882	25	9.479%	947,900
8	7.630%	7.630% Series	12/99	12/19	6.9	20,000,000	20,000,000	0	0.00	150,000	0.750	45,421		0.23	19,804,579	99.023	20	7.727%	1,545,400
9	5.370%	5.370% Series	03/09	02/20	7.1	75,000,000	75,000,000	0	0.00	468,750	0.625	10,394,058	[7]	13.86	64,137,192	85.516	11	7.327%	5,495,250
10	9.050%	9.050% Series	08/91	08/21	8.6	10,000,000	10,000,000	0	0.00	75,000	0.750	40,333		0.40	9,884,667	98.847	30	9.163%	916,300
11	3.176%	3.176% Series	09/11	09/21	8.7	50,000,000	50,000,000	0	0.00	312,500	0.625	292,655		0.59	49,394,845	98.790	10	3.319%	1,659,500
12	5.620%	5.620% Series	11/03	11/23	10.9	40,000,000	40,000,000	0	0.00	372,588	0.931	2,952,850	[6]	7.38	36,674,562	91.686	20	6.360%	2,544,190
13	7.720%	7.720% Series	09/00	09/25	12.7	20,000,000	20,000,000	0	0.00	150,000	0.750	1,136,261	[4]	5.68	18,713,739	93.569	25	8.336%	1,667,200
14	6.520%	6.520% Series	12/95	12/25	12.9	10,000,000	10,000,000	0	0.00	62,500	0.625	27,646		0.28	9,909,854	99.099	30	6.589%	658,900
15	7.050%	7.050% Series	10/96	10/26	13.8	20,000,000	20,000,000	0	0.00	125,000	0.625	50,940		0.25	19,824,060	99.120	30	7.121%	1,424,200
16	7.000%	7.000% Series	05/97	05/27	14.4	20,000,000	20,000,000	0	0.00	125,000	0.625	28,906		0.14	19,846,094	99.230	30	7.062%	1,412,400
17	6.650%	6.650% Series	11/97	11/27	14.9	19,700,000	20,000,000	0	0.00	125,000	0.625	37,800	[8]	0.19	19,837,200	99.186	30	6.714%	1,322,658
18	6.650%	6.650% Series	06/98	06/28	15.4	10,000,000	10,000,000	0	0.00	75,000	0.750	23,300		0.23	9,901,700	99.017	30	6.727%	672,700
19	7.740%	7.740% Series	08/00	08/30	17.7	20,000,000	20,000,000	0	0.00	150,000	0.750	1,354,914	[3]	6.77	18,495,086	92.475	30	8.433%	1,686,538
20	7.850%	7.850% Series	09/00	09/30	17.7	10,000,000	10,000,000	0	0.00	75,000	0.750	678,107	[5]	6.78	9,246,893	92.469	30	8.551%	855,100
21	5.820%	5.820% Series	09/02	09/32	19.7	30,000,000	30,000,000	0	0.00	225,000	0.750	165,382		0.55	29,609,618	98.699	30	5.913%	1,773,943
22	5.660%	5.660% Series	02/03	02/33	20.2	40,000,000	40,000,000	0	0.00	300,000	0.750	56,663		0.14	39,643,337	99.108	30	5.723%	2,289,200
23	5.250%	5.250% Series	06/05	06/35	22.5	10,000,000	10,000,000	0	0.00	75,000	0.750	22,974		0.23	9,902,026	99.020	30	5.316%	531,600
24	4.200%	4.200% Series	07/12	07/42	29.5	50,000,000	50,000,000	0	0.00	325,000	0.650	200,000		0.40	49,475,000	98.950	30	4.262%	2,131,173
25	3.330%	3.330% Series	11/12	11/22	9.8	25,000,000	25,000,000	0	0.00	156,250	0.625	250,000		1.00	24,593,750	98.375	30	3.524%	881,056
						$676,700,000	**$677,000,000**	**0**		**$4,549,338**		**$21,353,220**			**$651,097,442**			**6.070%**	**$41,077,350**

WEIGHTED EMBEDDED COST: $41,077,350 $676,700,000 EQUALS = 6.070%

[1] INCLUDES PREMIUM AND UMAMORTIZED COST ON EARLY REDEMPTION OF 9.8% SERIES BONDS ($1,044,111 ALLOCATED TO THE 8.31% SERIES, AND $835,723 ALLCOATED TO THE 8.26% SERIES).

[2] INCLUDES $910,800 PREMIUM AND $222,664 UNAMORTIZED COSTS ON EARLY REDEMPTION OF 9.125% SERIES BONDS ALLOCATED TO THE 6.60% SERIES.

[3] INCLUDES $992,143 PREMIUM, $178,966 UNAMORTIZED COSTS ON EARLY REDEMPTION OF 9.75% SERIES BONDS, AND $148,605 UNAMORTIZED COSTS ON EARLY REDEMPTION OF 15.375% SERIES BONDS ALLOCATED TO THE 7.74% SERIES.

[4] INCLUDES $826,786 PREMIUM, $149,139 UNAMORTIZED COSTS ON EARLY REDEMPTION OF 9.75% SERIES BONDS, AND $123,837 UNAMORTIZED COSTS ON EARLY REDEMPTION OF 15.375% SERIES BONDS ALLOCATED TO THE 7.72% SERIES.

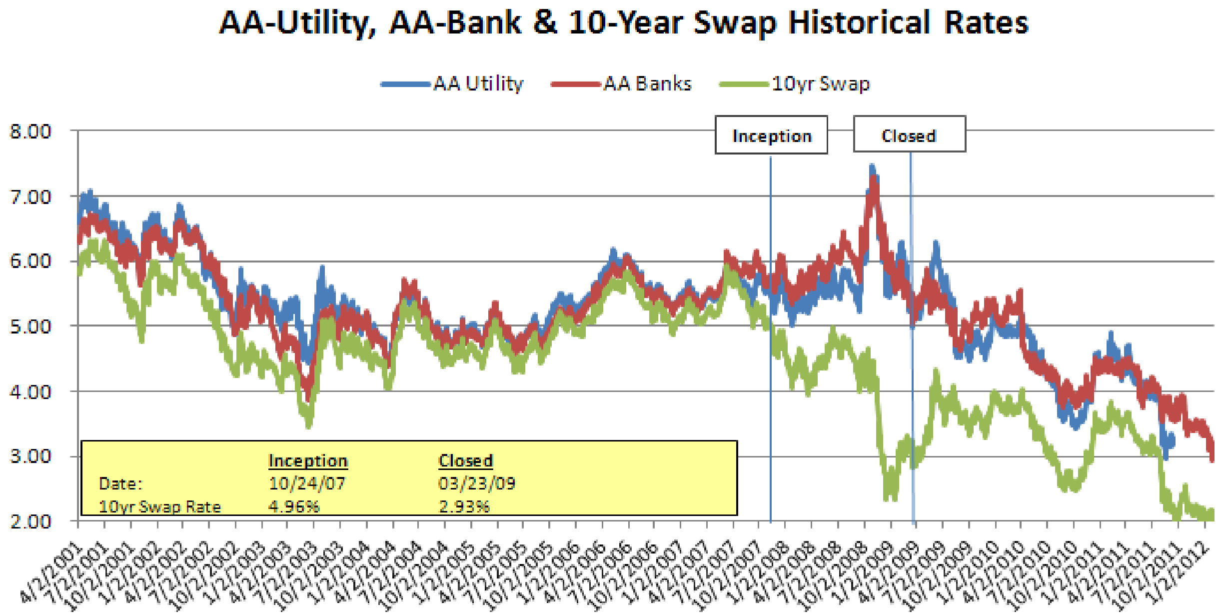
[5] INCLUDES $496,071 PREMIUM, $89,483 UNAMORTIZED COSTS ON EARLY REDEMPTION OF 9.75% SERIES BONDS, AND $74,302 UNAMORTIZED COSTS ON EARLY REDEMPTION OF 15.375% SERIES BONDS ALLOCATED TO THE 7.85% SERIES.

[6] INCLUDES $150,000 PREMIUM AND $405,971 UNAMORTIZED COSTS ON EARLY REDEMPTION OF 7.50% SERIES BONDS, $413,600 PREMIUM AND $1,116,479 UNAMORTIZED COSTS ON EARLY REDEMPTION OF 7.52% SERIES BONDS AND $730,000 PREMIUM AND $136,800 UNAMORTIZED COSTS ON EARLY REDEMPTION OF 7.25% SERIES BONDS ALLOCATED TO 5.62% SERIES.

[7] INCLUDES $10,096,000 COSTS PAID ON INTEREST RATE HEDGE LOSS AND $298,058 UNAMORTIZED COSTS ON SHELF REGISTRATION, ALLOCATED TO 5.37% SERIES.

[8] In November 2009 one investor exercised its right under a one-time put option to redeem $0.3 million of the $20 million outstanding. This one-time put option has now expired, and the remaining $19.7 million remaining principal outstanding is expected to be redeemed at maturity in November 2027.

Historical Interest Rate Trends



In 2007, when the Company began exploring options to mitigate volatile interest rates for a future bond issuance, an interest rate swap appeared reasonable given the AA utility and bank rates and ten-year swap rates had historically tracked together. Bonds were expected to be issued in October 2008; however, at that time the trend between AA utility and bank rates and the swap rates had become inversely correlated.

The graph above shows that the rates have begun to track more closely together again in late 2009 and the positive correlation has returned subsequently.

Note: The Bloomberg AA-Utility index was discontinued September 15, 2011 and the AA-Bank index was discontinued January 30, 2012. However the graph demonstrates normalized conditions after the 2008-09 period.

NWN Request:

54. Reference Staff/1200, pgs. 13-16: Does Mr. Muldoon believe that it is a common practice for a utility to hire an independent third party to conduct such analysis? If the answer is yes, please provide the basis for this belief.

OPUC Response:

54. Please see the response to DR 47. Staff notes that the advice from investment banks includes disclaimers that the Company should consider securing its own expertise as part of its own review of risk and likelihood of potential outcomes.

NWN Request:

55. Reference Staff/1200, pgs. 13-16: Can Mr. Muldoon provide any examples of utilities performing or hiring an independent third party to perform such an analysis prior to entering into a financial hedge? If so, please provide the examples.

OPUC Response:

55. Nothing specific at this time, that is part of the public record. Staff reserves the right to update this record, subject to permission of other jurisdictional utilities.

Exhibit 2004

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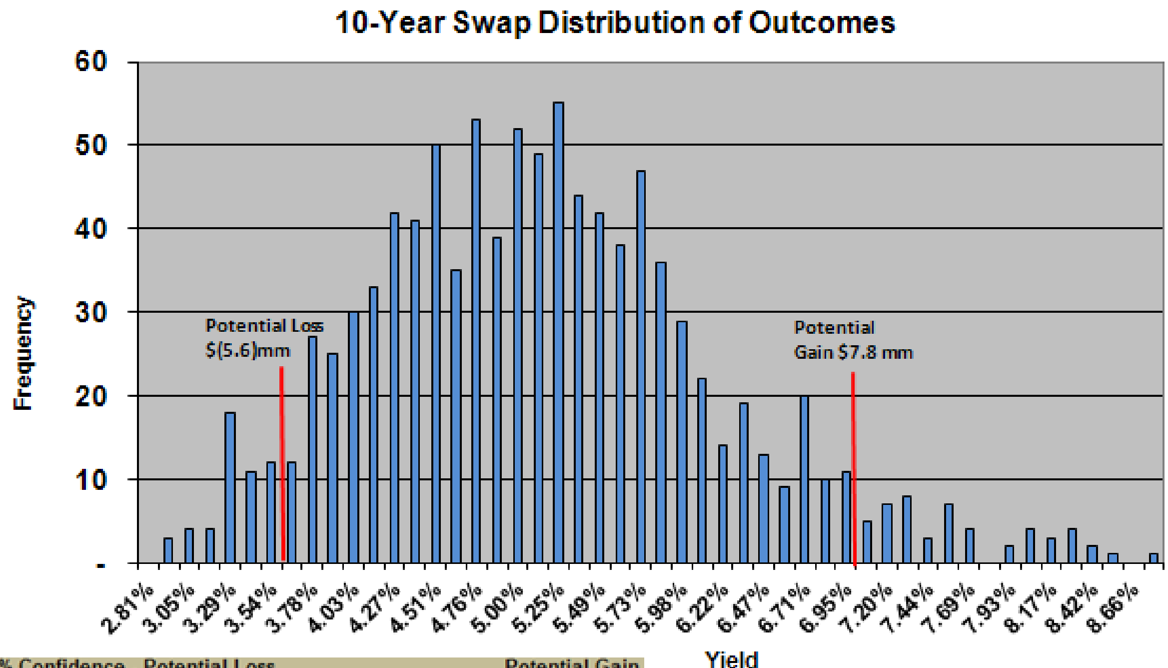
Monte Carlo Simulation Results



95% Confidence - Potential Loss					Potential Gain
95% Quantile		3.65%	5% Quantile		7.09%
Change in bps		(144)	Change in bps		201
DV01 - Bloomberg	$	38,930	DV01 - Bloomberg	$	38,930
Value-At-Risk	$	(5,586,958)	Value-At-Risk	$	7,826,540

A Monte Carlo method is probabilistic analysis often used to simulate sources of uncertainty when estimating the value of a financial instrument. It is generally a flexible tool as it incorporates the correlated behavior of multiple factors.

The graph above reflects the distribution of ten-year AA forward starting interest rate swaps as of September 30, 2008. With a 95 percent confidence level, the maximum potential gain for these swaps is \$7.8 million and the maximum potential loss is \$5.6 million.

NWN Pension Funding Analysis
Proposed Oregon Rate Base Adjustment - UPDATED JUNE 2012

		FAS 87 Expense Collected - Oregon				Pension Contributions		Oregon Rate Adjustment Calculations		
		O&M		Cap-Ex	Total			Contributions	Cumulative	Cumulative
	FAS 87	UG-152	UM 1475	Amount	Ratepayer		Amt Allocated	In Excess of	Excess	Excess
Year	Expense [1,5]	in Rates [2]	Deferral [3]	Capitalized [4]	"Collected"	Total [1,5]	to Oregon [6]	Collections	Difference	Net of Tax
2004	6,629,242	3,796,055		2,187,914	5,983,969	8,260,704	7,434,634	1,450,665	1,450,665	870,399
2005	6,914,465	3,796,055		2,262,530	6,058,585	31,000,000	27,900,000	21,841,415	23,292,080	13,975,248
2006	8,172,990	3,796,055		2,658,278	6,454,333	-	-	(6,454,333)	16,837,747	10,102,648
2007	6,687,898	3,796,055		2,202,346	5,998,401	-	-	(5,998,401)	10,839,346	6,503,608
2008	4,292,980	3,796,055		1,406,380	5,202,435	-	-	(5,202,435)	5,636,911	3,382,146
2009	14,579,030	3,563,854		4,644,879	8,208,733	25,000,000	22,500,000	14,291,267	19,928,178	11,956,907
2010	11,404,046	3,796,055		3,592,274	7,388,329	10,000,000	9,000,000	1,611,671	21,539,848	12,923,909
2011	16,295,255	3,796,055	6,007,909	4,861,766	14,665,730	20,245,000	18,220,500	3,554,771	25,094,619	15,056,771
Sub-Total	74,975,906	30,136,239	6,007,909	23,816,367	59,960,515	94,505,704	85,055,134	25,094,619		
2012	19,832,904	3,796,055	7,806,194	6,247,365	17,849,614	28,000,000	25,200,000	7,350,386	32,445,005	19,467,003
2013	17,000,000	3,796,055	6,148,945	5,355,000	15,300,000	26,000,000	23,400,000	8,100,000	40,545,005	24,327,003
2014	15,000,000	3,796,055	4,978,945	4,725,000	13,500,000	25,000,000	22,500,000	9,000,000	49,545,005	29,727,003
2015	10,000,000	3,796,055	2,053,945	3,150,000	9,000,000	24,000,000	21,600,000	12,600,000	62,145,005	37,287,003
2016	5,000,000	3,796,055	(871,055)	1,575,000	4,500,000	20,000,000	18,000,000	13,500,000	75,645,005	45,387,003
2017	-	3,796,055	(3,796,055)	-	-	7,000,000	6,300,000	6,300,000	81,945,005	49,167,003
2018	(1,000,000)	3,796,055	(4,381,055)	(315,000)	(900,000)	-	-	900,000	82,845,005	49,707,003
2019	(2,000,000)	3,796,055	(4,966,055)	(630,000)	(1,800,000)	-	-	1,800,000	84,645,005	50,787,003
2020	(3,000,000)	3,796,055	(5,551,055)	(945,000)	(2,700,000)	-	-	2,700,000	87,345,005	52,407,003
2021	(4,000,000)	3,796,055	(6,136,055)	(1,260,000)	(3,600,000)	-	-	3,600,000	90,945,005	54,567,003
Sub-Total	56,832,904	37,960,550	(4,713,301)	17,902,365	51,149,614	130,000,000	117,000,000	65,850,386		
Total	131,808,810	68,096,789	1,294,608	41,718,732	111,110,129	224,505,704	202,055,134	90,945,005		

Total Revenue Requirement for a "Return Of" Test Year Amount	**39,195,005**
Annualized Revenue Requirement for a "Return Of" Test Year Amount over 8 years	**4,899,376**

[1] **Reflects actual expenses contributions for years 2004-2011, plus actuarial projections for years after 2011.**
[2] **Assumes Oregon UG-152 revenue requirement for pensions is collected each year, less any automatic refunds.**
[3] **Reflects estimated balancing account deferral in Oregon starting Jan. 1, 2011.**
[4] **Assumes FAS 87 expense allocated to cap-ex is recovered in rates in the same year FAS 87 is capitalized, adjusted for 90% allocation to Oregon**
[5] **Reflects actuarial report and projections as of June 2012, including discount rate and asset return assumptions and 80% minimum funding targets.**
[6] **Total contribution adjusted to reflect 90% Oregon allocation.**

Exhibit 2007

CONFIDENTIAL
SUBJECT TO MODIFIED PROTECTIVE ORDER

Recap of SOS on Regulatory Treatment of Pension Expense and Contributions

Survey Questions:

1. If you have a defined benefit pension plan, please identify the basis for rate recovery of pension costs?
2. If your rate recovery is based on FAS 87 expense, do you also recovery a cost of capital for prepaid pension asset or contributions above FAS 87 expense?
3. Has the basis of your rate recovery for pension expense changed over the last 10 years, or since the adoption of new funding requirements imposed by the Pension Protection Act of 2006?

	DB Plan	Recovery Method				
	(Y or N)	FAS 87	Contributions	Prepaid Asset	Change	Other Comments
1	Y	X		X	No	Allowed to defer excess funding with credit to pension expense, and to seek in future rate proceeding.
2	Y	X			No	No changes to recovery method.
3	Y	X		X	No	
4	Y	X			No	Recover FAS 87 amount as long as they contribute at least the FAS 87 expense amount.
5	Y	X		X	2010	Carrying cost recovery was based on working capital study; argued it was necessary to meet more stringent PPA requirements.
6	Y	X			No	Allowed to add a portion of O&M expense to rate base for FAS 87 expense not allocated to CWIP.
7	Y	X		X	No	In one jurisdiction, they receive prepaid carrying cost, but in another they do not.
8	Y		X		2009	
9	Y	X			No	Pension is currently overfunded. Pension asset is excluded from rate base.
10	Y	X	X	X	2012	Company operates in many states. FAS 87 is recovered in all but 2 states, and cash contributions are basis of recovery in other 2 states. Prepaid carrying cost is included for 2 states. Also, one state has allowed Company to defer actual FAS 87 expense in excess of amount recovered in rates.
11	Y	X			No	
12	Y	X		X	2010	Prepaid carrying cost was requested in last rate case, but case was settled without explicit approval. Company intends to request prepaid carrying cost in all rate cases going forward.
13	Y		X		No	Difference between cash contribution recovered and pension book expense is adjusted out of regulatory earnings for rate of return review. No changes in last 10 years because Company has not been in for a rate case during that period of time.
14	Y	X			Yes	Rate recovery changed to allow deferral of pension expense changes between rate cases.
15	Y	X			No	Company has not been in for a rate case when contributions were in excess of FAS 87.
16	Y		X		In Process	Company has requested a change in pension recovery for current rate case (2012/2013 test year). Company is not subject to Pension Protection Act of 2006.
17	Y	X			In Process	Had discussions with Commission on a petition to allow recovery of prepaid funding in next rate case.
Summary	**17**	**14**	**4**	**6**		
		82%	**24%**	**35%**		

Thanks for your participation in this survey. If you have any questions, please contact Steve Feltz of NW Natural at 503-220-2345.

BEFORE THE

PUBLIC UTILITY COMMISSION OF OREGON

UG 221

NW Natural

Rebuttal Testimony of Samuel C. Hadaway

RATE OF RETURN ON EQUITY
EXHIBIT 2100

June 15, 2012

EXHIBIT 2100 – REPLY TESTIMONY – RATE OF RETURN ON EQUITY

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Rates & Regulatory Affairs
NW NATURAL
220 N.W. Second Avenue
Portland, Oregon 97209-3991
1-503-226-4211

I. INTRODUCTION

Q. Please state your name, occupation, and business address.

A. My name is Samuel C. Hadaway. I am a Principal in FINANCO, Inc., Financial Analysis Consultants, 3520 Executive Center Drive, Austin, Texas 78731.

Q. Are you the same Samuel C. Hadaway who filed direct testimony on behalf of NW Natural in this proceeding?

A. Yes. My testimony supporting the Company's requested rate of return on equity (ROE) was filed as NWN/500.

II. PURPOSE AND SUMMARY OF TESTIMONY

Q. What is the purpose of your reply testimony?

A. The purpose of my reply testimony is to respond to the ROE recommendation offered by Public Utility Commission of Oregon Staff witness Steve Storm. In my analysis, I will demonstrate that Mr. Storm's ROE recommendation does not reflect the ongoing volatility that utilities face in the equity markets and that his recommended ROE is well below the average rates of return that are being allowed for other natural gas local distribution companies (LDCs) like NW Natural. I will also respond to Mr. Storm's comments on the methodology I used in my direct testimony to estimate NW Natural's cost of equity. Finally, I will update my ROE analysis for current market costs and conditions and discuss the Company's revised ROE recommendation of 10.2 percent.

Rates & Regulatory Affairs
NW NATURAL
220 N.W. Second Avenue
Portland, Oregon 97209-3991
1-503-226-4211

III. REVIEW OF ROE RECOMMENDATIONS

Q. What are the parties' ROE recommendations?

A. Mr. Storm recommends an ROE of 9.2 percent. The Company's original requested ROE was 10.3 percent, based upon my original DCF analysis, which indicated a range from 9.6 percent to 10.3 percent, and Company- specific business risks, articulated in the testimony of NW Natural's chief financial officer, Mr. David Anderson (NWN/200). In supporting this recommendation, I discounted the results of my original risk premium models, which indicated a range of 9.52 percent to 9.53 percent.

Q. Has the Company revised its ROE recommendation in this case?

A. Yes. Mr. Anderson's reply testimony (NWN/1800) sponsors the Company's revised ROE recommendation of 10.2 percent.

Q. Is this change informed by your updated analysis?

A. Yes. As I will explain in my updated analysis, my DCF models currently indicate a narrower range of 9.6 percent to 10.0 percent, and my updated risk premium models indicate a wider range of 9.45 percent to 9.75 percent. The high end of my original range was 10.3 percent and the high end of my updated range is 10.0 percent. Considering these results, the Company adjusted its ROE recommendation to 10.2 percent, acknowledging my updated analysis, but ultimately giving more weight to my original analysis.

Q. In your opinion, is this a reasonable approach to consideration of your updated analysis?

A. Yes. I understand that the Commission has generally relied on the most current information to estimate the cost of equity, because "in an efficient market, the

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current stock price provides the best information of future prices."[1] However, the Commission has deviated from this approach when faced with "wide fluctuations in the utility's stock," or other evidence of "price aberrations."[2]

The "efficient market" assumptions underlying the Commission's approach to model updates do not apply under current, aberrant market conditions. Because I do not believe that the updated model results provide the best information about NW Natural's cost of equity in the rate effective period beginning in November 2012, it is reasonable for NW Natural to continue to primarily rely upon my original analysis in support of its 10.2 percent ROE recommendation.

Q. Please explain.

A. The government's ongoing efforts to hold interest rates at record low levels have created an artificial supply and demand relationship in the capital markets. While these efforts have been successful in reducing borrowing costs, they have not had an equal effect in mitigating equity market risks, a fact that the models do not capture and that Mr. Storm does not address. Under these circumstances, and given the Company-specific risks discussed by Mr. Anderson, an ROE recommendation between the high end of the ranges supported by my original and updated analyses, 10.2 percent ROE, is reasonable.

Q. How to the Parties' ROEs compare to the Rates of Return recently allowed for other LDCs around the country?

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[1] *In re Northwest Natural Gas Company,* Order No. 99-697 at 14 (1999).

[2] *Id.* at 15.

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A. Mr. Storm's 9.2 percent recommendation is somewhat lower, and the Company's requested 10.2 percent is somewhat higher. In my Exhibit NWN/2101, I provide quarterly average ROE data for LDCs through the 1st Quarter of 2012. These data show that there has not been one quarter in the past five years when allowed ROEs have been nearly as low as Mr. Storm's recommendation. In fact, the average allowed ROE for LDC's in 2011 was 9.92 percent. The data further show that this is the lowest annual average allowed ROE that has been recorded. Under these circumstances, Mr. Storm's recommendation at more than 70 basis points below the lowest annual average allowed ROE is extreme and should not be accepted by the Commission as the basis for reducing NW Natural's allowed rate of return.

Q. Mr. Storm acknowledges that his estimated ROEs are low compared with regulated utilities' authorized roes "in some prior periods." Is this statement completely accurate?

A. No. As shown in the historical returns set forth in Exhibit Staff/1305, Storm/2, Mr. Storm's estimated ROEs are far lower than regulated utilities' authorized ROEs in <u>any</u> prior period.

Q. Mr. Storm relies upon the 1st quarter 2012 average allowed ROE for LDCs to support his roe recommendation, arguing that it indirectly supports an even lower ROE for NW Natural. Please comment.

A. The first quarter 2012 average allowed ROE for LDCs was 9.63 percent, a drop of approximately 50 basis points from the first quarter 2011 average allowed ROE of 10.10 percent. On an annual basis, changes in allowed returns generally demonstrate much more gradualism than this, with typical step changes of less

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than 10 to 20 basis points year-to-year. Given how the volatility of current market conditions can dramatically impact model results from one quarter to the next, a policy of gradualism in adjusting allowed ROEs at this time becomes imperative and undercuts Mr. Storm's argument in support of his admittedly low ROE recommendation.

Q. Did the average allowed return for electric utilities increase in the 1st quarter of 2012?

A, Yes, from the Regulatory Research Associates data that support Staff/1305, Storm/2, the average allowed return for vertically-integrated electric utilities in the 1st Quarter of 2012 increased to 10.30 percent.[3] The wide divergence in LDC and electric utility average allowed returns for the 1st Quarter 2012—67 basis points—is not supported by the historical relationship between LDC and electric utility returns, which generally track within 10 to 20 basis points of one another (also shown on the exhibit). These divergent results are more evidence of the challenges of estimating cost of equity under current market conditions. Just as Mr. Storm will not advocate for an increase in electric utility ROEs on the basis of 1st Quarter 2012 average allowed returns, neither should he use1st Quarter 2012 average allowed returns to advocate a decrease in NW Natural's ROE.

Q. What are your general comments on Mr. Storm's ROE analysis?

A. The current, artificially low interest rate environment presents a serious challenge for any effort to apply traditional rate of return models to estimate investors' expectations regarding return on equity. I believe that Mr. Storm's failure to

[3] The average allowed ROE for the 1st Quarter of 2012 for all electric utilities was 10.84 percent. However, this higher average includes several "power plant-only" cases in Virginia, which may not be comparable to allowed ROEs in vertically-integrated electric utility rate cases.

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recognize and account for this challenge creates a significant deficiency in his testimony and recommendation. The government's stated policy[4] of intervening in the capital markets to keep interest rates low has disrupted normal supply and demand relationships. Under these circumstances, the analytical results from traditional rate of return estimation models are questionable. Dividend-paying stocks, like utilities, have become sought-after by income-seeking investors, reducing the dividend yield percentage. In the basic "yield plus growth" DCF format, the outcome is historically low ROE estimates. Similarly, in the equity risk premium models, either the CAPM or conventional risk premium plus bond yield models, artificially low interest rates directly reduce ROE estimates. The currently low dividend yields for utilities produce lower DCF estimates and low interest rates produce lower ROE estimates from equity risk premium models.

These results are simply a manifestation of the artificially low interest rates created by government monetary policy. Moreover, these results do not capture investors' requirements for a long-term equity return. Current interest rates do not represent a reliable baseline for determining the risk premium expected by investors for equity investment. Ongoing market volatility continues

[4] On January 25, 2012 the Federal Open Market Committee of the Federal Reserve System ("Fed") issued the following policy statement:
Consistent with its statutory mandate, the Committee seeks to foster maximum employment and price stability. The Committee expects economic growth over coming quarters to be modest and consequently anticipates that the unemployment rate will decline only gradually toward levels that the Committee judges to be consistent with its dual mandate. Strains in global financial markets continue to pose significant downside risks to the economic outlook. The Committee also anticipates that over coming quarters, inflation will run at levels at or below those consistent with the Committee's dual mandate.
To support a stronger economic recovery and to help ensure that inflation, over time, is at levels consistent with the dual mandate, the Committee expects to maintain a highly accommodative stance for monetary policy. In particular, the Committee decided today to keep the target range for the federal funds rate at 0 to 1/4 percent and currently anticipates that economic conditions--including low rates of resource utilization and a subdued outlook for inflation over the medium run--are likely to warrant exceptionally low levels for the federal funds rate at least through late 2014.

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to increase investor risk aversion, yet that cost is not captured in models hampered by the artificially low interest rate environment.

Q. Mr. Storm acknowledges that market uncertainty exists, but claims that risk aversion and uncertainty are "going the other way" and do not support NW Natural's requested ROE. How do you respond to this statement and the graph he presents at Staff/1300 Storm/81?

A. Like many factors in the stock market, the expected volatility index (VIX)[5] changes daily. While I agree that VIX had declined through the March 30 date in Mr. Storm's Figure 13 graph, as shown in the Graph 1 below, it has more recently moved up, indicating that investors are again becoming more risk averse:

[5] VIX is the ticker symbol for the Chicago Board Options Exchange (CBOE) Volatility Index. It is developed from option pricing models and is intended to measure investors' expected market volatility for the S&P 500 Index over the coming 30-day period.

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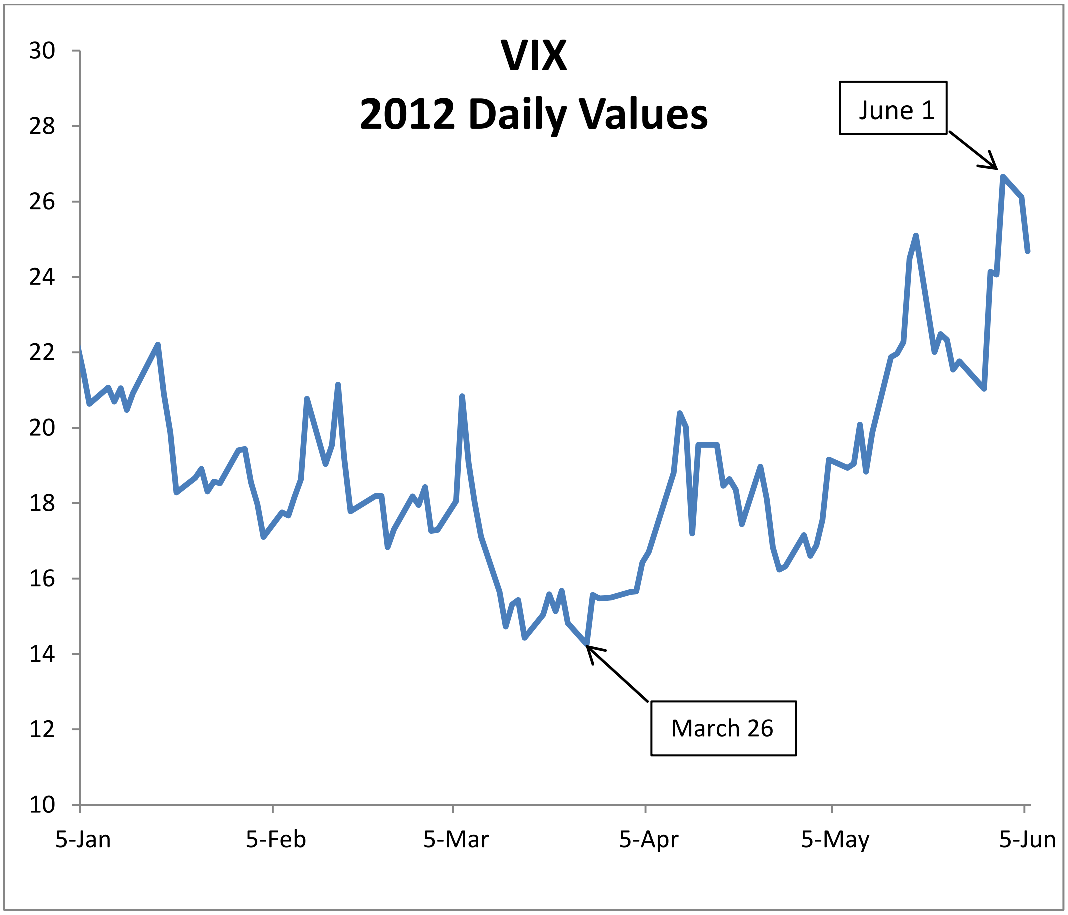
Graph 1



The more recent movements in the VIX index do not support Mr. Storm's statement that risk aversion and uncertainty are "going the other way."

Q. **In your direct testimony, you provided data that illustrated interest rate trends and the spreads between U.S. Treasury bond yields and yields on single-A rated utility bonds. Have you updated that information?**

A. Yes. In my Exhibit NWN/2102, page 1, I have updated the government and utility interest rates and the associated spread data. The results for the past two years are summarized in Table 1 below.

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Table 1

Long-Term Interest Rate Trends

Month	**Single-A Utility Rate**	**30-Year Treasury Rate**	**Single-A Spread**
Jun-09	6.20	4.52	1.68
Jul-09	5.97	4.41	1.56
Aug-09	5.71	4.37	1.34
Sep-09	5.53	4.19	1.34
Oct-09	5.55	4.19	1.36
Nov-09	5.64	4.31	1.33
Dec-09	5.79	4.49	1.30
Jan-10	5.77	4.60	1.17
Feb-10	5.87	4.62	1.25
Mar-10	5.84	4.64	1.20
Apr-10	5.81	4.69	1.12
May-10	5.50	4.29	1.21
Jun-10	5.46	4.13	1.33
Jul-10	5.26	3.99	1.27
Aug-10	5.01	3.80	1.21
Sep-10	5.01	3.77	1.24
Oct-10	5.10	3.87	1.23
Nov-10	5.37	4.19	1.18
Dec-10	5.56	4.42	1.14
Jan-11	5.57	4.52	1.05
Feb-11	5.68	4.65	1.03
Mar-11	5.56	4.51	1.05
Apr-11	5.55	4.50	1.05
May-11	5.32	4.29	1.03
Jun-11	5.26	4.23	1.03
Jul-11	5.27	4.27	1.00
Aug-11	4.69	3.65	1.04
Sep-11	4.48	3.18	1.30
Oct-11	4.52	3.13	1.39
Nov-11	4.25	3.02	1.23
Dec-11	4.33	2.98	1.35
Jan-12	4.34	3.03	1.31
Feb-12	4.36	3.11	1.25
Mar-12	4.48	3.28	1.20
Apr-12	4.40	3.18	1.22
May-12	4.20	2.93	1.27
3-Mo Avg	**4.36**	**3.13**	**1.23**
12-Mo Avg	**4.55**	**3.45**	**1.22**

Sources: Mergent Bond Record (Utility Rates); www.federalreserve.gov (Treasury rates). Three month average is for March-May 2012. Twelve month average is for June 2011-May 2012.

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The data in Table 1 track the steady decline in corporate interest rates that has occurred since early 2009 and the market turmoil that has existed during this time period. The Federal Reserve's continuing efforts to keep short-term rates near zero and longer-term U.S. Treasury rates at historically low levels are holding down corporate debt costs as well. While the effects of these monetary policy efforts are not easily captured in rate of return estimation models, equity market turbulence and the resulting elevated level of risk aversion indicate that the decline in ROE has been far less than the decline in corporate interest rates.

Q. Do the smaller spreads between single-a utility bond yields and U.S. Treasury bonds mean that the markets have fully recovered from the economic turmoil that resulted from the financial crisis?

A. No. While markets have stabilized considerably since early 2009, concerns remain about high unemployment, large federal deficits, the sovereign debt crisis in Europe, as well as other domestic economic issues. These factors combined with sluggish growth in gross domestic product (GDP) continue to raise substantial equity market concerns and contribute to heightened investor risk aversion.

Q. What do interest rate forecasts show for the coming year and beyond?

A. By late this year, interest rates are expected to have begun increasing from currently low levels. In my Exhibit NWN/2102, page 2, I provide S&P's *Trends & Projections* forecasts, which extend through 2013. Table 2 below summarizes the interest rate forecasts:

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Table 2
Interest Rate Forecast

	May 2012 Average	2012E Average	2013E Average
Treasury Bills	0.1%	0.1%	0.1%
10-Yr. T-Bonds	1.8%	2.1%	2.6%
30-Yr. T-Bonds	2.9%	3.2%	3.7%
Aaa Corp. Bonds	3.8%	4.0%	4.4%

Sources: Current Rates, www.federalreserve.gov.
Projected Rates, S&P *Trends & Projections*, May 2012.

These data show that during 2013, long-term Treasury interest rates are expected to rise by 80 basis points relative to the low levels in May 2012. The yields on high-grade corporate bonds are also expected to rise by a similar amount.

Q. How have utility stocks performed since the market low point reached in March 2009?

A. Prior to May of 2011, utility stock prices had lagged well behind the general market recovery. Since the latter part of 2011, however, fears of potential sovereign defaults as well as domestic financial problems have caused equity market risk aversion to increase. This situation has made dividend oriented stocks, like utilities, relatively more attractive for all income-oriented investors. Improving stock performance for utilities has produced lower dividend yields in the DCF model; i.e., the DCF model results, with respect to dividend yields, do not reflect the overall market's volatility and heightened risk aversion. This anomaly makes it more difficult to interpret current DCF cost of equity estimates for utility companies.

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IV. TECHNICAL REBUTTAL OF STAFF WITNESS STORM

Q. What are your principal areas of disagreement with Mr. Storm's analysis and recommendation?

A. Mr. Storm offers a multi-stage DCF analysis to support his recommendation without any modification to reflect the highly unusual conditions that currently exist in the capital markets. I consider a broader range of ROE estimation models, and I provide specific consideration for the unique market conditions that are currently affecting the results that those models produce.

Without such consideration, Mr. Storm fails to reflect the fact that ROE does not change in lockstep with interest rates. He gives virtually no consideration to the government's ongoing intervention in the capital markets. While the government's activities have driven interest rates to record low levels, they have not had an equally calming effect on the equities markets. Without consideration for this divergence, Mr. Storm's analysis effectively ignores ongoing equity market risk and, therefore, his estimates significantly understate NW Natural's market cost of equity capital.

With respect to our analytical models, in the Commission's preferred multi-stage DCF approach, the only substantive difference in our analytical results stems from the alternative long-term growth rates in GDP. While I disagree with Mr. Storm's selection of only five LDCs (including NW Natural) for his comparable group, I will show that after his required adjustment to equalize capital structures is applied, the differences in our results due to sample selection are small. I do, however, strongly disagree with his lower long-term DCF growth rate because it includes currently depressed estimates of real GDP growth and

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inflation rates that are not consistent with investors' long-term experience. My larger sample of LDC's and combination gas and electric utilities is more representative of normal market conditions than his very small sample. I will also show that, while Mr. Storm's methodology for estimating long-term GDP growth is not unreasonable, it currently produces low growth rate estimates because it includes government estimates that are historically low and entirely inconsistent with investors' long-term experience in U.S. capital markets. When these factors are corrected, Mr. Storm's multi-stage DCF models produce ROE estimates well above the 9.2 percent he recommends.

Perhaps more important than these technical issues, Mr. Storm and I disagree about the effect of the government's ongoing "easy money" policies. Major consideration should be given to the artificial interest rate environment that governmental monetary policy has created. Mr. Storm hardly mentions current market conditions and, as I have shown above with respect to Mr. Storm’s VIX graph, when he does discuss market volatility, his conclusions are incorrect. He refuses to acknowledge that the government's current monetary policy has created an artificially low interest rate environment, which does not extend directly to the cost of equity. While we agree that the cost of capital has come down in recent years, the precipitous drop in ROE recommended by Mr. Storm is extreme and should not be the basis for the Commission to determine NW Natural's allowed cost of capital.

Q. How does Mr. Storm arrive at his 9.2 percent ROE recommendation?

A. Mr. Storm's 9.2 percent ROE recommendation is slightly below the midpoint of his recommended range of 8.8 percent to 9.5 percent. Mr. Storm appears to

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develop this final recommendation at Storm/55 in Table 6 by adjusting downward from the 10 percent multi-stage growth DCF estimate that I provided in my direct testimony. Also, in Exhibit Staff/1304, Storm/3-4, Mr. Storm derives a 9.2 percent ROE estimate from his five-company multi-stage DCF model--8.8 percent base ROE plus a 0.4 percent "Hamada" capital structure adjustment.[6] The upper end of his range, 9.5 percent, appears to come from the same multi-stage models applied to his group, but using a slightly higher estimate of GDP growth from the GDP growth rate estimate in my direct testimony (Staff/1304, Storm/5-6).

Q. How is Mr. Storm's DCF analysis structured?

A. Mr. Storm provides the details of DCF analysis in Staff/1304 and in his electronic workpapers. In his exhibit, he presents six DCF estimates based on two alternative three-stage DCF models. With these models, Mr. Storm estimates investors' expected returns from dividends and capital gains over the next 30 years. He applies three stages of growth, with Stage 1, the first five years (2012-2017), based on Value Line's projected dividend growth rates; Stage 3, the final 20 years (2023-2042), based on alternative estimates of GDP growth; and Stage 2, the middle five years, based on an extrapolation between Stages 1 and 3. For three of the models, Mr. Storm creates a terminal value in 2042 (the investor's final selling price) from a textbook growing perpetuity equation. In the other three models, he calculates the terminal value by multiplying estimated 2042 earnings

[6] In Staff/1304, the average equity percentage of capital for Mr. Storm's 5-company group is 59.0 percent, whereas the NW Natural's requested debt-equity percentage is 50/50. Therefore, for each of his models, Mr. Storm applies a 40 basis point upward adjustment to his base analytical results. A similar adjustment is not required for my larger comparable group because that group's average debt-equity percentage is 50/50.

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per share (EPS) by the current price-to-earnings ratio. Because the dividends, earnings, and first stage growth rates are the same in all the models, Mr. Storm's alternative ROE estimates are caused by the alternative GDP growth rate assumptions he applies.

Q. How are Mr. Storm's GDP growth rates calculated?

A. Mr. Storm explains his GDP growth rate calculations (at Staff/1300, Storm/61-62) and illustrates the results in Table 8 (at Staff/1300, Storm/62). For his first two DCF models, Mr. Storm uses a weighted average of three government agency forecasts plus his own GDP growth rate estimate. Mr. Storm's estimate is based on historical real growth for 1980-2011 (2.91%) and an estimate of expected inflation. To estimate the inflation rate, Mr. Storm provides an analysis of nominal Treasury bond yields and yields on Treasury Inflation Protected Securities (TIPS). His projected inflation rate from this TIPS analysis is 2.43 percent. Giving 50 percent weight to the agency forecasts and 50 percent weight to his historical/TIPS forecast, he determines an expected long-term GDP growth rate of only 4.96 percent.

In his 3rd and 4th DCF models, Mr. Storm eliminates the government agency forecasts and relies solely on his on historical/TIPS based GDP growth rate (5.43%) In his 5th and 6th DCF models, Mr. Storm uses ("for illustrative purposes") the 5.8 percent long-term GDP growth rate forecasts I provided in my direct testimony.

Q. What is your response to these calculations?

A. As noted previously, in Staff/1304, Mr. Storm derives a 9.2 percent DCF estimate from his 5-company group. This estimate comes from his 3rd and 4th DCF

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models, in which the long-term growth rate is the historical/TIPS based GDP growth estimate (5.43%). The same methodology in his 5th and 6th DCF models (based on my 5.8 percent long-term GDP growth rate) produces an adjusted ROE estimate for his group of 9.5 percent. Therefore, as Mr. Storm notes, a long-term growth rate difference of 0.37 percent (5.8% - 5.43% = 0.37%) produces a 30 basis point (0.3%) difference in the results for his comparable group.

There at least two reasons why Mr. Storm's historical/TIPS GDP growth rate should have been higher. First, Mr. Storm's methodology is an approach for forecasting long-term growth that is proposed in the Morningstar/Ibbotson annual Valuation Yearbook.[7] In the Morningstar analysis, the real growth rate in GDP is 3.3 percent,[8] not the 2.91 percent that Mr. Storm derives from his 1980-2011 data.

A second question about Mr. Storm's historical/TIPS analysis involves liquidity differences between nominal Treasury securities and the TIPS themselves. To the extent that nominal Treasuries trade in a much more liquid market than TIPS, and in times of financial stress are a haven for "flight to safety" investors, the differences between nominal Treasury bond yields and yields on TIPS, which Mr. Storm uses to calculate the "break-even inflation rate," will be understated.

On this topic, research by Federal Reserve System economists offers the following: "The additional 'liquidity premium' TIPS investors require for holding

[7] 2011 Ibbotson SBBI Valuation Yearbook, Morningstar, Inc., Chicago, Illinois 60602.

[8] Id., p. 51.

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such instruments will drive up TIPS yields and depress the TIPS breakeven inflation."[9] While it is not possible to know the extent that the TIPS break-even inflation estimate understates long-term expected inflation, recent market activities indicate that the amount may be significant. Factors such as the negative real interest rates that have been implied by such models during recent years, the government's ongoing intervention in the nominal Treasury bond markets, as well as "flight to safety" issues all point to potential lower nominal Treasury bond yields. These factors cause understated inflation and, thus, understated nominal GDP growth rates in Mr. Storm's models.

Q. Can you demonstrate the effect on Mr. Storm's ROE estimates if the higher Morningstar 3.3 percent real GDP growth rate is used instead of his 1980-2011 historical average?

A. Yes. That analysis is provided in my Exhibit NWN/2103. Using Mr. Storm's electronic spreadsheets, which he provided in his workpapers, on page 3 of my exhibit, I have first re-estimated his long-term GDP growth rate using the Morningstar 3.3 percent long-term real rate. The result of that calculation is an expected GDP growth rate of 5.82 percent. On pages 1 and 2 of my exhibit, I show the ROE estimates from Mr. Storm's two-stage DCF model with this higher growth rate applied in the 3rd Stage of each model. As shown in the right-hand column of the exhibit, the adjusted ROE estimate for Mr. Storm's group is 9.5 percent and for my group it is 9.7 percent. If the Commission uses direct

[9] D'Amico, Stefania, Don H. Kim, and Min Wei. 2010. "Tips from TIPS: The Informational Content of Treasury Inflation-Protected Security Prices." Finance and Economics Discussion Series 2010-19, Federal Reserve Board. While D'Amico, et al, find that the liquidity premium had declined during their study period (from about 1% in 1997-2003 period to a smaller amount 2004-2006), they caution: " given that TIPS is less liquid than nominal Treasury securities, we caution that TIPS liquidity premiums might rise again in times of financial market stress" (at page 34).

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analytical DCF results to determine NW Natural's allowed ROE, these results provide a more balanced view of where the Staff position should have been. A midpoint outcome between these modified Staff model results and the Company's requested 10.2 percent would result in an allowed ROE of approximately 10 percent.

Q. Are the differences in Mr. Storm's results caused by his comparable group versus yours large?

A. No. In Staff/1304, Storm/1-6, the differences between our groups, before adjustment for capital structure differences, can be seen in Column A (Unadjusted ROE). Although the numbers change slightly across his various models, the unadjusted ROE is consistently 50 basis points (0.5%) lower for his group.

Q. In the final analysis, does this mean that your group overstates or that Mr. Storm's group understates the estimate of the ROE?

A. No. While Mr. Storm goes on at length about the lack of comparability for some of my companies, he ultimately has to adjust his results upward (by 40 basis points) to account for the capital structure differences that his group produces. In this context, it appears that his group comparability discussion and his criticism of my group are something of a "red herring."

Q. Beginning on page 75, Mr. Storm criticizes your risk premium analysis, saying (at Staff/1300, Storm/79) that your analysis would have produced an ROE of about 9.3 percent but for the extreme years in your analysis in the early 1980's. How do you respond to these comments?

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A. In any analysis, it is difficult to know which data are "representative" and which data may be "outliers." One must be careful, however, not to fall into a "selectivity" trap by modifying the time period to produce a desired outcome. In his discussion of my risk premium analysis, it appears that Mr. Storm has fallen into such a trap. He states (at Staff/1300, Storm/79) that by eliminating the first three years of data from my analysis or by eliminating the first two years and the last four years, he finds a lower negative regression coefficient for my analysis and, therefore, a lower ROE estimate.

There are at least two reasons why this type of analysis is faulty. First, investors are aware of data extending back to 1980, and many remember that utilities were not allowed ROEs much, if any, above the cost of debt in some years. While, as Mr. Storm suggests, these years were extreme observations, so are current interest rate levels relative to average rates over the past 20-30 years. Mr. Storm's elimination of years with extremely high interest rates, while current interest rates are equally extreme, but in the opposite direction, does not seem to be a balanced approach.

Q. What does your risk premium analysis show if you eliminate the early-1980 years and begin with 1988?

A. With the caveat that selectivity is not appropriate and with my previous discussion of why current risk premium estimates of ROE are understated, I have prepared a 1988-2010 analysis only for comparison to Mr. Storm's revisions to my original risk premium analysis. My 1988-2010 analysis is presented in my Exhibit NWN/2104. As shown on page 3 of that analysis, the shortened time period produces a negative regression coefficient

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(-40.31%) similar to the one in my original risk premium analysis (-41.71). This result shows that Mr. Storm's criticisms of my risk premium analysis based on the time period are misplaced.

V. UPDATED ROE ANALYSIS

Q. Have you updated your roe analysis to take into account recent data and current conditions in the capital markets?

A. Yes. Consistent with my customary practice, I have updated my ROE analysis for current market conditions using the same methodologies that I employed in my previous analysis.

Q. What are the results of your updated DCF analyses?

A. My updated DCF results are shown in Exhibit NWN/2106. My updated GDP growth rate forecast, which is used in portions of the DCF analysis, is provided in my Exhibit NWN/2105. In the updated analysis, based on my original selection criteria, one company was removed and three companies were added relative to my original 14-company group. The resulting group, therefore, contains 16 companies. The indicated DCF range is 9.6 percent to 10.0 percent.

Q. What are the results of your updated bond yield plus risk premium analysis?

A. My updated risk premium analysis is presented in my Exhibit NWN/2107. Based on projected single-A utility interest rates, the risk premium analysis indicates an ROE of 9.75 percent. Based on the most recent three month's average single-A rates, the risk premium ROE is 9.42 percent. As noted previously, these results are depressed by current artificially low interest rates caused by the government's ongoing intervention in the credit markets.

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Q. What do you conclude from your updated ROE analyses?

A. My updated technical analyses indicate a current cost of equity capital in the range of 9.5 percent to 10.0 percent. While my updated results show clearly that Mr. Storm's 9.2 percent recommendation is below NW Natural's current cost of equity capital, I believe that these results are unduly affected by the government's ongoing intervention in the credit markets and that they do not adequately reflect the equity market risk that remains. As stated previously, given current difficulties with interpreting financial model estimates, the forecasts for higher interest rates that I have presented and the Company-specific risks articulated by Mr. Anderson, I believe the Company's revised ROE request of 10.2 percent is reasonable. .

Q. Does this conclude your testimony?

A. Yes.

Rates & Regulatory Affairs
NW NATURAL
220 N.W. Second Avenue
Portland, Oregon 97209-3991
1-503-226-4211

BEFORE THE

PUBLIC UTILITY COMMISSION OF OREGON

UG 221

NW Natural

Exhibits of Samuel C. Hadaway

RATE OF RETURN ON EQUITY
EXHIBITS 2101 - 2107

June 15, 2012

EXHIBITS 2101-2107 – RATE OF RETURN ON EQUITY

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Rates & Regulatory Affairs
NW NATURAL
220 N.W. Second Avenue
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Northwest Natural Gas Company
Authorized Gas Utility Equity Returns

Gas Utilities	2008		2009		2010		2011		2012	
Quarter 1	10.38%	(7)	10.24%	(4)	10.24%	(9)	10.10%	(5)	9.63%	(5)
Quarter 2	10.17%	(3)	10.11%	(8)	9.99%	(11)	9.88%	(5)		
Quarter 3	10.49%	(7)	9.88%	(2)	9.93%	(4)	9.65%	(2)		
Quarter 4	10.34%	(13)	10.27%	(15)	10.09%	(13)	9.88%	(4)		
Average Gas Utilities	10.37%	(30)	10.19%	(29)	10.08%	(37)	9.92%	(16)		

Data Sources:
Regulatory Focus , "Major Rate Case Decisions," Regulatory Research Associates, Apr 5, 2012; January 7, 2011; January 12, 2009.
Number of cases in parentheses.

Northwest Natural Gas Co.
Long-Term Interest Rate Trends

Month	Single-A Utility Rate	30-Year Treasury Rate	Single-A Utility Spread
Jun-09	6.20	4.52	1.68
Jul-09	5.97	4.41	1.56
Aug-09	5.71	4.37	1.34
Sep-09	5.53	4.19	1.34
Oct-09	5.55	4.19	1.36
Nov-09	5.64	4.31	1.33
Dec-09	5.79	4.49	1.30
Jan-10	5.77	4.60	1.17
Feb-10	5.87	4.62	1.25
Mar-10	5.84	4.64	1.20
Apr-10	5.81	4.69	1.12
May-10	5.50	4.29	1.21
Jun-10	5.46	4.13	1.33
Jul-10	5.26	3.99	1.27
Aug-10	5.01	3.80	1.21
Sep-10	5.01	3.77	1.24
Oct-10	5.10	3.87	1.23
Nov-10	5.37	4.19	1.18
Dec-10	5.56	4.42	1.14
Jan-11	5.57	4.52	1.05
Feb-11	5.68	4.65	1.03
Mar-11	5.56	4.51	1.05
Apr-11	5.55	4.50	1.05
May-11	5.32	4.29	1.03
Jun-11	5.26	4.23	1.03
Jul-11	5.27	4.27	1.00
Aug-11	4.69	3.65	1.04
Sep-11	4.48	3.18	1.30
Oct-11	4.52	3.13	1.39
Nov-11	4.25	3.02	1.23
Dec-11	4.33	2.98	1.35
Jan-12	4.34	3.03	1.31
Feb-12	4.36	3.11	1.25
Mar-12	4.48	3.28	1.20
Apr-12	4.40	3.18	1.22
May-12	4.20	2.93	1.27
3-Mo Avg	**4.36**	**3.13**	**1.23**
12-Mo Avg	**4.55**	**3.33**	**1.22**

Sources: Mergent Bond Record (Utility Rates); www.federalreserve.gov (Treasury Rates).

Three month average is for March 2012-May 2012.

Twelve month average is for June 2011-May 2012.

NWN/2102
Hadaway/2

Economic Indicators

Seasonally Adjusted Annual Rates — Dollar Figures in Billions

2011	E2012	E2013	Annual % Change 2011	Annual % Change E2012	Annual % Change E2013		2011 Q3	2011 Q4	2012 AQ1	2012 EQ2	2012 EQ3	2012 EQ4	E2013 Q1	E2013 Q2
						Gross Domestic Product								
$15,094.0	$15,658.5	$16,249.4	3.9	3.7	3.8	GDP (current dollars)	$15,176.1	$15,319.4	$15,461.8	$15,581.7	$15,725.2	$15,865.4	$16,013.1	$16,144.2
3.9	3.7	3.8	-	-	-	Annual rate of increase (%)	4.4	3.8	3.8	3.1	3.7	3.6	3.8	3.3
1.7	2.1	2.4	-	-	-	Annual rate of increase–real GDP (%)	1.8	3.0	2.2	1.9	1.7	2.3	2.4	2.4
2.1	1.6	1.4	-	-	-	Annual rate of increase–GDP deflator (%)	2.6	0.9	1.5	1.2	2.0	1.3	1.4	0.8
						***Components of Real GDP**								
$9,421.3	$9,626.1	$9,827.4	2.2	2.2	2.1	Personal consumption expenditures	$9,433.5	$9,482.1	$9,550.2	$9,607.1	$9,648.8	$9,698.3	$9,754.7	$9,799.8
2.2	2.2	2.1	-	-	-	% change	1.7	2.1	2.9	2.4	1.7	2.1	2.3	1.9
1,285.4	1,389.8	1,446.2	8.2	8.1	4.1	Durable goods	1,277.8	1,326.5	1,374.5	1,386.4	1,393.5	1,404.6	1,425.1	1,437.9
2,075.8	2,104.6	2,141.3	1.7	1.4	1.7	Nondurable goods	2,073.7	2,077.6	2,088.5	2,100.3	2,110.2	2,119.6	2,129.4	2,137.3
6,076.1	6,166.4	6,282.5	1.4	1.5	1.9	Services	6,096.1	6,102.1	6,120.6	6,154.8	6,179.9	6,210.1	6,239.7	6,265.9
1,435.5	1,517.3	1,617.4	8.8	5.7	6.6	Nonresidental fixed investment	1,465.6	1,484.2	1,476.2	1,504.7	1,532.7	1,555.6	1,571.2	1,601.4
8.8	5.7	6.6	-	-	-	% change	15.7	5.2	(2.1)	8.0	7.7	6.1	4.1	7.9
1,125.7	1,214.3	1,308.6	10.4	7.9	7.8	Producers durable equipment	1,145.7	1,166.6	1,171.5	1,203.9	1,230.8	1,251.1	1,268.7	1,298.6
316.6	344.9	398.3	(1.5)	8.9	15.5	Residental fixed investment	315.7	324.6	339.5	341.5	345.8	352.8	364.5	383.1
(1.5)	8.9	15.5	-	-	-	% change	1.2	11.8	19.7	2.3	5.1	8.4	14.0	22.0
34.6	63.9	47.1	-	-	-	Net change in business inventories	(2.0)	52.2	69.5	62.7	60.8	62.5	54.4	48.6
2,502.7	2,454.3	2,413.9	(2.1)	(1.9)	(1.6)	Gov't purchases of goods & services	2,507.6	2,481.2	2,462.2	2,465.3	2,451.1	2,438.6	2,426.8	2,417.8
1,055.0	1,030.0	999.2	(1.9)	(2.4)	(3.0)	Federal	1,063.7	1,044.7	1,029.7	1,039.9	1,030.1	1,020.4	1,011.1	1,003.0
1,453.8	1,430.0	1,419.4	(2.2)	(1.6)	(0.7)	State & local	1,450.4	1,442.4	1,438.0	1,431.4	1,426.8	1,423.7	1,420.9	1,419.7
(413.6)	(417.0)	(377.6)	-	-	-	Net exports	(402.8)	(410.8)	(410.1)	(424.4)	(422.0)	(411.7)	(392.0)	(382.1)
1,774.2	1,854.2	1,982.2	6.7	4.5	6.9	Exports	1,785.2	1,797.0	1,820.7	1,840.9	1,863.8	1,891.5	1,929.8	1,965.4
2,187.7	2,271.3	2,359.8	4.9	3.8	3.9	Imports	2,187.9	2,207.7	2,230.9	2,265.2	2,285.8	2,303.3	2,321.7	2,347.5
						****Income & Profits**								
$13,005.3	$13,493.2	$14,049.7	5.1	3.8	4.1	Personal income	$13,056.8	$13,162.1	$13,281.7	$13,402.3	$13,568.1	$13,720.7	$13,840.1	$13,975.6
11,605.0	11,965.4	12,340.8	3.8	3.1	3.1	Disposable personal income	11,647.7	11,731.9	11,812.9	11,909.1	12,019.3	12,120.5	12,186.3	12,264.6
4.7	3.8	3.4	-	-	-	Savings rate (%)	4.6	4.5	3.9	3.8	3.8	3.8	3.4	3.3
1,896.3	2,137.8	2,321.4	4.2	12.7	8.6	Corporate profits before taxes	1,912.9	1,904.6	2,181.4	2,139.0	2,129.2	2,101.6	2,317.8	2,305.2
1,480.1	1,671.3	1,795.1	5.1	12.9	7.4	Corporate profits after taxes	1,501.5	1,493.9	1,696.5	1,670.5	1,667.9	1,650.2	1,789.1	1,783.4
86.95	100.27	112.97	12.4	15.3	12.7	‡Earnings per share (S&P 500)	86.98	86.95	88.42	92.91	96.26	100.27	105.31	106.74
						†Prices & Interest Rates								
3.1	2.2	1.7	-	-	-	Consumer price index	3.1	1.3	2.5	1.5	2.8	1.4	1.7	1.0
0.1	0.1	0.1	-	-	-	Treasury bills	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1
2.8	2.1	2.6	-	-	-	10-yr notes	2.4	2.0	2.0	2.0	2.1	2.2	2.3	2.6
3.9	3.2	3.7	-	-	-	30-yr bonds	3.7	3.0	3.1	3.1	3.2	3.3	3.4	3.6
4.6	4.0	4.4	-	-	-	New issue rate–corporate bonds	4.5	3.9	3.9	4.0	4.1	4.1	4.1	4.3
						Other Key Indicators								
610.1	721.7	988.4	4.3	18.3	37.0	Housing starts (1,000 units SAAR)	615.3	670.3	687.3	699.3	737.1	763.0	812.4	928.9
12.7	14.2	14.9	10.3	11.2	4.9	Auto & truck sales (1,000,000 units)	12.4	13.4	14.5	14.3	14.0	13.8	14.4	14.8
9.0	8.1	7.8	-	-	-	Unemployment rate (%)	9.1	8.7	8.3	8.2	8.1	8.0	7.9	7.9
(5.9)	2.7	0.1	-	-	-	§U.S. dollar	1.0	15.6	2.8	(0.4)	0.5	(0.9)	(0.9)	0.6

Note: Annual changes are from prior year and quarterly changes are from prior quarter. Figures may not add to totals because of rounding. A–Advance data. P–Preliminary. E–Estimated. R–Revised.
*2005 Chain-weighted dollars. **Current dollars. ‡Trailing 4 quarters. †Average for period. §Quarterly % changes at quarterly rates. This forecast prepared by Standard & Poor's.

Northwest Natural Gas Company

Recalculation of Mr. Storm's Three-stage DCF Model Terminal Valuation based on Perpetuity Stage 3 Growth Rate of 5.82 Percent

	Unadjusted ROE[1] (IRR) (A)	Average Recent Share Price (B)	Dividend Yield @ Average Recent Share Price[2] (C)	2012-17 Annual Dividend Growth Rate[3] (D)	2018-22 Annual Dividend Growth Rate[3] (E)	2023-42 Annual Dividend Growth Rate[3] (F)	Terminal Value as % of Total Valuation[1] (G)	2012 Common Equity % of Capital Structure (H)	Test Year Common Equity % of Capital Structure (I)	Value Line Beta[4] (J)	Unlevered Beta[5] (Business Risk) (K)	Beta Relevered to Test Year Capital Structure[5] (L)	ROE Adjustment (Hamada Equation) (M)	**ROE[1] Adjusted for Divergent Capital Structures (O)**
Staff's Peer Utilities														
1 Laclede Group	9.2%	$41.02	4.0%	2.2%	4.3%	5.82%	39.9%	63.0%	50.0%	0.60	0.43	0.72	0.5%	**9.7%**
2 Northwest Natural	9.0%	$46.55	3.8%	2.1%	4.3%	5.82%	41.9%	55.0%	50.0%	0.60	0.38	0.65	0.2%	**9.2%**
3 Piedmont Natural Gas	9.1%	$32.27	3.7%	3.2%	4.7%	5.82%	41.3%	57.0%	50.0%	0.70	0.46	0.78	0.3%	**9.5%**
4 Questar	9.3%	$19.39	3.4%	5.7%	5.7%	5.82%	39.8%	52.5%	50.0%	NMF	0.40	0.66	0.1%	**9.4%**
5 WGL Holdings	9.1%	$41.54	3.8%	2.4%	4.4%	5.82%	41.4%	67.5%	50.0%	0.65	0.50	0.81	0.7%	**9.8%**
Group Average	9.2%		3.8%	3.1%	4.7%	5.82%	40.9%	59.0%	50.0%	0.64	0.44	0.72	0.4%	**9.5%**
Northwest Natural's Peer Utilities														
1 Alliant Energy	10.0%	$42.96	4.2%	5.2%	5.5%	5.82%	32.6%	49.0%	50.0%	0.75	0.41	0.74	-0.1%	**10.0%**
2 Black Hills	9.4%	$33.71	4.4%	1.5%	4.1%	5.82%	37.6%	54.0%	50.0%	0.85	0.54	0.90	0.2%	**9.6%**
3 Consolidated Edison	9.1%	$58.62	4.1%	1.2%	4.0%	5.82%	40.7%	51.5%	50.0%	0.60	0.37	0.61	0.1%	**9.2%**
4 DTE Energy	10.0%	$54.35	4.5%	3.8%	4.9%	5.82%	32.9%	51.0%	50.0%	0.75	0.46	0.76	0.0%	**10.0%**
5 Northwest Natural Gas	9.0%	$46.55	3.8%	2.1%	4.3%	5.82%	41.9%	55.0%	50.0%	0.60	0.38	0.65	0.2%	**9.2%**
6 NiSource	8.6%	$23.94	3.8%	0.0%	3.5%	5.82%	46.2%	45.0%	50.0%	0.85	0.49	0.78	-0.3%	**8.4%**
7 Piedmont Natural Gas	9.1%	$32.27	3.7%	3.2%	4.7%	5.82%	41.3%	57.0%	50.0%	0.70	0.46	0.78	0.3%	**9.5%**
8 Pepco Holdings	10.5%	$19.37	5.6%	1.4%	3.9%	5.82%	27.9%	51.0%	50.0%	0.80	0.48	0.81	0.1%	**10.5%**
9 SCANA	9.5%	$45.18	4.4%	2.1%	4.3%	5.82%	36.6%	46.0%	50.0%	0.70	0.39	0.65	-0.2%	**9.3%**
10 Sempra Energy	9.6%	$59.41	3.5%	6.6%	6.0%	5.82%	37.3%	50.5%	50.0%	0.80	0.46	0.81	0.0%	**9.6%**
11 Southwest Gas	9.0%	$42.77	2.8%	8.3%	6.3%	5.82%	43.8%	55.5%	50.0%	0.75	0.49	0.81	0.3%	**9.3%**
12 Vectren	10.3%	$29.22	4.8%	3.0%	5.0%	5.82%	30.4%	48.0%	50.0%	0.70	0.41	0.68	-0.1%	**10.2%**
13 Wisconsin Energy	10.5%	$34.59	3.5%	11.1%	7.3%	5.82%	30.2%	46.0%	50.0%	0.65	0.37	0.61	-0.2%	**10.3%**
14 Xcel Energy	10.3%	$26.52	4.0%	6.3%	6.3%	5.82%	30.9%	46.5%	50.0%	0.65	0.37	0.61	-0.2%	**10.1%**
Group Average	9.6%		4.1%	4.0%	5.0%	5.82%	36.5%	50.4%	50.0%	0.73	0.43	0.73	0.0%	**9.7%**

Notes

1. Based on average of Beginning of Year values and End of Year values.
2. Based on Value Line's estimated 2012 dividends.
3. Based on calendar year dividends.
4. Value Line reports Questar's beta as "NMF" (not meaningful). Questar's unlevered beta is average of remaining members of peer group.
5. Calculations of the unlevered beta and the relevered beta use the Hamada Equation.

Displayed values have not been rounded.

Northwest Natural Gas Company

Recalculation of Mr. Storm's
Three-stage DCF Model
Terminal Valuation Based on P/E Ratio
Stage 3 Growth Rate of 5.82 Percent

	Unadjusted ROE[1] (IRR) (A)	Average Recent Share Price (B)	Dividend Yield @ Average Recent Share Price[2] (C)	2013-17 Average Annual Dividend Growth Rate[3] (D)	2013-17 Average Annual EPS[4] Growth Rate[3] (E)	2018-22 Average Annual Dividend Growth Rate[3] (F)	2018-22 Average Annual EPS[4] Growth Rate[3] (G)	2023-42 Average Annual Dividend & EPS[4] Growth Rates[3] (H)	Terminal Value as % of Total Valuation[1] (I)	2012 Common Equity % of Capital Structure (J)	Test Year Common Equity % of Capital Structure (K)	Value Line Beta[5] (L)	Unlevered Beta[5] (Business Risk) (M)	Beta Relevered to Test Year Capital Structure[6] (N)	ROE Adjustment (Hamada Equation) (O)	**ROE[1] Adjusted for Divergent Capital Structures (P)**
Staff's Peer Utilities																
1 Laclede Group	8.9%	$41.02	4.0%	2.2%	3.0%	4.3%	4.6%	5.82%	37.2%	63.0%	50.0%	0.60	0.43	0.72	0.5%	**9.4%**
2 Northwest Natural	9.3%	$46.55	3.8%	2.2%	7.7%	4.3%	6.2%	5.82%	43.8%	55.0%	50.0%	0.60	0.38	0.65	0.2%	**9.5%**
3 Piedmont Natural Gas	8.9%	$32.27	3.7%	3.2%	3.6%	4.7%	5.0%	5.82%	39.3%	57.0%	50.0%	0.70	0.46	0.78	0.3%	**9.2%**
4 Questar	9.9%	$19.39	3.4%	5.5%	9.6%	5.7%	7.7%	5.82%	44.5%	52.5%	50.0%	NMF	0.40	0.66	0.1%	**10.0%**
5 WGL Holdings	8.8%	$41.54	3.8%	2.4%	2.9%	4.4%	4.7%	5.82%	38.8%	67.5%	50.0%	0.65	0.50	0.81	0.7%	**9.5%**
Group Average	9.2%		3.8%	3.1%	5.4%	4.7%	5.6%	5.82%	40.7%	59.0%	50.0%	0.64	0.44	0.72	0.4%	**9.5%**
Northwest Natural's Peer Utilities																
1 Alliant Energy	10.0%	$42.96	4.2%	5.1%	5.4%	5.5%	5.5%	5.82%	32.1%	49.0%	50.0%	0.75	0.41	0.74	-0.1%	**9.9%**
2 Black Hills	9.3%	$33.71	4.4%	1.5%	4.0%	4.1%	5.1%	5.82%	36.3%	54.0%	50.0%	0.85	0.54	0.90	0.2%	**9.5%**
3 Consolidated Edison	8.7%	$58.62	4.1%	1.2%	2.2%	4.0%	4.3%	5.82%	37.3%	51.5%	50.0%	0.60	0.37	0.61	0.1%	**8.8%**
4 DTE Energy	9.8%	$54.35	4.5%	3.7%	4.6%	4.9%	5.2%	5.82%	31.9%	51.0%	50.0%	0.75	0.46	0.76	0.0%	**9.9%**
5 Northwest Natural Gas	9.3%	$46.55	3.8%	2.2%	7.7%	4.3%	6.2%	5.82%	43.8%	55.0%	50.0%	0.60	0.38	0.65	0.2%	**9.5%**
6 NiSource	8.9%	$23.94	3.8%	0.0%	6.4%	3.5%	6.3%	5.82%	47.9%	45.0%	50.0%	0.85	0.49	0.78	-0.3%	**8.6%**
7 Piedmont Natural Gas	8.9%	$32.27	3.7%	3.2%	3.6%	4.7%	5.0%	5.82%	39.3%	57.0%	50.0%	0.70	0.46	0.78	0.3%	**9.2%**
8 Pepco Holdings	10.6%	$19.37	5.6%	1.7%	6.8%	3.9%	6.1%	5.82%	29.5%	51.0%	50.0%	0.80	0.48	0.81	0.1%	**10.7%**
9 SCANA	9.4%	$45.18	4.4%	2.1%	4.5%	4.3%	5.4%	5.82%	36.0%	46.0%	50.0%	0.70	0.39	0.65	-0.2%	**9.3%**
10 Sempra Energy	9.8%	$59.41	3.5%	6.2%	7.6%	6.0%	6.5%	5.82%	39.1%	50.5%	50.0%	0.80	0.46	0.81	0.0%	**9.8%**
11 Southwest Gas	9.4%	$42.77	2.8%	7.7%	9.3%	6.3%	7.2%	5.82%	47.5%	55.5%	50.0%	0.75	0.49	0.81	0.3%	**9.7%**
12 Vectren	10.5%	$29.22	4.8%	3.3%	7.7%	5.0%	6.5%	5.82%	32.5%	48.0%	50.0%	0.70	0.41	0.68	-0.1%	**10.4%**
13 Wisconsin Energy	10.3%	$34.59	3.5%	10.3%	5.0%	7.3%	5.3%	5.82%	28.6%	46.0%	50.0%	0.65	0.37	0.61	-0.2%	**10.1%**
14 Xcel Energy	10.0%	$26.52	4.0%	6.9%	2.6%	6.3%	4.5%	5.82%	27.5%	46.5%	50.0%	0.65	0.37	0.61	-0.2%	**9.8%**
Group Average	9.6%		4.1%	3.9%	5.5%	5.0%	5.7%	5.82%	36.4%	50.4%	50.0%	0.73	0.43	0.73	0.0%	**9.7%**

Notes

1. Based on average of Beginning of Year values and End of Year values. ROE is unadjusted for divergent capital structures.
2. Based on Value Line's estimated 2012 dividends.
3. Based on calendar year dividends and Earnings per Share (EPS).
4. Earnings per Share
5. Value Line reports Questar's beta as "NMF" (not meaningful). Questar's unlevered beta is average of remaining members of peer group.
6. Calculations of the unlevered beta and the relevered beta use the Hamada Equation.

Displayed values have not been rounded.

Northwest Natural Gas Company

Recalculation of Mr. Storm's Long-term GDP Growth Rate Using Morningstar Long-term Real GDP Growth of 3.3%

Long-term Annual Growth Rates	
Dr. Hadaway's GDP Growth Rate	5.80%
Calculated Historical Annual Average Nominal GDP	
1930 - 2011	6.26%
1951 - 2011	6.67%
1980 - 2011	5.70%
Historical Rate: Based on Morningstar/Ibbotson Data	
Real GDP Annual Growth Rate: 1929-2010	**3.30%**
TIPS Breakeven: 3/2022 - 2/2032	2.44%
Long-run Nominal GDP Annual Growth Rate based on history & TIPS Inflation forecast	**5.82%**

Northwest Natural Gas Co.

Revised Risk Premium Analysis

(Based on Projected Interest Rates)

	MOODY'S AVERAGE PUBLIC UTILITY BOND YIELD (1)	AUTHORIZED GAS COMPANY RETURNS (2)	INDICATED RISK PREMIUM
1988	10.45%	12.85%	2.40%
1989	9.66%	12.88%	3.22%
1990	9.76%	12.67%	2.91%
1991	9.21%	12.46%	3.25%
1992	8.57%	12.01%	3.44%
1993	7.56%	11.35%	3.79%
1994	8.30%	11.35%	3.05%
1995	7.91%	11.43%	3.52%
1996	7.74%	11.19%	3.45%
1997	7.63%	11.29%	3.66%
1998	7.00%	11.51%	4.51%
1999	7.55%	10.66%	3.11%
2000	8.14%	11.39%	3.25%
2001	7.72%	10.95%	3.23%
2002	7.53%	11.03%	3.50%
2003	6.61%	10.99%	4.38%
2004	6.20%	10.59%	4.39%
2005	5.67%	10.46%	4.79%
2006	6.08%	10.43%	4.35%
2007	6.11%	10.24%	4.13%
2008	6.65%	10.37%	3.72%
2009	6.28%	10.19%	3.91%
2010	5.55%	10.08%	4.53%
AVERAGE	7.56%	11.23%	3.67%

INDICATED COST OF EQUITY

PROJECTED SINGLE-A UTILITY BOND YIELD*	4.54%
MOODY'S AVG ANNUAL YIELD DURING STUDY	7.56%
INTEREST RATE DIFFERENCE	-3.02%
INTEREST RATE CHANGE COEFFICIENT	-40.31%
ADUSTMENT TO AVG RISK PREMIUM	1.22%
BASIC RISK PREMIUM	3.67%
INTEREST RATE ADJUSTMENT	1.22%
EQUITY RISK PREMIUM	4.89%
PROJECTED SINGLE-A UTILITY BOND YIELD*	4.54%
INDICATED EQUITY RETURN	**9.43%**

(1) Moody's Investors Service

(2) Regulatory Focus, Regulatory Research Associates, Inc.

*Projected single-A bond yield is 124 basis points over projected long-term Treasury bond rate of 3.3% from NWN/502, Hadaway/3. The single-A spread is for 3 months ended October 2011 from NWN/502, Hadaway/2.

Northwest Natural Gas Co.

Revised Risk Premium Analysis

(Based on Current Interest Rates)

	MOODY'S AVERAGE PUBLIC UTILITY BOND YIELD (1)	AUTHORIZED GAS COMPANY RETURNS (2)	INDICATED RISK PREMIUM
1988	10.45%	12.85%	2.40%
1989	9.66%	12.88%	3.22%
1990	9.76%	12.67%	2.91%
1991	9.21%	12.46%	3.25%
1992	8.57%	12.01%	3.44%
1993	7.56%	11.35%	3.79%
1994	8.30%	11.35%	3.05%
1995	7.91%	11.43%	3.52%
1996	7.74%	11.19%	3.45%
1997	7.63%	11.29%	3.66%
1998	7.00%	11.51%	4.51%
1999	7.55%	10.66%	3.11%
2000	8.14%	11.39%	3.25%
2001	7.72%	10.95%	3.23%
2002	7.53%	11.03%	3.50%
2003	6.61%	10.99%	4.38%
2004	6.20%	10.59%	4.39%
2005	5.67%	10.46%	4.79%
2006	6.08%	10.43%	4.35%
2007	6.11%	10.24%	4.13%
2008	6.65%	10.37%	3.72%
2009	6.28%	10.19%	3.91%
2010	5.55%	10.08%	4.53%
AVERAGE	7.56%	11.23%	3.67%

INDICATED COST OF EQUITY	
CURRENT SINGLE-A UTILITY BOND YIELD*	4.56%
MOODY'S AVG ANNUAL YIELD DURING STUDY	7.56%
INTEREST RATE DIFFERENCE	-3.00%
INTEREST RATE CHANGE COEFFICIENT	-40.31%
ADUSTMENT TO AVG RISK PREMIUM	1.21%
BASIC RISK PREMIUM	3.67%
INTEREST RATE ADJUSTMENT	1.21%
EQUITY RISK PREMIUM	4.88%
CURRENT SINGLE-A UTILITY BOND YIELD*	4.56%
INDICATED EQUITY RETURN	**9.44%**

(1) Moody's Investors Service

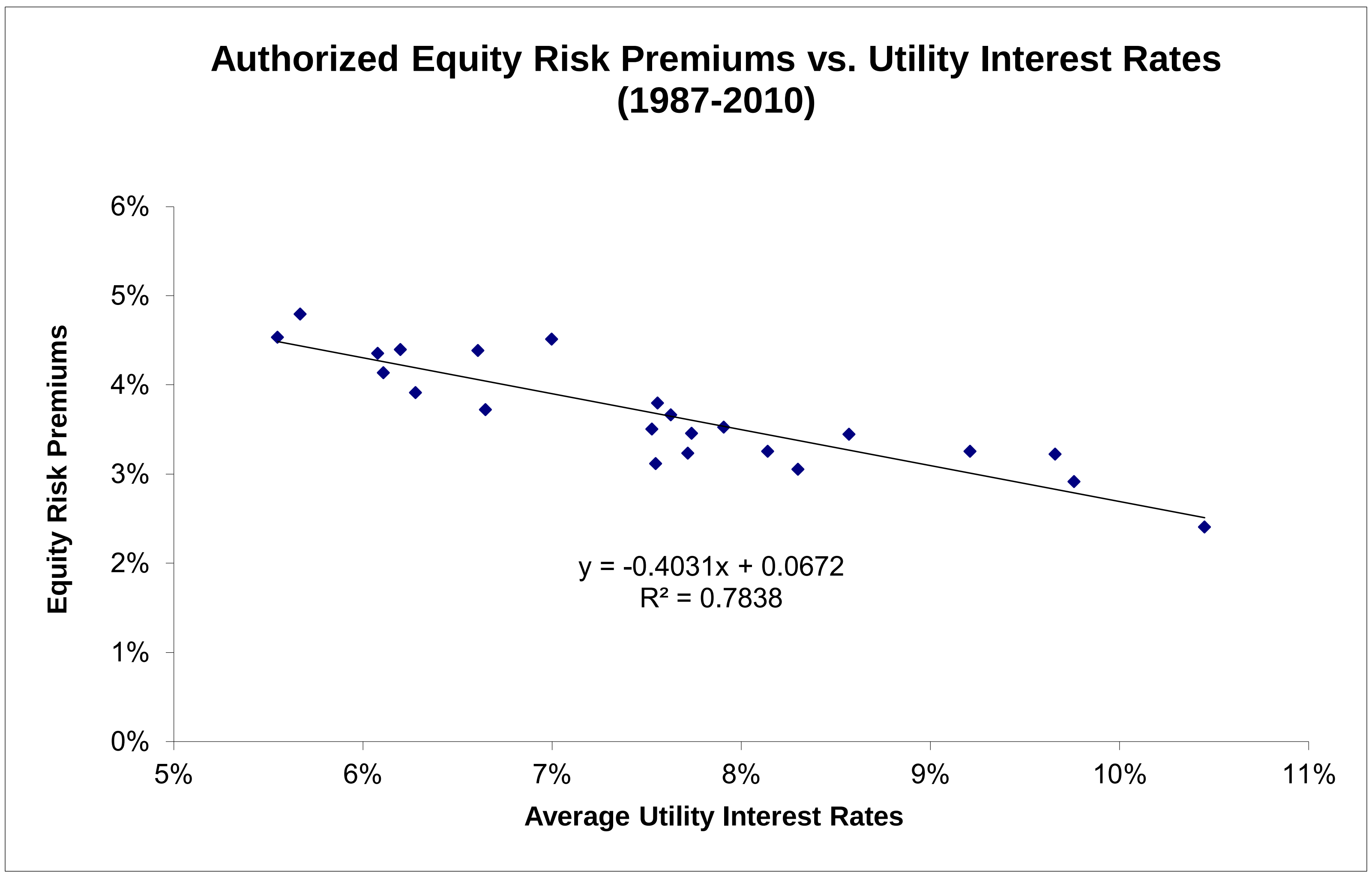
(2) Regulatory Focus, Regulatory Research Associates, Inc.

*Current single-A utility bond yield is three month average of Moody's Single-A Public Utility Bond Yield Average through October 2011 from NWN/502, Hadaway/2.

Northwest Natural Gas Co.

Revised Risk Premium Analysis

Regression Analysis & Interest Rate Change Coefficient



SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.885316143
R Square	0.783784674
Adjusted R Square	0.773488706
Standard Error	0.002916334
Observations	23

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.000647447	0.000647447	76.12539975	1.99433E-08
Residual	21	0.000178605	8.50501E-06		
Total	22	0.000826052			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.067206482	0.003545008	18.95805996	1.09038E-14	0.059834234	0.074578731	0.059834234	0.074578731
X Variable 1	-0.403064809	0.046196608	-8.724987092	1.99433E-08	-0.499135915	-0.306993704	-0.499135915	-0.306993704

Northwest Natural Gas Co.
GDP Growth Rate Forecast

	Nominal GDP	% Change	GDP Price Deflator	% Change	CPI	% Change
1951	347.9		15.9		26.5	
1952	371.4	6.8%	16.1	1.5%	26.7	0.9%
1953	375.9	1.2%	16.2	0.8%	26.9	0.6%
1954	389.4	3.6%	16.4	0.8%	26.8	-0.4%
1955	426.0	9.4%	16.8	2.6%	26.9	0.4%
1956	448.1	5.2%	17.4	3.3%	27.6	2.8%
1957	461.5	3.0%	17.8	2.7%	28.5	3.0%
1958	485.0	5.1%	18.3	2.5%	29.0	1.8%
1959	513.2	5.8%	18.4	0.9%	29.4	1.5%
1960	523.7	2.0%	18.7	1.4%	29.8	1.4%
1961	562.6	7.4%	18.9	1.1%	30.0	0.7%
1962	593.3	5.5%	19.2	1.3%	30.4	1.2%
1963	633.5	6.8%	19.4	1.4%	30.9	1.6%
1964	675.6	6.6%	19.7	1.5%	31.3	1.2%
1965	747.5	10.6%	20.1	2.0%	31.9	1.9%
1966	806.9	7.9%	20.8	3.5%	32.9	3.4%
1967	852.7	5.7%	21.4	3.1%	34.0	3.3%
1968	936.2	9.8%	22.4	4.6%	35.6	4.7%
1969	1004.5	7.3%	23.6	5.2%	37.7	5.9%
1970	1052.7	4.8%	24.8	5.0%	39.8	5.6%
1971	1151.4	9.4%	25.9	4.7%	41.1	3.3%
1972	1286.6	11.7%	27.1	4.5%	42.5	3.4%
1973	1431.8	11.3%	28.9	6.8%	46.3	8.9%
1974	1552.8	8.5%	32.0	10.7%	51.9	12.1%
1975	1713.9	10.4%	34.5	7.6%	55.6	7.1%
1976	1884.5	10.0%	36.3	5.4%	58.4	5.0%
1977	2110.8	12.0%	38.8	6.7%	62.3	6.7%
1978	2416.0	14.5%	41.6	7.3%	67.9	9.0%
1979	2659.4	10.1%	45.2	8.7%	76.9	13.3%
1980	2915.3	9.6%	49.6	9.7%	86.4	12.4%
1981	3194.7	9.6%	53.7	8.3%	94.1	8.9%
1982	3312.5	3.7%	56.5	5.2%	97.7	3.8%
1983	3688.1	11.3%	58.4	3.3%	101.4	3.8%
1984	4034.0	9.4%	60.5	3.6%	105.5	4.0%
1985	4318.7	7.1%	62.1	2.8%	109.5	3.8%
1986	4543.3	5.2%	63.6	2.3%	110.8	1.2%
1987	4883.1	7.5%	65.5	3.1%	115.6	4.3%
1988	5251.0	7.5%	68.0	3.7%	120.7	4.4%
1989	5581.7	6.3%	70.3	3.5%	126.3	4.6%
1990	5846.0	4.7%	73.2	4.2%	134.2	6.3%
1991	6092.5	4.2%	75.6	3.2%	138.2	3.0%
1992	6493.6	6.6%	77.2	2.2%	142.3	3.0%
1993	6813.8	4.9%	78.9	2.2%	146.3	2.8%
1994	7248.2	6.4%	80.6	2.1%	150.1	2.6%
1995	7542.5	4.1%	82.2	2.0%	153.9	2.5%
1996	8023.0	6.4%	83.7	1.8%	159.1	3.4%
1997	8505.7	6.0%	85.1	1.6%	161.8	1.7%
1998	9027.5	6.1%	86.0	1.1%	164.4	1.6%
1999	9607.7	6.4%	87.3	1.5%	168.8	2.7%
2000	10129.8	5.4%	89.4	2.5%	174.6	3.4%
2001	10373.1	2.4%	91.2	2.0%	177.4	1.6%
2002	10766.9	3.8%	92.9	1.8%	181.8	2.5%
2003	11414.8	6.0%	94.8	2.1%	185.5	2.0%
2004	12123.9	6.2%	97.9	3.2%	191.7	3.3%
2005	12901.4	6.4%	101.3	3.5%	198.1	3.3%
2006	13584.2	5.3%	104.2	2.8%	203.1	2.5%
2007	14253.2	4.9%	107.0	2.7%	211.4	4.1%
2008	14081.7	-1.2%	109.3	2.2%	211.4	0.0%
2009	14087.4	0.0%	109.9	0.6%	217.3	2.8%
2010	14755.0	4.7%	111.6	1.5%	220.4	1.4%
2011	15320.8	3.8%	114.1	2.2%	227.0	3.0%
10-Year Average		4.0%		2.3%		2.5%
20-Year Average		4.7%		2.1%		2.5%
30-Year Average		5.4%		2.5%		3.0%
40-Year Average		6.7%		3.8%		4.4%
50-Year Average		6.9%		3.7%		4.2%
60-Year Average		6.6%		3.4%		3.7%
Average of Periods		5.7%		3.0%		3.4%

Source: St. Louis Federal Reserve Bank, www.research.stlouisfed.org

Northwest Natural Gas Co.
Discounted Cash Flow Analysis
Summary Of DCF Model Results

	Company	Constant Growth DCF Model Analysts' Growth Rates	Constant Growth DCF Model Long-Term GDP Growth	Low Near-Term Growth Two-Stage Growth DCF Model
1	Alliant Energy Co.	10.6%	10.1%	10.0%
2	Avista Corp.	9.5%	10.5%	10.4%
3	Black Hills Corp	10.8%	10.2%	9.8%
4	CMS Energy Corp.	10.9%	10.4%	10.3%
5	Con. Edison	7.5%	9.9%	9.4%
6	DTE Energy Co.	9.2%	10.3%	10.0%
7	Integrys Energy	10.6%	10.8%	10.2%
8	N.W. Nat'l Gas	7.8%	9.7%	9.3%
9	NiSource Inc.	12.7%	9.5%	9.0%
10	Piedmont Nat'l	7.8%	9.6%	9.3%
11	Pepco Holdings	9.6%	11.5%	10.9%
12	SCANA Corp.	8.5%	10.2%	9.8%
13	Sempra Energy	10.4%	9.9%	9.7%
14	Southwest Gas	9.4%	8.8%	8.9%
15	Wisconsin Energy	9.6%	9.6%	10.0%
16	Xcel Energy Inc.	9.6%	9.9%	10.0%
	GROUP AVERAGE	9.7%	10.0%	9.8%
	GROUP MEDIAN	9.6%	10.0%	9.9%

Sources: Value Line Investment Survey, Electric Utility (East), Feb 24, 2012; (Central), Mar 23, 2012; (West), May 4, 2012; Natural Gas Utility, Mar 9, 2012.

NOTE: SEE PAGE 5 OF THIS EXHIBIT FOR FURTHER EXPLANATION OF EACH COLUMN.

Northwest Natural Gas Co.
Constant Growth DCF Model
Analysts' Growth Rates

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
				Analysts' Estimated Growth				
Company	Recent Price(P0)	Next Year's Div(D1)	Dividend Yield	Value Line	Zacks	Thomson	Average Growth *(Cols 4-6)*	**ROE** K=Div Yld+G *(Cols 3+7)*
1 Alliant Energy Co.	43.21	1.90	4.40%	6.50%	6.20%	6.00%	6.23%	10.6%
2 Avista Corp.	25.39	1.22	4.80%	5.50%	4.70%	4.00%	4.73%	9.5%
3 Black Hills Corp	33.59	1.50	4.47%	7.00%	6.00%	6.00%	6.33%	10.8%
4 CMS Energy Corp.	21.87	1.02	4.66%	7.00%	5.80%	5.96%	6.25%	10.9%
5 Con. Edison	58.33	2.44	4.18%	3.00%	3.70%	3.15%	3.28%	7.5%
6 DTE Energy Co.	54.74	2.52	4.60%	5.00%	4.40%	4.29%	4.56%	9.2%
7 Integrys Energy	53.06	2.72	5.13%	7.00%	4.50%	5.00%	5.50%	10.6%
8 N.W. Nat'l Gas	46.02	1.82	3.95%	4.00%	4.30%	3.25%	3.85%	7.8%
9 NiSource Inc.	23.90	0.92	3.85%	8.00%	NA	9.63%	8.82%	12.7%
10 Piedmont Nat'l	31.76	1.23	3.87%	2.50%	4.70%	4.55%	3.92%	7.8%
11 Pepco Holdings	19.18	1.12	5.84%	2.50%	4.00%	4.85%	3.78%	9.6%
12 SCANA Corp.	44.91	2.02	4.50%	3.50%	4.00%	4.60%	4.03%	8.5%
13 Sempra Energy	59.99	2.50	4.17%	4.50%	7.00%	7.05%	6.18%	10.4%
14 Southwest Gas	42.38	1.30	3.07%	9.50%	5.30%	4.15%	6.32%	9.4%
15 Wisconsin Energy	34.90	1.36	3.90%	6.50%	5.30%	5.35%	5.72%	9.6%
16 Xcel Energy Inc.	26.52	1.11	4.19%	6.00%	5.00%	5.27%	5.42%	9.6%
GROUP AVERAGE	38.73	1.67	4.35%	5.50%	4.99%	5.19%	5.31%	9.7%
GROUP MEDIAN			4.29%					9.6%

Sources: Value Line Investment Survey, Electric Utility (East), Feb 24, 2012; (Central), Mar 23, 2012; (West), May 4, 2012; Natural Gas Utility, Mar 9, 2012.

NOTE: SEE PAGE 5 OF THIS EXHIBIT FOR FURTHER EXPLANATION OF EACH COLUMN.

Northwest Natural Gas Co.
Constant Growth DCF Model
Long-Term GDP Growth

	Company	(9) Recent Price(P0)	(10) Next Year's Div(D1)	(11) Dividend Yield	(12) GDP Growth	(13) **ROE** K=Div Yld+G *(Cols 11+12)*
1	Alliant Energy Co.	43.21	1.90	4.40%	5.70%	10.1%
2	Avista Corp.	25.39	1.22	4.80%	5.70%	10.5%
3	Black Hills Corp	33.59	1.50	4.47%	5.70%	10.2%
4	CMS Energy Corp.	21.87	1.02	4.66%	5.70%	10.4%
5	Con. Edison	58.33	2.44	4.18%	5.70%	9.9%
6	DTE Energy Co.	54.74	2.52	4.60%	5.70%	10.3%
7	Integrys Energy	53.06	2.72	5.13%	5.70%	10.8%
8	N.W. Nat'l Gas	46.02	1.82	3.95%	5.70%	9.7%
9	NiSource Inc.	23.90	0.92	3.85%	5.70%	9.5%
10	Piedmont Nat'l	31.76	1.23	3.87%	5.70%	9.6%
11	Pepco Holdings	19.18	1.12	5.84%	5.70%	11.5%
12	SCANA Corp.	44.91	2.02	4.50%	5.70%	10.2%
13	Sempra Energy	59.99	2.50	4.17%	5.70%	9.9%
14	Southwest Gas	42.38	1.30	3.07%	5.70%	8.8%
15	Wisconsin Energy	34.90	1.36	3.90%	5.70%	9.6%
16	Xcel Energy Inc.	26.52	1.11	4.19%	5.70%	9.9%
	GROUP AVERAGE	38.73	1.67	4.35%	5.70%	10.0%
	GROUP MEDIAN			4.29%		10.0%

Sources: Value Line Investment Survey, Electric Utility (East), Feb 24, 2012; (Central), Mar 23, 2012; (West), May 4, 2012;
Natural Gas Utility, Mar 9, 2012.

NOTE: SEE PAGE 5 OF THIS EXHIBIT FOR FURTHER EXPLANATION OF EACH COLUMN.

Northwest Natural Gas Co.
Low Near-Term Growth
Two-Stage Growth DCF Model

	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
			Annual	CASH FLOWS							ROE=Internal
	2013	2016	Change	Recent	Year 1	Year 2	Year 3	Year 4	Year 5	Year 5-150	Rate of Return
Company	Div	Div	to 2016	Price	Div	Div	Div	Div	Div	Div Growth	*(Yrs 0-150)*
1 Alliant Energy Co.	1.90	2.20	0.10	-43.21	1.90	2.00	2.10	2.20	2.33	5.70%	10.0%
2 Avista Corp.	1.22	1.40	0.06	-25.39	1.22	1.28	1.34	1.40	1.48	5.70%	10.4%
3 Black Hills Corp	1.50	1.60	0.03	-33.59	1.50	1.53	1.57	1.60	1.69	5.70%	9.8%
4 CMS Energy Corp.	1.02	1.20	0.06	-21.87	1.02	1.08	1.14	1.20	1.27	5.70%	10.3%
5 Con. Edison	2.44	2.54	0.03	-58.33	2.44	2.47	2.51	2.54	2.68	5.70%	9.4%
6 DTE Energy Co.	2.52	2.80	0.09	-54.74	2.52	2.61	2.71	2.80	2.96	5.70%	10.0%
7 Integrys Energy	2.72	2.80	0.03	-53.06	2.72	2.75	2.77	2.80	2.96	5.70%	10.2%
8 N.W. Nat'l Gas	1.82	1.94	0.04	-46.02	1.82	1.86	1.90	1.94	2.05	5.70%	9.3%
9 NiSource Inc.	0.92	0.92	0.00	-23.90	0.92	0.92	0.92	0.92	0.97	5.70%	9.0%
10 Piedmont Nat'l	1.23	1.35	0.04	-31.76	1.23	1.27	1.31	1.35	1.43	5.70%	9.3%
11 Pepco Holdings	1.12	1.16	0.01	-19.18	1.12	1.13	1.15	1.16	1.23	5.70%	10.9%
12 SCANA Corp.	2.02	2.15	0.04	-44.91	2.02	2.06	2.11	2.15	2.27	5.70%	9.8%
13 Sempra Energy	2.50	2.80	0.10	-59.99	2.50	2.60	2.70	2.80	2.96	5.70%	9.7%
14 Southwest Gas	1.30	1.60	0.10	-42.38	1.30	1.40	1.50	1.60	1.69	5.70%	8.9%
15 Wisconsin Energy	1.36	1.80	0.15	-34.90	1.36	1.51	1.65	1.80	1.90	5.70%	10.0%
16 Xcel Energy Inc.	1.11	1.35	0.08	-26.52	1.11	1.19	1.27	1.35	1.43	5.70%	10.0%
GROUP AVERAGE											9.8%
GROUP MEDIAN											9.9%

Sources: Value Line Investment Survey, Electric Utility (East), Feb 24, 2012; (Central), Mar 23, 2012; (West), May 4, 2012; Natural Gas Utility, Mar 9, 2012.

NOTE: SEE PAGE 5 OF THIS EXHIBIT FOR FURTHER EXPLANATION OF EACH COLUMN.

Northwest Natural Gas Co.
Discounted Cash Flow Analysis
Column Descriptions

Column 1: Three-month Average Price per Share (Feb 2012-Apr 2012)

Column 2: Estimated 2013 Div per Share from Value Line

Column 3: Column 2 Divided by Column 1

Column 4: "Est'd '09-'11 to '15-'17" Earnings Growth Reported by Value Line

Column 5: "Next 5 Years" Company Growth Estimate as Reported by Zacks.com

Column 6: "Next 5 Years (per annum) Growth Estimate Reported by Thomson Financial Network (at Yahoo Finance)

Column 7: Average of Columns 4-6

Column 8: Column 3 Plus Column 7

Column 9: See Column 1

Column 10: See Column 2

Column 11: Column 10 Divided by Column 9

Column 12: Average of GDP Growth During the Last 10 year, 20 year, 30 year, 40 year, 50 year, and 60 year growth periods. See NWN/2105, Hadaway

Column 13: Column 11 Plus Column 12

Column 14: Estimated 2013 Div per Share from Value Line

Column 15: Estimated 2016 Div per Share from Value Line

Column 16: (Column 15 Minus Column 14) Divided by Three

Column 17: See Column 1

Column 18: See Column 14

Column 19: Column 18 Plus Column 16

Column 20: Column 19 Plus Column 16

Column 21: Column 20 Plus Column 16

Column 22: Column 21 Increased by the Growth Rate Shown in Column 23

Column 23: See Column 12

Column 24: The Internal Rate of Return of the Cash Flows in Columns 17-22 along with the Dividends for the Years 6-150 Implied by the Growth Rates shown in Column 23

Northwest Natural Gas Co.

Risk Premium Analysis

(Based on Projected Interest Rates)

	MOODY'S AVERAGE PUBLIC UTILITY BOND YIELD (1)	AUTHORIZED GAS COMPANY RETURNS (2)	INDICATED RISK PREMIUM
1980	13.15%	14.05%	0.90%
1981	15.62%	15.11%	-0.51%
1982	15.33%	15.62%	0.29%
1983	13.31%	15.25%	1.94%
1984	14.03%	15.31%	1.28%
1985	12.29%	14.75%	2.46%
1986	9.46%	13.46%	4.00%
1987	9.98%	12.74%	2.76%
1988	10.45%	12.85%	2.40%
1989	9.66%	12.88%	3.22%
1990	9.76%	12.67%	2.91%
1991	9.21%	12.46%	3.25%
1992	8.57%	12.01%	3.44%
1993	7.56%	11.35%	3.79%
1994	8.30%	11.35%	3.05%
1995	7.91%	11.43%	3.52%
1996	7.74%	11.19%	3.45%
1997	7.63%	11.29%	3.66%
1998	7.00%	11.51%	4.51%
1999	7.55%	10.66%	3.11%
2000	8.14%	11.39%	3.25%
2001	7.72%	10.95%	3.23%
2002	7.53%	11.03%	3.50%
2003	6.61%	10.99%	4.38%
2004	6.20%	10.59%	4.39%
2005	5.67%	10.46%	4.79%
2006	6.08%	10.43%	4.35%
2007	6.11%	10.24%	4.13%
2008	6.65%	10.37%	3.72%
2009	6.28%	10.19%	3.91%
2010	5.55%	10.08%	4.53%
2011	5.17%	9.92%	4.75%
AVERAGE	8.82%	12.02%	3.20%

INDICATED COST OF EQUITY

PROJECTED SINGLE-A UTILITY BOND YIELD*	4.93%
MOODY'S AVG ANNUAL YIELD DURING STUDY	8.82%
INTEREST RATE DIFFERENCE	-3.89%
INTEREST RATE CHANGE COEFFICIENT	-41.76%
ADUSTMENT TO AVG RISK PREMIUM	1.62%
BASIC RISK PREMIUM	3.20%
INTEREST RATE ADJUSTMENT	1.62%
EQUITY RISK PREMIUM	4.82%
PROJECTED SINGLE-A UTILITY BOND YIELD*	4.93%
INDICATED EQUITY RETURN	**9.75%**

(1) Moody's Investors Service

(2) Regulatory Focus, Regulatory Research Associates, Inc.

*Projected single-A bond yield is 123 basis points over projected long-term Treasury bond rate of 3.7%.
The single-A spread is for 3 months ended May 2012 from NWN/2102, Hadaway/1.
The projected Treasury bond rate is from NWN/2102, Hadaway/2.

Northwest Natural Gas Co.

Risk Premium Analysis

(Based on Current Interest Rates)

	MOODY'S AVERAGE PUBLIC UTILITY BOND YIELD (1)	AUTHORIZED GAS COMPANY RETURNS (2)	INDICATED RISK PREMIUM
1980	13.15%	14.05%	0.90%
1981	15.62%	15.11%	-0.51%
1982	15.33%	15.62%	0.29%
1983	13.31%	15.25%	1.94%
1984	14.03%	15.31%	1.28%
1985	12.29%	14.75%	2.46%
1986	9.46%	13.46%	4.00%
1987	9.98%	12.74%	2.76%
1988	10.45%	12.85%	2.40%
1989	9.66%	12.88%	3.22%
1990	9.76%	12.67%	2.91%
1991	9.21%	12.46%	3.25%
1992	8.57%	12.01%	3.44%
1993	7.56%	11.35%	3.79%
1994	8.30%	11.35%	3.05%
1995	7.91%	11.43%	3.52%
1996	7.74%	11.19%	3.45%
1997	7.63%	11.29%	3.66%
1998	7.00%	11.51%	4.51%
1999	7.55%	10.66%	3.11%
2000	8.14%	11.39%	3.25%
2001	7.72%	10.95%	3.23%
2002	7.53%	11.03%	3.50%
2003	6.61%	10.99%	4.38%
2004	6.20%	10.59%	4.39%
2005	5.67%	10.46%	4.79%
2006	6.08%	10.43%	4.35%
2007	6.11%	10.24%	4.13%
2008	6.65%	10.37%	3.72%
2009	6.28%	10.19%	3.91%
2010	5.55%	10.08%	4.53%
2011	5.17%	9.92%	4.75%
AVERAGE	8.82%	12.02%	3.20%

INDICATED COST OF EQUITY

CURRENT SINGLE-A UTILITY BOND YIELD*	4.36%
MOODY'S AVG ANNUAL YIELD DURING STUDY	8.82%
INTEREST RATE DIFFERENCE	-4.46%
INTEREST RATE CHANGE COEFFICIENT	-41.76%
ADUSTMENT TO AVG RISK PREMIUM	1.86%
BASIC RISK PREMIUM	3.20%
INTEREST RATE ADJUSTMENT	1.86%
EQUITY RISK PREMIUM	5.06%
CURRENT SINGLE-A UTILITY BOND YIELD*	4.36%
INDICATED EQUITY RETURN	**9.42%**

(1) Moody's Investors Service

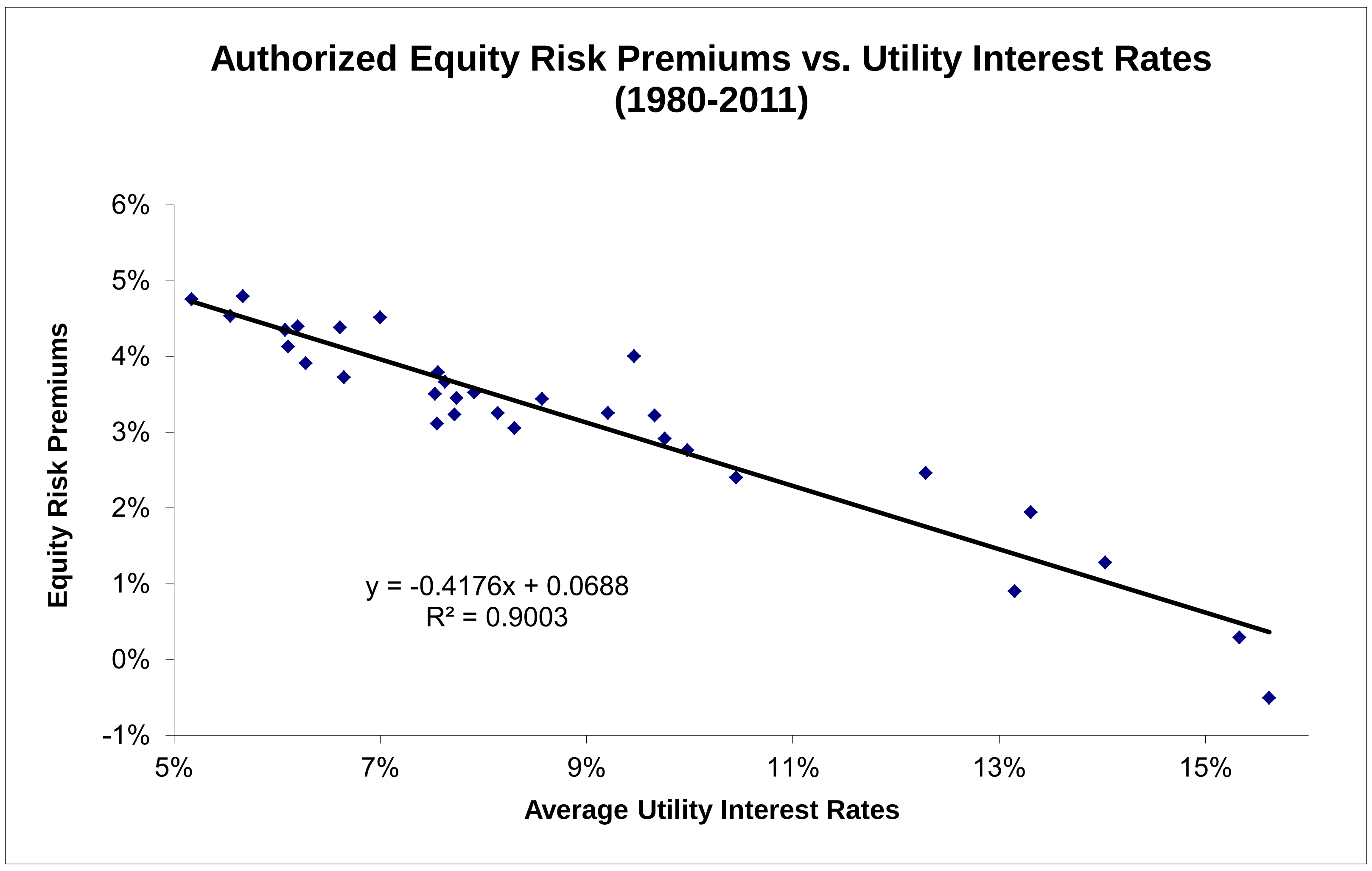
(2) Regulatory Focus, Regulatory Research Associates, Inc.

*Current single-A utility bond yield is three month average of Moody's Single-A Public Utility Bond Yield Average through May 2012 from NWN/2102, Hadaway/1.

Northwest Natural Gas Co.

Risk Premium Analysis

Regression Analysis & Interest Rate Change Coefficient



SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.948865848
R Square	0.900346398
Adjusted R Square	0.897024611
Standard Error	0.004075265
Observations	32

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.004501421	0.004501421	271.0428055	1.44033E-16
Residual	30	0.000498234	1.66078E-05		
Total	31	0.004999655			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.068814727	0.002350063	29.28207837	1.26325E-23	0.064015258	0.073614196	0.064015258	0.073614196
X Variable 1	-0.417571846	0.02536368	-16.46337771	1.44033E-16	-0.469371391	-0.365772301	-0.469371391	-0.365772301

BEFORE THE

PUBLIC UTILITY COMMISSION OF OREGON

UG 221

NW Natural

Reply Testimony of Grant Yoshihara

MID-WILLAMETTE VALLEY FEEDER / SYSTEM INTEGRITY PROGRAM

EXHIBIT 2200

June 15, 2012

EXHIBIT 2200 – REPLY TESTIMONY – MID-WILLAMETTE VALLEY FEEDER / SYSTEM INTEGRITY PROGRAM

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I. INTRODUCTION AND SUMMARY

Q. Are you the same Grant Yoshihara who provided direct testimony on behalf of Northwest Natural Gas Company ("NW Natural" or "the Company") in this proceeding?

A. Yes, as Exhibit NWN/600.

Q. What is the purpose of your reply testimony?

A. My reply testimony responds to the adjustment related to the Mid-Willamette Valley Feeder proposed by Mr. Sobhy on behalf of Commission Staff ("Staff") and Mr. Zimmerman's proposal to discontinue the System Integrity Program (SIP).

Q. Please provide a summary of your testimony.

A. In my testimony, I:

- Demonstrate that the Company's decision to develop the Mid-Willamette Valley Feeder was prudent and necessary for reliability purposes; and
- Explain the benefits the SIP has provided to customers and why Staff's proposal to discontinue the SIP should be rejected.

II. MID-WILLAMETTE VALLEY FEEDER

Q. Which phases of the Mid-Willamette Valley Feeder Project ("MWVF") were included in rate base in the Company's direct case?

A. The four phases of the MWVF are Perrydale to Monmouth, Monmouth Reinforcement, Willamette Crossing, and South of Monmouth Bare Replacement. The Perrydale to Monmouth and Monmouth Reinforcement phases are included in rate base in this case. The Willamette Crossing phase is not included in rates because it is scheduled for completion in 2013. The Company is proposing rate recovery for the South of

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Monmouth Bare Replacement phase, which is scheduled for service in 2013, through the SIP. First I will address the prudence of developing the MWVF as a whole. I will then address how Staff's proposal to terminate the SIP affects the Company's recovery of costs for the South of Monmouth Bare Replacement phase.

Q. Do the parties propose disallowances of certain elements of the MWVF?

A. Yes. Staff claims that the Company has not demonstrated the prudence of the MWVF project as a whole and recommends disallowance of costs related to the phases of the project that were included in rates in this case. Other arguments related to the MWVF made by Staff and NWIGU-CUB are addressed separately in a Partial Stipulation filed concurrently with the Company's Reply Testimony filing.

Q. What phases of the MWVF is Staff proposing to disallow on the basis of prudence?

A. Staff states that the only phase subject to rate base treatment in this proceeding is the Monmouth Reinforcement phase, and that is the only phase addressed in Mr. Sobhy's testimony on prudence. However, I believe that Staff's position is based on a misunderstanding. Staff asserts that the Company stated in a data request (included with Staff's testimony as Staff/1103) that the Company is not including the Perrydale to Monmouth phase in rates because it will not be in service by the rate effective date. As that data request shows, the Company stated that the Perrydale to Monmouth phase is scheduled for completion in 2012. This phase is included in rate base for the purposes of the Company's calculation of the Company's revenue requirement.

Q. What is the basis for Staff's claim that the MWVF is imprudent?

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A. Staff claims that the Company should not have developed the MWVF on the timeframe that it did because the 2011 Modified Integrated Resource Plan (IRP) does not select the MWVF project until the 2025-2026 timeframe. Staff also argues that if reduced loads were reflected in the IRP, the MWVF would have been selected even later.

Q. Do you agree with Staff's claim that the MWVF is imprudent?

A., No, I do not. Below I will explain why the MWVF was included in the IRP and that the inclusion in the IRP was not relevant to the reliability issues that drove the development of the MWVF. Second, I explain why it was prudent for the Company to develop the MWVF for reliability purposes in 2012.

<u>MWVF in the IRP</u>

Q. Do you agree with Staff's claim that the fact that the Company's modified IRP selected the MWVF at a later timeframe means the Company's development of the project was imprudent?

A. No. Staff's IRP argument ignores the nature and purpose of IRP modeling, and the Company's descriptions in this proceeding about the purposes for which the project is being developed.

Q. Please explain the purpose of the IRP.

A. The IRP provides a process through which utilities develop long-term resource plans for meeting resource needs on a least-cost, least-risk basis. Specifically for NW Natural, the IRP is a long-term forecast of the gas purchases and capacity contracts for bringing sufficient gas supplies to the boundary of the utility's distribution system. The Company performs its analysis to determine the resources it will need by using the modeling software SENDOUT, which is also used by Avista Corporation and Cascade Natural Gas

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Company for the development of their IRPs. See my Exhibit NWN/2201. Importantly for this discussion, SENDOUT is used only to evaluate the least-cost approach for acquiring supply and transporting that supply *to* the Company's system over the twenty-year planning period. SENDOUT is not used to model the distribution of the gas within the system, system expansions, or system reinforcements.

Q. Why does the Company not model distribution, system expansions, or system reinforcements in the IRP?

A. Modeling the Company's distribution needs is a separate endeavor than modeling for resource needs and requires different analytical software. The Company's IRPs have historically included a short discussion on its distribution system, noting that infrastructure requirements are modeled using Synergy software[1] in the normal course of business rather than a formal documented process such as the IRP. While SENDOUT is an excellent analytical tool for least cost resource planning, it is incapable of doing what Synergy does, which is to simulate gas flows under various flows and other varied service conditions.

Q. Should the Company have included analysis of its distribution system in its IRP?

A. No. The Commission's IRP Guidelines[2] do not require the inclusion of distribution planning. As mentioned, the Company has not historically included distribution planning in its IRP, and all of the Company's filed IRPs developed under the current guidelines have been acknowledged by the Commission as having met the requirements for analysis and content.

[1] Formerly referred to as Stoner Workstation Service, See page 3.17 of 2011 Modified IRP.
[2] Re. Pub. Util. Comm'n of Or. Investigation into Integrated Resource Planning, Docket UM 1056, Order No. 07-002 (Jan. 8, 2007) and Order No. 07-047 (Feb. 9, 2007).

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Q. Is the MWVF part of the distribution system?

A. Yes. MWVF will be an intrastate pipeline within the Company's service territory that will serve the purpose of delivering retail gas to NW Natural's customers. The MWVF is regulated by the Commission. In contrast, a transmission pipeline in the IRP is not a part of the Company's distribution system, but rather is an interstate pipeline that delivers wholesale gas purchases to a local distribution company's (LDCs) distribution system. The Federal Energy Regulatory Commission (FERC) regulates transmission pipelines.

Q. Why was the MWVF included in the IRP if the IRP is not used to model distribution, system expansion, or system reinforcements?

A. The inclusion of the MWVF in the IRP did not serve the purpose of modeling the pipeline's functionality within the Company's distribution system; rather, the Company included the MWVF because it was trying to address a limitation of SENDOUT.

Q. Please explain the SENDOUT limitation.

A. As mentioned above, SENDOUT is used by LDCs in Oregon to analyze the cost and availability of bringing gas to their systems. As compared with other LDCs, NW Natural is unique in that it has on-system gas storage at its Mist facility. When NW Natural performs model runs, SENDOUT overwhelmingly chooses Mist recall as a cost effective supply-side resource. Since Mist storage is a resource within the Company's system, SENDOUT does not marry this supply with available distribution delivery capacity, which is necessary if this gas is going to serve customers in the Company's southern region. To address this limitation with SENDOUT, MWVF was included in the Company's IRP in

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an attempt to model an increased peak day delivery of Mist and potentially Newport LNG storage to the Company's southern region.

Q. When and under what circumstances did the IRP modeling select the MWVF?

A. As Staff describes in opening testimony (See Staff/1100, Sobhy/10), two different model runs selected the MWVF. First, upon Staff request during the public process of developing the 2011 Modified IRP, the Company attempted to model service disruptions to test the reliability of its plan for bringing gas to its system. The Company applied various scenarios to one model run consisting of five disruptions that were staggered in two-year increments[3]. Under two service disruption scenarios, MWVF was chosen in 2019 as the least cost resource for delivering the incremental increase in gas requirements to the southern region.

Second, the modeling scenarios that did not include service disruptions revealed that the Company would need additional capacity in 2025/2026 for its incremental load growth. It is for this reason that Staff argues that the MWVF is not needed until 2025.[4]

Q. Does the fact that the Company's IRP model included the MWVF and did not select the MWVF until 2019 at the earliest indicate that it was not prudent to develop the MWVF beginning in 2012?

A. No. As I explained above, the IRP is not used to model distribution reliability and therefore the need that the MWVF is being built to fulfill is not modeled in the IRP. In fact, the text of the plan included a short discussion on the MWVF benefits that were not

[3] See page 5.15 of the Company's 2011 Modified IRP
[4] See Staff/1100, Sobhy/3, lines 17-21.

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modeled as part of the SENDOUT process, such as the replacement of bare steel and system reliability, which are discussed in the next section of my testimony.[5]

Prudence of MWVF

Q. Why was it prudent to develop the MWVF on the timeframe of 2012-2013 rather than the 2025-2026 timeframe advocated by Staff?

A. It was prudent to develop the MWVF on the 2012-2013 timeframe for a number of reasons. First, the Company needs to replace existing bare steel along the MWVF alignment in accordance with its bare steel program which is scheduled to complete before 2021. When system reinforcements are made such as in the SIP or the bare steel program, it is considered prudent to ensure that replacement pipe is appropriately sized to meet capacity needs. Second, it is important to enhance reliability in the region south of Salem. In a 2008 study, the Company identified the largest potential customer outages on NW Natural's distribution system that would result from a disruption of service through a single-feed system.[6] The Albany-Corvallis area was identified as having the biggest potential for large scale customer outages due to service disruptions from a single-feed system. Developing the MWVF on the 2012-2013 timeframe addresses this issue now. Finally, when it became apparent to the Company that Mist storage is the Company's primary, low-cost resource, the Company determined that it was important to acquire a means to bring this low-cost resource to customers in the South. MWVF meets all three of these objectives. It is important to remember that

[5] See Exhibit NWN/2302.
[6] See Exhibit Staff/1115, Sobhy/3.

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these objectives as well as the distribution of gas within the Company's service territory are not modeled in the Company's IRP.

Q. What do you mean by a "single-feed system"?

A. A single-feed system is a demand center within an LDC's distribution system that is fully dependent upon receiving its natural gas supply from one delivery source; in this case, at the Albany Gate Station from Northwest Pipeline Grant's Pass Lateral. By contrast, the Salem area, which is not a single-feed system, can receive natural gas from Northwest Pipeline, Mist storage, and Newport LNG.

Q. Please explain why being served by a single-feed system makes Albany-Corvallis vulnerable to customer outages.

A. The entire service area from Sweet Home to Philomath is served through a single delivery point from Northwest Pipeline's Grant's Pass Lateral at the Albany Gate Station. As a result, there is no ability to deliver gas through an alternate transmission pipeline network to this entire corridor should a service disruption occur anywhere upstream of the gate station.

Q. Staff argues that the Company managed to meet peak demand during prior service disruptions on the Grants Pass Lateral. Do you agree with Staff's characterization of these service disruptions?

A. No, I do not. Staff's characterization of the past events occurring during colder-than-normal (peak) events is not correct.

Q. Please explain.

A. Staff presents an analysis on pages 10-11 and 14-15 of Mr. Sobhy's opening testimony arguing that the Company managed to meet peak demand during significantly colder-

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than-normal weather during disruptions on the Grants Pass Lateral in February 1990, January 2004, and December 2009. Staff's data is incorrect and the logic presented in Staff's opening testimony on this topic is flawed. The actual weather experienced on the dates of the disruptions on the Grants Pass Lateral was much warmer than the Company's design peak day temperature.

The January 4, 2004 event occurred on a 34 Heating Degree Day (HDD). Normal weather for January 4 is 24 HDD (or 41 degrees Fahrenheit), so the temperature on the day of this event was colder than normal weather, but much warmer than the design peak day of 53 HDD. Additionally, January 4, 2004 was a Sunday of a holiday weekend, when firm system loads are generally lower, indicating that the disruption would have been more severe had it occurred on a weekday or non-holiday weekend.

Likewise, the December 2009 event occurred on a 44 HDD which was colder than the average 30 HDD that is typical for December, but the day was still significantly warmer than design peak day weather.

The Grants Pass Lateral disruption on February 5, 1990 occurred on a normal weather day: A typical February 5 is a 23 HDD (or 42 degrees F) and February 5, 1990 was a 24 HDD. Therefore, none of these events occurred during a time when system loads approached design conditions.

Q. What does it mean that the actual weather experienced on the dates of the disruptions was much warmer than the Company's design peak day temperature?

A. The difference in the actual weather experienced and the Company's design peak day temperature demonstrates that these two service disruptions will not be typical of all service disruptions that the Company may experience in the future. If the weather is

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colder, the demand for gas tends to be greater, and if a service disruption occurs during colder weather, it stands to reason that more customers may suffer an interruption to their service due to the higher gas demands on the system in such circumstances. In accordance with the parameters developed for the 2011 Modified IRP, agreed to by parties to the process, and later acknowledged by the Commission in OPUC Order No.12-161, the Company plans for a design peak day of 53 HDD. Had the two events discussed above occurred on a 53 HDD, the disruptions would have been more significant.

Q. Do you agree with Staff that these disruptions indicate that the Company is able to serve firm demand during Grants Pass Lateral disruptions?

A. No. Staff cites the compressor failure on December 9, 2009 at the Jackson Prairie Facility as evidence that the Company can service firm demand during Grants Pass Lateral disruptions. This assertion is incorrect for two significant reasons.

First, Staff claims that this 2009 event had no impact on firm customers. This was true for Oregon customers. However, 329 customers in Vancouver were interrupted and had to be restored on a day when the total HDD was 44.[7] Higher losses could have occurred if the affected area was one that is not as easily served using on-system storage (Mist and Gasco) and distribution assets to back off receipts from NW Pipeline as is the case for Vancouver.

[7] In response to OPUC Data Request 359, the Company initially stated that no firm customers were affected by this outage. Staff/1111, Sobhy/1. After reviewing Staff's testimony on this issue, the Company realized that Staff's request was not limited to a discussion of firm customers in the Albany-Corvallis area, the Company supplemented its response to explain that no firm customers in the Albany-Corvallis area were affected, but that 329 firm customers in Vancouver were affected.

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Second, Staff is incorrect to assume a service disruption in the Company's northern service territory will typify the Company's ability to respond to disruptions in the south. Besides the access recently gained on the Company's North Willamette Valley Feeder that was installed South of Molalla in 2011 as part of the bare steel replacement program, NW Natural does not currently have sufficient pipeline delivery capability to manage service disruptions in the Company's southern service territory by drawing on other resources such as on-system storage. Without the MWVF, the Company is unable to mitigate the effects of service disruptions to firm sales customers in its southern region.

Q. Does customer growth since the 2004 disruption indicate that the Company's ability to meet peak demand during a similar disruption is now lower?

A. Yes. The number of residential and commercial customers has increased by approximately 16% since January 2004, when Staff says the Company was able to meet peak demand during a disruption on the Grants Pass Lateral. Therefore, it would be inaccurate to assume the Company's ability to serve load during the 2004 disruption would be similar to its ability to meet service requirements today under similar conditions.

Q. Does Staff agree that it is appropriate to improve reliability to meet firm demand?

A. Yes. Staff agrees that "the Company should plan to meet firm demand during peak day events and improve service reliability."[8] Staff's analysis actually validates the need for introducing greater reliability to meet firm customer requirements using storage assets

[8] Staff/1100, Sobhy/14.

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and distribution system improvements. Past compressor failures and service disruptions experienced on the Grants Pass Lateral demonstrate that disruptions occur and that the Company is wise to consider how to meet customers' service needs in such situations.

Q. How would a large outage on the Grants Pass Lateral affect NW Natural's system?

A. A major service interruption on the Grants Pass Lateral could easily impact 20,000 customers or more depending on the nature of the interruption. Restoration of service to a large customer base would require the Company to obtain mutual aid from other utilities and could take two to three weeks even after repairs are completed. In the case of electric service, restoration can be accomplished through re-energizing the electric distribution system once repairs are made and/or power supply is restored. In contrast, for natural gas, the restoration process is much more complex and time consuming, and requires more labor resources. Typically, restoration following repairs requires that the distribution system be isolated at the customer meters and the system purged to ensure that no air has entered the system. Only after this has occurred can service be restored to individual customer meters. To ensure safe restoration, each residence or business is entered, the house lines are purged to ensure that no air has entered the system, and each appliance behind each meter is returned to service. To prevent this type of outage, the Company must remedy the fact that the Albany-Corvallis area is currently served by a single-feed system.

Q. Was this reliability referenced as a basis for approving phases of the MWVF?

A. Yes. Attached as my Exhibit NWN/2203 is the financial authorization of the Monmouth Reinforcement phase of the project. It states that the project will provide "[i]ncreased reliability by providing an additional supply source to Willamette Valley customers."

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Q. Staff questions whether the MWVF is the most efficient and cost effective resource to address the objective of increased reliability. Are other alternatives available to meet the reliability objectives of the MWVF?

A. No, the MWVF is the only feasible solution for meeting the increased need for capacity to the Company's territory South of Salem. Satellite LNG storage was the only alternative resource chosen in the Company's IRP for meeting incremental load growth. However, satellite LNG storage is not a reasonable alternative to the MWVF for many reasons. First, satellite LNG is extremely difficult to site and permit. Second, satellite storage is a very small resource that would be drastically insufficient for the purposes of addressing reliability in the Albany-Corvallis area. For perspective, satellite LNG tanks not subject to FERC regulations can be no larger than 70,000 gallons, which would serve approximately 2000 residential customers for no more than three days. Satellite storage is intended to be a means for getting through limited duration, peak events. Third, satellite storage, even for a peak event, would require distribution system enhancements for moving the gas, which are not modeled as part of the IRP. Satellite LNG storage can be an effective supplemental supply solution to meeting smaller incremental load growth requirements but it does not provide the capacity for addressing a larger system reliability issue caused by the single-feed system.

Q. Is expanding the Grants Pass Lateral a feasible alternative?

A. No. Using the Grants Pass Lateral to move gas from on-system storage is not an option as the pipeline is fully subscribed. Besides this limitation, the continued or additional reliance on a single-feed system does not address the objective of enhancing system reliability. The most cost effective option to meet load requirements and improve

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reliability is to improve the distribution system to allow delivery from existing storage to the Company's load centers. This is what the MWVF would do. It eliminates the risks inherent with a single-feed system, increases capacity to serve future growth, and enhances the benefit of using lower cost storage gas for meeting winter and peak day delivery requirements.

Q. Given that satellite storage and expanding the Grants Pass Lateral are not feasible alternatives, why was the MWVF found to be the most appropriate way to address these reliability issues?

A. Because satellite storage and expanding the Grants Pass Lateral are not an alternative, the only cost-effective alternative for addressing these reliability issues is to develop another way to deliver existing storage to the Albany-Corvallis area. The MWVF is an existing delivery route and would simply require system re-enforcements to provide the reliability benefits. The Company evaluated MWVF and found that, as one would expect, there is no question that enhancing a pipeline in an existing pipeline alignment, where the Company has distribution assets and knows the ground conditions, is more cost effective than developing a new pipeline in a new pathway. See my Exhibit NWN/2204.

Q. What is the first element that makes the MWVF more cost effective than developing a new pipeline.

A. To begin, the North Willamette Valley Feeder already provides Mist storage delivery capability to the Salem area, and extending this delivery capability through the MWVF is the shortest possible alternative to move storage gas from Mist and Newport LNG to the Albany-Corvallis area.

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Q. Are there any other elements of the route that make it an especially desirable alternative?

A. Yes. The route minimizes public impact during construction due to its rural location, therefore reducing cost and increasing pipeline safety.

Q. Will the MWVF provide benefits in addition to reliability in the future?

A. Yes. The MWVF will help the Company meet expected future load increases by transporting the low-cost gas from Mist to customers in the southern region.

Q. Does the Company's bare steel replacement program have any impact on the cost effectiveness of upgrading the MWVF to meet reliability needs?

A. Absolutely. NW Natural had previously installed approximately five miles of 12" transmission line along the MWVF route as a safety-related bare steel replacement project in 2005. The timing of that project was driven by Oregon Department of Transportation construction activity along the route. Therefore, a portion of the MWVF had already been constructed. In addition, a portion of the route is in a corridor where additional bare steel main will be required to be replaced even in the absence of the MWVF.

Q. What portion of the MWVF will be required to be replaced because it is bare steel?

A. Approximately 12 miles of the route for the MWVF is along a corridor that contains bare steel, which is required to be replaced pursuant to OPUC Order No. 01-843. As I mentioned above, an additional five miles was installed in 2005 as a bare steel replacement project. These two components make up nearly half of the total pipeline route. Therefore, the incremental cost to complete the MWVF for reliability purposes

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was substantially reduced, making it the clear choice for increasing reliability in this area of our system.

Q. Did the Company evaluate the alternative routes and the costs associated with those alternatives prior to moving forward with the project?

A. Yes. In 2009 NW Natural contracted for professional engineering services to provide potential route alignments and a feasibility report for the MWVF. The associated documents for these services are included as my Exhibit NWN/2203.

Q. What action do you propose the Commission take on the MWVF?

A. I request that the Commission find the Company's decision to develop the MWVF was prudent. The MWVF remedies well-documented reliability concerns in the Albany-Corvallis area, thereby ensuring that the Company's customers in that area will not be vulnerable to outages. The MWVF is the most cost effective way to address these concerns and provides system benefits beyond reliability. Staff's proposed disallowance related to the MWVF should be rejected.

III. SYSTEM INTEGRITY PROGRAM

Q. What did the Company propose with respect to the SIP in its direct case?

A. As I discussed in my direct testimony, the Company proposed to continue the current regulatory treatment of SIP costs. In my direct testimony I explained that the SIP mechanism should be continued as the most appropriate way to address ongoing efforts to replace bare steel and continue to meet current and evolving safety regulations. The Company proposed increasing the existing $12 million soft cap to $26.3 million in 2013 and returning to the current $12 million soft cap after that year, understanding that new

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regulatory requirements may substantially increase the cap and require it to be revisited at a later date.

Q. What do the Company's proposed $26.3 million expenditures for 2013 include?

A. The $26.3 million reflects the expected annual SIP capital program expenditures of $12 million and a one-time expenditure of $14.3 million for a significant bare main replacement project that is integral to the MWVF project. My Exhibit NWN/ 2205 shows the Company's most recent forecast for planned spending on SIP projects in 2013. This estimate does not include any work that must be performed in response to unforeseen issues or new regulations that are issued in the future.

Q. What does Staff propose with respect to the SIP?

A. Mr. Zimmerman proposes that the SIP end on October 31, 2012 and that costs currently being recovered under SIP be included in rates in the future via the normal regulatory process.

Q. Does CUB or NWIGU provide testimony on the SIP?

A. No. Staff is the only party advocating eliminating the SIP.

Q. Is Staff's position on this issue entirely clear?

A. No. Staff witness Mr. Sobhy testified that the South of Monmouth Bare Replacement is not subject to rate base treatment in this case because the Company proposed to recover the project through SIP, while Staff witness Mr. Zimmerman advocates eliminating the SIP. The Company issued Data Request 57 to Staff requesting clarification of Staff's position on the SIP. See my Exhibit NWN/2206. Staff responded that "Staff does not address the elimination or continuation of the existing SIP

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mechanism." This response appears to be at odds with Mr. Zimmerman's opening testimony where he proposes to eliminate the SIP.

Q. Does the SIP continue to be the most appropriate way to address recovery of rates related to pipeline safety requirements?

A. Yes. To begin, the SIP has been working well since the Commission approved it in 2009, as it integrated the Bare Steel Replacement Program, Transmission Integrity Management Program (TIMP), and Distribution Integrity Management Program (DIMP) into the SIP, thus allowing for a more integrated approach to addressing pipeline safety-related issues. From the Company's perspective, and from the feedback the Company has received from stakeholders, including Staff, the additional regulatory oversight of pipeline safety investments that occurs in the SIP benefits the Company and customers. Through the SIP, the Company receives proactive and comprehensive feedback from Staff and stakeholders on the direction of the Company's pipeline safety efforts, allowing the Company to respond to concerns on a timely basis.

The SIP has also encouraged the Company to be proactive rather than reactive about pipeline safety. Early adoption of SIP principles in 1983 resulted in cast iron replacement and a large portion of bare steel replacement in a planned fashion over an extended period of time, spreading the cost impact on customers while improving safety. Because of the SIP, NW Natural has no cast iron to replace and only 21 miles of bare steel to replace, while other utilities around the country are facing much more significant investments.

Q. Are there any other benefits of the SIP process?

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A. Yes. The SIP has allowed the Company to conduct pipeline safety upgrades in the most cost effective way possible without concern for cost recovery timing issues. This is because the SIP allows for timely recovery of prudent pipeline safety investments and reduces regulatory lag associated with these investments.

Q. Does the SIP eliminate regulatory lag entirely?

A. No, it does not. The SIP includes an element of regulatory lag because $3.25 million in annual capital expense is excluded from the annual tracking mechanism by the terms of the mechanism. That amount cannot be collected until it is included in rates through a general rate case. Removing the SIP entirely, however, would exacerbate the problem of regulatory lag.

Q. Staff witness Mr. Zimmerman testifies that SIP investment costs and expenses should be reviewed in a general rate case rather than through a separate mechanism. Would reviewing SIP costs in a rate case be as effective as the SIP?

A. No. The SIP process gives Staff and stakeholders the opportunity to perform an annual and comprehensive review of the Company's pipeline safety projects and costs as well as its future plans, which periodic rate cases do not provide. It has been nine years since the Company's last general rate case. Customers have certainly benefitted from comprehensive reviews of the Company's pipeline safety investments in the intervening years. As with a general rate case, the SIP allows the Commission and stakeholders to evaluate safety investments for prudence, so there is no concern that imprudent investments are being included in rates through the SIP.

Q. Are SIP-type programs generally accepted as an appropriate way to recover pipeline-safety costs nationwide?

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A. Yes. The Company's SIP is just one of several industry models for effectively addressing prioritization and cost fluctuation related to meeting incremental regulatory requirements for natural gas safety.[9] Twenty-two states have approved full or limited cost recovery mechanisms, five utilities have mechanisms pending in another state and the District of Columbia, and seven states have approved recovery by utilities as part of broader infrastructure investment programs. Many of these programs have been implemented and/or updated in the last five years, indicating that the need for, and success of, SIP-type programs is higher than ever. This trend makes Staff's proposal all the more troubling, because it represents a direction at complete odds with the way regulatory commissions around the country are moving, and a step backwards with respect to this Commission's and NW Natural's position of having been a leader on this topic.

Q. Has Staff presented a compelling reason for discontinuing the SIP?

A. No, and in fact the basis for Staff's proposal is not clear. Staff identifies no problems with the current SIP process. Staff also does not explain what has changed since the Commission implemented the SIP two years ago to warrant abandoning the mechanism. Staff also does not address or provide any basis for terminating the original 2002 bare steel replacement stipulation (Docket UM 1030) that was integrated into the SIP. And, in fact, Staff's proposal violates the terms of the SIP as agreed to by all parties in Docket UM 1406, which allowed for the continuation of the Company's bare steel replacement program through to completion.

[9] See Exhibit NWN/2207.

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Q. Has the safety environment changed since 2009?

A. Yes. As I explained in my direct testimony, national awareness of pipeline safety has only heightened since 2009. On April 4, 2011, the United States Department of Transportation (DOT) issued a "Call to Action" for all pipeline stakeholders, including utility regulators, to design a strategy to achieve the goal of making pipeline infrastructure investments to ensure pipeline safety.[10] The DOT Pipeline and Hazardous Materials Safety Administration (PHMSA) is actively supporting the implementation of SIP-like mechanisms to facilitate pipeline infrastructure investments. Attached as my Exhibit NWN/2209 is PHMSA's testimony from Maryland proceedings supporting a SIP-like mechanism and stating that "We are encouraged by State efforts to provide for an expedited means to facilitate pipeline replacement programs outside of traditional ratemaking when appropriate."

Oregon was ahead of much of the rest of the country in establishing the SIP. As I explained above, because of the SIP and its predecessor pipe replacement programs, NW Natural has no cast iron and only 21 miles of bare steel to replace. Staff is proposing a significant step backwards just as the federal government is encouraging legislators and regulators to facilitate investments in pipeline safety in the way the Oregon Commission has been doing. Continuation of the SIP to proactively meet current regulatory requirements and reduce risk by completing the removal of bare steel puts the Company in a better position to address new regulatory requirements resulting

[10] See Exhibit NWN/2208.

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from the 2011 Pipeline Safety, Regulatory Certainty and Job Creation Act that was signed into law in January 2012.

Q. Does Staff respond to your testimony that due to the uncertainty of the requirements that will be adopted out of the reauthorization of the 2006 PIPES Act, the SIP mechanism continues to be the appropriate mechanism for addressing safety investments?

A. No, Staff does not address the uncertainty related to new regulations that make continuation of the SIP the appropriate way to address rate recovery of SIP costs. The current design of the SIP allows for effective prioritization of spending based on regulatory requirements, risk, and consequence. It provides Staff and stakeholders the opportunity to be involved in decision-making on any large and/or significant changes that would occur as a result of new regulations, especially those that would cause the soft cap to be exceeded.

Q. Does Staff testify that without the SIP, the Commission will still have the opportunity to monitor the Company's safety projects?

A. Yes. Staff suggests that without the SIP, the Commission can monitor the Company's safety projects during the IRP process. He states that through the IRP process NW Natural develops a portfolio that assigns resources to satisfy current and future SIP needs.[11]

Q. Do you agree with Staff's characterization of the review of SIP needs in the IRP process?

[11] See Staff/1000, Zimmerman/2.

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A. No. Staff is incorrect in the characterization of the IRP process. The IRP process is an approach to utility planning that requires consideration of all known resources for meeting the utility's load in the resource planning process.[12] As I explain above, the IRP is not used to plan distribution upgrades or system reinforcements, or for addressing federal safety requirements unless those requirements would specifically result in replacement of facilities that would benefit customers from being re-sized and/or re-routed to meet future load requirements. Therefore, the IRP would not provide a review of the Company's plans for addressing projects necessary to address safety requirements.

Q. How does Staff propose to change the Company's revenue requirement to reflect the elimination of the SIP?

A. Staff proposes that the Company add $8.75 million in SIP project costs to rate base for the Test Year. Staff states that this amount reflects the fact that the annual amount for SIP projects cannot exceed $8,176,000 million and $574,000 of O&M costs are currently reflected in rates.

Q. Is the inclusion of $8.75 million in rates for Test Year SIP costs sufficient to allow the Company to recover its costs?

A. No. First, Staff's proposed addition to rate base excludes the $3.25 million of capital costs that would have been deferred and later tracked into rates under SIP. However, since we are in a general rate case, there is no need to rely on the tracker (since new rates are being established), and the Company's full investment should be included in

[12] OPUC Order No. 89-507.

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rates. Second, Staff's proposed recovery level does not account for increases to SIP spending that I have testified will occur in 2013. As shown in my Exhibit NWN/2205, SIP O&M in 2013 will be $5 million and capital costs will be $26.3 million. If the Commission adopts Staff's position that the SIP should be eliminated this year, the Company's revenue requirement should reflect an additional $26.3 million in rate base and $5 million for O&M for SIP-related activities rather than the $4.5 million that was included in the revenue requirement.

Q. Do you have any other comments on the impact of a discontinuation of the SIP, or Staff's proposal?

A. Yes. First, Staff's opening testimony fails to account for the fact that even if the SIP were discontinued, the stipulation implementing the Accelerated Bare Steel Replacement Program ("Bare Steel Stipulation") will continue to be in place. The Commission adopted the Bare Steel Stipulation in OPUC Order No. 01-843, and the stipulation is effective until the bare steel facilities are replaced in 2021. The SIP stipulation explicitly agreed that upon expiration of the SIP stipulation, the Bare Steel Stipulation will remain in effect.[13]

Second, it is important to note that the result of Staff's proposal would be to create regulatory lag with respect to the Company's investment in system safety, instead of creating any improvement to the program. The Company strongly believes that the program works well, aligns the interests of the Company, customers, and the

[13] Order No. 09-067, Stipulation at 5.

Commission, and that Staff's proposals, which undermine that alignment, should be rejected.

Q. What does the Company request the Commission do with respect to the SIP?

A. The Company requests that the Commission reject Staff's proposal to eliminate the SIP and instead issue an order that would authorize the Company to continue to track up to $8.75 million SIP costs annually into rates as capital costs, with the one-time (2013) modification to the soft cap to account for completion of a single, large bare steel replacement project. The SIP benefits customers by providing additional regulatory oversight of the Company's pipeline safety investments and ensures that the Company can recover its prudent safety investments on a timely basis. The SIP sends the appropriate message to the Company and to the public: pipeline safety is a priority for the Oregon Commission. The fact that legislation in this area is still in flux and that the national trend is towards SIP-like mechanisms indicates that now is not the time to eliminate a program that is working well for customers, the Company, and stakeholders.

Q. Does this conclude your testimony?

A. Yes.

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BEFORE THE

PUBLIC UTILITY COMMISSION OF OREGON

UG 221

NW Natural

Exhibits of Grant Yoshihara

MID-WILLAMETTE VALLEY FEEDER / SYSTEM INTEGRITY PROGRAM EXHIBITS 2201 - 2209

June 15, 2012

EXHIBITS 2201-2209 – MID-WILLAMETTE VALLEY FEEDER / SYSTEM IINTEGRITY PROGRAM

Table of Contents

Rates & Regulatory Affairs
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I. OVERVIEW

NW Natural employs an analytic method utilizing Linear Programming to integrate the significant planning components, and to generate and evaluate long term resource plans. Linear Programming (LP) is a mathematical optimization technique which solves the "general problem of allocating limited resources among competing activities in the best possible way."[1] For the IRP, NW Natural's LP model examines all reasonable means for acquiring demand-side and/or supply-side resources to meet growing customer demand and determines the series of resource decisions through time which results in a plan that balances reliability and cost. The LP model acts as a tool to guide NW Natural's resource decisions; it is not the final answer. The deterministic model makes resource decisions based on perfect knowledge of the 20 year planning horizon, including weather, demand, future resource availability, and supply prices. For example, a decision made in year five may have been informed by an event occurring in year ten. LP modeling also allows for various combinations of resources, called portfolios, to be evaluated under assorted demand scenarios and ranked according to cost.

NW Natural holds a license with Ventyx, an ABB company, for their gas supply planning and optimization software product SENDOUT.® This application is designed to simultaneously analyze and optimize the entire gas supply portfolio – including supply, transportation and storage assets, and conservation programs. The objective function of the linear programming engine within SENDOUT® seeks to minimize system costs associated with meeting daily load. The resource mix optimization module both evaluates and optimally sizes resources to meet load based on the associated fixed and variable costs of the resource. The Monte Carlo module provides risk planning analysis around hundreds of weather and price simulations. This allows portfolios to be evaluated from a probabilistic standpoint.

II. IRP MODIFICATION

The 2011 IRP was filed with the state of Oregon on January 12, 2011 and with Washington on March 31, 2011. The IRP included the proposed Palomar East pipeline project, which was modeled as a potential resource component of the least cost plan. Pipeline rates for reserving capacity were modeled on an existing precedent agreement which included a rate cap. Model runs which excluded capacity on the proposed pipeline were also completed, but the majority of runs included Palomar East. Deterministic modeling indicated that the overall cost of serving demand over the 20 year horizon was slightly less when capacity was reserved on the Palomar East Pipeline. Additional reliability and Monte Carlo modeling also indicated favorable results with a resource portfolio that included capacity on Palomar East.

On March 23, 2011, Palomar Gas Transmission LLC withdrew its pipeline application with FERC, while stating its expectation of re-filing at a later date. Information for a new Cross-Cascades pipeline project called Palomar/Blue Bridge was presented in February 2011 at a public workshop jointly sponsored by the Public Utility Commission of Oregon and the Washington Utility and Transportation Commission. The information included new estimates for pipeline rates and service dates. In light of the uncertainty

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1 Hillier, Fredrick S. and Lieberman, Gerald L, Introduction To Operations Research 6th Edition, McGraw-Hill, Inc., 1995, 25.

could also work in conjunction with a pipeline capacity expansion project from Newport as described above. As shown in Table 3.7 below, the project includes a total of three segments serving three load regions, Salem, Albany, and Eugene

Table 3.7 - Willamette Valley Feeder Project Segments

Segment	Assumed Capacity (Dth)	Estimated Capital Cost
North WVF	85,000	$15,000,000
Mid WVF	41,000	$40,000,000
South WVF	14,000	$58,000,000

This project would be an alternative to continued expansion of NWPL's Grants Pass Lateral, which transports gas to NW Natural's system throughout the Willamette Valley. In the past it was thought that the Willamette Valley Feeder project would only proceed if environmental, civic, or other pressures significantly increase the cost or time needed to expand NWPL's lateral. However, the Company has enhanced portions of its pipeline from Portland to Salem over the past few years in the course of routine replacement activities (leakage repair, road grading projects, etc.), and would expect to continue these activities in the future as well as implement additional projects through the IMP mentioned above. Because of the project-specific nature of the Company's pipeline integrity programs, one or more specific segments of a Willamette Valley Feeder project, for example, from Albany to Eugene, could become cost-effective in lieu of incremental NWPL capacity between those two locations. For this reason, the Valley Feeder and NWPL capacity options have been segmented in the IRP analysis. The NWPL expansion capacity project includes three segments: Molalla to Salem, Salem to Albany, and Albany to Eugene. SENDOUT® evaluates the costs of Willamette Valley Feeder segments to the assumed incremental costs of the NWPL's Grants Pass Lateral capacity expansion segments, as well as to the strategic placement of satellite LNG storage discussed below. As of the date of filing this IRP, the Company expects that the North Willamette Valley Feeder will be completed and in service before the end of 2011.

It should also be noted that a Willamette Valley Feeder project offers three advantages over continued expansion of NWPL's Grants Pass Lateral that are qualitative in nature and so have not been modeled in SENDOUT.® These advantages are:

1. Risk management. By providing gas deliveries through pipelines following different routes, NW Natural will be less susceptible to disruptions affecting NWPL's system.

2. New service opportunities. By following new routes, homes and businesses that previously may have been too distant may now be able to access gas service.

3. Lower impact. Further expansion of NWPL's Grants Pass Lateral would necessitate expansion of existing distribution lines emanating from the NWPL gate stations. Prior customer growth along these corridors may make those lines more difficult to expand as compared to the Willamette Valley Feeder, which would approach those communities using alternate routes.

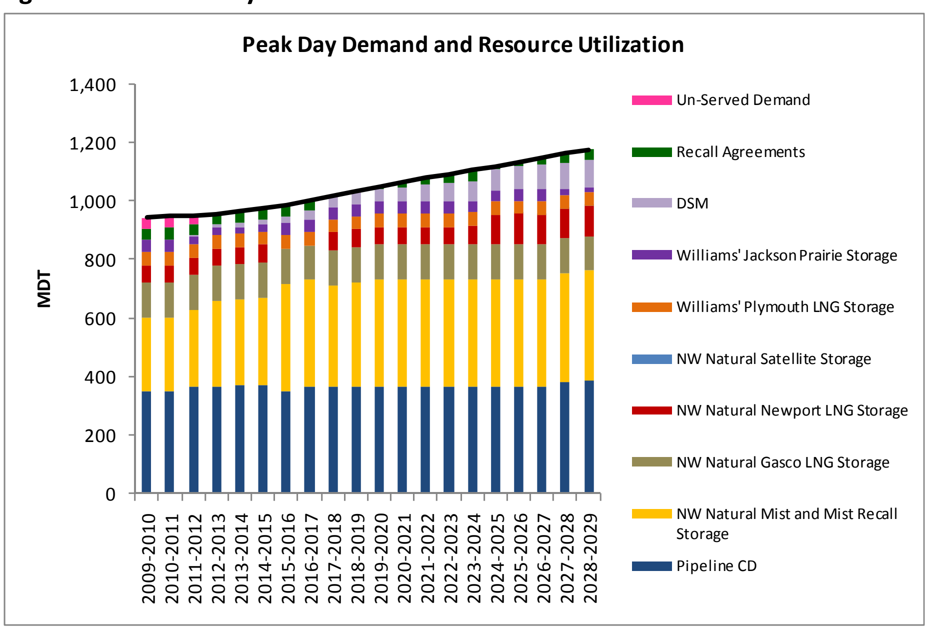
option is assumed to be added incrementally as needed. NW Natural has not built and operated any comparable facilities and the cost estimation may need further refinement in future IRPs.

In contrast with the Grants Pass Lateral expansion and Satellite Storage, the Company has substantially more knowledge of the Willamette Valley Feeder option. We have currently modeled it in a way that may be more realistic; the mid and south sections of the WVF are restricted to their full capacity and costs. They are considered lumpy. The WVF pipeline was modeled this way to avoid an unrealistic planning situation where a pipeline is assumed to grow in capacity over time. NW Natural notes that the Mid-WVF has additional benefits, which are not incorporated into the model, including the replacement of a significant portion of the remaining bare steel on NW Natural's system, and the fact that the Mid-WVF will add system reliability that may be even more important given the delay in the Palomar-East project. It should be noted that when an outage is modeled on the Northwest Pipeline Lateral, the model does select the Mid-WVF to meet load. NW Natural believes that these considerations are important in determining which resource will be relied on to meet load in the Willamette Valley and in determining a reliable operation of its system.

F. Peak Day Utilization

Figure 5.14 displays the peak day resource utilization results from the base case 1411-2011 IRP Mod Base Case.

Figure 5.15 - Peak Day Utilization



Newport LNG drops out of the picture from 2015 through 2017 as it's assumed to be down for repairs. Mist Storage fills in during that time frame. DSM plays an increasingly important role through time while Recall Agreements drop in and out to fill in gaps. Model results for utilization on non-peak day events have a different pattern depending on the season. After taking account for DSM, pipeline CD serves 100% of demand on a typical fall day. Moving into winter, demand for a typical day in December is met with a 60/40 mix of pipeline CD and storage. On peak day, storage serves approximately 60% of

NW Natural

Monmouth Project
Project #200580
G-67 Financial Authorization
August 2011

8/15/11

Jon Huddleston
Sponsor

Date

8/16/11

Grant Yoshihara
Executive Sponsor

Date

8/16/2011

John Soh
Finance

Date

8/19/11

Alex Miller
Director, Rates/Regulatory Compliance

Date

8/23/2011

Steve Feltz
Treasurer/Controller

Date

9/16/11

David Anderson
Senior VP, Finance and CFO

Date

9/19/11

Gregg Kantor
President and CEO

Date

MONMOUTH – PROJECT 200580

Date Submitted: 8/12/11	Facility: P30	Business Unit: Engineering
Project Sponsor: Steve Nelson		Executive Sponsor: Grant Yoshihara
Project Manager: Greg Bronson	Desired Implement Date: November, 2011	Prepared By: Greg Bronson/Katie Gough
Engineer: Greg Bronson	Short Title: Monmouth	

1. **Project Title:** Monmouth

2. **Project Description:**
   This project is for installation of approximately 27,400 feet (5 miles) of 12-inch steel natural gas pipeline tested and certified at a Maximum Allowable Operating Pressure (MAOP) of 720 psig.

   This project is part of the Perrydale to Corvallis/Albany (Mid-Willamette Valley Feeder – P30 pipeline). This project starts North of Monmouth at Hoffman Rd heading South on Hwy 99, continues through Monmouth, heads East on Stapleton, South on Corvallis Rd and ends 2790' to the South of Stapleton.

   Phase 1 will be a bore through Monmouth in public ROW. Phase 2 will be bore/open cut South of Monmouth ending South of Stapleton.

3. **Project Manager Assignment:** Greg Bronson

4. **Project Objectives:**
   This project is one phase of a larger project – Perrydale to Corvallis/Albany. The project will connect the Central Coast Transmission pipeline to the Albany/Corvallis Transmission pipeline. This project has been identified in the IRP long range forecast.

5. **Schedule**
   This project will start in November 2011 and be completed in May 2012. Phase 2 is dependant on easement acquisition.

6. Cost Constraints

- Project is estimated at $8,087,373 and includes 10% contingency.
- Project funding is on the System Reinforcement 115 account.
- Project preliminary design costs are on Project number 200163.

Other cost constraints include:

- Easement and workspace acquisitions.
- Work restriction due to environmental permitting including wetland delineation and erosion control and sedimentation plans.
- Haul off and disposal of spoils and bore fluid from directional drill activity.
- ODOT limitation of work hours and permit requirements for traffic control and restoration on State Hwy 99.

7. Business Case

The Perrydale to Corvallis/Albany project is necessary for the following reasons:

- Increases Public Safety by accelerating the bare steel replacement.
- Increases reliability by providing an additional supply source for Willamette Valley customers.
- Complements IRP long term forecast.
- Availability of materials may be more difficult in 2015/16.
- Cost of Capital is expected to increase if project is constructed in 2015/16.
- Impact of new Integrity regulations may consume internal/external resources.

The Monmouth section can be completed during the winter. Due to the permitting delays with the Corvallis project, crew and pipe are available.

8. Project Deliverables

- Install approximately 27,400 feet of 12-inch steel Class E main.
- Install approximately 3,000 feet of 4-inch poly Class B main.
- Build 3 new Class E regulator stations.
- Install telemetry to the new regulator stations.
- Install a new bridle.

9. Communication Plan

The Communication Plan for this project is to specifically discuss the project at the Capital Projects Meetings scheduled on a bi-monthly basis. These meetings serve the function of communicating any project related management issues and addressing them in a small team environment. Key stakeholders regularly attending the meeting include Construction Supervisors, Resource Management Coordinator, Integrity Management Supervisor, Capital Project Manager, Project Engineer and Field Engineering. Outside stakeholders will be communicated with as necessary.

Approvals.

Greg Bronson ______ Date: 8-12-11	______ Date: ______
______ Date: 8/15/11	______ Date: ______
______ Date: 8/15/11	______ Date: ______
______ Date: ______	

G-67 PROJECT PLAN - RESPONSIBLITY MATRIX

Project:	Monmouth
PS #:	200580
PM:	Greg Bronson

A = Accountable
P = Participant
I = Input/Review

Tasks	Task Start	Task End	Project Manager	FET	Engineering	Integrity Management	Transmission Const. Supervisors	Station Design	Resource Management	Risk & Land	Purchasing / Stores	Environmental / HazMat	Safety	Gas Supply	Gas Plants	Major Acct. Services	Electrical/ Communications	Corrosion	Municipalities	Private Eng. Firm	Other	Transmission Construction	Welders	Distribution Crew	Specialty Const. Crew (ROW)	Transmission Maintenance Crew	Gas Supply Crew
PROJECT TEAM			●	●	●	●	●		●	●	●	●	●	●								●	●		●		●
INITIATION TASKS	8/1/11	8/12/11																									
Create Project in SAP			A																								
Create Initiation Memo			A																								
Outline Proposed Construction Dates			A	P																							
Preliminary Design Meeting			A	P		P	P																				
PLANNING TASKS	8/1/11	10/15/11																									
Identify Project Team			A																								
Create Work Orders					A																						
Assemble As Builts & Historical Documentation					A																						
Request Design Locates									A																		
Request Survey			A																								
Request Easements			A							P																	
Draft Preliminary Design			A	P	P	P																					
Draft Preliminary Cost Estimate			A	P		P	P																				
Contract for Outside Services			A								P																
Create Design Documentation			A		P	P																					
Finalize Design			A			I	I																				
Finalize Construction Dates			A	P			P		P													I					
Create Charter or G-67 Project Plan			A																								
Charter or G-67 Project Plan Approved			A																								
Complete Engineering Sketch			P	P	A																						
Complete Traffic Control Plan				A																							
Request Permit					A																						
EXECUTING TASKS	10/15/11	11/1/11																									
Request Construction Locates									A																		
Install Construction Field Stakes				A																							
Schedule Field Resources							I		A																		
Hold Pre-Construction/Safety Meeting			A	P		P	P		I		P	P															
Notify Stakeholders of Firm Start Dates			A				I		I													P	P				P
																						I					

G-67 PROJECT PLAN - RESPONSIBLITY MATRIX

Project:	Monmouth
PS #:	200580
PM:	Greg Bronson

A = Accountable
P = Participant
I = Input/Review

Tasks	Task Start	Task End	Project Manager	FET	Engineering	Integrity Management	Transmission Const. Supervisors	Station Design	Resource Management	Risk & Land	Purchasing / Stores	Environmental / HazMat	Safety	Gas Supply	Gas Plants	Major Acct. Services	Electrical/ Communications	Corrosion	Municipalities	Private Eng. Firm	Other	Transmission Construction	Welders	Distribution Crew	Specialty Const. Crew (ROW)	Transmission Maintenance Crew	Gas Supply Crew
MONITORING TASKS	11/1/11	4/1/12																									
Monitor Worksite Activities			P	P		P	A		P													A					
Complete and Submit Project Change Request Form as Necessary			A				I																				
Monitor Schedule			A				P		P													P					
Monitor Budget			A				P																				
Receive & Approve all Invoices			A				A																				
Coordinate Construction Activities with Stakeholders			A				A															A					
Finalize Tie-in Procedure			A			I	P							I								P	P		P		P
Tie-in Procedure Signed Off			A		I	I	I							I													
Schedule Tie-in and Coordinate with Support Crews			I			I	I		A					I								I					
Establish Final Punch List Items & Timeline for Completion			A				A															A					
CLOSEOUT TASKS	4/1/11	6/1/11																									
Complete As Built Packet							I															A					
Audit work orders and asbuilt					A																						
Complete project document review					A	I																					
Plat asbuilt					A	I																					
Conduct Project Learning Meeting			A	P		P	P																				
Complete Final Report for Project			A																								

Risk Analysis

Project:	Monmouth
PS Number:	200580
Project Manager:	Greg Bronson
Date:	8/12/2011

Risk	**Probability**	**Impact**	**Score (Probability x Impact)**	**COMMENTS (Eliminate / Mitigate)**
Acquisition of Materials	*3 Numerous Non-Stock or Specialty Items*	*2 - May Impact Project*	6	Mitigate: Order parts early, determine supply for equipment that is moving and may need repairs and determine who is responsible for repairs and how long they may take.
Land Acquisition	*5 Multiple Easements*	*2 - May Impact Project*	10	Mitigate: Start work on the section that doesn't require easements.
Standard Permits	*2 Permits with Minor Conditions*	*2 - May Impact Project*	4	ODOT and Monmouth permit requirements.
Special Permits	*1 No Special Permits*	*1 - Minimal or No Impact*	1	Mitigate: Avoid open cut in sensitive areas.
Environmental Impact	*1 No Impacts*	*1 - Minimal or No Impact*	1	
Ground Conditions	*1 No Concerns*	*1 - Minimal or No Impact*	1	
Utility Conflicts	*2 Minor Utility Conflicts*	*1 - Minimal or No Impact*	2	
Weather	*3 Winter*	*2 - May Impact Project*	6	Mitigate: Add time to cost estimate to cover winter work.
Construction Method	*1 Open Trench*	*1 - Minimal or No Impact*	1	
Bore Method	*1 Horizontal Directional Drill*	*1 - Minimal or No Impact*	1	
Resources	*1 Resources Available*	*1 - Minimal or No Impact*	1	
Working Hours	*1 No Restrictions*	*2 - May Impact Project*	2	Mitigate: Work with ODOT for highway restrictions. Make sure Traffic Control Plan keep the flow of traffic moving.
Contract Availability	*1 Resources Available*	*1 - Minimal or No Impact*	1	
System Impact	*1 No Impacts - Adequate Feed*	*1 - Minimal or No Impact*	1	
		Avg Score	**2.71**	**10**
				% Contingency

PROJECT TIMELINE

Project:	Monmouth
PS #:	200580
Project Manager:	Greg Bronson
Date:	8/12/2011

Construction Duration	24	Weeks
Construction Expected Start Date	11/1/2011	
Construction Expected Completion Date	4/1/2012	
Construction Timeline	Flexible	

Initiation Tasks

	8/1/2011 Required Task	8/12/2011 Resp
Complete Initiation Memo	Yes	PM
Complete Charter	Yes	PM
Complete Design Review	Yes	PM

Planning Tasks

	8/1/2011 Required Task	10/15/2011 Resp
Request Easements	No	N/A
Address Environmental Issues	Yes	Envir
Request Corrosion Input	Yes	Tual Eng
RFP for Outside Services	Yes	Purch
Complete Design	Yes	Tual Eng
Station Packet	Yes	N/A
Pressure Test Documentation	Yes	Tual Eng
Order Non-Stock Parts/Reserve Stock Parts	Yes	Stores
Complete Tie-in Details	Yes	Tual Eng
Finalize Design/Engineering Sketches	Yes	Tual Eng
Complete Traffic Control Plan	Yes	FET
Request Permits	Yes	EC
Notify Stakeholders Affected by Project	Yes	PM
Complete Bore Plan	Yes	Tual Eng
Draft Preliminary Procedure	Yes	Tual Eng

Executing Tasks

	10/15/2011 Required Task	10/31/2011 Resp
Pre-Construction/Safety Meeting with Crew	Yes	Tual Eng
Install Construction Field Stakes	Yes	FET
Notifiy Stakeholders of Firm Start Dates	Yes	PM
Review Preliminary Procedure with Crew	Yes	Tual Eng

Monitoring Construction Tasks

	11/1/2011 Required Task	4/1/2012 Resp
Monitor Schedule	Yes	PM
Monitor Budget	Yes	PM
Procedure Sign Off	Yes	Tual Eng

Closeout Tasks

	5/1/2012 Required Task	5/16/2012 Resp
Conduct Project Learning Meeting	Yes	PM
Complete Final Report for Project	Yes	PM

FINANCIAL ANALYSIS

Project Title:	Monmouth	**Project Number:**	200580
Project Manager:	Greg Bronson	**Cost Center Manager:**	Steve Nelson

Funding:	**System Reinforcement**
Act Type:	115 – System Reinforcement Category 3 (COH 22% 2011)
Total Cost:	2011 $2,500,000 2012 $5,587,373 **TOTAL** **$8,087,373**
Contingency ($ and %)	Contingency used is 10% based on the size of the project. Total contingency for this project is $735,215.
Project Justification:	• This project will be funded by the System Reinforcement account. • The project falls within the established Annual Capital Budget for 2011. Current Capital Budget for System Reinforcement is $19,212,598. Current projected forecast is approximately $15,500,000. • Project is one phase of a larger replacement of existing ageing and under-sized infrastructure to support future growth that is also connected to a larger, multi-year bare steel replacement program. • Project improves deliverability and reliability as supported by the Integrated Resource Plan. • Project increases capability to utilize storage gas to support peak day needs and provide non-interstate dependent delivery to areas that are currently dependent on a single interstate delivery point. • Project is expected to be completed and placed into service in 2012. • Project costs are expected to be included in Rate Base and recovered in customer rates beginning Nov. 2012.

Monmouth Reinforcement
Preliminary Financial Analysis

PROJECT BUDGETS

	Monmouth	
DIVISION	**CAP**	**O&M**
System Reinforcement	7,352,158	-
Subtotals	**7,352,158**	**-**
Contingency	735,216	
Construction Overhead		-
AFUDC		-
Totals	**8,087,374**	**-**
Project Totals		**8,087,374**

FINANCIAL METRICS

Without Rate Recovery	**Monmouth**
NPV	(7,212,677)
IRR	-3.4%
Discount Rate	7.2%
PV of Revenue Requirement	12,666,234

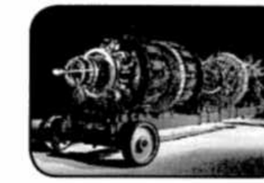
With Rate Recovery	**Monmouth**
NPV	2,225,379
IRR	9.5%
Discount Rate	7.2%

ANALYSIS ASSUMPTIONS

- 60 year project life, 60 year book, 39 year MACRS
- 2012 Oregon test year
- no change in annual operating expenses
- Capital structure approved in the last rate case of 49.82% debt, 0.68% preferred, and 49.5% common equity with a 7.07% debt rate, a 7.16% preferred rate, and a 10.2% equity rate. The
- A 39.29% tax rate and 1.48% property tax rate was used.

\\OPSNT01\data\groups\Financial Planning and Analysis\Investment Analysis\2011 Projects\Monmouth\Monmouth System Reinforcement Model.xlsx, Summary

PROJECT ENGINEERING REPORT (PER)



Mid-Willamette Feeder Project
Salem to Albany

Prepared for

NW Natural

WHPacific

February 2011

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Page #

Section 1 - Introduction

The purpose of the Mid-Willamette Valley Feeder Project is to provide for a more extensive network for natural gas distribution in the Mid-Willamette Valley and replace the aging transmission line south of Monmouth. NW Natural is looking for route alignments and feasibility report to construct and install a 12" nominal MAOP 720 psig Transmission pipeline (Mid-Willamette Feeder) between the Central Coast Transmission pipeline and the Albany-Corvallis Transmission pipeline. Roughly 5.2 miles of this line was previously constructed from north of highway 22 to Hoffman Road (just north of Monmouth, Oregon). This leaves two sections to be studied: 1) the north section between highway 22 and the Central Coast Transmission pipeline and; 2) the south section between Hoffman Road and the Albany-Corvallis Transmission pipeline. The installed pipe will be 12 inch by 0.312 inch, ERW API 5L, Grade X-52 coated steel natural gas line. The pipe will have a minimum cover of 4 feet over the pipe in native material and 15 foot of cover at water body crossings. The 12 inch size places this pipe outside the Federal Energy Regulatory Commission (FERC) guidelines and under local transmission constraints.

The selected alignment is as follows:

- **Polk County 1 North (P1N)**– Starting at the intersection of the Perrydale line and the Central Coast Transmission line the alignment heads east for approximately 1 ½ miles and then heads south along the east side of Pacific Highway 99 (Hwy 99W) for approximately 8 miles. This section lies within Polk County and will very likely fit within the right-of-way with approximately 5 water crossings, various wetland crossings, 5 local and County roadway crossings, 1 state highway crossing, 2 railroad crossings and 1 BPA transmission line crossing.

- **City of Monmouth (M1)** – Starting at the southern end of the existing transmission line in Pacific Highway 99 (Hwy 99W) at the intersection of Hoffman Road this route continues due south along the east side of the highway through Monmouth for approximately 3 miles. At the intersection of Stapleton Road the route turns due east and proceeds approximately one mile to Talmadge Road along the south side and ends. This section lies within Polk County and the City of Monmouth and contains an approximate 1.05 mile bore through the center of Monmouth. This section also contains 1 water crossing.

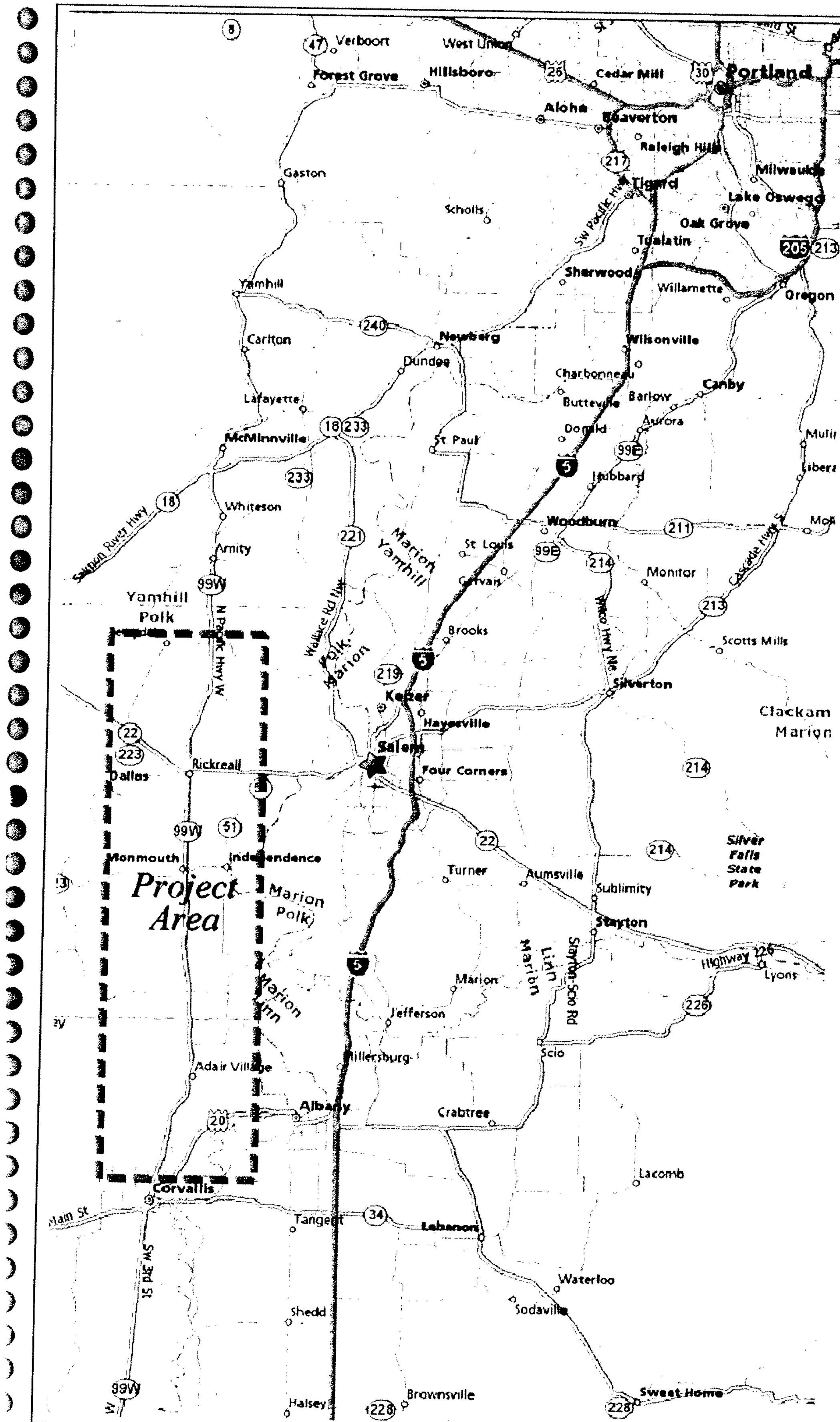
- **Polk County 1 South (P1S)** – Starting at the intersection of Talmadge Road and Stapleton Road the route heads due east along the north side of Stapleton Road for approximately 1 ¼ mile to Albany Road. At Albany Road the route heads due south along the east side of the road. Approximately 2 ¼ miles down Albany Road the route veers southeast onto Oak Hill Road which eventually becomes Independence Highway. This route section continues along the east side of the road for approximately 5 miles to the Benton County Line. This section is wholly within Polk County and contains approximately 2 water crossings, various wetland crossings, 8 local and county road crossing and 1 railroad crossings. This route provides opportunity for approximately 19,910 lineal feet of line replacement.

- **Benton County 1 North (B1N)** – Starting at the Polk and Benton County line on Independence Highway, this route travels along the west side of the road approximately 6 miles south to just short of the Highway 20 intersection. This section is wholly within Benton County and contains various wetland crossings, 7 local and county road crossings, 1 state highway crossing and 2 BPA transmission line crossings. This route provides opportunity for approximately 18,809 lineal feet of line replacement.

- **Benton County 4 South (B4S)** - Starting immediately north of the Highway 20 and Independence Highway, the route heads east along the Southern Pacific rail line and

Highway 20 for approximately 1 ¾ miles. At this point the route turns due south for approximately 2 ¾ miles towards the transmission line in Pirtle Drive SW. Once the route leaves the highway ROW this section is primarily agricultural in nature and there are no existing ROW's. This section is within Benton and Linn counties and contains approximately 2 water crossings, various wetland crossings, 1 local and county road crossings, 1 state highway crossing, 1 railroad crossing and 1 BPA transmission line crossings.

These alignments were chosen based on a combination of length of route, potential for pipe line replacement, existing easement, width of right-of-way, minimum number of water crossings, distance from homes and development, minimum number of road crossings and various other elements.



Northwest Natural Gas Company

Mid-Willamette Feeder Project
Salem to Albany, OR

Vicinity Map

July 9, 2009

WHPacific

035886-PLAN-EP04.DWG

Section 2 - Executive Summary

Alignments

Through a coordinated effort of the design team and NW Natural staff, the alternative alignments have been reviewed and selected alignment is identified and summarized below:

Alignment	Total Length *(Includes replacement, new and bored lengths)*	Total Replacement Length (BARE Main)	Total New Length	Total Boring Length
	(Linear Feet)	*(Linear Feet)*	*(Linear Feet)*	*(Linear Feet)*
Polk County 1 North (P1N)	51,740	0	44,640	7100
Monmouth 1 (M1)	17,715	0	11,745	5,970
Polk County 1 South (P1S)	48,145	19,910	24,405	3,830
Benton County 1 North (B1N)	30,947	18,809	11,413	725
Benton County 4 South (B4S)	24,032	0	20,832	3,200

Data Collection

Following identification of the study corridor and alternative alignments, secondary data was collected from federal, state, county, and local agencies. Federal documents collected and reviewed included Federal Energy Regulatory Commission (FERC) and sensitive species lists from the United States Fish and Wildlife Service (USFWS) (Refer to Appendix B). State documents collected and reviewed included state game and fish department sensitive species lists. City and county documents collected and reviewed included county and local comprehensive plans and zoning ordinances. (Refer to Appendix C).

NW Natural

Northwest Natural Gas Company

Mid-Willamette Feeder Project
Salem to Albany, OR

Preferred Alignment

July 9, 2009

Legend:

Polk County

P1N, P1S

M1

Benton County

B1N

B4S

Linn County

B4S

Alignment marker

WHPacific

035886-PLAN-EP03.DWG

Section 1 - Evaluation Matrix

NORTHWEST NATURAL GAS

Mid Willamette Feeder Project

Alignment Evaluation Matrix

ALTERNATIVE ALIGNMENTS	Project Data				Cost Impact Concern Factors				Safety Impact Concern Factors						
	Total Length *(Includes replacement, new and bored lengths)* *(Linear Feet)*	Total Replacement Length (BARE Main) *(Linear Feet)*	Total New Length *(Linear Feet)*	Total Boring Length [1] *(Linear Feet)*	Opinion of Probable Acquisition Costs [2][5] *($) Dollars*	Opinion of Probable Construction Costs *($) Dollars*	Existing Pipeline Identified for Replacement *(Yes/No)*	Replacement Savings Benefit *($) Dollars*	Railroad Crossings *(Number of)*	Intersection (County, City) Crossings *(Number of)*	Intersection (State Highway) Crossings *(Number of)*	Line Running within ROW (yes/no)	Transmission Line Crossings *(Number of)*	Close Proximity to Schools Facilities (e.g. K-8, Private and Colleges) *(Yes/No)*	Close Proximity to Civic Facilities (e.g. Fire Stations, Hospitals, Government Buildings) *(Yes/No)*
P1N	51,740	0	50,800	940	$1,616,875	$9,656,500	No	$0	2	5	1	Yes	1	No	No
M1	17,715	0	11,201	6,514	$553,594	$3,863,535	No	$0	0	3	0	Yes	0	No	Yes
P1S	48,145	19,910	26,235	2,000	$1,504,531	$8,389,975	Yes	$1,493,250	1	7	0	No	0	No	No
B1N	30,947	18,809	11,413	725	$967,094	$5,132,130	Yes	$1,410,675	0	7	0	No	2	No	No
B4S	24,032	0	22,277	1,755	$751,000	$4,603,870	No	$0	1	1	1	Yes	1	No	No

ALTERNATIVE ALIGNMENTS	Agricultural Impact Concern		Permitting & Technical Concern Factors								Environmental Concern Factors				Geotechnical Impact Concern
	Potential Disturbance Property Owners *(Number of)*	Impacts to Agricultural Operations *(Yes/No)*	Benton County [6] *(Yes/No)*	City of Monmouth [6] *(Yes/No)*	Polk County [6] *(Yes/No)*	Linn County [6] *(Yes/No)*	Division of State Lands (DSL) [3][6] *(Yes/No)*	Corps of Engineers (COE) [3][6] *(Yes/No)*	Oregon Department of Transportation (ODOT) [6] *(Yes/No)*	Existing Easements [4] *(Yes/No)*	River Crossings *(Number of)*	Creek/Stream Crossings *(Number of)*	Presence of Floodplain *(Yes/No)*	Wetlands Crossings *(Number of)*	Geotechnical Issues (Includes unstable conditions, fill materials, etc.)
P1N	38 [7]	Yes	N/A	N/A	Yes	N/A	Yes	Yes	Yes	Yes/No	0	5	Yes	28	
M1	10	No	N/A	Yes	N/A	N/A	Yes	Yes	Yes	No	0	1	Yes	5	
P1S	30	Yes	N/A	N/A	Yes	N/A	Yes	Yes	No	Yes/No	1	1	Yes	19	
B1N	33	Yes	Yes	N/A	N/A	N/A	Yes	Yes	No	Yes	0	0	Yes	8	
B4S	20	Yes	Yes	N/A	N/A	Yes	Yes	Yes	Yes	Yes/No	1	1	Yes	13	

[1] *Assumes 150 per river crossing (other than Willamette River); 50 feet per creek/stream crossing; 60 feet per railroad crossing and 75 feet per highway crossing. Wetlands distances vary and are based on NWI mapping data. Boring lengths do not take into consideration any allowances for vertical curves.*
[2] *Assumes 25 foot wide easement @ $1.25 square foot*
[3] *Assumes DSL and COE permits will be required unless boring occurs at all environmental features.*
[4] *NNG has easements for a portion or all of the proposed alignment*
[5] *Excludes portion of alignment where existing easements exists.*

Section 2 - Appendix

Appendix A – Regulatory Checklist

Appendix B - Geotechnical Report

Northwest Natural Gas Corvallis Extension Project

Regulatory Compliance Checklist October 2010

AGENCY	DOCUMENTATION TASK	OWNER	STATUS
	City of Corvallis		
Assistant Planner, Brian Latta, 541-766-6908 brian.latta@ci.corvallis.or.us	6/21/10 – Brian will handle all land use permitting. Crossing of the Willamette may require a Willamette River Greenway (WRG) permit. 10/28/10 – Contacted Brian again and confirmed all data still accurate.	WHP	On Going
Public Works, Mark Bauer 541-766-6729, mark.bauer@ci.corvallis.or.us	6/22/10 – Mark will handle all permitting for work within City ROW. Contact him once we are further along and he will work with us regarding permitting. Geotechnical borings will also require permitting. 10/28/10 – Contacted Mark again and confirmed all data still accurate.	WHP	On Going
	Benton County		
Community Development Greg Verret, Community Development Director 541-766-6819 x6294	At this time it is not anticipated that Benton Co. permitting will not be required.	WHP	On Going if required
Gordon Kurtz, Associate Engineer, 541-766-6006		WHP	On Going if required
Kristin Anderson, Planner 541-766-6819		WHP	On Going if required
Toby Lewis, Floodplain Specialist 541-766-6819		WHP	On Going if required
	Linn County		
Planning and Building Department, Robert Wheeldon, Department Director at 541-967-3816	Linn County has not been met with in person. Once the final southern alignment is chosen, a meeting will be scheduled with the County to discuss the permitting process. It appears from review of their development code that the transmission line would be allowed outright.	WHP	On Going

AGENCY	DOCUMENTATION TASK	OWNER	STATUS
John Hixson, Building Official, 541-967-3816	10/01/09 – With the Mid-Willamette line extension, corresponded with the Building Official and was informed no permitting is required for geotechnical bores. 11/23/09 – With the Mid-Willamette line extension, spoke with John Hixson and it is his determination that we would not be required any permitting for construction. He would like a courtesy set of plans and to be kept advised of our schedule. If for some reason, we require underground vaults, John would need to be advised due to high ground water table. Contacted/emailed John with our new proposal on 6/10 and 6/22/10. John has not responded. Need to follow-up. Based on our last project experience we do not foresee any issues.	WHP	On Going
Kate Foster, Assistant Planner, 541-967-3816 (ext. 2360) kfoster@co.linn.or.us	11/23/09 – From previous Mid-Willamette line extension, worked with Kate to determine land use approvals. The project will require a pre-application conference and two conditional use permits for a utility facility and Willamette River Greenway Permit – the fee is $2500.00 combined. This is a Type II process. 10/28/10 - Confirmed all previous discussions. Additional permitting may be required if any "visual" changes will remain after installation.	WHP	On Going
	Federal Government		
COE Northwestern Division / Portland District	Joint DSL & COE permitting will be required for wetland impacts. Once the final alignment is selected and impacts are known, we can make contact as appropriate. Polk County – Brian Villalon at 503-808-4368 (Portland Office) Benton County – Bennie Dean at 541-465-6769 (Eugene Office) Linn County – Shelly Hanson at 541-465-6878 (Eugene Office) Final impacts are still undetermined. Will make appropriate contacts as soon as impacts are identified	WHP	On Going
United States Fish and Wildlife Service	Once final alignments are known, contact determination will be made. Final impacts are still undetermined. Will make appropriate contacts as soon as impacts are identified.	WHP	On Going
Federal Energy Regulatory Commission (FERC)	Once final alignments are known, contact determination will be made.	WHP	On Going

AGENCY	DOCUMENTATION TASK	OWNER	STATUS
	State Government		
ODSL, General Information, 503-986-5200	Joint DSL & COE permitting will be required for wetland impacts. The Benton & Linn County Resource Coordinator is Gloria Kiryuta at 503-986-5226. Property Manager – Benton / Linn Counties : Mr. Cy Young 503-986-5245 Note: Easement for Willamette required. Final impacts are still undetermined. Will make appropriate contacts as soon as impacts are identified. Any impacts over 50 cubic yards will require permitting. Good information @ www.oregonstatelands.us	WHP	On Going
ODFW Northwest Regional Office 503-673-6000	Issue regarding threatened and endangered species must be reviewed for several of the proposed water crossings. Once final alignment is approved contact will be made to discuss permitting issues. The Fish Division Administrator is Ed Bowles at 503-947-6202. The Wildlife Division Administrator is Ron Anglin at 503-947-6312.	WHP	On Going
ODOT, District 4, Ken Lamb, Right of Way Specialist, 541-757-4182, kenneth.e.lamb@odot.state.or.us	Ken Lamb has been contacted and has provided comments on the preliminary alignment. His emailed comments are included in the this report. He has concerns regarding contaminated land at the Corvallis By-pass location and a new roadway alignment in the same area. Refer to emailed comments.	WHP	On Going
	Oregon Department of Energy (ODOE)		
ODOE 625 Marion Street NE Salem, Oregon 97301 800-221-8035	Once final alignments and exact impacts are known, contact determination will be made.		
	Department of Environmental Quality (ODEQ)		
ODEQ 811 SW 6th Ave. Portland, Oregon 97204 800-452-4011	Once final alignments and exact impacts are known, contact determination will be made.		

HDD Feasibility Study
Mid-Willamette Feeder Pipeline

Polk, Benton and Linn Counties, Oregon

for
WHPacific

April 23, 2010

GeoEngineers

15055 SW Sequoia Parkway, Suite 140
Portland, Oregon 97224
503.624.9274

HDD Feasibility Study
Mid-Willamette Feeder Pipeline
Polk, Benton and Linn Counties, Oregon

File No. 6024-107-01

April 23, 2010

Prepared for:

WHPacific
9755 SW Barnes Road, Suite 300
Portland, Oregon 97225

Attention: Daniel Boultinghouse, PE

Prepared by:

GeoEngineers, Inc.
15055 SW Sequoia Parkway, Suite 140
Portland, Oregon 97224
503.624.9274

-for-
Mark A. Miller, PE
Project Engineer

Brian C. Ranney, CEG
Senior Geologist

Trevor, N. Hoyles, PE
Associate

CERTIFIED
OREGON
BRIAN C. RANNEY
No. E1917
ENGINEERING GEOLOGIST
Exp 11/30/2010

MAM:BCR:TNH:cje
SharePoint\602410701\Mid-Willamette HDD Feasibility

GeoEngineers

Table of Contents

1.0 INTRODUCTION AND PROJECT DESCRIPTION

This report provides our Horizontal Directional Drill (HDD) feasibility evaluation of thirteen HDD sites along the proposed 12-inch-diameter Mid-Willamette Pipeline located in Polk, Benton and Linn Counties, Oregon. The proposed pipeline route is shown with respect to the surrounding area in Figure 1.

Northwest Natural Gas (NW Natural) is proposing to construct a 12-inch-diameter pipeline in the Willamette Valley of Oregon. The pipeline will connect the existing Central Coast transmission pipeline located north of Rickreall, Oregon to the existing Albany-Corvallis transmission pipeline southwest of Albany, Oregon. The pipeline will also connect to an existing 5.2-mile segment of the Mid-Willamette Feeder that was installed between Monmouth and Rickreall, Oregon.

The proposed 12-inch-diameter pipeline will cross several sensitive features including wetlands, water bodies, railroads and roads that will require trenchless installation methods. During this HDD feasibility phase of the project, WHPacific and Northwest Natural elected to investigate the feasibility of installing the pipeline using HDD installation methods in thirteen locations. We understand that an additional HDD is proposed within the City of Monmouth; however the feasibility of a HDD within the City of Monmouth was not authorized in this phase of work. Based on discussions with WHPacific and Northwest Natural, we understand that the proposed City of Monmouth HDD would likely be approximately 4,000 feet long. The thirteen sites investigated during this feasibility study, approximate HDD lengths and associated sensitive features are shown in Table 1 below. The sites are shown with respect to the proposed pipeline and surrounding area in Figure 1.

TABLE 1. EVALUATED HDD SITES

Site	Approximate HDD length (ft)	Sensitive Features
Ash Swale North	2,000	Creek and Railroad
Plum Creek/Bethel Road	800	Creek and Road
Ash Swale/Highway 99 Railroad	1,275	Creek, Wetland and Railroad
Crowley Creek	620	Creek and Road
Basket Slough	650	Creek
Middle Fork Ash Creek	725	Creek
South Fork Ash Creek	650	Creek
Stapleton Road Railroad	2,075	Wetland and Railroad
Luckiamute River	860	River
Soap Creek	850	Creek
Highway 20	500	Two Roads and Railroad
Highway 20 Slough	1,200	Creek
Willamette River	1,300	River

We completed a geotechnical exploration program for our study that consisted of observing surface and subsurface conditions at each site. A minimum of two exploratory borings were completed at each site, with the exception of the Willamette River site. We completed one exploratory boring on the north side of the Willamette River. We are not able to complete a boring on the south side of the river until July 17, 2010 because of saturated soil conditions and access restrictions. Therefore, we included a preliminary assessment of the HDD feasibility at the Willamette River site for this study. After the second exploratory boring is completed later this year, we will issue an addendum report finalizing our HDD feasibility conclusions for the Willamette River site.

Appendices A through M attached to this report present HDD feasibility evaluations for each site. Laboratory testing, surface conditions, subsurface conditions at each site, as well as specific HDD feasibility conclusions for each installation are included in the Appendices.

2.0 PURPOSE AND SCOPE

The purpose of our services was to explore surface and subsurface conditions at each of the thirteen sites in order to evaluate the feasibility of installing the pipeline in these locations using HDD methods. In general, we completed a desk top study to ascertain mapped geologic conditions along the alignment, performed surface reconnaissance to evaluate surface conditions at each site, completed a subsurface exploration program to characterize subsurface conditions at each site and completed a HDD feasibility study based on the surface and subsurface conditions at each site. Our specific Scope included the following.

1. Completed a site reconnaissance of each site to locate borings and evaluate surface conditions.
2. Prepared a preliminary plan and profile drawing for each proposed HDD to aid in selecting boring depths for the geotechnical exploratory program.
3. Completed 26 exploratory borings to depths ranging from 40 to 80 feet below ground surface (bgs) to evaluate subsurface geologic conditions in the vicinity of the proposed HDDs. A minimum of two borings were completed at each site with the exception of the Willamette River site. A representative from GeoEngineers managed the drilling operations and logged the explorations. We also contacted the local "One-Call" utility locating agency to locate utilities in the project area prior to starting the exploratory borings.
4. Obtained samples at representative intervals from the borings using a combination of standard penetration test (SPT) sampling and NQ rock coring methods.
5. Classified the materials encountered in the borings in general accordance with ASTM International (ASTM) D 2488 or the Oregon Department of Transportation (ODOT) classification system, as appropriate. We developed a detailed log of each exploration
6. Completed a laboratory testing program on selected samples obtained from the borings to evaluate pertinent engineering properties of the materials encountered. Testing included:
    a. Twenty-seven Atterberg limits determinations in general accordance with ASTM D4318.
    b. Ten sieve analyses in general accordance with ASTM C136
    c. Thirty-six percent fines determinations in general accordance with ASTM D1140.

    d. Eight unconfined compressive strength tests in general accordance with ASTM D7012

7. Evaluated the feasibility of the proposed HDD installations from a surface condition, geometric and subsurface soil conditions standpoint.

8. Prepared this data report summarizing the findings of our exploration program, laboratory testing and HDD feasibility evaluation.

3.0 SITE CONDITIONS

3.1 Geologic Setting

3.1.1 Regional Geology

The site is situated in the Willamette Valley, which extends from Cottage Grove in the south to the Portland Basin in the north (Burns, 1998; Orr and Orr, 1999). The Willamette Valley is part of the Puget-Willamette Trough physiographic province, a forearc basin associated with the tectonically active Cascadia convergent margin. The lowland is generally an elongate alluvial plain, bordered on the west by the Coast Ranges and on the east by the Cascade Mountains. Ridges and hills of uplifted mountains underlain by Tertiary-aged volcanic (Mainly Siletz River Volcanics and Columbia River Basalts) and sedimentary rocks (mainly Tyee Spencer, Yamhill and Keasy Formations) disrupt the normally flat alluvial plain of the Willamette Valley.

Alluvial sediments have been accumulating in the Willamette Valley for at least 20 million years, transported by tributaries from the Coast and Cascade Ranges, foothills streams, and the upper Willamette River. In addition, the Willamette Valley was back-flooded by catastrophic floods (the Missoula Floods) between about 15,500 and 12,700 years ago. Floodwaters rose to about 400 feet above mean sea level (MSL) in the valley, and deposited silts and fine sands (the Missoula Flood Deposits) over the surfaces below that elevation. Since then, fluvial processes (stream erosion, avulsion, channel and floodplain deposition, reworking of older sediments, etc.) have created a complex series of terraces, dropping from the foothills down to the current Willamette River channel. Weathering and soil formation have acted on the sediments, producing many different soil types from the various parent materials.

3.1.2 Site Geology

Site geology can be summarized by grouping the proposed HDD sites into two regions: The Greater Willamette Valley region and the Willamette River flood plain. Twelve of the 13 HDD sites are located within the greater Willamette Valley region. The Willamette River HDD is located within the Willamette River floodplain.

Geologic mapping of surficial deposits indicates Quaternary aged Recent Alluvium and Quaternary aged Missoula Flood Deposits typically underlies the crossing within the greater Willamette Valley region. The Recent Alluvium, typically mapped along small tributary streams, is described as Mixed Grained Undifferentiated Sediments of gravel, sand, silt, and clay (O'Connor et. al., 2001). Missoula Flood Deposits, consisting silt, sand, and clay with isolated cobbles and boulders, locally underlies the Recent Alluvium (Allison, 1953, O'Connor et al, 2001) and blankets a majority of the Willamette Valley. Tertiary aged marine and non-marine sedimentary rocks, including the Spencer and Yamhill Formations, underlie the Recent Alluvium and Missoula Flood Deposits.

Geologic mapping shows Quaternary aged Alluvial Deposits of the Willamette River consisting of silt, sand, and gravel within the Willamette Valley flood plain region. These deposits represent overbank deposits of the Willamette River that were deposited within roughly the last 7,000 years (O'Connor el. al, 2001). The unit occurs within flood plains of the Willamette River where the river has cut through the older Missoula Flood Deposits, creating terraces. The Missoula Flood Deposits, described as Quaternary aged deposits of silt, sand, and gravel with isolated cobbles and boulders, are the primary unit comprising the terraces found along the Willamette River. The Spencer Formation, described as late Eocene aged marine and non-marine micaceous and tuffaceous sandstones and siltstones, also underlies the Alluvial Deposits of the Willamette River and the Missoula Flood Deposits.

3.2 Surface Conditions

We evaluated the surface conditions in the vicinity of the proposed HDDs by completing a surface reconnaissance of each site between the dates of October 6, 2009 and February 1, 2010. Our reconnaissance consisted of evaluating potential HDD entry and exit workspaces, pipe stringing and fabrication areas and observing general topographic and vegetative conditions at each HDD site. Surface conditions for each site are described in the attached appendices A through M.

3.3 Subsurface Conditions

We explored subsurface conditions at each site between October 26, 2009 and February 3, 2010 by advancing a minimum of two borings at each site (with the exception of the Willamette River HDD site as discussed above) to depths ranging from 40 to 80 feet below ground surface (bgs). The borings were drilled by Subsurface Technologies of Banks, Oregon. A representative from GeoEngineers managed and observed the borings on a full-time basis, visually classified and collected the soil samples and logged other pertinent drilling information.

Soil samples were obtained from the borings at 5-foot-depth intervals using mud rotary drilling techniques and SPT samplers. Rock coring techniques were used to collect continuous samples of competent bedrock encountered in the borings, where possible. Laboratory tests, including Atterberg limits, sieve analyses and percent fines determinations were completed on selected samples from the borings. A description of the field exploration and laboratory testing procedures, as well as logs of the borings, are presented in Appendix B.

Soils encountered in the borings in the field were classified by a GeoEngineers representative in general accordance with ASTM International (ASTM) Standard Practice D 2488, the Standard Practice for the Classification of Soils (Visual-Manual Procedure) which is described in Figure 2. Rock encountered in the borings was classified in general accordance with the Oregon Department of Transportation Soil and Rock Classification Manual (ODOT, 1987), which is briefly described in Figure 3.

The boring logs and figures showing the approximate boring locations are presented in Appendices A through M. Soil and rock classifications and sampling intervals are shown in the boring logs. Inclined lines at the material contacts shown on the log indicate uncertainty as to the exact contact elevation, rather than the inclination of the contact itself.

The relative density of the SPT samples recovered at each interval was evaluated based on correlations with lab and field observations in general accordance with the values outlined in Table 2 below.

TABLE 2. CORRELATION BETWEEN BLOW COUNTS AND RELATIVE DENSITY *

Cohesive Soils (Clay/Silt)

Parameter	Very Soft	Soft	Medium Stiff	Stiff	Very Stiff	Hard
Blows, N	< 2	2 - 4	4 - 8	8 - 16	16 - 32	>32

Cohesionless Soils (Gravel/Sand/Silty Sand) **

Parameter	Very Loose	Loose	Medium Dense	Dense	Very Dense
Blows, N	0 - 4	4 - 10	10 - 30	30 - 50	> 50

* After Terzaghi, K and Peck, R.B., "Soil Mechanics in Engineering Practice," John Wiley & Sons, Inc., 1962.

** Classification applies to soils containing additional constituents; that is, organic clay, silty or clayey sand, etc.

3.3 Groundwater Conditions

Groundwater levels were evaluated by direct observation of groundwater in the borings, visual observations of moisture contents observed within the soil samples we collected, and by researching well logs obtained from the Oregon Water Resources Department (OWRD, 2009). Groundwater conditions observed at each HDD site are discussed in the attached appendices A through M.

In general, groundwater levels were variable between each HDD site, and typically related to the level of adjacent water bodies or topographic conditions. At most sites, groundwater was encountered between about 8 and 20 feet bgs during our explorations. Notable exceptions are the Luckiamute and Soap Creek sites where groundwater was located roughly 20 feet bgs. Groundwater was encountered at the Highway 20 site between 20 and 35 feet bgs. This relatively extreme difference is likely a result of the adjacent Willamette River and associated flood plain which is located about 15 feet lower in elevation than the surface of Highway 20.

We anticipate that groundwater levels will fluctuate depending on precipitation, site utilization or other factors. At the Willamette River, Plum Creek/Bethel road, Crowley Creek, Basket Slough and South Fork Ash Creek sites, groundwater is likely located at or near the surface during the wet time of the year, or when flood conditions are present.

4.0 CONCLUSIONS

Based on our explorations and analyses as presented in appendices A through M, it is our opinion that installing the 12-inch-diameter pipeline is feasible using HDD installation methods at all 13 proposed sites. However, the feasibility of the proposed Willamette River HDD is currently based on a single exploratory boring. At least one additional boring is required to adequately evaluate the feasibility.

The presence of deep gravels is of greatest concern at the Willamette River site. We did not encounter deep gravels on the north side of the river; however geologic mapping suggest that gravels may be encountered on the south side of the crossing. Depending on the depth of these gravels, and the type of underlying materials, the unknown subsurface conditions on the south side of the Willamette River could potentially have an adverse affect on the feasibility of the Willamette River HDD. A boring is scheduled to be completed on the south side of the Willamette River in July 2010. Once that boring is completed, we can finalize our feasibility evaluation for crossing the Willamette River using HDD installation methods.

Table 3 below summarizes the subsurface conditions, HDD feasibility and design considerations at each site. The potential for hydraulic fracture and inadvertent returns is a consideration for design at each of the 13 crossings. The required temporary workspace for HDD operations is also a consideration for design at each of the 13 sites. Therefore, the table below lists design considerations specific to each crossing.

TABLE 3 – SUBSURFACE CONDITIONS AND HDD FEASIBILITY

Site	General Subsurface Conditions	HDD Feasibility	Design Considerations
Ash Swale North	Silt and Clay overlying partially decomposed to fresh siltstone	Yes	• Depth of HDD profile with respect to bedrock and bottom of swale. • Provide an adequate stringing area depending on final length of the HDD.
Plum Creek/Bethel Road	Silt and Clay overlying decomposed to fresh siltstone	Yes	• Depth of HDD profile with respect to bedrock. • Workspaces relative to residential properties.
Ash Swale/Highway 99 Railroad	Clay overlying basalt, decomposed siltstone and interbedded siltstone and sandstone	Yes	• Depth of HDD profile with respect to railroad ROW. • HDD likely to encounter bedrock.
Crowley Creek	Clay overlying partially and completely decomposed siltstone	Yes	• Location of temporary entry/exit workspaces. • Reduce potential for inadvertent returns.
Basket Slough	Clay overlying decomposed siltstone	Yes	• Depth of HDD profile with respect to bedrock.
Middle Fork Ash Creek	Clay with occasional thin gravel layers overlying clayey sand	Yes	• Minor grading on south side of crossing may be necessary. • Depth and length of HDD profile dependant on channel depth and gravel layers.
South Fork Ash Creek	Clay overlying silty/clayey sand and decomposed to soft siltstone bedrock	Yes	• Location of overhead power lines with respect to workspaces.
Stapleton Road Railroad	Clay overlying sand	Yes	• Length of HDD dependent on wetland boundaries. • Pipe stringing area restrictions may require multiple stings of product pipe. • Location of entry workspace to reduce hydraulic fracture potential beneath railroad.

Site	General Subsurface Conditions	HDD Feasibility	Design Considerations
Luckiamute River	Silt and clay overlying sand with occasional thin gravel layers	Yes	• Depth and length of HDD profile dependant on channel depth and gravel layers. • Vegetation removal required in temporary workspaces.
Soap Creek	Interbedded silt, clay and sand	Yes	• Depth and length of HDD profile dependant on channel depth and gravel layers. • Permanent easement likely required on south side of crossing because of existing fill slopes on east side of Corvallis Road.
Highway 20	Clay overlying interbedded sand and gravel overlying siltstone	Yes	• HDD profile dependant on depth of gravels and required depth beneath railroad ROW and Highway 20.
Highway 20 Slough	Clay overlying sand with minor gravel layer overlying predominantly decomposed to slightly weathered siltstone	Yes	• HDD profile likely to encounter bedrock. • Depth and length of HDD profile dependant on channel depth.
Willamette River*	Silt overlying siltstone and mudstone	Yes: Pending*	• HDD profile likely to encounter bedrock. • Potential for deep gravels on south side of river unknown.

* Willamette River subsurface conditions are only known on the north side of the river; HDD feasibility is preliminary and will be finalized after completion of the southern boring. We recommend that the river bottom profile along the proposed pipeline alignment be obtained prior to final design.

5.0 RECOMMENDATIONS

As stated in the Introduction Section of this report, an additional HDD is proposed within the City of Monmouth. The City of Monmouth HDD would likely be approximately 4,000 feet long. We recommend completing a feasibility study of the proposed City of Monmouth HDD prior to construction. Depending on the proposed length of the City of Monmouth HDD, the feasibility study should include four to five exploratory borings near the proposed alignment of the HDD. If the feasibility study determines that the City of Monmouth HDD is feasible, we recommend completing a detailed HDD design for the City of Monmouth HDD prior to construction.

In addition to the second boring at the proposed Willamette River HDD site, we also recommend that the river profile along the proposed alignment be surveyed so that the designed depth of the HDD profile can be determined.

6.0 REFERENCES

Allison, I.S., Bulletin No. 37: Geology of the Albany Quadrangle, Oregon, DOGAMI, 1953.

Bela, J.L., GMS 18 – Geology of the Rickreall, Salem West, Monmouth, and Sidney Quadrangles, Marion, Polk, and Linn Counties, Oregon, DOGAMI, 1981.

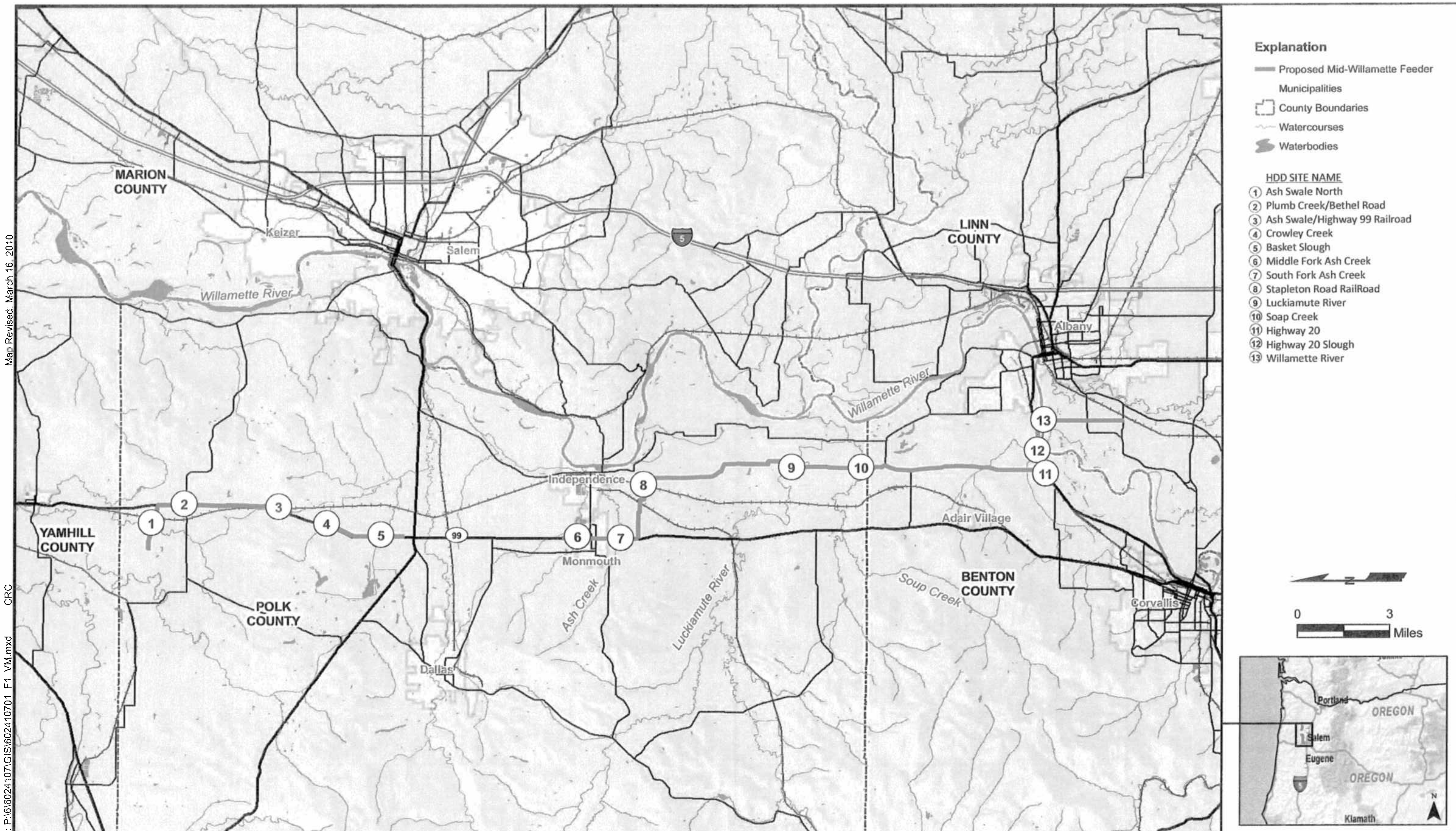
Burns, Scott, Geologic and physiographic provinces of Oregon: p 3-14 *in* S. Burns, editor, *Environmental, Groundwater and Engineering Geology: Applications from Oregon*: Association of Engineering Geologists, Special Publication 11; Star Publishing Co., Belmont, California; 1998, p. 689.

O'Connor, J.E., Sarna-Wojcicki, A., Wozniak, K.C., Polette, D.J., and Fleck, R.J., Origin, Extent, and Thicknesses of Quaternary Geologic Units in the Willamette Valley, Oregon. Published by the U.S. Geological Survey as Professional Paper 1620, 2001.

Oregon Department of Transportation Highway Division, Oregon Department of Transportation Soil and Rock Classification Manual, 1987.

Oregon Water Resources Department, Oregon Water Resources Department Well Log Query at http://apps2.wrd.state.or.us/apps/gw/well_log/Default.aspx, 2009.

Orr, E.L., Orr, W.N., *Geology of Oregon*. Kendall/Hunt Publishing Company, Dubuque, Iowa; 1999, p. 254.



Office: POR Path: P:\6\6024107\GIS\602410701_F1_VM.mxd CRC Map Revised: March 16, 2010

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. GeoEngineers, Inc. cannot guarantee the accuracy and content of this map.
3. It is unlawful to copy or reproduce all or any part of this document whether for personal use or resale, without permission.

Data Sources: ESRI Shaded Relief, StreetMap World and street map data (2005).
County and Municipality data obtained from Oregon Geospatial Enterprise Office (2009).
Projection: UTM Zone 10

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VICINITY MAP

Mid-Willamette Feeder Pipeline
Polk, Benton and Linn County

Figure 1

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% RETAINED ON NO. 200 SIEVE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES
				GP	POORLY GRADED GRAVELS, GRAVEL - SAND MIXTURES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS
				SP	POORLY-GRADED SANDS, GRAVELLY SAND
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% PASSING NO. 200 SIEVE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS, ROCK FLOUR, CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS AND SILTS OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: Multiple symbols are used to indicate borderline or dual soil classifications

Sampler Symbol Descriptions

- 2.4-inch I.D. split barrel
- Standard Penetration Test (SPT)
- Shelby tube
- Piston
- Direct-Push
- Bulk or grab

Blowcount is recorded for driven samplers as the number of blows required to advance sampler 12 inches (or distance noted). See exploration log for hammer weight and drop.

A "P" indicates sampler pushed using the weight of the drill rig.

ADDITIONAL MATERIAL SYMBOLS

SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
	CC	Cement Concrete
	AC	Asphalt Concrete
	CR	Crushed Rock/ Quarry Spalls
	TS	Topsoil/ Forest Duff/Sod

Measured groundwater level in exploration, well, or piezometer

Groundwater observed at time of exploration

Perched water observed at time of exploration

Measured free product in well or piezometer

Graphic Log Contact

Distinct contact between soil strata or geologic units

Approximate location of soil strata change within a geologic soil unit

Material Description Contact

Distinct contact between soil strata or geologic units

Approximate location of soil strata change within a geologic soil unit

Laboratory / Field Tests

%F	Percent fines
AL	Atterberg limits
CA	Chemical analysis
CP	Laboratory compaction test
CS	Consolidation test
DS	Direct shear
HA	Hydrometer analysis
MC	Moisture content
MD	Moisture content and dry density
OC	Organic content
PM	Permeability or hydraulic conductivity
PP	Pocket penetrometer
SA	Sieve analysis
TX	Triaxial compression
UC	Unconfined compression
VS	Vane shear

Sheen Classification

NS	No Visible Sheen
SS	Slight Sheen
MS	Moderate Sheen
HS	Heavy Sheen
NT	Not Tested

NOTE: The reader must refer to the discussion in the report text and the logs of explorations for a proper understanding of subsurface conditions. Descriptions on the logs apply only at the specific exploration locations and at the time the explorations were made; they are not warranted to be representative of subsurface conditions at other locations or times.

KEY TO EXPLORATION LOGS

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FIGURE 2

EXPLANATION OF BEDROCK TERMS

Scale of Relative rock Weathering (ODOT; 1987)

Designation	Field Identification
Fresh	Crystals are bright. Discontinuities may show some minor surface staining. No discoloration in rock fabric.
Slightly Weathered	Rock mass is generally fresh. Discontinuities are stained and may contain clay. Some discoloration in rock fabric. Decomposition extends up to 1 inch into rock.
Moderately Weathered	Rock mass is decomposed 50% or less. Significant portions of rock show discoloration and weathering effects. Crystals are dull and show visible chemical alteration. Discontinuities are stained and may contain secondary mineral deposits.
Predominantly Decomposed	Rock mass is more than 50% decomposed. Rock can be excavated with geologist's pick. All discontinuities exhibit secondary mineralization. Complete discoloration of rock fabric. Surface of core is friable and usually pitted due to washing out of highly altered minerals by drilling water.
Decomposed	Rock mass is completely decomposed. Original rock "fabric" may be evident. May be reduced to soil with hand pressure.

Scale of Relative Rock Hardness (ODOT, 1987)

Term	Hardness Designation	Field Identification	Approximate Unconfined Compressive Strength
Extremely Soft	R0	Can be indented with difficulty by thumbnail. May be moldable or friable with finger pressure.	< 100 psi
Very Soft	R1	Crumbles under firm blows with point of a geology pick. Can be peeled by a pocket knife. Scratched with fingernail.	100-1000 psi
Soft	R2	Can be peeled by a pocket knife with difficulty. Cannot be scratched with fingernail. Shallow indentation made by firm blow of geology pick.	1000-4000 psi
Medium Hard	R3	Can be scratched by knife or pick. Specimen can be fractured with a single firm blow of hammer/geology pick.	4000-8000 psi
Hard	R4	Can be scratched with knife or pick only with difficulty. Several hard hammer blows required to fracture specimen.	8000-16000 psi
Very Hard	R5	Cannot be scratched by knife or sharp pick. Specimen requires many blows of hammer to fracture or chip. Hammer rebounds after impact.	> 16000 psi

Rock Quality Designation (RQD)

RQD (Percent)	Description of Rock Quality
0 to 25	Very Poor
25 to 50	Poor
50 to 75	Fair
75 to 90	Good
90 to 100	Excellent

RQD is a modified core recovery measurement which expresses the number of hard and sound rock pieces of 4" or more in size as a percentage of the total length of core run.

Discontinuity Spacing

Description for Bedding, Foliation, or Flow Banding	Spacing		Description of Joints, Faults, or Other Fractures
Very Thickly	>2 meters	>6 feet	Very Widely
Thickly	60 cm – 2 meters	2-6 feet	Widely
Medium	200 mm – 60 cm	8-24 feet	Medium
Thinly	60-200 mm	2-1/2 – 8 inches	Closely
Very Thinly	20-60 mm	¾ - 2 ½ inches	Very Closely
Description for Lamination, Foliation, or Cleavage			
Intensely	6-20 mm	¼ - ¾ inch	Extremely Close
Very Intensely	<6 mm	<1/4 inch	

Explanation of Bedrock Terms

Mid-Willamette Feeder Pipeline

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Figure 3

P:\0\6024094\00\Finals\602409400 Figure A-2.ppt GAW:GAW 082207

APPENDIX A
Ash Swale North HDD

APPENDIX A
ASH SWALE NORTH HDD

The Ash Swale North HDD site is located approximately 4 miles south of Amity, Oregon. The proposed pipeline alignment at the site is oriented approximately northwest-southeast and roughly perpendicular to the Southern Pacific Railroad right-of-way (ROW) and Ash Swale, as shown in Figure A-1. The proposed HDD crosses beneath both Ash Swale and the railroad ROW from northwest to southeast (entry to exit). An HDD of approximately 2,000 feet in length is required at this site.

SITE DESCRIPTION

Surface Conditions

The HDD alignment passes through a relatively flat agricultural area. Figure A-1 shows a cross sectional view of the site topography along the proposed alignment and a conceptual HDD profile.

The area along the proposed pipeline alignment northwest of Ash Swale is a relatively flat agricultural field at an elevation of approximately 165 feet above mean sea level (MSL). Along the proposed HDD alignment, the ground surface slopes gently down toward the southeast and Ash Swale. Southeast of the swale, the ground surface along the proposed alignment slopes up gently toward the southeast through another agricultural field where elevations range from approximately 160 to 170 feet above MSL. At this time, the bottom profile of Ash Swale has not been determined.

Subsurface Conditions

We explored subsurface conditions at the site on February 15 and 16, 2010 by drilling three borings to a maximum depth of approximately 56 feet below ground surface (bgs) at the approximate locations shown in Figure A-1. In general, our subsurface explorations encountered soft to very stiff silt and clay overlying decomposed to fresh siltstone and partially decomposed sandstone. Subsurface conditions encountered in the borings are consistent with the geologic mapping for the area (Allison, 1953, O'Connor et al, 2001). Logs of the borings are presented as Figures A-2 through A-4.

Boring B-1 was completed adjacent to the Southern Pacific Railroad ROW approximately 150 feet northwest of the conceptual exit point. The boring encountered medium stiff to soft fat clay with trace sand content from the ground surface to a depth of approximately 20 feet bgs. Between depths of 20 and 40 feet bgs, the boring encountered medium stiff to very stiff silt with trace sand. Decomposed siltstone was encountered between depths of 40 and 46.5 feet bgs, the maximum depth explored.

Boring B-2 was drilled approximately 760 feet northwest of the conceptual exit point along an unpaved road that crosses the proposed alignment. The boring encountered stiff to medium stiff fat clay with trace sand content from the ground surface to a depth of approximately 20 feet bgs. Between depths of 20 and 40 feet bgs, the boring encountered soft to stiff clayey silt. Partially decomposed siltstone consisting of stiff to very stiff fat clay with sand was encountered between depths of 40 and 50 feet bgs. Below 50 feet bgs the boring encountered fresh, very soft, siltstone to 56 feet, the maximum depth explored.

Boring B-3 was drilled near the proposed alignment adjacent to the northwest bank of Ash Swale approximately 380 feet southeast of the conceptual entry point. The boring encountered soft to stiff fat clay with occasional sand from the ground surface to a depth of approximately 25 feet bgs. Between depths of 25 and 33 feet bgs, the boring encountered decomposed siltstone consisting of stiff silt with varying sand content. Partially decomposed sandstone consisting of dense clayey sand was encountered between depths of approximately 33 and 36 feet bgs. A thin lense of dense gravel with silt was encountered between depths of approximately 36 and 37 feet bgs. Below 37 feet bgs, the boring encountered fresh, very soft siltstone to 50.5 feet bgs, the maximum depth explored.

Groundwater

We observed groundwater at a depth of approximately 15 feet bgs in borings B-1 and B-2 and at a depth of approximately 10 feet bgs in boring B-3. These depths correspond with the approximate level of the water surface of Ash Swale. We anticipate that groundwater levels will fluctuate due to seasonal variations in precipitation, changes in site utilization or other factors. For the design and construction of an HDD, the groundwater level is not typically a factor affecting feasibility. The hydrostatic drilling fluid pressure typically compensates for high groundwater levels.

LABORATORY TESTING

Percent fines analyses were performed on six samples collected from the borings in general accordance with ASTM D 1140. The percentage passing the U.S. No. 200 sieve is shown on the boring logs at the respective sample depths.

Atterberg limits tests were performed on four soil samples. The tests were used to classify the soil as well as to evaluate engineering index properties. The liquid limit and the plastic limit were estimated through a procedure performed in general accordance with ASTM D 4318. The results of the Atterberg limits testing are shown in Figures A-5 through A-8.

HDD FEASIBILITY CONCLUSIONS AND RECOMMENDATIONS

Based on our HDD evaluation, the HDD method of construction at the Ash Swale North HDD site is feasible. We anticipate that an HDD design profile for this site would be about 2,000 feet long, and between about 15 and 20 feet below the bottom of Ash Swale. A conceptual HDD profile for this site is shown in Figure A-1.

We recommend that a detailed design be completed for this proposed HDD so that the alignment and profile can be further refined. The detailed design should include final alignment and profile design, workspace layouts, analyses of installation and operating stresses, and a hydraulic fracture and inadvertent returns evaluation. A bathymetric survey should be completed along the conceptual HDD alignment to determine the depth of Ash Swale which will aid the detailed design process. The following sections summarize conclusions regarding workspace considerations, subsurface conditions and conceptual HDD geometry.

Workspace Considerations

In our opinion, the entry and exit sides of the Ash Swale HDD should be located on the northwest and southeast sides, respectively. The layout and dimensions for the proposed entry/exit side workspaces have not been identified in Figure A-1, but will be added during the detailed design phase. For typical HDD installations of this magnitude, the additional temporary workspace required at the entry and exit points will be approximately 60 feet by 150 feet along the proposed alignment.

The following paragraphs describe the conceptual entry and exit sides of the HDD.

Conceptual Entry Side (Northwest Side)

Adequate entry workspace exists along the proposed pipeline ROW on the northwest side of Ash Swale in the relatively flat agricultural field. Only minor grading would be required to provide a level workspace area for the drilling equipment. Access to the entry workspace could be via the pipeline ROW from Perrydale Road to the west of the site. Depending on site conditions at the time of construction, a temporary gravel or timber mat access road may be required between the proposed entry workspace and Perrydale road.

Conceptual Exit Side (South Side)

Adequate exit workspace exists along the proposed pipeline alignment southwest of the railroad ROW for HDD operations, stringing and fabrication of the product pipe. The exit workspace could be accessed via the pipeline ROW from Pacific Highway to the east, or from a private road located approximately 950 feet north of the conceptual alignment.

Depending on the final length of the HDD design, there is likely adequate length for a temporary pipe fabrication and stringing workspace between the conceptual exit point and Pacific Highway to the east. If the final design is greater than about 2,000 feet, the conceptual entry and exit points would likely need to be reversed in order to gain adequate length for a single product pipe string to be fabricated and pulled back during construction.

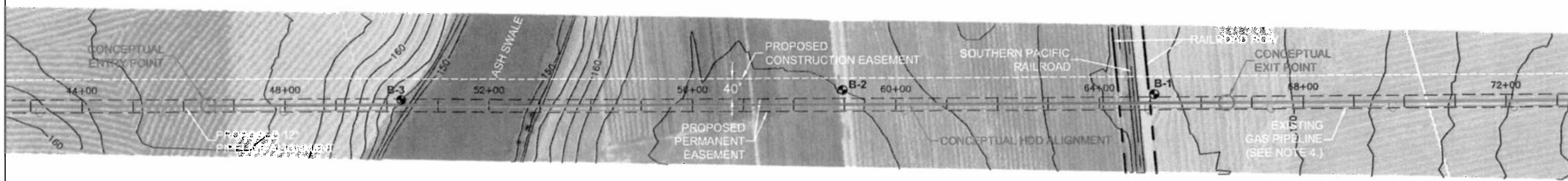
Subsurface Considerations

The soils at the anticipated depths of the conceptual HDD consist of soft to very stiff clay and silt. However, decomposed siltstone and decomposed sandstone bedrock underlie the clay and silt soils. It may be preferable to keep the HDD profile within the soils above the decomposed siltstone unit along the entire length of the HDD because the pilot hole could be jetted through the overlying silt and clay soils without the need for a positive displacement mud motor. However, the depth of the HDD profile should be determined during final design based on the results of hydraulic fracture and inadvertent returns evaluation.

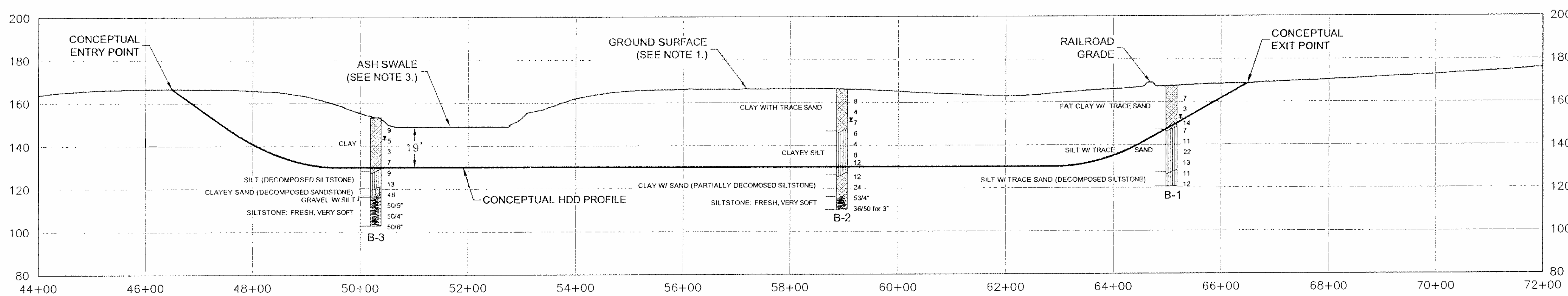
Conceptual HDD Geometry

The length, depth and orientation of a potential HDD is a function of Northwest Natural's 15-foot minimum depth requirement below waterbodies, the topography along the proposed alignment, the minimum allowable radius of curvature of the product pipe and the subsurface conditions encountered in the borings.

The ground surface topography at the site is favorable for what could be considered a minimum length HDD; however, in order to cross both Ash Swale and the Southern Pacific Railroad ROW, the HDD would have a horizontal length of approximately 2,000 feet. For this HDD, we expect the depth of the HDD profile beneath Ash Swale could range between 15 and 20 feet. The actual profile length and depth should be based on additional geometric and hydraulic fracture analyses completed during the detailed design phase of the project.



PLAN
1" = 200'



PROFILE
HORIZ.: 1"=200'
VERT.: 1"=50'

NOT FOR CONSTRUCTION

Notes:
1. Topographic information based on a site specific topographic survey dated 9/19/09, provided by WH Pacific.
2. The locations of all features shown are approximate.
3. A bathymetric survey of Ash Swale has not been completed. The elevation shown is based on topographic survey.
4. The location of the existing gas pipeline should be field verified prior to construction.
5. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. can not guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Legend

Boring Location

Soil Classification

SPT (N) Value

Boring ID

Centerline in Existing Easement
Centerline in R.O.W.
Centerline in Private Property

N E S W

SITE PLAN & PROFILE

ASH SWALE NORTH HDD
POLK COUNTY, OREGON

GEOENGINEERS

FIGURE A-1

BCR : MWJ

W:\Portland\Projects\6\6024107\01\CAD\Ash Swale North.dwg\TAB:Figure 2 modified on Apr 13, 2010 - 2:20pm

Drilled: Start 2/16/2010, End 2/16/2010	Total Depth (ft) 46.5	Logged By BKB; Checked By MAM	Driller Subsurface Technologies
Drilling Method	Mud Rotary		
Surface Elevation (ft) / Vertical Datum	167.2	Hammer Data	140 lb Auto
Drilling Equipment	Diedrich D-50 Truck Mounted		
Easting (X) / Northing (Y)	7500489.099 / 519070.9412	System Datum	NAD83 SP N US FOOT
Groundwater: Date Measured	2/16/2010	Depth to Water (ft) 15.0	Elevation (ft) 152.2
Notes:			

FIELD DATA

Depth (feet)	Recovered (in)	Blows/foot	Sample Name	Water Level	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
0					CH	Brown fat clay with orange/brown/black mottling and trace sand (medium stiff, moist)			
5	18	7	1						AL
10	18	3	2			Becomes soft			
15	14	14	3	▼		Becomes wet			
20	18	7	4		ML	Gray silt with trace sand (medium stiff, moist)			%F=99
25	18	11	5			Becomes stiff			
30	18	22	6			Becomes very stiff			%F=99
35									

Elevation (feet): 165, 160, 155, 150, 145, 140, 135

Plotted Date:4/5/10 Path:P:\6\6024107\01\GINT\602410701.GPJ DBTemplate/LibTemplate:GEOENGINEERS8.GDT/GEI8_GEOTECH_STANDARD

Log of Boring B-1

GEOENGINEERS

Project: Mid Willamette Feeder-Ash Swale North
Project Location: Polk County, OR
Project Number: 6024-107-01 Task0100

Figure A-2
Sheet 1 of 2

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	FIELD DATA: Recovered (in)	FIELD DATA: Blows/foot	FIELD DATA: Collected Sample	FIELD DATA: Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
	35		18	13		7			ML	Gray silt with trace sand (medium stiff, moist) Becomes stiff			
130													
	40		18	11		8			ML	Gray silt with trace sand (moist, stiff) (Decomposed Siltstone)			
125													
	45		18	12		9							

Portland: Date:4/5/10 Path:P:\6\6024107\01\GINT\602410701.GPJ DBTemplate/LibTemplate:GEOENGINEERS6.GDT/GEI6_GEOTECH_STANDARD

Log of Boring B-1 (continued)

GeoEngineers

Project: Mid Willamette Feeder-Ash Swale North
Project Location: Polk County, OR
Project Number: 6024-107-01 Task0100

Figure A-2
Sheet 2 of 2

Drilled — Start: 2/16/2010, End: 2/16/2010	Total Depth (ft): 56	Logged By: BKB Checked By: MAM	Driller: Subsurface Technologies
Drilling Method: Mud Rotary	Surface Elevation (ft) / Vertical Datum: 166.0	Hammer Data: 140 lb Auto	Drilling Equipment: Diedrich D-50 Truck Mounted
Easting (X): 7499905.358 Northing (Y): 519251.4956	System Datum: NAD83 SP N US FOOT	Notes:	

Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
2/16/2010	15.0	151.0

Elevation (feet)	Depth (feet)	Interval / Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
165	0							CH	Brown fat clay with orange/brown mottling and trace sand (stiff, moist)			
160	5	18	8		1							
155	10	18	4		2				Becomes medium stiff			
150	15	18	7		3	▼			Becomes wet			%F=96
145	20	18	6		4			ML	Brown clayey silt (medium stiff, wet)			%F=97
140	25	18	4		5				Becomes soft			
135	30	14	8		6				Becomes stiff 4" thick layer gray silty sand at 30.5'			AL
	35											

Portland: Date 4/5/10 Path P:\6\6024107\01\GINT\JPC 602410701.GPJ DBTemplate/LibTemplate GEOENGINEERS8.GDT/GEIe_GEOTECH_STANDARD

Log of Boring B-2

GEOENGINEERS

Project: Mid Willamette Feeder-Ash Swale North
Project Location: Polk County, OR
Project Number: 6024-107-01 Task0100

Figure A-3
Sheet 1 of 2

Elevation (feet)	Depth (feet)	Recovered (in)	Blows/foot	Sample Name / Testing	Water Level	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
130	35	14	12	7		ML	Brown clayey silt (medium stiff, wet)			
										AL
125	40	18	12	8		CH	Gray/green fat clay with sand (moist, stiff) (partially decomosed Siltstone)			
										%F=72
120	45	18	24	9			Becomes very stiff and sandy			
115	50	4	53/4"	10		SLST	Black siltstone: fresh, very soft			
110	55	9	36/50 for 3"	11						

Portland: Date:4/5/10 Path P:\6\6024107\01\GINT JPG 602410701\602410701.GPJ DBTemplate/LibTemplate:GEOENGINEERS8.GDT/GEI8_GEOTECH_STANDARD

Log of Boring B-2 (continued)

GEOENGINEERS

Project: Mid Willamette Feeder-Ash Swale North
Project Location: Polk County, OR
Project Number: 6024-107-01 Task0100

Figure A-3
Sheet 2 of 2

Drilled Start 2/15/2010 End 2/15/2010	Total Depth (ft) 50.5	Logged By MCV Checked By MAM	Driller Subsurface Technologies	Drilling Method Mud Rotary
Surface Elevation (ft) Vertical Datum 154.0		Hammer Data 140 lb Auto	Drilling Equipment Diedrich D-50 Truck Mounted
Easting (X) 7499067.38 Northing (Y) 519477.0914		System Datum NAD83 SP N US FOOT	Groundwater: Date Measured 2/15/2010; Depth to Water (ft) 10.0; Elevation (ft) 144.0
Notes:			

Elevation (feet)	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
	0							CH	Brown fat clay (stiff, moist)			
150	5	16	9		1							
145	10	16	5		2	▼			Becomes medium stiff and wet with trace sand			%F=4
140	15	18	3		3				Becomes soft with brown/gray mottling			
135	20	14	7		4				Becomes gray and medium stiff			AL
130	25	15	9		5			ML	Blue/gray silt (stiff, moist) (decomposed Siltstone)			
125	30	14	13		6				Becomes sandy			
120								SC	Blue/gray clayey sand (dense, moist) (partially decomposed Sandstone)			
	35											

Portland: Date:4/5/10 Path:P:\6\6024107\01\GINT JPG 6024107\01\602410701.GPJ DBTemplate/LibTemplate:GEOENGINEERS8.GDT/GEI8_GEOTECH_STANDARD

Log of Boring B-3

GEOENGINEERS

Project: Mid Willamette Feeder-Ash Swale North
Project Location: Polk County, OR
Project Number: 6024-107-01 Task0100

Figure A-4
Sheet 1 of 2

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
	35		14	48		7			SC	Blue/gray clayey sand (dense, moist) (partially decomposed Sandstone)			
									GP-GM	Brown/gray gravel with silt (dense, wet)			
									SLST	Black siltstone: fresh, very soft			
115													
	40		4	50/5"		8							
110													
	45		4	50/4"		9							
105													
	50		5	50/6"		10							

Portland: Date:4/5/10 Path:P:\6\6024107\01\GINT JPG 602410701.GPJ DBTemplate/LibTemplate:GEOENGINEERS8.GDT/GEI8_GEOTECH_STANDARD

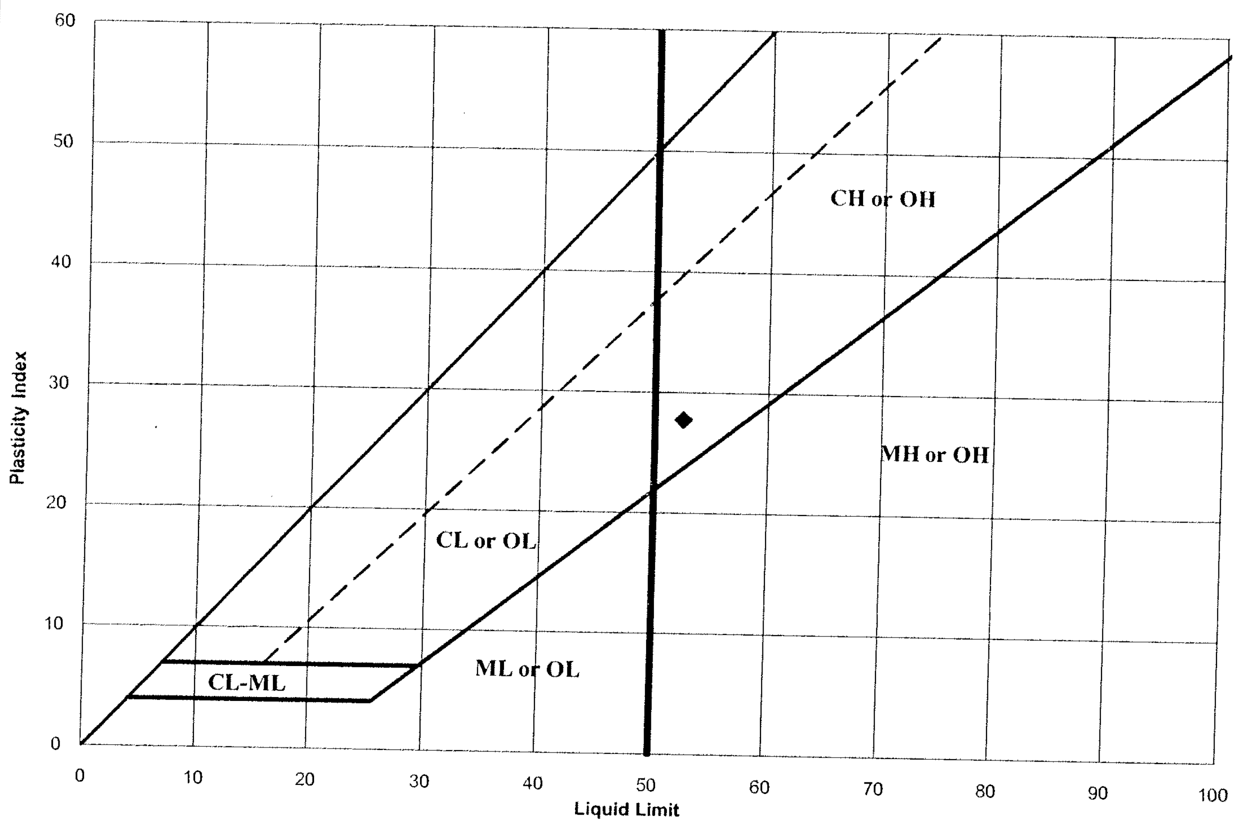
Log of Boring B-3 (continued)

GeoEngineers

Project: Mid Willamette Feeder-Ash Swale North
Project Location: Polk County, OR
Project Number: 6024-107-01 Task0100

Figure A-4
Sheet 2 of 2

Project:	MWF-Ash Swale North	**Lab No.**	10-0008
Project No.	6024-107-01Task 0100	**Date:**	02/22/10
Boring/TP No.	B-1	**Tested By:**	KAR
Sample No./Depth:	S-1 @ 5'	**Checked By:**	BCR
USCS Classification:	CH	**PA/PM:**	BCR



Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Description
38.6%	53	25	28	**CH**	**Fat Clay**

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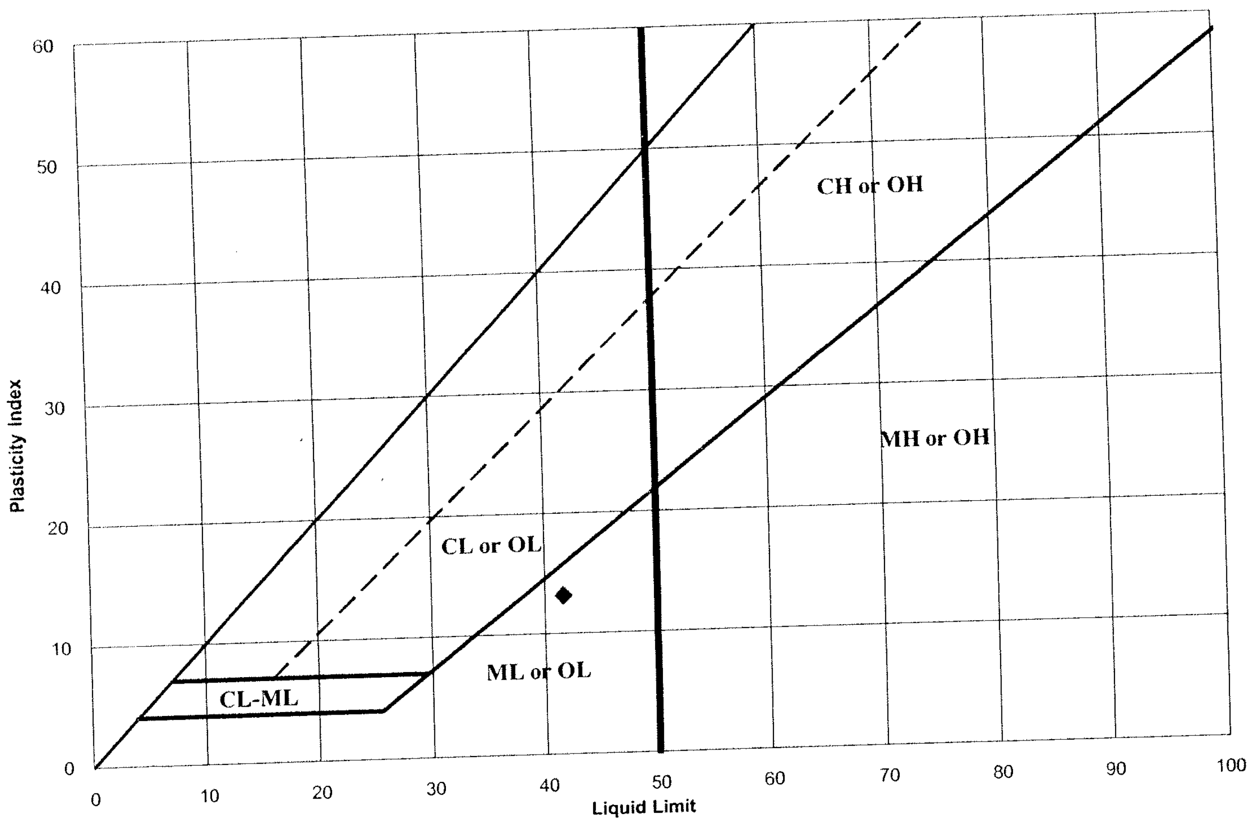
Atterberg Limits ASTM D 4318

Figure A-5

Project:	MWF-Ash Swale North	Lab No.	10-0008
Project No.	6024-107-01 Task 0100	Date:	02/22/10
Boring/TP No.	B-2	Tested By:	KAR
Sample No./Depth:	S-6 @ 30'	Checked By:	BCR
USCS Classification:	ML	PA/PM:	BCR



Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Description
35.2%	42	28	13	ML	Silt

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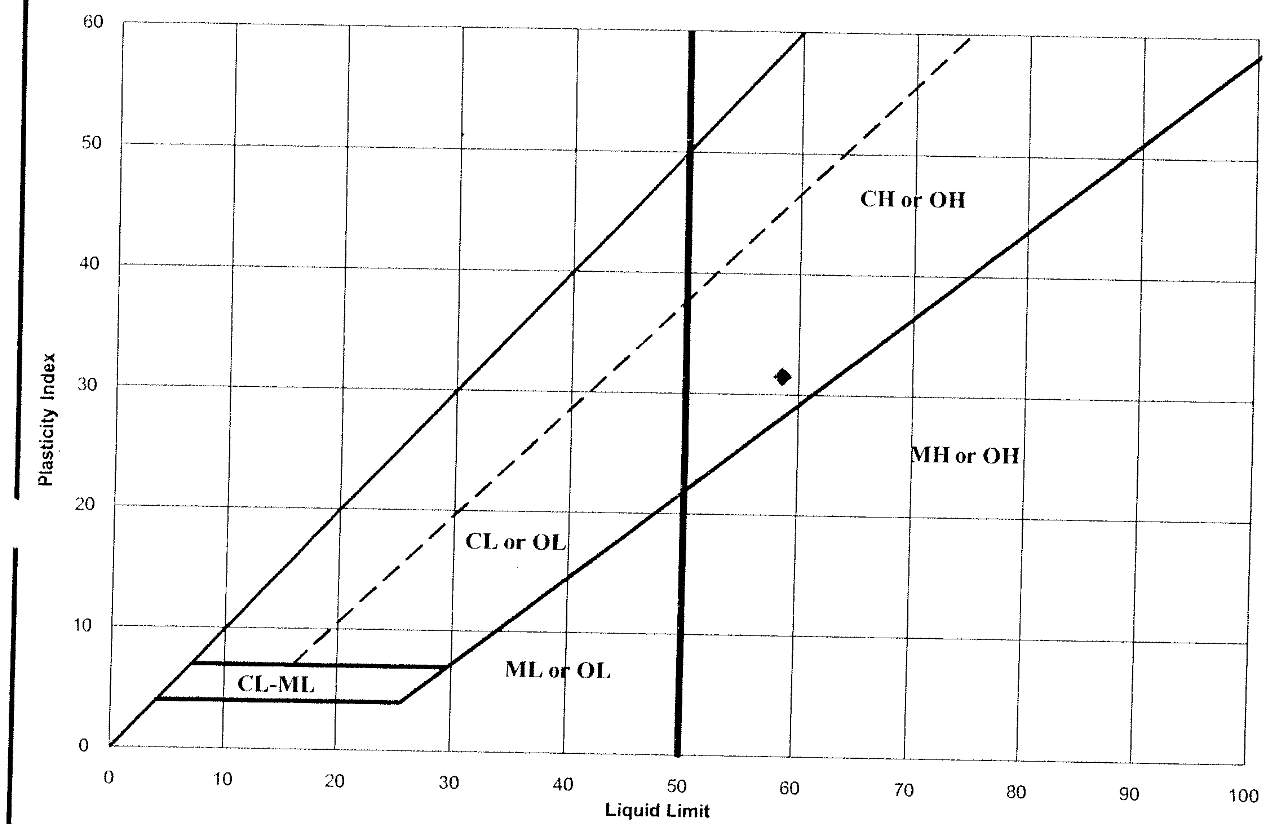
Atterberg Limits ASTM D 4318

Figure A-6

Project:	MWF-Ash Swale North	**Lab No.**	10-0008
Project No.	6024-107-01 Task 0100	**Date:**	02/22/10
Boring/TP No.	B-2	**Tested By:**	KAR
Sample No./Depth:	S-8 @ 40'	**Checked By:**	BCR
USCS Classification:	CH	**PA/PM:**	BCR



Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Description
28.4%	59	27	31	CH	Fat Clay

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Atterberg Limits ASTM D 4318

Figure A-7

APPENDIX B
Plum Creek and Bethel Road HDD

APPENDIX B
PLUM CREEK AND BETHEL ROAD HDD

The Plum Creek/Bethel Road HDD site is located near the intersection of Pacific Highway West and Bethel Road, approximately 5 miles south of Amity, Oregon. The proposed pipeline alignment at the site is oriented north-south and parallel to the west side of Pacific Highway as shown in Figure B-1. The proposed alignment is located 12.5 feet outside of the existing Oregon Department of Transportation (ODOT) right-of-way (ROW). The HDD alignment crosses beneath a residential property, Bethel Road and Plum Creek. An HDD of approximately 800 feet in length is required at this site.

SITE DESCRIPTION

Surface Conditions

The site generally slopes down from north to south with the Plum Creek channel being the lowest point along the proposed alignment. The area north of Bethel Road is currently occupied by a residential property and an agricultural field. The ground surface at the north side of the site slopes down gently toward the south with ground surface elevations ranging from approximately 200 to 168 feet above mean sea level (MSL) at Bethel Road. An existing overhead power line parallels the proposed pipeline alignment on the west side of Pacific Highway north of Bethel Road.

South of Bethel Road, the ground surface is relatively flat between the road and Plum Creek. The creek channel generally parallels the south side of the Bethel Road west of Pacific Highway. The creek channel is incised approximately 6 feet below the elevation of the roadway. The south bank of the creek is approximately 15 feet high and both stream banks are relatively well vegetated with deciduous trees and underbrush. An agricultural field is located south of Plum Creek. The ground surface within the agricultural field is generally flat along the proposed pipeline alignment at an elevation of approximately 176 feet above MSL.

Subsurface Conditions

We explored subsurface conditions at the site on October 28, 2009 and February 16, 2010 by drilling two borings to maximum depths of up to 55 feet below ground surface (bgs) at the approximate locations shown in Figure B-1. In general, the borings encountered soft to very stiff silt and clay overlying decomposed to fresh siltstone. Subsurface conditions encountered in the borings are consistent with the geologic mapping for the area (Allison, 1953, O'Connor et al, 2001). Logs of the borings are presented as Figures B-2 and B-3.

Boring B-1 was drilled near the southwest corner of the intersection of Pacific Highway and Bethel Road, approximately 400 feet north-northwest of the conceptual HDD entry point. The boring encountered approximately 10 feet of medium stiff lean clay overlying soft to stiff fat clay to approximately 30 feet bgs. Between depths of 30 and 35 feet bgs, the boring encountered partially decomposed sandstone consisting of medium dense clayey sand. Below 35 feet bgs, the boring encountered fresh, very soft siltstone to a depth of 55 feet bgs, the maximum depth explored.

Boring B-2 was drilled near the proposed alignment approximately 200 feet north of the conceptual entry point. The boring encountered 10 feet of stiff silt overlying soft to medium elastic silt to approximately 19 feet bgs. Between depths of 19 and 39 feet bgs, the boring encountered soft to stiff lean clay with varying sand content. Decomposed siltstone consisting of hard sandy silt was encountered between depths of 39 and 43.5 feet bgs. The siltstone became partially decomposed at approximately 43.5 feet bgs and extended to 50 feet bgs, the maximum depth explored.

Groundwater

We observed groundwater at a depth of approximately 10 feet bgs in boring B-1. Groundwater was not observed in boring B-2. We anticipate that groundwater levels will fluctuate due to seasonal variations in precipitation, changes in site utilization or other factors. In addition, groundwater may rise to the ground surface during heavy or prolonged precipitation events or flood events. For the design and construction of an HDD, the groundwater level is not typically a factor affecting feasibility. The hydrostatic drilling fluid pressure typically compensates for high groundwater levels.

LABORATORY TESTING

Percent fines analyses were performed on three samples in general accordance with ASTM D 1140. The percentage passing the U.S. No. 200 sieve is shown on the boring logs at the respective sample depths.

One sieve analysis (grain size determination) was performed in general accordance with ASTM C 136. The results of the sieve analysis were plotted and classified in general accordance with the Unified Soil Classification System (USCS) and are presented in Figure B-4. The percentage passing the U.S. No. 200 sieve is shown on the boring logs at the sample depth.

Atterberg limits tests were performed on three soil samples in general accordance with ASTM D 4318. The results of the Atterberg limits testing are shown in Figures B-5 through B-7.

HDD FEASIBILITY CONCLUSIONS AND RECOMMENDATIONS

Based on our evaluation, the HDD method of construction at the Plum Creek/Bethel Road site is feasible. Because of the elevation difference between the north and south sides of the site, the HDD would likely need to be drilled from south to north in order to reduce the annular drilling fluid pressures during pilot hole operations, thus reducing the potential for hydraulic fracture and inadvertent returns to Plum Creek. A conceptual HDD profile for this site is shown in Figure B-1.

We recommend that a detailed design be completed for this proposed HDD so that the alignment and profile can be further refined. The detailed design should include final alignment and profile design, workspace layouts, analyses of installation and operating stresses, and a hydraulic fracture and inadvertent returns evaluation. The hydraulic fracture and inadvertent returns evaluation will be especially important because of the presence of soft cohesive soils (clay and silt) underlying the site, and the elevation difference between the two sides of the site. The orientation of the conceptual HDD shown in Figure B-1 was developed considering hydraulic fracture and inadvertent returns potential from a qualitative standpoint. A quantitative analysis will be required to determine the final depth of the HDD profile.

The following sections summarize conclusions regarding workspace considerations, subsurface conditions and conceptual HDD geometry.

Workspace Considerations

In our opinion, the entry side of the HDD should be located on the south side of the site and the exit side of the HDD should be located on the north side of the site because drilling the pilot hole from south to north would reduce the annular drilling fluid pressures during drilling and reduce the risk of hydraulic fracture and inadvertent drilling fluid returns surfacing along the alignment or in the creek channel.

The layout and dimensions for the proposed entry/exit side workspaces have not been identified in Figure B-1, but will be added during the detailed design phase. For typical HDD installations of this magnitude, the additional temporary workspace required at the entry and exit points will be approximately 60 feet by 150 feet along the proposed alignment.

Conceptual Entry and Exit Sides

The agricultural fields on both sides of the crossing are suitable for use as temporary workspace from a constructability standpoint. The area is relatively flat and significant grading of the site would not likely be necessary. Access to the workspace could be gained directly from Pacific Highway. There is adequate space available on both sides of the site for stringing and fabricating the product pipe.

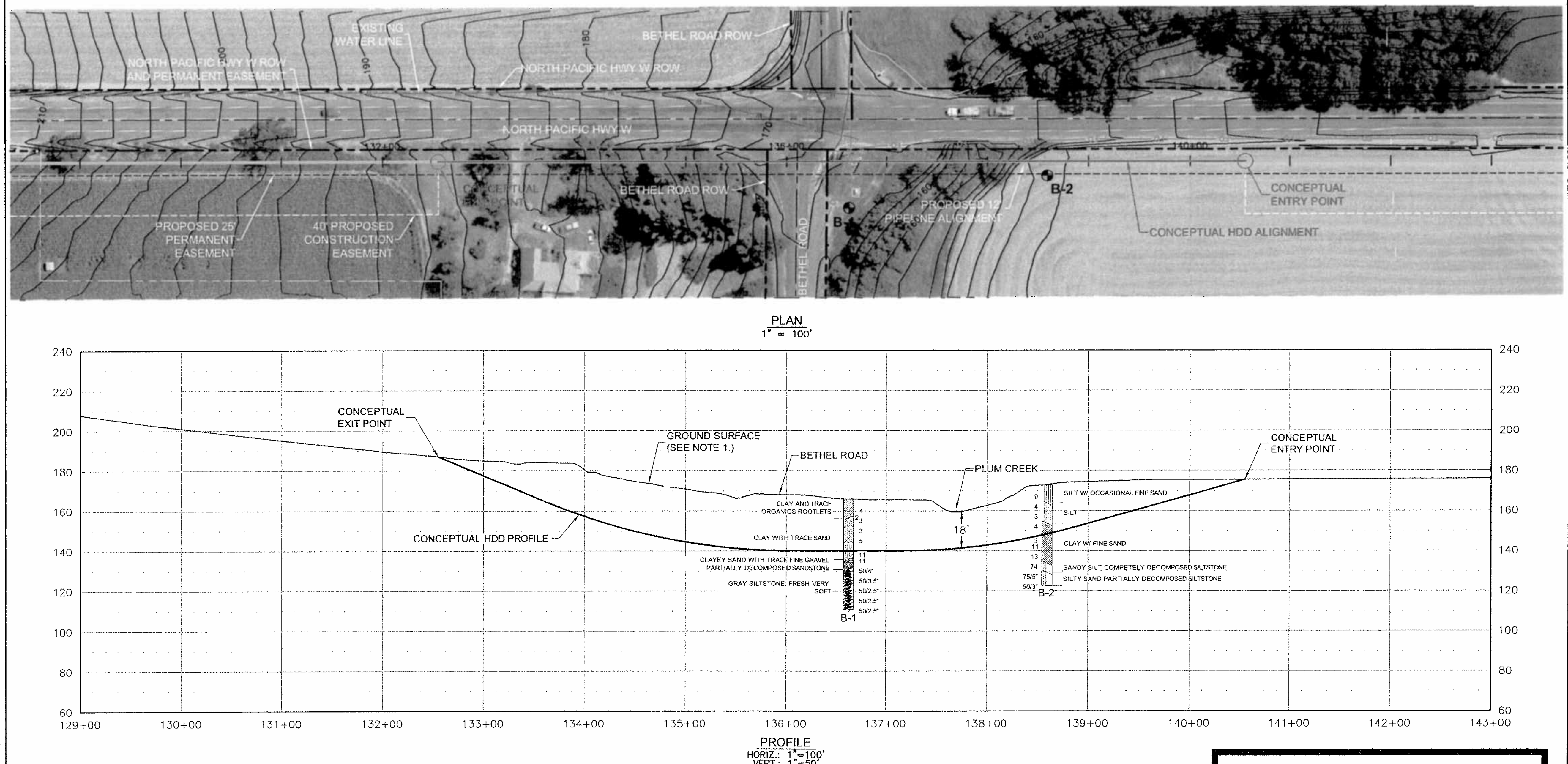
Subsurface Considerations

The soils at the anticipated depths of a potential HDD consist of soft to stiff cohesive soils and medium dense clayey sand. However, decomposed to fresh siltstone bedrock was encountered underlying the clay and silt soils. As currently envisioned, the entire HDD path is entirely within the soft to stiff silt and clay soil units above the more dense decomposed siltstone because the pilot hole could be jetted through the overlying clay soils without the need for a positive displacement mud motor. However, the depth of the HDD profile should be determined during final design based the results of hydraulic fracture and inadvertent returns evaluation.

Conceptual HDD Geometry

The length, depth and orientation of a potential HDD is a function of Northwest Natural's 15-foot minimum depth requirement below stream crossings, the topography along the proposed alignment, the minimum allowable radius of curvature of the product pipe and the subsurface conditions encountered in the borings.

The conceptual Plum Creek HDD is approximately 800 feet long and provides approximately 18 feet of cover below Plum Creek. A setback of the entry point from the south bank of Plum Creek would be required to provide adequate profile depth beneath the creek channel. The actual profile length and depth should be based on additional geometric and hydraulic fracture analyses completed during the detailed design phase of the project.



NOT FOR CONSTRUCTION

Notes:
1. Topographic information based on a site specific topographic survey dated 9/19/09, provided by WH Pacific.
2. The locations of all features shown are approximate.
3. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. can not guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Legend

Boring Location

Soil Classification

SPT (N) Value

Boring ID

Centerline in Existing Easement
Centerline in R.O.W.
Centerline in Private Property

SITE PLAN & PROFILE

PLUM CREEK HDD
POLK COUNTY, OREGON

GEOENGINEERS

FIGURE B-1

BCR : MWJ

W:\Portland\Projects\6\6024107\01\CAD\Plum Creek.dwg\TAB:Figure 2 modified on Apr 13, 2010 - 2:42pm

Drilled	Start 2/17/2010	End 2/17/2010	Total Depth (ft)	55.25
Logged By	BKB	Checked By	MAM	
Driller	Subsurface Technologies	Drilling Method	Mud Rotary	
Surface Elevation (ft) Vertical Datum	165.1	Hammer Data	140 lb Auto	
Drilling Equipment	Diedrich D-50 Truck Mounted			
Easting (X) Northing (Y)	7502460.917 513539.9197	System Datum	NAD83 SP N US FOOT	

Notes: Groundwater elevation based on visual observations.

Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
	10.0	155.1

Elevation (feet)	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
	0							CL	Brown lean clay with orange mottling and trace organics (rootlets) (moist, medium stiff)			
160	5	16	4		1							
155	10	16	3		2	∇		CH	Brown fat clay with trace sand (soft, wet)			AL
150	15	18	3		3				Becomes gray			
145	20	18	5		4				Becomes sandy and medium stiff			%F=77
140	25	18	11		5				Becomes stiff			
135	30	18	11		6			SC	Orange/gray mottled clayey sand with trace fine gravel (medium dense, wet) (partially decomposed Sandstone)			SA, %Gravel=3 %Sand=52 %F=45
	35											

Portland: Date 4/5/10 Path P:\6\6024107\01\GINT JPG 602410701.GPJ DBTemplate/LibTemplate GEOENGINEERS8.GDT/GE8_GEOTECH_STANDARD

Log of Boring B-1

GEOENGINEERS

Project:	Mid Willamette Feeder-Plum Creek
Project Location:	Polk County, OR
Project Number:	6024-107-01Task0300

Figure B-2
Sheet 1 of 2

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
	35		4	50/4"		7			SLST	Gray siltstone: fresh, very soft, finely laminated			
125	40		3.5	50/3.5"		8							
120	45		2.5	50/2.5"		9							
115	50		2.5	50/2.5"		10							
110	55		2.5	50/2.5"		11							

Log of Boring B-1 (continued)

GEOENGINEERS

Project: Mid Willamette Feeder-Plum Creek
Project Location: Polk County, OR
Project Number: 6024-107-01Task0300

Figure B-2
Sheet 2 of 2

Drilled Start 10/28/2009 End 10/28/2009	Total Depth (ft) 50.25	Logged By DWW Checked By MAM	Driller Subsurface Technologies	Drilling Method Mud Rotary
Surface Elevation (ft) Vertical Datum 173.1		Hammer Data 140 lb Auto		Drilling Equipment Diedrich D-50 Truck Mounted
Easting (X) 7502485.401 Northing (Y) 513341.8391		System Datum NAD83 SP N US FOOT		Groundwater: Date Measured / Depth to Water (ft) / Elevation (ft)
Notes:				

FIELD DATA

Elevation (feet)	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
	0							ML	Brown silt with occasional fine sand (stiff, moist)			
170												
	5	15	9		1							
165												
								MH	Brown elastic silt (medium stiff, moist)			
	10	16	4		2							
160												
	15	16	3		3							
									Becomes soft			
155												
								CL	Blue/gray lean clay with fine sand (medium stiff, moist)			
	20	18	4		4					41		AL
150												
	25	18	3		5							
									Becomes soft			
145									Becomes gray and stiff			
	30	18	11		6							
140												
	35											

Log of Boring B-2

GeoEngineers

Project: Mid Willamette Feeder-Plum Creek
Project Location: Polk County, OR
Project Number: 6024-107-01Task0300

Figure B-3
Sheet 1 of 2

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
	35		15	13		7			CL	Becomes sandy	27		AL, %F=55
135													
									ML	Dark gray fine sandy silt (hard, moist) (competely decomposed siltstone)			
	40		15	74		8							
130													
									SLST	Dark gray silty sand with lenses of hard dark gray silt (very dense, moist) (partially decomposed siltstone)			
	45		5	75/5"		9					27		%F=61
125													
	50			50/3"		10							

Log of Boring B-2 (continued)

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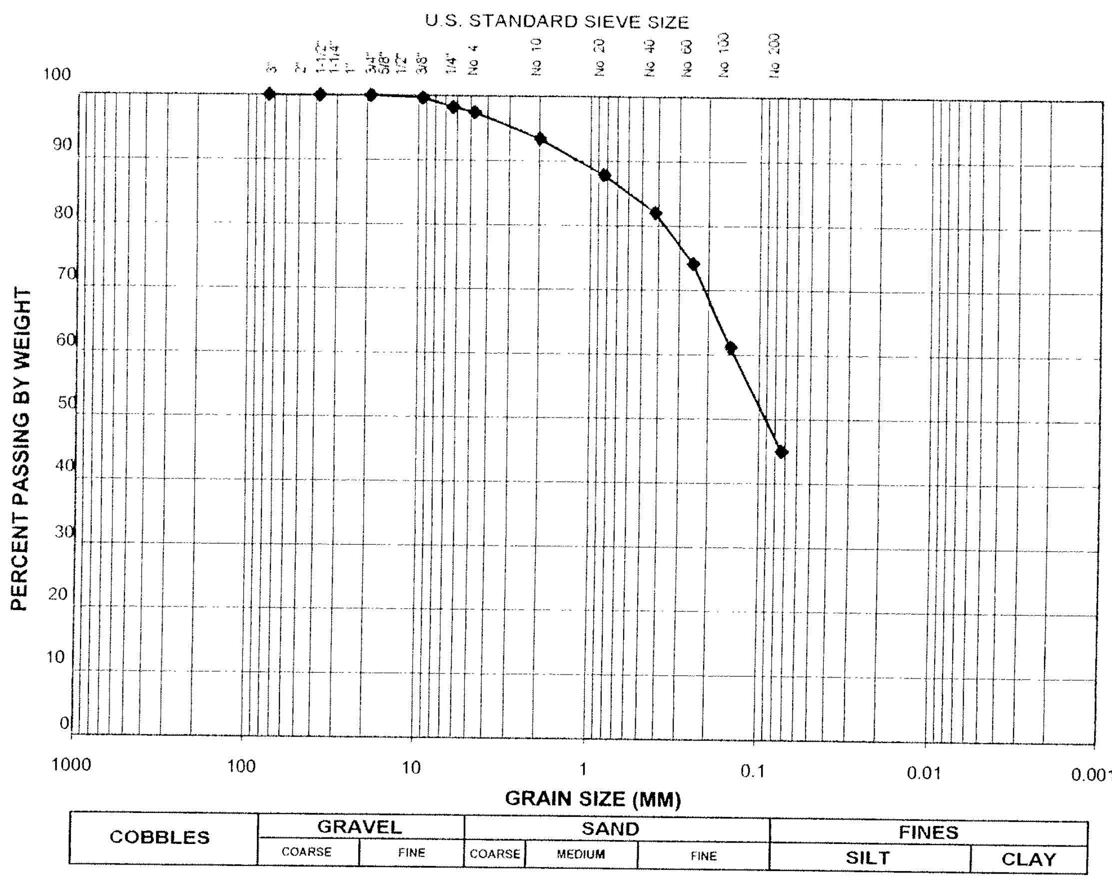
Project: Mid Willamette Feeder-Plum Creek
Project Location: Polk County, OR
Project Number: 6024-107-01Task0300

Figure B-3
Sheet 2 of 2

Project:	MWF-Plum Creek	Lab No.	10-0009
Project No.	6024-107-01 Task 0300	Date:	02/22/10
Boring/TP No.	B-1	Tested By:	KAR
Sample No./Depth:	S-6 @ 30'	Checked By:	BCR
USCS Classification:	SC	PA/PM:	BCR



Nat. Water Content, %	Gravel Total, %	Sand Total, %	Fines Total, %	USCS	Description
25.1	2.6	52.4	45.1	SC	Clayey sand

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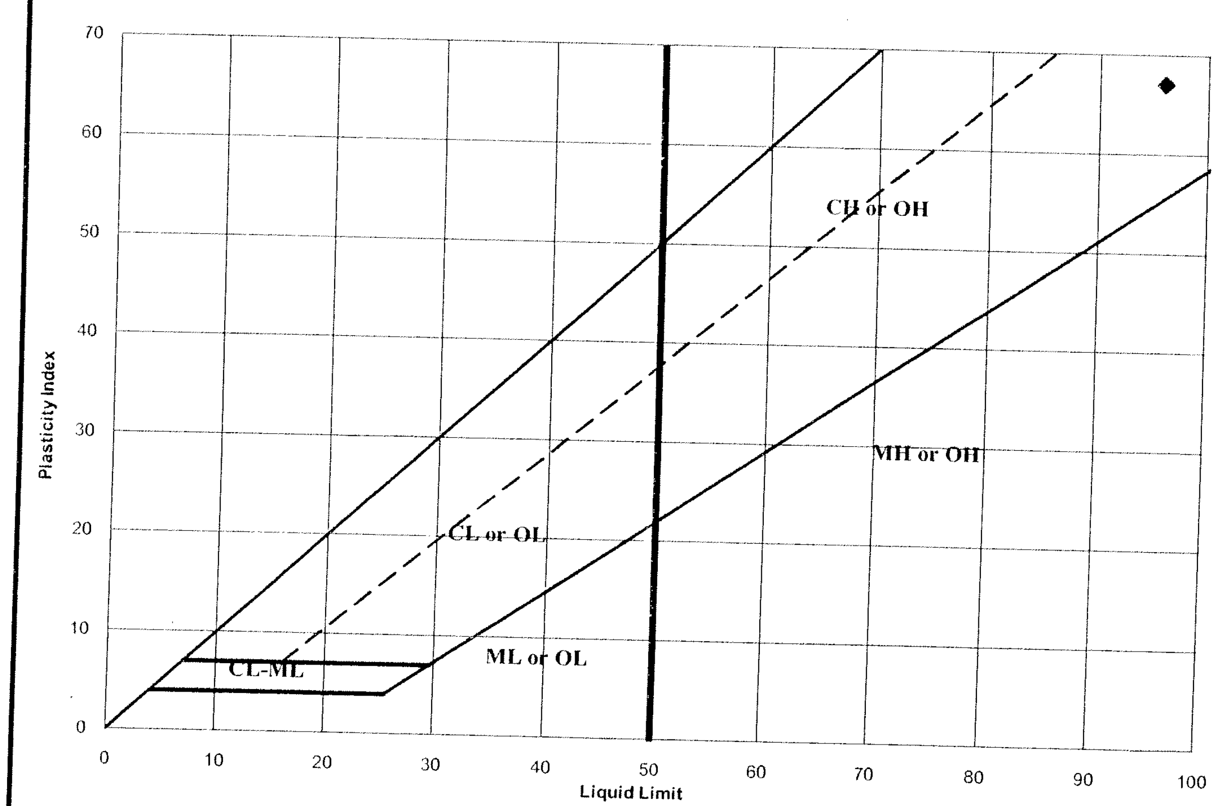
Grain Size Analysis ASTM C 136

Figure B-4

Project: MWF-Plum Creek	**Lab No.** 10-0009
Project No. 6024-107-00 Task 0300	**Date:** 02/22/10
Boring/TP No. B-1	**Tested By:** KAR
Sample No./Depth: S-2 @ 10'	**Checked By:** BCR
USCS Classification: CH	**PA/PM:** BCR



Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Description
43.4%	96	29	67	CH	Fat Clay

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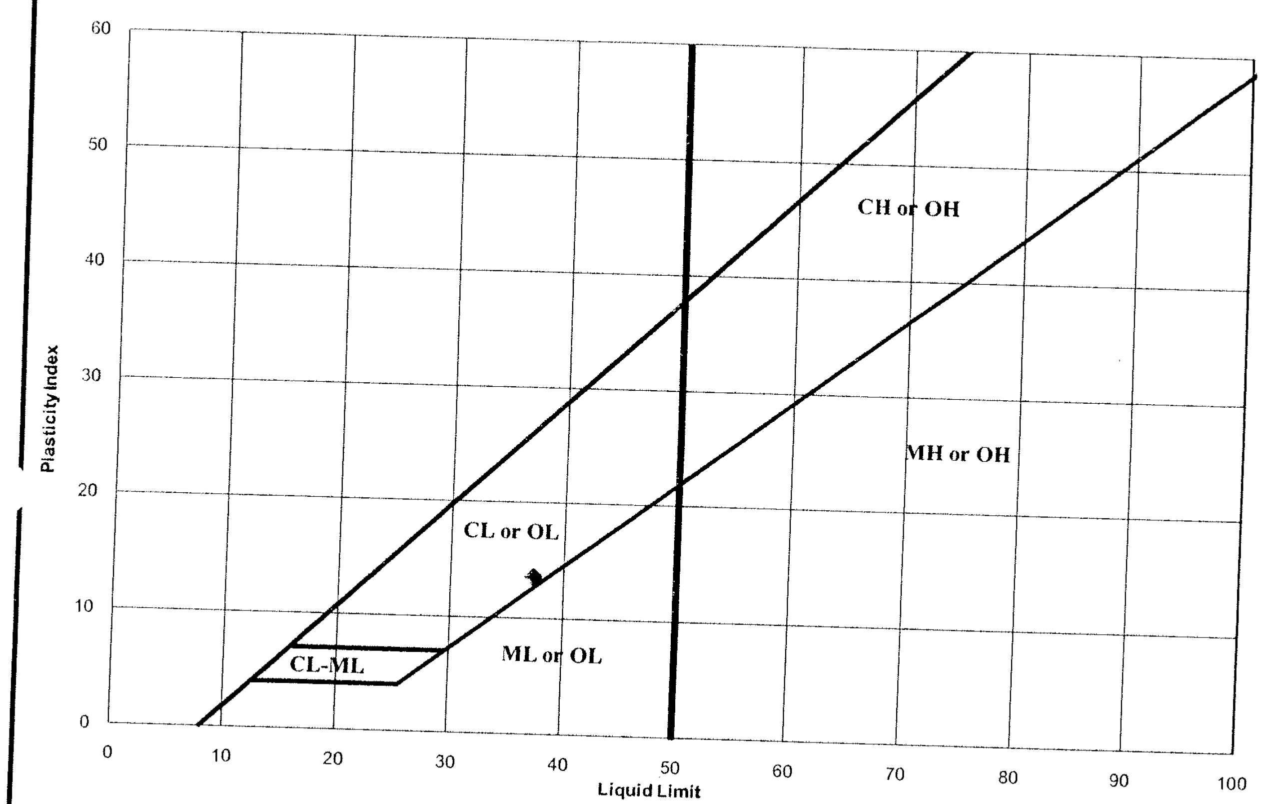
Atterberg Limits ASTM D 4318

Figure B-5

Project:	Mid Willamette Feeder - Plum Creek	**Lab No.**	09-0049
Project No.	6024-107-01	**Date:**	11/02/09
Boring/TP No.	B-2	**Tested By:**	KAR/BKB
Sample No./Depth:	S-4/20'	**Checked By:**	KAR
Description:	CL	**PA/PM:**	MAM/BCR



Moisture Content %	Liquid Limit	Plastic Limit	Plasticity Index	Classification	Description
40.6%	37	24	14	CL	Lean Clay

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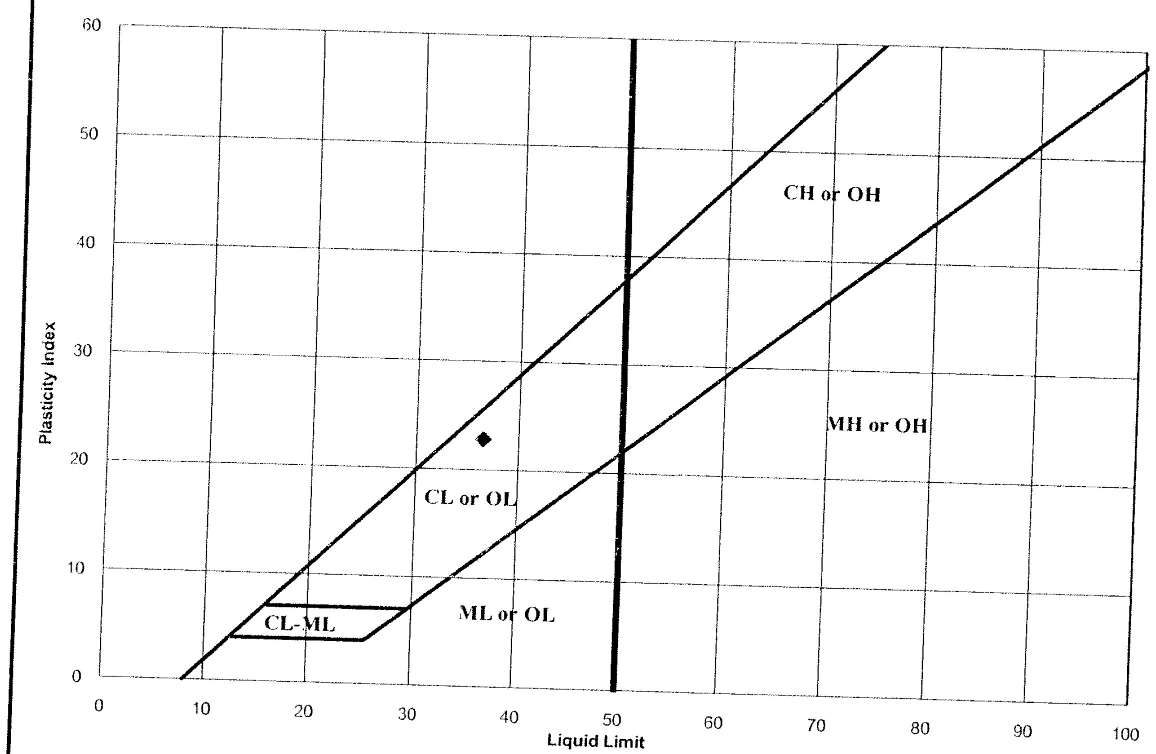
Atterberg Limits ASTM D 4318

Figure B-6

Project:	Mid Willamette Feeder-Plum Creek	**Lab No.**	09-0049
Project No.	6024-107-01-0300	**Date:**	11/02/09
Boring/TP No.	B-2	**Tested By:**	BKB
Sample No./Depth:	S-7/35'	**Checked By:**	KAR
Description:	CL	**PA/PM:**	MAM/BCR



Moisture Content %	Liquid Limit	Plastic Limit	Plasticity Index	Classification	Description
27.3%	37	14	23	CL	Lean Clay

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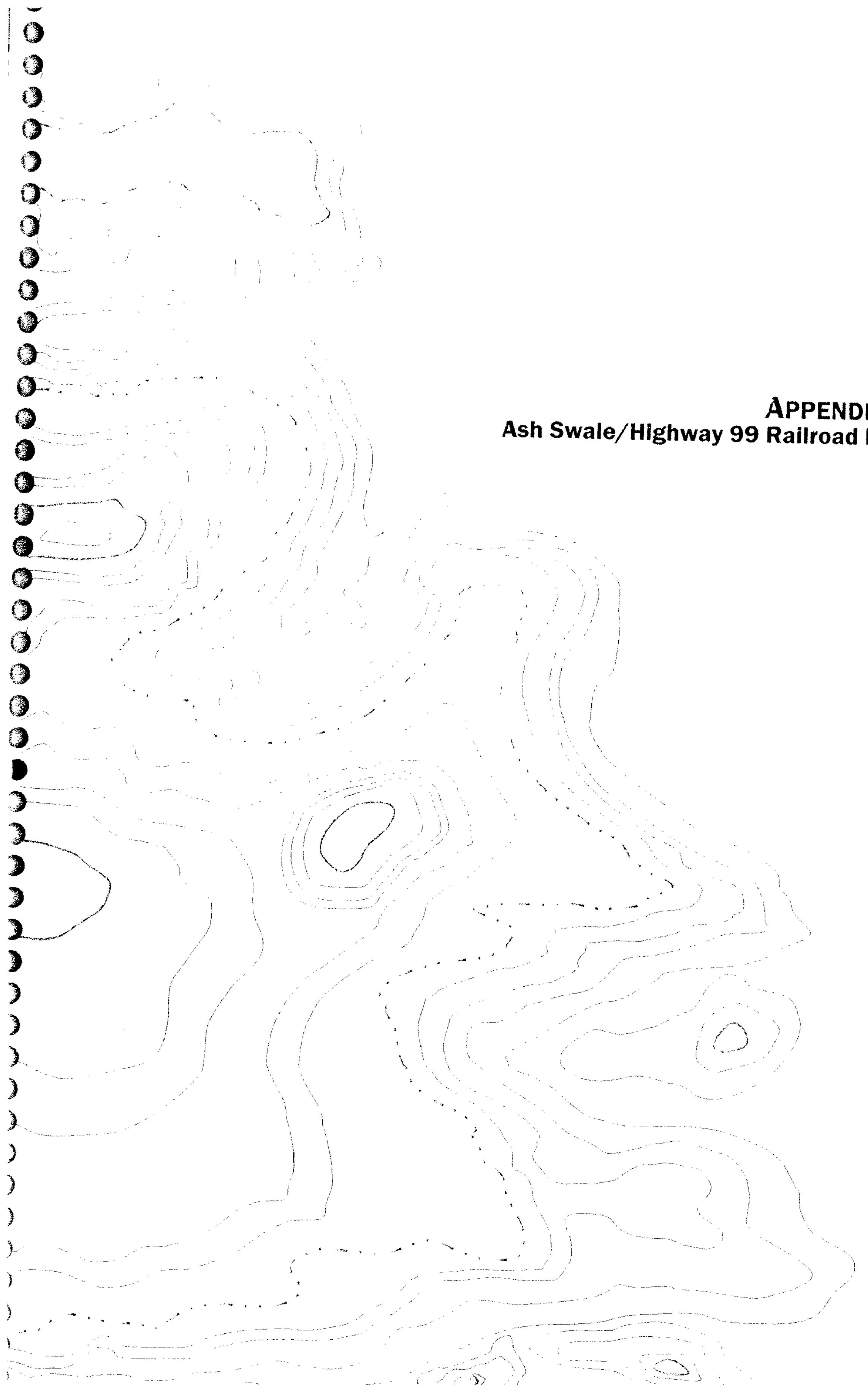
Atterberg Limits ASTM D 4318

Figure B-7



APPENDIX C
Ash Swale/Highway 99 Railroad HDD

APPENDIX C
ASH SWALE/HIGHWAY 99 RAILROAD HDD

The Ash Swale and Highway 99 Railroad HDD site is located approximately 7.5 miles south of Amity, Oregon. The proposed pipeline alignment at the site is oriented northeast to southwest and parallel to the east side of Pacific Highway. At this site, a portion of the proposed pipeline alignment is located within existing Oregon Department of Transportation (ODOT) right-of-way (ROW) and a portion is located on private property outside the ODOT ROW. An existing railroad ROW crosses the proposed pipeline alignment as shown in Figure C-1. The proposed HDD crosses beneath the railroad ROW, a small wetland area and Ash Swale. An HDD of approximately 1,260 feet in length is required at this site.

SITE DESCRIPTION

Surface Conditions

The ground surface along the alignment generally slopes gently downward from northeast to southwest with the base of Ash Swale being the lowest point along the alignment. Figure C-1 shows a cross sectional view of the site topography along the proposed alignment.

The area along the proposed pipeline alignment north of the railroad crossing is currently vacant land that slopes up toward the northeast. It appears that grading activities have recently occurred on the hillside east of the ODOT ROW. Within about 500 feet north of the railroad ROW, the surface along the alignment is vegetated with grasses and sparse trees. Between the pipeline alignment and Pacific Highway, the ground surface slopes down to the highway at an approximate gradient of 3H:1V (Horizontal to Vertical). This slope gradient increases to the north, to a maximum gradient of approximately 1.5H:1V.

The ground surface along the ODOT ROW south of the railroad crossing is relatively flat. A wetland is located between the railroad ROW and Ash Swale. The proposed pipeline ROW south of Ash Swale is bounded by an agricultural field to the east and Pacific Highway on the west. The area is generally vegetated with grasses and small trees lining the east edge of the ROW.

Subsurface Conditions

We explored subsurface conditions at the site between October 29 and November 2, 2009 by drilling two borings to maximum depths of up to 50 feet below ground surface (bgs) at the approximate locations shown in Figure C-1. In general, the borings encountered medium stiff to very stiff clay overlying basalt, decomposed siltstone and interbedded siltstone and sandstone bedrock. Subsurface conditions encountered in the borings are consistent with the geologic mapping for the area (Allison, 1953, O'Connor et al, 2001). Logs of the borings are presented as Figures C-2 and C-3.

Boring B-1 was drilled along the south edge of a gravel access road approximately 150 feet northeast of the railroad ROW. The boring encountered medium stiff to very stiff fat clay with varying sand content from the ground surface to a depth of 20.5 feet bgs. Between depths of 20.5 and 24 feet bgs, the boring encountered very dense clayey sand. Basalt bedrock was encountered between depths of 24 and 26 feet bgs. The Rock Quality Designation (RQD) value of the basalt was 78 percent. Below 26 feet bgs, the boring encountered interbedded units of fresh siltstone and fine grained sandstone with thin beds of soft claystone. RQD values of the siltstone and sandstone ranged between 60 and 92 percent.

Boring B-2 was drilled adjacent a gravel access road off of Pacific Highway near the south end of the proposed HDD. The boring encountered medium stiff to very stiff fat clay with varying sand content from the ground surface to a depth of approximately 13 feet bgs. Decomposed siltstone consisting of hard sandy fat clay was observed between depths of 13 and 42 feet bgs. Below 42 feet bgs, the boring encountered decomposed siltstone consisting of very dense clayey fine sand to 44 feet bgs, the maximum depth explored.

Groundwater

Groundwater was not observed in boring B-1. We observed groundwater at a depth of approximately 11 feet bgs in boring B-2. We expect that groundwater levels can rise to the ground surface through the southern portion of the site near Ash Swale after heavy precipitation events which might result in flooding conditions. We anticipate that groundwater levels will fluctuate due to seasonal variations in precipitation, changes in site utilization or other factors. For the design and construction of an HDD, the groundwater level is not typically a factor affecting feasibility. The hydrostatic drilling fluid pressure typically compensates for high groundwater levels.

LABORATORY TESTING

Percent fines analyses were performed on three samples collected from the borings in general accordance with ASTM D 1140. The percentage passing the U.S. No. 200 sieve is shown on the boring logs at the respective sample depths.

Atterberg limits tests were performed on two soil samples. The tests were used to classify the soil as well as to evaluate engineering index properties. The liquid limit and the plastic limit were estimated through a procedure performed in general accordance with ASTM D 4318. The results of the Atterberg limits testing are shown in Figures C-4 and C-5.

An unconfined compression (UC) test was performed on one intact rock core sample of basalt obtained from boring B-1 in general accordance with ASTM D 2938. The test results are presented on the boring log at the depth where the sample was obtained. A UC test was attempted on a sample of the siltstone obtained from boring B-1, however the rock was not competent enough to trim for the testing.

HDD FEASIBILITY CONCLUSIONS AND RECOMMENDATIONS

Based on our HDD evaluation, the HDD method of construction at the Ash Swale and Highway 99 Railroad HDD site is feasible. A horizontal curve in the HDD alignment will be required to follow the general alignment of the planned pipeline ROW. However, the permanent easement shown in Figure C-1 would need to be modified to follow the conceptual HDD alignment. If encountered, bedrock underlying the site could potentially be problematic during construction.

We recommend that a detailed design be completed for this proposed HDD so that the alignment and profile can be further refined. The detailed design should include final alignment and profile design, workspace layouts, analyses of installation and operating stresses, and a hydraulic fracture and inadvertent returns evaluation.

The following sections summarize conclusions regarding workspace considerations, subsurface conditions and conceptual HDD geometry.

Workspace Considerations

In our opinion, the entry side of the HDD should be located on the north side of the site and the exit side of the HDD should be located on the south side of the site because of the suitable area for stringing and fabricating the product pipe south of the site.

The layout and dimensions for the proposed entry/exit side workspaces have not been identified in Figure C-1, but will be added during the detailed design phase. For typical HDD installations of this magnitude, the additional temporary workspace required at the entry and exit points will be approximately 60 feet by 150 feet along the proposed alignment. The following paragraphs describe the conceptual entry and exit sides of the HDD.

Conceptual Entry Side (North Side)

The entry workspace should be located along the ODOT ROW north of the railroad crossing and north of the gravel access road off of Pacific Highway where boring B-1 was drilled. Adequate temporary workspace should be acquired along the ODOT ROW and in the open area to the east of the ROW. Some grading would be required to provide a level workspace area for the drilling equipment. Access to the entry workspace could be via the existing access road off of Pacific Highway.

Conceptual Exit Side (South Side)

The exit workspace should be located along the proposed alignment south of the existing dirt access road off of Pacific Highway near where boring B-2 was completed. Adequate temporary workspace is available adjacent to the ODOT ROW for exit side operations and stringing and fabrication of the product pipe. The exit workspace could be accessed from the north via the existing field road off of Pacific Highway while access to the product pipe stringing and fabrication workspace could be accessed from the south directly off of Pacific Highway.

Subsurface Considerations

A thin layer of hard basalt bedrock was encountered between depths of approximately 24 to 26 feet bgs in boring B-1. Relatively soft siltstone was encountered below the basalt in boring B-1 and at a depth of approximately 35 feet bgs in boring B-2. The variability of the bedrock surface at the site will have to be considered during the detailed design of this HDD.

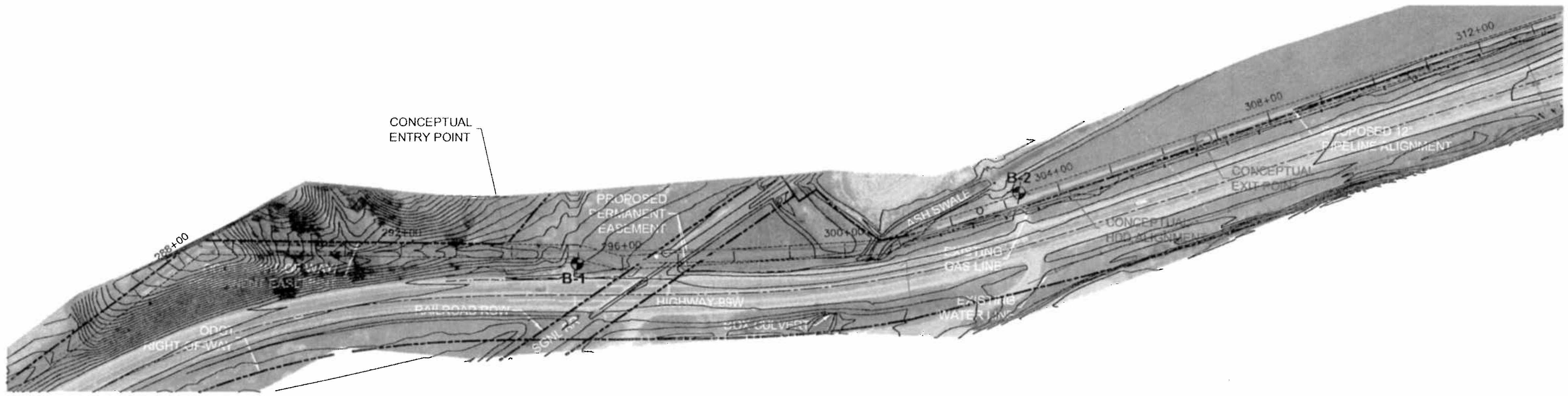
In order to maintain adequate depth of cover below the railroad and Ash Swale, the conceptual bottom tangent is located below the bedrock elevation encountered in boring B-1. Therefore, it is likely that at least a portion of the drill path will encounter bedrock. In general, the rock quality of the bedrock core samples recovered from boring B-1 ranged from good to excellent with RQD values ranging from 60 to 92 percent. The unconfined compressive strength of one sample of basalt bedrock was approximately

36,000 pounds per square inch (psi). Based on field testing, and our experience with similar rock in the area, the siltstone and sandstone underlying the site likely has a lower strength than the basalt sample we tested. In either case, an HDD that encounters the basalt or siltstone bedrock would require rock tools to complete pilot hole and reaming operations.

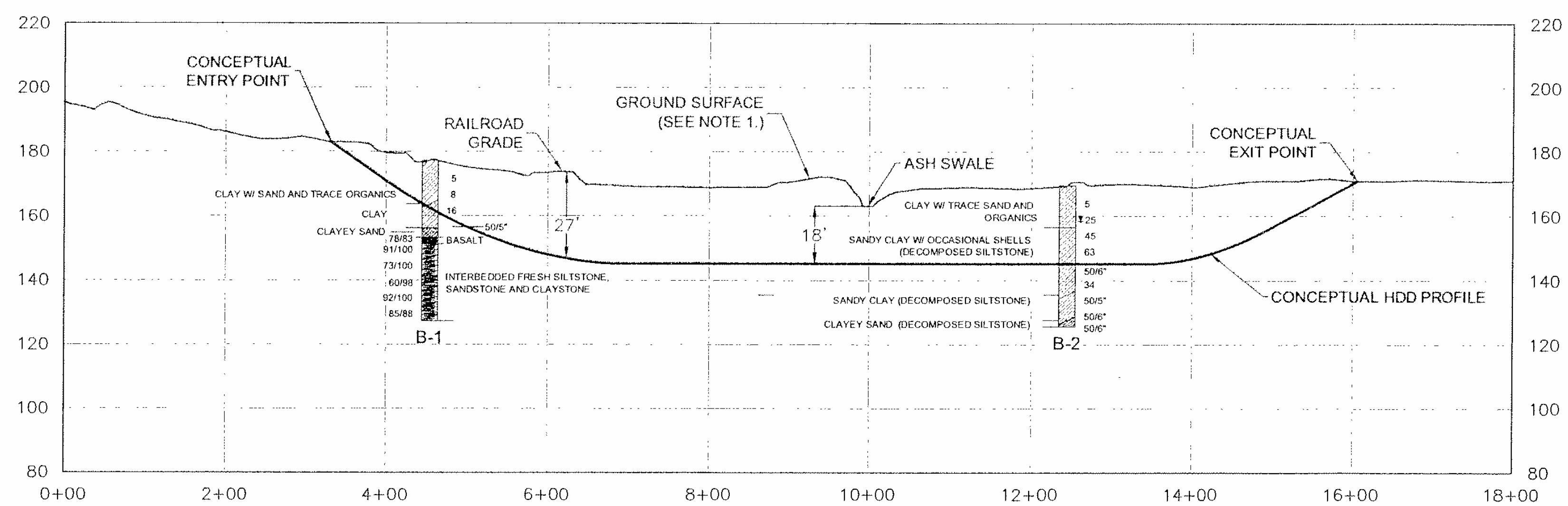
Conceptual HDD Geometry

The length, depth and orientation of a potential HDD is a function of Northwest Natural's 15-foot minimum depth requirement below waterbodies, the topography along the proposed alignment, the minimum allowable radius of curvature of the product pipe and the subsurface conditions encountered in the borings.

A conceptual HDD at this site would be approximately 1,260-foot long with a depth of approximately 18 feet below Ash Swale. A setback of the entry point from the railroad ROW would be required to provide adequate profile depth beneath the railroad tracks. The actual profile length and depth should be based on additional geometric and hydraulic fracture analyses completed during the detailed design phase of the project.



PLAN
1" = 200'



PROFILE
HORIZ.: 1"=200'
VERT.: 1"=50'

Notes:
1. Topographic information based on a site specific topographic survey dated 9/19/09, provided by WH Pacific.
2. The locations of all features shown are approximate.
3. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. can not guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Legend
- Boring Location
- Soil Classification
- SPT (N) Value
- Boring ID
- Centerline in Existing Easement
- Centerline in ODOT R.O.W.
- Centerline in Private Property

NOT FOR CONSTRUCTION

SITE PLAN & PROFILE

ASH SWALE/HIGHWAY 99 RAILROAD HDD
POLK COUNTY, OREGON

GEOENGINEERS

FIGURE C-1

W:\Portland\Projects\6\6024107\01\CAD\HWY99 RR and Ash Swale.dwg\TAB:Figure 2 modified on Apr 13, 2010 - 3:40pm

BCR : BTL

Drilled	Start 10/30/2009	End 11/2/2009	Total Depth (ft) 50	Logged By DWW Checked By MAM	Driller Subsurface Technologies	Drilling Method	Mud Rotary and NQ-3 Rock Coring
Surface Elevation (ft) Vertical Datum	175.8		Hammer Data	140 lb Auto		Drilling Equipment	Diedrich D-50 Truck Mounted
Easting (X) Northing (Y)	7501578.093 497928.6052		System Datum	NAD83 SP N US FOOT		Groundwater	Date Measured / Depth to Water (ft) / Elevation (ft)
Notes:							

Elevation (feet)	Depth (feet)	FIELD DATA: Interval / Recovered (in)	Sample/Run	Blows/foot	RQD %	Water Level	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
175	0						CH	Dark gray/brown fat clay with sand and trace organics (medium stiff, moist)			
170	5	14	1	5					37		AL
165	10	14	2	8				Becomes stiff			
								Becomes blue/green and very stiff			
160	15	14	3	16							
155	20	12	4	50/5"				Becomes sandy	37		%F=62
							SC	Light gray and green/blue clayey sand (very dense, moist)			
		15/18	R1		78		BSLT	Gray to dark gray basalt: fresh, very hard, moderately close fractured			UC=36,318psi Mohs hardness = 6
150	25	54/54	R2		91		SLST	Gray to dark gray siltstone: fresh, soft, moderately close fractured			Mohs hardness = 4
145	30	60/60	R3		73			Fractured zone 31-32'			
	35										

Log of Boring B-1

GEOENGINEERS

Project: Mid Willamette Feeder-Highway 99/ Ash Swale RR
Project Location: Polk County, OR
Project Number: 6024-107-01Task0500

Figure C-2
Sheet 1 of 2

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	Recovered (in)	Sample/Run	Blows/foot	RQD %	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
140	35		59/60	R4		60			SLST	Gray to dark gray siltstone: fresh, soft, moderately close fractured			
									SSS	Dark gray sandstone: fresh, soft moderately close fractured			Mohs hardness - 4
									SLST	Dark gray siltstone: fresh, soft, moderately close fractures			Mohs hardness - 1-2
									CLS	Dark gray clay stone: fresh, soft, moderately close fractured			
135	40		60/60	R5		92			SSS	Dark gray sandstone: fresh, medium hard, moderately close fractured Becomes soft			
130	45		53/60	R6		85							
									SLST	Dark gray siltstone: fresh, soft, moderately close fractured			
	50												

Portland: Date:4/5/10 Path:P:\6\6024107\01\GINT JPG 602410701 GPJ DBTemplate/LibTemplate:GEOENGINEERS8 GDT/GEI8_GEOTECH_SOIL_ROCK

Log of Boring B-1 (continued)

GeoEngineers

Project:	Mid Willamette Feeder-Highway 99/ Ash Swale RR
Project Location:	Polk County, OR
Project Number:	6024-107-01Task0500

Figure C-2
Sheet 2 of 2

Drilled Start 10/29/2009 End 10/30/2009	Total Depth (ft) 44	Logged By DWW Checked By MAM	Driller Subsurface Technologies	Drilling Method Mud Rotary and HSA
Surface Elevation (ft) Vertical Datum 168.9	Hammer Data 140 lb Auto		Drilling Equipment Diedrich D-50 Truck Mounted	
Easting (X) 7501170.962 Northing (Y) 497239.0393	System Datum NAD83 SP N US FOOT		Groundwater: Date Measured / Depth to Water (ft) 11 feet / Elevation (ft)	
Notes:				

Elevation (feet)	Depth (feet)	Recovered (in)	Blows/foot	Sample Name Testing	Water Level	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
	0					CH	Dark gray fat clay with trace fine sand and organics (medium stiff, moist)			
165	5	18	5	1				42		AL
160							Becomes sandy, very stiff and tan/gray with orange mottling			
	10		25	2	▼			31		%F=77
155						CH	Dark gray fine sandy fat clay with occasional shells (hard, moist) (decomposed siltstone)			
	15	14	45	3				27		%F=73
150	20	16	63	4			No shells			
145	25	11.5	50/6"	5						
140	30	14	34	6			Becomes blue/green/gray with calcite deposits			
135	35					CL	See sheet 2 for description			

Log of Boring B-2

GeoEngineers

Project:	Mid Willamette Feeder-Highway 99/ Ash Swale RR
Project Location:	Polk County, OR
Project Number:	6024-107-01Task0500

Figure C-3
Sheet 1 of 2

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
	35		11	50/5"		7			CL	Dark gray sandy lean clay (hard, moist) (decomposed siltstone)			
130													
	40		10	50/6"		8							
									SC	Grades to gray clayey fine sand (very dense, moist) (decomposed siltstone)			
125				50/6"		9							

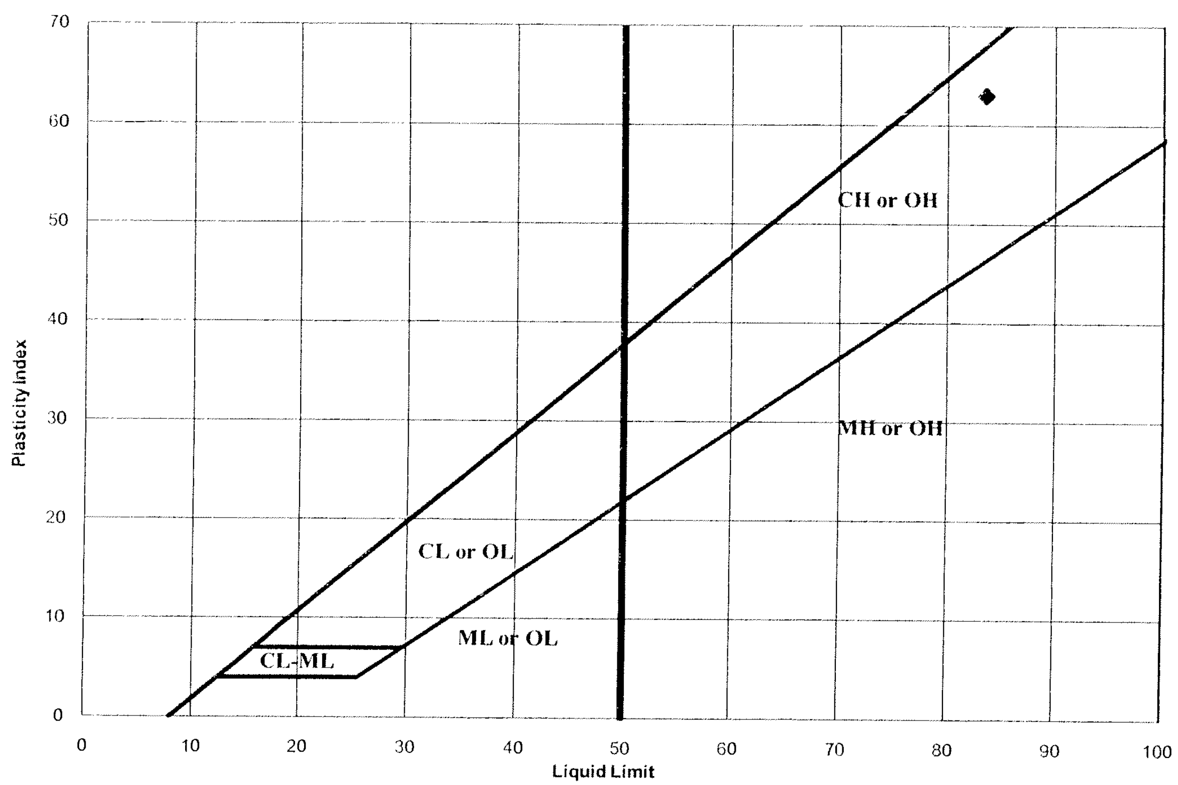
Log of Boring B-2 (continued)

GEOENGINEERS

Project: Mid Willamette Feeder-Highway 99/ Ash Swale RR
Project Location: Polk County, OR
Project Number: 6024-107-01Task0500

Figure C-3
Sheet 2 of 2

Project:	Mid-Willamette - Ash Swale/Hwy 99 RR Xing	Lab No.	09-0051
Project No.	6024-107-01-0500	Date:	11/03/09
Boring/TP No.	B-1	Tested By:	BKB/KAR
Sample No./Depth:	S-1/5'	Checked By:	KAR
Description:	CH	PA/PM:	MAM/BCR



Moisture Content %	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Description
37.2%	84	21	63	CH	Fat Clay

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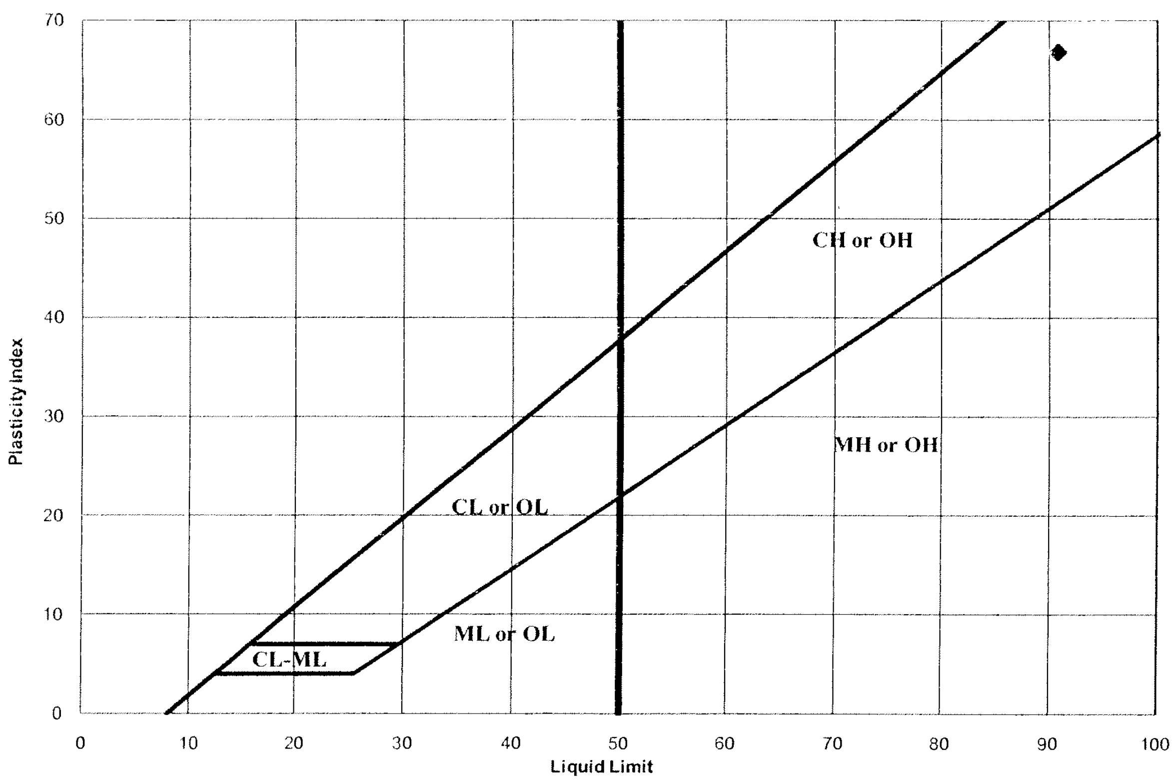
Atterberg Limits ASTM D 4318

Figure C-4

Project:	Mid-Willamette - Ash Swale/Hwy 99 RR Xing	**Lab No.**	09-0051
Project No.	6024-107-01-0500	**Date:**	11/03/09
Boring/TP No.	B-2	**Tested By:**	BKB/KAR
Sample No./Depth:	S-1/5'	**Checked By:**	KAR
Description:	CH	**PA/PM:**	MAM/BCR



Moisture Content %	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Description
41.7%	91	24	67	CH	Fat Clay

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Atterberg Limits ASTM D 4318

Figure C-5

APPENDIX D
Crowley Creek HDD

APPENDIX D
CROWLEY CREEK HDD

The Crowley Creek HDD site is located approximately 3.25 miles north of Rickreal, Oregon. The proposed pipeline alignment at the site is oriented approximately north-south and parallel to the east side of Pacific Highway 99. The proposed pipeline alignment is located approximately 12.5 feet inside the existing Oregon Department of Transportation (ODOT) right-of-way (ROW). The conceptual HDD alignment crosses beneath Crowley Road and Crowley Creek. As the proposed HDD alignment crosses under Crowley Creek, two culverts convey the flow under Pacific Highway. Depending on the actual invert elevation of the culvert, the proposed HDD should be approximately 620 feet in length at this site.

SITE DESCRIPTION

Surface Conditions

The area along the proposed pipeline alignment north of Crowley Road is agricultural land that slopes gently upwards toward the north. The Pacific Highway embankment along the west side of the pipeline alignment slopes up to the highway at an approximate gradient of 3H:1V (Horizontal to Vertical). The agricultural land east of the ODOT ROW is relatively flat. Two, 50-foot-wide Bonneville Power Administration (BPA) power line easements cross the pipeline alignment north of the intersection of Crowley Road and Pacific Highway.

South of Crowley Road, the proposed pipeline alignment crosses Crowley Creek and follows the base of the Pacific Highway embankment toward the south. Here, the highway embankment also slopes up along the west side of the pipeline alignment at an approximate gradient of 3H:1V. The open pasture east of the ODOT ROW is relatively flat. At the pipeline crossing, the Crowley Creek channel is oriented nearly parallel to Crowley Road and roughly perpendicular to Pacific Highway. An overhead power line follows the east side of the ODOT ROW south of Crowley Road.

Subsurface Conditions

We explored subsurface conditions at the site on November 3, 2009 by drilling two borings to maximum depths of 45.5 feet below ground surface (bgs) at the approximate locations shown in Figure D-1. In general, the borings encountered medium stiff to stiff clays with varying sand content overlying partially and completely decomposed siltstone, which is consistent with the geologic mapping for the area (Allison, 1953, O'Connor et al, 2001). Logs of the borings are presented as Figures D-2 and D-3.

Boring B-1 was drilled in the ODOT ROW between Crowley Road and Crowley Creek. The boring encountered 25 feet of medium stiff to stiff lean clay with varying sand content overlying completely decomposed siltstone consisting of hard sandy fat clay to 30 feet bgs. Below 30 feet bgs the boring encountered moderately weathered, soft siltstone to 45.5 feet bgs, the maximum depth explored.

Boring B-2 was completed within the ODOT ROW south of Crowley Creek. This boring encountered 29 feet of medium stiff to very stiff lean clay with varying sand content overlying moderately weathered, soft siltstone to a depth of 45 feet bgs, the maximum depth explored.

Groundwater

The depth to groundwater was not observed in either of the borings due to the use of drilling fluid. Samples obtained from the borings did not appear visually wet; therefore, an approximate groundwater level could not be determined by visual observation of the samples. Based on our research of well logs in the area (OWRD, 2009), we expect that groundwater levels can rise to within a few feet of the ground surface at the site during heavy prolonged precipitation or flooding events. We anticipate that groundwater levels will fluctuate due to seasonal variations in precipitation, changes in site utilization or other factors. For the design and construction of an HDD, the groundwater level is not typically a factor affecting feasibility. The hydrostatic drilling fluid pressure typically compensates for high groundwater levels.

LABORATORY TESTING

We performed two percent fines analyses in general accordance with ASTM D 1140 on two samples collected from the borings. The percentage passing the U.S. No. 200 sieve is shown on the boring logs at the respective sample depths.

We performed Atterberg limits tests in general accordance with ASTM D 4318 on two samples collected from the borings. The tests were used to classify the soil as well as to evaluate index properties. The results of the Atterberg limits testing are shown in Figures D-4 and D-5.

HDD FEASIBILITY CONCLUSIONS AND RECOMMENDATIONS

Based on our HDD evaluation, the HDD method of construction at the Crowley Creek site is feasible. Additional temporary workspace would be required in the private agricultural fields east of Pacific Highway in order to provide adequate workspaces during construction. Some minor grading of the toe of the fill slope may be required during construction to make the tie-in between the HDD and the open trench section of the pipeline south of Crowley Creek.

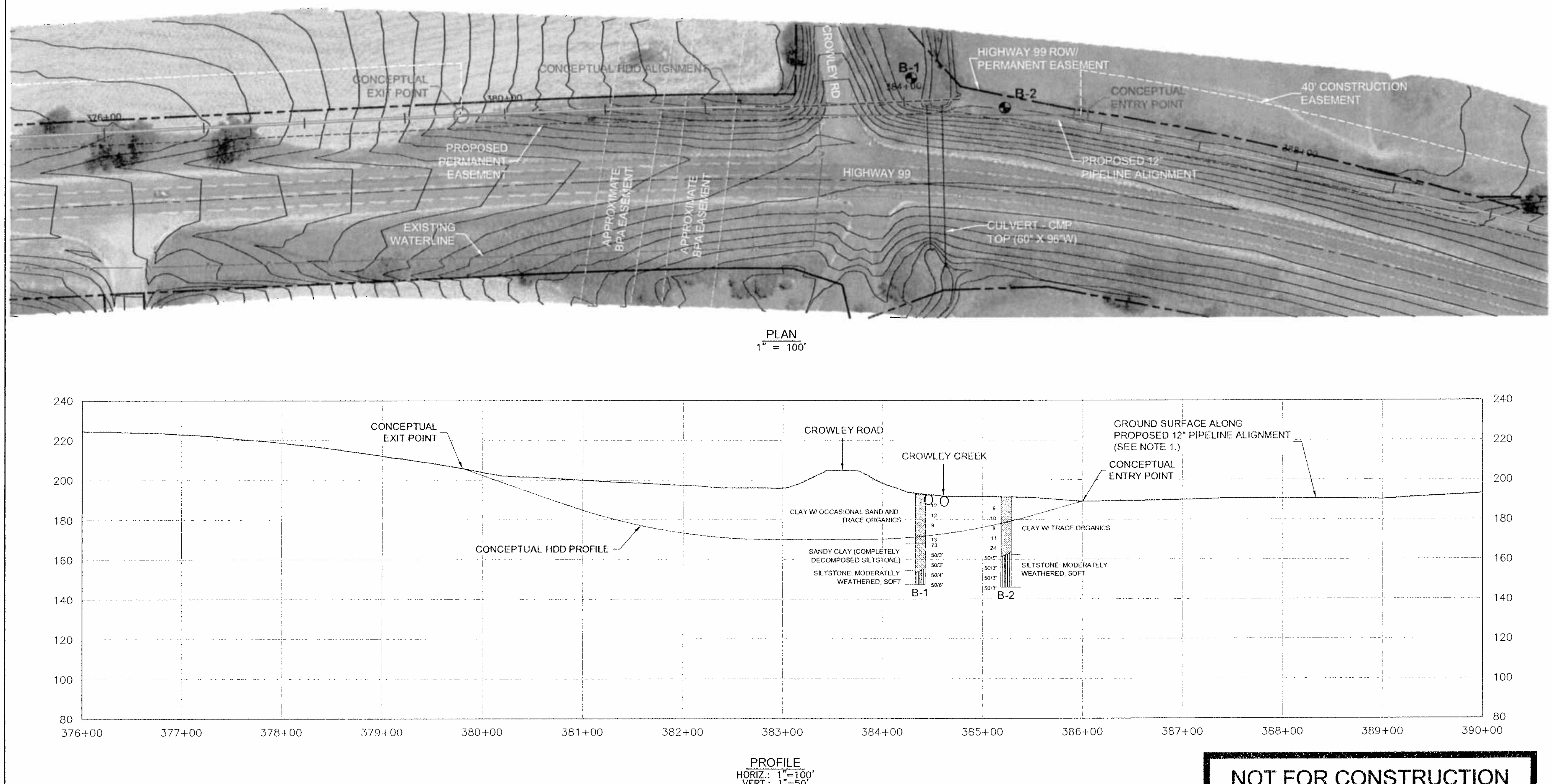
We recommend that a detailed design be completed for this proposed HDD so that the alignment and profile can be further refined. Prior to the detailed design being completed, we recommend an additional boring be completed near Station 381+00, 25 feet east of the proposed alignment. The detailed design should include final alignment and profile design, workspace layouts, analyses of installation and operating stresses, and a hydraulic fracture and inadvertent returns evaluation. The design should also consider how the bedrock encountered in our exploratory borings may impact HDD construction methods.

The following sections summarize conclusions regarding workspace considerations, subsurface conditions and conceptual HDD geometry.

Workspace Considerations

In our opinion, the entry side of the HDD should be located on the south side of the site and the exit side of the HDD should be located on the north side of the site because access to the north side of the site is better for stringing and fabricating the product pipe. Also, the power line that parallels the proposed

setback of the entry point from the south edge of the culverts would be required to provide adequate profile depth beneath the culverts. The actual profile length and depth should be based on additional geometric and hydraulic fracture analyses completed during the detailed design phase of the project.



BCR : MWJ

W:\Portland\Projects\6\6024107\01\CAD\Crowley Creek.dwg\TAB:Figure 2 modified on Apr 13, 2010 - 10:45am

Notes:

1. Topographic information based on a site specific topographic survey dated 9/19/09, provided by WH Pacific.
2. The locations of all features shown are approximate.
3. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. can not guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Legend

Boring Location

Soil Classification

SPT (N) Value

Boring ID

Centerline in Existing Easement

Centerline in ODOT R.O.W.

Centerline in Private Property

NOT FOR CONSTRUCTION

SITE PLAN & PROFILE

CROWLEY CREEK HDD
POLK COUNTY, OREGON

GEOENGINEERS

FIGURE D-1

Drilled	Start 11/3/2009	End 11/3/2009	Total Depth (ft) 45.5	Logged By DWW Checked By MAM	Driller Subsurface Technologies	Drilling Method Mud Rotary

Surface Elevation (ft) Vertical Datum	189.4	Hammer Data	140 lb Auto	Drilling Equipment	Diedrich D-50 Truck Mounted
Easting (X) Northing (Y)	7498679.971 489616.5156	System Datum	NAD83 SP N US FOOT	Groundwater	Date Measured / Depth to Water (ft) / Elevation (ft)
Notes:					

Elevation (feet)	Depth (feet)	FIELD DATA: Interval / Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
	0							CL	Dark gray/brown lean clay with occasional fine sand and trace organics (stiff, moist)			
185	5	8	12		1					20		AL
180	10	14	12		2				Becomes brown with orange mottling and hard clay inclusions			
175	15	14	9		3				Becomes blue/gray and medium stiff			
170	20	18	13		4				Becomes stiff with trace sand			
165	25	18	73		5			CH	Reddish brown and gray sandy fat clay (hard, moist) (completely decomposed siltstone)	25		%F=56
160	30	3	50/3"		6			SLST	Gray to dark gray siltstone: moderately weathered, soft			
155	35											

Log of Boring B-1

GeoEngineers

Project: Mid Willamette Feeder-Crowley Creek
Project Location: Polk County, OR
Project Number: 6024-107-01Task0700

Figure D-2
Sheet 1 of 2

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
	35			50/3"		7			SI ST	Gray to dark gray siltstone: moderately weathered, soft			
150													
	40		3.5	50/4"		8							
145													
	45		5.5	50/6"		9							

Log of Boring B-1 (continued)

GeoEngineers

Project: Mid Willamette Feeder-Crowley Creek
Project Location: Polk County, OR
Project Number: 6024-107-01Task0700

Figure D-2
Sheet 2 of 2

Drilled	Start 11/3/2009	End 11/3/2009	Total Depth (ft)	45.25	Logged By DWW Checked By MAM	Driller	Subsurface Technologies	Drilling Method	Mud Rotary
Surface Elevation (ft) Vertical Datum	189.8		Hammer Data	140 lb Auto		Drilling Equipment	Diedrich D-50 Truck Mounted		
Easting (X) Northing (Y)	7498630.428 489532.5778		System Datum	NAD83 SP N US FOOT		Groundwater	Date Measured	Depth to Water (ft)	Elevation (ft)
Notes:									

Elevation (feet)	Depth (feet)	FIELD DATA: Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
	0							CL	Gray/brown lean clay with trace organics (stiff, moist)			
185	5	10	9		1							
									Becomes gray/brown with orange mottling			
180	10	14	10		2							
									Becomes blue/gray			
175	15	16	9		3					41		AL
170	20	16	11		4							
									Becomes very stiff tan/brown/gray and sandy			
165	25	14	24		5					31		%F=53
								SLST	Dark gray siltstone: moderately weathered, soft			
160	30	4.5	50/5"		6							
155	35											

Portland: Date 4/6/10 Path P:\6\6024107\01\GINT\JPG 602410701.GPJ DBTemplate/LibTemplate GEOENGINEERS8.GDT/GE8_GEOTECH_STANDARD

Log of Boring B-2

GEOENGINEERS

Project: Mid Willamette Feeder-Crowley Creek
Project Location: Polk County, OR
Project Number: 6024-107-01Task0700

Figure D-3
Sheet 1 of 2

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
	35		3	50/3"		7			SLST	Dark gray siltstone: moderately weathered, soft			
150	40		3	50/3"		8							
145	45		3	50/3"		9							

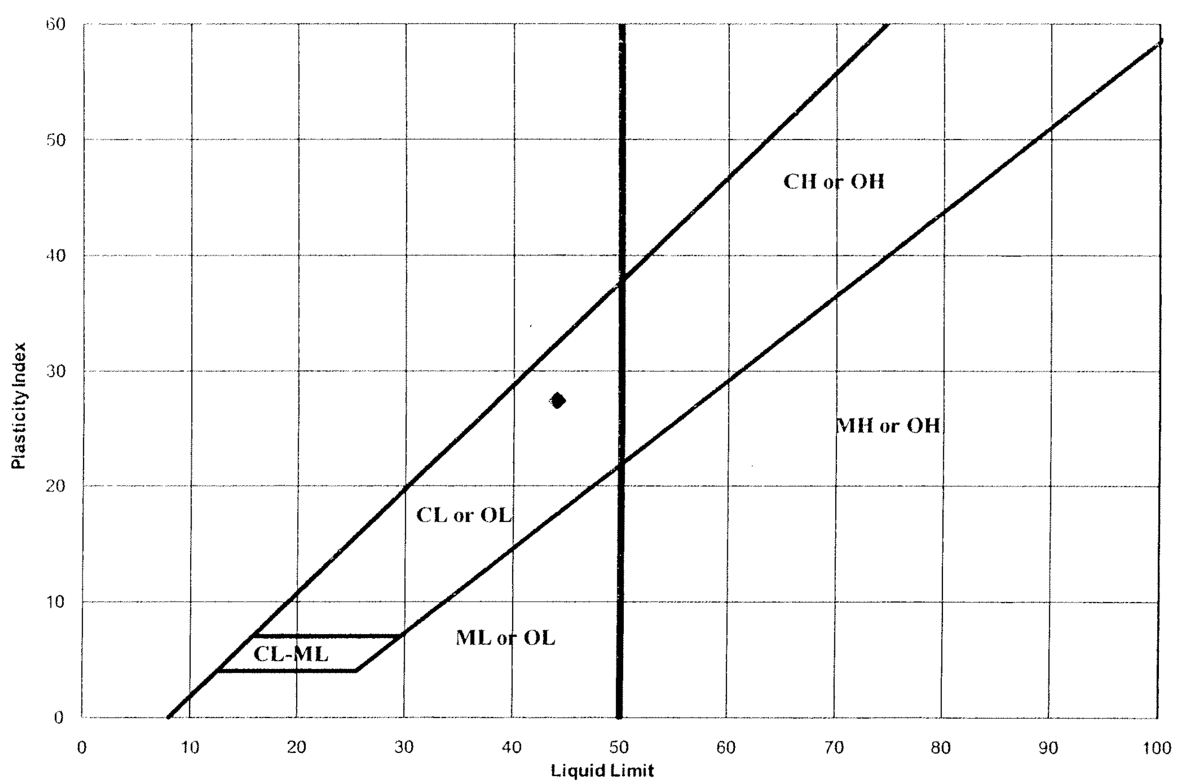
Log of Boring B-2 (continued)

GEOENGINEERS

Project:	Mid Willamette Feeder-Crowley Creek
Project Location:	Polk County, OR
Project Number:	6024-107-01Task0700

Figure D-3
Sheet 2 of 2

Project:	Mid Willamette Feeder-Crowley Creek	**Lab No.**	09-0052
Project No.	6024-107-01Task 0700	**Date:**	11/04/09
Boring/TP No.	B-1	**Tested By:**	BKB/KAR
Sample No./Depth:	S-1/5'	**Checked By:**	KAR
Description:	CL	**PA/PM:**	TNH/BCR



Moisture Content %	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Description
20.1%	44	17	27	CL	Lean Clay

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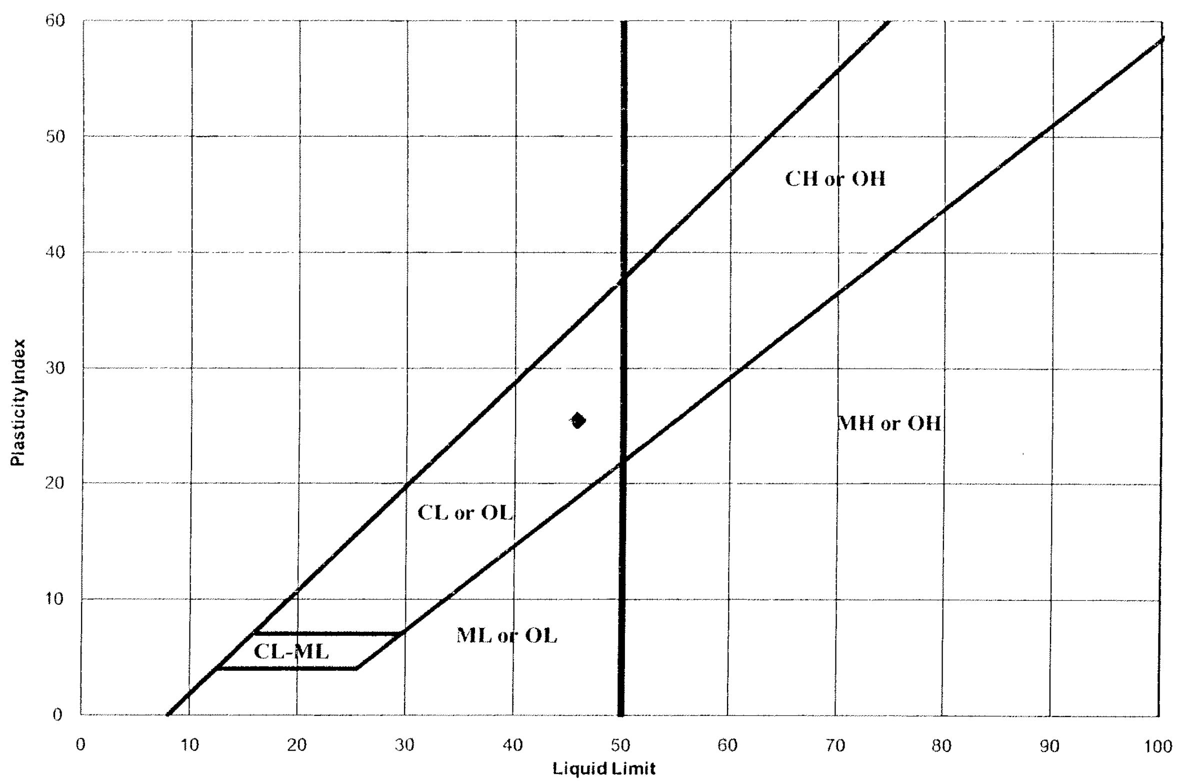
Atterberg Limits ASTM D 4318

Figure D-4

Project:	Mid Willamette Feeder-Crowley Creek	Lab No.	09-0052
Project No.	6024-107-01Task 0700	Date:	11/04/09
Boring/TP No.	B-2	Tested By:	BKB/KAR
Sample No./Depth:	S-3/15'	Checked By:	KAR
Description:	CL	PA/PM:	TNH/BCR



Moisture Content %	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Description
40.8%	46	20	26	CL	Lean Clay

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Atterberg Limits ASTM D 4318

Figure D-5

APPENDIX E
BASKET SLOUGH HDD

The Basket Slough HDD site is located along the east side of Pacific Highway approximately 1.25 miles north of Rickreal, Oregon. The proposed pipeline alignment at the site is oriented north-south and parallel to the east side of Pacific Highway, and within the existing Oregon Department of Transportation (ODOT) right-of-way (ROW). An HDD approximately 650 feet in length is required at this site.

SITE DESCRIPTION

Surface Conditions

The crossing site is located in a generally flat area. The area north of Basket Slough is agricultural land. The proposed pipeline alignment is located along the base of the roadway embankment on the east side of Pacific Highway. The roadway embankment is approximately 3 feet above the ground surface elevation along the proposed pipeline alignment. Basket Slough crosses the proposed pipeline alignment at a perpendicular angle. Basket Slough is incised approximately 5 feet below surrounding site grades.

South of Basket Slough, the ground surface is also relatively flat agricultural land. The proposed pipeline alignment south of Basket Slough also follows the base of the roadway embankment of Pacific Highway that is approximately 3 feet above the ground surface elevation along the proposed pipeline alignment. A field access road crosses the proposed pipeline alignment approximately 400 feet south of Basket Slough.

Subsurface Conditions

We explored subsurface conditions at the site on October 26, 2009 and February 22 and 23, 2010 by drilling two borings to maximum depths of up to 80 feet below ground surface (bgs) at the approximate locations shown in Figure E-1. In general, the borings encountered soft to hard silts and clays overlying decomposed to moderately weathered siltstone bedrock, which is consistent with the geologic mapping for the area (Allison, 1953, O'Connor et al, 2001). Detailed logs of the borings are presented as Figures E-2 and E-3.

Boring B-1 was drilled in the ODOT ROW approximately 110 feet north of Basket Slough. We observed soft to hard silts and lean clays with varying sand content from the ground surface to a depth of approximately 41.5 bgs, the maximum depth explored.

Boring B-2 was completed within the ODOT ROW approximately 75 feet south of Basket Slough. We observed soft to very stiff fat and lean clay with varying sand content from the ground surface to a depth of approximately 43.5 feet bgs. Below 43.5 feet bgs, the boring encountered predominantly decomposed, very soft, closely fractured siltstone. The siltstone became moderately weathered and soft at approximately 60 feet bgs, and extended to 80 feet bgs, the maximum depth explored.

Groundwater

We encountered groundwater at a depth of approximately 8 feet bgs in boring B-1 and at approximately 15 feet bgs in boring B-2, which is the approximate water level of Basket Slough. Based on our research (OWRD, 2009), we expect that groundwater levels can rise to within a few feet of the ground surface at the site, and may be at or above the ground surface during flooding events We anticipate that groundwater levels will fluctuate due to seasonal variations in precipitation, changes in site utilization or other factors. For the design and construction of an HDD, the groundwater level is not typically a factor affecting feasibility. The hydrostatic drilling fluid pressure typically compensates for high groundwater levels.

LABORATORY TESTING

Percent fines analyses were performed on two samples in general accordance with ASTM D 1140. The percentage passing the U.S. No. 200 sieve is shown on the boring logs at the respective sample depths.

Atterberg limits tests were performed on three soil samples. The tests were used to classify the soil, as well as to evaluate engineering index properties. The liquid limit and the plastic limit were estimated through a procedure performed in general accordance with ASTM D 4318. The results of the Atterberg limits testing are shown in Figures E-4 through E-6.

HDD FEASIBILITY CONCLUSIONS

Based on our HDD evaluation, the installation of an HDD at the Basket Slough pipeline crossing site is feasible. A bathymetric survey has not been completed within Basket Slough so the channel depth within the slough is unknown at this time. We anticipate that the depth of the Basket Slough channel is about 3 to 7 feet below the average water surface level.

We recommend that a detailed design be completed for this proposed HDD so that the alignment and profile can be further refined. The detailed design should include final alignment and profile design, workspace layouts, analyses of installation and operating stresses, and a hydraulic fracture and inadvertent returns evaluation. A bathymetric survey should be completed along the conceptual HDD alignment to determine the depth of Basket Slough which will aid the detailed design process. The following sections summarize conclusions regarding workspace considerations, subsurface conditions and conceptual HDD Geometry.

Workspace Considerations

In our opinion, the entry side of the crossing should be located on the north side of the crossing and the exit side of the crossing should be located on the south side of the site because racks of drill pipe are typically loaded onto the left side of smaller drill rigs. Placing the entry workspace on the north side of the crossing will allow the left side of the drill rig to be facing the east where a piece of equipment can more easily replace the pipe racks during drilling operations. Suitable workspace for stringing and fabricating the product pipe is located on both sides of the proposed crossing site.

The layout and dimensions for the proposed entry/exit side workspaces have not been identified in Figure E-1, but will be added during the detailed design phase. For typical HDD installations of this magnitude, the additional temporary workspace required at the entry and exit points will be approximately 60 feet by 150 feet along the proposed alignment.

Conceptual Entry and Exit Sides

The agricultural fields on both sides of the crossing are suitable for use as temporary workspace from a constructability standpoint. The area is relatively flat and significant grading of the site would not likely be necessary. Access to the workspace could be gained directly from Pacific Highway. There is adequate space available on both sides of the site for stringing and fabricating the product pipe.

Subsurface Considerations

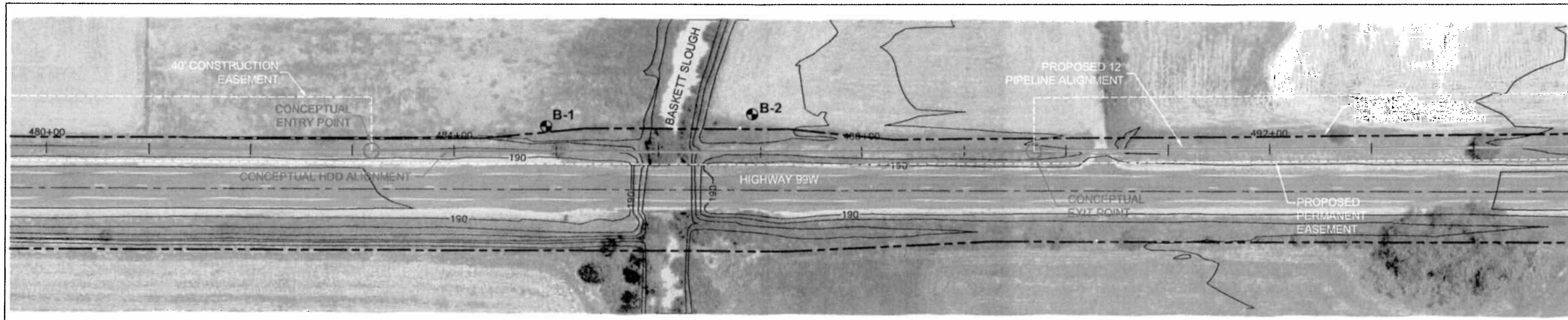
The soils at the anticipated depths of the conceptual HDD at this site consist of soft to hard silts and clays overlying decomposed siltstone bedrock. The nature of the decomposed bedrock is similar to that of a hard cohesive soil.

As currently envisioned, the entire HDD path is entirely within the soft to stiff silt and clay soil units above the more dense decomposed siltstone because the pilot hole could be jetted through the overlying clay soils without the need for a positive displacement mud motor. However, the depth of the HDD profile should be determined during final design based the results of hydraulic fracture and inadvertent returns evaluation.

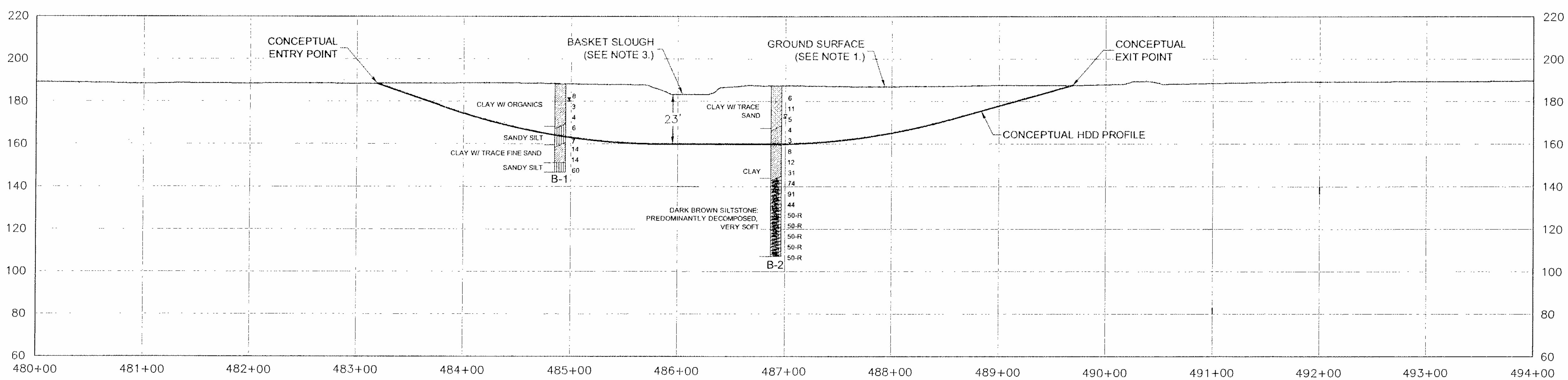
Conceptual HDD Geometry

The length, depth and orientation of a potential HDD at this site is a function of Northwest Natural's 15-foot minimum depth requirement below waterbodies, the topography along the proposed alignment, the minimum allowable radius of curvature of the product pipe and the subsurface conditions encountered in the borings.

For this crossing we envision a HDD with a length of approximately 650 feet. For this crossing we expect that the depth of the HDD profile beneath the Basket Slough channel could range between 20 and 25 feet. A setback of the entry point from the north bank of Basket Slough would be required to provide adequate profile depth beneath the channel. The actual profile length and depth should be based on additional geometric and hydraulic fracture analyses completed during the detailed design phase of the project.



PLAN
1" = 100'



PROFILE
HORIZ.: 1"=100'
VERT.: 1"=50'

Notes:
1. Topographic information based on a site specific topographic survey dated 9/19/09, provided by WH Pacific.
2. The locations of all features shown are approximate.
3. A bathymetric survey of Basket Slough has not been completed. The elevation shown is based on topographic survey.
4. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. can not guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Legend

Boring Location
Soil Classification
SPT (N) Value
Boring ID
Centerline in Existing Easement
Centerline in ODOT R.O.W.
Centerline in Private Property

NOT FOR CONSTRUCTION

SITE PLAN & PROFILE

BASKET SLOUGH HDD
POLK COUNTY, OREGON

GEOENGINEERS

FIGURE E-1

BCR : MWJ

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Drilled Start 10/26/2009 End 10/26/2009	Total Depth (ft) 41.5	Logged By DWW Checked By MAM	Driller Subsurface Technologies	Drilling Method HSA
Surface Elevation (ft) Vertical Datum 187.0	Hammer Data 140 lb Auto	Drilling Equipment Diedrich D-50 Truck Mounted	
Easting (X) 7495935.786 Northing (Y) 480172.8561	System Datum NAD83 SP N US FOOT	Groundwater: Date Measured / Depth to Water (ft) 8 feet / Elevation (ft)	
Notes:			

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
	0								CL	Brown gray clay with organics (stiff, moist)			
185													
	5		14	8		1							
180							▼						
	10		18	3		2				Becomes soft, wet and lacks organics below 10 feet			
175													
	15		18	4		3				Becomes medium stiff with occasional fine sand seams			
170													
	20		18	6		4			ML	Gray sandy silt (medium stiff, wet)			
165													
	25		18	7		5				Becomes clayey with trace sand	36		AL %F = 98
160													
									CL	Gray clay with trace fine sand (stiff, wet)			
	30		18	14		6							
155													
	35												

Log of Boring B-1

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Project: Mid Willamette Feeder-Basket Slough
Project Location: Polk County, OR
Project Number: 6024-107-01Task0800

Figure E-2
Sheet 1 of 2

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
	35		18	14		7			CL	Gray clay with occasional fine sand below 35 feet (stiff, wet)	35		%F = 66
150									ML	Gray to dark gray sandy silt (hard, moist)			
	40		18	60		8							

Log of Boring B-1 (continued)

GeoEngineers	Project:	Mid Willamette Feeder-Basket Slough
	Project Location:	Polk County, OR
	Project Number:	6024-107-01Task0800

Figure E-2
Sheet 2 of 2

Portland: Date 4/5/10 Path P:\6\6024107\01\GINT\JPG 602410701.GPJ DBTemplate/LibTemplate:GEOENGINEERS8.GDT/GEI8_GEOTECH_STANDARD

Drilled	Start 2/22/2010	End 2/23/2010	Total Depth (ft)	80.25	Logged By BKB Checked By MAM	Driller	Subsurface Technologies	Drilling Method	Mud Rotary

Surface Elevation (ft) Vertical Datum	188.6	Hammer Data	140 lb Auto	Drilling Equipment	Diedrich D-50 Truck Mounted
Easting (X) Northing (Y)	7495941.978 479970.902	System Datum	NAD83 SP N US FOOT	Groundwater	
Notes:					

Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
2/22/2010	15.0	173.6

Elevation (feet)	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content %	Dry Density (pcf)	REMARKS
	0							CH	Dark brown fat clay with trace sand (medium stiff, moist)			
185												
	5	12	6		1							
180												
	10	14	11		2				Becomes brown and stiff			AL
175												
	15	18	5		3	▽			Becomes medium stiff, wet and with sand			
170												
	20	18	4		4			CL	Gray lean clay (soft, wet)			AL
165												
	25	18	3		5							
160												
	30	18	8		6				Becomes medium stiff			
155												
	35											

Log of Boring B-2

GEOENGINEERS

Project: Mid Willamette Feeder-Basket Slough
Project Location: Polk County, OR
Project Number: 6024-107-01Task0800

Figure E-3
Sheet 1 of 3

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
	35		18	12		7			CL	Gray lean clay (soft, wet) Becomes gray/green, sandy and stiff			
150													
	40		18	31		8				Becomes very stiff with trace fine gravel sized siltstone clasts			
										Becomes gray/orange mottled and lacks gravel sized siltstone clasts			
145									SLST	Dark brown siltstone: predominantly decomposed, very soft			
	45		17	74		9							Gravel pieces easily broken down with finger pressure.
140													
	50		17	91		10							
135													
	55		16	44		11							
130													
	60		11	50-R		12				Becomes moderately weathered and soft			
125													
	65		4	50-R		13				Becomes soft			
120													
	70		5	50-R		14							
115													
	75		5	50-R		15							

Portland: Date:4/5/10 Path:P:\6\6024107\01\GINT\JPG 602410701.GPJ DBTemplate/LibTemplate:GEOENGINEERS8.GDT/GEI8_GEOTECH_STANDARD

Log of Boring B-2 (continued)

GeoEngineers

Project:	Mid Willamette Feeder-Basket Slough
Project Location:	Polk County, OR
Project Number:	6024-107-01Task0800

Figure E-3
Sheet 2 of 3

Elevation (feet)	Depth (feet)	FIELD DATA						Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
		Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level						
110									SLST	Dark brown siltstone: predominantly decomposed, very soft			
	80		2	50-R		16							

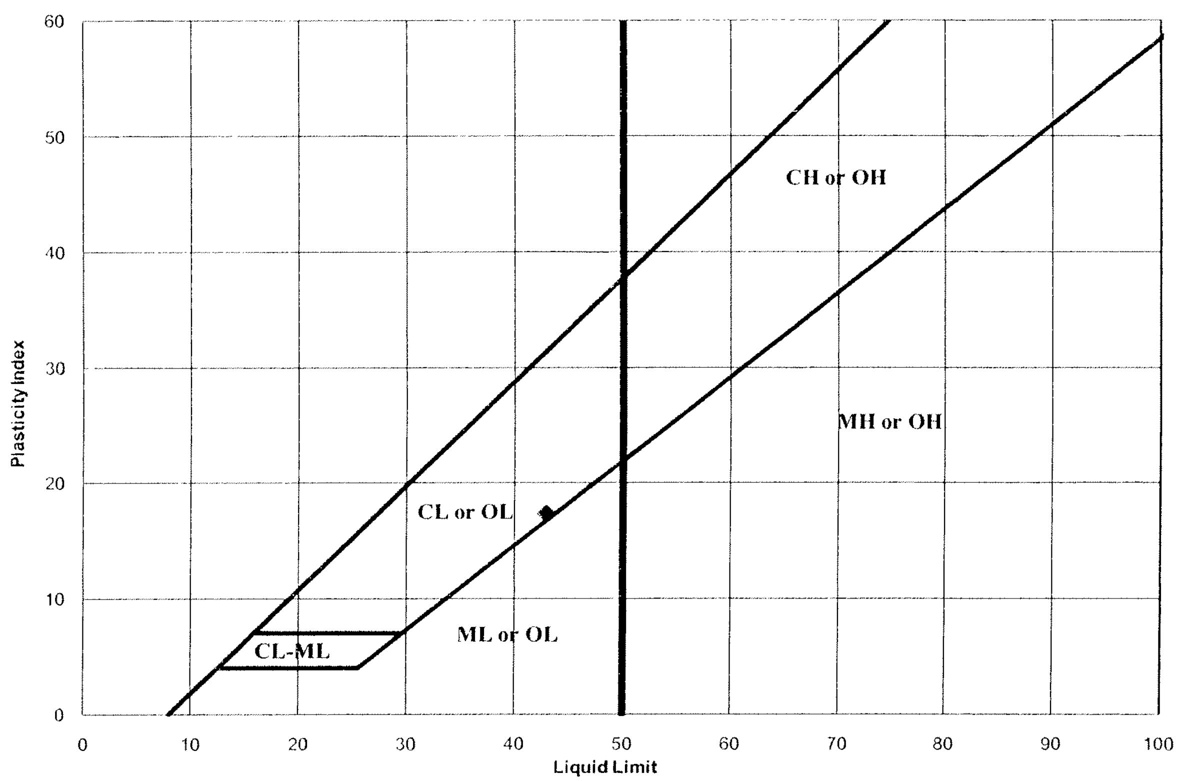
Log of Boring B-2 (continued)

GeoEngineers

Project: Mid Willamette Feeder-Basket Slough
Project Location: Polk County, OR
Project Number: 6024-107-01Task0800

Figure E-3
Sheet 3 of 3

BCR+A1 **Project:**	Mid Willamette Feeder-Basket Slough	**Lab No.**	09-0045
Project No.	6024-107-01-0800	**Date:**	10/27/09
Boring/TP No.	B-1	**Tested By:**	KAR
Sample No./Depth:	S-5 @ 20'	**Checked By:**	
Description:	CL	**PA/PM:**	TNH/BCR



Moisture Content %	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Description
36.1%	43	26	17	CL	Lean clay

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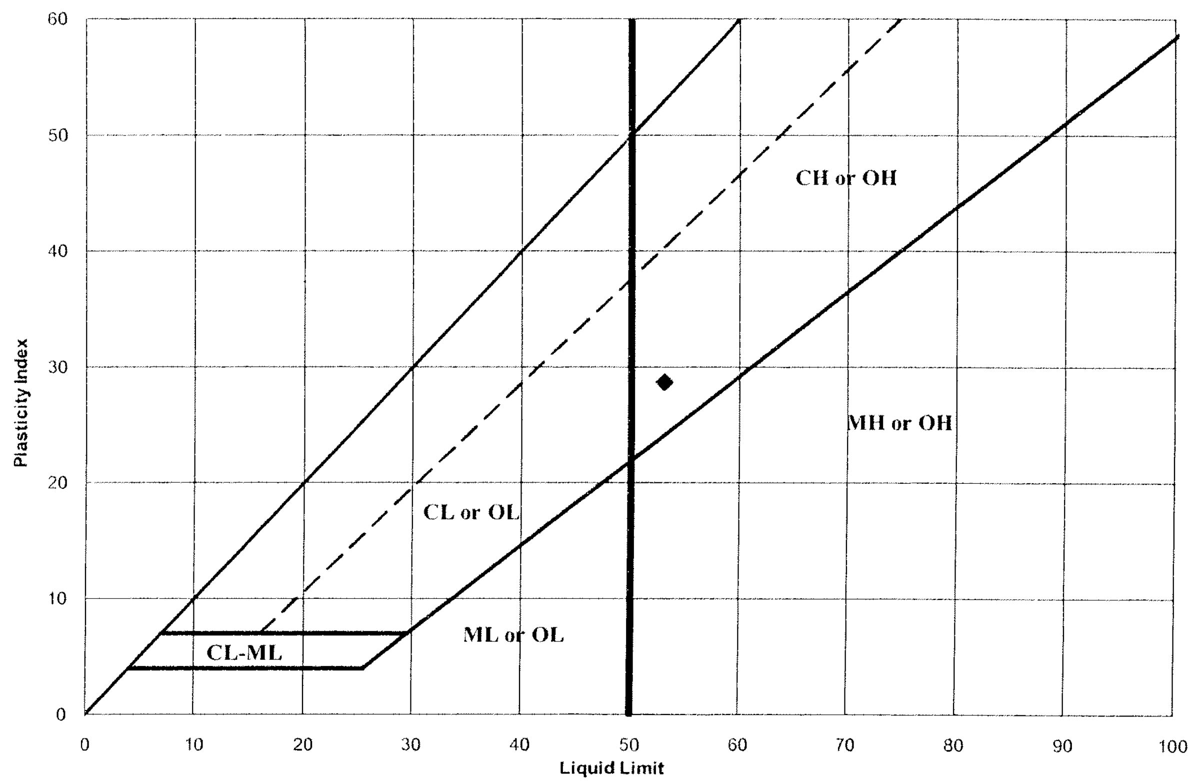
Atterberg Limits ASTM D 4318

Figure E-4

Project:	Mid Willamette Feeder-Basket Slough	**Lab No.**	10-0014
Project No.	6024-107-01Task 0800	**Date:**	02/27/10
Boring/TP No.	B-2	**Tested By:**	KAR
Sample No./Depth:	S-2 @ 10'	**Checked By:**	BCR
USCS Classification:	CH	**PA/PM:**	BCR



Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Description
34.9	53	24	29	CH	Fat Clay

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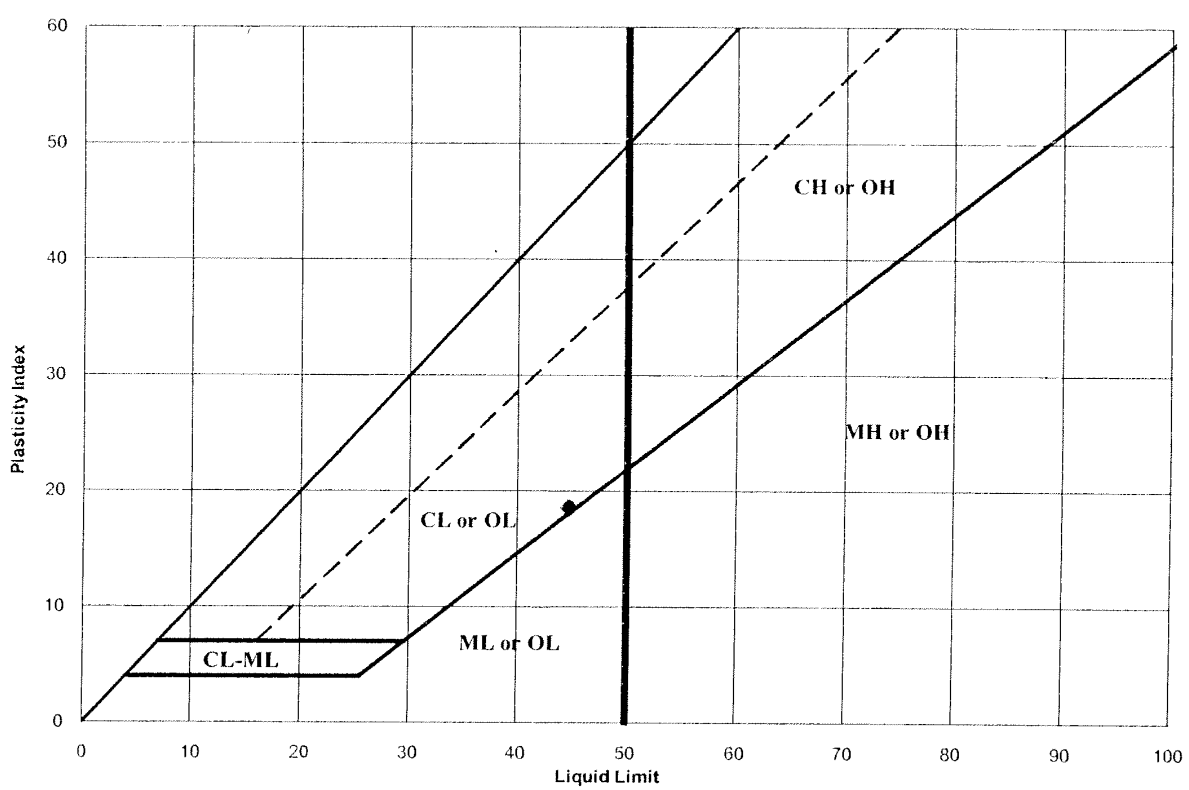
Atterberg Limits ASTM D 4318

Figure E-5

Lean Clay+A1 Project:	Mid Willamette Feeder-Basket Slough	Lab No.	10-0014
Project No.	6024-107-01Task 0800	Date:	02/27/10
Boring/TP No.	B-2	Tested By:	KAR
Sample No./Depth:	S-4 @ 20'	Checked By:	BCR
USCS Classification:	CL	PA/PM:	BCR



Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Description
42.0	45	26	19	CL	Gray lean clay

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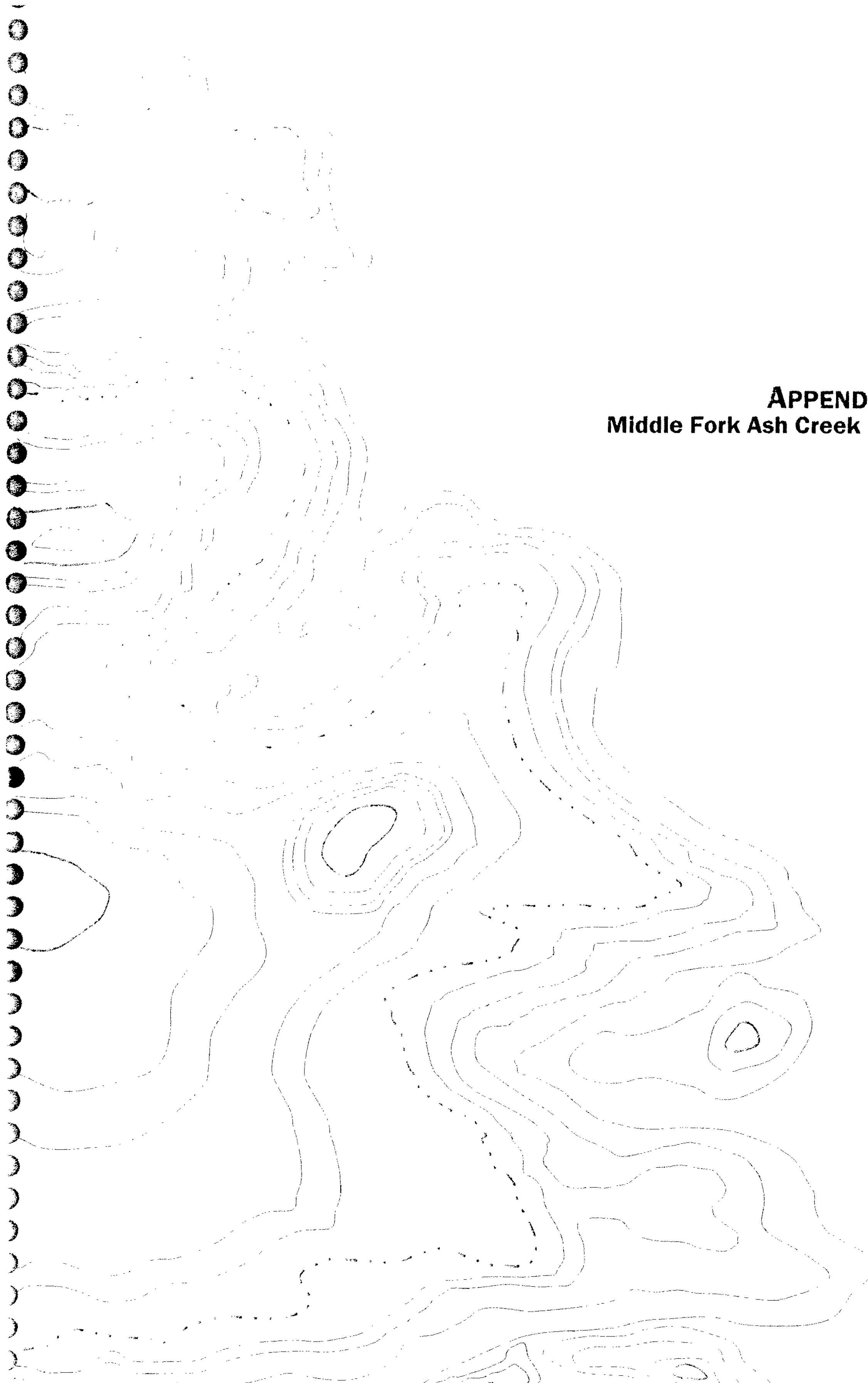
Figure E-6



APPENDIX F
Middle Fork Ash Creek HDD

Groundwater

The depth to groundwater was not observed in either of the borings due to the use of drilling fluid. Groundwater levels at the site are likely located near the elevation of the water level in Middle Fork Ash Creek, which is approximately 10 feet bgs of borings B-1 and B-2. We anticipate that groundwater levels will fluctuate due to seasonal variations in precipitation, changes in site utilization or other factors. In addition, groundwater levels may rise to the surface during flooding conditions. For the design and construction of an HDD, the groundwater level is not typically a factor affecting feasibility. The hydrostatic drilling fluid pressure typically compensates for high groundwater levels.

LABORATORY TESTING

Percent fines analyses were performed on two samples in general accordance with ASTM D 1140. The percentage passing the U.S. No. 200 sieve is shown on the boring logs at the respective sample depths.

Sieve analyses (grain size determination) were performed on two samples in general accordance with ASTM C 136. The results of the sieve analyses were plotted and classified in general accordance with the Unified Soil Classification System (USCS) and are presented in Figures F-4 and F-5. The percentage passing the U.S. No. 200 sieve is shown on the boring logs at the respective sample depths.

Atterberg limits tests were performed on one soil sample. The tests were used to classify the soil as well as to evaluate engineering index properties. The liquid limit and the plastic limit were estimated through a procedure performed in general accordance with ASTM D 4318. The results of the Atterberg limits testing are shown in Figure F-6.

HDD FEASIBILITY CONCLUSIONS AND RECOMMENDATIONS

Based on our HDD evaluation, the HDD method of construction at the Middle Fork Ash Creek site is feasible. Because of the deeply incised creek channel and the gravelly unit encountered in boring B-1, the HDD would need to be slightly deeper and longer than what would be considered a minimum length HDD. A conceptual profile for this HDD is shown in Figure F-1.

We recommend that a detailed design be completed for this proposed HDD so that the alignment and profile can be further refined. The detailed design should include final alignment and profile design, workspace layouts, analyses of installation and operating stresses, and a hydraulic fracture and inadvertent returns evaluation.

The following sections summarize conclusions regarding workspace considerations, subsurface conditions and conceptual HDD geometry.

Workspace Considerations

In our opinion, the entry side of the crossing should be located on the south side of the HDD and the exit side of the HDD should be located on the north side of the site because the proposed pipeline alignment north of the creek is more suitable for stringing and fabricating the product pipe. Based on our experience with projects of similar scale, a relatively small drill rig would likely be required for this crossing. Therefore, the existing ODOT ROW, as shown in Figure F-1, would likely provide sufficient workspace for HDD operations. The following paragraphs describe the conceptual entry and exit sides of the HDD.

The layout and dimensions for the proposed entry/exit side workspaces have not been identified in Figure F-1, but will be added during the detailed design phase. For typical HDD installations of this magnitude, the additional temporary workspace required at the entry and exit points will be approximately 60 feet by 150 feet along the proposed alignment. The following paragraphs describe the conceptual entry and exit sides of the HDD.

Conceptual Entry Side (South Side)

The entry workspace could conceptually be located along the ODOT ROW on the south side of Middle Fork Ash Creek. Because of the highway embankment, some site grading will be necessary within the entry workspace to provide a level area for the drilling equipment. Access to the workspace could be gained directly from Pacific Highway.

Conceptual Exit Side (North Side)

The exit workspace could be located within the ODOT ROW on the north side of the site. Adequate temporary workspace is available along the ODOT ROW for exit side operations and stringing and fabrication of the product pipe. Access to the exit workspace could be gained via a primitive access road off of Pacific Highway approximately 375 feet north of the site proposed exit point.

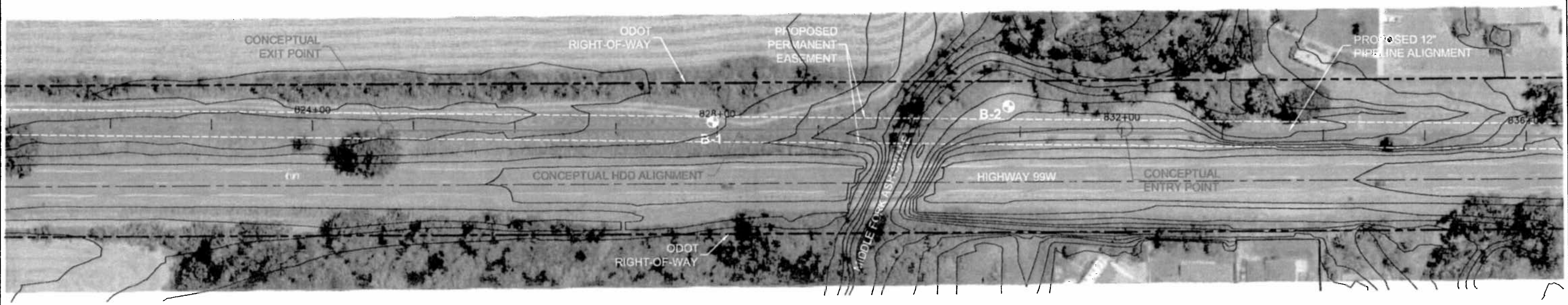
Subsurface Considerations

The soils at the anticipated depths of the conceptual HDD consist of medium stiff to stiff clays and medium dense to dense clayey sands. The thin gravel unit encountered in boring B-1 could present a risk for hole instability if it is encountered during drilling. The HDD profile should be designed in such a way as to avoid having its bottom tangent elevation within this gravel unit. However, the depth of the HDD profile should be determined during final design based on the results of hydraulic fracture and inadvertent returns evaluation.

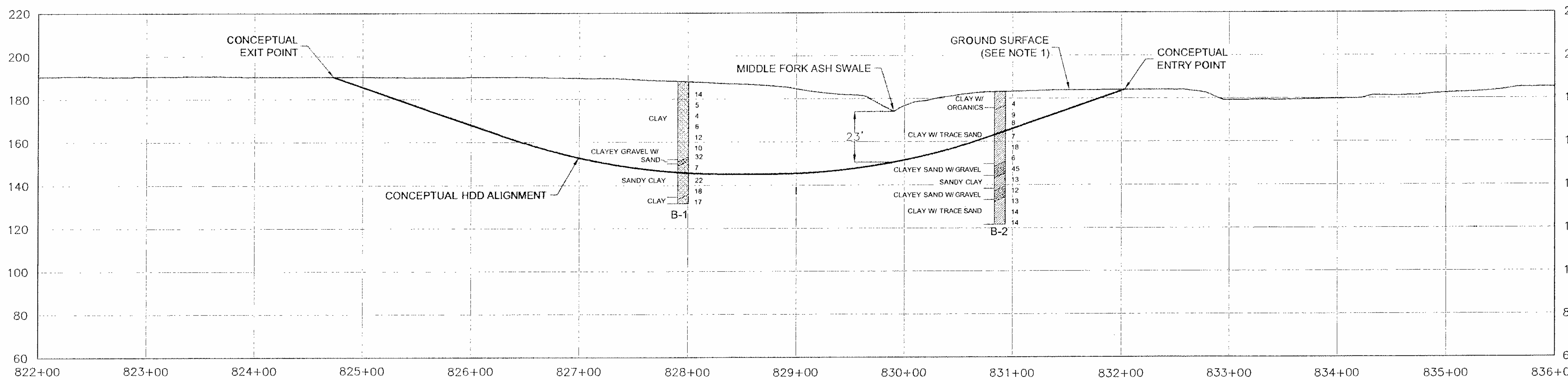
Conceptual HDD Geometry

The length, depth and orientation of a potential HDD at this site is a function of Northwest Natural's 15-foot minimum depth requirement below waterbodies, the topography along the proposed alignment, the minimum allowable radius of curvature of the product pipe and the subsurface conditions encountered in the borings.

Because of the deeply incised creek channel and the gravelly unit encountered in boring B-1, the HDD would need to be deeper and longer than what would be considered a minimum length HDD. The minimum horizontal length of an HDD crossing at this site would have to be approximately 730 feet. Shortening the HDD would increase the difficulty of drilling the pilot hole within acceptable tolerances while shallowing the HDD profile would increase the risk of hole instability within the gravel unit observed in boring B-1. For this crossing we expect that the depth of the HDD profile beneath Middle Fork Ash Creek could range between 20 and 25 feet. The actual profile length and depth should be based on additional geometric and hydraulic fracture analyses completed during the detailed design phase of the project.



PLAN
1" = 100'



PROFILE
HORIZ.: 1"=100'
VERT.: 1"=50'

Notes:
1. Topographic information based on a site specific topographic survey dated 9/19/09, provided by WH Pacific.
2. The locations of all features shown are approximate.
3. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. can not guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Legend

Boring Location

Soil Classification

SPT (N) Value

Boring ID

Centerline in Existing Easement
Centerline in R.O.W.
Centerline in Private Property

NOT FOR CONSTRUCTION

SITE PLAN & PROFILE

MIDDLE FORK ASH CREEK HDD
POLK COUNTY, OREGON

GEOENGINEERS

FIGURE F-1

BCR : MWJ

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Drilled	Start 11/4/2009	End 11/4/2009	Total Depth (ft)	56.5	Logged By DWW Checked By MAM	Driller	Subsurface Technologies	Drilling Method	Mud Rotary
Surface Elevation (ft) Vertical Datum	188.3		Hammer Data	140 lb Auto		Drilling Equipment	Diedrich D-50 Track Mounted		
Easting (X) Northing (Y)	7494601.664 445894.2679		System Datum	NAD83 SP N US FOOT		Groundwater	Date Measured	Depth to Water (ft)	Elevation (ft)
Notes:									

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content %	Dry Density (pcf)	REMARKS
	0								CH	Brown fat clay (stiff, moist)			
185													
	5		12	14		1							
180													
	10		16	5		2				Becomes medium stiff	36		
175													
	15		18	4		3					36		
170													
	20		18	6		4				With fine sand			
165													
	25		18	12		5				Becomes blue/gray, stiff and sandy			
160													
	30		18	10		6				Lacking sand	31		AL
155													
	35												

Log of Boring B-1

GEOENGINEERS

Project: Mid Willamette Feeder-Middle Fork Ash Creek
Project Location: Polk County, OR
Project Number: 6024-107-01Task0900

Figure F-2
Sheet 1 of 2

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
	35			12		7			CH	Brown fat clay (stiff, moist)			
									GC	Dark gray/brown clayey gravel with sand (dense, wet)			
150									CH	Dark gray sandy fat clay (medium stiff, wet)			
	40		12	7		8							
145													
	45		16	22		9				Becomes very stiff with brown mottling			
										Becomes gray/brown with orange mottling			
140													
	50		14	18		10							
135									CH	Gray/light gray with orange mottling fat clay with slicken sides (very stiff, moist)			
	55		14	17		11							

Log of Boring B-1 (continued)

GEOENGINEERS

Project: Mid Willamette Feeder-Middle Fork Ash Creek

Project Location: Polk County, OR

Project Number: 6024-107-01Task0900

Figure F-2
Sheet 2 of 2

Drilled — Start: 2/18/2010, End: 2/18/2010	Total Depth (ft): 61.5	Logged By: BKB Checked By: MAM	Driller: Subsurface Technologies
Drilling Method: Mud Rotary			
Surface Elevation (ft) Vertical Datum: 181.4	Hammer Data: 140 lb Auto	Drilling Equipment: Diedrich D-50 Track Mounted	
Easting (X): 7494603.307 Northing (Y): 445600.8294	System Datum: NAD83 SP N US FOOT	Groundwater — Date Measured / Depth to Water (ft) / Elevation (ft)	
Notes:			

Elevation (feet)	Depth (feet)	Recovered (in)	Blows/foot	Sample Name / Testing	Group Classification	MATERIAL DESCRIPTION	REMARKS
	0				CL	Orange and dark brown lean clay with organics (medium stiff, moist) (fill)	
175	5	16	4	1			
					CL	Gray lean clay with orange mottling and trace sand (stiff, moist)	
170	10	14	9	2			
165	15	16	8	3		Becomes brown with orange mottling	
160	20	18	7	4		Becomes gray and medium stiff	
155	25	14	18	5		Becomes very stiff, gray/orange mottled and sandy with fine gravel	SA, %Gravel=15 %F=51
150	30	12	6	6		Lacks gravel below 30'	
					SC	Gray clayey sand with gravel (dense,wet)	
	35						

Log of Boring B-2

GeoEngineers

Project: Mid Willamette Feeder-Middle Fork Ash Creek
Project Location: Polk County, OR
Project Number: 6024-107-01Task0900

Figure F-3
Sheet 1 of 2

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	FIELD DATA: Recovered (in)	FIELD DATA: Blows/foot	FIELD DATA: Collected Sample	FIELD DATA: Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
145	35		10	15		7			SC	Gray clayey sand with gravel (dense,wet)			%Gravel=41 %Sand=47 %Fines=12
140	40		18	13		8			CL	Gray sandy clay with orange/brown mottling (moist, stiff)			%F=71
135	45			12		9			SC	Brown clayey sand with gray mottles (medium dense, moist) weathered gravel in last 2" of sample			%F=49
130	50			13		10			CL	Gray/red mottled lean clay with trace sand (stiff, moist)			
125	55		16	14		11				Becomes gray/orange/red mottled			
120	60			14		12							

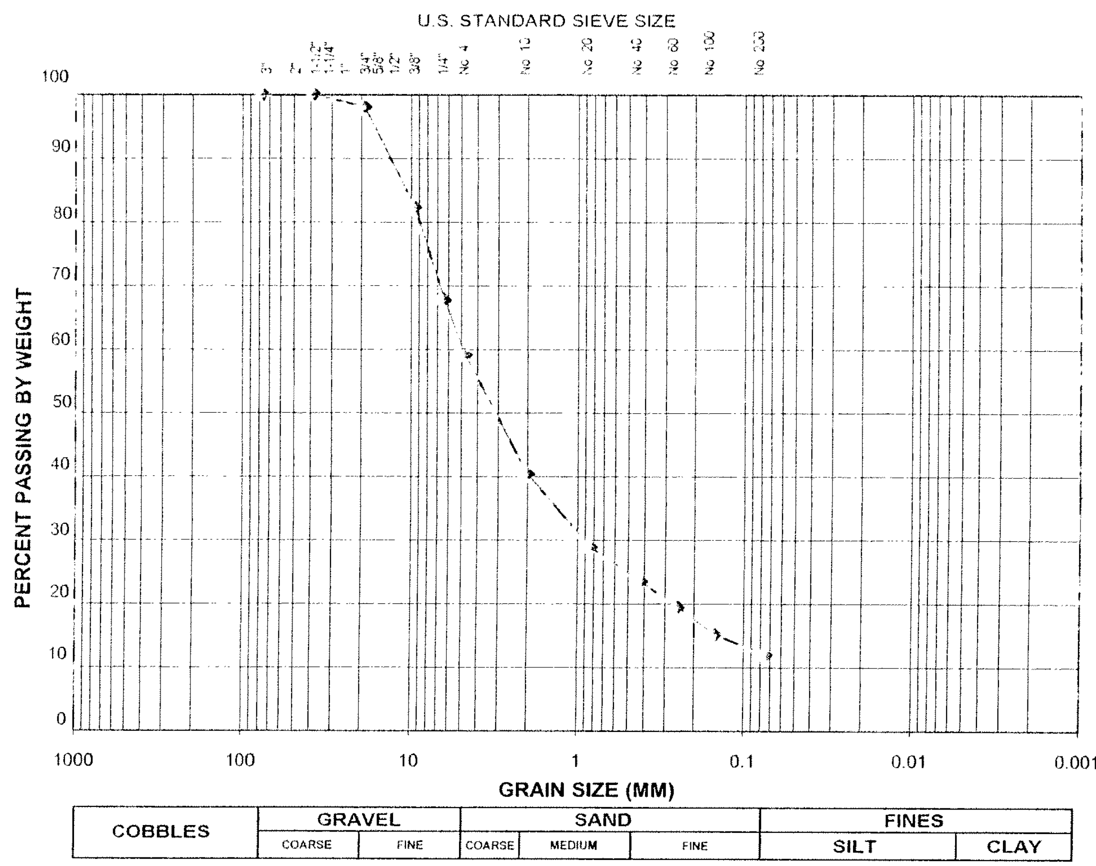
Log of Boring B-2 (continued)

GeoEngineers

Project: Mid Willamette Feeder-Middle Fork Ash Creek
Project Location: Polk County, OR
Project Number: 6024-107-01Task0900

Figure F-3
Sheet 2 of 2

Project:	Mid Willamette Feeder-Middle Fork Ash Swale	**Lab No.**	10-0007
Project No.	6024-107-01 Task 0900	**Date:**	02/22/10
Boring/TP No.	B-2	**Tested By:**	KAR
Sample No./Depth:	S-7 @ 35'	**Checked By:**	
USCS Classification:	SP-SC	**PA/PM:**	BCR



Nat. Water Content, %	Gravel Total, %	Sand Total, %	Fines Total, %	USCS	Description
0.2	40.8	47.2	12.0	SP-SC	Poorly graded clayey sand with gravel

NOTE: Test results are applicable only to the specific sample on which they were performed, and should not be interpreted as representative of any other samples obtained at other times, depths or locations or generated by separate operations or processes. This report may not be reproduced, except in full, without written approval of GeoEngineers, Inc.

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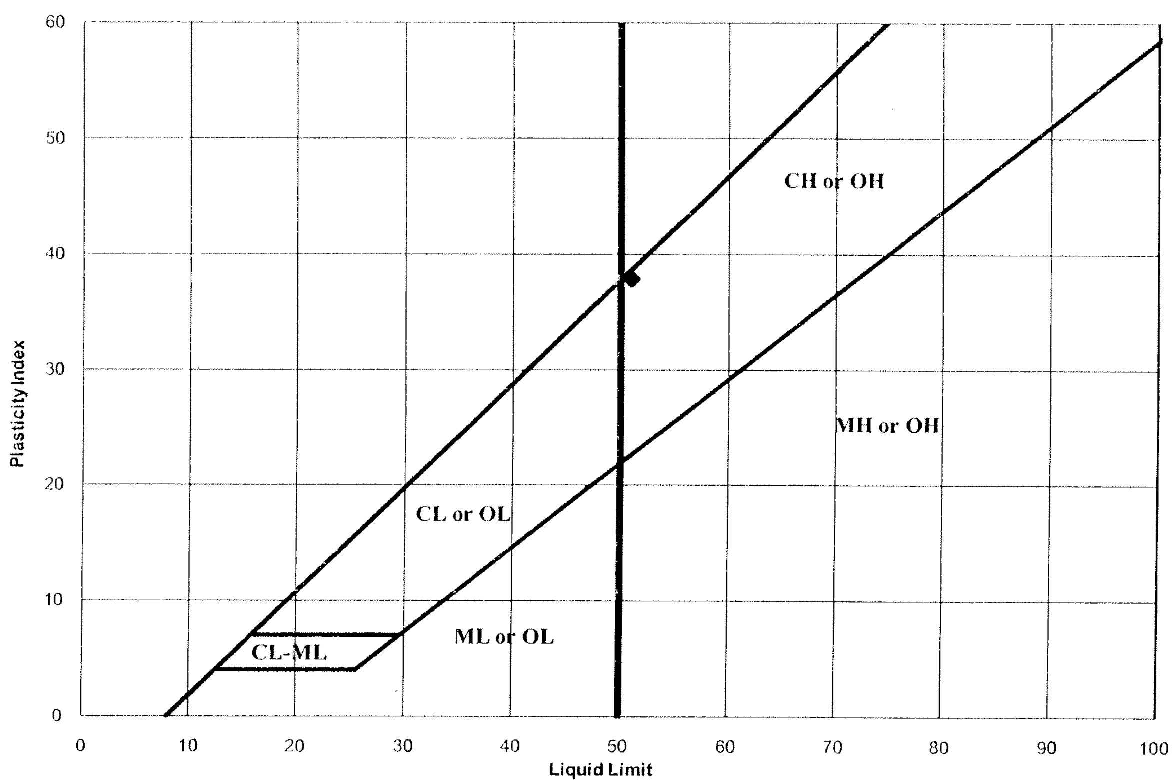
Grain Size Analysis ASTM C 136

Figure F-5

Project:	Mid-Willamette Feeder - Middle Fork Ash Swale	**Lab No.**	09-0053
Project No.	6024-107-01	**Date:**	11/05/09
Boring/TP No.	B-1	**Tested By:**	BKB/KAR
Sample No./Depth:	S-6/30'	**Checked By:**	KAR
Description:	CH	**PA/PM:**	TNH/BCR



Moisture Content %	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Description
30.8%	51	13	38	CH	Brown fat clay

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Atterberg Limits ASTM D 4318

Figure F-6

APPENDIX G
South Fork Ash Creek HDD

APPENDIX G
SOUTH FORK ASH CREEK HDD

The South Fork Ash Creek HDD site is located along the east side of Pacific Highway south of the Monmouth, Oregon city limits. The proposed pipeline alignment is oriented north-south, and parallel to the east side of Pacific Highway, as shown in Figure G-1. The proposed pipeline alignment is located east of the existing Oregon Department of Transportation (ODOT) right-of-way (ROW). An HDD approximately 650 feet in length is required at this site.

SITE DESCRIPTION

Surface Conditions

The proposed pipeline alignment is located along the base of the roadway embankment on the east side of Pacific Highway. The roadway embankment is approximately 2 feet above the ground surface elevation along the proposed pipeline alignment. A newly installed overhead power line is located within the ODOT ROW along the east side of the highway parallel to the proposed pipeline alignment. The proposed HDD alignment would cross beneath a residential property, South Fork Ash Creek and a primitive field access road. South Fork Ash Creek crosses the proposed pipeline alignment at a nearly perpendicular angle. South Fork Ash Creek is incised approximately 10 feet below surrounding site grades.

South of South Fork Ash Creek, the proposed pipeline alignment also follows the base of the Pacific Highway roadway embankment, which is approximately 2 feet above the ground surface elevation along the proposed pipeline alignment. A primitive access road crosses the proposed pipeline alignment approximately 35 feet north of the proposed exit point.

Subsurface Conditions

We explored subsurface conditions at the site on October 26 and 27, 2009 and February 23, 2010 by drilling two borings to a maximum depth of 50.5 feet below ground surface (bgs) at the approximate locations shown in Figure G-1. In general, the borings encountered medium stiff to very stiff clays and medium dense to very dense sands with varying silt and clay content, overlying completely decomposed siltstone and very soft siltstone bedrock. Subsurface conditions encountered in the borings are consistent with the geologic mapping for the area (Allison, 1953, O'Connor et al, 2001). Logs of the borings are presented as Figures G-2 and G-3.

Boring B-1 was drilled east of the ODOT ROW approximately 300 feet north of the creek. We observed soft to very stiff lean clay with varying sand content from the ground surface to a depth of approximately 34 feet bgs. A thin unit of dense clayey sand was encountered between depths of 34 and 35.5 feet bgs. Completely decomposed siltstone consisting of hard silt was encountered between depths of 35.5 and 40 feet bgs. From 40 to 45 feet bgs, the maximum depth explored, the boring encountered moderately weathered very soft siltstone.

Boring B-2 was drilled within the ODOT ROW approximately 300 feet south of the creek. We observed medium stiff to stiff lean clay to a depth of approximately 33.5 feet bgs. From a depth of 33.5 feet bgs to 50.5 feet bgs, the maximum depth explored, the boring encountered dense to very dense silty sand.

Groundwater

Groundwater was observed at a depth of approximately 15 feet bgs in boring B-1. The depth to groundwater was not observed in boring B-2. We anticipate that groundwater levels will fluctuate due to seasonal variations in precipitation, changes in site utilization or other factors, and may rise to the surface during flooding conditions. For the design and construction of an HDD, the groundwater level is not typically a factor affecting feasibility. The hydrostatic drilling fluid pressure typically compensates for high groundwater levels.

LABORATORY TESTING

Percent fines analyses were performed on three samples in general accordance with ASTM D 1140. The percentage passing the U.S. No. 200 sieve is shown on the boring logs at the respective sample depths.

Sieve analyses (grain size determination) were performed on one sample in general accordance with ASTM C 136. The results of the sieve analysis were plotted and classified in general accordance with the Unified Soil Classification System (USCS) and are presented in Figure G-4. The percentage passing the U.S. No. 200 sieve is shown on the boring logs at the respective sample depths.

Atterberg limits tests were performed on one soil sample. The tests were used to classify the soil as well as to evaluate engineering index properties. The liquid limit and the plastic limit were estimated through a procedure performed in general accordance with ASTM D 4318. The results of the Atterberg limits testing are shown in Figure G-5.

HDD FEASIBILITY CONCLUSIONS AND RECOMMENDATIONS

Based on our HDD evaluation, the HDD method of construction at the South Fork Ash Creek site is feasible. We anticipate that a HDD profile for this site would be about 650 feet long, and about 20 feet below the bottom of South Fork Ash Creek. A conceptual HDD profile for this HDD is shown in Figure G-1.

We recommend that a detailed design be completed for this proposed HDD so that the alignment and profile can be further refined. The detailed design should include final alignment and profile design, workspace layouts, analyses of installation and operating stresses, and a hydraulic fracture and inadvertent returns evaluation.

The following sections summarize conclusions regarding workspace considerations, subsurface conditions and conceptual HDD geometry.

Workspace Considerations

In our opinion, the entry side of the HDD should be located on the north side of the site and the exit side of the HDD should be located on the south side of the site because the proposed pipeline alignment south of the site is more suitable for stringing and fabricating the product pipe. The overhead power line on the east side of Pacific Highway is high enough that it should not interfere with pipeline or HDD construction activities. However, the location of power poles for this overhead line should be considered when acquiring temporary HDD workspaces.

The layout and dimensions for the proposed entry/exit side workspaces have not been identified in Figure G-1, but will be added during the detailed design phase. For typical HDD installations of this magnitude, the additional temporary workspace required at the entry and exit points will be approximately 60 feet by 150 feet along the proposed alignment.

Conceptual Entry and Exit Sides

The ODOT ROW and private properties east of the ODOT ROW on both sides of the crossing are suitable for use as temporary workspace from a constructability standpoint. The areas are relatively flat and significant grading of the site would not likely be necessary. Access to the workspace could be gained directly from Pacific Highway.

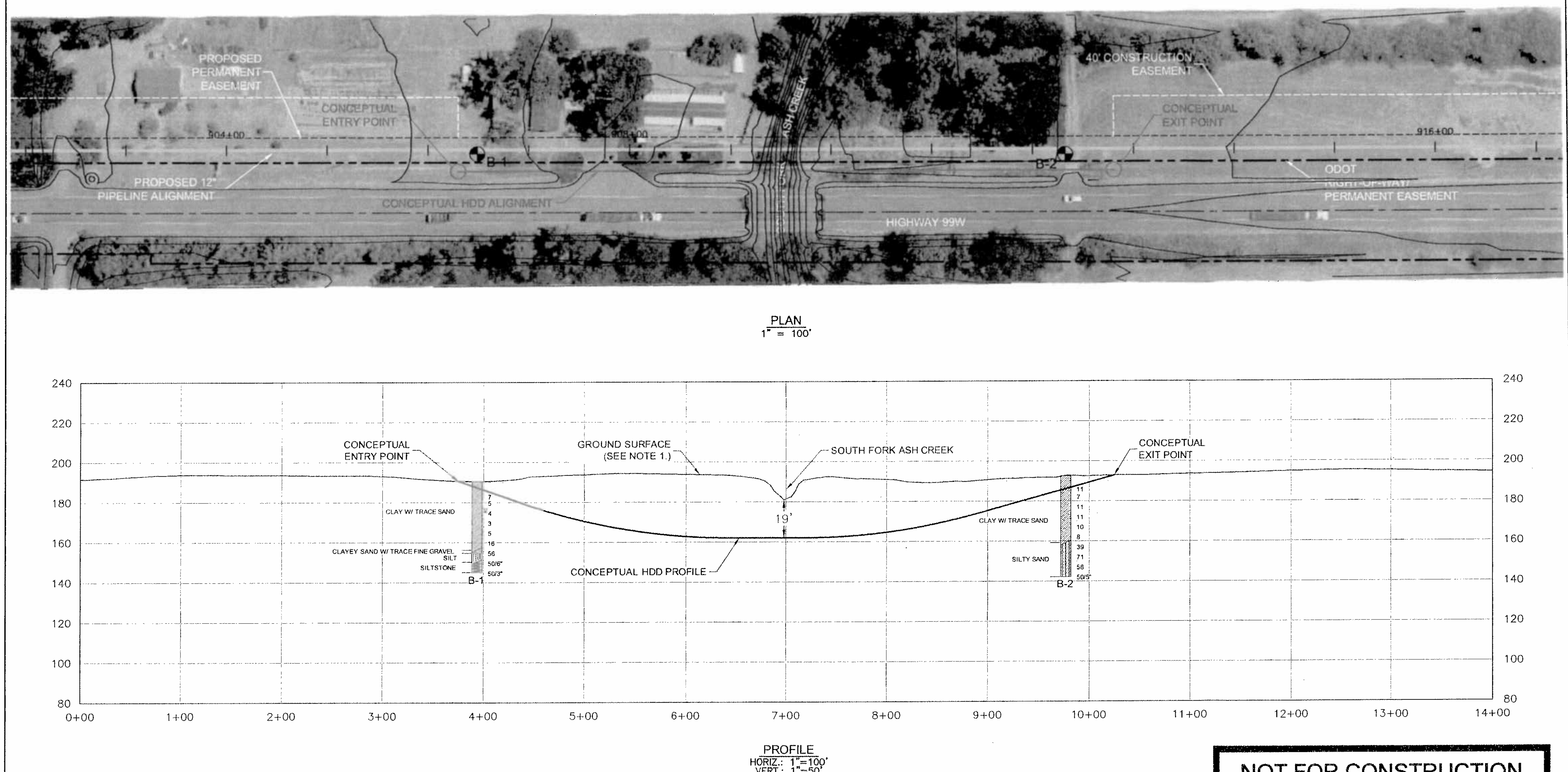
Subsurface Considerations

The soils at the anticipated depths of the conceptual HDD consist of soft to hard clay and silt and dense to very dense silty and clayey sand overlying very soft siltstone bedrock. An HDD at this site could be designed such that the HDD profile would remain above the siltstone bedrock. However, the final design depth of the HDD should be determined during final design based on the results of hydraulic fracture and inadvertent returns evaluation.

Conceptual HDD Geometry

The length, depth and orientation of a potential HDD crossing is a function of Northwest Natural's 15-foot minimum depth requirement below waterbodies, the topography along the proposed alignment, the minimum allowable radius of curvature of the product pipe and the subsurface conditions encountered in the borings.

Because of the relatively flat topography and favorable subsurface conditions, this proposed HDD could be designed as a minimum length crossing. The minimum horizontal length of an HDD crossing at this site would have to be approximately 650 feet. For this crossing we expect that the depth of the HDD profile beneath the creek channel would be approximately 20 feet. The actual profile length and depth should be based on additional geometric and hydraulic fracture analyses completed during the detailed design phase of the project.



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Notes:
1. Topographic information based on a site specific topographic survey dated 9/19/09, provided by WH Pacific.
2. The locations of all features shown are approximate.
3. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. can not guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Legend

Boring Location

Soil Classification

SPT (N) Value

Boring ID

Centerline in Existing Easement
Centerline in ODOT R.O.W.
Centerline in Private Property

SITE PLAN & PROFILE

SOUTH FORK ASH CREEK HDD
POLK COUNTY, OREGON

GEOENGINEERS

FIGURE G-1

Drilled	Start 2/23/2010	End 2/23/2010	Total Depth (ft) 45.25	Logged By BKB Checked By MAM	Driller Subsurface Technologies	Drilling Method Mud Rotary

Surface Elevation (ft) Vertical Datum	190.4	Hammer Data	140 lb Auto	Drilling Equipment	Diedrich D-50 Track Mounted	
Easting (X) Northing (Y)	7494276.522 438062.5132	System Datum	NAD83 SP N US FOOT	Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
Notes: Groundwater elevation based on visual observations.					15.0	175.4

Elevation (feet)	Depth (feet)	FIELD DATA: Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
190	0							CL	Light brown clay with orange mottling and trace sand (medium stiff, moist)			
185	5	14	7		1							
180	10	18	5		2							
175	15	18	4		3	∇			Grades to with sand wet below 15'			
170	20	18	3		4				Becomes gray and soft			
165	25	18	5		5				Becomes medium stiff and sandy			%F=69
160	30	18	16		6				Becomes very stiff with orange mottling			
								SC	See sheet 2 for description			
	35											

Log of Boring B-1

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Project: Mid Willamette Feeder-South Fork Ash Creek
Project Location: Polk County, OR
Project Number: 6024-107-01Task1100

Figure G-2
Sheet 1 of 2

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	FIELD DATA: Recovered (in)	FIELD DATA: Blows/foot	FIELD DATA: Collected Sample	FIELD DATA: Sample Name / Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density (pcf)	REMARKS
155	35		14	56		7			SC	Brown/orange/gray mottled clayey sand with trace fine gravel (dense, moist)			SA, %Gravel =3 %F =35
									ML	Dark gray finely laminated silt (hard, moist) (completely decomposed siltstone)			
150	40		6	50/6"		8			SLST	Dark gray siltstone: moderately weathered, very soft			
	45		3	50/3"		9							

Log of Boring B-1 (continued)

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Project:	Mid Willamette Feeder-South Fork Ash Creek
Project Location:	Polk County, OR
Project Number:	6024-107-01Task1100

Figure G-2
Sheet 2 of 2

Drilled	Start 10/26/2009	End 10/27/2009	Total Depth (ft)	50.5	Logged By DWW Checked By MAM	Driller	Subsurface Technologies	Drilling Method	Mud Rotary

Surface Elevation (ft) Vertical Datum	192.9	Hammer Data	140 lb Auto
Easting (X) Northing (Y)	7494251.27 437479.783	System Datum	NAD83 SP N US FOOT
Drilling Equipment	Diedrich D-50 Track Mounted	Groundwater	Date Measured / Depth to Water (ft) / Elevation (ft)
Notes:			

Elevation (feet)	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
	0							CL	Brown and gray lean clay with trace fine sand (stiff, moist)			
190												
	5	15	11		1							
185												
	10	17	7		2				Becomes medium stiff	32		
180												
	15	16	11		3				Becomes gray and stiff			
175												
	20	15	11		4							
170												
	25	16	10		5				With occasional organics	31		%F = 98 AL
165												
	30	15	8		6							
160												
								SM	Gray and brown silty fine sand (dense, wet)			
	35											

Log of Boring B-2

GEOENGINEERS

Project:	Mid Willamette Feeder-South Fork Ash Creek
Project Location:	Polk County, OR
Project Number:	6024-107-01Task1100

Figure G-3
Sheet 1 of 2

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	FIELD DATA: Recovered (in)	FIELD DATA: Blows/foot	FIELD DATA: Collected Sample	FIELD DATA: Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
	35		14	39		7 %F			SM	Gray and brown silty fine sand (dense, wet)	33		%F = 43
155													
	40		14	71		8				Becomes very dense			
150													
	45		16	58		9				Becomes dark gray with gravel			
145													
	50		5	50/5"		10							

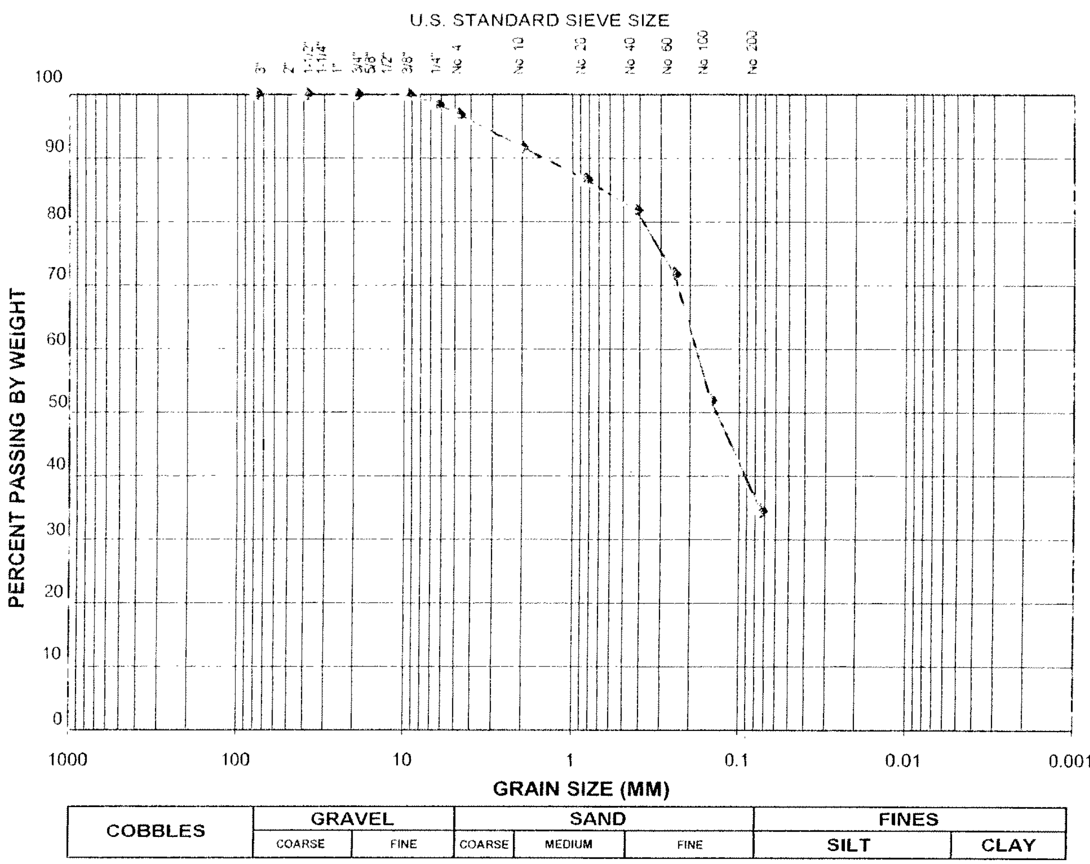
Log of Boring B-2 (continued)

GEOENGINEERS

Project:	Mid Willamette Feeder-South Fork Ash Creek
Project Location:	Polk County, OR
Project Number:	6024-107-01Task1100

Figure G-3
Sheet 2 of 2

Project:	Mid Willamette Feeder-South Fork Ash Creek	**Lab No.**	10-0010
Project No.	6024-107-01Task1100	**Date:**	02/26/10
Boring/TP No.	B-1	**Tested By:**	KAR
Sample No./Depth:	S-7 @ 35'	**Checked By:**	
USCS Classification:	SC	**PA/PM:**	BCR



Nat. Water Content, %	Gravel Total, %	Sand Total, %	Fines Total, %	USCS	Description
27.2	3.1	62.3	34.6	SC	Brown clayey sand

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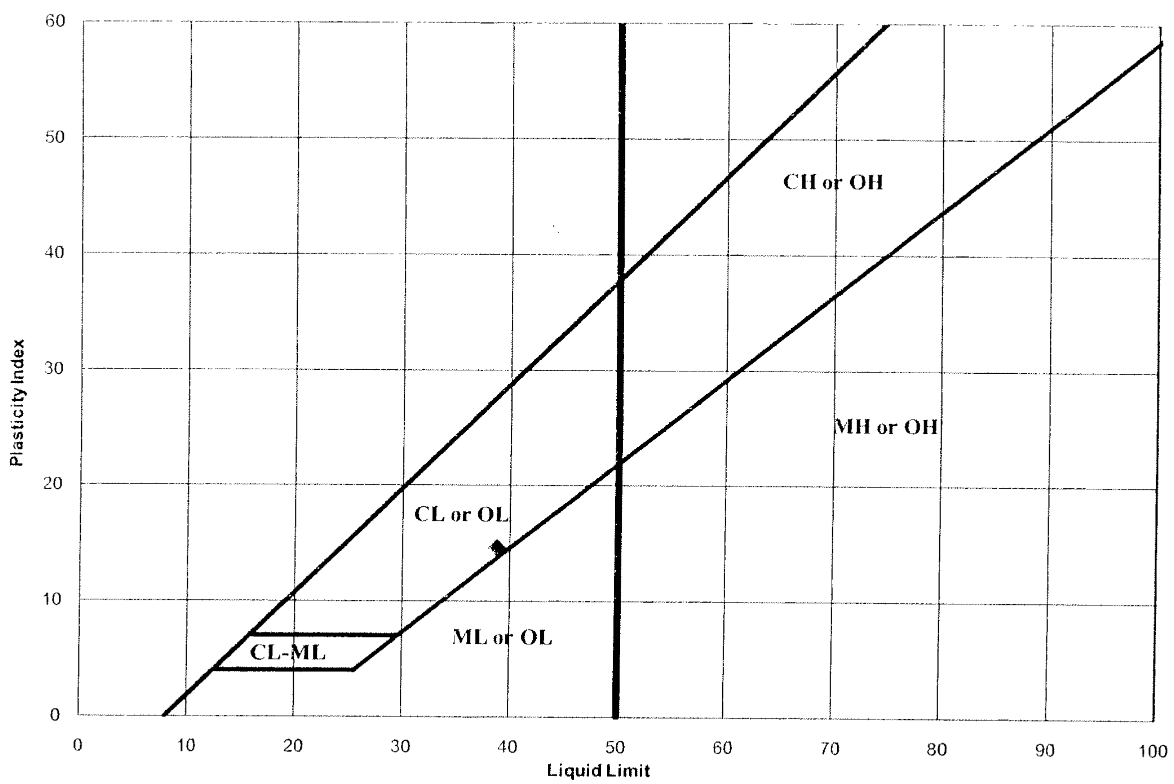
Grain Size Analysis ASTM C 136

Figure G-4

Project:	Mid Willamette Feeder-South Fork Ash Creek	**Lab No.**	09-0047
Project No.	6024-107-01-1100	**Date:**	10/28/09
Boring/TP No.	B-2	**Tested By:**	KAR
Sample No./Depth:	S-5 @ 25'	**Checked By:**	BCR
Description:	CL	**PA/PM:**	TNH/BCR



Moisture Content %	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Description
30.8%	39	24	15	CL	Lean clay

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Atterberg Limits ASTM D 4318

Figure G-5

APPENDIX H
Stapleton Road Railroad HDD

APPENDIX H
STAPLETON ROAD RAILROAD HDD

The Stapleton Road Railroad HDD site is located along the south side of Stapleton road, approximately 1.75 miles south-southwest of Independence, Oregon. The proposed pipeline alignment at the site is oriented east-west and parallel to the south side of Stapleton Road as shown in Figure H-1. An HDD approximately 2,075 feet in length is required at this site.

SITE DESCRIPTION

Surface Conditions

The HDD site is located in a generally flat area along the south side of Stapleton Road. Figure H-1 shows the alignment with respect to topography and surface conditions in the area. The proposed HDD would cross beneath the Southern Pacific Railroad right-of-way (ROW) and a wetland area. The proposed pipeline alignment crosses the railroad ROW at an approximate perpendicular angle and the railroad embankment is approximately 3 feet above surrounding site grades.

Highland Road is located approximately 400 feet west of the conceptual exit point. Highland Road is a low traffic volume gravel road that is bordered to the east and west by agricultural fields.

Corvallis Road is located approximately 1,200 feet east of the conceptual entry point. Corvallis Road is a moderate traffic volume paved road. It is bordered to the east and west by agricultural fields.

Subsurface Conditions

We explored subsurface conditions at the site on November 5, 2009 and February 22, 2010 by drilling two borings to maximum depths of 46.5 feet below ground surface (bgs) at the approximate locations shown in Figure H-1. In general, the borings encountered medium stiff to very stiff silts and clays and medium dense sands. Subsurface conditions encountered in the borings are consistent with the geologic mapping for the area (Allison, 1953, O'Connor et al, 2001). Logs of the borings are presented as Figures H-2 and H-3.

Boring B-1 was drilled in the eastbound lane of Stapleton Road, approximately 415 feet west of the conceptual entry point of the HDD. From the surface, the boring encountered approximately 6 inches of asphalt pavement overlying approximately 10 inches of road base aggregate. Between depths of approximately 1.5 and 44 feet bgs, the boring encountered medium stiff to very stiff clays with varying sand content. Dense clayey sand was encountered between depths of 44 and 44.5 feet bgs, the maximum depth explored.

Boring B-2 was drilled in the agricultural field on the east side of the proposed HDD, approximately 40 feet west of the conceptual HDD entry point. The boring encountered stiff to very stiff fat clay with varying sand content from the ground surface to a depth of approximately 28.5 feet bgs. Between depths of 28.5 and 40.5 feet bgs the boring encountered very stiff sandy silt and very dense sitly sand. Stiff sandy fat clay was encountered between depths of 40.5 and 43.5 feet bgs. Below depths of 43.5 feet bgs, the boring encountered medium dense fine sand to 46.5 feet bgs, the maximum depth explored.

Groundwater

Based on visual observations of moisture content in the samples collected within boring B-2, groundwater is likely located at a depth of approximately 17 feet bgs at the site. We anticipate that groundwater levels will fluctuate due to seasonal variations in precipitation, changes in site utilization or other factors. For the design and construction of an HDD, the groundwater level is not typically a factor affecting feasibility. The hydrostatic drilling fluid pressure typically compensates for high groundwater levels.

LABORATORY TESTING

Percent fines analyses were performed on two samples in general accordance with ASTM D 1140. The percentage passing the U.S. No. 200 sieve is shown on the boring logs at the respective sample depths.

Atterberg limits tests were performed on two soil samples. The tests were used to classify the soil as well as to evaluate engineering index properties. The liquid limit and the plastic limit were estimated through a procedure performed in general accordance with ASTM D 4318. The results of the Atterberg limits testing are shown in Figures H-4 and H-5.

HDD FEASIBILITY CONCLUSIONS AND RECOMMENDATIONS

Based on our HDD evaluation, the HDD method of construction at the Stapleton Road Railroad site is feasible. Because of the cohesive soils observed in boring B-2, the HDD would likely need to be drilled from east to west in order to reduce the annular drilling fluid pressures under the railroad ROW during pilot hole operations, thus reducing the potential for hydraulic fracture and inadvertent returns at that location. A conceptual HDD profile for this HDD is shown in Figure H-1.

We recommend that a detailed design be completed for this proposed HDD so that the alignment and profile can be further refined. Prior to the detailed design being completed, we recommend an additional boring be completed near Station 1015+00, 25 feet away from the proposed alignment. The detailed design should include final alignment and profile design, workspace layouts, analyses of installation and operating stresses, and a hydraulic fracture and inadvertent returns evaluation. The hydrofracture and inadvertent returns analysis will be especially important to reduce the potential hydrofracture related issues (settlement, inadvertent returns) beneath the railroad. The orientation of the conceptual HDD shown in Figure H-1 was developed considering hydraulic fracture and inadvertent returns potential from a qualitative standpoint. A quantitative analysis will be required to determine the final depth of the HDD profile.

The following sections summarize conclusions regarding workspace considerations, subsurface conditions and conceptual HDD geometry.

Workspace Considerations

In our opinion, the entry and exit points of the HDD could be located on either side of the HDD depending on how much temporary workspace can be acquired west of the site for stringing and fabricating the product pipe. However, to reduce the potential for hydrofracture and inadvertent returns at the railroad crossing during pilot hole operations, we recommend that the HDD enter on the east side of the site. The following paragraphs describe the conceptual entry and exit sides of the HDD.

The layout and dimensions for the proposed entry/exit side workspaces have not been identified in Figure H-1, but will be added during the detailed design phase. For typical HDD installations of this magnitude, the additional temporary workspace required at the entry and exit points will be approximately 60 feet by 150 feet along the proposed alignment. The following paragraphs describe the conceptual entry and exit sides of the HDD.

Conceptual Entry and Exit Sides

The agricultural fields on both sides of the crossing are suitable for use as temporary workspace from a constructability standpoint. The area is relatively flat and significant grading of the site would not likely be necessary. Access to the workspace could be gained directly from Stapleton Road.

Temporary workspace for stringing and fabrication of the product pipe should be acquired west of the conceptual exit point. The length of the conceptual HDD would require that the stringing and fabrication area extend into private agricultural land west of Highland Road. The product pipe could be strung and fabricated in one continuous section by excavating a narrow trench across Highland Road. Traffic flow on Highland Road could be maintained by covering the trench with steel road plates. After installation of the product pipe, the trench could be backfilled and the road surface restored. Access to the exit workspace could be gain directly from Stapleton Road or from Highland Road west of the site.

Alternatively, the product pipe could be strung and fabricated on the east side of the site. Because of Corvallis Road east of the site, adequate workspace for stringing and fabricating the product pipe in one continuous section does not exist. In this case, the product pipe could be fabricated in two sections, which would require a weld to be made during pullback operations, or a narrow trench could be excavated across Corvallis Road similar to the method discussed in the previous paragraph.

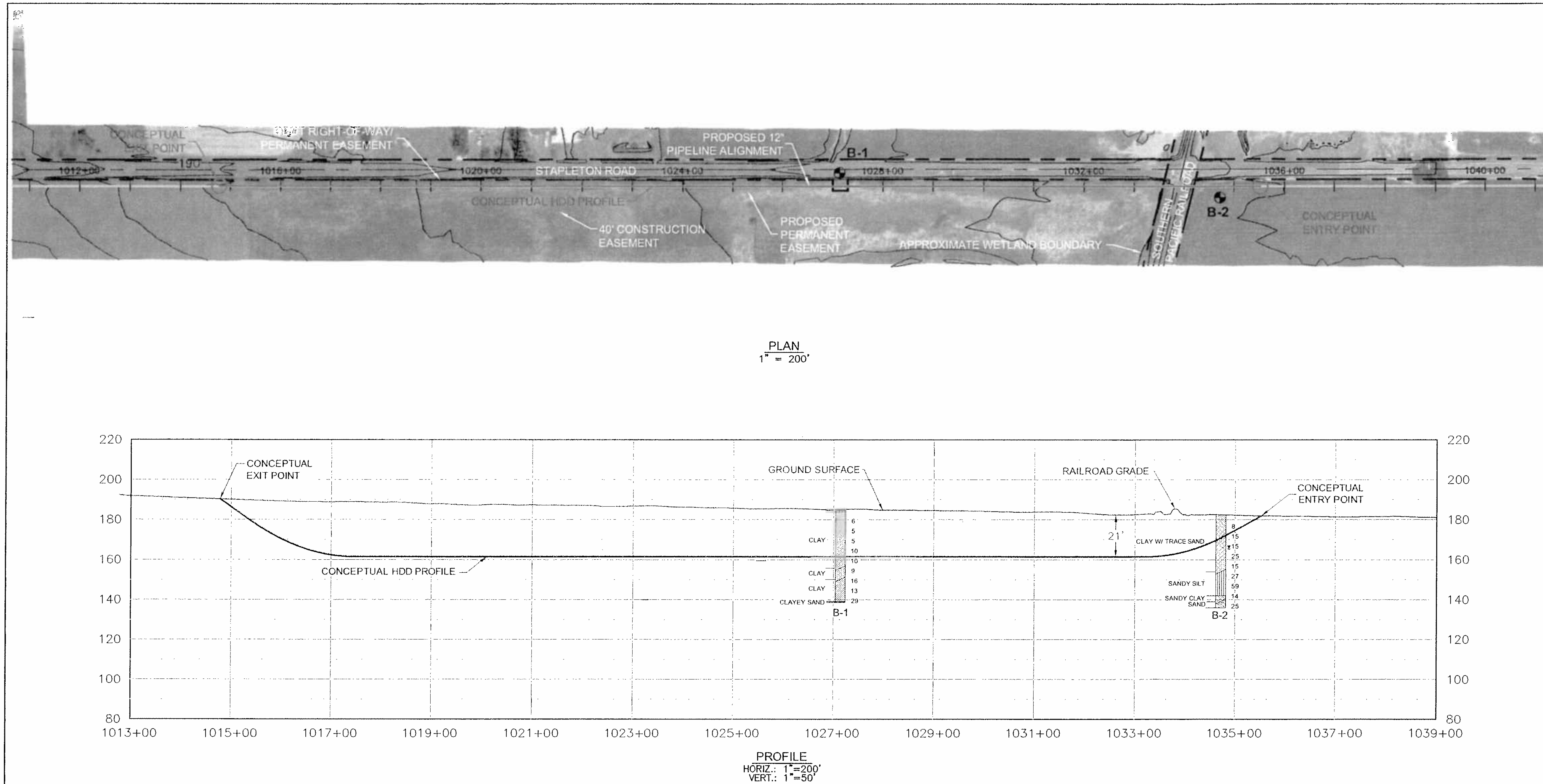
Subsurface Considerations

The soils at the anticipated depths of a potential HDD at this site consist of medium stiff to very stiff silts and clays, and medium dense sands. The depth of the HDD profile should be determined during final design based on the results of hydraulic fracture and inadvertent returns evaluation. The final design will also assist in determining the potential for hydraulic fracture related issues such as settlement of the railroad grade occurring as a result of HDD operations. The recommended additional boring should be completed to confirm the subsurface conditions.

Conceptual HDD Geometry

The length, depth and orientation of a potential HDD crossing is a function of Northwest Natural's 15-foot minimum depth requirement below waterbodies (including wetlands), the topography along the proposed alignment, the minimum allowable radius of curvature of the product pipe and the subsurface conditions encountered in the borings.

Because of the width of the wetland area that requires crossing, the HDD would have to be longer than what would be considered a minimum length HDD. The minimum horizontal length of an HDD at this site would have to be approximately 2,075 feet. For this HDD we expect that the depth of the HDD profile beneath the railroad ROW could range from 20 to 25 feet. Completing the pilot hole from east to west would reduce the risk of hydraulic fracture and inadvertent returns where the HDD profile crosses beneath the railroad ROW. A setback of the entry point from the railroad ROW would be required to provide adequate profile depth beneath the railroad. The actual profile length and depth should be based on additional geometric and hydraulic fracture analyses completed during the detailed design phase of the project.



BCR : MWJ

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NOT FOR CONSTRUCTION

Notes:
1. Topographic information based on a site specific topographic survey dated 9/19/09, provided by WH Pacific.
2. The locations of all features shown are approximate.
3. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. can not guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Legend

Boring Location

Soil Classification

SPT (N) Value

Boring ID

N W E S

Centerline in Existing Easement
Centerline in ODOT R.O.W.
Centerline in Private Property

SITE PLAN & PROFILE

STAPLETON RAILROAD HDD
POLK COUNTY, OREGON

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FIGURE H-1

Drilled	Start 2/22/2010, End 2/22/2010	Total Depth (ft)	46.5	Logged By BKB, Checked By MAM	Driller Subsurface Technologies; Drilling Method Mud Rotary
Surface Elevation (ft) Vertical Datum	184.0	Hammer Data	140 lb Auto	Drilling Equipment	Diedrich D-50 Truck Mounted
Easting (X) Northing (Y)	7502721.421 434240.5006	System Datum	NAD83 SP N US FOOT	Groundwater	Date Measured / Depth to Water (ft) / Elevation (ft)
Notes:					

Elevation (feet)	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density (pcf)	REMARKS
	0							AC	Asphalt			
								GP	Black gravel (road base aggregate)			
								CL	Brown lean clay with orange/black mottling (medium stiff, moist)			
180												
	5	16	6		1							
175												
	10	18	5		2				With occasional interbedded 2" thick layers of silty sand below 10'			
170												
	15	18	5		3							
165												
	20	18	10		4				Becomes gray and stiff			
160												
	25	18	10		5				Becomes sandy with orange/brown mottlings			%F=80
155												
	30	16	9		6			CH	Brown fat clay with gray and orange mottling (stiff, moist)			AL
150												
	35											

Log of Boring B-1

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Project: Mid Willamette Feeder-Stapleton Road
Project Location: Polk County, OR
Project Number: 6024-107-01Task1200

Figure H-2
Sheet 1 of 2

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density (pcf)	REMARKS
	35		18	16		7			CL	Brown lean clay (very stiff, moist)			
145													
	40		18	13		8				Becomes stiff			
140													
	45		18	29		9				Becomes dark gray and very stiff			
									SC	Dark gray clayey sand (dense, moist)			

Log of Boring B-1 (continued)

GeoEngineers

Project: Mid Willamette Feeder-Stapleton Road
Project Location: Polk County, OR
Project Number: 6024-107-01Task1200

Figure H-2
Sheet 2 of 2

Drilled	Start 11/5/2009	End 11/5/2009	Total Depth (ft) 46.5	Logged By DWW Checked By MAM	Driller Subsurface Technologies	Drilling Method HSA

Surface Elevation (ft) Vertical Datum	182.4	Hammer Data	140 lb Auto	Drilling Equipment	Diedrich D-50 Truck Mounted
Easting (X) Northing (Y)	7503477.714 434168.6583	System Datum	NAD83 SP N US FOOT	Groundwater Date Measured	Depth to Water (ft): 17.0 Elevation (ft): 165.4
Notes:					

Elevation (feet)	Depth (feet)	FIELD DATA: Interval / Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
	0							CH	Tan/brown fat clay with trace fine sand (stiff, moist)			
180												
	5	14	8		1							
175												
	10	18	15		2							
170												
	15	16	15		3							
						▽			Becomes wet			
165												
	20	18	25		4				Becomes very stiff	34.2		
160												
	25	18	15		5				Becomes stiff			
155												
								ML	Dark gray sandy silt (very stiff, moist)			
	30	18	27		6					34.5		%F=63
150												
	35											

Log of Boring B-2

GeoEngineers

Project: Mid Willamette Feeder-Stapleton Road
Project Location: Polk County, OR
Project Number: 6024-107-01Task1200

Figure H-3
Sheet 1 of 2

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	FIELD DATA: Recovered (in)	FIELD DATA: Blows/foot	FIELD DATA: Collected Sample	FIELD DATA: Sample Name / Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
	35		18	59		7			ML	Dark gray to black sandy silt (hard, wet)			
145													
	40		18	14		8							
									CH	Gray sandy fat clay (stiff, moist)			
140													
									SP	Dark gray fine sand (medium dense, wet)			
	45		18	25		9							

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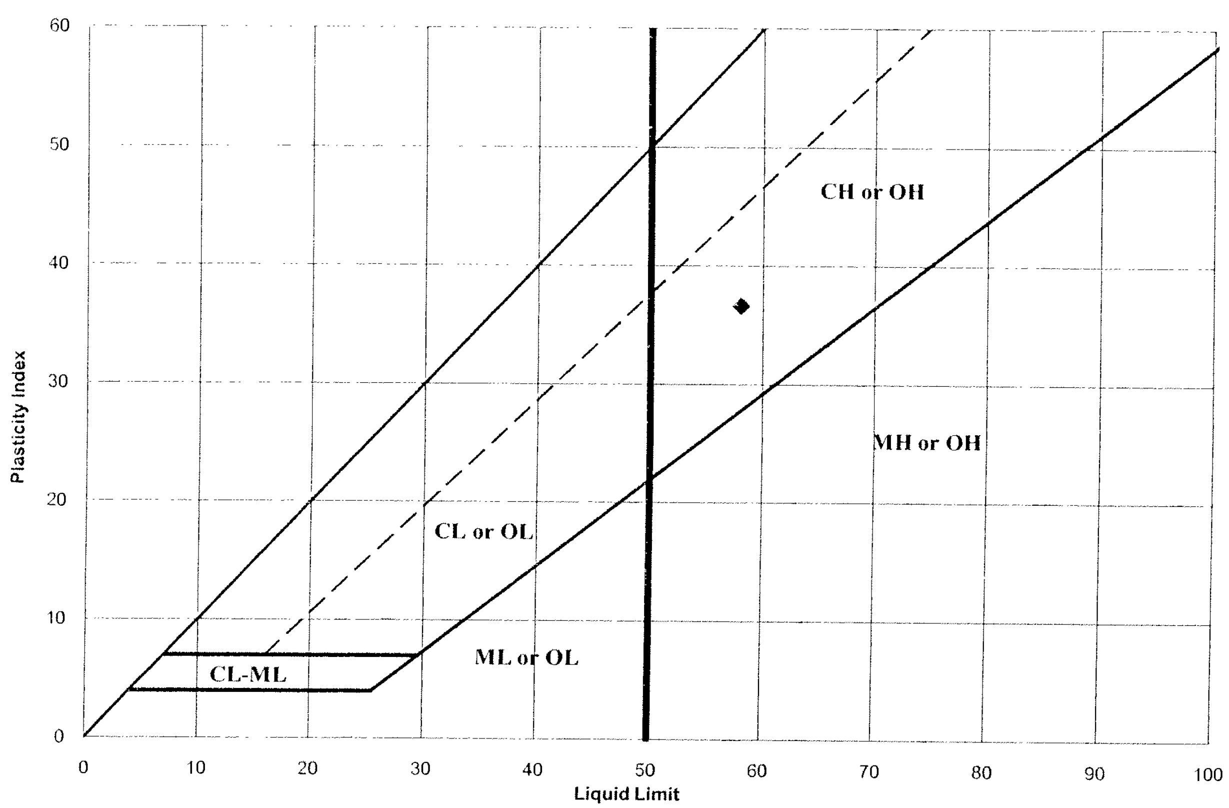
Log of Boring B-2 (continued)

GeoEngineers

Project:	Mid Willamette Feeder-Stapleton Road
Project Location:	Polk County, OR
Project Number:	6024-107-01Task1200

Figure H-3
Sheet 2 of 2

Project:	Mid Willamette Feeder-Highland/Stapleton	**Lab No.**	10-0012
Project No.	6024-107-01Task1200	**Date:**	02/26/10
Boring/TP No.	B-1	**Tested By:**	KAR
Sample No./Depth:	S-6 @30'	**Checked By:**	
USCS Classification:	CH	**PA/PM:**	BCR



Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Description
30.8	58	21	37	CH	Gray-brown and orange mottled fat clay

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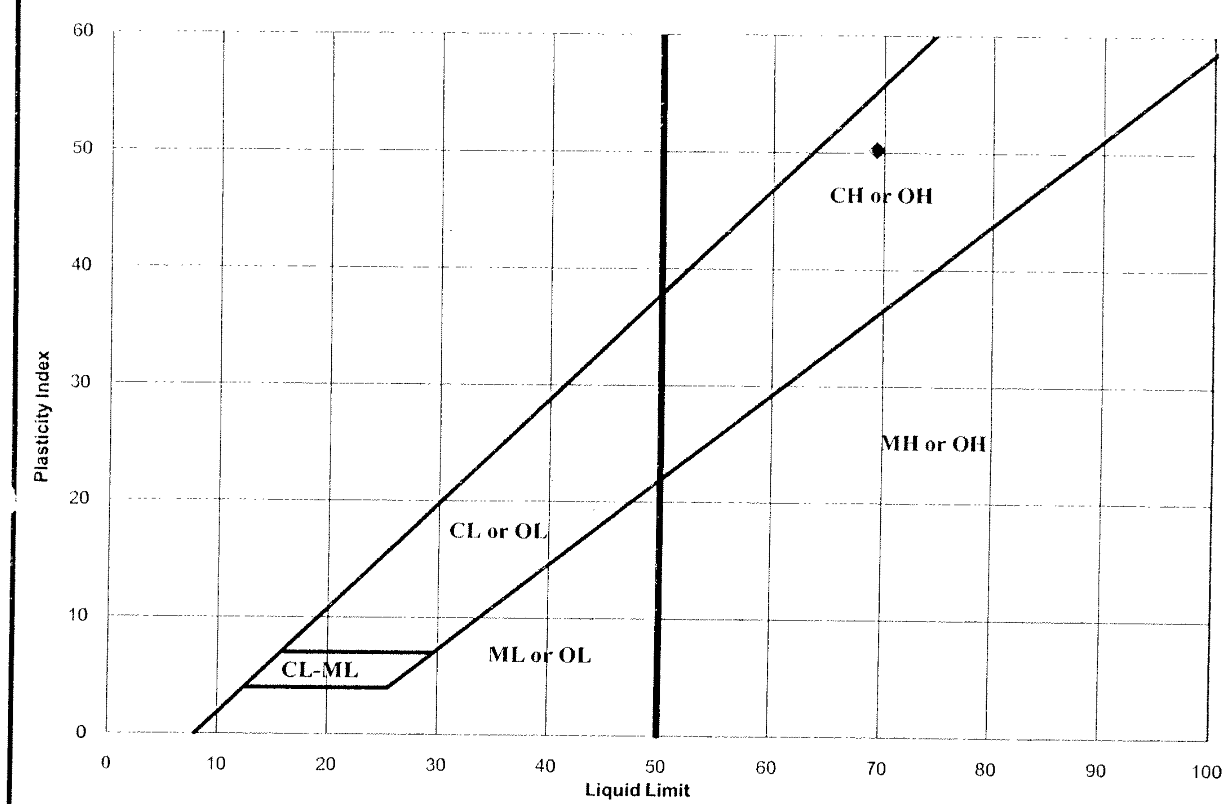
Atterberg Limits ASTM D 4318

Figure H-4

Project:	Mid-Willamette Feeder-Highland/Stapleton Rd	Lab No.	09-0056
Project No.	6024-107-01-1200	Date:	11/06/09
Boring/TP No.	B-2	Tested By:	KAR/BKB
Sample No./Depth:	S-4 @ 20'	Checked By:	KAR
Description:	CH	PA/PM:	BCR



Moisture Content %	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Description
34.2%	69	19	50	CH	Gray fat clay

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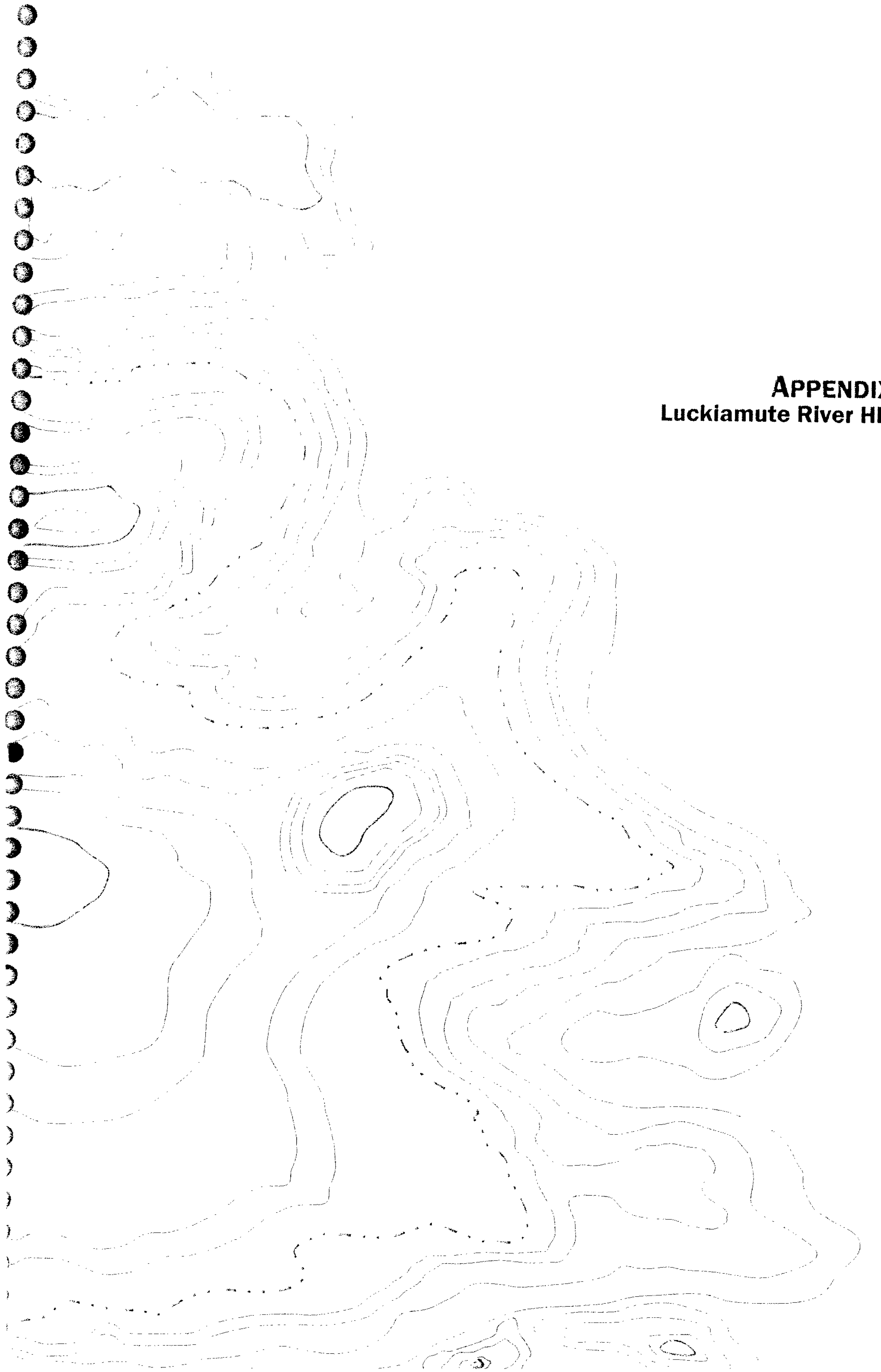
Atterberg Limits ASTM D 4318

Figure H-5



APPENDIX I
Luckiamute River HDD

APPENDIX I
LUCKIAMUTE RIVER HDD

The Luckiamute River HDD site is located adjacent to Corvallis Road approximately 1.75 miles southwest of Buena Vista, Oregon. The proposed pipeline alignment at the site is oriented north-south and parallel to the east side of Corvallis Road as shown in Figure I-1. An HDD crossing of approximately 860 feet in length is required at this site.

SITE DESCRIPTION

Surface Conditions

The area along the proposed pipeline alignment north of the Luckiamute River is undeveloped land that gently slopes down toward the north bank of the river. Figure I-1 shows a cross sectional view of the site topography along the proposed alignment and a conceptual HDD profile. The Luckiamute River is incised approximately 30 feet below both banks. Because no bathymetric survey was completed prior to the report, the channel depth of the Luckiamute River is unknown. The proposed pipeline alignment on the north side of the river is vegetated primarily with grasses and under brush with scattered deciduous trees. An existing overhead power line parallels the pipeline right-of-way (ROW) across the river.

South of the Luckiamute River, the ground surface along the proposed pipeline alignment is relatively flat toward the south but gently slopes up toward the west and Corvallis Road. The proposed pipeline ROW on the south side of the river is vegetated with dense underbrush. East of the pipeline ROW is a relatively flat agricultural field.

Subsurface Conditions

We explored subsurface conditions at the site on October 27, 2009 and February 24, 2010 by drilling two borings to maximum depths of 71.5 feet below ground surface (bgs) at the approximate locations shown on Figure I-1. In general, our borings encountered medium stiff to very stiff silts and clays with varying sand content and very loose to medium dense sands with varying silt and clay content. These subsurface conditions are consistent with the geologic mapping for the area (Allison, 1953, O'Connor et al, 2001). Logs of the borings are presented as Figures I-2 and I-3.

Boring B-1 was drilled approximately 200 feet north of the Lukiamute River. The boring encountered approximately 7 feet of lean clay fill overlying approximately medium stiff to stiff lean clay that extended to about 34 feet bgs. Between depths of 34 and 39.5 feet bgs, the boring encountered medium dense clayey sand. Below 39.5 feet bgs, medium stiff to hard lean clay was encountered to a depth of 71.5 feet bgs, the maximum depth explored.

Boring B-2 was drilled approximately 175 feet south of the Luckiamute River. We observed medium stiff sandy silt with occasional gravel from the ground surface to a depth of approximately 20 feet bgs. Between depths of 20 and 30 feet bgs the boring encountered very loose clayey sand. Very loose to medium dense sand with occasional gravel was observed between depths of 30 and 38 feet bgs. A unit of medium dense fine to coarse gravel with sand and silt was encountered between depths of 38 and

shorter HDD. The HDD could potentially be lengthened and shifted west to the proposed pipeline alignment. A cost analysis of additional trenching versus a longer HDD should be considered for final HDD design.

The following sections summarize conclusions regarding workspace considerations, subsurface conditions and conceptual HDD geometry.

Workspace Considerations

In our opinion, the entry side of the HDD should be located on the north side of the site and the exit side of the HDD should be located on the south side of the site because there is adequate space for stringing and fabricating the product pipe on the south side of the crossing.

The layout and dimensions for the proposed entry/exit side workspaces have not been identified in Figure B-1, but will be added during the detailed design phase. For typical HDD installations of this magnitude, the additional temporary workspace required at the entry and exit points will be approximately 60 feet by 150 feet along the proposed alignment.

Conceptual Entry and Exit Sides

The areas on both sides of the crossing are suitable for use as temporary workspace from a constructability standpoint. The areas are relatively flat and significant grading of the site would not likely be necessary. Access to the workspaces could be gained directly from Corvallis Road.

Subsurface Considerations

The soils at the anticipated depths of the conceptual HDD at this site generally consist of medium stiff to very stiff silts and clays and very loose to medium dense sands. The thin gravel unit encountered in boring B-2 could present a risk for hole instability if the bottom tangent of the HDD is located within this unit. The bottom tangent of the HDD profile should be designed in such a way as to avoid this gravel unit. However, the depth of the HDD profile should be determined during final design based on the results of hydraulic fracture and inadvertent returns evaluation.

Conceptual HDD Geometry

The length, depth and orientation of a potential HDD crossing is a function of Northwest Natural's 15-foot minimum depth requirement below waterbodies, the topography along the proposed alignment, the minimum allowable radius of curvature of the product pipe and the subsurface conditions encountered in the borings.

Because of the deeply incised channel of the Luckiamute River, and the gravelly unit encountered in boring B-2, the HDD would have to be longer than what would normally be considered a minimum length crossing. The minimum horizontal length of an HDD at this site would have to be approximately 860 feet. For this HDD we expect that the depth of the profile beneath the river could be approximately 20 feet. The actual profile length and depth should be based on a future bathymetric survey of the river bottom and additional geometric and hydraulic fracture analyses completed during the detailed design phase of the project.

BCR : BTL

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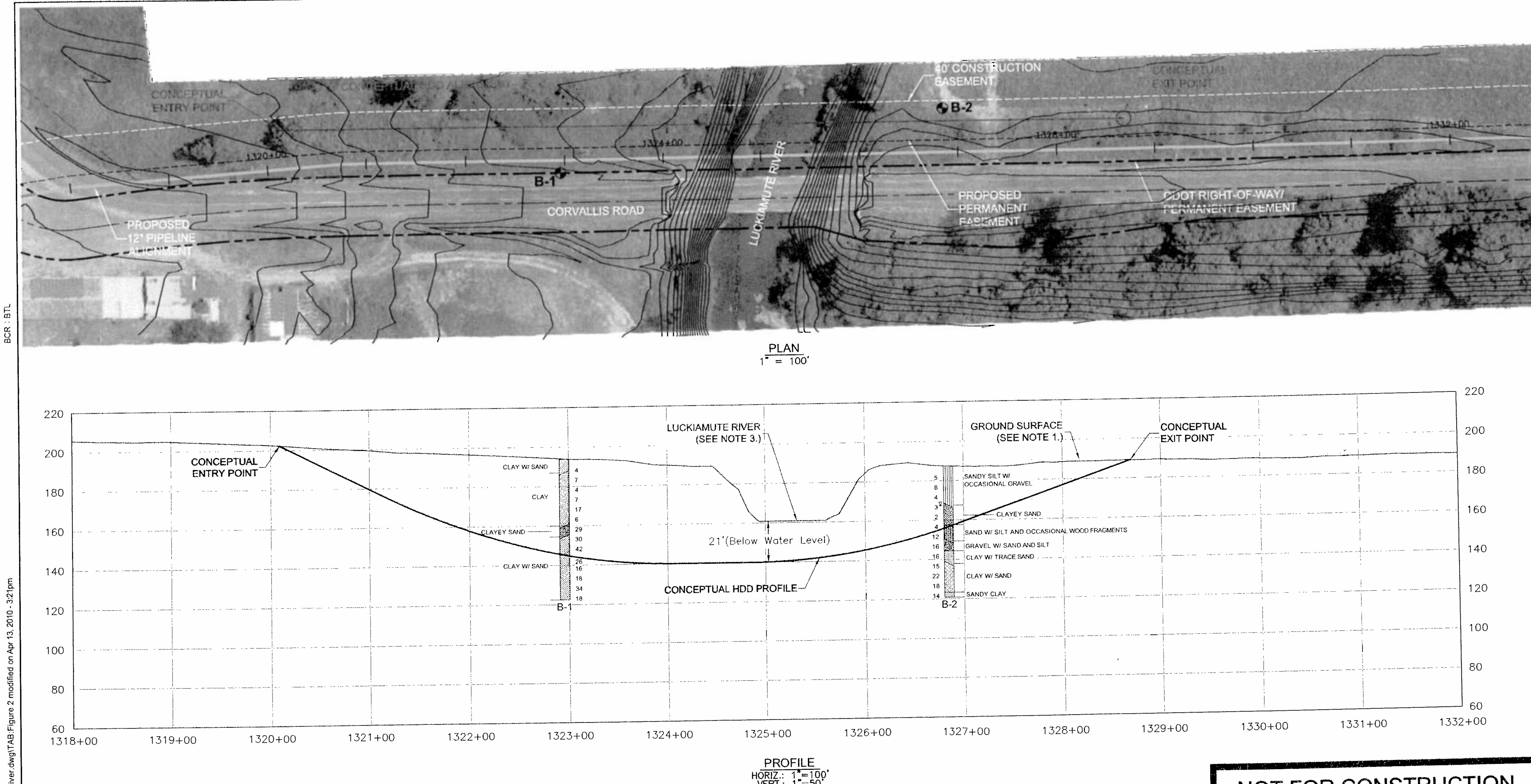

NOT FOR CONSTRUCTION

Notes:
1. Topographic information based on a site specific topographic survey dated 9/19/09, provided by WH Pacific.
2. The locations of all features shown are approximate.
3. No bathymetric survey was completed during the feasibility phase of this project. Therefore the depth of the Luckiamute River channel is not known at this time. Depth shown on profile is the depth below the water level at the time of the topographic survey.
4. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. can not guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Legend

Boring Location

Soil Classification

SPT (N) Value

Boring ID

Centerline in Existing Easement

Centerline in ODOT R.O.W.

Centerline in Private Property

SITE PLAN & PROFILE

LUCKIAMUTE RIVER HDD
POLK COUNTY, OREGON

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FIGURE I-1

Drilled	Start 2/24/2010	End 2/24/2010	Total Depth (ft) 71.5	Logged By BKB / Checked By MAM	Driller Subsurface Technologies
Drilling Method	Mud Rotary				
Surface Elevation (ft) Vertical Datum	196.6	Hammer Data	140 lb Auto	Drilling Equipment	Diedrich D-50 Truck Mounted
Easting (X) Northing (Y)	7505752.195 409197.2976	System Datum	NAD83 SP N US FOOT	Groundwater	Date Measured / Depth to Water (ft) / Elevation (ft)
Notes:					

FIELD DATA

Elevation (feet)	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density (pcf)	REMARKS
	0							CL	Dark brown clay with sand (medium stiff, moist) (fill)			
195												
	5	3	4		1							
190								CL	Light Brown lean clay with light gray mottling (medium stiff, moist)			
	10	18	7		2							AL
185												
	15	18	4		3							
180												
	20	18	7		4				Becomes brown with orange/gray mottling			%F=87
175												
	25	8	17		5				Becomes stiff			%F=67
170												
									Becomes gray and medium stiff			
	30	16	6		6							
165												
	35							SC	Brown clayey sand (medium dense, wet)			

Log of Boring B-1

GEOENGINEERS

Project:	Mid Willamette Feeder-Luckiamute River
Project Location:	Polk County, OR
Project Number:	6024-107-01Task1300

Figure I-2
Sheet 1 of 2

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	FIELD DATA: Recovered (in)	FIELD DATA: Blows/foot	FIELD DATA: Collected Sample	FIELD DATA: Sample Name / Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
	35		12	29		7							SA, %Gravel=14 %F=17
160													
	40		18	30		8			CL	Gray/brown mottled lean clay with sand (very stiff, moist)			
155													
	45		18	42		9				Becomes hard			
150													
	50		18	26		10				Becomes medium stiff			
145													
	55		18	16		11				Becomes sandy			
140													
	60		18	18		12				Grades to with sand			
135													
	65		14	34		13				Becomes hard and sandy			%F=54
130													
	70		18	18		14				Becomes stiff and brown/gray mottled with occasional weathered gravel fragments			

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Log of Boring B-1 (continued)

GeoEngineers

Project:	Mid Willamette Feeder-Luckiamute River
Project Location:	Polk County, OR
Project Number:	6024-107-01Task1300

Figure I-2
Sheet 2 of 2

Drilled: Start 10/27/2009, End 10/27/2009	Total Depth (ft) 66.5	Logged By DWW Checked By MAM	Driller Subsurface Technologies		Drilling Method Mud Rotary
Surface Elevation (ft) / Vertical Datum	186.6	Hammer Data	140 lb Auto	Drilling Equipment	Diedrich D-50 Truck Mounted
Easting (X) / Northing (Y)	7505765.885 / 408804.143	System Datum	NAD83 SP N US FOOT	Groundwater: Date Measured / Depth to Water (ft) / Elevation (ft)	20 feet
Notes:					

Elevation (feet)	Depth (feet)	FIELD DATA: Interval / Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density (pcf)	REMARKS
185	0							ML	Brown sandy silt with occasional coarse gravel (medium stiff, moist)			
180	5	6	5		1					27		SA; %F = 55 %Gravel = 16
175	10	8	8		2				Lacking gravel			
170	15	8	4		3							
165	20	12	3		4	∇		SC	Brown clayey sand (very loose, wet)			
160	25	18	2		5					34		%F = 23
155	30	18	4		6			SP-SM	Bluish-gray fine to medium sand with silt and occasional wood fragments (very loose, wet)			
	35											

Portland: Date:4/2/10 Path:P:\6\6024107\01\GINT\PG 602410701\602410701.GPJ DBTemplate/LibTemplate:GEOENGINEERS8.GDT/GEI8_GEOTECH_STANDARD

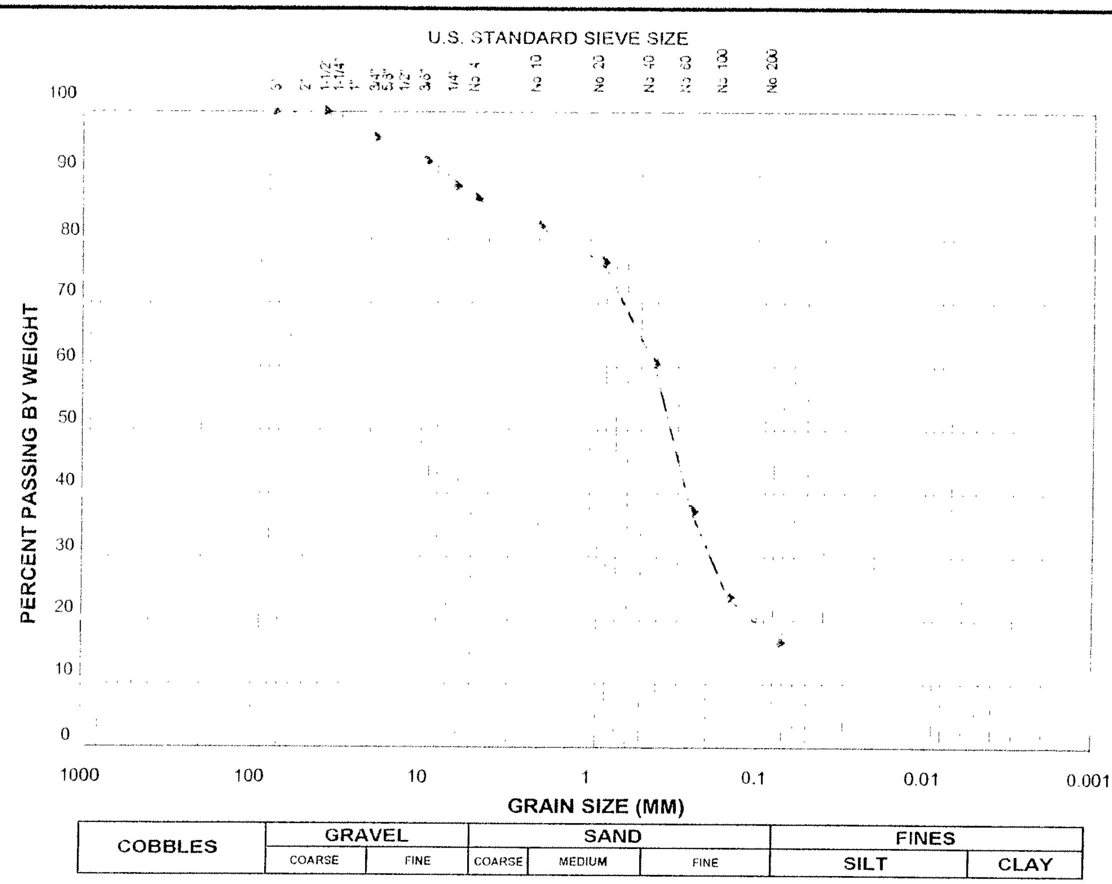
Log of Boring B-2

GeoEngineers

Project: Mid Willamette Feeder-Luckiamute River
Project Location: Polk County, OR
Project Number: 6024-107-01Task1300

Figure I-3
Sheet 1 of 2

Project:	Mid Willamette Feeder-Luckiamute	**Lab No.**	10-0012
Project No.	6024-107-01	**Date:**	02/26/10
Boring/TP No.	B-1	**Tested By:**	KAR
Sample No./Depth:	S-7 @ 35'	**Checked By:**	
USCS Classification:	SC	**PA/PM:**	BCR



Nat. Water Content, %	Gravel Total, %	Sand Total, %	Fines Total, %	USCS	Description
3.6	13.7	69.7	16.6	SC	Brown-orange clayey sand

NOTE: Test results are applicable only to the specific sample on which they were performed, and should not be interpreted as representative of any other samples obtained at other times, depths or locations or generated by separate operations or processes. This report may not be reproduced, except in full, without written approval of GeoEngineers, Inc.

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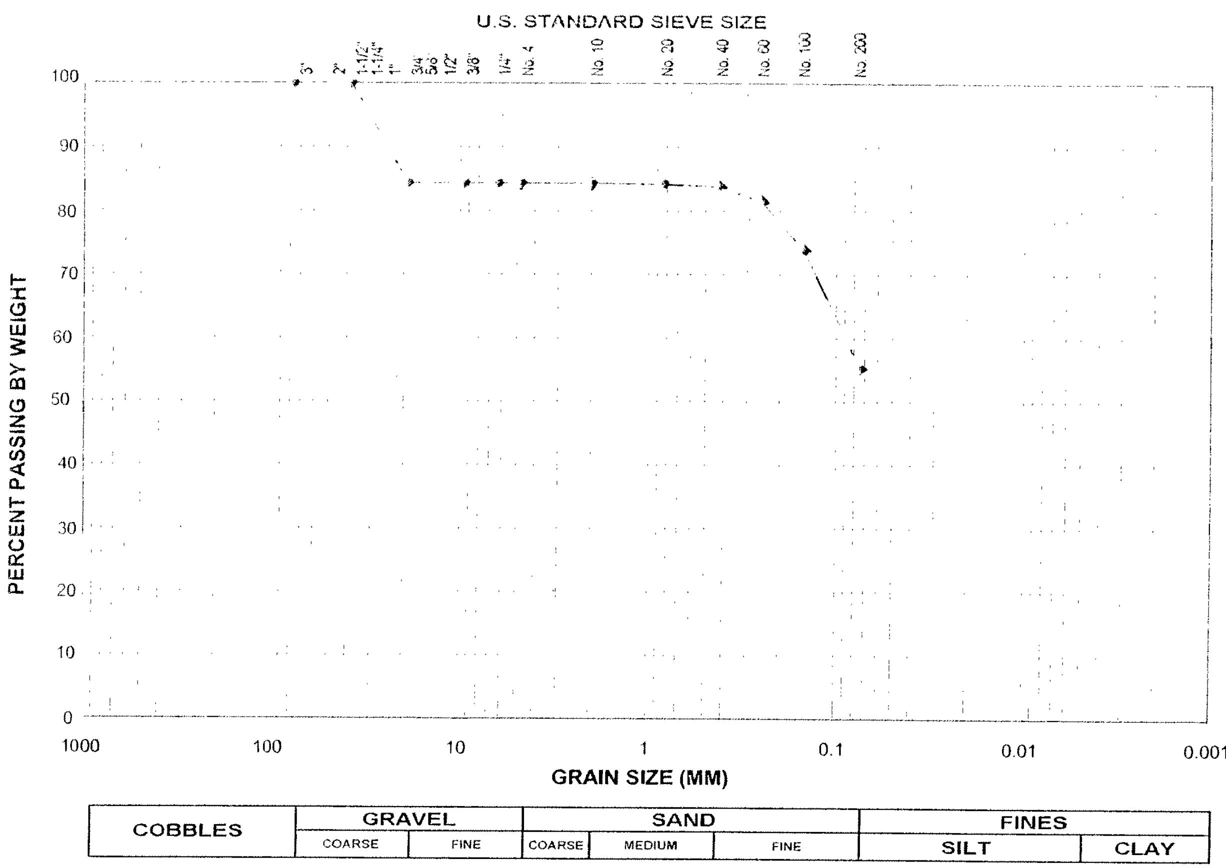
Grain Size Analysis ASTM C 136

Figure I-4

Project:	Mid Willamette Feeder-Luckiamute River	**Lab No.**	09-0046
Project No.	6024-107-01-1300	**Date:**	10/28/09
Boring/TP No.	B-2	**Tested By:**	BKB
Sample No./Depth:	S-1 @ 5'	**Checked By:**	
Description:	ML	**PA/PM:**	TNH/BCR



Nat. Water Content, %	Total Gravel, %	Total Sand, %	Total Fines, %	USCS	Description
27.2%	15.6%	29.1%	55.2%	ML	Sandy silt with gravel

NOTE: Test results are applicable only to the specific sample on which they were performed, and should not be interpreted as representative of any other samples obtained at other times, depths or locations or generated by separate operations or processes. This report may not be reproduced, except in full, without written approval of GeoEngineers, Inc.

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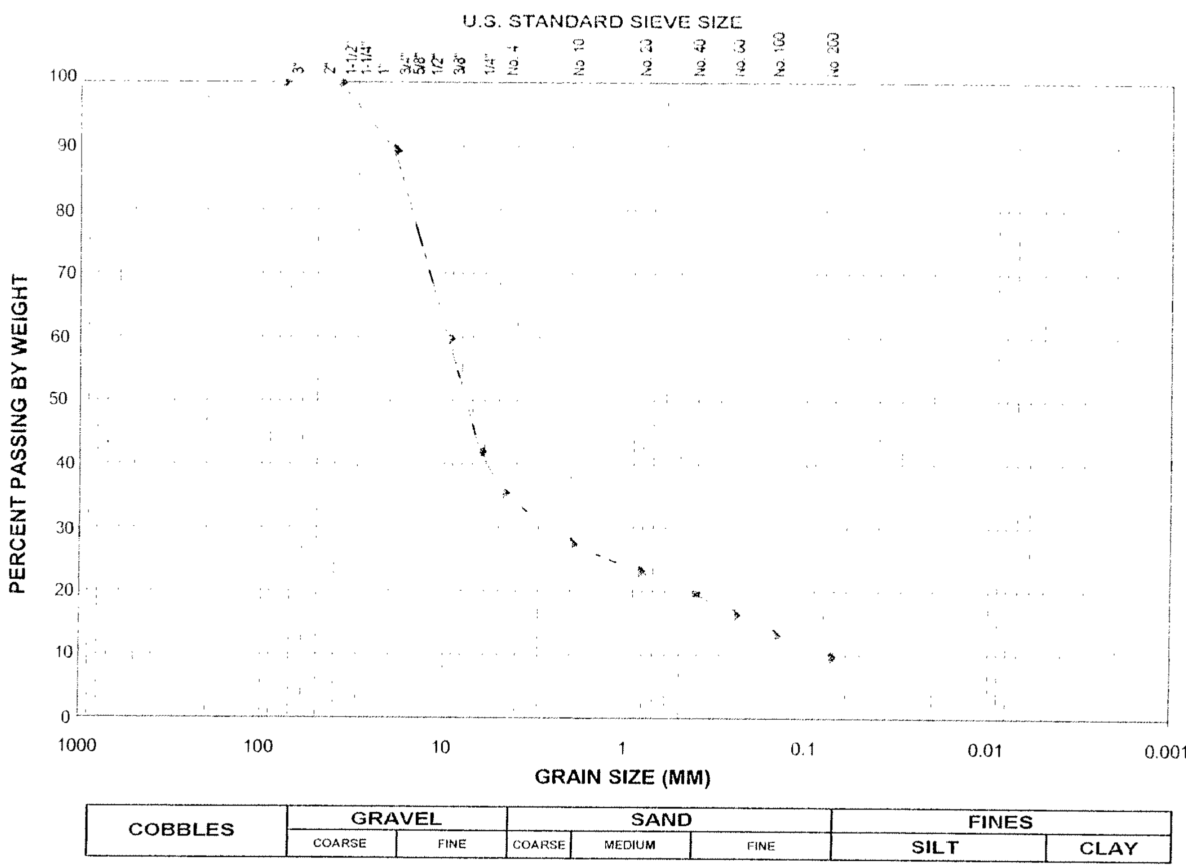
Grain Size Analysis ASTM C 136

Figure I-5

Project:	Mid Willamette Feeder-Luckiamute River	Lab No.	09-0046
Project No.	6024-107-01-1300	Date:	10/28/09
Boring/TP No.	B-2	Tested By:	KAR/BKB
Sample No./Depth:	S-8 @ 40'	Checked By:	
Description:	GW-GM	PA/PM:	TNH/BCR



Nat. Water Content, %	Gravel Total, %	Sand Total, %	Fines Total, %	USCS	Description
17.8%	64.5%	25.7%	9.8%	GW-GM	Well-graded gravel with silt and sand

NOTE: Test results are applicable only to the specific sample on which they were performed, and should not be interpreted as representative of any other samples obtained at other times, depths or locations or generated by separate operations or processes. This report may not be reproduced, except in full, without written approval of GeoEngineers, Inc.

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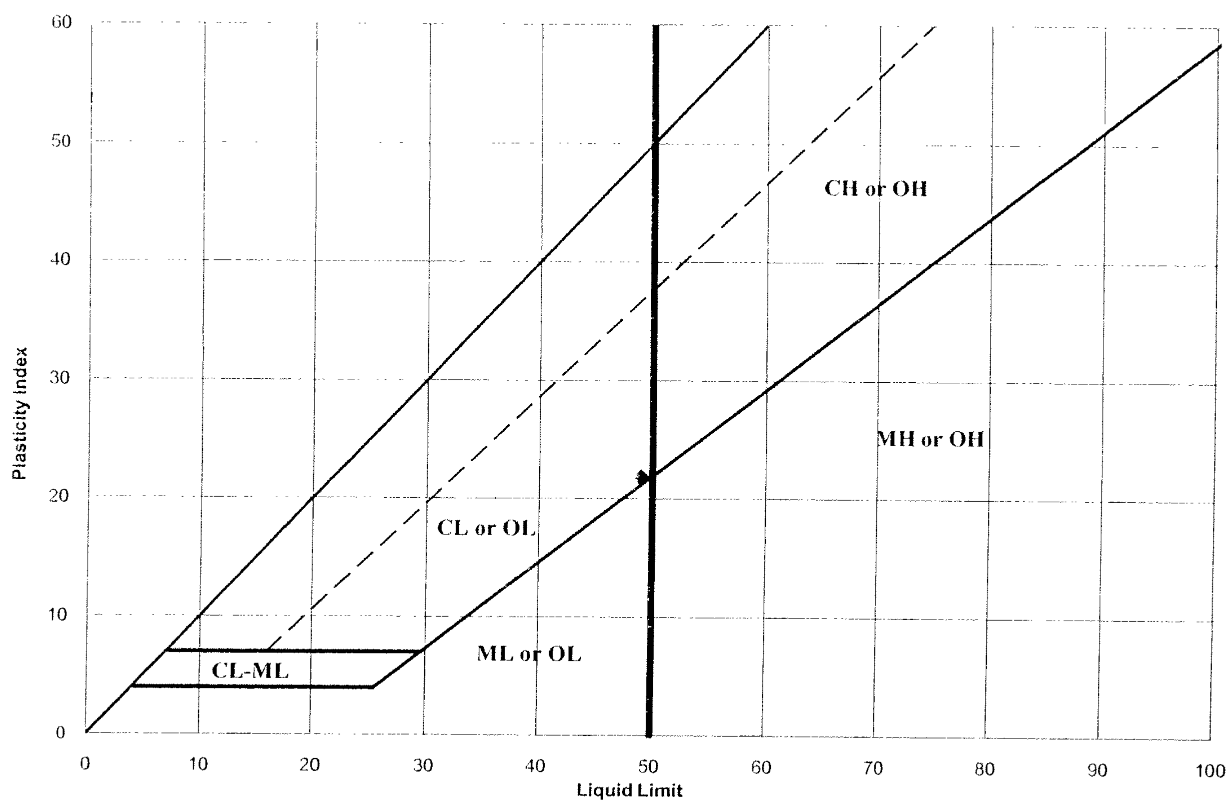
Grain Size Analysis ASTM C 136

Figure I-6

Project:	Mid Willamette Feeder-Luckiamute	**Lab No.**	10-0012
Project No.	6024-107-01Task1300	**Date:**	02/26/10
Boring/TP No.	B-1	**Tested By:**	KAR
Sample No./Depth:	S-2 @10'	**Checked By:**	
USCS Classification:	CL	**PA/PM:**	BCR



Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Description
36.5	49	27	22	**CL**	**Brown lean clay**

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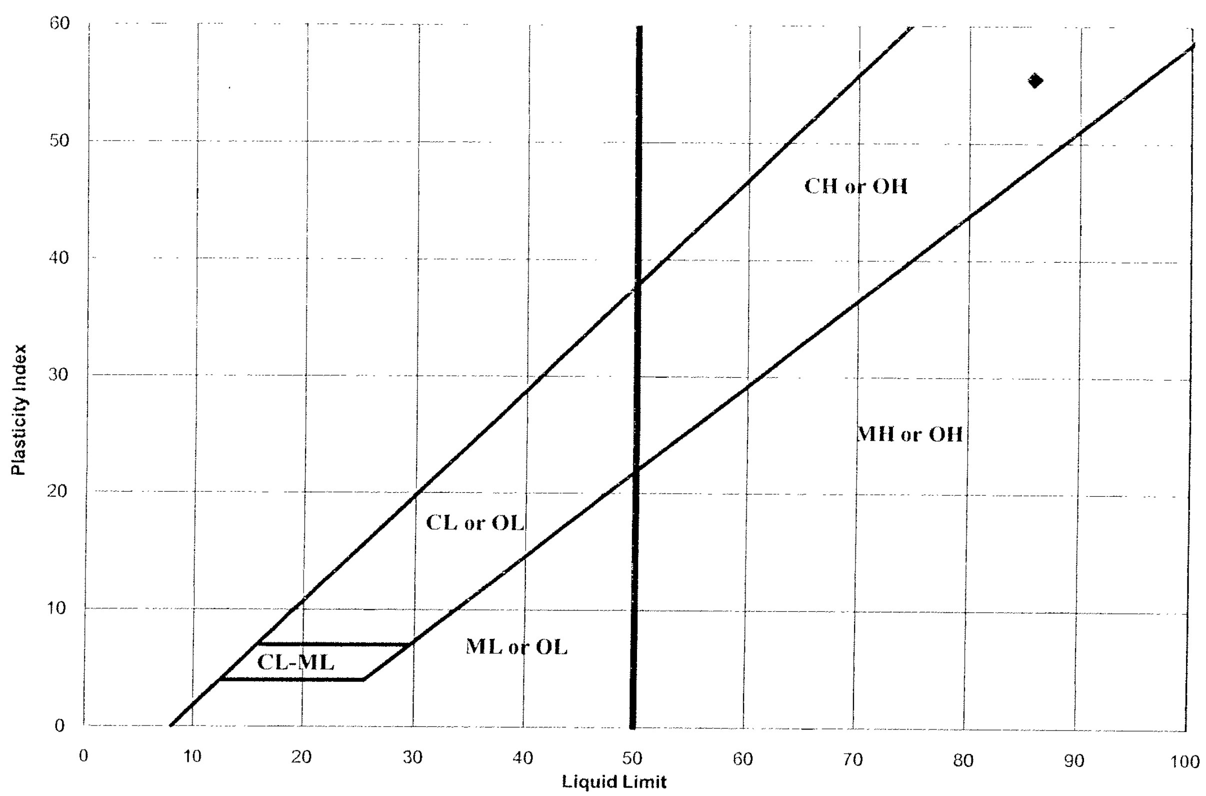
Atterberg Limits ASTM D 4318

Figure I-7

Project:	Mid Willamette Feeder-Luckiamute	Lab No.	09-0046
Project No.	6024-107-01-1300	Date:	10/28/09
Boring/TP No.	B-2	Tested By:	KAR
Sample No./Depth:	S-10 @ 50'	Checked By:	
Description:	CH	PA/PM:	TNH/BCR



Moisture Content %	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Description
42.6%	86	30	55	CH	Fat clay

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Atterberg Limits ASTM D 4318

Figure I-8

APPENDIX J
SOAP CREEK HDD

The Soap Creek HDD site is located along Corvallis Road, approximately 7 miles northwest of Albany, Oregon. The proposed pipeline alignment at the site is oriented north-south and parallel to the east side of Corvallis Road as shown in Figure J-1. The proposed pipeline would be installed within private properties adjacent to the existing Polk County Public Works Department (PCPW) right-of-way (ROW). An HDD crossing of approximately 850 feet in length is required at this site.

SITE DESCRIPTION

Surface Conditions

The area along the proposed pipeline alignment north of Soap Creek is occupied by a residential property and agricultural land that is relatively flat north of the creek bank. The residential property has a semi-circular driveway that has two entrances into the property off of Corvallis Road. The Soap Creek channel is incised approximately 30 feet below both banks. A bathymetric survey was not completed for Soap Creek so the channel depth is unknown. The north side of the creek bank is vegetated primarily with deciduous trees. Residential and agricultural land north of the creek bank was not vegetated at the time of our reconnaissance. We assume that these areas are normally vegetated with short grasses for residential and agricultural purposes. An existing overhead power line is positioned within the PCPW ROW along the east side of and parallel to Corvallis Road.

South of Soap Creek, the ground surface along the proposed pipeline alignment is a relatively flat agricultural field. At the pipeline crossing, Soap Creek is oriented nearly perpendicular to Corvallis Road with heavy deciduous tree vegetation along the southern creek bank. An overhead power line also follows the east side of Corvallis Road south of Soap Creek. The agricultural land on the south side of Soap Creek was vegetated with short agricultural grass at the time of our reconnaissance.

Subsurface Conditions

We explored subsurface conditions at the site on October 28, 2009 and February 24 and 25, 2010 by drilling two borings to a maximum depth of approximately 71.5 feet below ground surface (bgs) at the approximate locations shown on Figure J-1. In general the borings encountered medium stiff to hard silts and clays with varying sand and gravel content, and loose to dense sands with varying silt, clay and gravel content. These subsurface conditions are consistent with the geologic mapping for the area (Allison, 1953, O'Connor et al, 2001). Logs of the borings are presented as Figures J-2 and J-3.

Boring B-1 was drilled in an open agricultural field on the north side of Soap Creek. The boring encountered medium stiff to stiff silt with varying sand content from the ground surface to a depth of approximately 21 feet bgs. Between depths of 21 and 33 feet bgs, the boring encountered stiff fat clay with varying sand content. From 33 to 39 feet bgs, medium dense clayey fine sand was encountered, overlying dense fine to coarse sandy gravel to 42 feet bgs. A sieve analysis on a sample obtained from 40 feet bgs indicated 56 percent gravel content. Below the gravel, very stiff sandy clay and sandy silt was encountered to 51.5 feet bgs, the maximum depth explored.

Boring B-2 was completed within the PCPW ROW south of Soap Creek. The boring encountered medium stiff to stiff fat clay from the ground surface to a depth of approximately 23.5 feet bgs. The fat clay became sandy at 20 feet bgs, and occasional fine gravel was found from 20 to 20.3 feet bgs. From 23.5 to 35.5 feet, loose to medium dense clayey sand was encountered overlying very stiff lean clay to a depth of 60 feet bgs. Below 60 feet bgs, very stiff to hard silt with varying sand content was encountered to 71.5 feet bgs, the maximum depth explored.

Groundwater

Based on visual observations of moisture contents in the samples obtained from boring B-1, groundwater levels are estimated to be at a depth of 15 feet bgs at the site. This groundwater level is about 15 feet higher than the level of Soap Creek, which is likely a result of the groundwater levels in the area mimicking topography. Because of the deeply incised nature of the river, we do not anticipate that flood waters would inundate the surrounding topography, except during extremely high and prolonged precipitation events. We anticipate that groundwater levels will fluctuate due to seasonal variations in precipitation, changes in site utilization or other factors. For the design and construction of an HDD, the groundwater level is not typically a factor affecting feasibility. The hydrostatic drilling fluid pressure typically compensates for high groundwater levels.

LABORATORY TESTING

Percent fines analyses were performed on four samples in general accordance with ASTM D 1140. The percentage passing the U.S. No. 200 sieve is shown on the boring logs at the respective sample depths.

Sieve analyses (grain size determination) were performed on two samples in general accordance with ASTM C 136. The results of the sieve analyses were plotted and classified in general accordance with the Unified Soil Classification System (USCS) and presented in Figures J-4 and J-5. The percentage passing the U.S. No. 200 sieve is shown on the boring logs.

Atterberg limits tests were performed on two soil samples. The tests were used to classify the soil as well as to evaluate engineering index properties. The liquid limit and the plastic limit were estimated through a procedure performed in general accordance with ASTM D 4318. The results of the Atterberg limits testing are shown in Figures J-6 and J-7.

HDD FEASIBILITY CONCLUSIONS AND RECOMMENDATIONS

Based on our HDD evaluation, the HDD method of construction at the Soap Creek site is feasible. We anticipate that a HDD profile for this site would be a minimum of 850 feet long, and between about 15 and 20 feet below the bottom of Soap Creek. However, the depth of the river had not been surveyed at the time of our study. A conceptual HDD profile for this HDD is shown in Figure J-1.

We recommend that a detailed design be completed for this proposed HDD so that the alignment and profile can be further refined. The detailed design should include final alignment and profile design, workspace layouts, analyses of installation and operating stresses, and a hydraulic fracture and inadvertent returns evaluation. In addition, a bathymetric survey of the Luckiamute River should be completed in the vicinity of the conceptual HDD alignment to determine the depth of the river which will aid the detailed design process.

The following sections summarize conclusions regarding workspace considerations, subsurface conditions and conceptual HDD geometry.

Workspace Considerations

In our opinion, the entry side of the HDD should be located on the south side of the creek and the exit side of the HDD should be located on the north side of the creek because there is adequate space for stringing and fabricating the product pipe on the north side. Depending on the location of the exit point, actions may need to be taken to conduct operations without blocking the semi-circular driveway to the residence property. The existing overhead power line along the east side of Corvallis Road should be considered when laying out a temporary exit workspace. This power line may also affect the location of the final HDD alignment.

The layout and dimensions for the proposed entry/exit side workspaces have not been identified in Figure J-1, but will be added during the detailed design phase. For typical HDD installations of this magnitude, the additional temporary workspace required at the entry and exit points will be approximately 60 feet by 150 feet along the proposed alignment. The following paragraphs describe the conceptual entry and exit sides of the HDD.

Conceptual Entry and Exit Sides

The areas on both sides of the site are suitable for use as temporary workspace from a constructability standpoint. The areas are relatively flat and significant grading of the site would not likely be necessary. Access to the workspaces could be gained directly from Corvallis Road. There is adequate space available on both sides of the site for stringing and fabricating the product pipe.

Subsurface Considerations

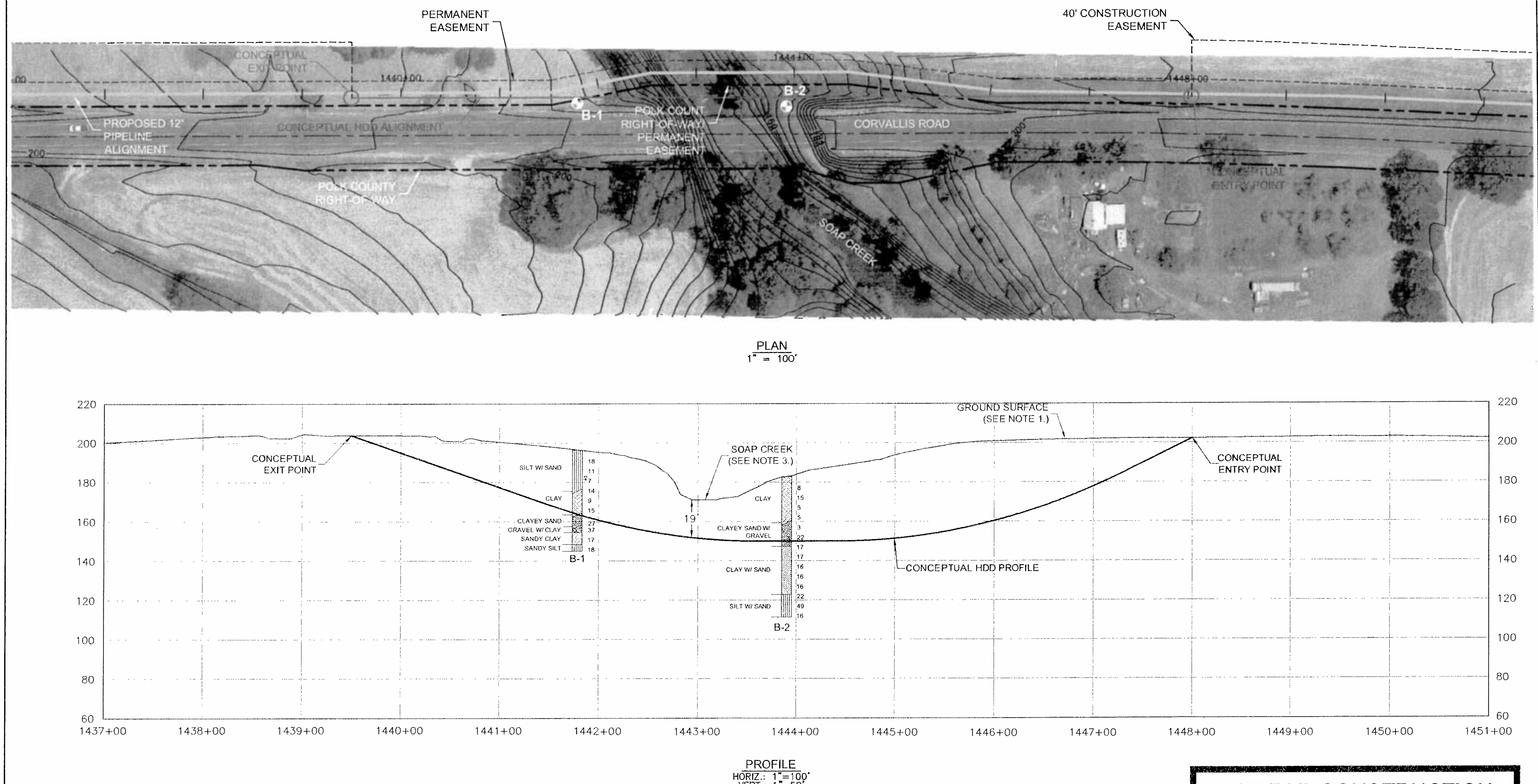
The soils at the anticipated depths of a potential HDD consist of medium stiff to hard cohesive soils with varying sand and gravel content and loose to dense sands with varying silt, clay and gravel content. A sieve analysis conducted on a sample obtained from 40 feet bgs in boring B-1 indicated a gravel content of 56 percent. This sieve analysis was the only test conducted that indicated a substantial amount of gravel. It would be preferable to design the profile of the HDD to avoid this gravel layer. However, the depth of the HDD profile should be determined during final design based the results of hydraulic fracture and inadvertent returns evaluation.

Conceptual HDD Geometry

The length, depth and orientation of a potential HDD is a function of Northwest Natural's 15-foot minimum depth requirement below waterbodies, the topography along the proposed alignment, the minimum allowable radius of curvature of the product pipe and the subsurface conditions encountered in the borings.

Because of the approximate deeply incised channel of Soap Creek, the HDD would have to be longer than what would normally be considered a minimum length HDD. The minimum horizontal length of an HDD at this site would have to be approximately 850 feet. A conceptual HDD of this length would position a conceptual exit point between the semi-circular driveways on the residential property on the north side of Soap Creek. For this HDD we expect that the depth of the profile beneath the creek bed could range between 15 and 20 feet. However, the channel depth within the river is not known because a bathymetric survey of the river was not completed for this phase of the project. A setback of the entry point from the south bank of Soap Creek would be required to provide adequate profile depth beneath the creek channel. The actual profile length and depth should be based on additional geometric and hydraulic fracture analyses completed during the detailed design phase of the project.

If one of the residential driveways near the conceptual exit point cannot be blocked, the HDD could be lengthened by shifting the conceptual exit point to the north to extend the HDD beneath both driveways entering the residential property. This would result in additional cost to drill a HDD at this site. A HDD for this scenario may be approximately 950 feet long. Lengthening the crossing would prevent the product pipe string from crossing the driveways during pullback operations.



Notes:
1. Topographic information based on a site specific topographic survey dated 9/19/09, provided by WH Pacific.
2. The locations of all features shown are approximate.
3. No bathymetric survey was completed during the feasibility phase of this project. Therefore the depth of the Soap Creek channel is not known at this time. Depth shown on profile is the depth below the water level at the time of the topographic survey.
4. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. can not guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Legend

Boring Location

Soil Classification

SPT (N) Value

Boring ID

Centerline in Existing Easement
Centerline in R.O.W.
Centerline in Private Property

NOT FOR CONSTRUCTION

SITE PLAN & PROFILE

SOAP CREEK HDD
POLK COUNTY, OREGON

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FIGURE J-1

W:\Portland\Projects\6\6024107\01\CAD\Soap Creek.dwg\TAB:Figure 2 modified on Apr 13, 2010 - 3:27pm

BCR : BTL

Drilled	Start 10/28/2009	End 10/28/2009	Total Depth (ft) 51.5	Logged By DWW Checked By MAM	Driller Subsurface Technologies	Drilling Method Mud Rotary

Surface Elevation (ft) Vertical Datum	196.8	Hammer Data	140 lb Auto	Drilling Equipment	Diedrich D-50 Truck Mounted
Easting (X) Northing (Y)	7505281.008 397485.495	System Datum	NAD83 SP N US FOOT	Groundwater Date Measured	Depth to Water (ft) 15.0 / Elevation (ft) 181.8
Notes:					

Elevation (feet)	Depth (feet)	Recovered (in)	Blows/foot	Sample Name Testing	Water Level	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
	0					ML	Brown silt with fine sand (stiff, moist)			
195										
	5	18	18	1						
190										
	10	18	11	2						
185							Becomes gray/brown			
							Becomes sandy			
	15	18	7	3	∇			35		%F=81
180										
							Becomes gray/brown with orange mottling (stiff, moist)			
	20	16	14	4		CH	Gray fat clay (stiff, wet)			
175										
	25	18	9	5				43		AL
170							Becomes blue/gray with trace sand			
	30	18	15	6				33		%F=72
165							Becomes sandy			
						SC	Blue/gray clayey fine to medium sand (medium dense, wet)			
	35									

Log of Boring B-1

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Project: Mid Willamette Feeder-Soap Creek
Project Location: Polk County, OR
Project Number: 6024-107-01Task1400

Figure J-2
Sheet 1 of 2

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
	35			27		7			SC	Blue/gray clayey fine to medium sand (medium dense, wet)			
160													
									GW-GC	Gray to dark gray fine to coarse gravel with clay (dense, wet)			
	40		10	37		8					11		SA; %Gravel=56
155													
									CH	Dark blue/gray fine sandy clay (very stiff, wet)			
	45		18	17		9					53		%F=59
150													
									ML	Dark blue/gray fine sandy silt (very stiff, wet)			
	50			18		10							AL

Log of Boring B-1 (continued)

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Project: Mid Willamette Feeder-Soap Creek
Project Location: Polk County, OR
Project Number: 6024-107-01Task1400

Figure J-2
Sheet 2 of 2

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
	35		12	17		7			CL	Brown lean clay with sand (stiff, moist)			
145													
	40		18	17		8				Becomes gray			
140													
	45		18	16		9							
135													
	50		18	16		10							
130													
	55		18	16		11				Becomes green/gray with trace gravel sized siltstone clasts			Gravel breaks down with light hammer blow
125													
	60		18	22		12			ML	Brown/gray mottled silt with sand (very stiff, moist) 2" thick silty sand layer 61-61.1'			
120													
	65		18	49		13				Becomes hard 4" thick clayey sand layer at 66-66.3'			
115													
	70		18	16		14				Becomes gray and very stiff with trace sand			

Log of Boring B-2 (continued)

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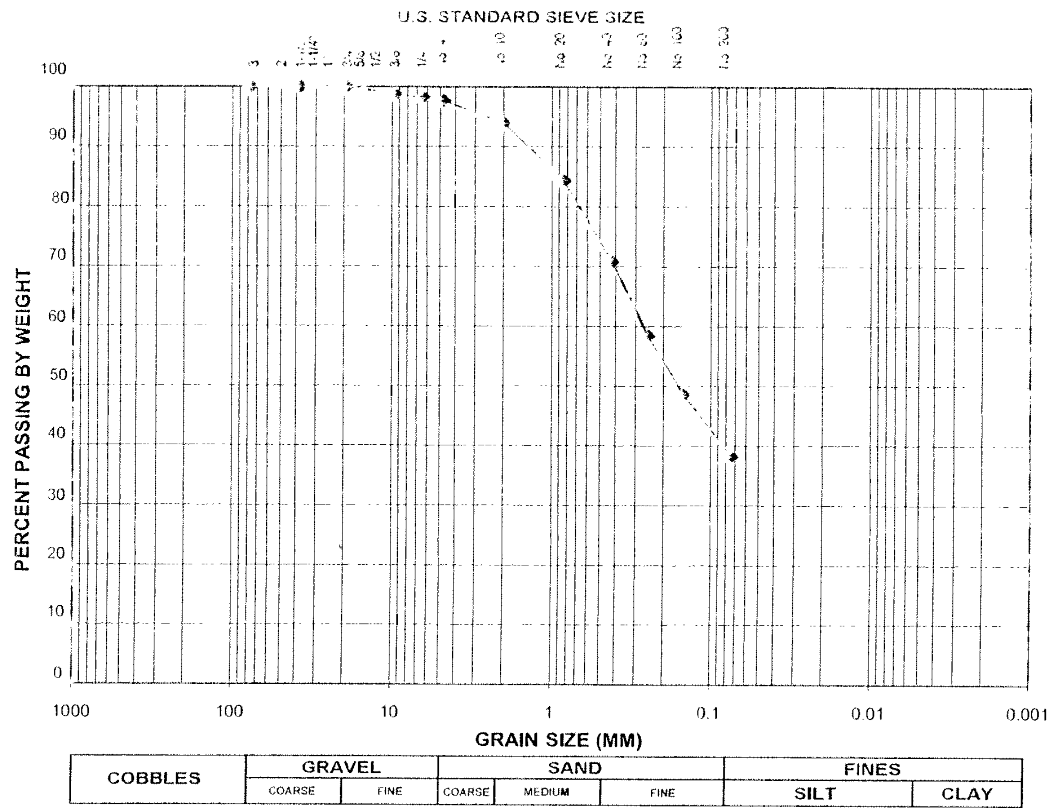
Project: Mid Willamette Feeder-Soap Creek
Project Location: Polk County, OR
Project Number: 6024-107-01Task1400

Figure J-3
Sheet 2 of 2

Project:	Mid Willamette Feeder-Soap Creek	**Lab No.**	10-0013
Project No.	6024-107-01Task 1400	**Date:**	03/05/10
Boring/TP No.	B-2	**Tested By:**	KAR
Sample No./Depth:	S-5 @ 25'	**Checked By:**	DWW
USCS Classification:	SC	**PA/PM:**	BCR



Nat. Water Content, %	Gravel Total, %	Sand Total, %	Fines Total, %	USCS	Description
35.6	2.4	59.4	38.3	SC	Gray clayey sand with trace fine gravel

NOTE: Test results are applicable only to the specific sample on which they were performed, and should not be interpreted as representative of any other samples obtained at other times, depths or locations or generated by separate operations or processes. This report may not be reproduced, except in full, without written approval of GeoEngineers, Inc.

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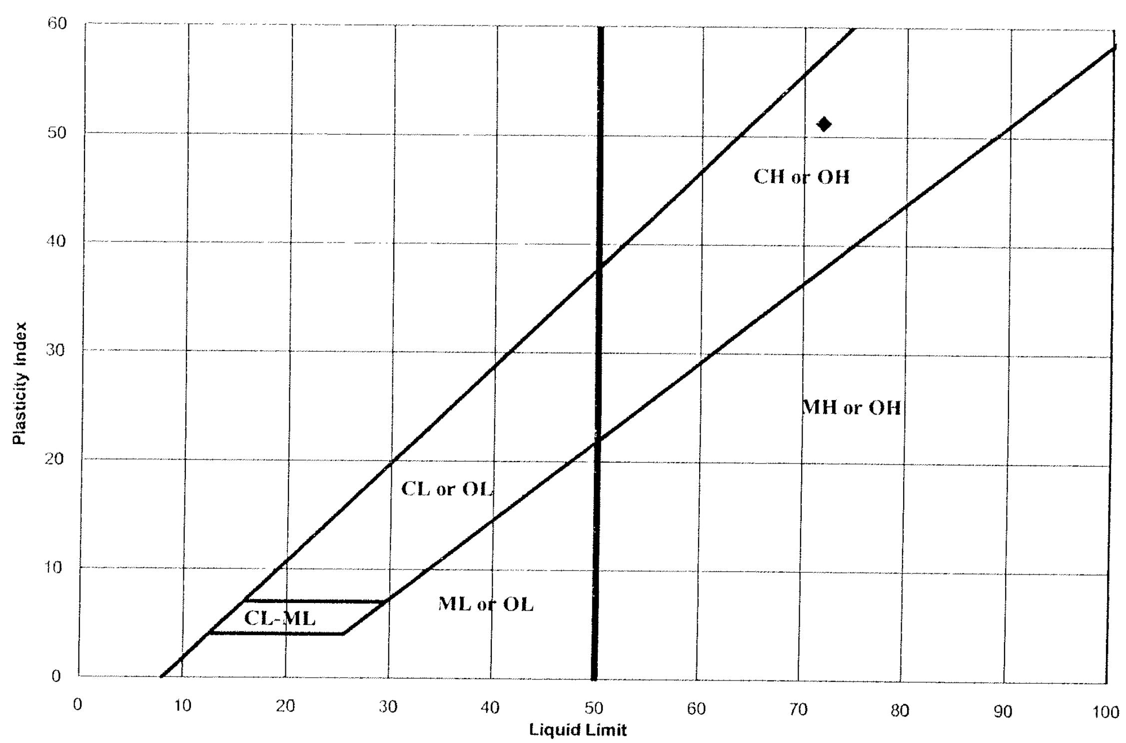
Grain Size Analysis ASTM C 136

Figure J-5

Project:	Mid Willamette Feeder-Soap Creek	Lab No.	09-0050
Project No.	6024-107-01-1400	Date:	11/02/09
Boring/TP No.	B-1	Tested By:	BKB/KAR
Sample No./Depth:	S-5/25'	Checked By:	KAR
Description:	CH	PA/PM:	MAM/BCR



Moisture Content %	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Description
43.3%	72	21	51	CH	Blue/Gray fat clay

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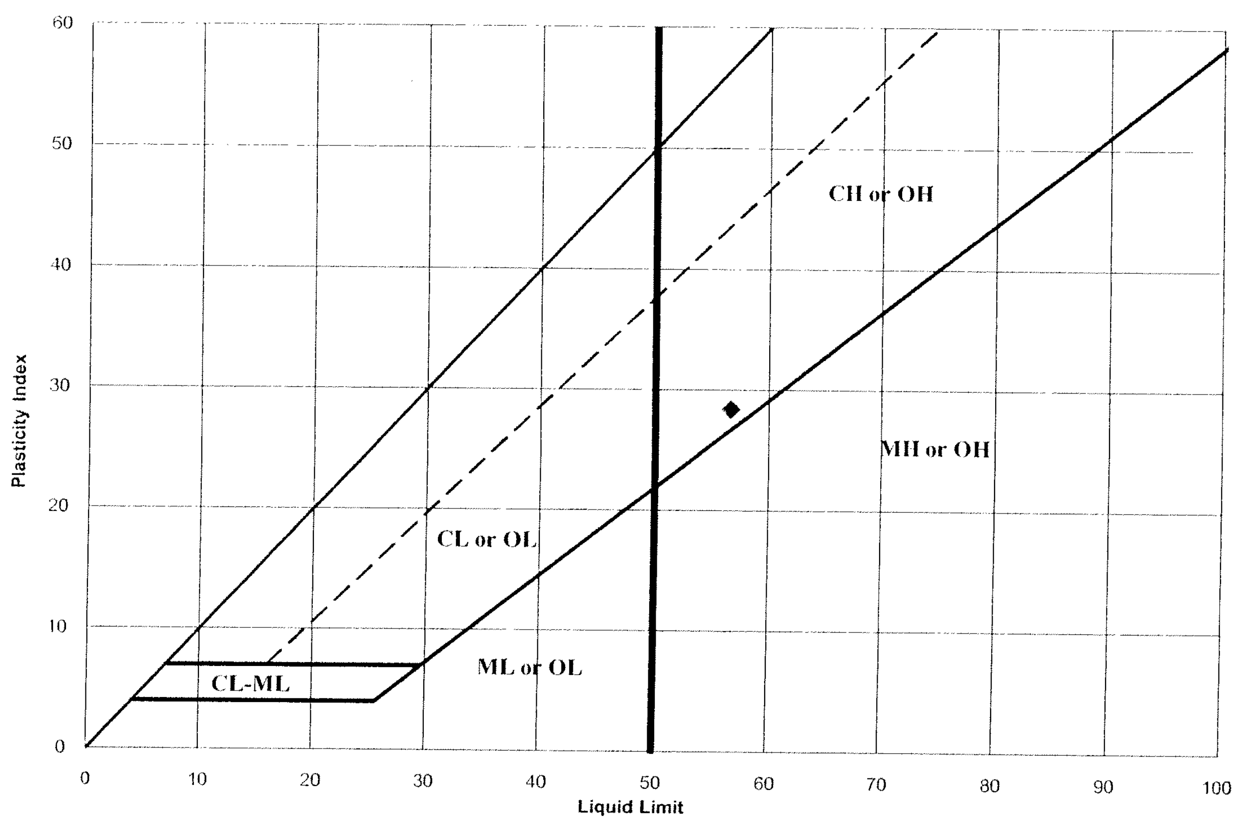
Atterberg Limits ASTM D 4318

Figure J-6

Project:	Mid Willamette Feeder-Soap Creek	**Lab No.**	10-0013
Project No.	6024-107-01Task 1400	**Date:**	02/27/10
Boring/TP No.	B-2	**Tested By:**	KAR
Sample No./Depth:	S-3 @ 15'	**Checked By:**	DWW
USCS Classification:	CH	**PA/PM:**	BCR



Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Description
51.6	57	28	28	CH	Dark gray fat clay

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Atterberg Limits ASTM D 4318

Figure J-7

Appendix K
Highway 20 HDD

APPENDIX K
HIGHWAY 20 HDD

The Highway 20 HDD site is located approximately 3.5 miles west of Albany, Oregon. The proposed pipeline alignment at the site is oriented approximately west-east. The HDD alignment crosses beneath an existing Southern Pacific Railroad right-of-way (ROW) and Highway 20 as shown in Figure K-1. An HDD of approximately 500 feet in length is required at this site to allow the HDD alignment to be positioned within the proposed ROW, and between the proposed pipeline points of intersection (PI) on each side of Highway 20.

SITE DESCRIPTION

Surface Conditions

The ground surface along the proposed pipeline alignment is relatively flat with approximately 6 feet of topographic relief between the east and west sides of the site. The area along the proposed pipeline alignment north of the Southern Pacific Railroad ROW is predominately agricultural land that is generally flat. The conventional lay pipeline alignment trends from the north along the east side of Independence Highway. A pipeline PI is located approximately 140 feet north of the intersection of Independence Highway and the Southern Pacific Railroad, and the pipeline trends to the east beyond the PI. The elevation of Independence Highway and the Southern Pacific Railroad ROW are approximately 2 to 3 feet above surrounding grades. An existing overhead power line follows the eastern edge of the Independence Highway ROW.

South of the Southern Pacific Railroad ROW, the proposed pipeline alignment crosses Highway 20 at an oblique angle. The ground surface along the proposed pipeline alignment south of the Southern Pacific Railroad ROW gently slopes down toward the east.

Subsurface Conditions

We explored subsurface conditions at the site on November 4 and November 5, 2009 by drilling two borings to a maximum depth of approximately 60 feet below ground surface (bgs) at the approximate locations shown in Figure K-1. In general our borings encountered medium stiff to stiff lean clay overlying dense to very dense gravel and sand, and soft siltstone. Logs of the borings are presented as Figures K-2 and K-3.

Boring B-1 was drilled along the east edge of Independence Highway approximately 50 feet north of the railroad ROW. Boring B-1 encountered 35 feet of medium stiff to stiff lean clay overlying dense sand that extended to 45 feet bgs. Between 45 and 50 feet bgs the boring encountered very dense sandy gravel with clay that we interpret as partially decomposed siltstone. Below 50 feet bgs, boring B-1 encountered moderately weathered, very soft to soft, closely fractured siltstone to 60 feet, the maximum depth explored.

Boring B-2 was drilled within the ODOT ROW on the south side of Highway 20. Boring B-2 encountered approximately 35 feet of medium stiff to very stiff lean clay overlying very dense clayey sand that extended to approximately 38 feet bgs. Between 38 and about 54 feet bgs the boring encountered very dense clayey gravel. Below 54 feet bgs the boring encountered medium dense sand to 56.5 feet bgs, the maximum depth explored. We interpret the clayey gravel and sand below 38 feet bgs to represent decomposed siltstone.

Groundwater

Based on visual observations of moisture content of the samples obtained from the borings, we estimate the groundwater level at the site to be about 20 feet bgs. We anticipate that groundwater levels will fluctuate due to seasonal variations in precipitation, changes in site utilization or other factors. For the design and construction of an HDD, the groundwater level is not typically a factor affecting feasibility. The hydrostatic drilling fluid pressure typically compensates for high groundwater levels.

LABORATORY TESTING

Percent fines analyses were performed on four samples in general accordance with ASTM D 1140. The percentage passing the U.S. No. 200 sieve is shown on the boring logs at the respective sample depths.

Atterberg limits tests were performed on two soil samples. The tests were used to classify the soil as well as to evaluate engineering index properties. The liquid limit and the plastic limit were estimated through a procedure performed in general accordance with ASTM D 4318. The results of the Atterberg limits testing are shown in Figures K-4 and K-5.

HDD FEASIBILITY CONCLUSIONS AND RECOMMENDATIONS

Based on our HDD evaluation, the HDD method of construction at the Highway 20 site is feasible. We anticipate that an HDD profile for this site would be about approximately 500 feet in length to cross beneath the Southern Pacific Railroad and Highway 20 as well as position the HDD between the two proposed pipeline PIs. A conceptual HDD profile for this HDD is shown in Figure K-1.

We recommend that Northwest Natural verify with both Southern Pacific Railroad and ODOT that they will allow an HDD to be installed at an oblique angle to their ROWs. If the pipeline crossing must be completed at a nearly perpendicular angle to the railroad and highway ROW, it may be more appropriate to modify the proposed pipeline alignment and install the pipeline crossing using conventional boring techniques.

If both Southern Pacific Railroad and ODOT will allow an oblique HDD across their ROW, we recommend that a detailed design be completed for this proposed HDD so that the alignment and profile can be further refined. The detailed design should include final alignment and profile design, workspace layouts, analyses of installation and operating stresses, and a hydraulic fracture and inadvertent returns evaluation.

The following sections summarize conclusions regarding workspace considerations, subsurface conditions and conceptual HDD geometry.

Workspace Considerations

In our opinion, the conceptual entry side of the HDD should be located on the west side of the HDD, and the conceptual exit side of the HDD should be located on the east side of the site, because the availability of workspace and access to the east side of the site is better for stringing and fabricating the product pipe. Temporary workspace will be required to string and fabricate the product pipe through the agricultural field east of the conceptual exit point.

The layout and dimensions for the proposed entry/exit side workspaces have not been identified in Figure B-1, but will be added during the detailed design phase. For typical HDD installations of this magnitude, the additional temporary workspace required at the entry and exit points will be approximately 60 feet by 150 feet along the proposed alignment. The following paragraphs describe the conceptual entry and exit sides of the HDD.

Conceptual Entry Side (West Side)

The entry workspace could be located along the proposed alignment on the west side of the site, in an open agricultural field as shown in Figure K-1. Access to the entry workspace could be gained directly from Independence Highway. An overhead power line is located along the east side of Independence Highway which would position the power line at the western end of the entry workspace.

Conceptual Exit Side (East Side)

The exit workspace could be located at the end of Old Highway 20 on the east side of the site. The exit point would have to be placed near the end of Old Highway 20 in order to provide adequate profile depth beneath Highway 20. This would require closing the western end of Old Highway 20 to traffic during construction but would still allow access to private properties east of the site via the eastern end of Old Highway 20. The exit workspace and stringing area could be accessed from the western end of Old Highway 20.

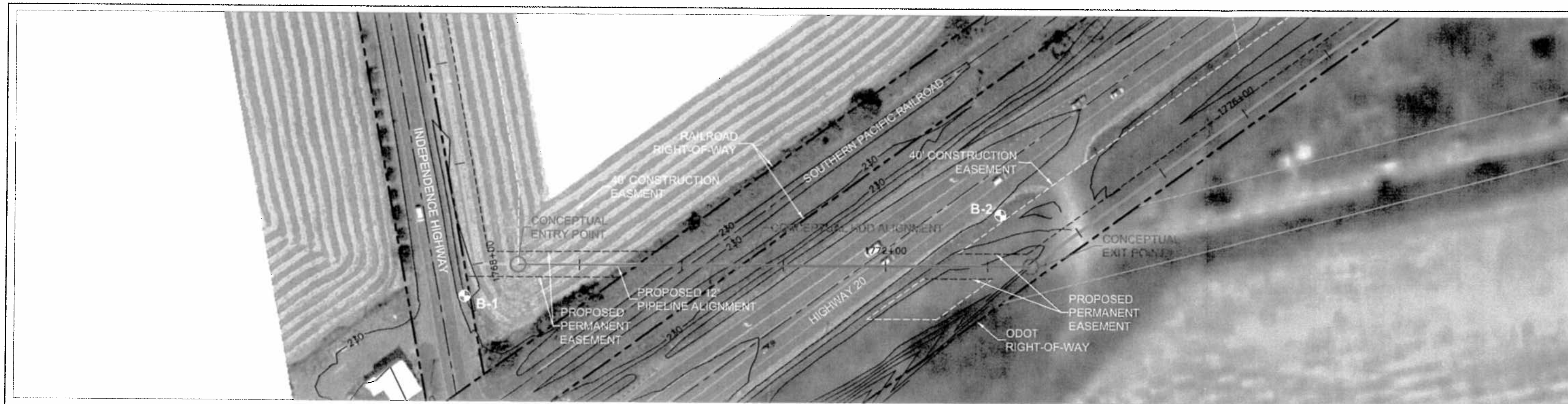
Subsurface Considerations

The soils at the anticipated depths of the conceptual HDD consist of medium stiff to stiff clay overlying sands, gravels and siltstone bedrock. A gravel unit was encountered at a depth of 45 feet bgs in boring B-1 and at a depth of 38 feet bgs in boring B-2. In our opinion, the HDD profile should be designed above the gravel unit observed in the two borings. Maintaining the HDD profile above the gravel unit will increase the likelihood of successfully installing an HDD at this site. The soils above the gravel unit are predominately medium stiff to stiff clay units that will be susceptible to hydraulic fracture and inadvertent drilling fluid returns. Therefore, the depth of the HDD profile should be determined during final design based the results of hydraulic fracture and inadvertent returns evaluation.

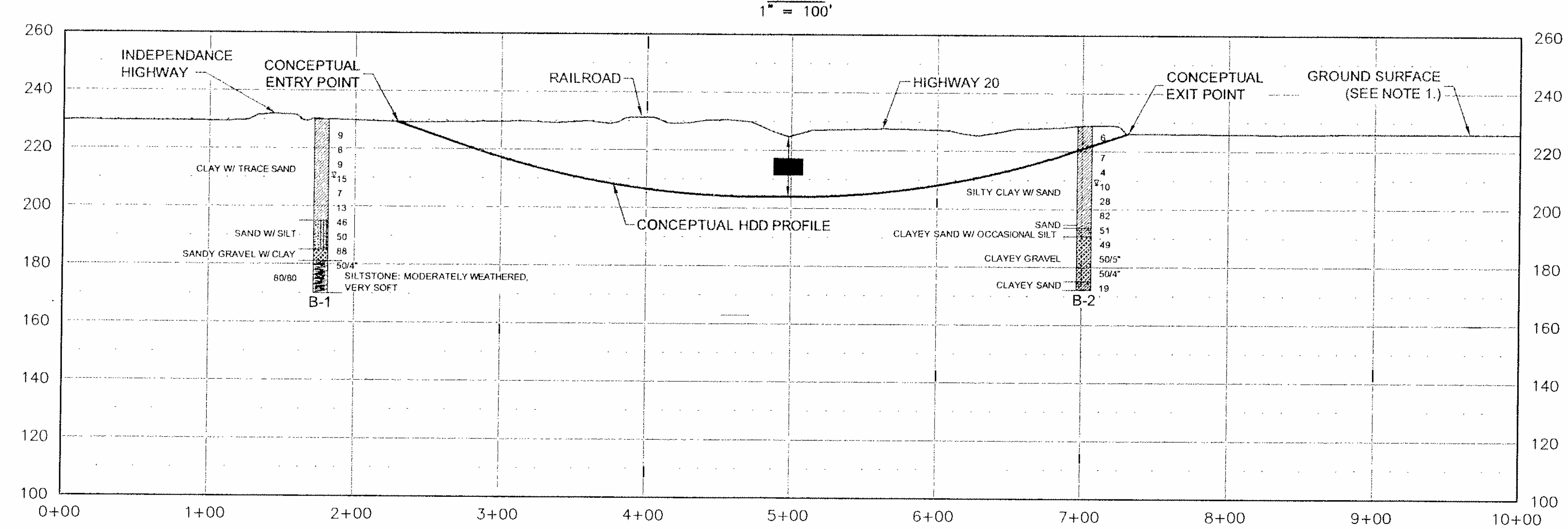
Conceptual HDD Geometry

The length, depth and orientation of a potential HDD is a function of Southern Pacific Railroad's 20-foot minimum depth requirement below the railroad, the topography along the proposed alignment, the minimum allowable radius of curvature of the product pipe, the subsurface conditions encountered in the borings, and ultimately, the location of the proposed pipeline PIs on both sides of Highway 20.

In order for a potential HDD to cross the railroad ROW and Highway 20, and still be positioned between the pipeline PIs, a HDD of approximately 500 feet in horizontal length is envisioned. This length is less



PLAN
1" = 100'



PROFILE
HORIZ.: 1"=100'
VERT.: 1"=50'

BCR : BTL

W:\Portland\Projects\6\6024107\01\CAD\HWY20 Crossing.dwg\TAB:Figure 2 modified on Apr 13, 2010 - 4:16pm

Notes:
1. Topographic information based on a site specific topographic survey dated 9/19/09, provided by WH Pacific.
2. The locations of all features shown are approximate.
3. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. can not guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Legend

Boring Location

Soil Classification

SPT (N) Value

Boring ID

Centerline in Existing Easement
Centerline in ODOT R.O.W.
Centerline in Private Property

N W E S

NOT FOR CONSTRUCTION

SITE PLAN & PROFILE

HIGHWAY 20 HDD
BENTON COUNTY, OREGON

GEOENGINEERS

FIGURE K-1

Drilled	Start 11/4/2009	End 11/5/2009	Total Depth (ft) 60	Logged By APB Checked By MAM	Driller Subsurface Technologies	Drilling Method Mud Rotary and NQ-3 Rock Coring

Surface Elevation (ft) Vertical Datum	229.9	Hammer Data	140 lb Auto	Drilling Equipment	Diedrich B-53 Truck Mounted
Easting (X) Northing (Y)	7503909.387 365216.2855	System Datum	NAD83 SP N US FOOT	Groundwater	
Notes:					

Date Measured	Depth to Water (ft)	Elevation (ft)
	20.0	209.9

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Sample/Run	Blows/foot	RQD %	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
	0								CL	Brown lean clay with trace fine sand (stiff, moist)			
225	5		18	1	9								
220	10		18	2	8					Grades to with sand	35		%F=84
215	15		18	3	9					Grades to with trace sand			
210	20		18	4	15		∇			Grades to with sand and becomes wet			
205	25		18	5	7					Becomes medium stiff with 1"-2" thick silty sand layers			
200	30		18	6	13					Becomes stiff	35		AL
195	35												

Log of Boring B-1

GEOENGINEERS

Project: Mid Willamette Feeder-Highway 20 Crossing
Project Location: Benton County, OR
Project Number: 6024-107-01Task1900

Figure K-2
Sheet 1 of 2

Elevation (feet)	Depth (feet)	Recovered (in)	Sample/Run	Blows/foot	RQD %	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
	35	18	7	46		SP-SM	Dark brown medium sand with silt and occasional 1/4"-1" thick silt layers (dense, wet)			
190	40	18	8	50			Becomes very dense			
185	45	18	9	88		GC	Brown medium sandy gravel with clay (very dense, wet) (partially decomposed siltstone)			Drill rig chatter @45'
						SLST	Blue/gray siltstone: moderately weathered, very soft, closely fractured			
180	50	4	10	50/4"				20		%F=47
175	55	80	R1		80		Becomes soft			
170	60									

Log of Boring B-1 (continued)

GEOENGINEERS

Project: Mid Willamette Feeder-Highway 20 Crossing
Project Location: Benton County, OR
Project Number: 6024-107-01Task1900

Figure K-2
Sheet 2 of 2

Drilled	Start 11/5/2009	End 11/5/2009	Total Depth (ft) 56.5	Logged By APB, Checked By MAM	Driller Subsurface Technologies	Drilling Method Mud Rotary
Surface Elevation (ft) Vertical Datum	225.2		Hammer Data	140 lb Auto	Drilling Equipment	Diedrich B-57 Truck Mounted
Easting (X) Northing (Y)	7504439.306 365187.4285		System Datum	NAD83 SP N US FOOT	Groundwater	
Notes:					Date Measured / Depth to Water (ft) / Elevation (ft)	20.0 / 205.2

Elevation (feet)	Depth (feet)	Recovered (in)	Blows/foot	Sample Name Testing	Water Level	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density (pcf)	REMARKS
225	0					CL	Brown silty lean clay with sand (medium stiff, moist)			
220	5	18	6	1						
215	10	18	7	2						
210	15	15	4	3			Becomes soft with 1"-2" thick layers of silty fine sand			
205	20	18	10	4	▽		Becomes stiff and wet			
200	25	18	28	5			Becomes very stiff			
195	30	18	82	6			Becomes dark gray with trace sand (hard, wet)	29.2		AL
	35					SC	See sheet 2 of 2 for description			

Log of Boring B-2

GeoEngineers

Project: Mid Willamette Feeder-Highway 20 Crossing
Project Location: Benton County, OR
Project Number: 6024-107-01Task1900

Figure K-3
Sheet 1 of 2

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	FIELD DATA: Recovered (in)	FIELD DATA: Blows/foot	FIELD DATA: Collected Sample	FIELD DATA: Sample Name / Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density (pcf)	REMARKS
190	35		18	51		7			SC	Dark brown clayey sand with occasional 1/4"-1" thick silt layers (very dense, wet)	25		%F=22
									GC	Reddish brown clayey gravel (dense, wet) (partially decomposed siltstone)			Drill rig chatter @ 38' suggest gravel contact
185	40		18	49		8							
180	45		5	50/5"		9				Becomes very dense			
175	50		4	50/4"		10							
									SC	Light blue clayey fine sand (medium dense, wet) (decomposed siltstone)			
170	55		18	19		11					38		%F=34

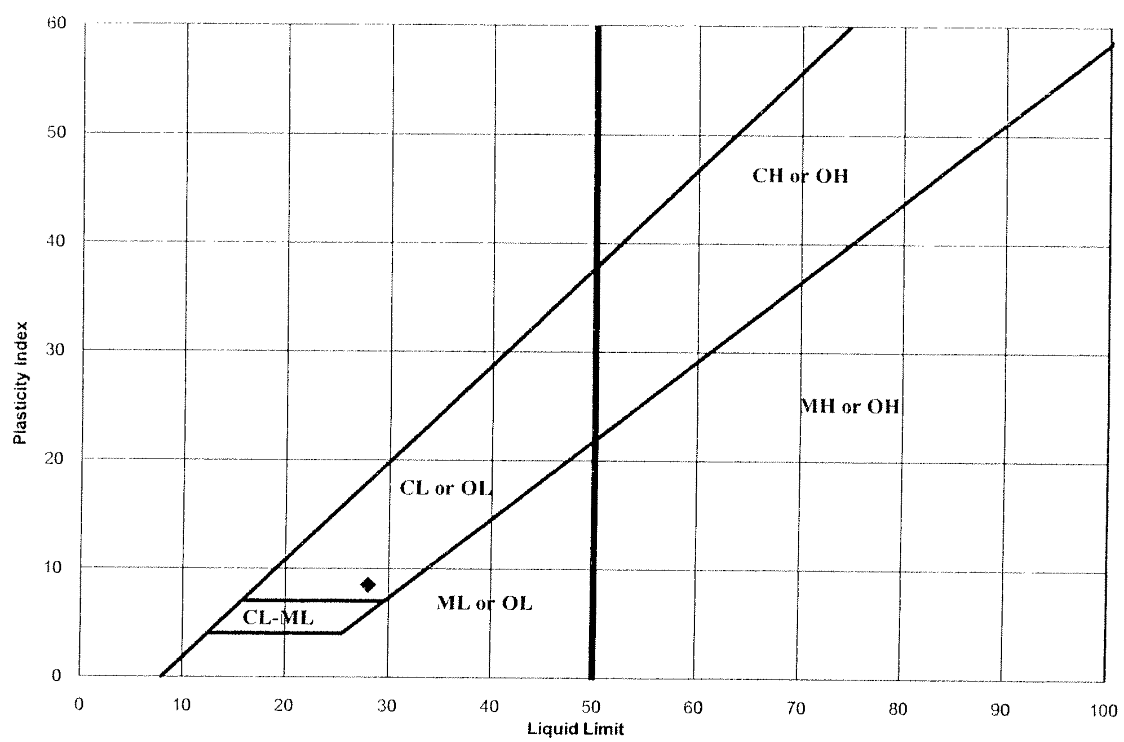
Log of Boring B-2 (continued)

GeoEngineers

Project: Mid Willamette Feeder-Highway 20 Crossing
Project Location: Benton County, OR
Project Number: 6024-107-01Task1900

Figure K-3
Sheet 2 of 2

Project:	Mid-Willamette Feeder-Highway 20	Lab No.	09-0055
Project No.	6024-107-01-1900	Date:	11/06/09
Boring/TP No.	B-1	Tested By:	KAR/BKB
Sample No./Depth:	S-6 @ 30'	Checked By:	BCR
Description:	CL	PA/PM:	BCR



Moisture Content %	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Description
34.5%	28	20	8	CL	Brown lean clay

NOTE: This report may not be reproduced, except in full, without written approval of GeoEngineers, Inc. Test results are applicable only to the specific sample on which the test was performed, and should not be interpreted as representative of samples obtained at other times or locations, or generated by other operations or processes.

GeoEngineers

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Atterberg Limits ASTM D 4318

Figure K-4

Appendix L
Highway 20 Slough HDD

APPENDIX L
HIGHWAY 20 SLOUGH HDD

The Highway 20 Slough HDD site is located along the south side of Highway 20, approximately 3 miles west of Albany, Oregon. The proposed pipeline alignment at the site is oriented east-west and parallel to the south side of Highway 20 as shown in Figure L-1. The proposed pipeline alignment would be located within existing Oregon Department of Transportation (ODOT) right-of-way (ROW). An HDD approximately 1,300 feet in length is required at this site.

SITE DESCRIPTION

Surface Conditions

Topography on the east and west sides of the Highway 20 Slough[1] near the conceptual entry and exit points is generally flat. Roughly 440 feet west of the conceptual exit point, the ground surface slopes down to the west at an approximately 5H:1V (horizontal to vertical) slope to a wetland adjacent to the east bank of Highway 20 Slough. The east bank of the slough is heavily vegetated with deciduous trees and a few conifer trees.

The west bank of Highway 20 Slough is heavily vegetated with deciduous trees and a few conifer trees. West of the slough, the proposed pipeline alignment follows the south side of Highway 20. The ODOT ROW west of the slough is vegetated with short grasses.

Subsurface Conditions

We explored subsurface conditions at the site between March 1 and 3, 2010 by drilling two borings to maximum depths of up to 70 feet below ground surface (bgs) at the locations shown in Figure L-1. In general, our borings encountered medium stiff to very stiff clay overlying loose clayey sand and dense gravel. Beneath the clayey sand and gravel, our borings encountered extremely soft to medium hard siltstone. The contact between the siltstone and overlying soils, and the engineering characteristics of the siltstone, was highly variable at the site. The subsurface conditions were generally consistent with the geologic mapping for the area (Allison, 1953, O'Connor et al, 2001).

Boring B-1 was drilled within the ODOT ROW on the west side of Highway 20 Slough. The boring encountered about 20 feet of medium stiff to stiff sandy lean clay overlying loose clayey sand that extended to about 23 feet bgs. Very dense gravel was encountered between 23 and 25 feet bgs. Below 25 feet bgs the boring encountered predominately decomposed, extremely soft, very close fractured siltstone. The siltstone became slightly weathered, soft and closely fractured below 40 feet bgs. Below 45 feet bgs, the siltstone became moderately close fractured and medium hard with occasional 1 to 3-inch-thick sandstone layers, and extended to about 63 feet bgs. Rock quality designation (RQD) values of the siltstone, between the depths of 25 to 40 feet bgs, ranged between 23 and 58 percent. Between 40 and 63 feet, RQD values ranged between 88 and 100 percent.

---

[1] The slough is formally named Basket Slough; however, we have termed this crossing the Highway 20 Slough to avoid confusion with another crossing of Basket Slough that is planned to be crossed using open trench methods.

Unconfined compression (UC) tests on rock core samples obtained from approximately 44.5 and 47.5 feet bgs indicated unconfined compressive strengths of 3,365 and 5,999 pounds per square inch (psi), respectively. At 63 feet bgs, the siltstone graded into slightly weathered, soft to medium hard, moderately close fractured sandstone that extended to 70 feet bgs, the maximum depth explored. RQD values of the sandstone ranged between 89 and 95 percent.

Boring B-2 was drilled within the ODOT ROW just east of the wetland on the east side of Highway 20 Slough. This boring encountered approximately 10 feet of stiff fat clay overlying loose clayey sand that extended to about 14 feet bgs. Below 14 feet bgs, the boring encountered extremely soft decomposed very closely fractured siltstone. Below about 20 feet the character of the siltstone was highly variable ranging from slightly weathered and soft to decomposed and extremely soft. Attempts to sample the siltstone using rock coring techniques were unsuccessful; however, the siltstone could be easily drilled using mud rotary techniques with a drag bit. The drilling subcontractor was able to obtain rock core samples of the siltstone between 60 and 69.5 feet bgs. These samples revealed that the siltstone was very soft to extremely soft, very closely fractured, and slightly too moderately weathered. The siltstone extended to 69.5 feet bgs, the maximum depth explored.

Groundwater

Based on observations of moisture content of samples collected in boring B-1, groundwater is likely located at approximately 20 feet bgs, which is generally consistent with the water level in the slough at the time of our explorations. We expect that groundwater could rise to the surface of the east side of the site during flood conditions; however, because of the incised nature of the slough, it is unlikely that groundwater levels rise to the ground surface on the west side of the slough. We anticipate that groundwater levels will fluctuate due to seasonal variations in precipitation, changes in site utilization or other factors. For the design and construction of an HDD, the groundwater level is not typically a factor affecting feasibility. The hydrostatic drilling fluid pressure typically compensates for high groundwater levels.

LABORATORY TESTING

A percent fines analysis was performed on one sample in general accordance with ASTM D 1140. The percentage passing the U.S. No. 200 sieve is shown on the B-2 boring log at the respective sample depth.

A sieve analysis (grain size determination) was performed on one sample in general accordance with ASTM C 136. The result of the sieve analysis was plotted and classified in general accordance with the Unified Soil Classification System (USCS) and is presented in Figure L-4. The percentage passing the U.S. No. 200 sieve is shown on the boring B-1 log at the respective sample depth.

Atterberg limits tests were performed on two soil samples. The tests were used to classify the soil as well as to evaluate engineering index properties. The liquid limit and the plastic limit were estimated through a procedure performed in general accordance with ASTM D 4318. The results of the Atterberg limits testing are shown in Figures L-5 and L-6.

Two unconfined compressive strength tests were performed in general accordance with ASTM D 7012 on rock core samples obtained in boring B-1. The results of the tests are shown in the log of boring B-1.

HDD FEASIBILITY CONCLUSIONS AND RECOMMENDATIONS

Based on our HDD evaluation, the HDD method of construction at the Highway 20 Slough site is feasible. We anticipate that a HDD profile for this site would be about 1,300 feet long, and between 20 and 25 feet below the bottom of the slough. However, accurate topographic survey had not been received at the time of our study. Based on the subsurface conditions at the site, we anticipate that a positive displacement mud motor will be required to complete the pilot hole of the HDD. A conceptual HDD profile for this HDD is shown in Figure L-1.

We recommend that a detailed design be completed for this proposed HDD so that the alignment and profile can be further refined. The detailed design should include final alignment and profile design, workspace layouts, analyses of installation and operating stresses, and a hydraulic fracture and inadvertent returns evaluation. Topographic and bathymetric surveys should be completed along the conceptual HDD alignment to determine the topography at the site and the depth of Highway 20 Slough which will aid the detailed design process.

The following sections summarize conclusions regarding workspace considerations, subsurface conditions and conceptual HDD geometry.

Workspace Considerations

In our opinion, the entry side of the HDD should be located on the west side of the site and the exit side of the crossing should be located on the east side of the site because having the entry point on the west side of the site may reduce the potential for hydraulic fracture and inadvertent returns beneath the slough. The proposed pipeline alignment east of the site is also more suitable for stringing and fabricating the product pipe for pullback operations.

The layout and dimensions for the proposed entry/exit side workspaces have not been identified in Figure L-1, but will be added during the detailed design phase. For typical HDD installations of this magnitude, the additional temporary workspace required at the entry and exit points will be approximately 60 feet by 150 feet along the proposed alignment. The following paragraphs describe the conceptual entry and exit sides of the HDD.

Conceptual Entry Side (West Side)

The entry workspace could conceptually be located along the ODOT ROW on the west side of Highway 20 Slough. The proposed pipeline alignment on the west side of the site follows a shallow ditch along the south side of Highway 20 that will likely have to be temporarily backfilled to provide a level workspace for the HDD drill rig. Adequate temporary workspace could be acquired along the ODOT ROW and in the field to the south of the alignment. Access to the workspace could be gained either from Highway 20 or via a temporary access road from Old Highway 20.

Conceptual Exit Side (East Side)

The exit workspace could be located in the ODOT ROW on the east side of the site. Adequate temporary workspace could be acquired along the ODOT ROW and in the field south of the proposed pipeline alignment. Adequate temporary workspace is available along the ODOT ROW for exit side operations and stringing and fabrication of the product pipe. Access to the exit workspace could be gained directly from Highway 20. An overhead power line is located to the east of Old Highway 20, so the exit point may have to be designed with adequate separation from the power line to avoid interference during product pipe pullback operations.

Subsurface Considerations

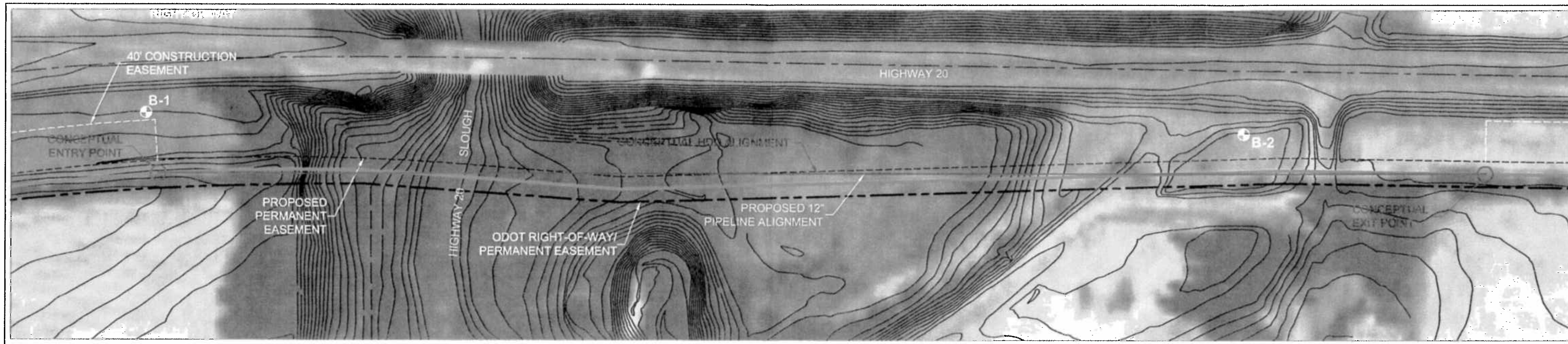
The soils at the anticipated depths of the conceptual HDD at this site generally consist of medium stiff to stiff clays, loose clayey sand and very dense gravel overlying weathered and decomposed siltstone bedrock. A very dense gravel layer was encountered in boring B-1 from a depth of 23 to 25 feet. The gravel unit could present a risk for hole instability if the bottom tangent of the HDD is located within this unit. The HDD bottom tangent should be designed in such a way as to avoid this gravel unit. Gravelly deposits were not observed in boring B-2.

Additionally, RQD values of the siltstone bedrock were highly variable throughout the borings ranging from 23 to 100 percent. The siltstone bedrock will likely require the use of a positive displacement mud motor during pilot hole operations. The depth of the HDD profile should be determined during final design such that the HDD is positioned in zones of siltstone bedrock with higher rock quality

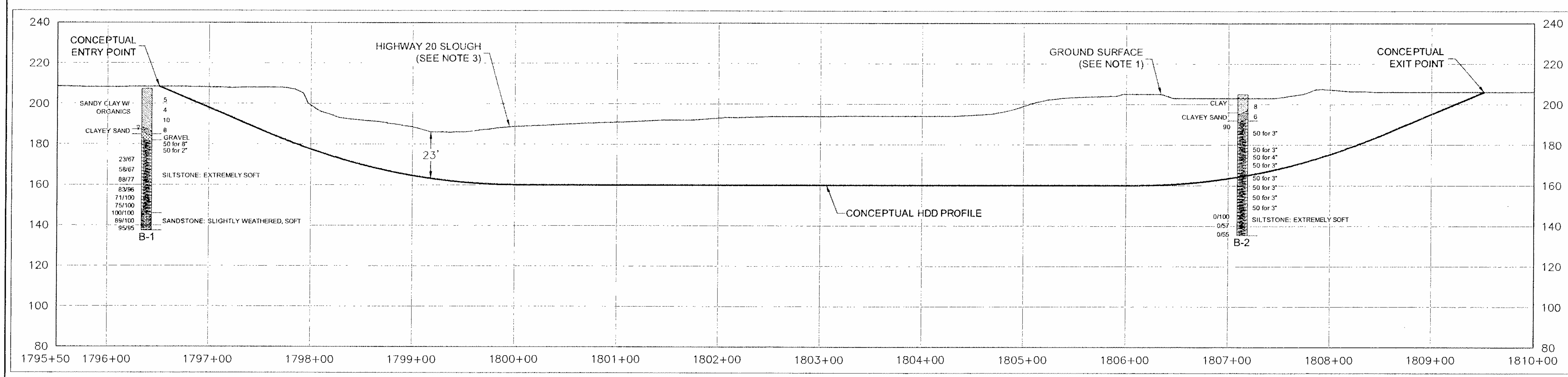
Conceptual HDD Geometry

The length, depth and orientation of a potential HDD crossing is a function of Northwest Natural's 15-foot minimum depth requirement below waterbodies, the topography along the proposed alignment, the minimum allowable radius of curvature of the product pipe and the subsurface conditions encountered in the borings.

The conceptual HDD alignment is shown as a straight alignment between the entry and exit point even though the proposed pipeline alignment is shown with curvature and pipeline points of intersection. To provide a minimum length HDD, attempts should be made to design the HDD with a straight alignment. The conceptual HDD is approximately 1,300 feet long and provides approximately 20-25 feet of cover below the Highway 20 Slough. A setback of the entry point from the west bank of the slough would be required to provide adequate profile depth beneath the channel. The actual profile length and depth should be based on additional geometric and hydraulic fracture analyses completed during the detailed design phase of the project.



PLAN
1" = 100'



PROFILE
HORIZ.: 1"=100'
VERT.: 1"=50'

NOT FOR CONSTRUCTION

Notes:
1. Topographic information based on a site specific topographic survey dated 9/19/09, provided by WH Pacific.
2. The locations of all features shown are approximate.
3. No bathymetric survey was completed during the feasibility phase of this project. Therefore the depth of the Highway 20 Slough channel is not known at this time. Depth shown on profile is the depth below the water level at the time of the topographic survey.
4. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. can not guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Legend

Boring Location

Soil Classification

SPT (N) Value

Boring ID

N W E S

Centerline in Existing Easement
Centerline in ODOT R.O.W.
Centerline in Private Property

SITE PLAN & PROFILE

HIGHWAY 20 SLOUGH HDD
BENTON COUNTY, OREGON

GEOENGINEERS

FIGURE L-1

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BCR : MWJ

Drilled	Start 3/2/2010	End 3/3/2010	Total Depth (ft) 70	Logged By BKB Checked By MAM	Driller Subsurface Technologies
Drilling Method	Mud Rotary and NQ-3 Rock Coring				
Surface Elevation (ft) Vertical Datum	208.0	Hammer Data	140 lb Auto	Drilling Equipment	Diedrich D-50 Track Mounted
Easting (X) Northing (Y)	7506595.508 365999.979	System Datum	NAD83 SP N US FOOT	Groundwater	
Notes:					

Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
	20.0	188.0

Elevation (feet)	Depth (feet)	Interval / Recovered (in)	Sample/Run	Blows/foot	RQD %	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content %	Dry Density (pcf)	REMARKS
	0							CL	Brown sandy lean clay (medium stiff, moist) with organics			
205												
	5	14	1	5						34		AL
200												
	10	18	2	4					With sand and orange mottling below 10'			
195												
	15	18	3	10					Becomes stiff, wet and sandy 2" thick silty sand layer at 15.5'	43		SA; %Gravel=0 %F=57
190												
	20	18	4	8		∇		SC	Clayey sand (loose, wet)			
185								GP	Gray gravel (very dense, wet)			Rig chatter suggests gravel layer @ 23'
	25	8	5	50 for 8"				SLST	Dark gray siltstone: predominantly decomposed, extremely soft, very close fractured			
180												
	30	2	6	50 for 2"								Gravel sized clasts break down under finger pressure
175												
	35											Siltstone easily drilled with drag bit

Log of Boring B-1

GEOENGINEERS

Project: Mid Willamette Feeder-Highway 20 Slough
Project Location: Benton County, OR
Project Number: 6024-107-01Task1800

Figure L-2
Sheet 1 of 2

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Sample/Run	Blows/foot	RQD %	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content %	Dry Density, (pcf)	REMARKS
	FIELD DATA												
	35		10	R1		23			SLST	Dark gray siltstone: moderately decomposed, soft, very close fractured			Switched to NQ Rock Coring
170										Becomes slightly weathered, soft and closely fractured			
										Very closely fractured 38.5-40'			
	40		10	R2		58							
165													
	45		46	R3		88				Becomes moderately close fractured and medium hard with occasional 1-3" thick sandstone layers below 45'		140	UC=3,365psi
160												139	UC=5,999psi
	50		46	R4		83							
155			12	R5		71				Very closely fractured 54-54.5'			
	55		60	R6		75				Becomes closely fractured			
150													
	60		42	R7		100				Becomes moderately close fractured			
									SSTN	Dark gray sandstone: slightly weathered, soft to medium hard, moderately close fractured			
145			16	R8		89							
	65		57	R9		95							
140													
	70												

Portland: Date:4/5/10 Path:P:\6\6024107\01\GINT JPG 6024107\01\602410701.GPJ DBTemplate/LibTemplate:GEOENGINEERS8.GDT/GE8_GEOTECH_SOIL_ROCK

Log of Boring B-1 (continued)

GeoEngineers

Project:	Mid Willamette Feeder-Highway 20 Slough
Project Location:	Benton County, OR
Project Number:	6024-107-01Task1800

Figure L-2
Sheet 2 of 2

Drilled: Start 3/1/2010, End 3/2/2010	Total Depth (ft): 69.5	Logged By: BKB; Checked By: MAM	Driller: Subsurface Technologies	Drilling Method: Mud Rotary and NQ-3 Rock Coring
Surface Elevation (ft), Vertical Datum: 205.0		Hammer Data: 140 lb Auto		Drilling Equipment: Diedrich D-50 Track Mounted
Easting (X): 7507670.508; Northing (Y): 365998.0823		System Datum: NAD83 SP N US FOOT		Groundwater: Date Measured / Depth to Water (ft) / Elevation (ft)
Notes:				

FIELD DATA

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Sample/Run	Blows/foot	RQD %	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density (pcf)	REMARKS
	0								CH	Brown/gray mottled fat clay (stiff, moist)			
200	5		14	1	8						33		AL
									SC	Gray clayey sand (loose, moist)			
195	10		14	2	6						34		%F=43
									SLST	Dark gray siltstone: decomposed, extremely soft, very closely fractured			
190	15		14	3	90								Gravel sized clasts break under finger pressure
185	20		3	4	50 for 3"					Becomes soft and predominately decomposed			
180	25		3	5	50 for 3"								
175	30		4	6	50 for 4"								
170	35												

Log of Boring B-2

GEOENGINEERS

Project: Mid Willamette Feeder-Highway 20 Slough
Project Location: Benton County, OR
Project Number: 6024-107-01Task1800

Figure L-3
Sheet 1 of 2

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Sample/Run	Blows/foot	RQD %	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density (pcf)	REMARKS
		FIELD DATA											
	35		3	7	50 for 3"					Dark gray siltstone: decomposed, extremely soft, very closely fractured			
										Becomes moderately weathered			
165	40		3	8	50 for 3"								Attempted to sample using rock coring techniques but the core barell plugged off. Switched back to mud rotary drilling
160	45		10	9	50 for 3"					Becomes decomposed			
155	50		3	10	50 for 3"					Becomes predominantly decomposed			
150	55		3	11	50 for 3"					Becomes moderately weathered			
145	60		12	R1		0				Becomes slightly weathered, very soft and very closely fractured			Switched to NQ Rock Coring
			24	R2		0							
										Becomes moderately weathered and extremely soft			
										Becomes slightly weathered and very soft			
140	65		36	R3		0							
										Becomes moderately weathered and extremely soft			
										Becomes moderately weathered and very soft			

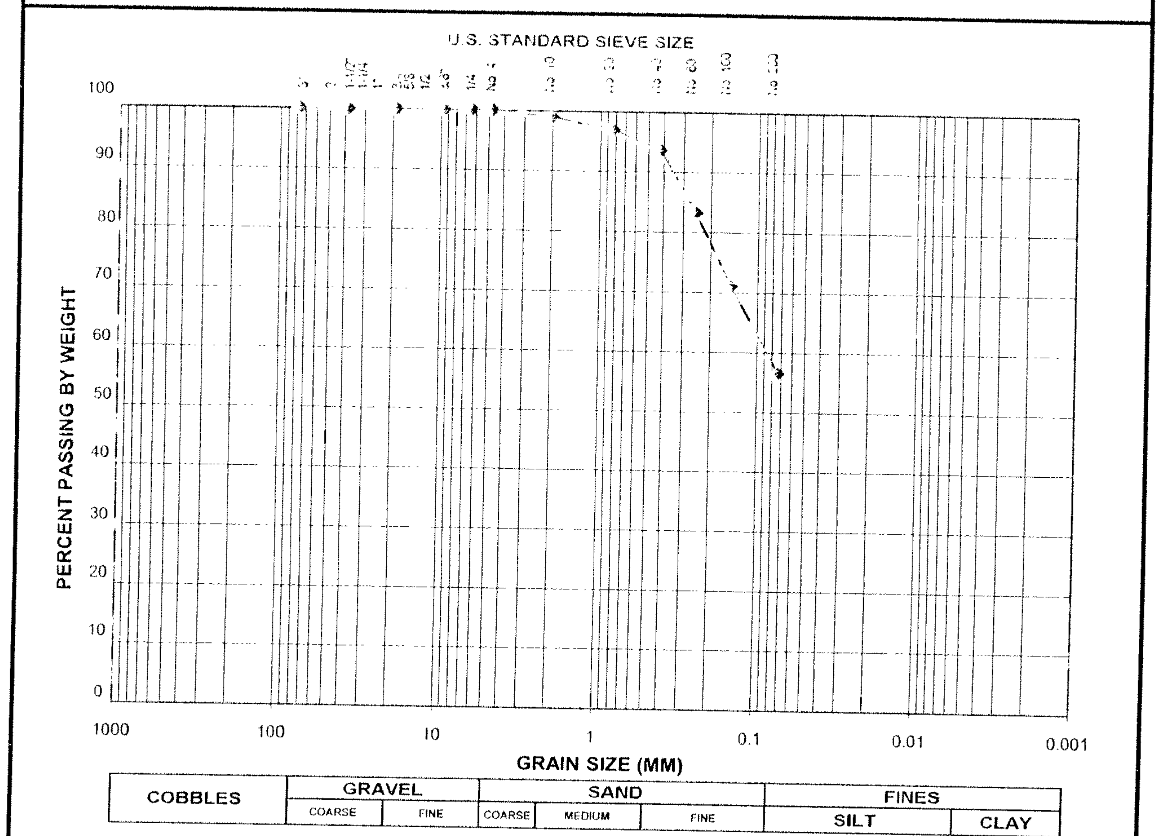
Log of Boring B-2 (continued)

GeoEngineers

Project: Mid Willamette Feeder-Highway 20 Slough
Project Location: Benton County, OR
Project Number: 6024-107-01Task1800

Figure L-3
Sheet 2 of 2

Project:	Mid Willamette Feeder-Hwy 20 Slough	**Lab No.**	10-0015
Project No.	6024-107-01Task 1800	**Date:**	03/05/10
Boring/TP No.	B-1	**Tested By:**	KAR
Sample No./Depth:	S-3 @15'	**Checked By:**	BCR
USCS Classification:	CL	**PA/PM:**	BCR



Nat. Water Content, %	Gravel Total, %	Sand Total, %	Fines Total, %	USCS	Description
43.2	0.0	43.4	56.6	CL	Sandy Lean Clay

NOTE: Test results are applicable only to the specific sample on which they were performed, and should not be interpreted as representative of any other samples obtained at other times, depths or locations or generated by separate operations or processes. This report may not be reproduced, except in full, without written approval of GeoEngineers, Inc.

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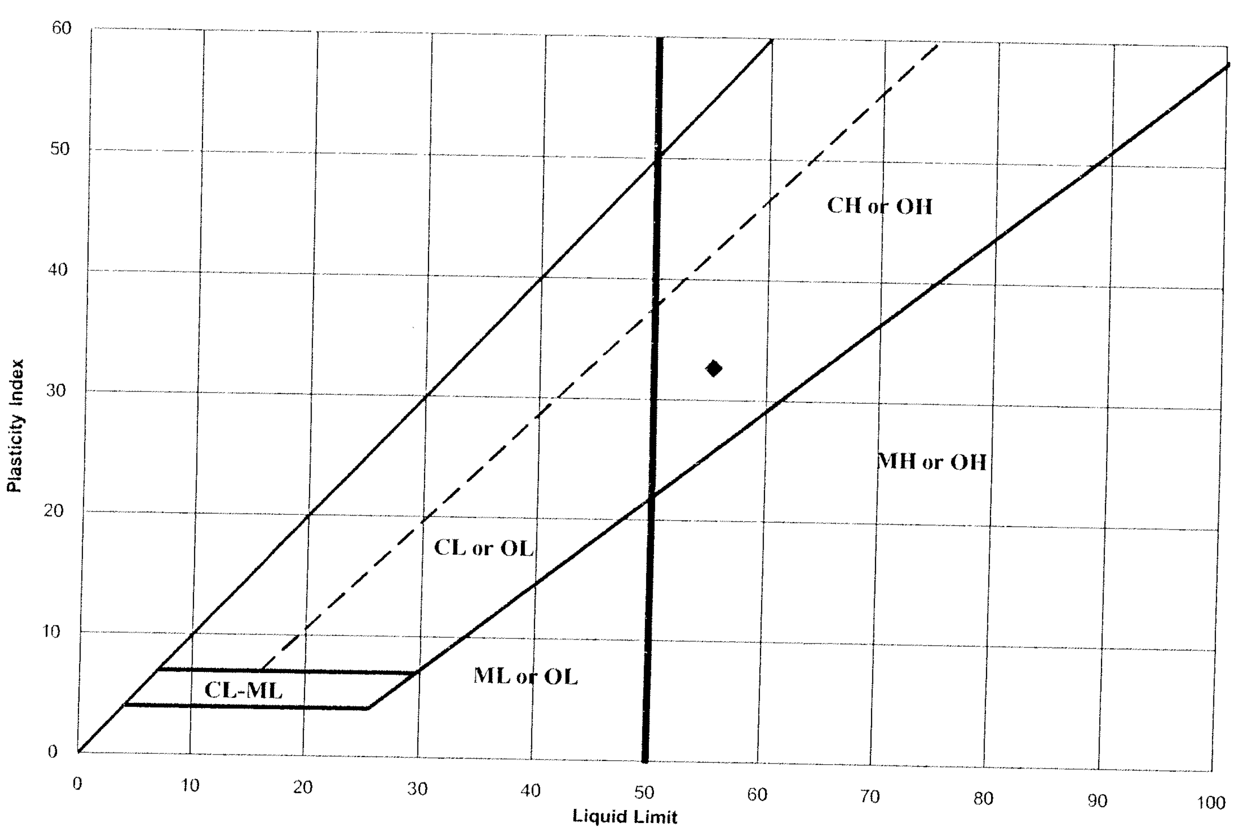
Grain Size Analysis ASTM C 136

Figure L-4

Project:	Mid Willamette Feeder-Hwy 20 Slough	**Lab No.**	10-0015
Project No.	6024-107-01Task 1800	**Date:**	03/05/10
Boring/TP No.	B-2	**Tested By:**	KAR
Sample No./Depth:	S-1 @ 5'	**Checked By:**	BCR
USCS Classification:	CH	**PA/PM:**	BCR



Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Description
32.8	55	23	33	CH	Brown fat clay

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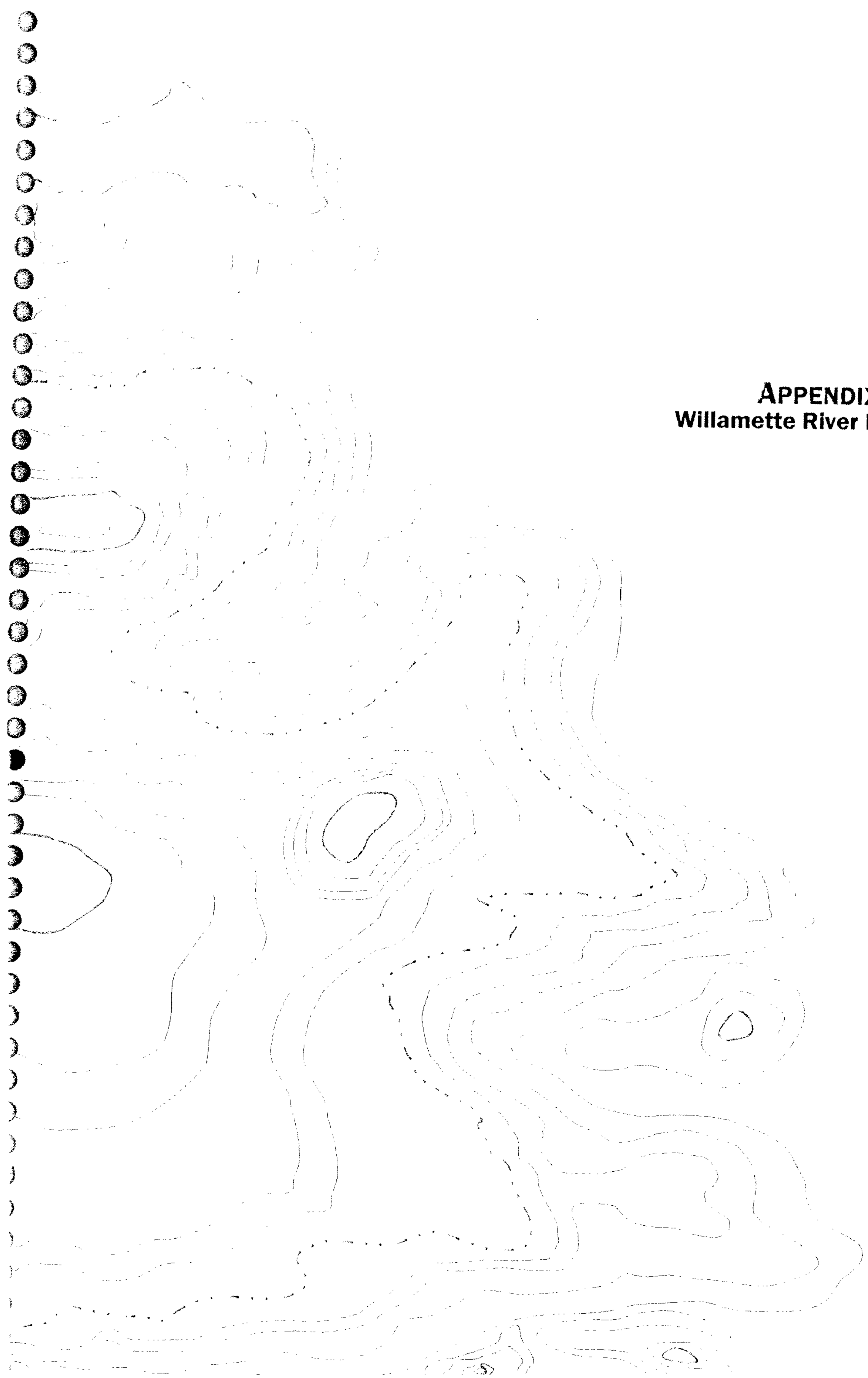
Atterberg Limits ASTM D 4318

Figure L-6



APPENDIX M
Willamette River HDD

APPENDIX M
WILLAMETTE RIVER HDD

The Willamette River HDD site is located approximately 2 miles west of Albany, Oregon. The proposed pipeline alignment at the site is oriented approximately north-south and roughly perpendicular to the Willamette River channel as shown in Figure M-1. An HDD of approximately 1,300 feet in length is required at this site.

SITE DESCRIPTION

Surface Conditions

Outside of the banks of the Willamette River, the ground surface along the proposed pipeline alignment is relatively flat with approximately 11 feet of topographic relief between the north and south sides of the site. The area along the proposed pipeline alignment north of the river channel is vacant land periodically used for livestock, with ground surface elevations ranging from approximately 198 to 207 feet above mean sea level (MSL). The northern river bank is approximately 20 feet in height and slopes down south toward the river at an approximate gradient of 2.5H:1V (Horizontal to Vertical). The pipeline alignment on the north side of the river is vegetated with grass, underbrush and moderately dense trees. The northern river bank is vegetated with dense underbrush. The proposed pipeline alignment crosses an existing power line easement at approximately the mid-point of the river.

South of the Willamette River channel, the ground surface along the proposed pipeline alignment is gently rolling terrain with ground surface elevations ranging from approximately 190 to 200 feet above MSL. This area is currently used for agricultural land. The southern river bank is approximately 20 feet in height and slopes up toward the south at slopes between 3H:1V and 10H:1V. The southern river bank is heavily vegetated with dense underbrush.

Subsurface Conditions

We explored subsurface conditions at the site from November 2 through November 4, 2009 by drilling one boring (B-1) to a depth of approximately 80 feet below ground surface (bgs) at the approximate location shown in Figure M-1. Because of access restrictions, we were unable to complete a boring on the south side of the Willamette River. In general, boring B-1 encountered soft to stiff silt with varying sand content overlying siltstone and sandy mudstone bedrock which was consistent with the geologic mapping for the area. A log of boring B-1 is presented as Figure M-2.

Boring B-1 was drilled approximately 185 feet north of the northern bank of the Willamette River. We observed soft to stiff silt with varying sand content from the ground surface to a depth of approximately 21 feet bgs. Between depths of 21 and 50 feet bgs, siltstone bedrock was encountered. The rock quality of the siltstone ranged from good to excellent with Rock Quality Designation (RQD) values ranging from 80 to 100 percent. An unconfined compression (UC) test on a rock core sample obtained from approximately 36 feet bgs indicated an unconfined compressive strength of 4,039 pounds per square inch (psi). From a depth of 50 to 80 feet bgs, the maximum depth explored, we observed fresh, massively bedded sandy mudstone. The rock quality of the mudstone was primarily excellent with RQD values of 100 percent, with the exception of 50 percent from 70 to 75 feet bgs. A UC test on a rock core sample from approximately 68 feet bgs indicated an unconfined compressive strength of 8,752 psi.

Groundwater

Groundwater was observed at a depth of approximately 15 feet bgs in boring B-1. We anticipate that groundwater levels will fluctuate due to seasonal variations in precipitation, changes in site utilization or other factors. For the design and construction of an HDD, the groundwater level is not typically a factor affecting feasibility. The hydrostatic drilling fluid pressure typically compensates for high groundwater levels.

LABORATORY TESTING

Atterberg limits tests were performed on one soil sample. The tests were used to classify the soil as well as to evaluate engineering properties. The liquid limit and the plastic limit were estimated through a procedure performed in general accordance with ASTM D 4318. The results of the Atterberg limits testing are shown in Figure M-3.

UC tests were performed on two intact rock core samples obtained from boring B-1. The tests were used to evaluate shear strength characteristics of the rock and were completed in general accordance with the ASTM D 2938 test procedure. The results of the testing are presented on the boring log at the depths where the samples were obtained.

HDD FEASIBILITY CONCLUSIONS AND RECOMMENDATIONS

Based on our HDD evaluation and the limited geotechnical information available, the HDD method of construction at the Willamette River HDD site may be feasible. We anticipate that a HDD profile for this site would be about 1,300 feet long, and between 25 and 40 feet below the bottom of the Willamette River. However, the depth of the Willamette River had not been surveyed at the time of our study. A conceptual HDD profile for this HDD is shown in Figure M-1.

Subsurface conditions on the south side of the Willamette River had not been investigated at the time of this report. Therefore, we cannot provide a final conclusion regarding the feasibility of the Willamette River HDD. An additional boring is scheduled to be completed in July of 2010 to evaluate subsurface conditions on the south side of the Willamette River. An addendum feasibility report with our final feasibility conclusions will be provided upon completion of the July 2010 boring.

We recommend that a final design be completed for this proposed HDD so that the alignment and profile can be further refined. The design should include final alignment and profile design, workspace layouts, analyses of installation and operating stresses, and a hydraulic fracture and inadvertent returns evaluation. A bathymetric survey should be completed along the conceptual HDD alignment to determine the depth of the Willamette River which will be used for final design. We also recommend an additional boring be completed on the south side of the river.

The following sections summarize conclusions regarding workspace considerations, subsurface conditions and conceptual HDD geometry.

Workspace Considerations

In our opinion, the entry side of the crossing should be located on the north side of the river and the exit side of the crossing should be located on the south side of river because the availability of workspace in the field south of the river is better for stringing and fabricating the product pipe.

The layout and dimensions for the proposed entry/exit side workspaces have not been identified in Figure M-1, but will be added during the detailed design phase. For typical HDD installations of this magnitude, the additional temporary workspace required at the entry and exit points will be approximately 60 feet by 150 feet along the proposed alignment.

The following paragraphs describe the conceptual entry and exit sides of the HDD.

Conceptual Entry Side (North Side)

The entry workspace should be located along the proposed alignment on the north side of the site. The entry point would have to be approximately 500 feet north of the river in order to provide adequate profile depth beneath the river bed. Little, if any, grading would be required within the entry workspace. Access to the entry workspace could be gained from a field access road directly from Highway 20.

Conceptual Exit Side (South Side)

The exit workspace could be located in the agricultural field on the south side of the Willamette River. The exit point would have to be set back far enough from the river to provide adequate profile depth beneath the river bed. Adequate temporary workspace is available in the agricultural field for exit side operations and stringing and fabrication of the product pipe. The exit workspace and stringing area could be accessed from a field access road south of the site.

Subsurface Considerations

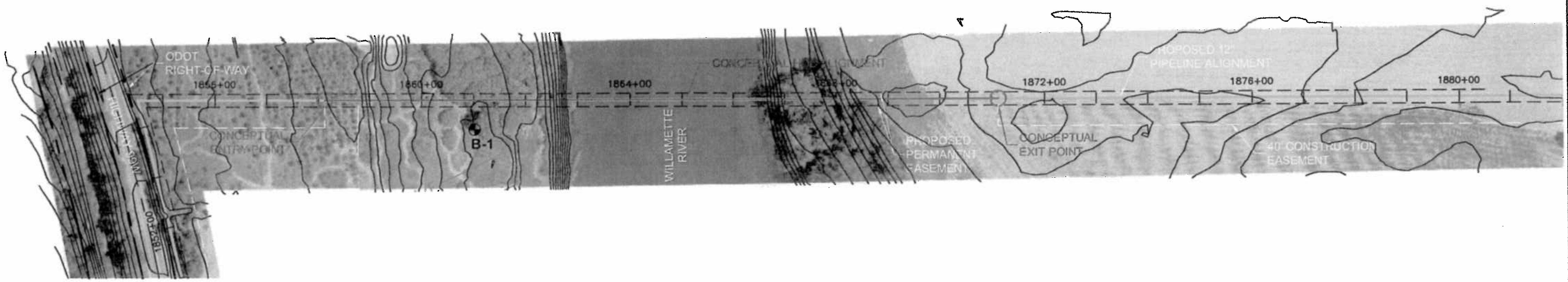
The subsurface conditions encountered in boring B-1 are considered favorable for an HDD at this site; however, the subsurface conditions were not explored on the south side of the crossing at the time of this report submittal. Based on our knowledge of the local geology, we anticipate that significant gravel deposits may be located on the south side of the site. We recommend completing a boring on the south side of the Willamette River to further characterize the subsurface conditions.

The weathered and decomposed siltstone and sandy mudstone encountered in boring B-1 indicate that a positive displacement mud motor will likely be required to complete the pilot hole. Additionally, rock hole openers may be required to enlarge the pilot hole in the rock formation.

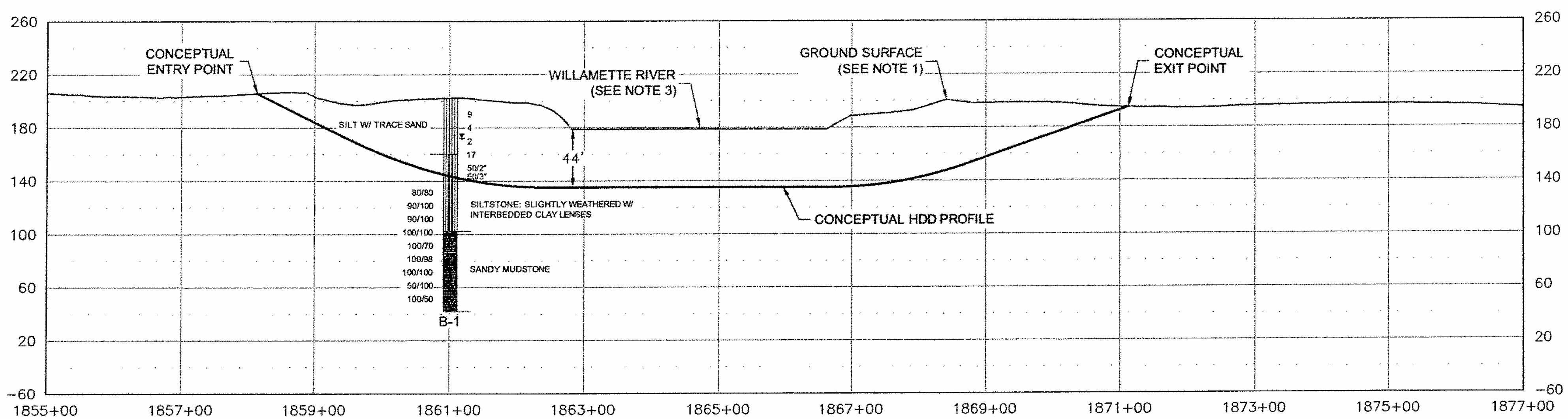
Conceptual HDD Geometry

The length, depth and orientation of a potential HDD crossing is a function of Northwest Natural's 15-foot minimum depth requirement below waterbodies, the topography along the proposed alignment, the minimum allowable radius of curvature of the product pipe and the subsurface conditions encountered in the single boring.

Because of the deeply incised river channel, the crossing would have to be longer than what would normally be considered a minimum length crossing. The minimum horizontal length of an HDD crossing at this site would have to be approximately 1,300 feet. For this crossing, we expect that the depth of the HDD profile beneath the river bed could range between 25 and 40 feet. The actual profile length and depth should be based on additional geometric and hydraulic fracture analyses completed during the design phase of the project.



PLAN
1" = 200'



PROFILE
HORIZ.: 1"=200'
VERT.: 1"=100'

NOT FOR CONSTRUCTION

Notes:
1. Topographic information based on a site specific topographic survey dated 9/19/09, provided by WH Pacific.
2. The locations of all features shown are approximate.
3. No bathymetric survey was completed during the feasibility phase of this project. Therefore the depth of the Willamette River channel is not known at this time. Depth shown on profile is the depth below the water level at the time of the topographic survey.
4. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. can not guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Legend

Boring Location

Soil Classification — SPT (N) Value — Boring ID

Centerline in Existing Easement
Centerline in ODOT R.O.W.
Centerline in Private Property

SITE PLAN & PROFILE

WILLAMETTE RIVER HDD
BENTON & LINN COUTIES, OREGON

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FIGURE M-1

BCR : MWJ

W:\Portland\Projects\6\6024107\01\CAD\Willamette River.dwg\TAB:Figure 2 modified on Apr 12, 2010 - 5:51pm

Drilled	Start 11/2/2009	End 11/4/2009	Total Depth (ft)	80	Logged By APB Checked By MAM	Driller	Subsurface Technologies	Drilling Method	Mud Rotary and NQ-3 Rock Coring

Surface Elevation (ft) Vertical Datum	202.4	Hammer Data	140 lb Auto	Drilling Equipment	Diedrich B-53 Truck Mounted
Easting (X) Northing (Y)	7512300.135 365575.0924	System Datum	NAD83 SP N US FOOT	Groundwater	
Notes:					

Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
11/2/2009	15.0	187.4

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	Recovered (in)	Sample/Run	Blows/foot	RQD %	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content %	Dry Density (pcf)	REMARKS
	0								ML	Brown silt with trace sand (stiff, moist)			
200													
	5		12	1	9								Tricone
195													
	10		18	2	4					Becomes sandy and medium stiff			
190													
	15		18	3	2		▼			Becomes soft, wet and gray/brown with brown mottling	46		AL
185													
	20		18	4	17					Becomes dark gray with siltstone fragments at bottom of sample			Higher blow counts due to siltstone in shoe. Switched to dragbit.
									SLST	Blue/gray siltstone, slightly weathered with interbedded clay lenses (medium hard)			
180													Slow drilling, chatter @ 23'.
	25		2	5	50/2"								
175													
	30		3	6	50/3"								
170													
	35									Becomes highly decomposed			

Portland: Date 4/5/10 Path P:\6\6024107\01\GINT\PG 602410701\602410701.GPJ DBTemplate/LibTemplate GEOENGINEERS8.GDT/GEI8_GEOTECH_SOIL_ROCK

Log of Boring B-1

GEOENGINEERS

Project: Mid Willamette Feeder-Willamette River
Project Location: Benton County, OR
Project Number: 6024-107-01Task2000

Figure M-2
Sheet 1 of 3

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Sample/Run	Blows/foot	RQD %	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density (pcf)	REMARKS
	35		48	R1		80				Blue/gray sandy siltstone, fresh, medium hard, massively bedded		144.6	Switched to Switched to NQ Rock Coring UC -4039psi
165													
	40		60	R2		90							
160													
	45		60	R3		90							
155													
	50		60	R4		100			MUDSTONE	Transitions to blue/gray sandy mudstone, fresh, hard and massive			
150													
	55		42	R5		100				With interbedded layers of sand and clay from 55' to 57'			
145													
	60		59	R6		100							
140													
	65		60	R7		100						145	UC-8752psi
135													
	70		60	R8		50							
130													
	75		30	R9		100				Fracture zone with infilled vertical fracture 75' to 77'			

Portland: Date:4/5/10 Path:P:\6\6024107\01\GINT\PG 6024107\01\6024107\01.GPJ DBTemplate\LibTemplate:GEOENGINEERS8.GDT\GEI8_GEOTECH_SOIL_ROCK

Log of Boring B-1 (continued)

GEOENGINEERS

Project: Mid Willamette Feeder-Willamette River
Project Location: Benton County, OR
Project Number: 6024-107-01Task2000

Figure M-2
Sheet 2 of 3

Elevation (feet)	Depth (feet)	FIELD DATA						Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, (pcf)	REMARKS
		Interval	Recovered (in)	Sample/Run	Blows/foot	RQD %	Water Level						
125	80	↕							MUDSTONE	Blue/gray sandy mudstone, fresh, hard and massive			

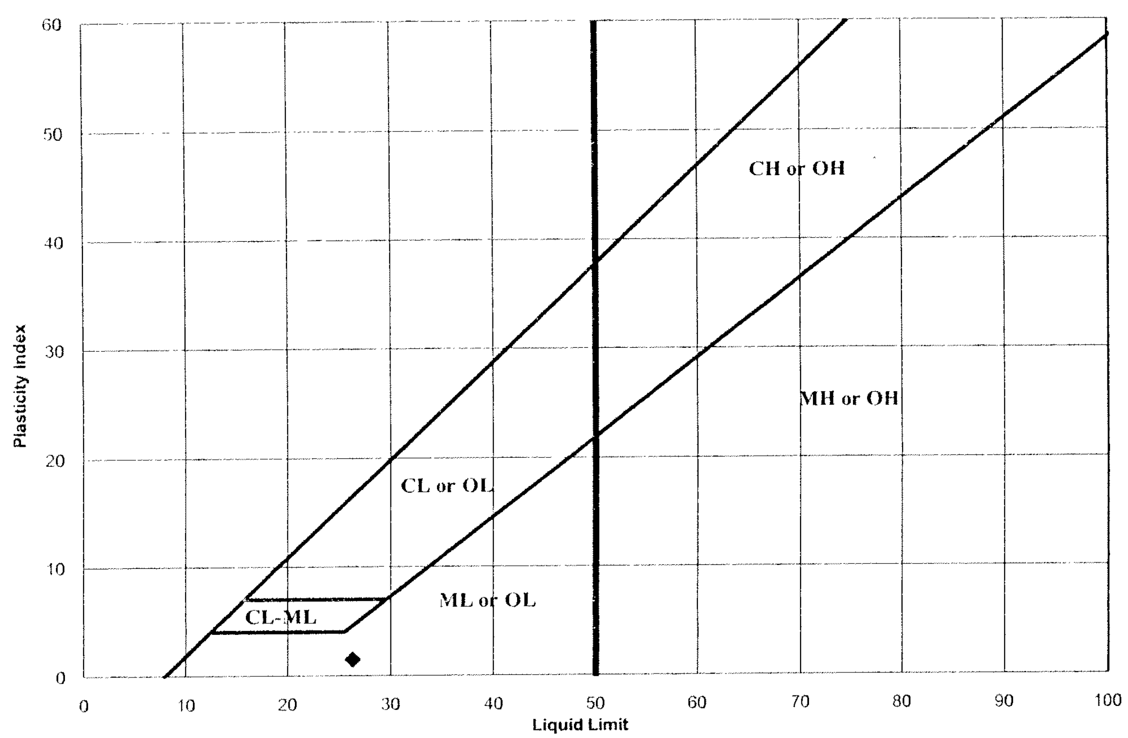
Log of Boring B-1 (continued)

GeoEngineers

Project: Mid Willamette Feeder-Willamette River
Project Location: Benton County, OR
Project Number: 6024-107-01Task2000

Figure M-2
Sheet 3 of 3

Project:	Mid-Willamette Feeder-Willamet	**Lab No.**	09-0054
Project No.	6024-107-01-2000	**Date:**	11/05/09
Boring/TP No.	B-1	**Tested By:**	BKB/KAR
Sample No./Depth:	S-3/15'	**Checked By:**	KAR
Description:	ML	**PA/PM:**	TNH/BCR



Moisture Content %	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Description
46.0%	26	25	1	ML	Brown silt

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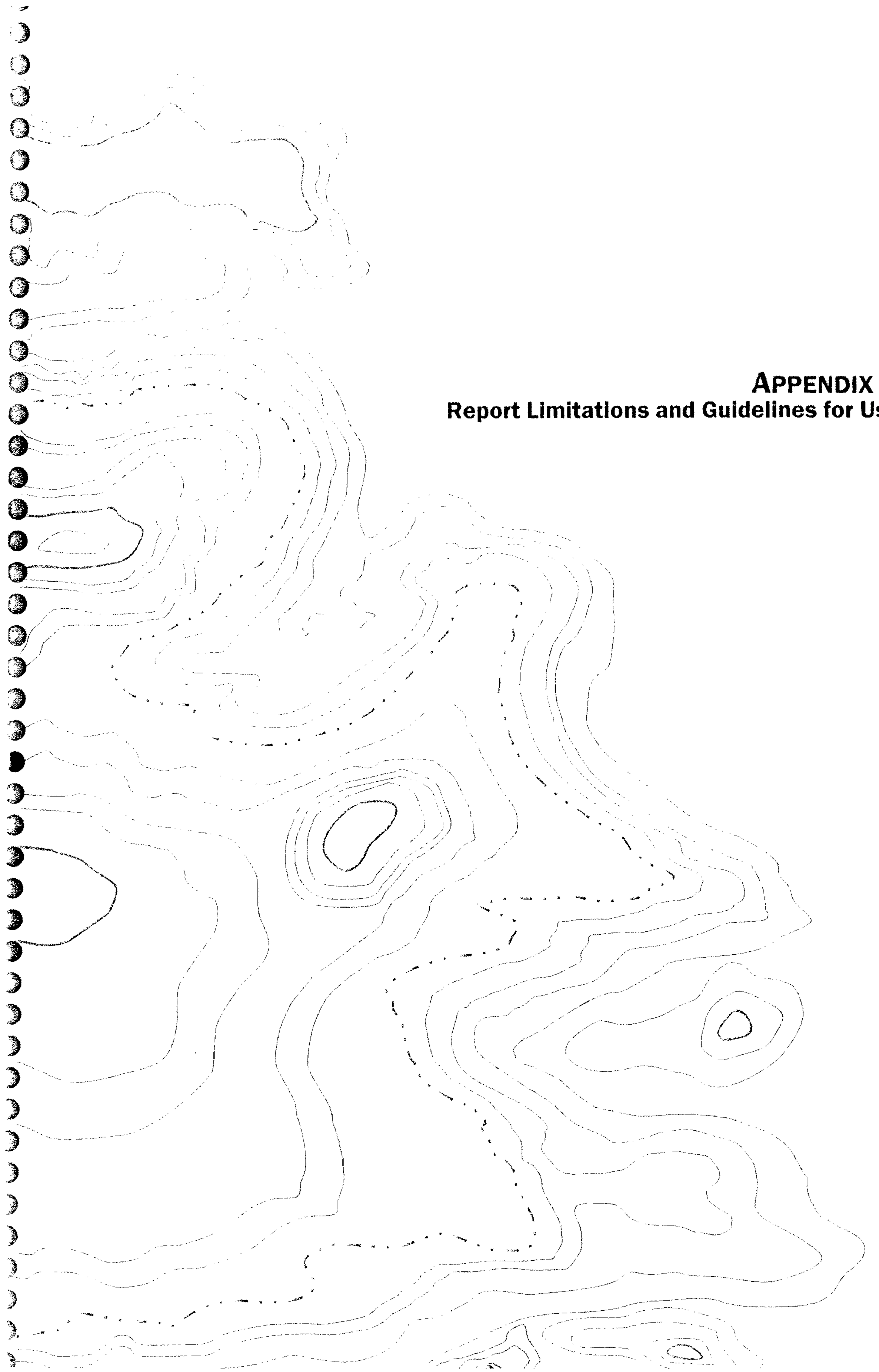
Atterberg Limits ASTM D 4318

Figure M-3



Appendix N
Report Limitations and Guidelines for Use

APPENDIX N
REPORT LIMITATIONS AND GUIDELINES FOR USE[1]

This appendix provides information to help you manage your risks with respect to the use of this report.

Geotechnical Services Are Performed for Specific Purposes, Persons and Projects

This report has been prepared for the exclusive use of WHPacific and their authorized agents. This report is not intended for use by others, and the information contained herein is not applicable to other sites.

GeoEngineers structures our services to meet the specific needs of our clients. For example, a geotechnical or geologic study conducted for a civil engineer or architect may not fulfill the needs of a construction contractor or even another civil engineer or architect that are involved in the same project. Because each geotechnical or geologic study is unique, each geotechnical engineering or geologic report is unique, prepared solely for the specific client and project site. Our report is prepared for the exclusive use of our Client. No other party may rely on the product of our services unless we agree in advance to such reliance in writing. This is to provide our firm with reasonable protection against open-ended liability claims by third parties with whom there would otherwise be no contractual limits to their actions. Within the limitations of scope, schedule and budget, our services have been executed in accordance with our Agreement with the Client and generally accepted geotechnical practices in this area at the time this report was prepared. This report should not be applied for any purpose or project except the one originally contemplated.

A Geotechnical Engineering or Geologic Report Is Based on a Unique Set of Project-specific Factors

This report has been prepared for WHPacific for the Mid-Willamette Feeder Project in Polk, Linn and Benton Counties, Oregon. GeoEngineers considered a number of unique, project-specific factors when establishing the scope of services for this project and report. Unless GeoEngineers specifically indicates otherwise, do not rely on this report if it was:

- not prepared for you.
- not prepared for your project.
- not prepared for the specific site explored.
- completed before important project changes were made.

For example, changes that can affect the applicability of this report include those that affect:

- the function of the proposed structure.
- elevation, configuration, location, orientation or weight of the proposed structure.
- composition of the design team.
- project ownership.

[1] Developed based on material provided by ASFE, Professional Firms Practicing in the Geosciences; www.asfe.org.

If important changes are made after the date of this report, GeoEngineers should be given the opportunity to review our interpretations and recommendations and provide written modifications or confirmation, as appropriate.

Subsurface Conditions Can Change

This geotechnical or geologic report is based on conditions that existed at the time the study was performed. The findings and conclusions of this report may be affected by the passage of time, by manmade events such as construction on or adjacent to the site, or by natural events such as floods, earthquakes, slope instability or groundwater fluctuations. Always contact GeoEngineers before applying a report to determine if it remains applicable.

Most Geotechnical and Geologic Findings Are Professional Opinions

Our interpretations of subsurface conditions are based on field observations from widely spaced sampling locations at the site. Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. GeoEngineers reviewed field and laboratory data and then applied our professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ, sometimes significantly, from those indicated in this report. Our report, conclusions and interpretations should not be construed as a warranty of the subsurface conditions.

Geotechnical Engineering Report Recommendations Are Not Final

Do not over-rely on the preliminary construction recommendations included in this report. These recommendations are not final, because they were developed principally from GeoEngineers' professional judgment and opinion. GeoEngineers' recommendations can be finalized only by observing actual subsurface conditions revealed during construction. GeoEngineers cannot assume responsibility or liability for this report's recommendations if we do not perform construction observation.

Sufficient observation, testing and consultation by GeoEngineers should be provided during construction to confirm that the conditions encountered are consistent with those indicated by the explorations, to provide recommendations for design changes should the conditions revealed during the work differ from those anticipated, and to evaluate whether or not earthwork activities are completed in accordance with our recommendations. Retaining GeoEngineers for construction observation for this project is the most effective method of managing the risks associated with unanticipated conditions.

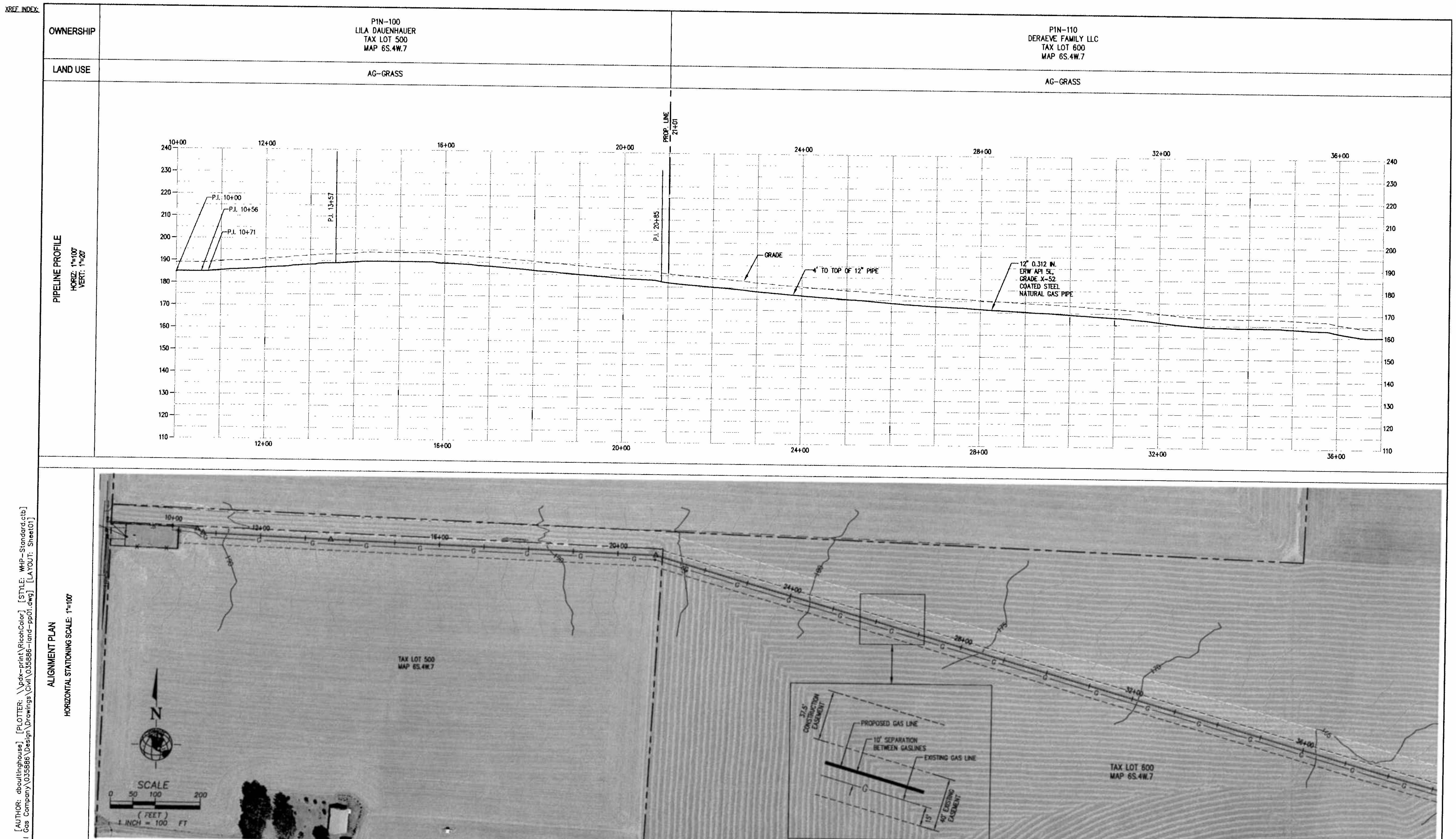
A Geotechnical Engineering or Geologic Report Could Be Subject to Misinterpretation

Misinterpretation of this report by other design team members can result in costly problems. You could lower that risk by having GeoEngineers confer with appropriate members of the design team after submitting the report. Also, retain GeoEngineers to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering or geologic report. Reduce that risk by having GeoEngineers participate in pre-bid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Exploration Logs

Geotechnical engineers and geologists prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering or geologic report should never be redrawn for inclusion in architectural or other design drawings. Only

If Client desires these specialized services, they should be obtained from a consultant who offers services in this specialized field.



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CENTERLINE IN EXISTING EASEMENT	EXISTING FIBER OPTIC
CENTERLINE IN R.O.W.	EXISTING GAS LINE
CENTERLINE IN PRIVATE PROPERTY	EXISTING WATER LINE
R.O.W.	EXISTING OVERHEAD UTILITIES
PROPERTY LINE	EXISTING CULVERT
CONSTRUCTION EASEMENT (temp)	EXISTING WETLANDS
ALIGNMENT STATIONING	EXISTING CONTOURS

SHEET INFO	
DESIGNED	DLB
DRAWN	RAI
CHECKED	DLB
APPROVED	—
LAST EDIT	2/9/2010
PLOT DATE	3/15/2011
SUBMITTAL	

REVISIONS

NO.	BY	DATE	REMARKS

PLAN & PROFILE
STA. 10+00 TO STA. 37+00
NORTHWEST NATURAL GAS COMPANY
MID-WILLAMETTE FEEDER PROJECT

PROJECT NUMBER	DRAWING FILE NAME	SCALE
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SHEET NUMBER
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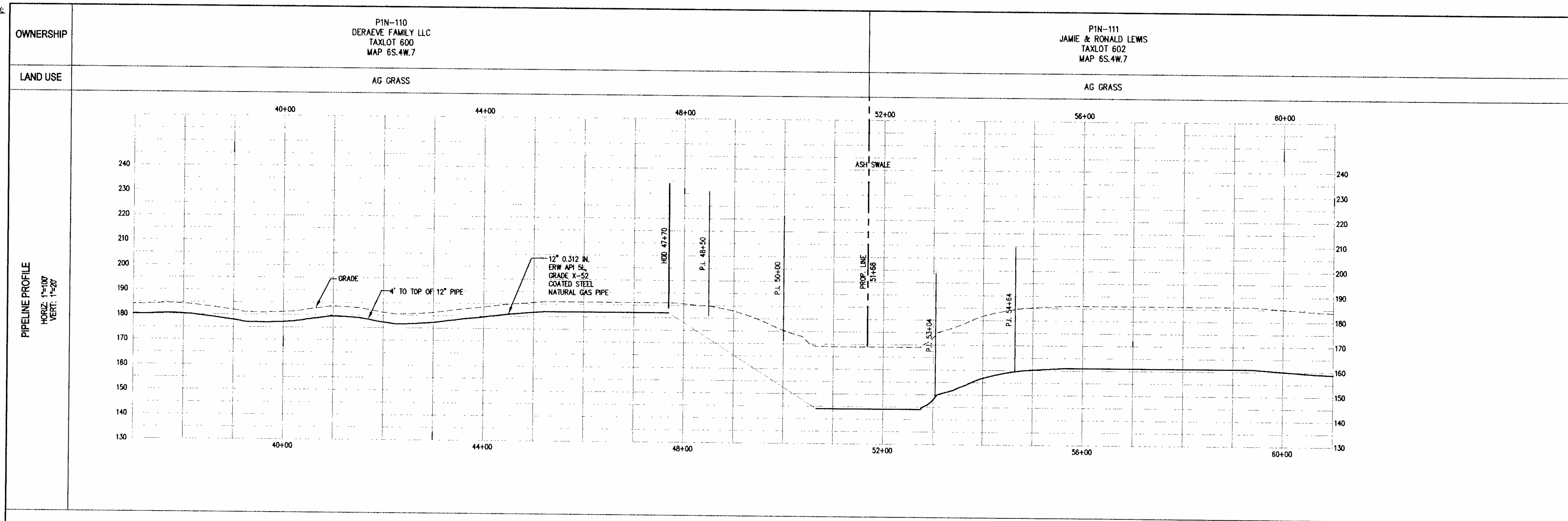

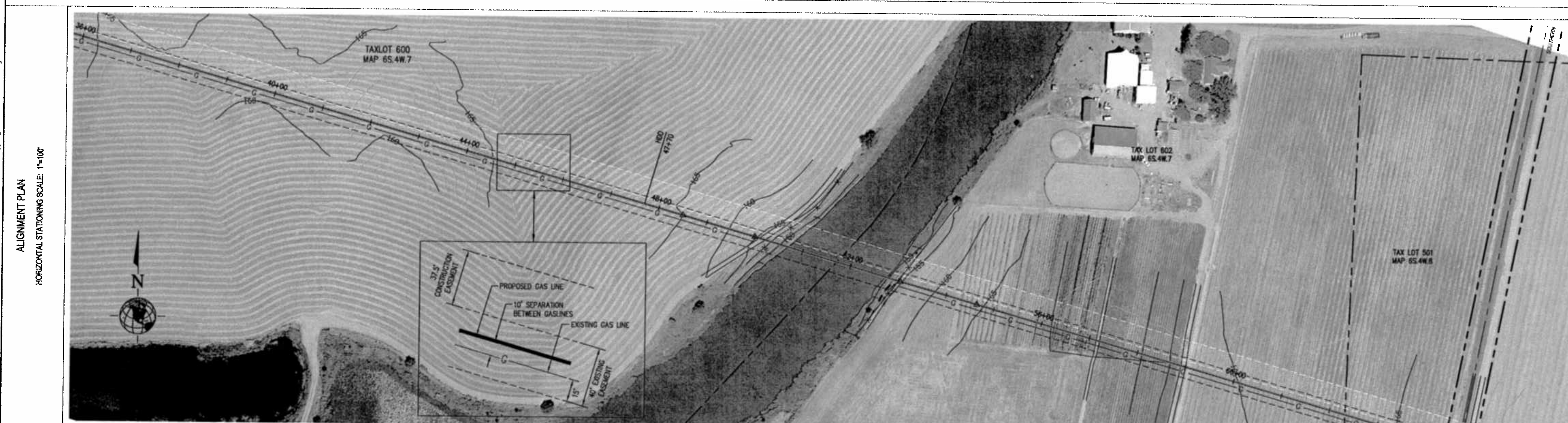

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CENTERLINE IN EXISTING EASEMENT	EXISTING FIBER OPTIC
CENTERLINE IN R.O.W.	EXISTING GAS LINE
CENTERLINE IN PRIVATE PROPERTY	EXISTING WATER LINE
R.O.W.	EXISTING OVERHEAD UTILITIES
PROPERTY LINE	EXISTING CULVERT
CONSTRUCTION EASEMENT (TEMP)	EXISTING WETLANDS
283+00 ALIGNMENT STATIONING	175 EXISTING CONTOURS

SHEET INFO	
DESIGNED	DB
DRAWN	RAI
CHECKED	—
APPROVED	—
LAST EDIT	2/9/2010
PLOT DATE	3/15/2011
SUBMITTAL	

REVISIONS

NO.	BY	DATE	REMARKS

PLAN & PROFILE
STA. 37+00 TO STA. 61+00
NORTHWEST NATURAL GAS COMPANY
MID-WILLAMETTE FEEDER PROJECT

PROJECT NUMBER	DRAWING FILE NAME	SCALE
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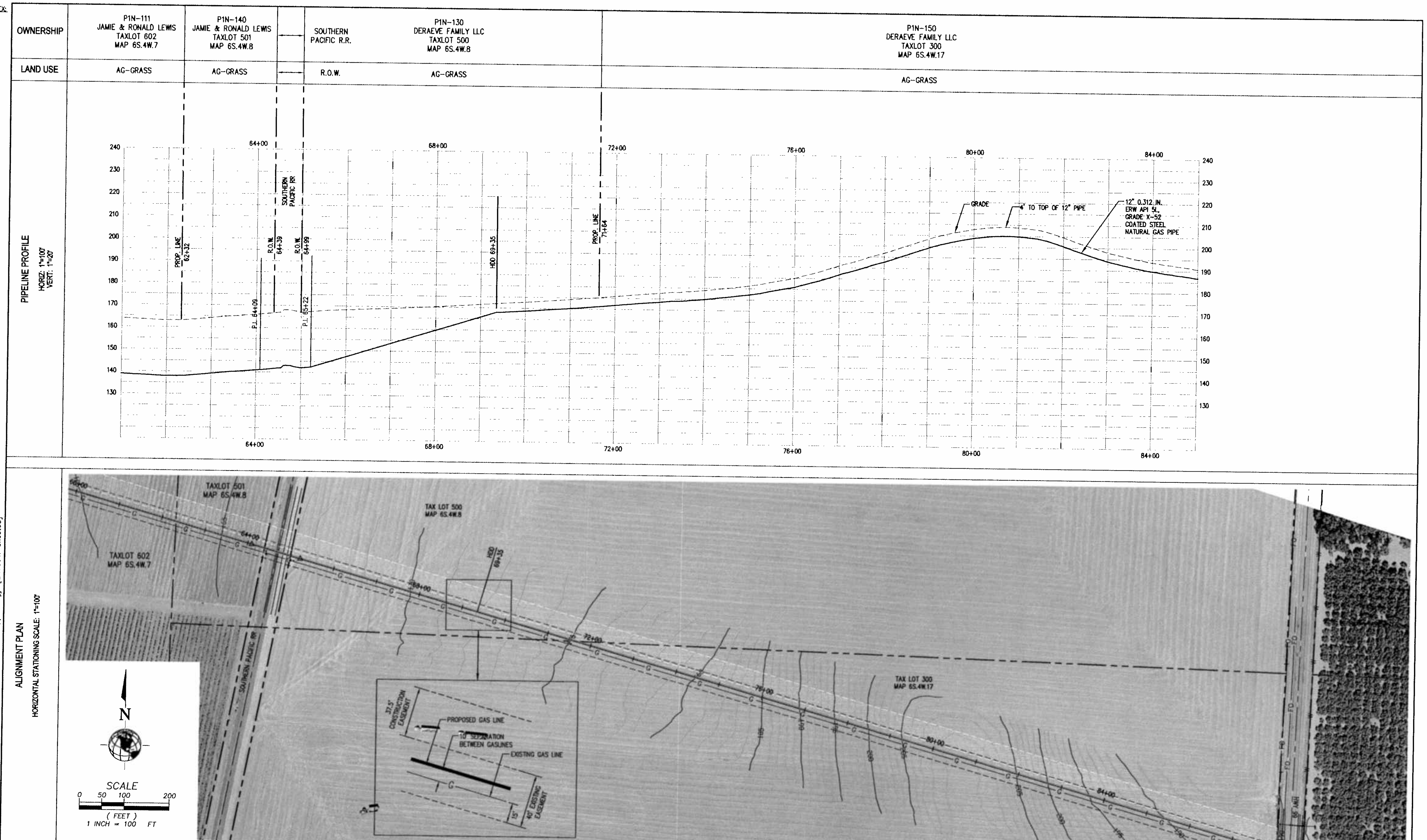
SHEET NUMBER
2



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CENTERLINE IN R.O.W.
CENTERLINE IN PRIVATE PROPERTY
R.O.W.
PROPERTY LINE

SHEET INFO	
DESIGNED	DB
DRAWN	RAI
CHECKED	—
APPROVED	—
LAST EDIT	2/9/2010
PLOT DATE	3/15/2011
SUBMITTAL	

REVISIONS

NO.	BY	DATE	REMARKS

PLAN & PROFILE
STA. 61+00 TO STA. 85+00
NORTHWEST NATURAL GAS COMPANY
MID-WILLAMETTE FEEDER PROJECT

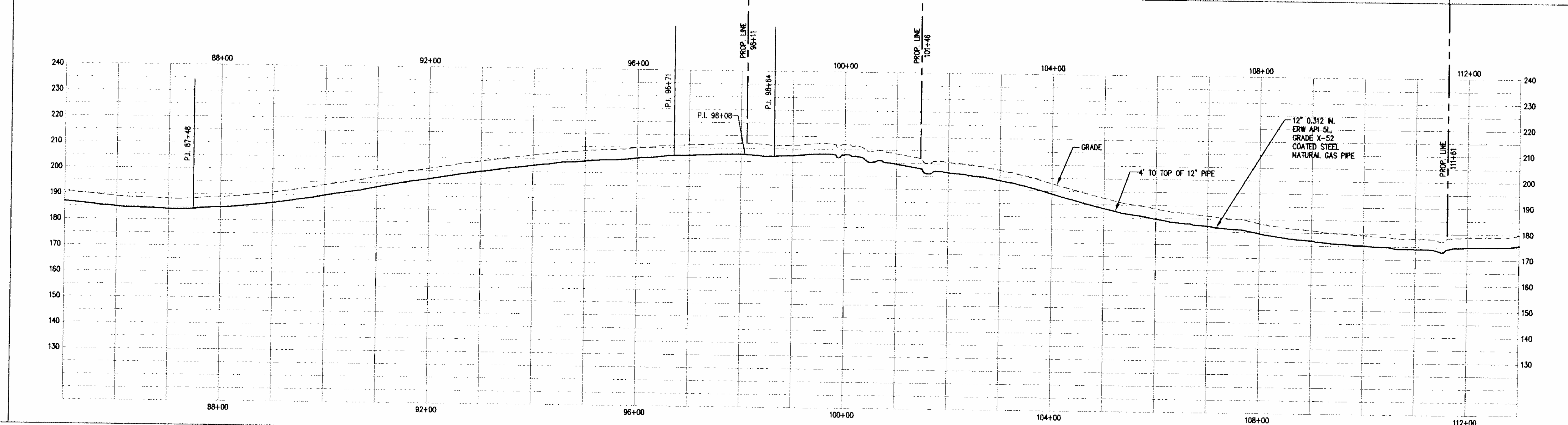
PROJECT NUMBER	DRAWING FILE NAME	SCALE
035886	035886-LAND-PP01	1"=100'

SHEET NUMBER 3

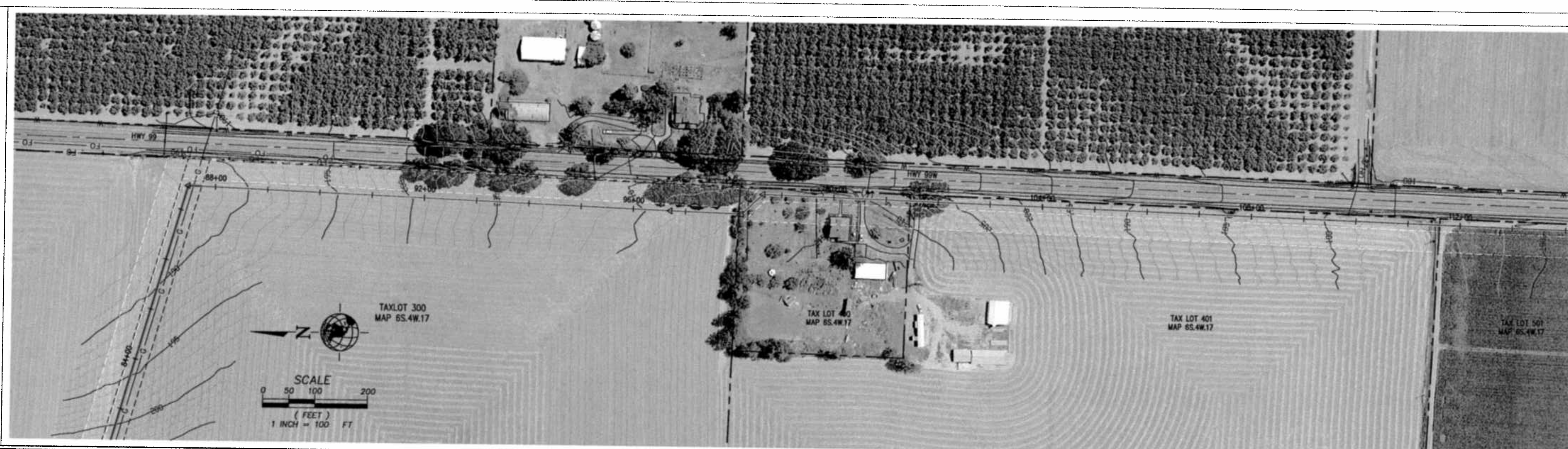
XREF INDEX:

OWNERSHIP	P1N-150 DERAEVE FAMILY LLC TAXLOT 300 MAP 6S.4W.17	P1N-160 JENNIFER HAGG ET AL TAXLOT 400 MAP 6S.4W.17	P1N-170 DERAEVE FAMILY LLC TAXLOT 401 MAP 6S.4W.17	P1N-190 DERAEVE FAMILY LLC TAXLOT 501 MAP 6S.4W.17
LAND USE	AG GRASS	PRIVATE RESIDENCE	AG GRASS	AG

PIPELINE PROFILE
HORIZ: 1"=100'
VERT: 1"=20'



ALIGNMENT PLAN
HORIZONTAL STATIONING SCALE: 1"=100'



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[PATH: P:\Northwest Natural Gas Company\035886\Design\Drawings\Civil\035886-land-pp01.dwg] [LAYOUT: Sheet04]

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CENTERLINE IN EXISTING EASEMENT
CENTERLINE IN R.O.W.
CENTERLINE IN PRIVATE PROPERTY
R.O.W.
PROPERTY LINE
CONSTRUCTION EASEMENT (WHITE)
ALIGNMENT STATIONING
EXISTING FIBER OPTIC
EXISTING GAS LINE
EXISTING WATER LINE
EXISTING OVERHEAD UTILITIES
EXISTING CULVERT
EXISTING WETLANDS
EXISTING CONTOURS

SHEET INFO	
DESIGNED	DB
DRAWN	RAI
CHECKED	—
APPROVED	—
LAST EDIT	2/9/2010
PLOT DATE	3/15/2011
SUBMITTAL	

REVISIONS

NO.	BY	DATE	REMARKS

PLAN & PROFILE
STA. 85+00 TO STA. 113+00
NORTHWEST NATURAL GAS COMPANY
MID-WILLAMETTE FEEDER PROJECT

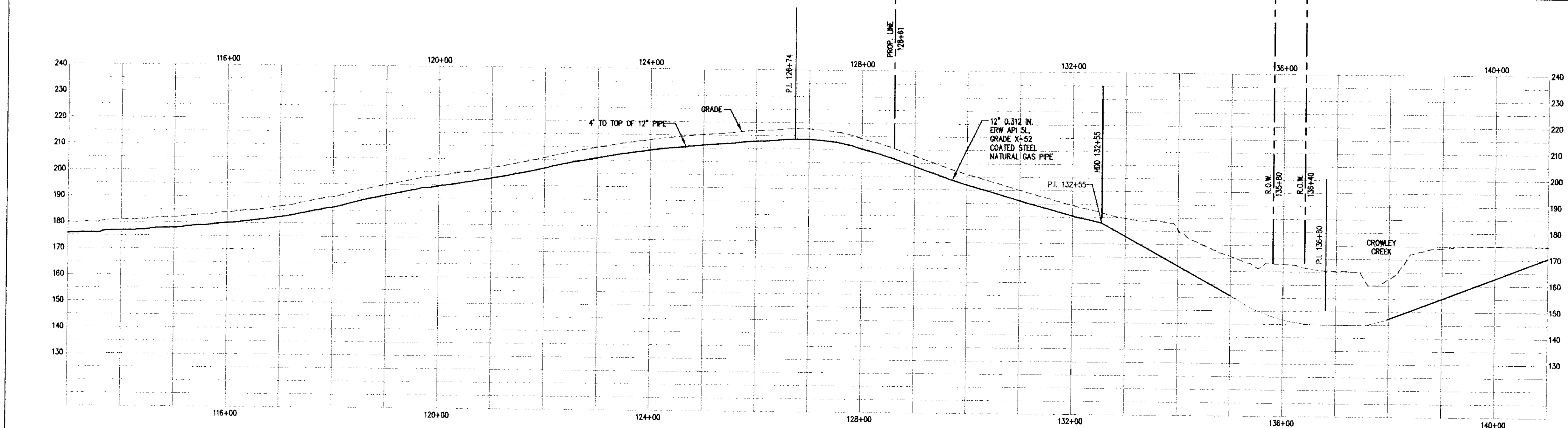
PROJECT NUMBER	DRAWING FILE NAME	SCALE
035886	035886-LAND-PP01	1"=100'

SHEET NUMBER
4

XREF INDEX:

OWNERSHIP	P1N-190 DERAEVE FAMILY LLC TAXLOT 501 MAP 6S.4W.17	P1N-180 BRIAN C. FINN TAXLOT 500 MAP 6S.4W.17		BETHEL RD	P1N-200 BRIAN C. FINN TAX LOT 300 MAP 6S.4W.20
LAND USE	AG	AG	PRIVATE RESIDENCE	R.O.W.	AG GRASS

PIPELINE PROFILE
HORIZ: 1"=100'
VERT: 1"=20'



ALIGNMENT PLAN
HORIZONTAL STATIONING SCALE: 1"=100'

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CENTERLINE IN PRIVATE PROPERTY
R.O.W.
PROPERTY LINE
CONSTRUCTION EASEMENT (WHITE)
283+00 ALIGNMENT STATIONING
FO EXISTING FIBER OPTIC
G EXISTING GAS LINE
W EXISTING WATER LINE
OH/E EXISTING OVERHEAD UTILITIES
EXISTING CULVERT
EXISTING WETLANDS
175 EXISTING CONTOURS

SHEET INFO	
DESIGNED	DB
DRAWN	RAI
CHECKED	—
APPROVED	—
LAST EDIT	2/9/2010
PLOT DATE	3/15/2011
SUBMITTAL	

REVISIONS

NO.	BY	DATE	REMARKS

PLAN & PROFILE
STA. 113+00 TO STA. 141+00
NORTHWEST NATURAL GAS COMPANY
MID-WILLAMETTE FEEDER PROJECT

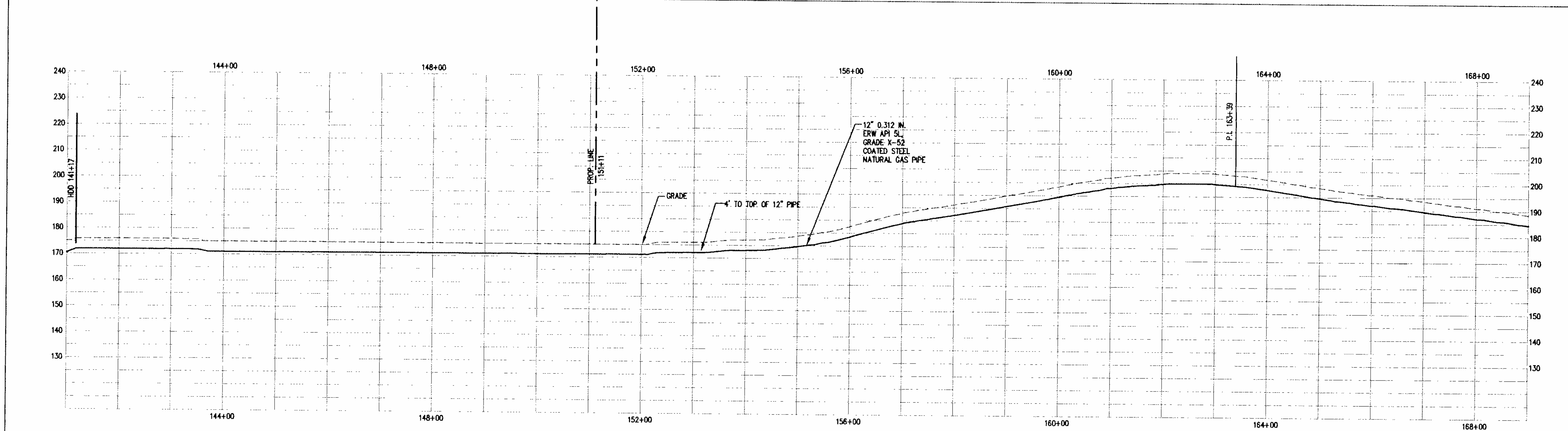
PROJECT NUMBER	DRAWING FILE NAME	SCALE
035886	035886-LAND-PP01	1"=100'

SHEET NUMBER
5

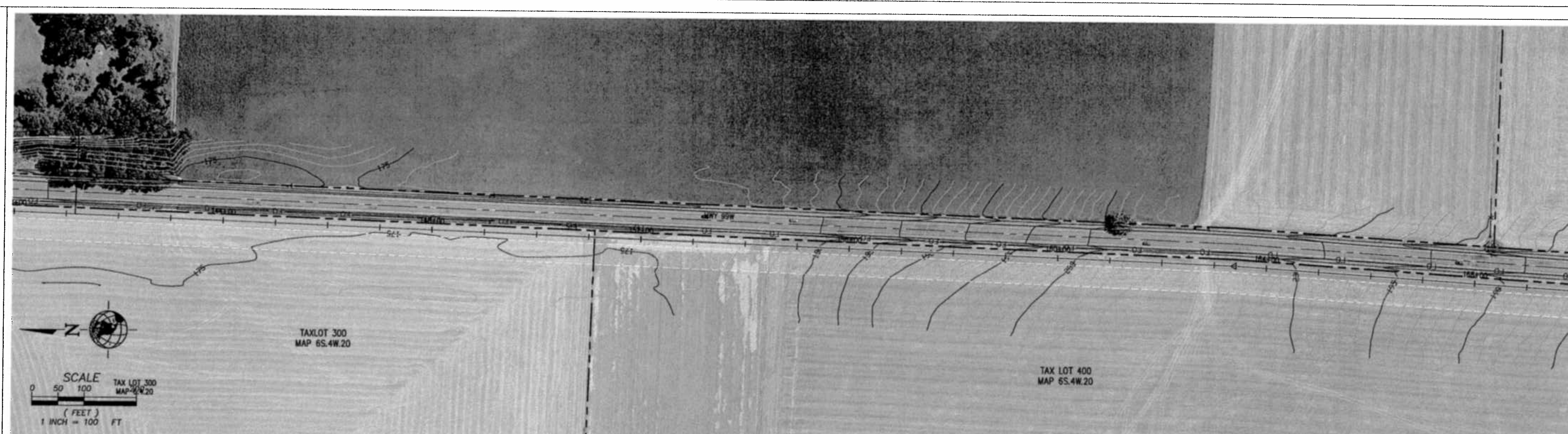
XREF INDEX:

	P1N-200	P1N-210
OWNERSHIP	P1N-200 BRIAN C. FINN TAXLOT 300 MAP 6S.4W.20	P1N-210 LOW LIVING TRUST JERRY & KRISTEN DOMES AGENT TAXLOT 400 MAP 6S.4W.20
LAND USE	AG GRASS	AG GRASS

PIPELINE PROFILE
HORIZ: 1"=100'
VERT: 1"=20'



ALIGNMENT PLAN
HORIZONTAL STATIONING SCALE: 1"=100'



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[PATH: P:\Northwest Natural Gas Company\035886\Design\Drawings\Civil\035886-land-pp01.dwg] [LAYOUT: Sheet06]

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CENTERLINE IN R.O.W.
CENTERLINE IN PRIVATE PROPERTY
R.O.W.
PROPERTY LINE
CONSTRUCTION EASEMENT (WHITE)
283+00 ALIGNMENT STATIONING
FO EXISTING FIBER OPTIC
G EXISTING GAS LINE
W EXISTING WATER LINE
OH/E EXISTING OVERHEAD UTILITIES
EXISTING CULVERT
EXISTING WETLANDS
175 EXISTING CONTOURS

SHEET INFO	
DESIGNED	DB
DRAWN	RAI
CHECKED	—
APPROVED	—
LAST EDIT	2/9/2010
PLOT DATE	3/15/2011
SUBMITTAL	

REVISIONS			
NO.	BY	DATE	REMARKS

PLAN & PROFILE
STA. 141+00 TO STA. 169+00
NORTHWEST NATURAL GAS COMPANY
MID-WILLAMETTE FEEDER PROJECT

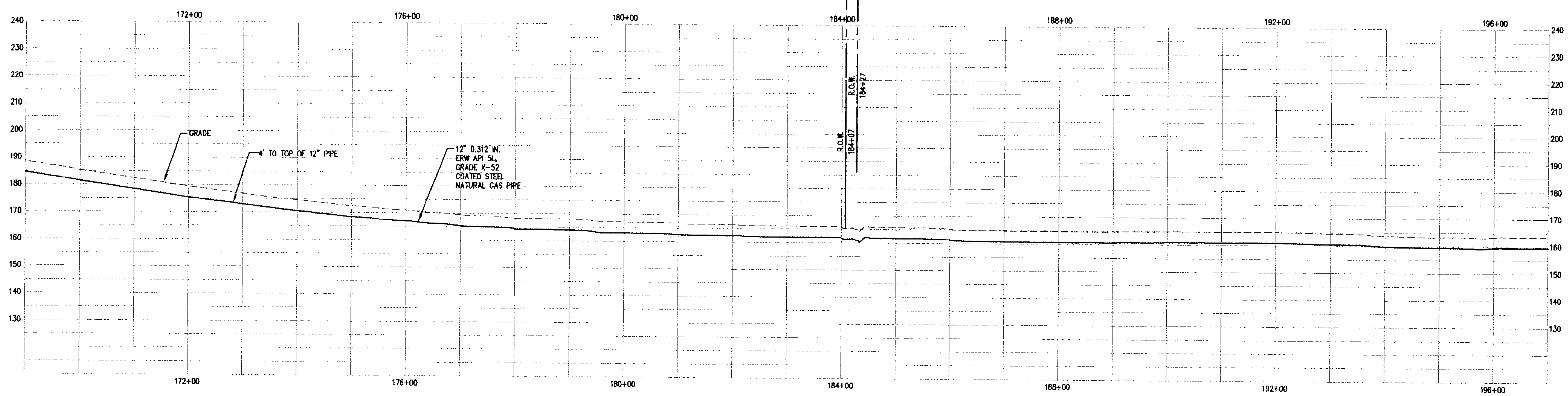
PROJECT NUMBER	DRAWING FILE NAME	SCALE
035886	035886-LAND-PP01	1"=100'

SHEET NUMBER
6

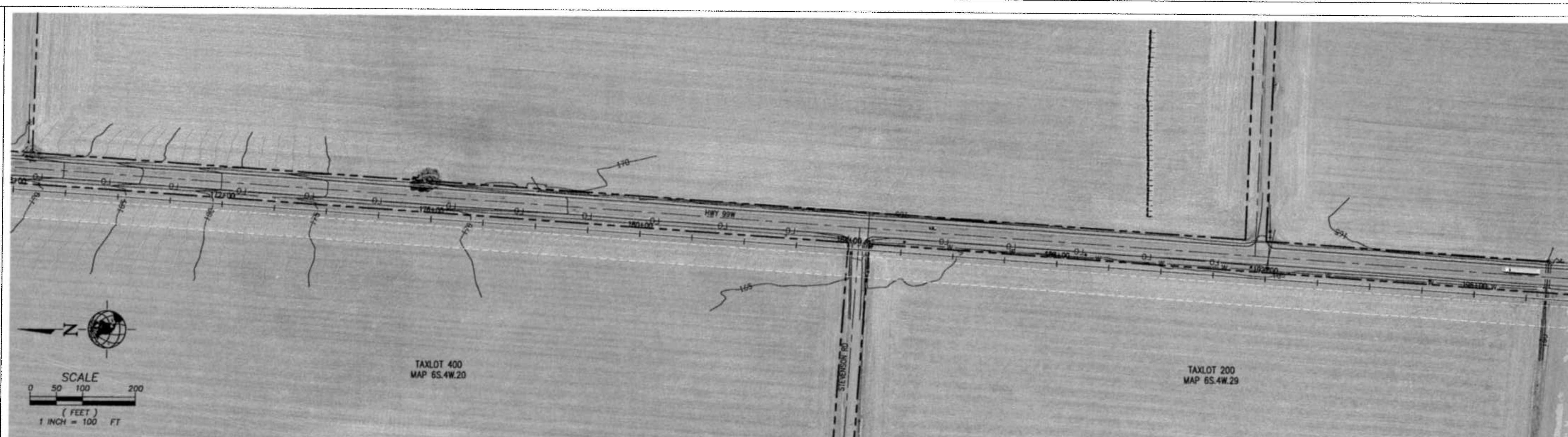
XREF INDEX:

OWNERSHIP	P1N-210 LOW LIVING TRUST JERRY & KRISTEN DOMES AGENT TAXLOT 400 MAP 6S.4W.20	STEVENSON RD	P1N-230 RICHARD MARTIN LIVING TRUST ET AL TAXLOT 200 MAP 6S.4W.29
LAND USE	AG GRASS	R.O.W.	AG GRASS

PIPELINE PROFILE
HORIZ: 1"=100'
VERT: 1"=20'



ALIGNMENT PLAN
HORIZONTAL STATIONING SCALE: 1"=100'



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[PATH: P:\Northwest Natural Gas Company\035886\Design\Drawings\Civil\035886-land-pp01.dwg] [LAYOUT: Sheet07]

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CENTERLINE IN R.O.W.	EXISTING GAS LINE
CENTERLINE IN PRIVATE PROPERTY	EXISTING WATER LINE
R.O.W.	EXISTING OVERHEAD UTILITIES
PROPERTY LINE	EXISTING CULVERT
CONSTRUCTION EASEMENT (WHITE)	EXISTING WETLANDS
283+00 ALIGNMENT STATIONING	175 EXISTING CONTOURS

SHEET INFO	
DESIGNED	DB
DRAWN	RAI
CHECKED	—
APPROVED	—
LAST EDIT	2/9/2010
PLOT DATE	3/15/2011
SUBMITTAL	

REVISIONS

NO.	BY	DATE	REMARKS

PLAN & PROFILE
STA. 169+00 TO STA. 197+00
NORTHWEST NATURAL GAS COMPANY
MID-WILLAMETTE FEEDER PROJECT

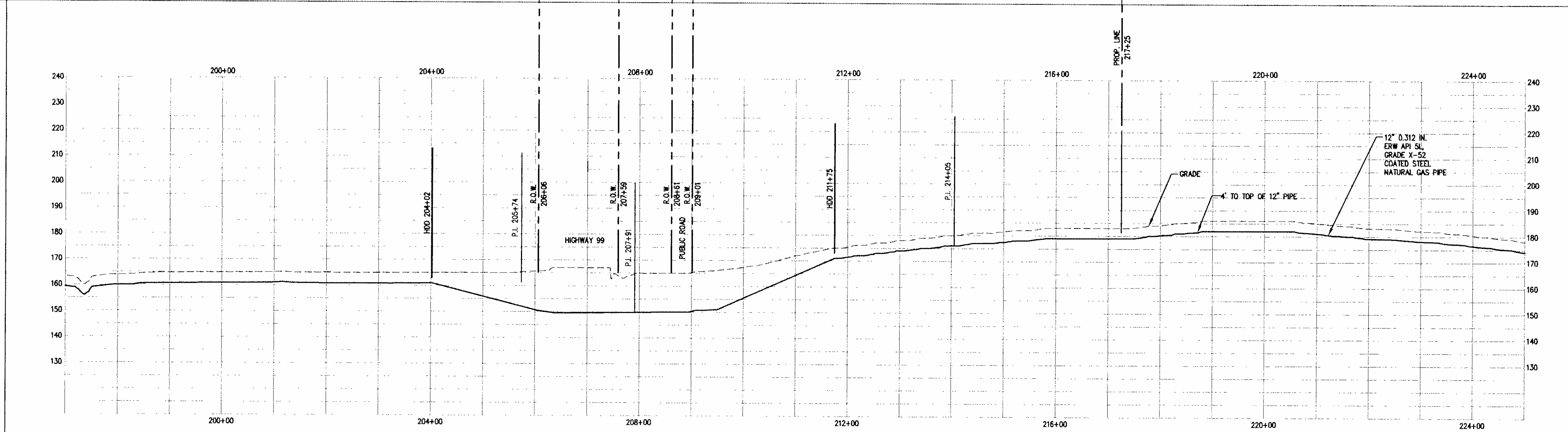
PROJECT NUMBER	DRAWING FILE NAME	SCALE
035886	035886-LAND-PP01	1"=100'

SHEET NUMBER
7

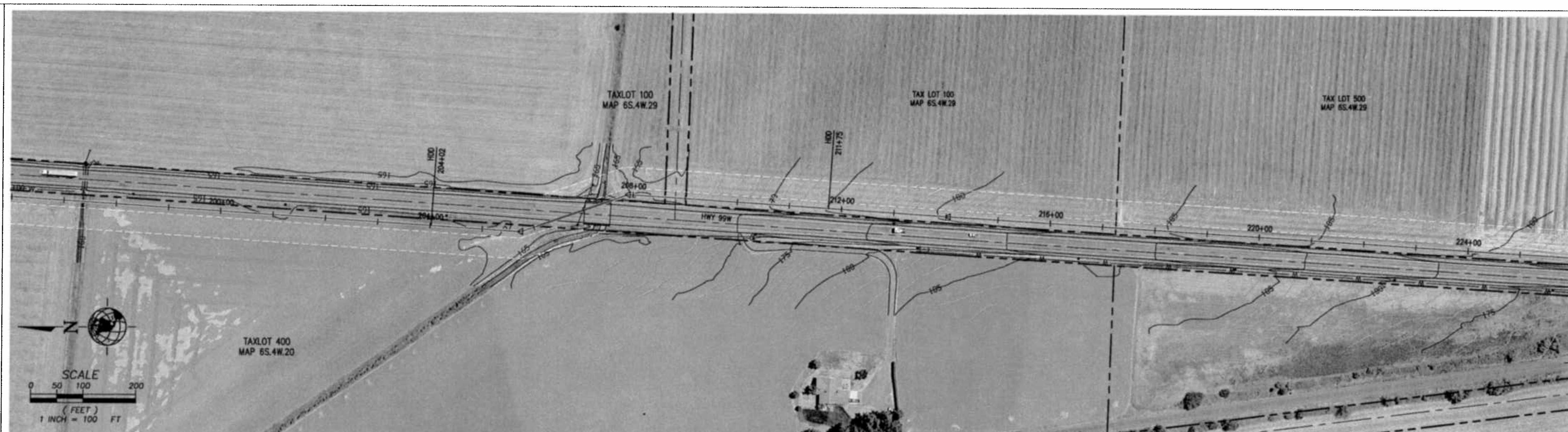
XREF INDEX:

OWNERSHIP	P1N-210 LOW LIVING TRUST JERRY & KRISTEN DOMES AGENT TAXLOT 400 MAP 6S.4W.20	HWY 99	P1N-220 EUGENE ROHDE FAMILY TRUST TAXLOT 100 MAP 6S.4W.29	PUBLIC RD	P1N-220 EUGENE ROHDE FAMILY TRUST TAXLOT 100 MAP 6S.4W.29	P1N-260 NIELSEN TRUST (BETSY NIELSEN) TAXLOT 500 MAP 6S.4W.29
LAND USE	AG GRASS	R.O.W.	AG GRASS	R.O.W.	AG GRASS	AG GRASS

PIPELINE PROFILE
HORIZ: 1"=100'
VERT: 1"=20'



ALIGNMENT PLAN
HORIZONTAL STATIONING SCALE: 1"=100'



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	CENTERLINE IN EXISTING EASEMENT		EXISTING FIBER OPTIC
	CENTERLINE IN R.O.W.		EXISTING GAS LINE
	CENTERLINE IN PRIVATE PROPERTY		EXISTING WATER LINE
	R.O.W.		EXISTING OVERHEAD UTILITIES
	PROPERTY LINE		EXISTING CULVERT
	CONSTRUCTION EASEMENT (white)		EXISTING WETLANDS
283+00	ALIGNMENT STATIONING	175	EXISTING CONTOURS

SHEET INFO	
DESIGNED	DB
DRAWN	RAI
CHECKED	—
APPROVED	—
LAST EDIT	2/9/2010
PLOT DATE	3/15/2011
SUBMITTAL	

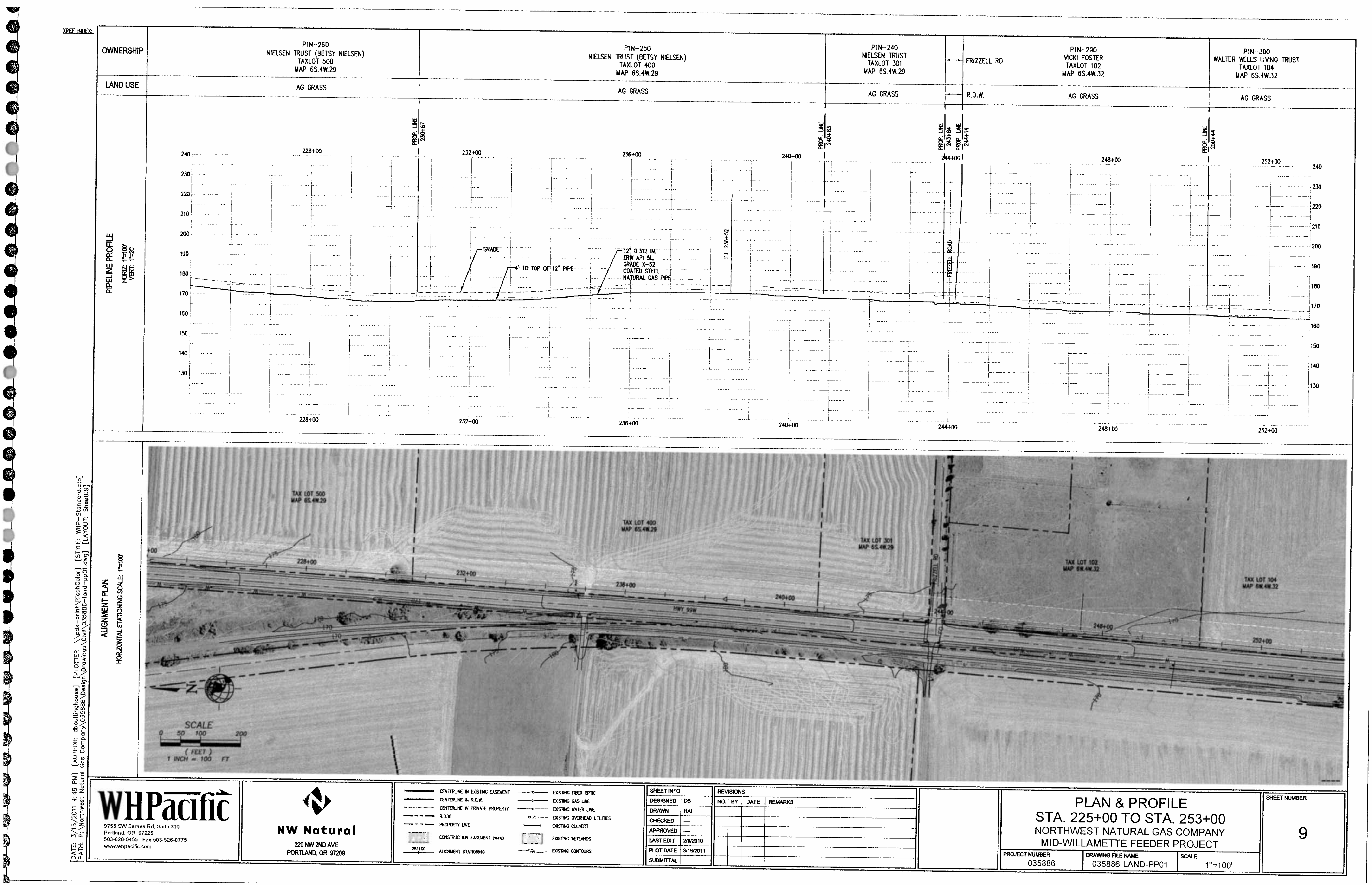
REVISIONS

NO.	BY	DATE	REMARKS

PLAN & PROFILE
STA. 197+00 TO STA. 225+00
NORTHWEST NATURAL GAS COMPANY
MID-WILLAMETTE FEEDER PROJECT

PROJECT NUMBER	DRAWING FILE NAME	SCALE
035886	035886-LAND-PP01	1"=100'

SHEET NUMBER
8


OWNERSHIP
P1N-260
NIELSEN TRUST (BETSY NIELSEN)
TAXLOT 500
MAP 6S.4W.29
P1N-250
NIELSEN TRUST (BETSY NIELSEN)
TAXLOT 400
MAP 6S.4W.29
P1N-240
NIELSEN TRUST
TAXLOT 301
MAP 6S.4W.29
FRIZZELL RD
P1N-290
VICKI FOSTER
TAXLOT 102
MAP 6S.4W.32
P1N-300
WALTER WELLS LIVING TRUST
TAXLOT 104
MAP 6S.4W.32
LAND USE
AG GRASS
R.O.W.
PIPELINE PROFILE
HORIZ: 1"=100'
VERT: 1"=20'
GRADE
4' TO TOP OF 12" PIPE
12" 0.312 IN. ERW API 5L GRADE X-52 COATED STEEL NATURAL GAS PIPE
P.I. 238+52
FRIZZELL ROAD
ALIGNMENT PLAN
HORIZONTAL STATIONING SCALE: 1"=100'
HWY 99W
SCALE
(FEET)
1 INCH = 100 FT
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SHEET INFO
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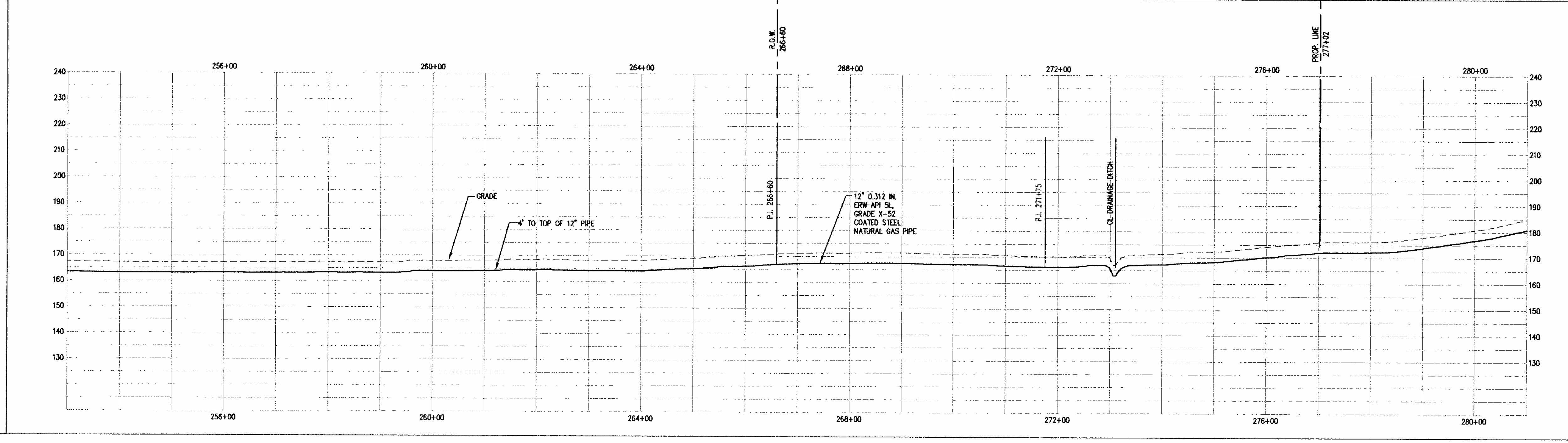
DRAWN RAI
CHECKED
APPROVED
LAST EDIT 2/9/2010
PLOT DATE 3/15/2011
SUBMITTAL
REVISIONS
PLAN & PROFILE
STA. 225+00 TO STA. 253+00
NORTHWEST NATURAL GAS COMPANY
MID-WILLAMETTE FEEDER PROJECT
PROJECT NUMBER 035886
DRAWING FILE NAME 035886-LAND-PP01
SCALE 1"=100'
SHEET NUMBER
9

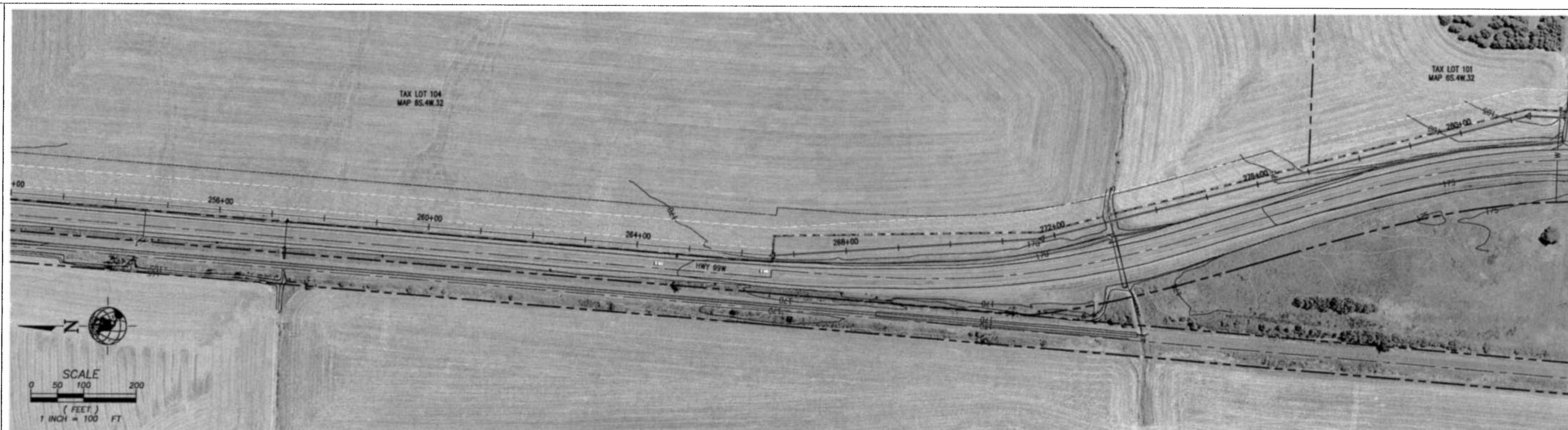
XREF INDEX:

OWNERSHIP	P1N-300 WALTER WELLS LIVING TRUST TAXLOT 104 MAP 6S.4W.32	HWY 99	P1N-280 EUGENE ZEIGLER JOINT REVOCABLE TRUST TAXLOT 104 MAP 6S.4W.32
LAND USE	AG-GRASS	R.O.W.	R.O.W.

PIPELINE PROFILE
HORIZ: 1"=100'
VERT: 1"=20'



ALIGNMENT PLAN
HORIZONTAL STATIONING SCALE: 1"=100'



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CENTERLINE IN PRIVATE PROPERTY
R.O.W.
PROPERTY LINE
CONSTRUCTION EASEMENT (WHT)
ALIGNMENT STATIONING
EXISTING FIBER OPTIC
EXISTING GAS LINE
EXISTING WATER LINE
EXISTING OVERHEAD UTILITIES
EXISTING CULVERT
EXISTING WETLANDS
EXISTING CONTOURS

SHEET INFO	
DESIGNED	DB
DRAWN	RAI
CHECKED	—
APPROVED	—
LAST EDIT	2/9/2010
PLOT DATE	3/15/2011
SUBMITTAL	

REVISIONS

NO.	BY	DATE	REMARKS

PLAN & PROFILE
STA. 253+00 TO STA. 281+00
NORTHWEST NATURAL GAS COMPANY
MID-WILLAMETTE FEEDER PROJECT

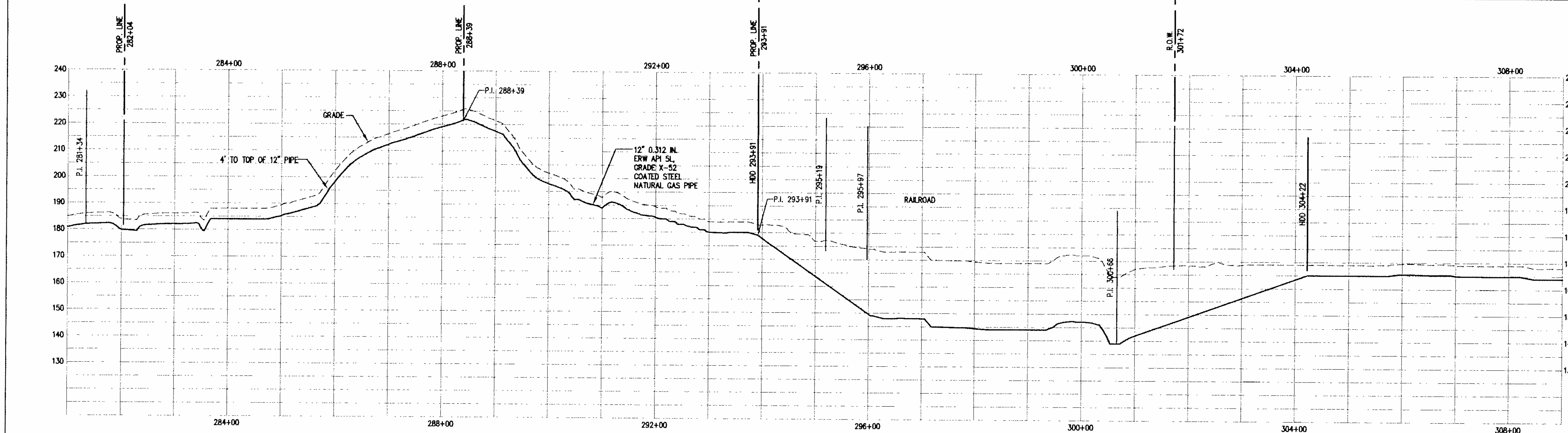
PROJECT NUMBER	DRAWING FILE NAME	SCALE
035886	035886-LAND-PP01	1"=100'

SHEET NUMBER
10

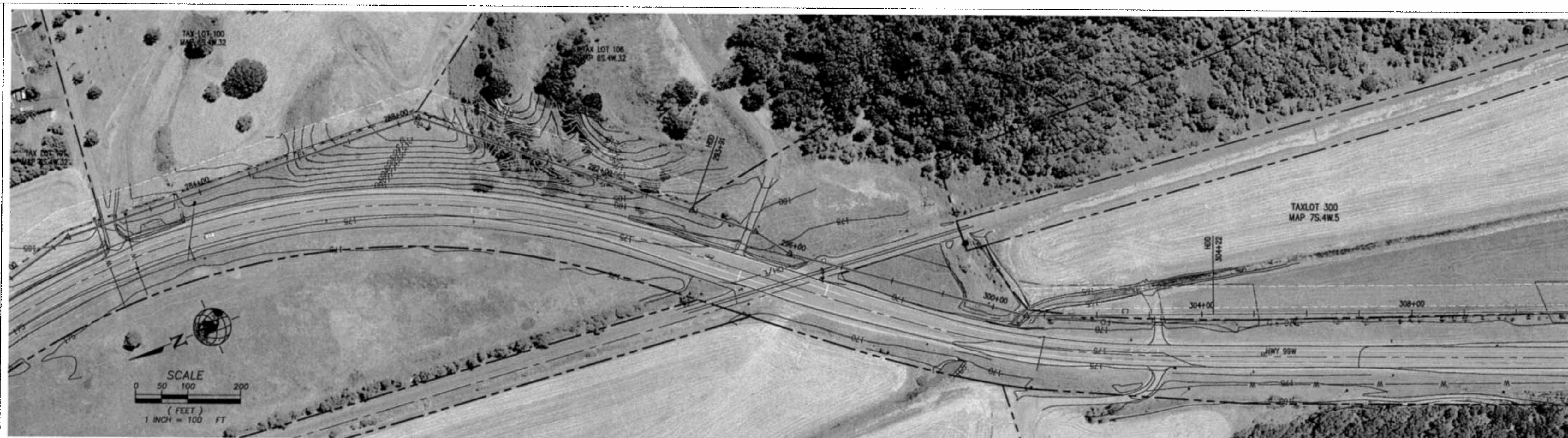
XREF INDEX:

OWNERSHIP	P1N-280 EUGENE ZEIGLER JOINT REVOCABLE TRUST TAX LOT 101 MAP 6S.4W.32	P1N-270 ROBERT MCCARTHY TAX LOT 100 MAP 6S.4W.32	P1N-310 ALIBADI & MARK WAHLE TAXLOT 106 MAP 6S.4W.32		ALIBADI & MARK WAHLE TAXLOT 300 MAP 7S.4W.5
LAND USE	AG - GRASS / R.O.W.	AG - GRASS / R.O.W.	AG - GRASS / R.O.W.	UNDEVELOPED / R.O.W.	AG GRASS

PIPELINE PROFILE
HORIZ: 1"=100'
VERT: 1"=20'



ALIGNMENT PLAN
HORIZONTAL STATIONING SCALE: 1"=100'



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[PATH: P:\Northwest Natural Gas Company\035886\Design\Drawings\Civil\035886-land-pp02.dwg] [LAYOUT: Sheet11]

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CENTERLINE IN PRIVATE PROPERTY
R.O.W.
PROPERTY LINE
CONSTRUCTION EASEMENT (TEMP)
ALIGNMENT STATIONING
EXISTING FIBER OPTIC
EXISTING GAS LINE
EXISTING WATER LINE
EXISTING OVERHEAD UTILITIES
EXISTING CULVERT
EXISTING WETLANDS
EXISTING CONTOURS

SHEET INFO	
DESIGNED	DB
DRAWN	RAI
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LAST EDIT	3/15/2010
PLOT DATE	3/15/2011
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REVISIONS

NO.	BY	DATE	REMARKS

PLAN & PROFILE
STA. 281+00 TO STA. 309+00
NORTHWEST NATURAL GAS COMPANY
MID-WILLAMETTE FEEDER PROJECT

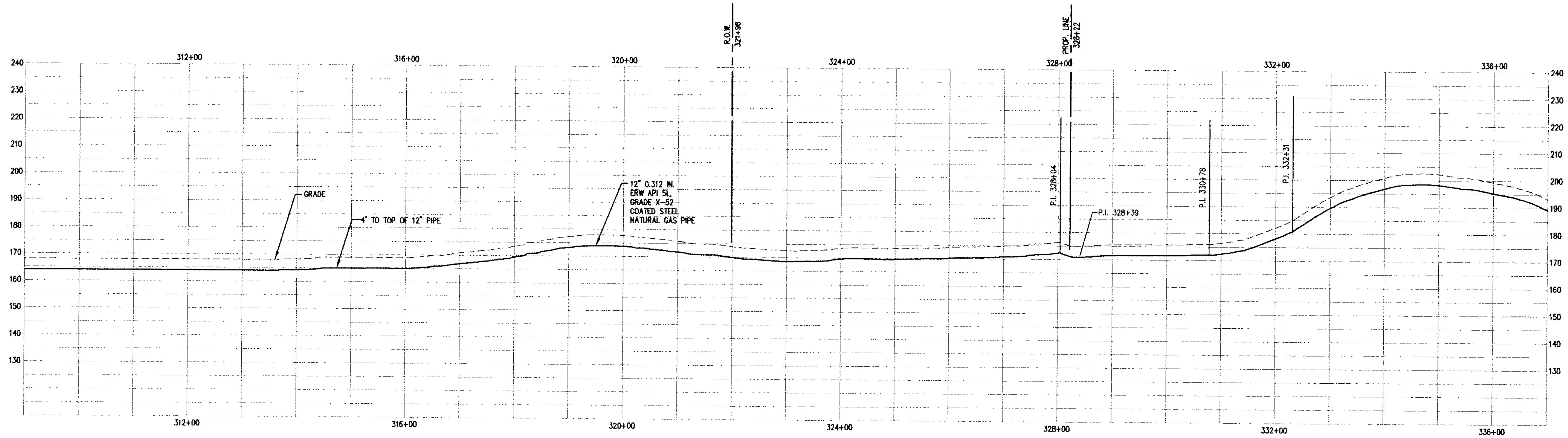
PROJECT NUMBER	DRAWING FILE NAME	SCALE
035886	035886-LAND-PP02	1"=100'

SHEET NUMBER
11
— of —

XREF INDEX:

OWNERSHIP	P1N-320 GARY & CHERYL COVILLE ET. AL. TAXLOT 400 MAP 7S.4W.5	P1N-320 GARY & CHERYL COVILLE ET. AL. TAXLOT 400 MAP 7S.4W.5	P1N-320 GARY & CHERYL COVILLE ET. AL. TAXLOT 300 MAP 7.4.5
LAND USE	AG GRASS	R.O.W.	AG GRASS

PIPELINE PROFILE
HORZ: 1"=100'
VERT: 1"=20'



ALIGNMENT PLAN
HORIZONTAL STATIONING SCALE: 1"=100'

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[PATH: P:\Northwest Natural Gas Company\035886\Design\Drawings\Civil\035886-land-pp02.dwg] [LAYOUT: Sheet12]

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R.O.W.
PROPERTY LINE
CONSTRUCTION EASEMENT (WHITE)
283+00 ALIGNMENT STATIONING
EXISTING FIBER OPTIC
EXISTING GAS LINE
EXISTING WATER LINE
EXISTING OVERHEAD UTILITIES
EXISTING CULVERT
EXISTING WETLANDS
EXISTING CONTOURS

SHEET INFO	
DESIGNED	DB
DRAWN	RAI
CHECKED	—
APPROVED	—
LAST EDIT	3/15/2010
PLOT DATE	3/15/2011
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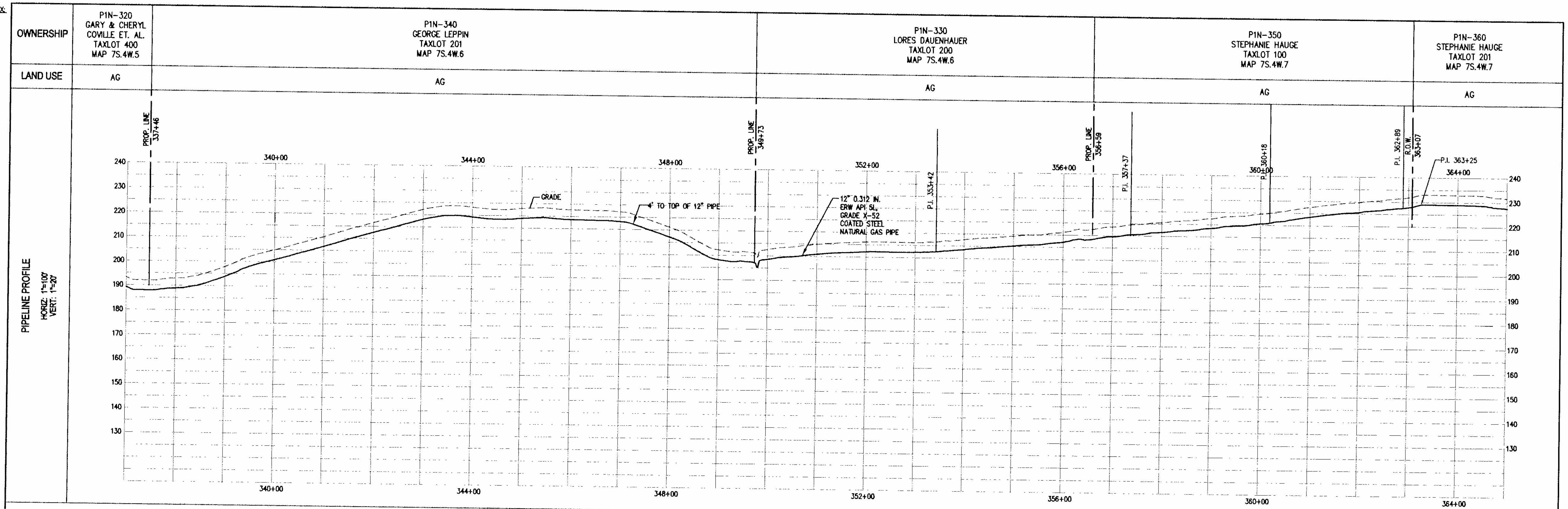
REVISIONS

NO.	BY	DATE	REMARKS

PLAN & PROFILE
STA. 309+00 TO STA. 337+00
NORTHWEST NATURAL GAS COMPANY
MID-WILLAMETTE FEEDER PROJECT

PROJECT NUMBER	DRAWING FILE NAME	SCALE
035886	035886-LAND-PP02	1"=100'

SHEET NUMBER
12



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[PATH: P:\Northwest Natural Gas Company\035886\Design\Drawings\Civil\035886-land-pp02.dwg] [LAYOUT: Sheet13]

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CENTERLINE IN R.O.W.
CENTERLINE IN PRIVATE PROPERTY
R.O.W.
PROPERTY LINE
CONSTRUCTION EASEMENT (WHITE)
ALIGNMENT STATIONING
EXISTING FIBER OPTIC
EXISTING GAS LINE
EXISTING WATER LINE
EXISTING OVERHEAD UTILITIES
EXISTING CULVERT
EXISTING WETLANDS
EXISTING CONTOURS

SHEET INFO	
DESIGNED	DB
DRAWN	RAI
CHECKED	—
APPROVED	—
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PLOT DATE	3/15/2011
SUBMITTAL	

REVISIONS

NO.	BY	DATE	REMARKS

PLAN & PROFILE
STA. 337+00 TO STA. 365+00
NORTHWEST NATURAL GAS COMPANY
MID-WILLAMETTE FEEDER PROJECT

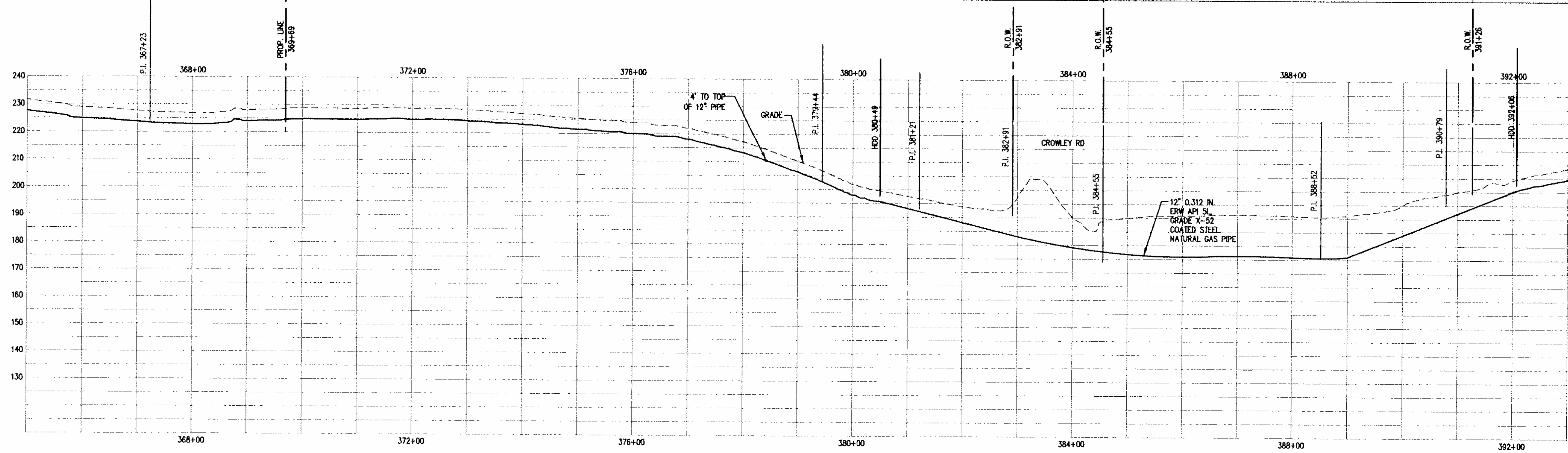
PROJECT NUMBER	DRAWING FILE NAME	SCALE
035886	035886-LAND-PP02	1"=100'

SHEET NUMBER
13
— of —

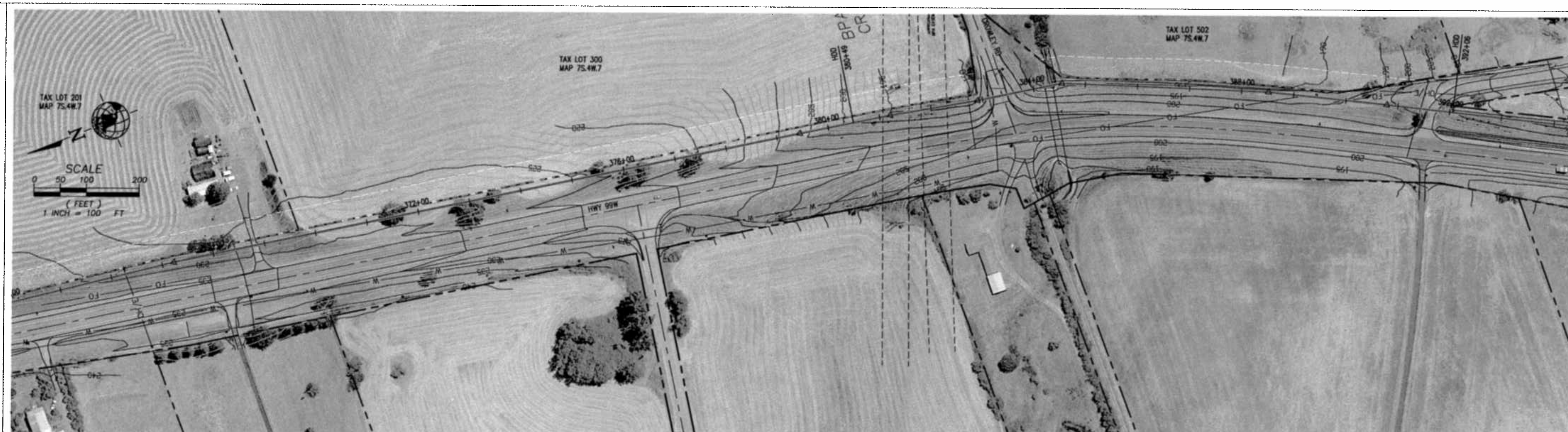
XREF INDEX:

OWNERSHIP	P1N-360 STEPHANIE HAUGE TAX LOT 201 MAP 7S.4W.7	P1N-370 DOROTHY & DONALD ROSS TAX LOT 300 MAP 7S.4W.7	CROWLEY RD	P1N-390 JUNE & ALFRED JONES TAX LOT 502 MAP 7S.4W.7
LAND USE	R.O.W.	R.O.W.	R.O.W.	R.O.W.

PIPELINE PROFILE
HORIZ: 1"=100'
VERT: 1"=20'



ALIGNMENT PLAN
HORIZONTAL STATIONING SCALE: 1"=100'



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[PATH: P:\Northwest Natural Gas Company\035886\Design\Drawings\Civil\035886-land-pp02.dwg] [LAYOUT: Sheet14]

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CENTERLINE IN EXISTING EASEMENT — EXISTING FIBER OPTIC
CENTERLINE IN R.O.W. — EXISTING GAS LINE
CENTERLINE IN PRIVATE PROPERTY — EXISTING WATER LINE
R.O.W. — EXISTING OVERHEAD UTILITIES
PROPERTY LINE — EXISTING CULVERT
CONSTRUCTION EASEMENT (TEMP) — EXISTING WETLANDS
ALIGNMENT STATIONING — EXISTING CONTOURS

SHEET INFO	
DESIGNED	DB
DRAWN	RAJ
CHECKED	—
APPROVED	—
LAST EDIT	3/15/2011
PLOT DATE	3/15/2011
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REVISIONS

NO.	BY	DATE	REMARKS

PLAN & PROFILE
STA. 365+00 TO STA. 393+00
NORTHWEST NATURAL GAS COMPANY
MID-WILLAMETTE FEEDER PROJECT

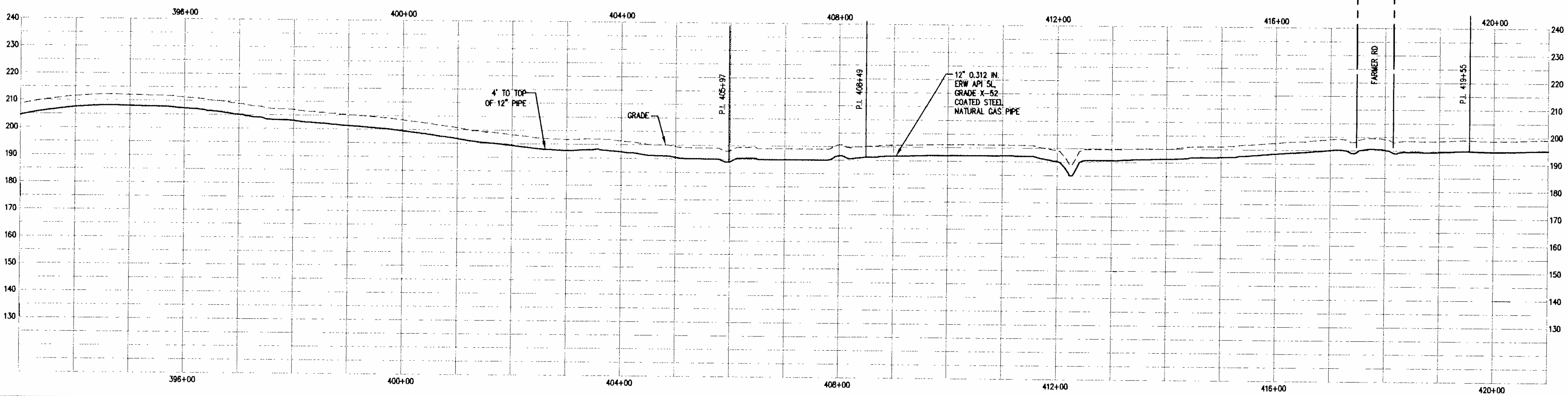
PROJECT NUMBER	DRAWING FILE NAME	SCALE
035886	035886-LAND-PP02	1"=100'

SHEET NUMBER
14

XREF INDEX:

OWNERSHIP	P1N-390 JUNE & ALFRED JONES TAXLOT 502 MAP 7S.4W.7	FARMER RD	P1N-410 CF & JEANNE FLYNN TRUST AGREEMENT TAXLOT 200 MAP 7S.4W.18
LAND USE	AG	R.O.W.	AG

PIPELINE PROFILE
HORIZ: 1"=100'
VERT: 1"=20'



ALIGNMENT PLAN
HORIZONTAL STATIONING SCALE: 1"=100'

[DATE: 3/15/2011 3:53 PM] [AUTHOR: dboultinghouse] [PLOTTER: \\pdx-print\RicohColor] [STYLE: WHP-Standard.ctb]
[PATH: P:\Northwest Natural Gas Company\035886\Design\Drawings\Civil\035886-land-pp02.dwg] [LAYOUT: Sheet15]

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CENTERLINE IN EXISTING EASEMENT
CENTERLINE IN R.O.W.
CENTERLINE IN PRIVATE PROPERTY
R.O.W.
PROPERTY LINE
CONSTRUCTION EASEMENT (WHITE)
283+00 ALIGNMENT STATIONING
EXISTING FIBER OPTIC
EXISTING GAS LINE
EXISTING WATER LINE
EXISTING OVERHEAD UTILITIES
EXISTING CULVERT
EXISTING WETLANDS
EXISTING CONTOURS

SHEET INFO	
DESIGNED	DB
DRAWN	RAI
CHECKED	—
APPROVED	—
LAST EDIT	3/15/2011
PLOT DATE	3/15/2011
SUBMITTAL	

REVISIONS

NO.	BY	DATE	REMARKS

PLAN & PROFILE
STA. 393+00 TO STA. 421+00
NORTHWEST NATURAL GAS COMPANY
MID-WILLAMETTE FEEDER PROJECT

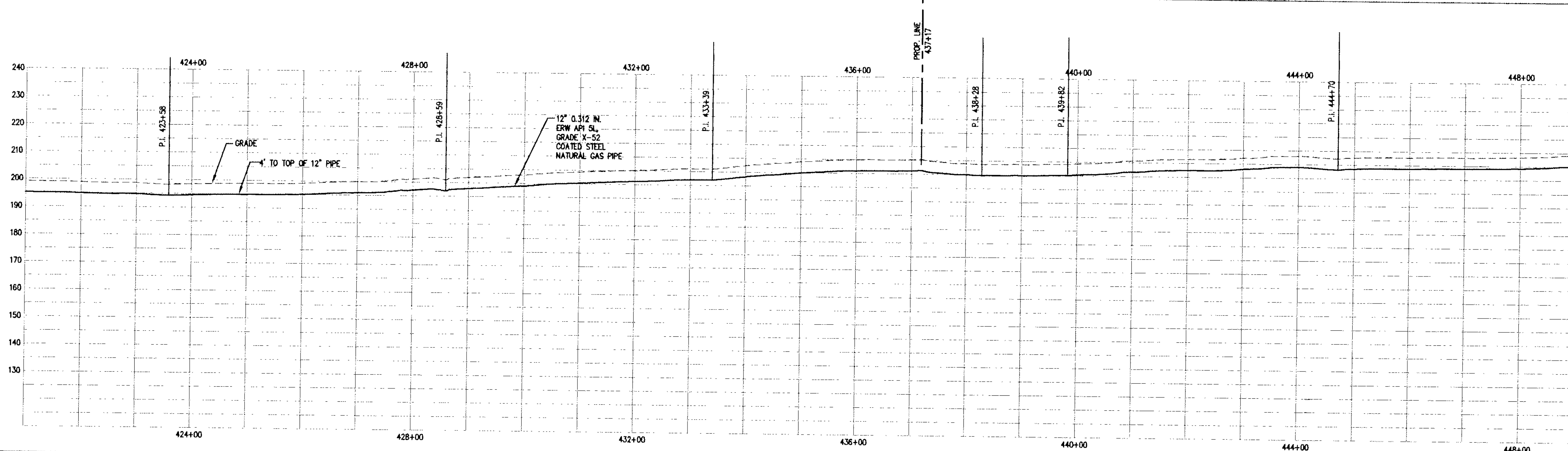
PROJECT NUMBER	DRAWING FILE NAME	SCALE
035886	035886-LAND-PP02	1"=100'

SHEET NUMBER
15

XREF INDEX:

OWNERSHIP	P1N-410 CF & JEANNE FLYNN TRUST AGREEMENT TAX LOT 200 MAP 7S.4W.18	P1N-420 VINDILLON VINEYARD LLC TAX LOT 400 MAP 7S.4W.18
LAND USE	R.O.W.	R.O.W.

PIPELINE PROFILE
HORIZ: 1"=100'
VERT: 1"=20'



ALIGNMENT PLAN
HORIZONTAL STATIONING SCALE: 1"=100'

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CENTERLINE IN R.O.W.
CENTERLINE IN PRIVATE PROPERTY
R.O.W.
PROPERTY LINE
CONSTRUCTION EASEMENT (TEMP)
ALIGNMENT STATIONING
EXISTING FIBER OPTIC
EXISTING GAS LINE
EXISTING WATER LINE
EXISTING OVERHEAD UTILITIES
EXISTING CULVERT
EXISTING WETLANDS
EXISTING CONTOURS

SHEET INFO	
DESIGNED	DB
DRAWN	RAI
CHECKED	—
APPROVED	—
LAST EDIT	3/15/2011
PLOT DATE	3/15/2011
SUBMITTAL	

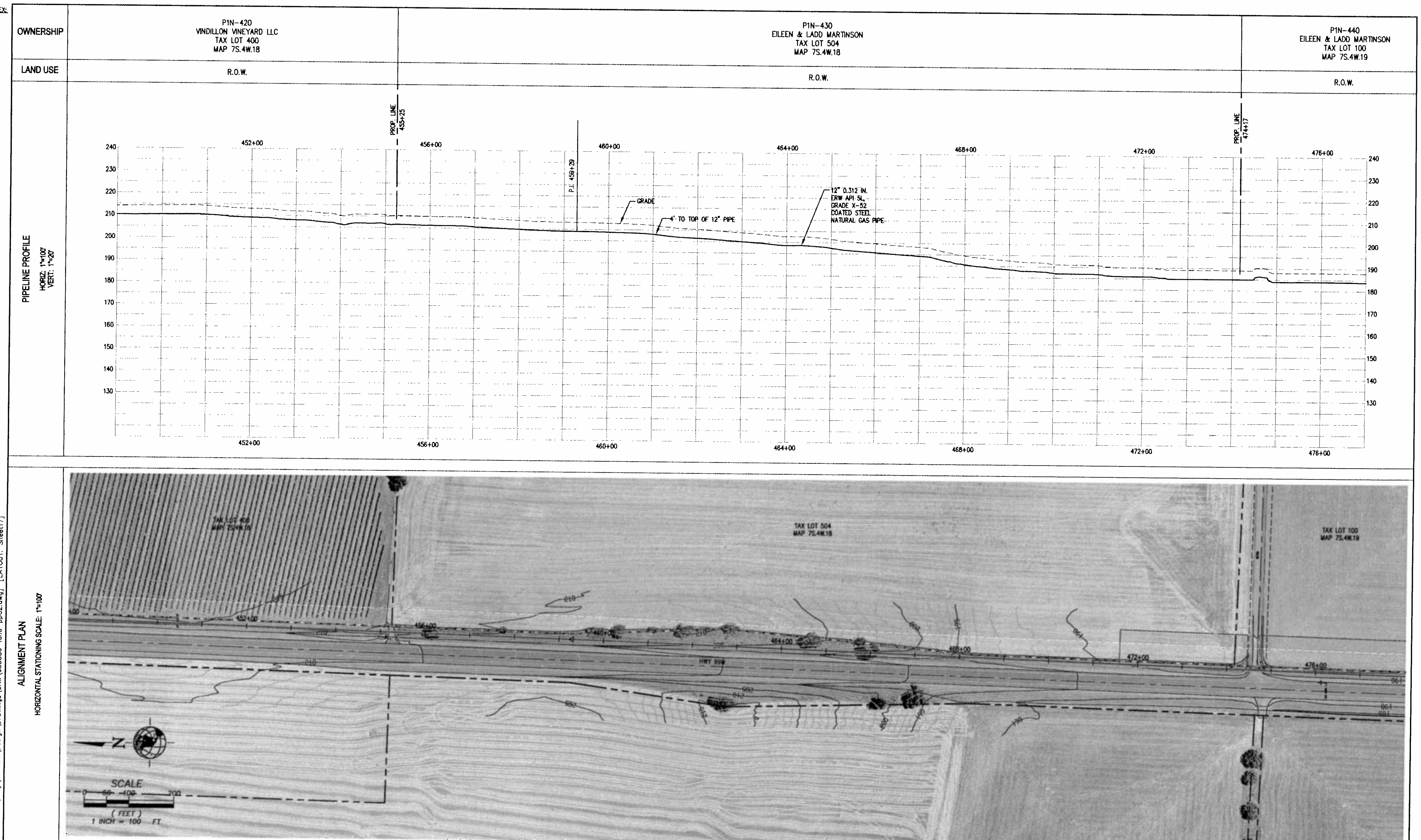
REVISIONS

NO.	BY	DATE	REMARKS

PLAN & PROFILE
STA. 421+00 TO STA. 449+00
NORTHWEST NATURAL GAS COMPANY
MID-WILLAMETTE FEEDER PROJECT

PROJECT NUMBER	DRAWING FILE NAME	SCALE
035886	035886-LAND-PP02	1"=100'

SHEET NUMBER
16



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[PATH: P:\Northwest Natural Gas Company\035886\Design\Drawings\Civil\035886-land-pp02.dwg] [LAYOUT: Sheet17]

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CENTERLINE IN R.O.W.
CENTERLINE IN PRIVATE PROPERTY
R.O.W.
PROPERTY LINE
CONSTRUCTION EASEMENT (temp)
ALIGNMENT STATIONING
EXISTING FIBER OPTIC
EXISTING GAS LINE
EXISTING WATER LINE
EXISTING OVERHEAD UTILITIES
EXISTING CULVERT
EXISTING WETLANDS
EXISTING CONTOURS

SHEET INFO	
DESIGNED	DB
DRAWN	RAI
CHECKED	—
APPROVED	—
LAST EDIT	3/15/2011
PLOT DATE	3/15/2011
SUBMITTAL	

REVISIONS

NO.	BY	DATE	REMARKS

PLAN & PROFILE
STA. 449+00 TO STA. 477+00
NORTHWEST NATURAL GAS COMPANY
MID-WILLAMETTE FEEDER PROJECT

PROJECT NUMBER	DRAWING FILE NAME	SCALE
035886	035886-LAND-PP02	1"=100'

SHEET NUMBER
17

[DATE: 3/15/2011 4:05 PM] [AUTHOR: dboultinghouse] [PLOTTER: \\pdx-print\RicohColor] [STYLE: WHP-Standard.ctb]
[PATH: P:\Northwest Natural Gas Company\035886\Design\Drawings\Civil\035886-land-pp02.dwg] [LAYOUT: Sheet18]

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CENTERLINE IN R.O.W.
CENTERLINE IN PRIVATE PROPERTY
R.O.W.
PROPERTY LINE
CONSTRUCTION EASEMENT (WIDE)
283+00 ALIGNMENT STATIONING
EXISTING FIBER OPTIC
EXISTING GAS LINE
EXISTING WATER LINE
EXISTING OVERHEAD UTILITIES
EXISTING CULVERT
EXISTING WETLANDS
EXISTING CONTOURS

SHEET INFO	
DESIGNED	DB
DRAWN	RAI
CHECKED	—
APPROVED	—
LAST EDIT	3/15/2011
PLOT DATE	3/15/2011
SUBMITTAL	

REVISIONS

NO.	BY	DATE	REMARKS

PLAN & PROFILE
STA. 477+00 TO STA. 505+00
NORTHWEST NATURAL GAS COMPANY
MID-WILLAMETTE FEEDER PROJECT

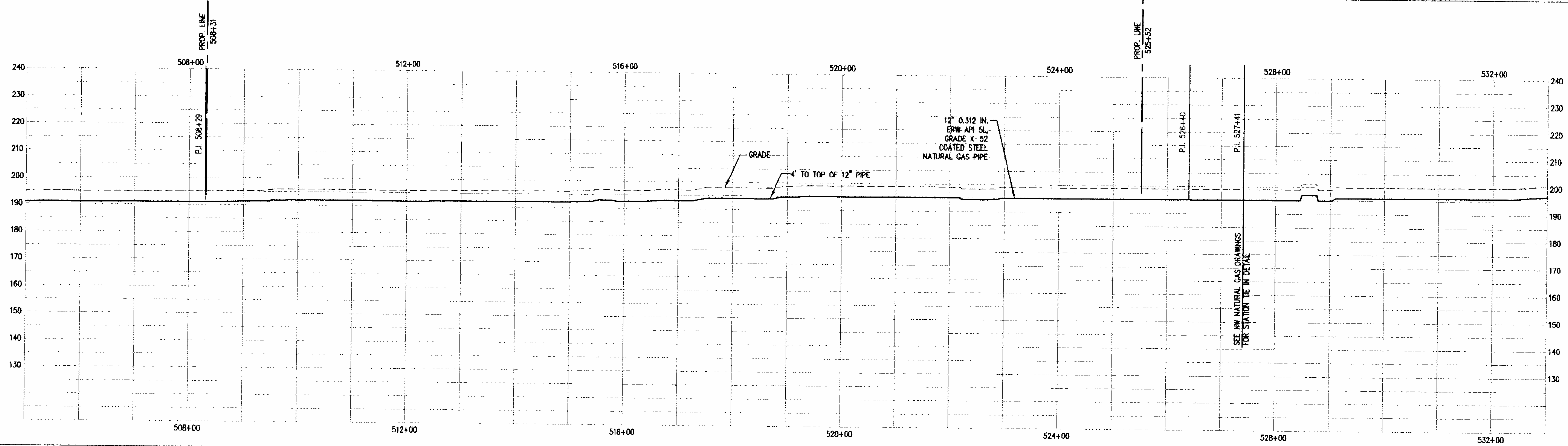
PROJECT NUMBER	DRAWING FILE NAME	SCALE
035886	035886-LAND-PP02	1"=100'

SHEET NUMBER
18

XREF INDEX:

OWNERSHIP	HWY 99	HWY 99	HWY 99
LAND USE	R.O.W.	R.O.W.	R.O.W.

PIPELINE PROFILE
HORIZ: 1"=100'
VERT: 1"=20'



ALIGNMENT PLAN
HORIZONTAL STATIONING SCALE: 1"=100'

[DATE: 3/15/2011 4:11 PM] [AUTHOR: dboultinghouse] [PLOTTER: \\pdx-print\RicohColor] [STYLE: WHP-Standard.ctb]
[PATH: P:\Northwest Natural Gas Company\035886\Design\Drawings\Civil\035886-land-pp02.dwg] [LAYOUT: Sheet19]

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CENTERLINE IN R.O.W.	EXISTING GAS LINE
CENTERLINE IN PRIVATE PROPERTY	EXISTING WATER LINE
R.O.W.	EXISTING OVERHEAD UTILITIES
PROPERTY LINE	EXISTING CULVERT
CONSTRUCTION EASEMENT (WHITE)	EXISTING WETLANDS
ALIGNMENT STATIONING	EXISTING CONTOURS

SHEET INFO	
DESIGNED	DB
DRAWN	RAI
CHECKED	—
APPROVED	—
LAST EDIT	3/15/2011
PLOT DATE	3/15/2011
SUBMITTAL	

REVISIONS

NO.	BY	DATE	REMARKS

PLAN & PROFILE
STA. 505+00 TO STA. 528+00
NORTHWEST NATURAL GAS COMPANY
MID-WILLAMETTE FEEDER PROJECT

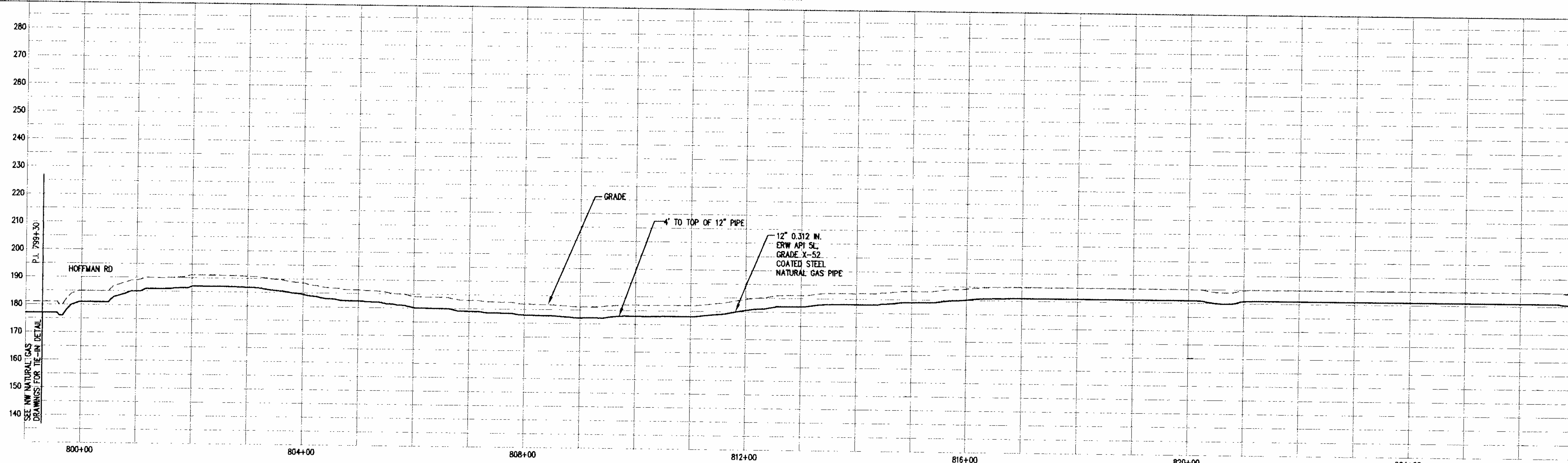
PROJECT NUMBER	DRAWING FILE NAME	SCALE
035886	035886-LAND-PP02	1"=100'

SHEET NUMBER
19

XREF INDEX:

OWNERSHIP	HWY 99
LAND USE	R.O.W.

PIPELINE PROFILE
HORIZ: 1"=100'
VERT: 1"=20'



ALIGNMENT PLAN
HORIZONTAL STATIONING SCALE: 1"=100'

[DATE: 3/28/2011 9:15 AM] [AUTHOR: smaxey] [PLOTTER: \\pdx-print\RicohColor] [STYLE: WHP-Standard.ctb]
[PATH: P:\Northwest Natural Gas Company\035886\Design\Drawings\Civil\035886-land-pp03.dwg] [LAYOUT: Sheet20]

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CENTERLINE IN EXISTING EASEMENT	EXISTING FIBER OPTIC
CENTERLINE IN R.O.W.	EXISTING GAS LINE
CENTERLINE IN PRIVATE PROPERTY	EXISTING WATER LINE
R.O.W.	EXISTING OVERHEAD UTILITIES
PROPERTY LINE	EXISTING CULVERT
CONSTRUCTION EASEMENT (WHITE)	EXISTING WETLANDS
283+00 ALIGNMENT STATIONING	175 EXISTING CONTOURS

SHEET INFO	
DESIGNED	DB
DRAWN	RAI
CHECKED	—
APPROVED	—
LAST EDIT	3/16/2010
PLOT DATE	3/28/2011
SUBMITTAL	

REVISIONS

NO.	BY	DATE	REMARKS

PLAN & PROFILE
STA. 799+00 TO STA. 827+00
NORTHWEST NATURAL GAS COMPANY
MID-WILLAMETTE FEEDER PROJECT

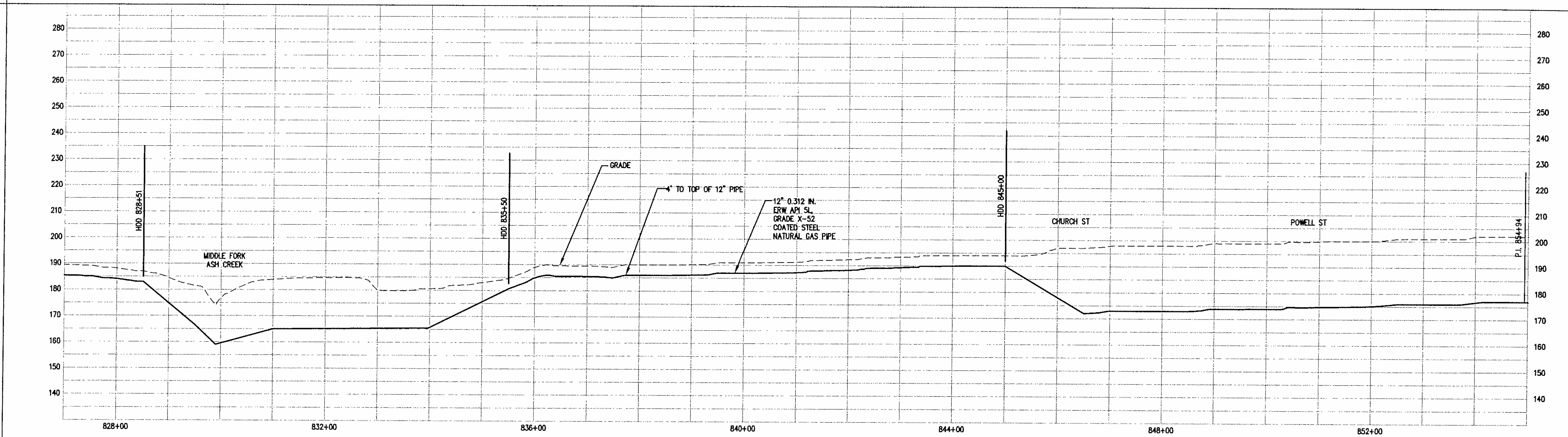
PROJECT NUMBER	DRAWING FILE NAME	SCALE
035886	035886-LAND-PP03	1"=100'

SHEET NUMBER
20
— of —

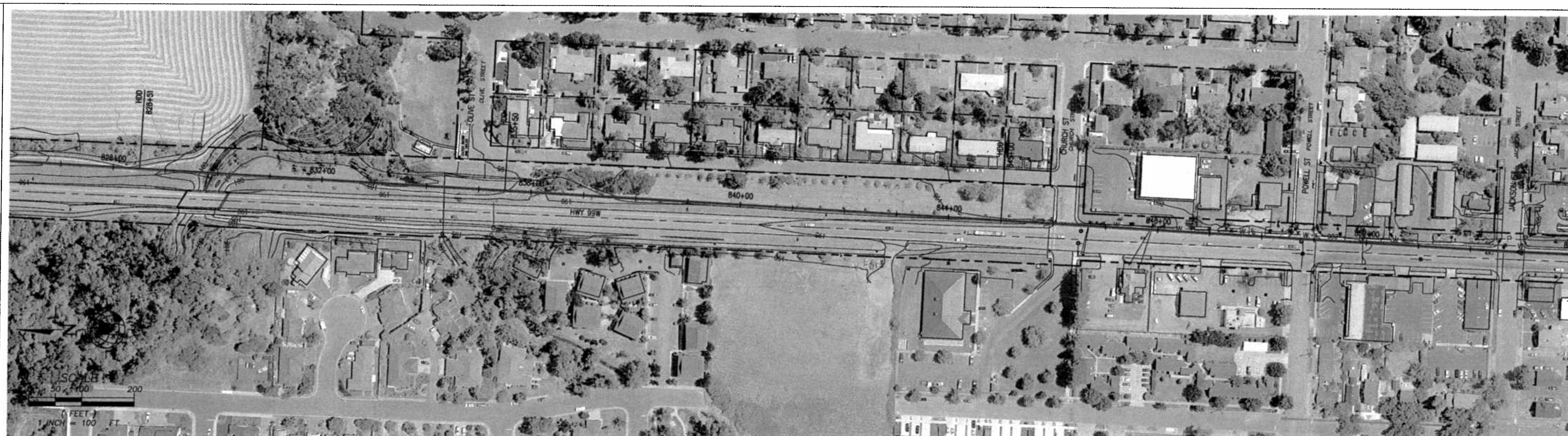
XREF INDEX:

OWNERSHIP	HWY 99
LAND USE	R.O.W.

PIPELINE PROFILE
HORIZ: 1"=100'
VERT: 1"=20'



ALIGNMENT PLAN
HORIZONTAL STATIONING SCALE: 1"=100'



[DATE: 3/28/2011 9:20 AM] [AUTHOR: smaxey] [PLOTTER: \\pdx-print\RicohColor] [STYLE: WHP-Standard.ctb] [LAYOUT: Sheet21]
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CENTERLINE IN EXISTING EASEMENT
CENTERLINE IN R.O.W.
CENTERLINE IN PRIVATE PROPERTY
R.O.W.
PROPERTY LINE
CONSTRUCTION EASEMENT (WHITE)
ALIGNMENT STATIONING
EXISTING FIBER OPTIC
EXISTING GAS LINE
EXISTING WATER LINE
EXISTING OVERHEAD UTILITIES
EXISTING CULVERT
EXISTING WETLANDS
EXISTING CONTOURS

SHEET INFO	
DESIGNED	DB
DRAWN	RAI
CHECKED	—
APPROVED	—
LAST EDIT	3/16/2010
PLOT DATE	3/28/2011
SUBMITTAL	

REVISIONS

NO.	BY	DATE	REMARKS

PLAN & PROFILE
STA. 827+00 TO STA. 855+00
NORTHWEST NATURAL GAS COMPANY
MID-WILLAMETTE FEEDER PROJECT

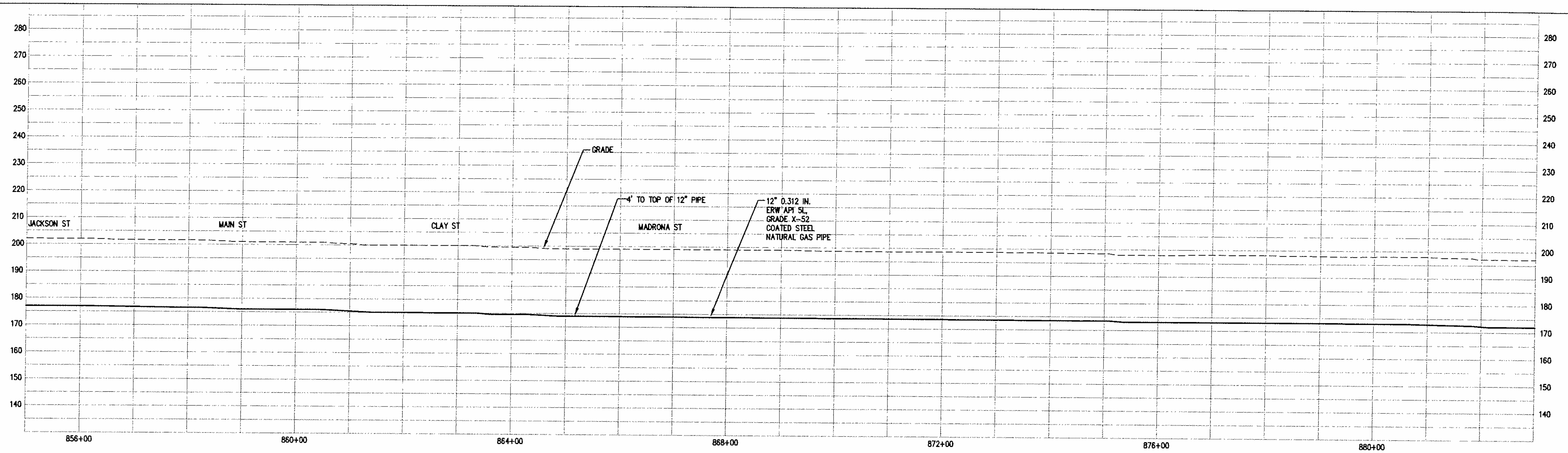
PROJECT NUMBER	DRAWING FILE NAME	SCALE
035886	035886-LAND-PP03	1"=100'

SHEET NUMBER
21

XREF INDEX:

OWNERSHIP	HWY 99
LAND USE	R.O.W.

PIPELINE PROFILE
HORIZ: 1"=100'
VERT: 1"=20'



ALIGNMENT PLAN
HORIZONTAL STATIONING SCALE: 1"=100'

[DATE: 3/28/2011 9:23 AM] [AUTHOR: dboultinghouse] [PLOTTER: \\pdx-print\RicohColor] [STYLE: WHP-Standard.ctb]
[PATH: P:\Northwest Natural Gas Company\035886\Design\Drawings\Civil\035886-land-pp03.dwg] [LAYOUT: Sheet22]

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CENTERLINE IN R.O.W.
CENTERLINE IN PRIVATE PROPERTY
R.O.W.
PROPERTY LINE
CONSTRUCTION EASEMENT (WIDTH)
ALIGNMENT STATIONING
EXISTING FIBER OPTIC
EXISTING GAS LINE
EXISTING WATER LINE
EXISTING OVERHEAD UTILITIES
EXISTING CULVERT
EXISTING WETLANDS
EXISTING CONTOURS

SHEET INFO	
DESIGNED	DB
DRAWN	RAI
CHECKED	—
APPROVED	—
LAST EDIT	3/16/2010
PLOT DATE	3/28/2011
SUBMITTAL	

REVISIONS

NO.	BY	DATE	REMARKS

PLAN & PROFILE
STA. 855+00 TO STA. 883+00
NORTHWEST NATURAL GAS COMPANY
MID-WILLAMETTE FEEDER PROJECT

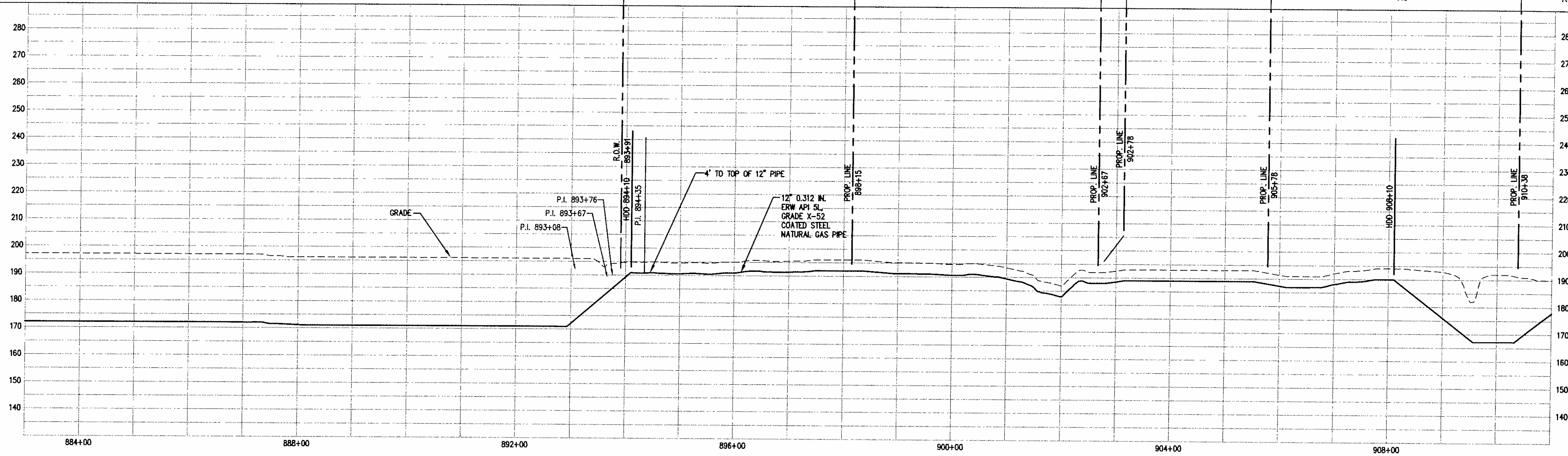
PROJECT NUMBER	DRAWING FILE NAME	SCALE
035886	035886-LAND-PP03	1"=100'

SHEET NUMBER
22

XREF INDEX:

OWNERSHIP	HWY 99	M1-100 CAROLYN SUE HENRY TAXLOT 300 MAP 8S.4W.31	M1-120 RAYMOND T. & SHELIA D. HENSCHEL TAXLOT 700 MAP 8S.4W.31	M1-110 ROBERT R. & DONNAH R. BLALOCK TAXLOT 600 MAP 8S.4W.31	M1-140 JENKS-OLSEN LAND CO., (OLSEN AGRICULTURE) TAXLOT 1100 MAP 8S.4W.31	M1-120 RAYMOND T. & SHELIA D. HENSCHEL TAXLOT 700 MAP 8S.4W.31
LAND USE	R.O.W.	AG	AG	AG	AG	AG

PIPELINE PROFILE
HORIZ. 1"=100'
VERT. 1"=20'



ALIGNMENT PLAN
HORIZONTAL STATIONING SCALE: 1"=100'

[DATE: 3/28/2011 9:40 AM] [AUTHOR: dboultinghouse] [PLOTTER: \\pdx-print\RicohColor] [STYLE: WHP-Standard.ctb]
[PATH: P:\Northwest Natural Gas Company\035886\Design\Drawings\Civil\035886-land-pp03.dwg] [LAYOUT: Sheet23]

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CENTERLINE IN R.O.W.
CENTERLINE IN PRIVATE PROPERTY
R.O.W.
PROPERTY LINE
CONSTRUCTION EASEMENT (WHI)
ALIGNMENT STATIONING
EXISTING FIBER OPTIC
EXISTING GAS LINE
EXISTING WATER LINE
EXISTING OVERHEAD UTILITIES
EXISTING CULVERT
EXISTING WETLANDS
EXISTING CONTOURS

SHEET INFO	
DESIGNED	DB
DRAWN	RAI
CHECKED	—
APPROVED	—
LAST EDIT	3/16/2010
PLOT DATE	3/28/2011
SUBMITTAL	

REVISIONS

NO.	BY	DATE	REMARKS

PLAN & PROFILE
STA. 883+00 TO STA. 911+00
NORTHWEST NATURAL GAS COMPANY
MID-WILLAMETTE FEEDER PROJECT

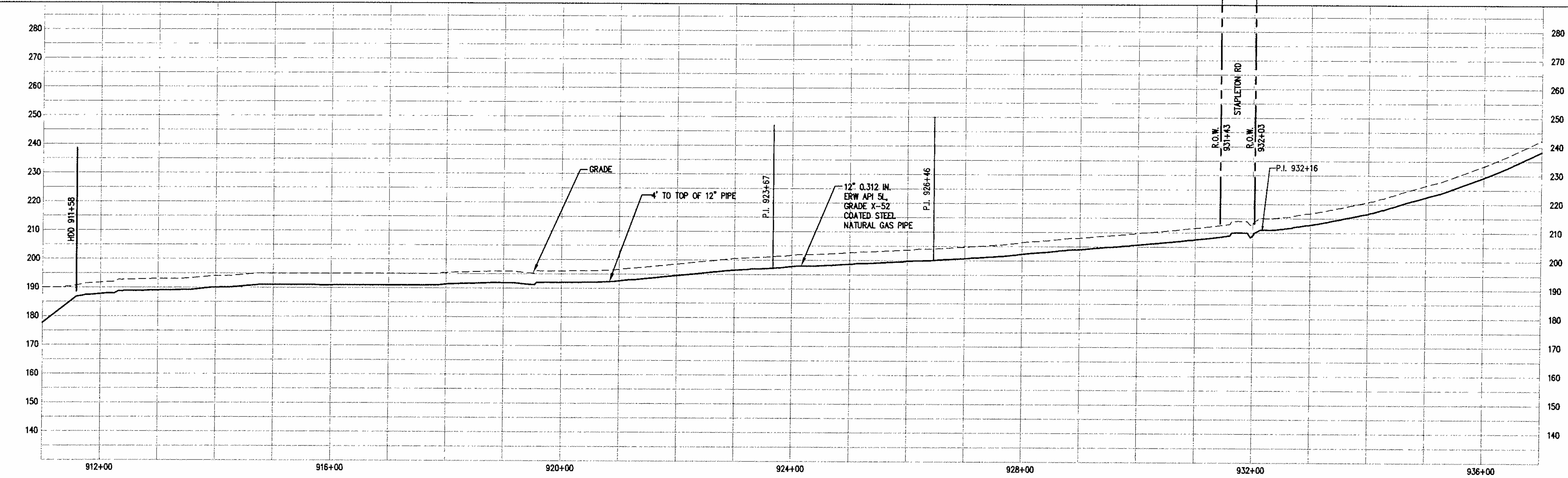
PROJECT NUMBER	DRAWING FILE NAME	SCALE
035886	035886-LAND-PP03	1"=100'

SHEET NUMBER
23

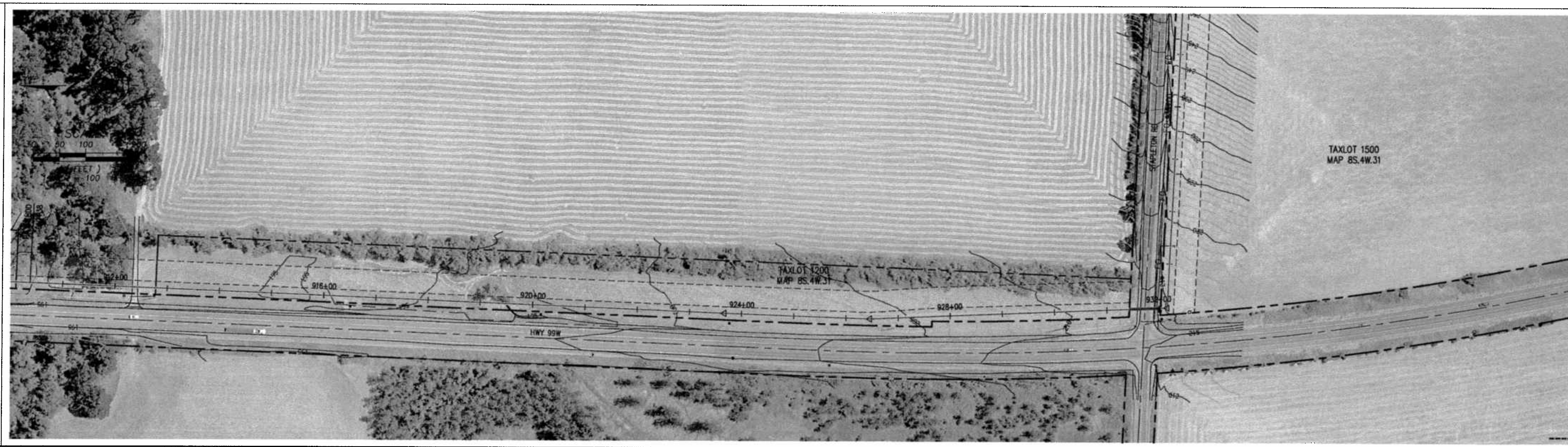
XREF INDEX:

OWNERSHIP	M1-150 BRANT WOLF & CINDY DEVEREUX-WOLF TAXLOT 1200 MAP 8S.4W.31	STAPLETON RD	M1-160 RIDDELL FARMS INC TAXLOT 1500 MAP 8S.4W.31
LAND USE	AG	R.O.W.	AG

PIPELINE PROFILE
HORIZ: 1"=100'
VERT: 1"=20'



ALIGNMENT PLAN
HORIZONTAL STATIONING SCALE: 1"=100'



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[PATH: P:\Northwest Natural Gas Company\035886\Design\Drawings\Civil\035886-land-pp03.dwg] [LAYOUT: Sheet24]

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CENTERLINE IN R.O.W.
CENTERLINE IN PRIVATE PROPERTY
R.O.W.
PROPERTY LINE
CONSTRUCTION EASEMENT (WIDE)
283+00 ALIGNMENT STATIONING
EXISTING FIBER OPTIC
EXISTING GAS LINE
EXISTING WATER LINE
EXISTING OVERHEAD UTILITIES
EXISTING CULVERT
EXISTING WETLANDS
EXISTING CONTOURS

SHEET INFO	
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DRAWN	RAI
CHECKED	—
APPROVED	—
LAST EDIT	3/16/2010
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REVISIONS

NO.	BY	DATE	REMARKS

PLAN & PROFILE
STA. 911+00 TO STA. 937+00
NORTHWEST NATURAL GAS COMPANY
MID-WILLAMETTE FEEDER PROJECT

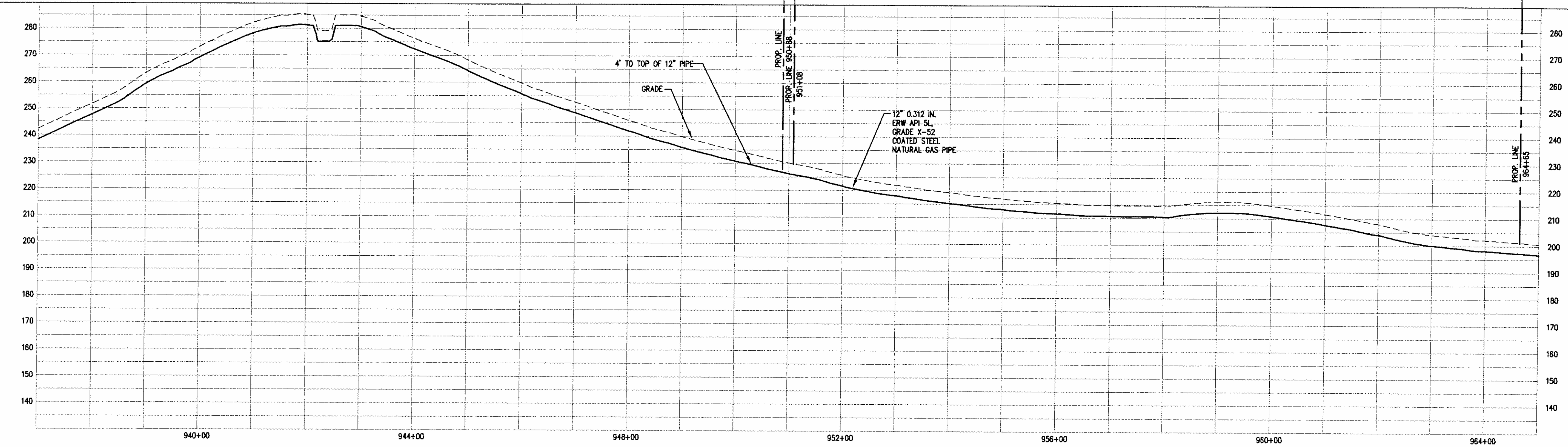
PROJECT NUMBER	DRAWING FILE NAME	SCALE
035886	035886-LAND-PP03	1"=100'

SHEET NUMBER
24

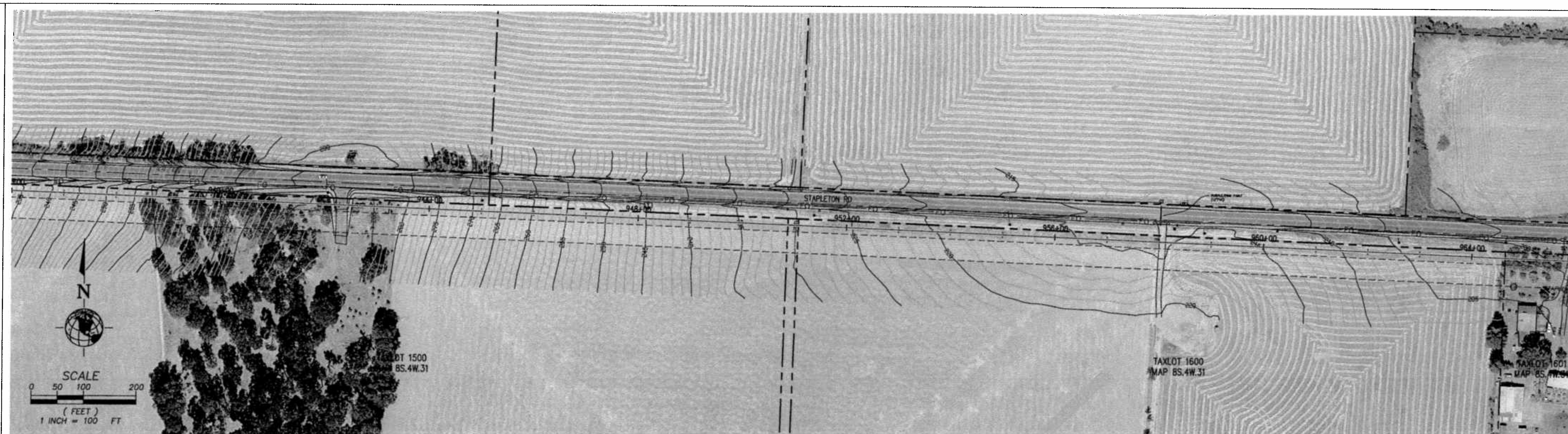
XREF INDEX:

OWNERSHIP	M1-160 RIDDELL FARMS INC TAXLOT 1500 MAP 8S.4W.31	M1-170 RIDDELL FARMS INC TAXLOT 1600 MAP 8S.4W.31	M1-180 ALAN R. & LAURIE L. MCLEAN ET AL TAXLOT 1601 MAP 8S.4W.31
LAND USE	AG	AG	AG

PIPELINE PROFILE
HORIZ: 1"=100'
VERT: 1"=20'



ALIGNMENT PLAN
HORIZONTAL STATIONING SCALE: 1"=100'



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CENTERLINE IN EXISTING EASEMENT	EXISTING FIBER OPTIC
CENTERLINE IN R.O.W.	EXISTING GAS LINE
CENTERLINE IN PRIVATE PROPERTY	EXISTING WATER LINE
R.O.W.	EXISTING OVERHEAD UTILITIES
PROPERTY LINE	EXISTING CULVERT
CONSTRUCTION EASEMENT (WHITE)	EXISTING WETLANDS
283+00 ALIGNMENT STATIONING	175 EXISTING CONTOURS

SHEET INFO	
DESIGNED	DB
DRAWN	RAI
CHECKED	—
APPROVED	—
LAST EDIT	3/16/2010
PLOT DATE	3/28/2011
SUBMITTAL	

REVISIONS

NO.	BY	DATE	REMARKS

PLAN & PROFILE
STA. 937+00 TO STA. 965+00
NORTHWEST NATURAL GAS COMPANY
MID-WILLAMETTE FEEDER PROJECT

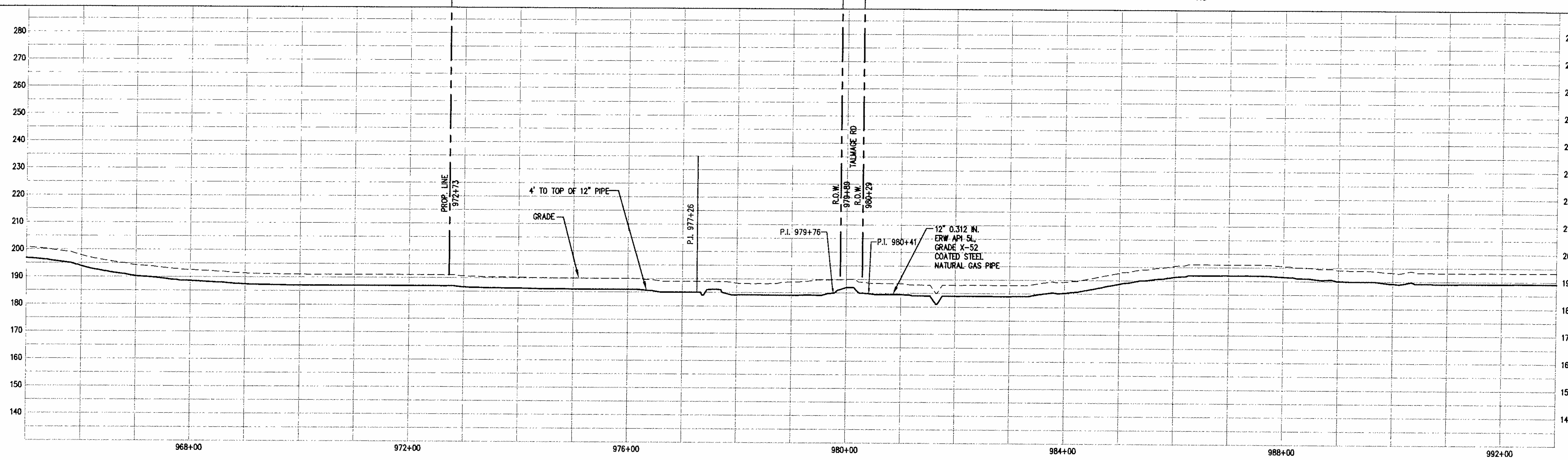
PROJECT NUMBER	DRAWING FILE NAME	SCALE
035886	035886-LAND-PP03	1"=100'

SHEET NUMBER
25

XREF INDEX:

OWNERSHIP	M1-180 ALAN R. & LAURIE L. MCLEAN ET AL TAXLOT 1601 MAP 8S.4W.31	M1-190 ALAN R. & LAURIE L. MCLEAN ET AL TAXLOT 1000 MAP 8S.4W.32	TALMAGE RD	P1S-100 GENE E. JR. & SARAH M. MILLER TAXLOT 1200 MAP 8S.4W.32
LAND USE	AG	AG	R.O.W.	AG

PIPELINE PROFILE
HORIZ: 1"=100'
VERT: 1"=20'



ALIGNMENT PLAN
HORIZONTAL STATIONING SCALE: 1"=100'

[DATE: 3/28/2011 9:49 AM] [AUTHOR: dboutlinghouse] [PLOTTER: \\pdx-print\RicohColor] [STYLE: WHP-Standard.ctb]
[PATH: P:\Northwest Natural Gas Company\035886\Design\Drawings\Civil\035886-land-pp03.dwg] [LAYOUT: Sheet26]

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CENTERLINE IN EXISTING EASEMENT
CENTERLINE IN R.O.W.
CENTERLINE IN PRIVATE PROPERTY
R.O.W.
PROPERTY LINE
CONSTRUCTION EASEMENT (WWK)
ALIGNMENT STATIONING
EXISTING FIBER OPTIC
EXISTING GAS LINE
EXISTING WATER LINE
EXISTING OVERHEAD UTILITIES
EXISTING CULVERT
EXISTING WETLANDS
EXISTING CONTOURS

SHEET INFO	
DESIGNED	DB
DRAWN	RAI
CHECKED	---
APPROVED	---
LAST EDIT	3/16/2010
PLOT DATE	3/28/2011
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REVISIONS

NO.	BY	DATE	REMARKS

PLAN & PROFILE
STA. 965+00 TO STA. 993+00
NORTHWEST NATURAL GAS COMPANY
MID-WILLAMETTE FEEDER PROJECT

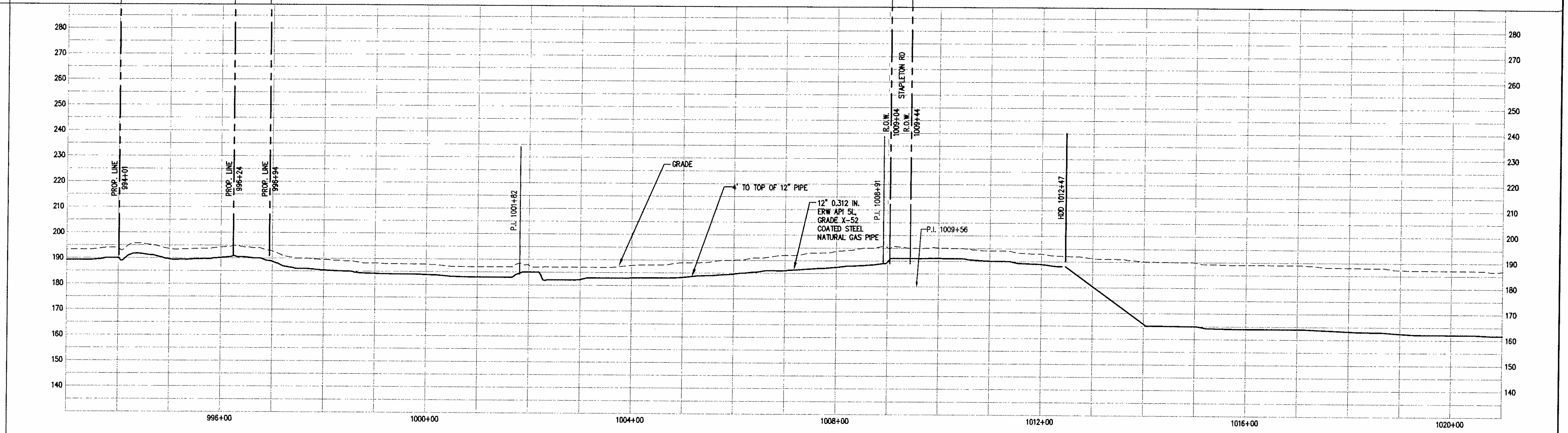
PROJECT NUMBER	DRAWING FILE NAME	SCALE
035886	035886-LAND-PP03	1"=100'

SHEET NUMBER
26

XREF INDEX:

OWNERSHIP	P1S-100 GENE E. JR. & SARAH M. MILLER TAXLOT 1200 MAP 8S.4W.32	ABANDONED & VACATED VALLEY & SILETZ RAILROAD	P1S-100 MARK J. & MILDRED LAUDAHL TAXLOT 1300 MAP 8S.4W.32	STAPLETON RD	P1S-190 MICHAEL & KAREN LIPPSMEYER TAXLOT 104 MAP 9S.4W.5
LAND USE	AG		AG	R.O.W.	AG

PIPELINE PROFILE
HORIZ: 1"=100'
VERT: 1"=20'



ALIGNMENT PLAN
HORIZONTAL STATIONING SCALE: 1"=100'

[DATE: 3/28/2011 9:52 AM] [AUTHOR: dboultinghouse] [PLOTTER: \\pdx-print\RicohColor] [STYLE: WHP-Standard.ctb]
[PATH: P:\Northwest Natural Gas Company\035886\Design\Drawings\Civil\035886-land-pp03.dwg] [LAYOUT: Sheet27]

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CENTERLINE IN PRIVATE PROPERTY
R.O.W.
PROPERTY LINE
CONSTRUCTION EASEMENT (temp)
ALIGNMENT STATIONING
EXISTING FIBER OPTIC
EXISTING GAS LINE
EXISTING WATER LINE
EXISTING OVERHEAD UTILITIES
EXISTING CULVERT
EXISTING WETLANDS
EXISTING CONTOURS

SHEET INFO	
DESIGNED	DB
DRAWN	RAI
CHECKED	—
APPROVED	—
LAST EDIT	3/16/2010
PLOT DATE	3/28/2011
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REVISIONS			
NO.	BY	DATE	REMARKS

PLAN & PROFILE
STA. 993+00 TO STA. 1021+00
NORTHWEST NATURAL GAS COMPANY
MID-WILLAMETTE FEEDER PROJECT

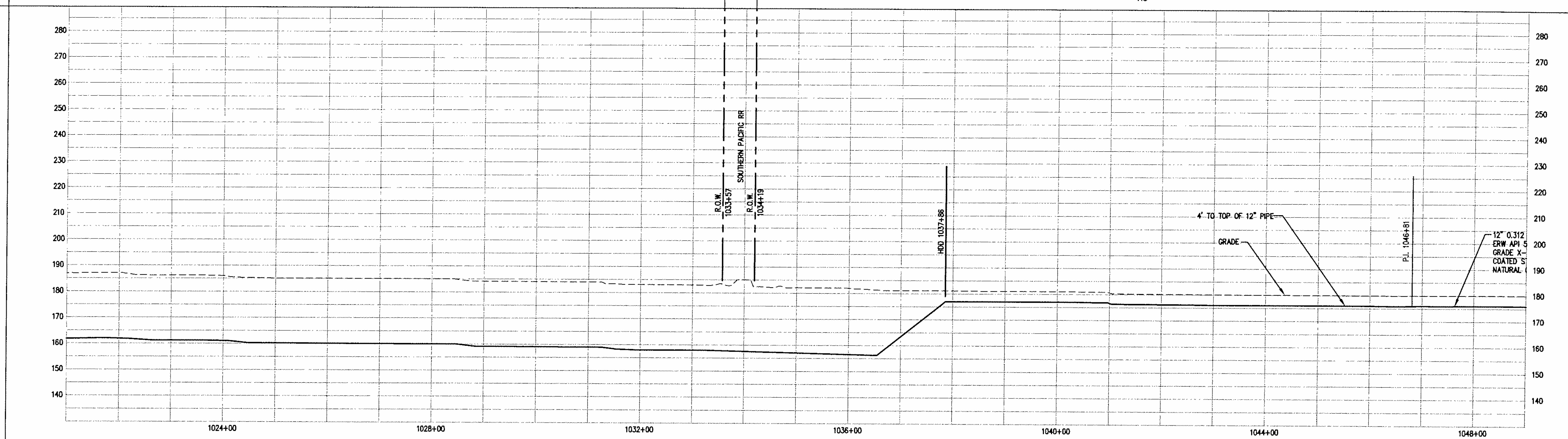
PROJECT NUMBER	DRAWING FILE NAME	SCALE
035886	035886-LAND-PP03	1"=100'

SHEET NUMBER
27

XREF INDEX:

OWNERSHIP	P1S-190 MICHAEL & KAREN LIPPSMEYER TAXLOT 104 MAP 9S.4W.5		SOUTHERN PACIFIC RR	P1S-140 PEYREE PROPERTIES TAXLOT 400 MAP 9S.4W.4
LAND USE	AG	R.O.W.		AG

PIPELINE PROFILE
HORIZ: 1"=100'
VERT: 1"=20'



ALIGNMENT PLAN
HORIZONTAL STATIONING SCALE: 1"=100'

[DATE: 3/28/2011 9:56 AM] [AUTHOR: dboullinghouse] [PLOTTER: \\pdx-print\RicohColor] [STYLE: WHP-Standard.ctb]
[PATH: P:\Northwest Natural Gas Company\035886\Design\Drawings\Civil\035886-land-pp03.dwg] [LAYOUT: Sheet28]

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R.O.W.
PROPERTY LINE
CONSTRUCTION EASEMENT (WHITE)
283+00 ALIGNMENT STATIONING
FO EXISTING FIBER OPTIC
G EXISTING GAS LINE
W EXISTING WATER LINE
OH/E EXISTING OVERHEAD UTILITIES
EXISTING CULVERT
EXISTING WETLANDS
176 EXISTING CONTOURS

SHEET INFO	
DESIGNED	DB
DRAWN	RAI
CHECKED	—
APPROVED	—
LAST EDIT	3/16/2010
PLOT DATE	3/28/2011
SUBMITTAL	

REVISIONS

NO.	BY	DATE	REMARKS

PLAN & PROFILE
STA.1021+00 TO STA. 1049+00
NORTHWEST NATURAL GAS COMPANY
MID-WILLAMETTE FEEDER PROJECT

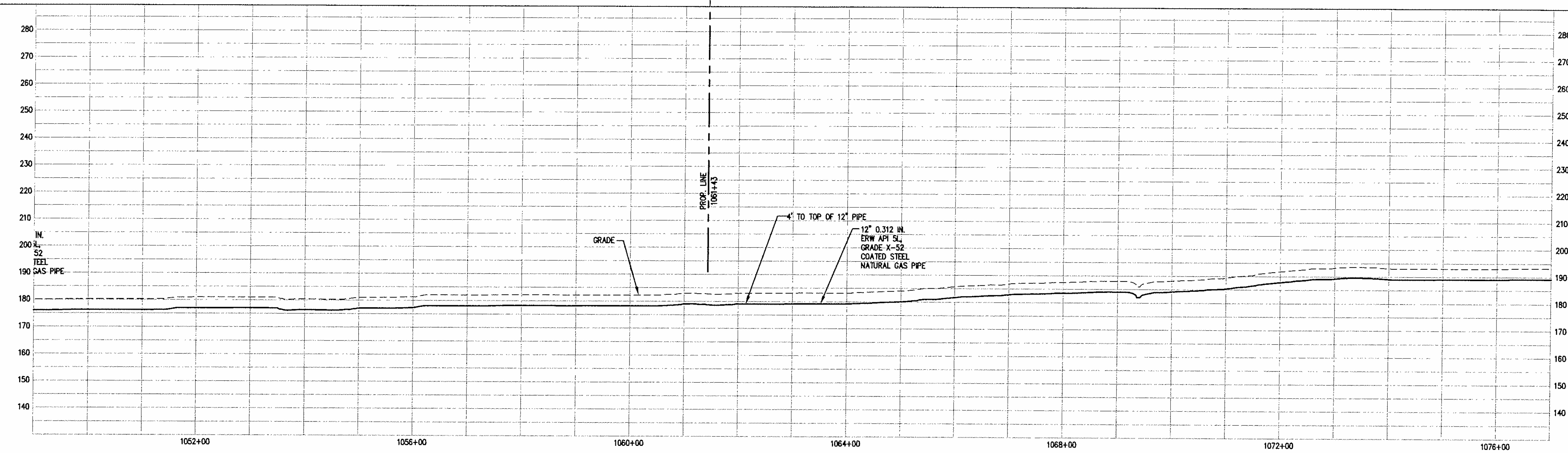
PROJECT NUMBER	DRAWING FILE NAME	SCALE
035886	035886-LAND-PP03	1"=100'

SHEET NUMBER
28

XREF INDEX:

OWNERSHIP	P1S-140 PEYREE PROPERTIES TAXLOT 400 MAP 9S.4W.4	P1S-150 FREDDY'S FLATS LLC TAXLOT 500 MAP 9S.4W.4
LAND USE	AG	AG

PIPELINE PROFILE
HORIZ: 1"=100'
VERT: 1"=20'



ALIGNMENT PLAN
HORIZONTAL STATIONING SCALE: 1"=100'

[DATE: 3/28/2011 9:58 AM] [AUTHOR: dboullinghouse] [PLOTTER: \\pdx-print\RicohColor] [STYLE: WHP-Standard.ctb]
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CENTERLINE IN PRIVATE PROPERTY
R.O.W.
PROPERTY LINE
CONSTRUCTION EASEMENT (WHITE)
ALIGNMENT STATIONING
EXISTING FIBER OPTIC
EXISTING GAS LINE
EXISTING WATER LINE
EXISTING OVERHEAD UTILITIES
EXISTING CULVERT
EXISTING WETLANDS
EXISTING CONTOURS

SHEET INFO	
DESIGNED	DB
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LAST EDIT	3/16/2010
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REVISIONS

NO.	BY	DATE	REMARKS

PLAN & PROFILE
STA. 1049+00 TO STA. 1077+00
NORTHWEST NATURAL GAS COMPANY
MID-WILLAMETTE FEEDER PROJECT

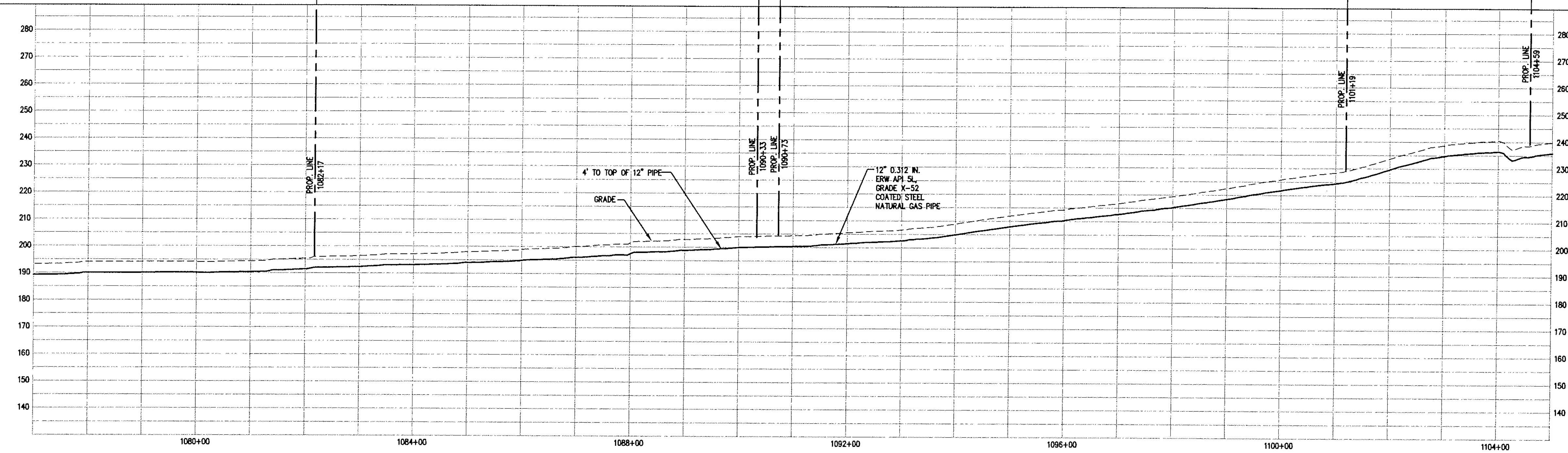
PROJECT NUMBER	DRAWING FILE NAME	SCALE
035886	035886-LAND-PP03	1"=100'

SHEET NUMBER
29

XREF INDEX:

OWNERSHIP	P1S-150 FREDDY'S FLATS LLC TAXLOT 500 MAP 9S.4W.4	P1S-160 JEAN E. WOODWARD TAXLOT 600 MAP 9S.4W.4	P1S-180 UNION PACIFIC RR COMPANY TAXLOT 900 MAP 9S.4W.4	—	P1S-170 WENDELL P. & SHERRY L. SPERLING TAXLOT 700 MAP 9S.4W.4	P1S-210 LARRY D. SMITH TRUST TAXLOT 402 MAP 9S.4W.9	P1S-200 MARION WARREN LIVING TRUST TAXLOT 401 MAP 9S.4W.9
LAND USE	AG	AG			AG	AG	AG

PIPELINE PROFILE
HORIZ: 1"=100'
VERT: 1"=20'



ALIGNMENT PLAN
HORIZONTAL STATIONING SCALE: 1"=100'

[DATE: 3/28/2011 10:17 AM] [AUTHOR: dboultinghouse] [PLOTTER: \\pdx-print\RicohColor] [STYLE: WHP-Standard.ctb]
[PATH: P:\Northwest Natural Gas Company\035886\Design\Drawings\Civil\035886-land-pp04.dwg] [LAYOUT: Sheet30]

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CENTERLINE IN R.O.W.		G	EXISTING GAS LINE
CENTERLINE IN PRIVATE PROPERTY		W	EXISTING WATER LINE
R.O.W.		OH/E	EXISTING OVERHEAD UTILITIES
PROPERTY LINE			EXISTING CULVERT
CONSTRUCTION EASEMENT (WHITE)			EXISTING WETLANDS
283+00	ALIGNMENT STATIONING	175	EXISTING CONTOURS

SHEET INFO	
DESIGNED	DB
DRAWN	RAI
CHECKED	—
APPROVED	—
LAST EDIT	2/10/2010
PLOT DATE	3/28/2011
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REVISIONS

NO.	BY	DATE	REMARKS

PLAN & PROFILE
STA. 1077+00 TO STA. 1105+00
NORTHWEST NATURAL GAS COMPANY
MID-WILLAMETTE FEEDER PROJECT

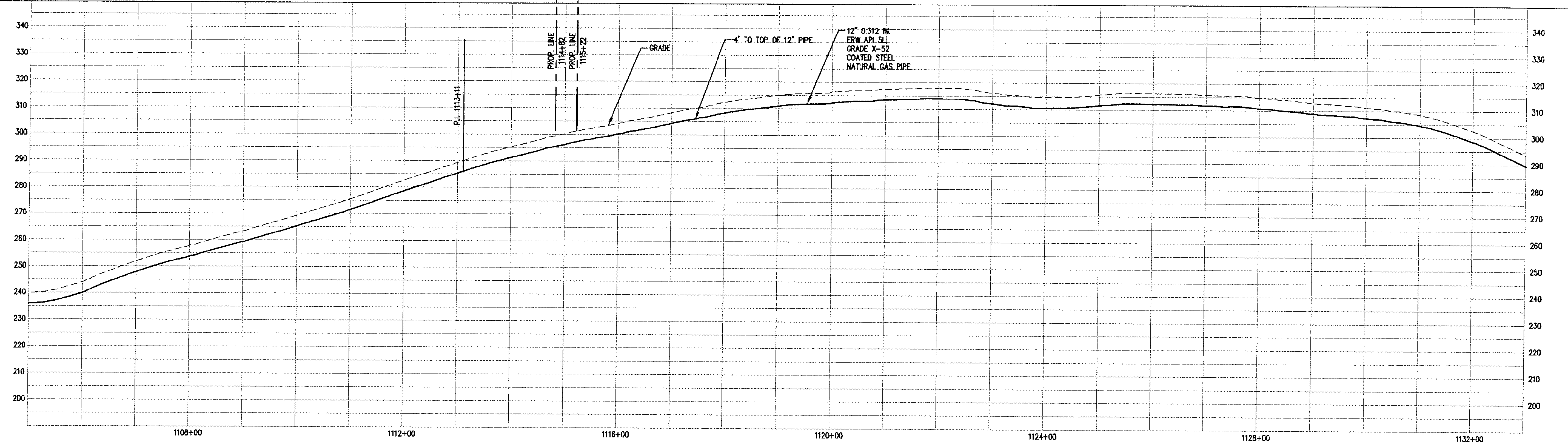
PROJECT NUMBER	DRAWING FILE NAME	SCALE
035886	035886-LAND-PP04	1"=100'

SHEET NUMBER
30

XREF INDEX:

OWNERSHIP	P1S-200 MARIAN WARREN LIVING TRUST TAXLOT 401 MAP 9S.4W.9	P1S-230 OREGON & CALIFORNIA RAILWAY GRANT TAXLOT 501 MAP 9S.4W.9	P1S-220 JOHNSON/COLE FAMILY RV LVG TRUST, MARGARET ANN JOHNSON TAXLOT 500 MAP 9S.4W.9
LAND USE	AG		AG

PIPELINE PROFILE
HORIZ: 1"=100'
VERT: 1"=20'



ALIGNMENT PLAN
HORIZONTAL STATIONING SCALE: 1"=100'

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[PATH: P:\Northwest Natural Gas Company\035886\Design\Drawings\Civil\035886-land-pp04.dwg] [LAYOUT: Sheet31]

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R.O.W.
PROPERTY LINE
CONSTRUCTION EASEMENT (WHITE)
263+00 ALIGNMENT STATIONING
FO EXISTING FIBER OPTIC
G EXISTING GAS LINE
W EXISTING WATER LINE
OH/E EXISTING OVERHEAD UTILITIES
EXISTING CULVERT
EXISTING WETLANDS
175 EXISTING CONTOURS

SHEET INFO	
DESIGNED	DB
DRAWN	RAI
CHECKED	—
APPROVED	—
LAST EDIT	2/10/2010
PLOT DATE	3/28/2011
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REVISIONS

NO.	BY	DATE	REMARKS

PLAN & PROFILE
STA. 1105+00 TO STA. 1133+00
NORTHWEST NATURAL GAS COMPANY
MID-WILLAMETTE FEEDER PROJECT

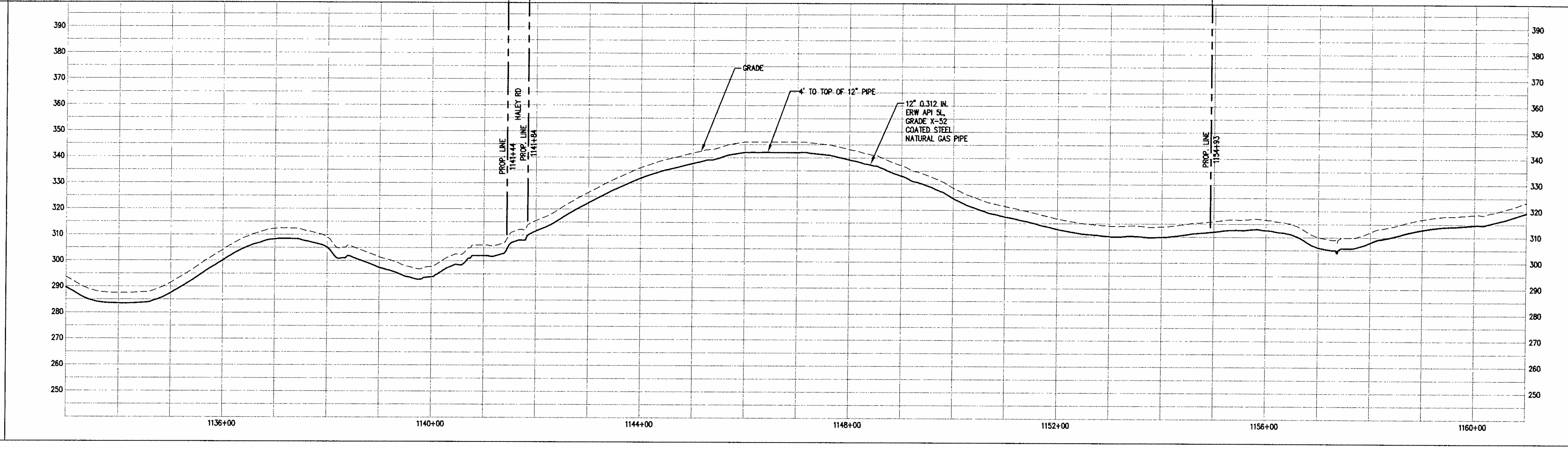
PROJECT NUMBER	DRAWING FILE NAME	SCALE
035886	035886-LAND-PP04	1"=100'

SHEET NUMBER
31

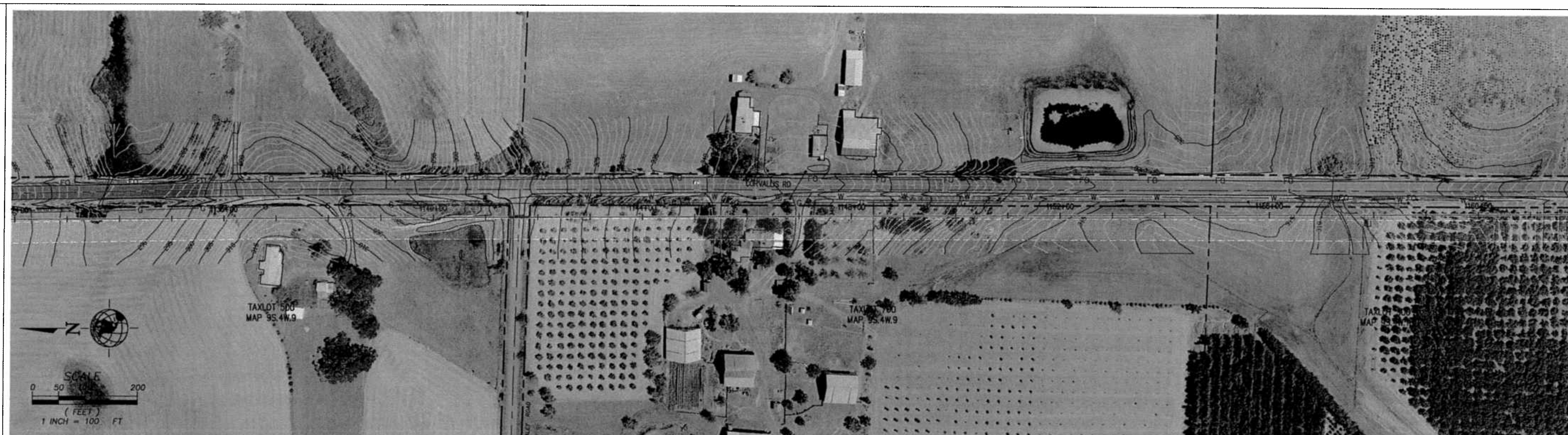
XREF INDEX:

OWNERSHIP	P1S-220 JOHNSON/COLE FAMILY RV LVG TRUST, MARGARET ANN JOHNSON TAXLOT 500 MAP 9S.4W.9	HALEY RD	P1S-240 BREITENSTEIN LIVING TRUST, HILDA BREITENSTEIN TAXLOT 700 MAP 9S.4W.9	P1S-250 BREITENSTEIN LIVING TRUST, HILDA BREITENSTEIN TAXLOT 700 MAP 9S.4W.9
LAND USE	AG	R.O.W.	AG	AG

PIPELINE PROFILE
HORIZ: 1"=100'
VERT: 1"=20'



ALIGNMENT PLAN
HORIZONTAL STATIONING SCALE: 1"=100'



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[PATH: P:\Northwest Natural Gas Company\035886\Design\Drawings\Civil\035886-land-pp04.dwg] [LAYOUT: Sheet32]

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CENTERLINE IN PRIVATE PROPERTY
R.O.W.
PROPERTY LINE
CONSTRUCTION EASEMENT (WHITE)
283+00 ALIGNMENT STATIONING
FO EXISTING FIBER OPTIC
G EXISTING GAS LINE
W EXISTING WATER LINE
OH/E EXISTING OVERHEAD UTILITIES
EXISTING CULVERT
EXISTING WETLANDS
175 EXISTING CONTOURS

SHEET INFO	
DESIGNED	DB
DRAWN	RAI
CHECKED	—
APPROVED	—
LAST EDIT	2/10/2010
PLOT DATE	3/28/2011
SUBMITTAL	

REVISIONS			
NO.	BY	DATE	REMARKS

PLAN & PROFILE
STA. 1133+00 TO STA. 1161+00
NORTHWEST NATURAL GAS COMPANY
MID-WILLAMETTE FEEDER PROJECT

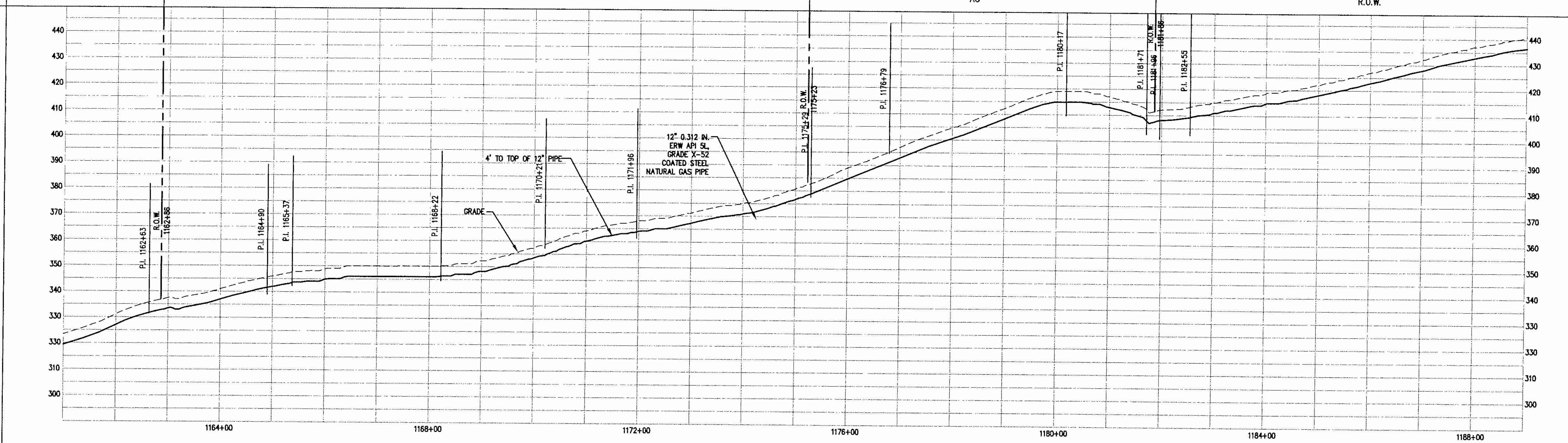
PROJECT NUMBER	DRAWING FILE NAME	SCALE
035886	035886-LAND-PP04	1"=100'

SHEET NUMBER
32

XREF INDEX:

OWNERSHIP	P1S-250 BREITENSTEIN LIVING TRUST, HILDA BREITENSTEIN TAXLOT 300 MAP 9S.4W.9	CORVALLIS RD	OAK HILL RD	P1S-245 VANDERZANDEN FAMILY TRUST TAX LOT 200 MAP 9S.4W.16	OAK HILL RD
LAND USE	AG	R.O.W.	R.O.W.	AG	R.O.W.

PIPELINE PROFILE
HORIZ: 1"=100'
VERT: 1"=20'



ALIGNMENT PLAN
HORIZONTAL STATIONING SCALE: 1"=100'

[DATE: 3/28/2011 10:31 AM] [AUTHOR: dboultinghouse] [PLOTTER: \\pdx-print\RicohColor] [STYLE: WHP-Standard.ctb]
[PATH: P:\Northwest Natural Gas Company\035886\Design\Drawings\Civil\035886-land-pp04.dwg] [LAYOUT: Sheet33]

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CENTERLINE IN PRIVATE PROPERTY
R.O.W.
PROPERTY LINE
CONSTRUCTION EASEMENT (TEMP)
ALIGNMENT STATIONING
EXISTING FIBER OPTIC
EXISTING GAS LINE
EXISTING WATER LINE
EXISTING OVERHEAD UTILITIES
EXISTING CULVERT
EXISTING WETLANDS
EXISTING CONTOURS

SHEET INFO	
DESIGNED	DB
DRAWN	RAI
CHECKED	—
APPROVED	—
LAST EDIT	2/10/2010
PLOT DATE	3/28/2011
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REVISIONS

NO.	BY	DATE	REMARKS

PLAN & PROFILE
STA. 1161+00 TO STA. 1189+00
NORTHWEST NATURAL GAS COMPANY
MID-WILLAMETTE FEEDER PROJECT

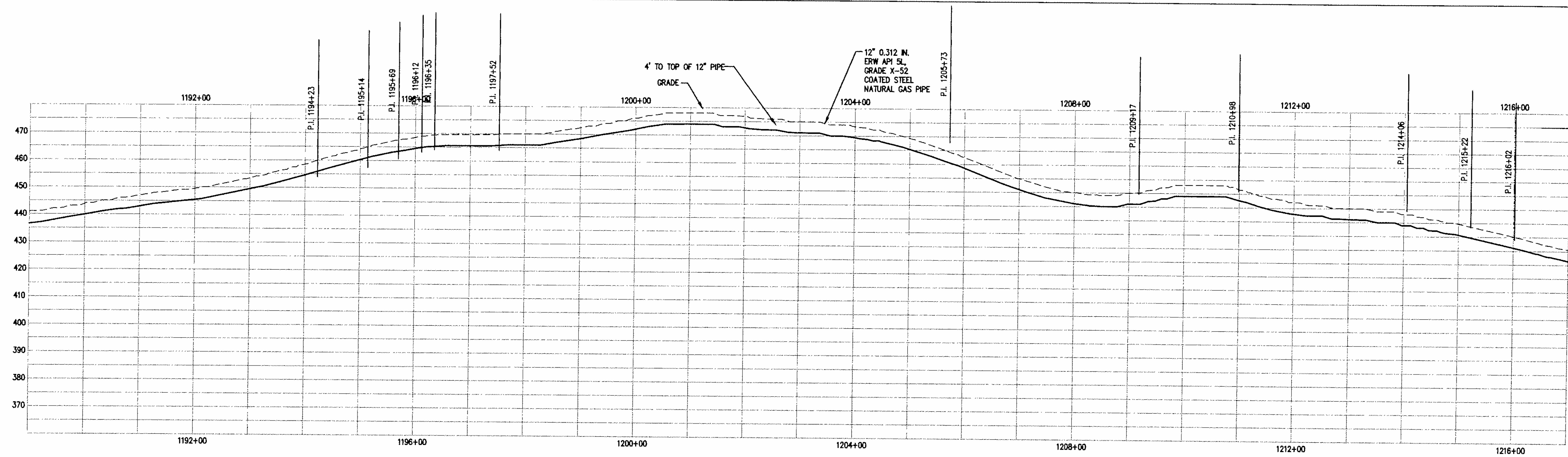
PROJECT NUMBER	DRAWING FILE NAME	SCALE
035886	035886-LAND-PP04	1"=100'

SHEET NUMBER
33

XREF INDEX:

OWNERSHIP	OAK HILL RD
LAND USE	R.O.W.

PIPELINE PROFILE
HORIZ: 1"=100'
VERT: 1"=20'



ALIGNMENT PLAN
HORIZONTAL STATIONING SCALE: 1"=100'

[DATE: 3/28/2011 10:37 AM] [AUTHOR: dboutinghouse] [PLOTTER: \\adc-print\RicohColor] [STYLE: WHP-Standard.ctb]
[PATH: P:\Northwest Natural Gas Company\035886\Design\Drawings\Civil\035886-land-pp04.dwg] [LAYOUT: Sheet34]

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CENTERLINE IN PRIVATE PROPERTY
R.O.W.
PROPERTY LINE
CONSTRUCTION EASEMENT (WHITE)
283+00 ALIGNMENT STATIONING
FO EXISTING FIBER OPTIC
EXISTING GAS LINE
EXISTING WATER LINE
OH/E EXISTING OVERHEAD UTILITIES
EXISTING CULVERT
EXISTING WETLANDS
175 EXISTING CONTOURS

SHEET INFO	
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APPROVED	—
LAST EDIT	2/10/2010
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NO.	BY	DATE	REMARKS

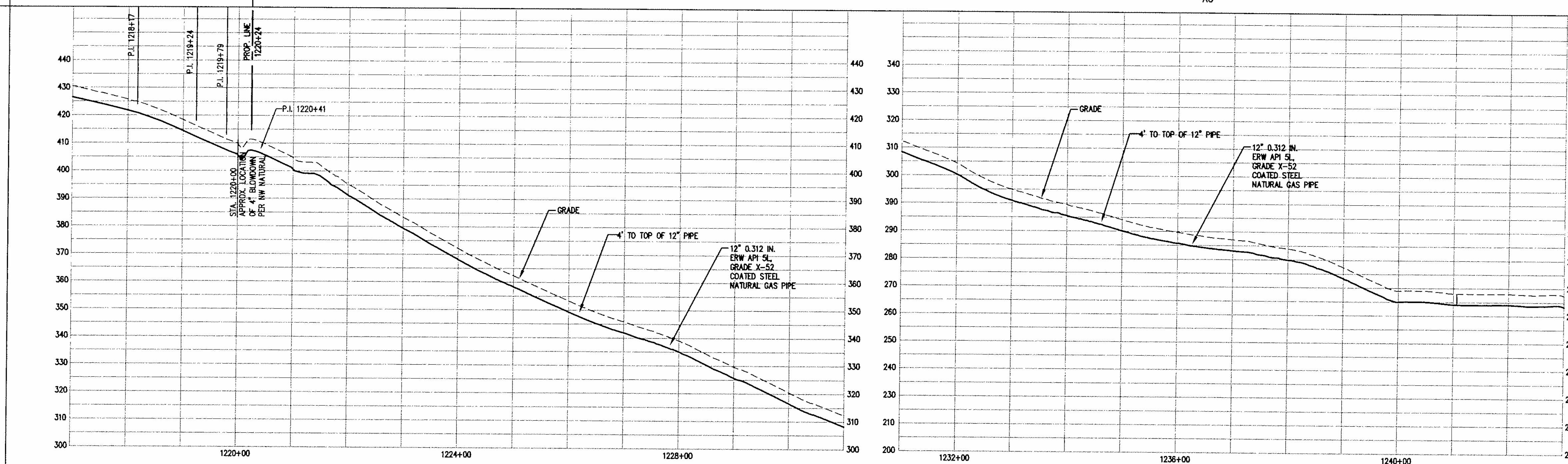
PLAN & PROFILE
STA. 1189+00 TO STA. 1217+00
NORTHWEST NATURAL GAS COMPANY
MID-WILLAMETTE FEEDER PROJECT

PROJECT NUMBER	DRAWING FILE NAME	SCALE	SHEET NUMBER
035886	035886-LAND-PP04	1"=100'	34

XREF INDEX:

OWNERSHIP	OAK HILL RD	P1S-340 PLATT FARMS LLC TAXLOT 100 MAP 9S.4W.21	P1S-340 PLATT FARMS LLC TAXLOT 100 MAP 9S.4W.21
LAND USE	R.O.W.	AG	AG

PIPELINE PROFILE
HORIZ: 1"=100'
VERT: 1"=20'



ALIGNMENT PLAN
HORIZONTAL STATIONING SCALE: 1"=100'

[DATE: 3/28/2011 10:39 AM] [AUTHOR: dboultinghouse] [PLOTTER: \\pdx-print\RicohColor] [STYLE: WHP-Standard.ctb]
[PATH: P:\Northwest Natural Gas Company\035886\Design\Drawings\Civil\035886-land-pp04.dwg] [LAYOUT: Sheet35]

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PROPERTY LINE
CONSTRUCTION EASEMENT
ALIGNMENT STATIONING
EXISTING FIBER OPTIC
EXISTING GAS LINE
EXISTING WATER LINE
EXISTING OVERHEAD UTILITIES
EXISTING CULVERT
EXISTING WETLANDS
EXISTING CONTOURS

SHEET INFO	
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NO.	BY	DATE	REMARKS

PLAN & PROFILE
STA. 1217+00 TO STA. 1243+00
NORTHWEST NATURAL GAS COMPANY
MID-WILLAMETTE FEEDER PROJECT

PROJECT NUMBER	DRAWING FILE NAME	SCALE
035886	035886-LAND-PP04	1"=100'

SHEET NUMBER
35

[DATE: 3/28/2011 10:46 AM] [AUTHOR: dboutinghouse] [PLOTTER: \\pdx-print\RicohColor] [STYLE: WHP-Standard.ctb]
[PATH: P:\Northwest Natural Gas Company\035886\Design\Drawings\Civil\035886-land-pp04.dwg] [LAYOUT: Sheet36]

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CENTERLINE IN R.O.W.	EXISTING GAS LINE
CENTERLINE IN PRIVATE PROPERTY	EXISTING WATER LINE
R.O.W.	EXISTING OVERHEAD UTILITIES
PROPERTY LINE	EXISTING CULVERT
CONSTRUCTION EASEMENT (TEMP)	EXISTING WETLANDS
ALIGNMENT STATIONING	EXISTING CONTOURS

SHEET INFO	
DESIGNED	DB
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REVISIONS

NO.	BY	DATE	REMARKS

PLAN & PROFILE
STA. 1243+00 TO STA. 1271+00
NORTHWEST NATURAL GAS COMPANY
MID-WILLAMETTE FEEDER PROJECT

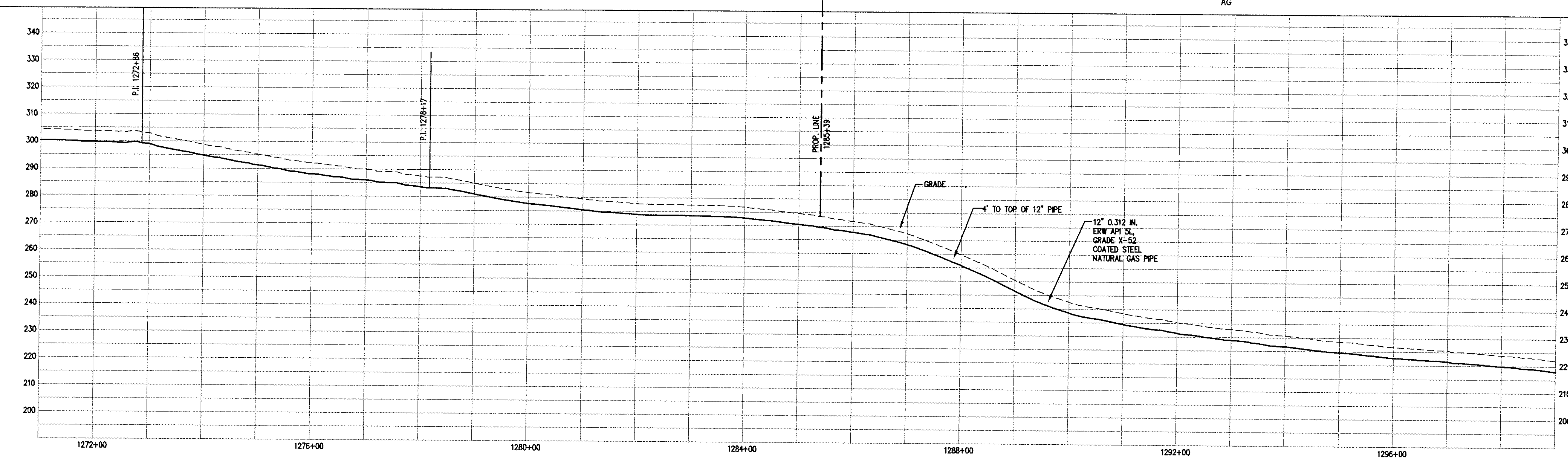
PROJECT NUMBER	DRAWING FILE NAME	SCALE
035886	035886-LAND-PP04	1"=100'

SHEET NUMBER
36

XREF INDEX:

OWNERSHIP	P1S-350 OLSEN VINYARD COMPANY LLC TAXLOT 600 MAP 9S.4W.21	P1S-360 PLATT FARMS LLC TAXLOT 200 MAP 9S.4W.28
LAND USE	AG	AG

PIPELINE PROFILE
HORIZ: 1"=100'
VERT: 1"=20'



ALIGNMENT PLAN
HORIZONTAL STATIONING SCALE: 1"=100'

[DATE: 3/28/2011 10:48 AM] [AUTHOR: dboultinghouse] [PLOTTER: \\pdx-print\RicohColor] [STYLE: WHP-Standard.ctb]
[PATH: P:\Northwest Natural Gas Company\035886\Design\Drawings\Civil\035886-land-pp04.dwg] [LAYOUT: Sheet37]

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CENTERLINE IN PRIVATE PROPERTY
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PROPERTY LINE
CONSTRUCTION EASEMENT (WHITE)
283+00 ALIGNMENT STATIONING
FO EXISTING FIBER OPTIC
EXISTING GAS LINE
EXISTING WATER LINE
OH/E EXISTING OVERHEAD UTILITIES
EXISTING CULVERT
EXISTING WETLANDS
175 EXISTING CONTOURS

SHEET INFO	
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APPROVED	—
LAST EDIT	2/10/2010
PLOT DATE	3/28/2011
SUBMITTAL	

REVISIONS

NO.	BY	DATE	REMARKS

PLAN & PROFILE
STA. 1271+00 TO STA. 1299+00
NORTHWEST NATURAL GAS COMPANY
MID-WILLAMETTE FEEDER PROJECT

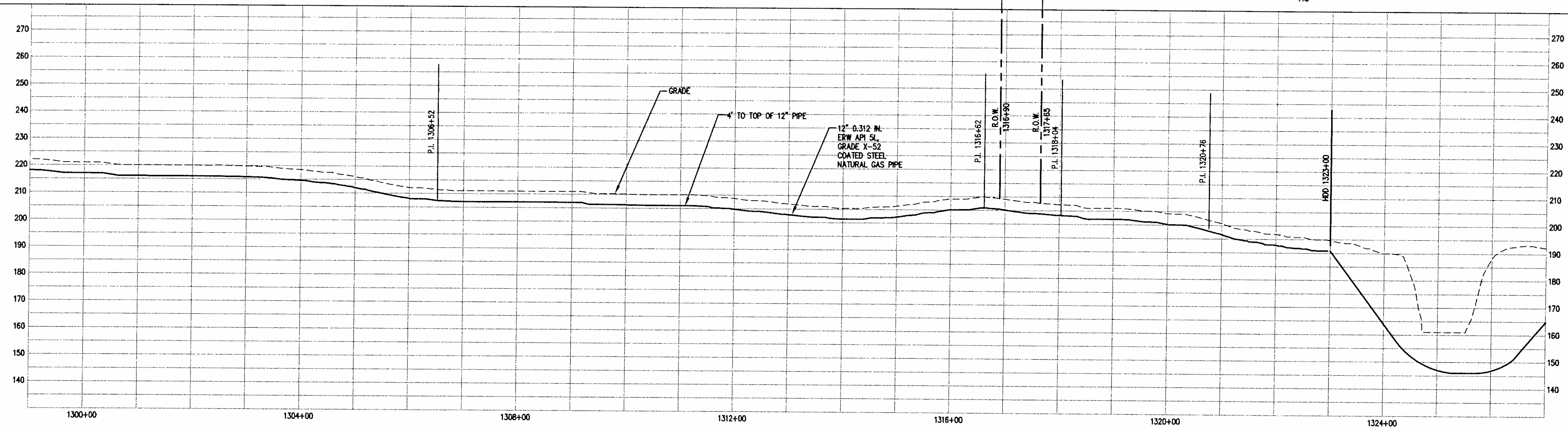
PROJECT NUMBER	DRAWING FILE NAME	SCALE
035886	035886-LAND-PP04	1"=100'

SHEET NUMBER
37

XREF INDEX:

OWNERSHIP	P1S-360 PLATT FARMS LLC TAXLOT 200 MAP 9S.4W.28	CORVALLIS RD	P1S-360 PLATT FARMS LLC TAXLOT 200 MAP 9S.4W.28
LAND USE	AG	R.O.W.	AG

PIPELINE PROFILE
HORIZ.: 1"=100'
VERT.: 1"=20'



ALIGNMENT PLAN
HORIZONTAL STATIONING SCALE: 1"=100'

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[PATH: P:\Northwest Natural Gas Company\035886\Design\Drawings\Civil\035886-land-pp04.dwg] [LAYOUT: Sheet38]

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CENTERLINE IN R.O.W.	EXISTING GAS LINE
CENTERLINE IN PRIVATE PROPERTY	EXISTING WATER LINE
R.O.W.	EXISTING OVERHEAD UTILITIES
PROPERTY LINE	EXISTING CULVERT
CONSTRUCTION EASEMENT (TEMP)	EXISTING WETLANDS
ALIGNMENT STATIONING	EXISTING CONTOURS

SHEET INFO	
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APPROVED	—
LAST EDIT	2/10/2010
PLOT DATE	3/28/2011
SUBMITTAL	

REVISIONS			
NO.	BY	DATE	REMARKS

PLAN & PROFILE
STA. 1299+00 TO STA. 1327+00
NORTHWEST NATURAL GAS COMPANY
MID-WILLAMETTE FEEDER PROJECT

PROJECT NUMBER	DRAWING FILE NAME	SCALE
035886	035886-LAND-PP04	1"=100'

SHEET NUMBER 38

XREF INDEX:

OWNERSHIP	P1S-360 PLATT FARMS LLC TAXLOT 200 MAP 9S.4W.28		CORVALLIS RD	P1S-370 DITCHEN LAND COMPANY LLC TAXLOT 300 MAP 9S.4W.33
LAND USE	AG		R.O.W.	AG

PIPELINE PROFILE
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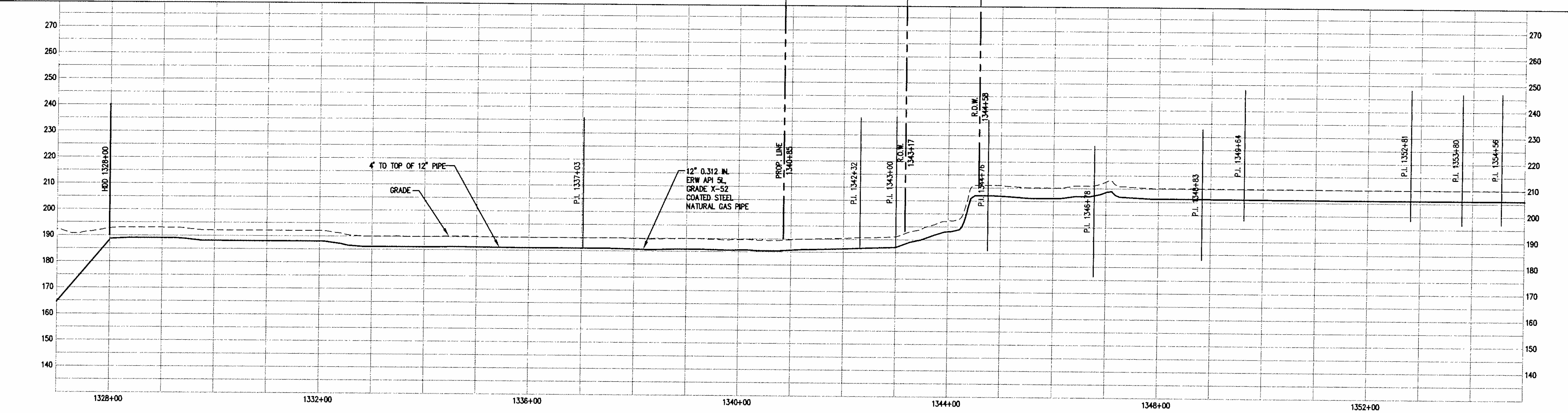

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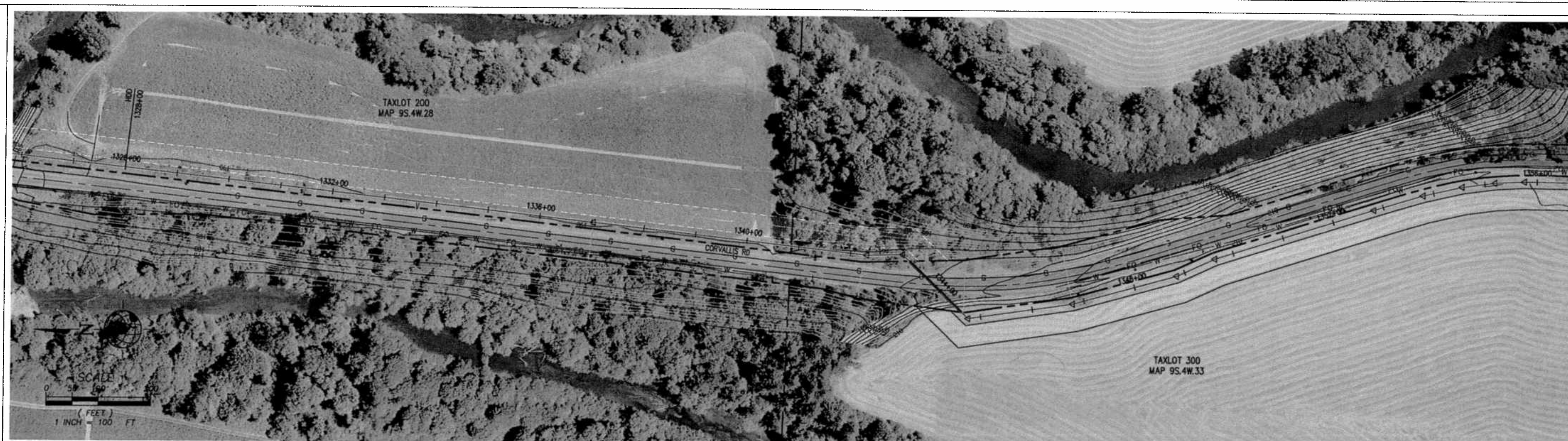

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EXISTING WETLANDS
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SHEET INFO	
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APPROVED	—
LAST EDIT	2/10/2010
PLOT DATE	3/28/2011
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REVISIONS

NO.	BY	DATE	REMARKS

PLAN & PROFILE
STA. 1327+00 TO STA. 1355+00
NORTHWEST NATURAL GAS COMPANY
MID-WILLAMETTE FEEDER PROJECT

PROJECT NUMBER	DRAWING FILE NAME	SCALE
035886	035886-LAND-PP04	1"=100'

SHEET NUMBER
39

XREF INDEX:

OWNERSHIP	P1S-370 DITCHEN LAND COMPANY, LLC TAXLOT 300 MAP 9S.4W.33	← CORVALLIS RD	P1S-360 PLATT FARMS LLC TAXLOT 200 MAP 9S.4W.28
LAND USE	AG	R.O.W.	LAND USE

PIPELINE PROFILE
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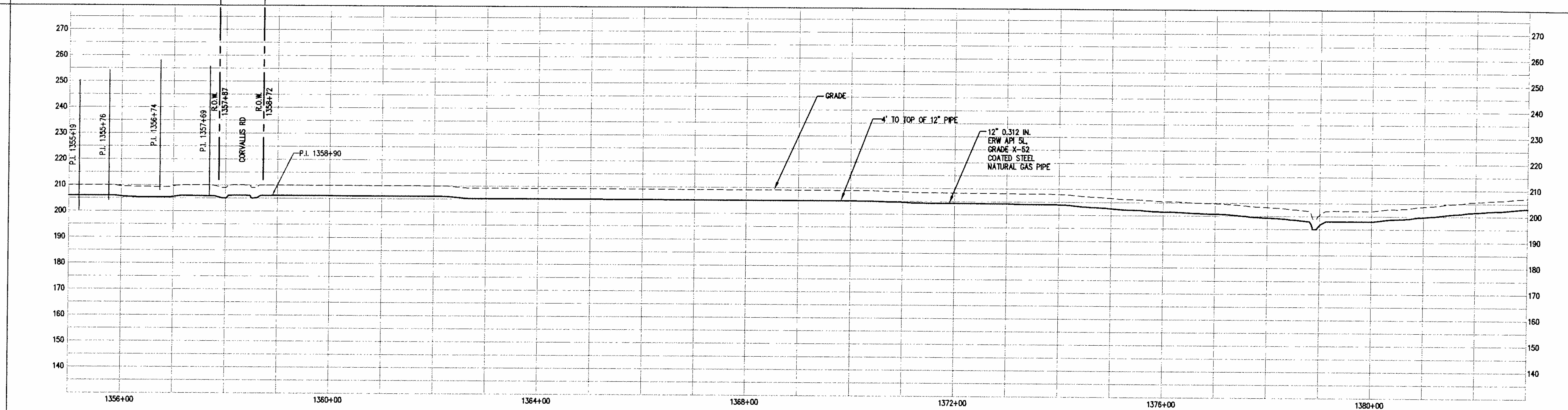
VERT: 1"=20'



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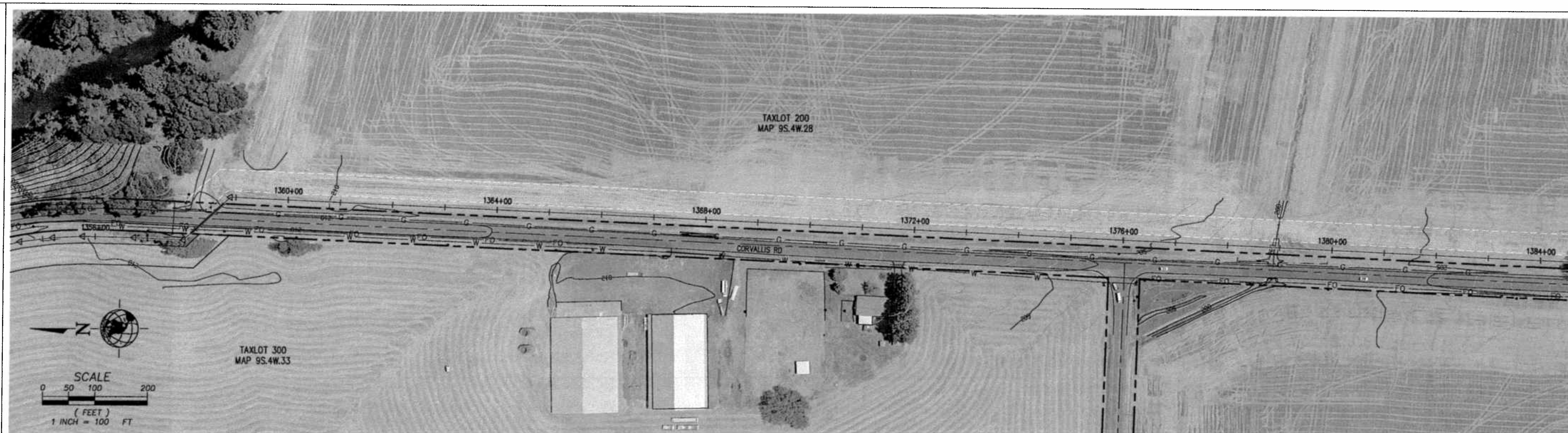

[DATE: 3/30/2011 9:25 AM] [AUTHOR: riwasaki] [PLOTTER: \\pdx-print\RicohColor] [STYLE: WHP-Standard.ctb]
[PATH: P:\Northwest Natural Gas Company\035886\Design\Drawings\Civil\035886-land-pp05.dwg] [LAYOUT: Sheet40]

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CONSTRUCTION EASEMENT (WIDTH)
ALIGNMENT STATIONING
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EXISTING CULVERT
EXISTING WETLANDS
EXISTING CONTOURS

SHEET INFO	
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LAST EDIT	2/10/2010
PLOT DATE	3/30/2011
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REVISIONS

NO.	BY	DATE	REMARKS

PLAN & PROFILE
STA. 1355+00 TO STA. 1383+00
NORTHWEST NATURAL GAS COMPANY
MID-WILLAMETTE FEEDER PROJECT

PROJECT NUMBER	DRAWING FILE NAME	SCALE
035886	035886-LAND-PP05	1"=100'

SHEET NUMBER
40

XREF INDEX:

OWNERSHIP	P1S-360 PLATT FARMS LLC TAXLOT 200 MAP 9S.4W.28	PAUL MULKEY LIVING TRUST, ET AL TAXLOT 100 MAP 10S.4W.4
LAND USE	AG	AG

PIPELINE PROFILE
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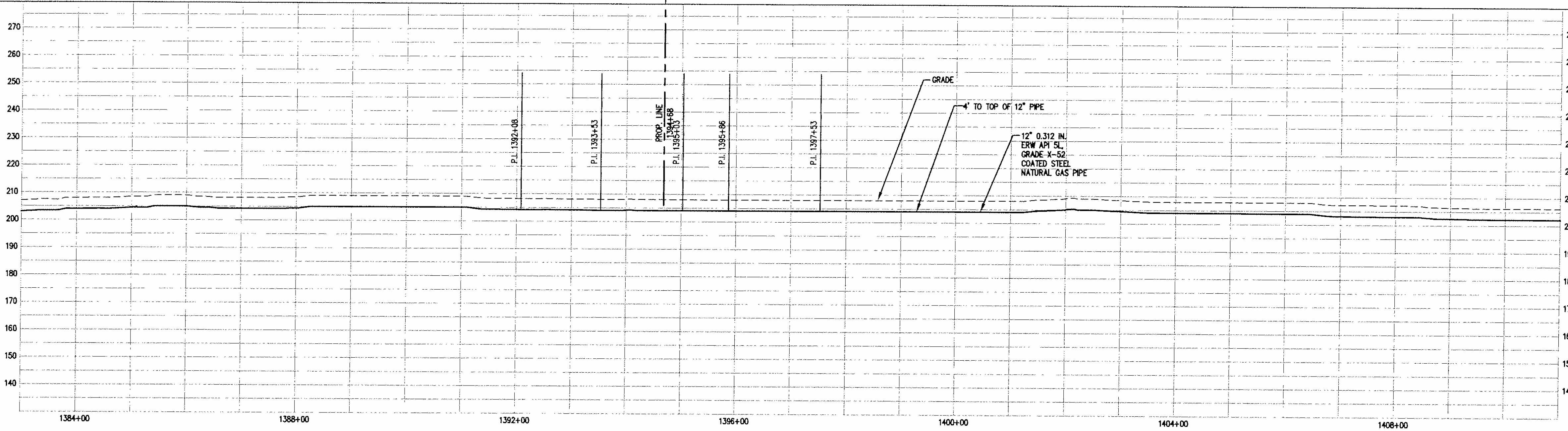
VERT: 1"=20'



ALIGNMENT PLAN
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LAST EDIT	2/10/2010
PLOT DATE	3/30/2011
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REVISIONS			
NO.	BY	DATE	REMARKS

PLAN & PROFILE
STA. 1383+00 TO STA. 1411+00
NORTHWEST NATURAL GAS COMPANY
MID-WILLAMETTE FEEDER PROJECT

PROJECT NUMBER	DRAWING FILE NAME	SCALE
035886	035886-LAND-PP05	1"=100'

SHEET NUMBER
41

XREF INDEX:

OWNERSHIP	PAUL MULKEY LIVING TRUST EL AL TAXLOT 100 MAP 10S.4W.4	P1S-390 RUTH ARLENE GRIMPS TRUST ET AL TAXLOT 800 MAP 10S.4W.4
LAND USE	AG	AG

[DATE: 3/30/2011 9:33 AM] [AUTHOR: dboultinghouse] [PLOTTER: \\vdx-print\RicohColor] [STYLE: WHP-Standard.ctb]
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NO.	BY	DATE	REMARKS

PLAN & PROFILE
STA. 1411+00 TO STA. 1439+00
NORTHWEST NATURAL GAS COMPANY
MID-WILLAMETTE FEEDER PROJECT

PROJECT NUMBER	DRAWING FILE NAME	SCALE
035886	035886-LAND-PP05	1"=100'

SHEET NUMBER
42

XREF INDEX:

OWNERSHIP	P1S-390 RUTH ARLENE GRIMPS TRUST ET AL TAXLOT 800 MAP 10S.4W.4	GAROLD LEPPIN TAXLOT 700 MAP 10S.4W.4	B1N-100 GAROLD LEPPIN & MARCY KAY FOLLETT TAXLOT 300 MAP 10S.4W.9
LAND USE	AG	AG	AG

PIPELINE PROFILE
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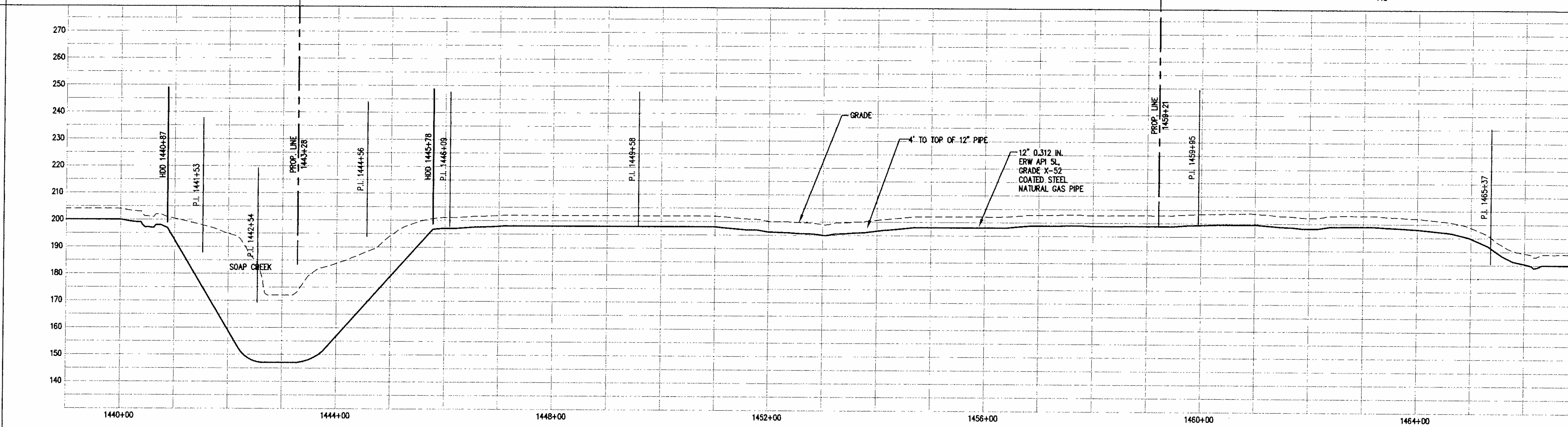

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[PATH: P:\Northwest Natural Gas Company\035886\Design\Drawings\Civil\035886-land-pp05.dwg] [LAYOUT: Sheet43]

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EXISTING GAS LINE
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EXISTING OVERHEAD UTILITIES
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LAST EDIT	2/10/2010
PLOT DATE	3/30/2011
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REVISIONS

NO.	BY	DATE	REMARKS

PLAN & PROFILE
STA. 1439+00 TO STA. 1467+00
NORTHWEST NATURAL GAS COMPANY
MID-WILLAMETTE FEEDER PROJECT

PROJECT NUMBER	DRAWING FILE NAME	SCALE
035886	035886-LAND-PP05	1"=100'

SHEET NUMBER
43

XREF INDEX:

OWNERSHIP	B1N-100 GAROLD LEPPIN & MARCY KAY FOLLETT TAXLOT 300 MAP 10S.4W.9	B1N-110 FRANK L. & LINDA C. BRICKER TAXLOT 502 MAP 10S.4W.9	CORVALLIS RD
LAND USE	AG	AG	R.O.W.

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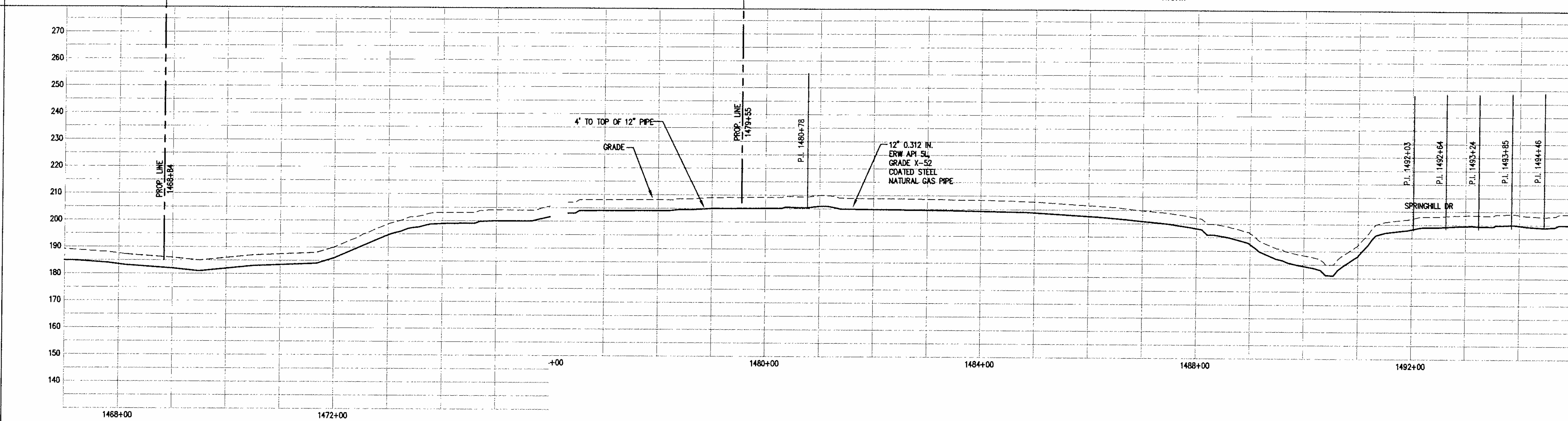
VERT: 1"=20'



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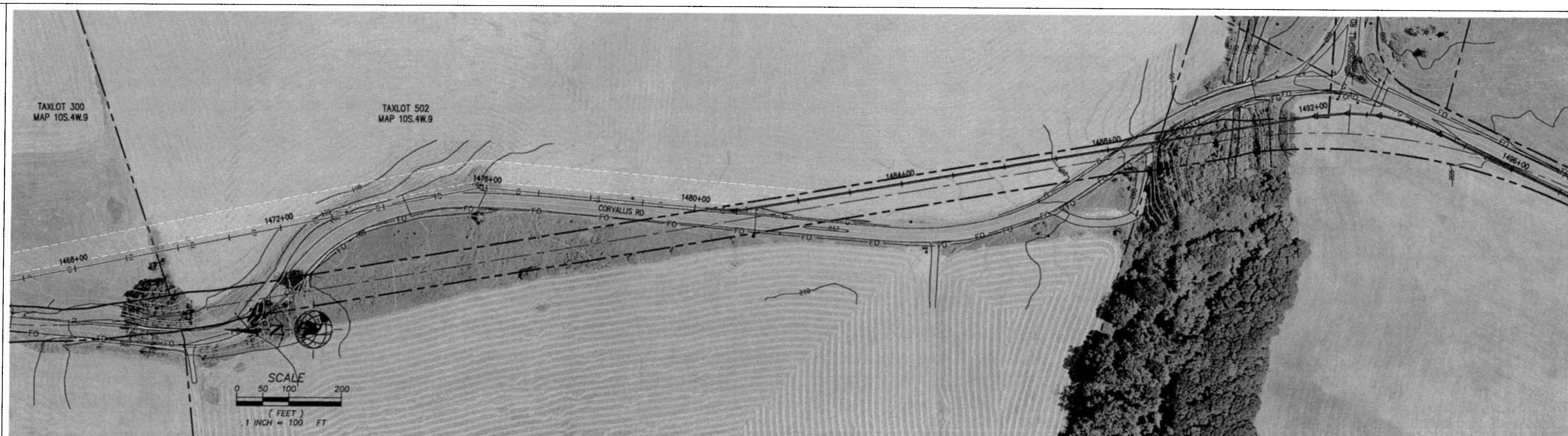

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[PATH: P:\Northwest Natural Gas Company\035886\Design\Drawings\Civil\035886-land-pp05.dwg] [LAYOUT: Sheet44]

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DESIGNED	DB
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LAST EDIT	2/10/2010
PLOT DATE	3/30/2011
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REVISIONS

NO.	BY	DATE	REMARKS

PLAN & PROFILE
STA. 1467+00 TO STA. 1495+00
NORTHWEST NATURAL GAS COMPANY
MID-WILLAMETTE FEEDER PROJECT

PROJECT NUMBER	DRAWING FILE NAME	SCALE
035886	035886-LAND-PP05	1"=100'

SHEET NUMBER
44

XREF INDEX:

OWNERSHIP	B1N-120 DENNIS L. BROWN & CLARA J. KRIEGER TAXLOT 700 MAP 10S.4W.9	B1N-130 DENNIS L. BROWN & CLARA J. KRIEGER TAXLOT 500 MAP 10S.4W.16
LAND USE	AG	AG

PIPELINE PROFILE
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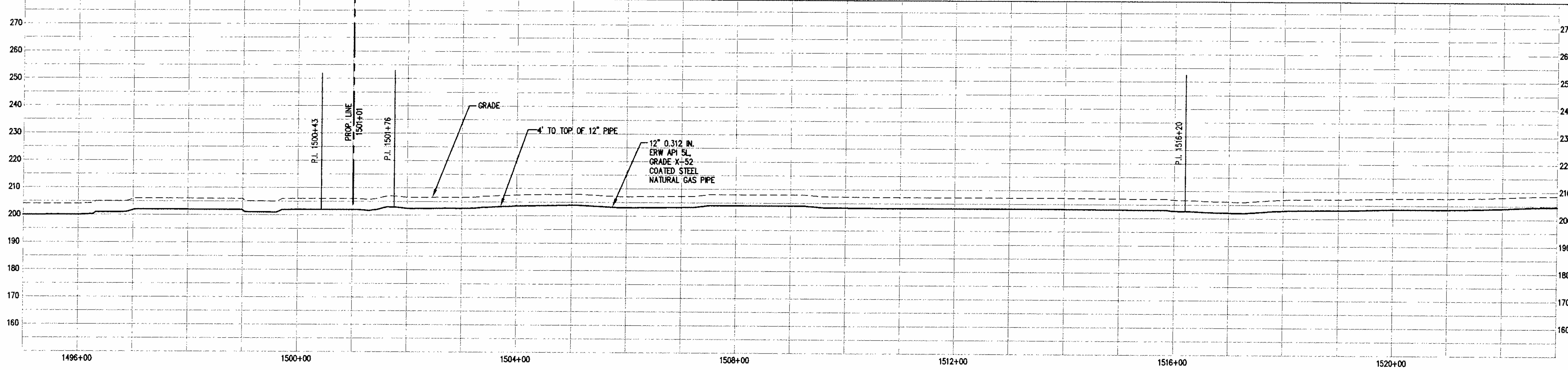

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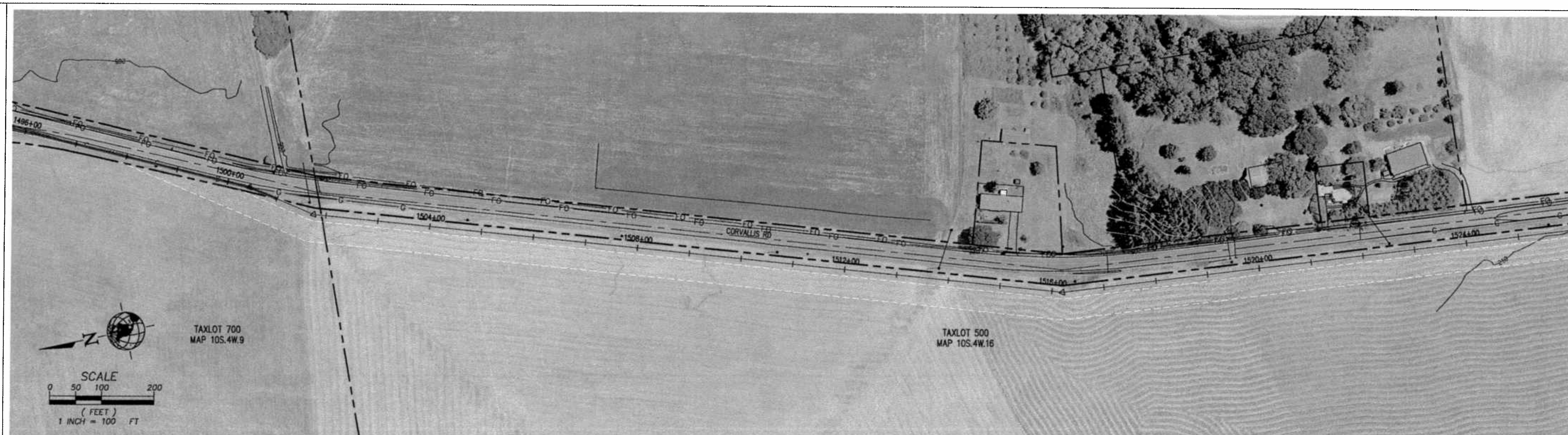
HORIZONTAL STATIONING SCALE: 1"=100'



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[PATH: P:\Northwest Natural Gas Company\035886\Design\Drawings\Civil\035886-land-pp05.dwg] [LAYOUT: Sheet45]

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PLOT DATE	3/30/2011
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PLAN & PROFILE
STA. 1495+00 TO STA. 1523+00
NORTHWEST NATURAL GAS COMPANY
MID-WILLAMETTE FEEDER PROJECT

PROJECT NUMBER	DRAWING FILE NAME	SCALE
035886	035886-LAND-PP05	1"=100'

SHEET NUMBER
45
— of —

Exhibit 2205

CONFIDENTIAL
SUBJECT TO MODIFIED PROTECTIVE ORDER

May 21, 2012

TO: Mark R. Thompson
Manager, Rates & Regulatory Affairs
NW Natural
220 NW 2nd Avenue
Portland, OR 97209

FROM: Lori Koho
Natural Gas Rates & Planning

OREGON PUBLIC UTILITY COMMISSION
Northwest Natural (NWN) Data Request to OPUC
Due May 29, 2012
NWN Data Request No DR 57

NWN Request:

57. Please refer to Staff/1100, Sobhy/2, lines 13-16 and Staff/1100, Sobhy/8, lines 3-7. Does Staff agree with the Company's proposal to recover the South of Monmouth Bare Replacement project through the System Integrity Program ("SIP")? If yes, please reconcile this position with Mr. Zimmerman's proposal to eliminate the SIP. If no, does Staff agree that the South of Monmouth Bare Replacement project should be included in rate base in this case? If Staff does not agree that the project should be included in rate base, please explain.

.

OPUC Response:

57. As noted in Staff/1100, Sobhy/2, lines 13-16 and Staff/1100, Sobhy/8, lines 3-7, the Commission authorized the current SIP mechanism in Order Nos. 09-067 and 11-337. Therefore, Staff does not address the elimination or continuation of the existing SIP mechanism. Accordingly, Staff addresses the South of Monmouth Bare Replacement project as a phase of the MWVF project within the scope of the current mechanism until further decision by the Commission. Mr. Sobhy's analysis excludes the South of Monmouth Bare Replacement phase from the remaining phases of the MWVF project since it falls within the currently authorized SIP mechanism. While the inclusion or exclusion of the South of Monmouth Bare Replacement phase is not within the scope of Mr. Sobhy's testimony, however, this issue

depends on two factors: 1) The Commission's decision to continue or discontinue the current SIP mechanism, 2) whether the in-service date satisfies the requirements of ORS 757.355.

NATURAL GAS
Rate Round-Up

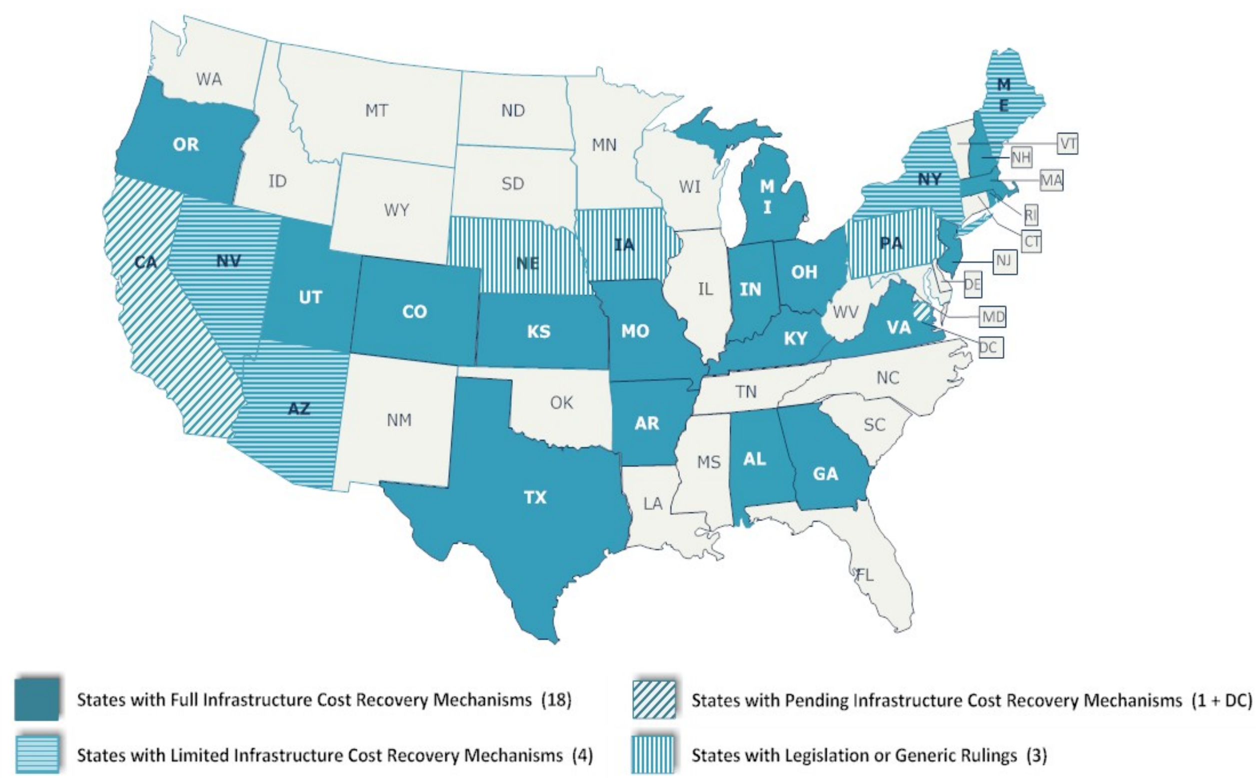
A Periodic Update on Innovative Rate Designs

June 2012

INFRASTRUCTURE COST RECOVERY UPDATE

In 2007, when AGA published its first report on infrastructure cost recovery methods, 15 natural gas utilities in 11 states serving 8 million residential natural gas customers were using innovative rate structures that allowed them to modify tariffs and recover the costs of investments in utility replacement incurred between rate cases. Since that time, the use of these advanced regulatory mechanisms has tripled. Today, 47 utilities in 22 states serving 24 million residential natural gas customers are using full or limited special rate mechanisms to recover their replacement infrastructure investments, and 5 utilities have mechanisms pending in another state and the District of Columbia. Ten states have enacted legislation or issued generic regulations that give utilities in three additional states the authority to implement these mechanisms. A further 14 utilities in 7 states are recovering these investments using rate stabilized tariffs. Together, these regulatory programs are helping natural gas utilities maintain safe and reliable service to more than 30 million of the nation's 65 million residential natural gas customers.

STATES WITH INFRASTRUCTURE COST RECOVERY RATE MECHANISMS



THE CHALLENGES OF INFRASTRUCTURE COST RECOVERY

Under traditional cost of service based ratemaking, the costs of natural gas utility infrastructure investments are recovered after the investment is in the ground and the regulator has approved the costs in a rate case. This system produces a significant lag between when the dollars are spent for infrastructure replacement and when the company begins to recover these expenditures in rates. In addition, while investments made to serve new customers or to deliver additional volumes of gas generate additional revenue, expenditures made to refurbish or to replace aging infrastructure do not produce incremental revenue.

Timely cost recovery of prudently incurred safety and reliability investments is of utmost importance to the financial stability of natural gas utilities. Because traditional ratemaking allows recovery of infrastructure investments only following approval in a rate case, there is often a multi-year delay before the recovery of such investments begins. Investments that are recovered long after they are incurred cause the utility to bear carrying costs without the opportunity to recover these prudent expenditures. Credit agencies criticize companies with lag in the recovery of their costs and assign a lower credit rating to such utilities that ultimately translates into higher rates for customers. The only alternative is to file a rate case each year, which is a costly activity that also leads to higher rates for customers.

RATE DESIGN SOLUTIONS

States have been encouraging natural gas companies to increase the investment levels necessary to maximize the safety and reliability of their systems. Since 2003, ten states have implemented new statutes or generic utility regulations concerning cost recovery of replacement and repair of natural gas infrastructures, and more than half of state regulatory commissions now allow utilities to use expense trackers or accounting deferrals to recover costs of infrastructure investments in a timely manner. These rate mechanisms reduce the costs associated with filing rate cases while reducing the regulatory lag associated with recovery of infrastructure investments. In addition, the mechanisms recognize that replacement investments will not lead to sales of additional volumes of natural gas that might otherwise have been expected to help recover the investments' cost.

Several rate design options are available for recovering expenses associated with replacing pipelines and other infrastructure that utilities incur after rates have been set. Trackers, surcharges, and rate stabilization mechanisms recover costs in the time period in which they are incurred, while deferral accounts delay the recovery of investments, and usually, carrying costs, until a future period. These mechanisms provide greater transparency and accountability than do traditional ratemaking methods. Infrastructure cost recovery mechanisms typically require that program funds be used exclusively for repair, replacement and improvements to pipelines and associated infrastructure, and that regulatory staff periodically audit program spending. Pre-program budget approval and after-the-fact prudency reviews are customary features of the regulatory approval process for these mechanisms.

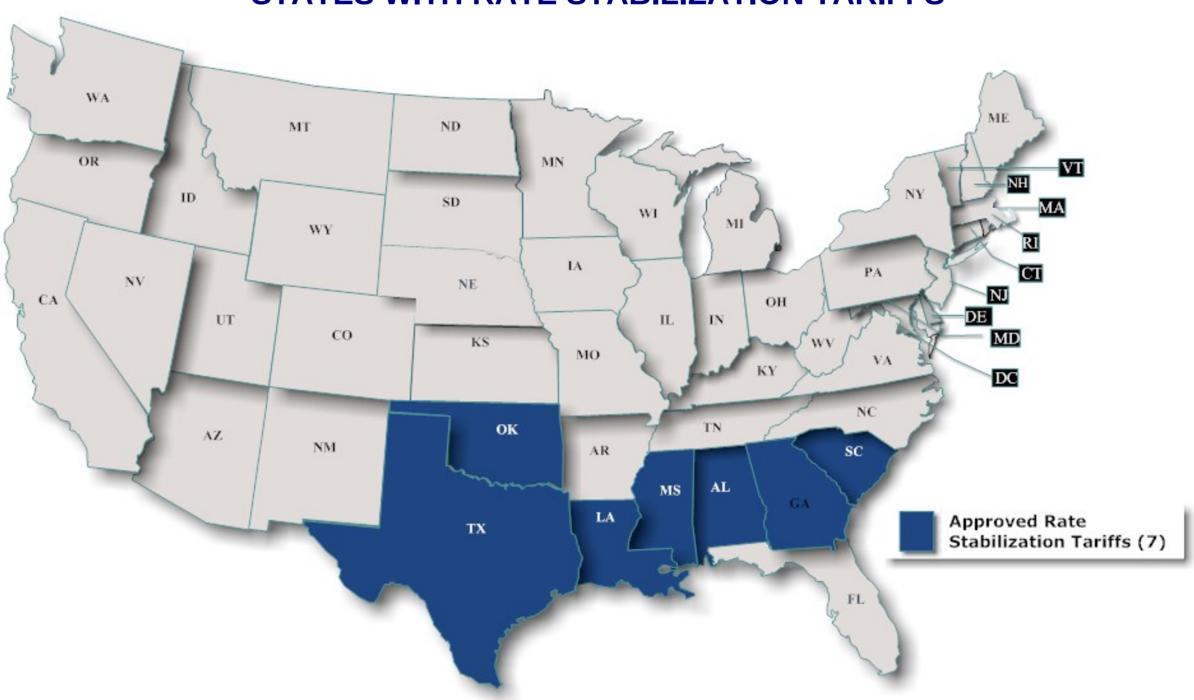
Tracker – A rate tracker is an example of an adjustment clause, a regulatory mechanism that allows a utility's rates to fluctuate in response to changes in operating costs or conditions, as they occur. Adjustment clauses have been in use since World War I, when the electric industry introduced them due to significant increases in the price of coal. Trackers may be automatic, actuated without the need for a formal rate hearing, or they may require additional regulatory review before they go into effect. Trackers allow the utility to adjust its tariff to facilitate the timely recovery of the capital costs, depreciation expense, and property taxes associated with the company's infrastructure investment program.

Surcharge to Rates – The most frequently used cost recovery method for infrastructure replacement cost programs is the surcharge to rates. A rate surcharge is a temporary adjustment to the customer bill that raises rates for a limited time by a fixed amount. Unlike the tracker, which allows the utility to recover ALL costs associated with infrastructure replacement, a surcharge limits the total amount of program cost recovery.

Deferral Account - Another option is the deferred accounting alternative. Using this approach, the utility treats infrastructure investment costs that are not included in the utility's existing rates in a segregated manner, thereby establishing a special deferred account. Generally, state authorities require a determination that the costs have been incurred prudently and have been accounted for properly. Often, these costs are deferred until the next rate case, at which time the costs are then amortized, recovered in rates, and the account balances are reduced or eliminated. In many cases, the assets in the deferral accounts accrue interest, and the interest is also amortized and recovered later in rates. The regulator may place limits on the amount or type of infrastructure costs that may be accrued, and on the time period over which the amortization may occur, and may require a showing of prudence in the incurring of specific costs.

Alternative Rate Design Method: Rate Stabilization – Rate stabilization is one of several rate designs that decouple the link between the volumes of gas consumed by a utility's customers and the revenues and cost recovery of the utility. A rate stabilization tariff operates much like a tracking mechanism since changes in ALL costs, including infrastructure investments, are tracked and flowed through to customers. With rate stabilization, rates are adjusted annually for new infrastructure replacement costs, as well as for costs for new construction. Utilities in seven states, serving 6 million customers, use this option to recover the incremental costs of new and replacement infrastructure investment. AGA discussed this rate design in a previous Rate Round-Up report, ***Rate Stabilization Mechanisms***.

STATES WITH RATE STABILIZATION TARIFFS



Related Programs: Pipeline Integrity Management - Related to programs that provide for the replacement of cast iron and bare steel infrastructure are programs that recover the costs of maintaining and improving pipeline integrity. Concerned about the magnitude of pipeline integrity management costs that were mandated by the Pipeline Safety Improvement Act (PSIA) of 2002, several utilities implemented rate options similar to the trackers, surcharges, and deferral accounts that are used to recover infrastructure investment costs. Some of these programs existed for a short time period (1-5 years) and have now expired, while other programs were wrapped into later infrastructure investment recovery programs and continue to recover expenses related to pipeline integrity management. Where pipeline integrity management program costs are still being recovered separately or have been subsumed into an infrastructure recovery program, program descriptions later in this report make a special note. AGA discussed cost recovery of these programs in the report, ***Rate Round-Up: Pipeline Integrity Management Cost Recovery***.

FULL INFRASTRUCTURE COST RECOVERY RATE MECHANISMS

1. Ameren Missouri
2. Atlanta Gas Light - GA
3. Atmos Energy – GA
4. Atmos Energy – KS
5. Atmos Energy– KY
6. Atmos Energy – MO
7. Atmos Energy – TX
8. Avista Corp. - OR
9. Black Hills Energy – KS
10. CenterPoint Energy - AR
11. CenterPoint Energy -TX
12. Columbia Gas Kentucky
13. Columbia Gas Massachusetts
14. Columbia Gas Ohio
15. Columbia Gas Virginia
16. Delta Natural Gas - KY
17. Dominion East Ohio
18. Duke Energy Kentucky
19. Duke Energy Ohio
20. Elizabethtown Gas – NJ
21. Kansas Gas Service
22. Laclede Gas - MO
23. Missouri Gas Energy
24. Mobile Gas Service - AL
25. National Grid Energy North - NH
26. National Grid Narragansett Gas - RI
27. National Grid Massachusetts
    NE – All Natural Gas Utilities May Apply
28. New England Gas - MA
29. New Jersey Natural Gas
30. NW Natural – OR
    PA - All Natural Gas Utilities May Apply
31. Public Service Co. of Colorado
32. Public Service Electric and Gas - NJ
33. Questar Gas - UT
34. SEMCO Energy - MI
35. South Jersey Gas
36. Texas Gas Service
37. Vectren North – Indiana Gas
38. Vectren Ohio
39. Vectren South – SIGECO
40. Washington Gas – VA

LIMITED INFRASTRUCTURE COST RECOVERY RATE MECHANISMS

1. Corning Natural Gas - NY
   Iowa- All Natural Gas Utilities May Apply
2. National Grid Long Island – NY
3. National Grid Niagara Mohawk - NY
4. National Grid New York City
5. Northern Utilities – ME
6. Southwest Gas – AZ
7. Southwest Gas - NV

PENDING INFRASTRUCTURE COST RECOVERY RATE MECHANISMS

1. Michigan Consolidated – MI
2. San Diego Gas and Electric - CA
3. Southern California Gas
4. Southwest Gas - NV
5. Washington Gas - DC

CURRENT RATE STABILIZATION TARIFFS

1. Alabama Gas
2. Atmos Energy - GA
3. Atmos Energy – LA
4. Atmos Energy – MS
5. Atmos Energy – TX
6. CenterPoint Energy – LA
7. Centerpoint Energy – MS
8. CenterPoint Energy – OK
9. CenterPoint Energy – TX
10. Entergy – LA
11. Mobile Gas – AL
12. Oklahoma Natural Gas
13. Piedmont Natural Gas – SC
14. South Carolina Electric and Gas

STATES WITH LEGISLATION OR GENERIC REGULATORY MECHANISMS

1. **Iowa - 2011**
2. **Kansas - 2006**
3. **Kentucky - 2005**
4. **Missouri - 2003**
5. **Nebraska - 2009**
6. **New Jersey - 2009**
7. **Pennsylvania - 2012**
8. **Rhode Island - 2010**
9. **Texas – 2003 and 2011**
10. **Virginia - 2010**

SUMMARY

Maintaining the safety and reliability of the nation's natural gas pipeline system remains the number one priority for AGA and its member utilities. Natural gas utilities annually incur billions of dollars in normal maintenance, safety, and operating expenses, and they recover these costs from customers in rates. Utilities also invest billions annually in system repairs, renovations, and new construction, but these new investments often are deferred until the next utility rate case. In 2011, natural gas utilities invested nearly $6 billion in their distribution systems.

Congress, the U.S. Department of Transportation, and state commissions are devoting greater attention to the need for additional investment in the infrastructure required to maintain and improve the safety and reliability of the distribution network. More than half of the states now allow utilities to recover the costs incurred between rate cases associated with replacing aging infrastructure, and ten states have implemented legislation or state-wide regulatory programs to comprehensively address infrastructure issues. Rate surcharges, cost trackers, and deferral accounts are rate mechanisms that specifically address infrastructure investment cost recovery, while rate stabilization is a type of rate design that is more general and recovers infrastructure investment as well as other costs incurred between rate cases. Twenty-two states have implemented infrastructure cost recovery mechanisms, and rate stabilization tariffs provide accelerated cost recovery in seven states. Together, these programs help utilities maintain safe and reliable service to more than 30 million of the nation's 65 million residential natural gas customers.

DESCRIPTIONS OF PROGRAMS AND LEGISLATION

Alabama – Mobile Gas Service – Docket No. 24794

Mobile Gas' Cast Iron Main Replacement Factor was approved by the Alabama Public Service Commission on November 27, 1995, as part of the company's general rate case. The program recovers the annual revenue requirement level of depreciation, taxes, and return associated with cast iron main replacements, adjusted for cumulative cast iron main retirements. The tracking mechanism is applied to all rate classes and is updated annually for incremental investment in cast iron main replacements.

Arizona – Limited Program Southwest Gas – Docket No. G-01551A-10-0458

Southwest Gas Corporation's January 6, 2012 rate case settlement provides for implementation of the Customer Owned Yard Line (COYL) replacement program. A normal service line configuration is one in which a meter is located adjacent to the housing structure and the service line from the meter to the gas main is owned and maintained by the utility. In contrast, approximately 100,000 of Southwest's customers have line configurations where the meter is located at or near the customer's property line near the gas main and the service line from the meter to the residence is owned by the customer or property owner. For these customers, responsibility for service line (yard line) maintenance is borne by the customers.

Pursuant to Southwest's COYL replacement program, over a three year period, the company will survey all COYLs for leaks and if leaks are found, the company will replace the COYL with a normal service line configuration. Subject to an annual reporting requirement, Southwest will be permitted to recover an amount approximately equal to the revenue requirement associated with the additional plant had it been in rate base during the test year. The mechanism will utilize a surcharge and all rate classes will be included. The surcharge is capped annually at one cent per therm.

Arkansas – CenterPoint Energy Southern Operations – Dockets 06-161-U and 10-108-U

CenterPoint's main replacement program is a tracker that applies to the replacement of bare steel mains, cast iron mains, and associated services. The company's Gas Main Replacement Program (GMRP) first became effective on January 1, 1988. The GMRP gave CenterPoint a return on its capital investment between rate cases as an incentive to replace, rather than repair, cast iron and other gas mains. On December 18, 1992, the program was modified to include recovery of capital investment (depreciation) and an offset to reflect O&M savings, the scope was expanded to include all cast iron gas main and related services, and the tariff was renamed the Cast Iron Gas Main Replacement Program (CIGMRP). The program was again modified to include bare steel and associated services and was renamed the Main Replacement Program, effective September 21, 2002.

The tracker is adjusted monthly with a commission filing and is collected from all classes of service through a volumetric charge. There is no true-up. A rate case is not required; however, when a general rate case is filed, expenditures are moved from tracking account to base rates. There is no term limit to the program, but the estimated completion date is 2026, based on the assumed funding and replacement amounts as shown in the company's 2010 Main Replacement Program Annual Report.

Colorado – Public Service Co. of Colorado – Docket No. 10AL-963G

On September 1, 2011, Public Service Company of Colorado received approval from the Colorado Public Utilities Commission to implement a pipeline system integrity adjustment tracker to recover costs associated with reliability improvements and compliance with certain federal safety regulations. Most of the program covers replacement pipe, but some upsizing pipe for transmission lines and changes to increase pressure systems (from inches to 60 psi systems, as an example), is also included when there is a concurrent safety and reliability concern. Projected costs of eligible program and projects during the upcoming calendar year are filed on October 1, and the mechanism is adjusted annually on January 1. No rate case is required to implement the mechanism.

Georgia – Atlanta Gas Light – Docket No. 8516-U

In 1998, Atlanta Gas Light began a 15-year Pipeline Replacement Program (PRP) to replace more than 2,300 miles of bare steel and cast iron natural gas pipeline in Georgia. In the early years, the Georgia Public Service Commission annually reviewed the company's infrastructure replacement expenses from the previous year and then approved a new surcharge amount. Halfway through the program, the commission agreed to a fixed dollar amount of expense to be recovered in rates over the remaining seven years of the program.

In 2009, Atlanta Gas Light significantly expanded the replacement program to include investments for infrastructure to serve new customers and expand service. The Strategic Infrastructure Development and Enhancement program merged with the company's existing PRP and allows the company to invest $400 million over the next ten years in infrastructure improvements. Those improvements include upgrading the backbone of the utility's distribution system and liquefied natural gas facilities to improve system reliability and create a platform to meet forecasted growth. The program was further expanded in 2010 and allows Atlanta Gas Light to invest up to $45 million to extend its pipeline facilities to serve customers without pipeline access. The new program will also allow Atlanta Gas Light to install pipelines to create new economic development corridors in order to help spur growth.

No rate case is required for the programs, but every three years the company must file its plan for the upcoming three years with the Georgia PSC. The mechanism is a surcharge with the tracked over and under collection of program costs to be refunded or surcharged at program completion in 2025. The maximum monthly amount that may be surcharged to residential customers is $3.13. The maximum that may be surcharged to smaller volume general service customers (less than 5,000 therms per day) is currently $7.03 per month. The maximum that may be surcharged to larger volume general service customers (greater than 5,000 therms per day) is currently $49.93 per month.

Georgia – Atmos Energy - Docket No. 12509-U

Atmos utilizes a surcharge mechanism that was implemented June 21, 2000, to recover the costs of replacing 184 miles of cast iron pipe in 15 years and 46 miles of bare steel pipe in 20 years.

Indiana – Vectren North - Indiana Gas - Cause No. 43298

In its most recent rate case in 2008, Vectren North (Indiana Gas) received approval to implement a tracking mechanism that allows the utility to defer expenses associated with investments in infrastructure replacement projects. Vectren defers the recovery of depreciation expense and property taxes and continues to utilize the allowance for funds used during construction (AFUDC) for 4 years from the date that each replacement was put in service. The company is allowed to defer up to $20 million per year. All projects receiving the accounting treatment at the time the company files its next base rate case continue to receive that treatment until a base rate order is issued; projects that are included in rate base and initiated after a rate case is filed are also eligible for the deferral accounting and later recovery.

Indiana – Vectren South - SIGECO - Cause No. 43112

In its 2006 rate cases, Vectren received approval of a tracking mechanism for recovery of an accelerated bare steel and cast iron pipeline replacement program for Vectren South (Southern Indiana Gas and Electric Company). The company defers the recovery of depreciation expense and continues AFUDC for a period of 3 years from the in-service date of each replacement project; the accounting treatment is limited to $3 million of program investment per year. Any projects receiving the accounting treatment at the time the company files its next base rate case continue to receive that treatment until a base rate order is issued; projects that are included in rate base and initiated after a rate case is filed are also eligible for the treatment.

Iowa Limited Program Generic Rule of the Utilities Board – Docket No. RMU-2011-0002

On October 13, 2011, the Iowa Utilities Board adopted a rule that allows natural gas utilities to implement either of two types of automatic adjustment mechanisms for recovery of a limited number of capital infrastructure investments outside of a general rate proceeding. Under one of the procedures, a utility may file for a mechanism that meets four specific and limiting criteria. Under the second procedure, a utility may implement an automatic adjustment mechanism by filing a proposed tariff that will establish a rate for recovery of eligible investments that are required by government mandates or are required by state or federal pipeline safety mandates. No utility has yet implemented either of the adjustment mechanisms.

Kansas State Wide Legislation

In April 2006, the Kansas legislature passed the Gas Safety and Reliability Policy Act (K.S.A. 66-2201 through 66-2204) that approved the implementation of a gas system reliability surcharge for Kansas natural gas utilities. Utilities in the state may surcharge between 0.5% and 10% of revenues to recover new infrastructure replacement costs not already in rates. Rates are adjusted annually. The surcharge may continue for no more than 5 years after the last rate case and then a new case must be held if the surcharge is to be continued.

Kansas – Atmos Energy – Docket No. 10-ATMG-133-TAR

Atmos has had a replacement program in Kansas since the 1980s. The current surcharge mechanism is authorized by the Kansas Gas Safety and Reliability Policy Act.

Kansas – Black Hills – Docket No. 05-AQ-367-RTS

In 2008, Black Hills implemented a surcharge mechanism under the authority of the Gas Safety and Reliability Policy Act. The mechanism covers both non-revenue producing replacement infrastructure and government mandated infrastructure relocations. The maximum amount the company is allowed to surcharge customers is an additional $0.40 per month above the base rates.

In an earlier order issued on May 4, 2005, Black Hills (then Aquila) received approval to implement a $0.2 million surcharge annually for three years for the recovery of the costs of replacing the gas main that runs parallel under pavement the entire length of 13th Street in Wichita, Kansas. At the end of the three-year period, the company was required to true-up if the actual cost of the project and the actual amount collected from customers under the surcharge.

Kansas – Kansas Gas Service – Docket No. 07-AQLL-431-RTS

Kansas Gas Service first began collecting the Gas Safety and Reliability Policy Act surcharge in 2009. The surcharge permits the company the opportunity to recover a return, taxes and depreciation on eligible safety and governmental relocation capital expenditures. The maximum increase in any given year is limited to $0.40 per month per residential customer. There are additional time limitations for such collections before Kansas jurisdictional utilities must file for an increase in base rates, at which time the surcharge would reset to zero and such costs would be recovered in base rates.

Kentucky State Wide Legislation
On June 20, 2005, Kentucky enacted KRS 278.509, Recovery of Costs for Investments in Natural Gas Pipeline Replacement Programs, that approved the implementation of a natural gas system replacement tracking mechanisms for Kentucky natural gas utilities.

Kentucky – Atmos Energy - Case No. 2009-00354
On May 28, 2010, the Kentucky Public Service Commission authorized Atmos Energy to implement a pipeline replacement program cost recovery surcharge that will be used to replace all bare steel mains over a 15 year period.

Kentucky – Columbia Gas – Case No. 2009-00141
Columbia Gas of Kentucky received approval of its Accelerated Main Replacement Program (AMRP) tracker as part of its last base rate case in October 2009. The AMRP allows for the recovery of investments to replace bare steel and cast iron mains and associated appurtenances for the previous calendar period. The revenue requirement reflects an offset of estimated O&M savings associated with the infrastructure replacement. Columbia earns a return on its investment at the rate allowed in its last base rate case proceeding, and a depreciation allowance at the most recently approved depreciation rates. The filing is made annually on March 1 to reflect cumulative programs costs, with new rates going into effect as early as June of each year.

Kentucky – Delta Natural Gas – Case No. 2010-00116
In October 2010, the Kentucky Public Service Commission authorized Delta Natural Gas to implement a pipe replacement program (PRP) rider to facilitate recovery of certain infrastructure costs. Delta's tracking mechanism, which began in 2011, is primarily for replacements but also contains a provision for new expenditures necessary to meet current safety or operational standards. There are no caps on the amount that may be recovered through the tracker, and there is no term limit to the mechanism.

Kentucky – Duke Energy Kentucky – Case No. 2001-00092
The company has had an accelerated main replacement mechanism in place in Kentucky since 2001. The mechanism applies to all customers receiving service under the company's sales and transportation rate schedules. The charge, which is calculated annually, is assessed monthly and is a flat fee for residential and general service customers and is volumetric for interruptible transportation customers.

Maine – Limited Program – Northern Utilities – Docket No. 2011-92
In November 2011, the Maine Public Utilities Commission authorized Northern Utilities to implement a limited, one year, incremental step adjustment of $0.9 million effective May 1, 2012, to reflect investments made under the company's Cast Iron Replacement Program (CIRP) in 2011. In accordance with a July 2010 PUC order, Northern Utilities had sought to implement a targeted infrastructure replacement adjustment (TIRA) tracker to reflect incremental CIRP investments beginning in 2012. However, the commission did not approve a permanent tracker but allowed the more limited mechanism for one year.

Massachusetts – Columbia Gas Massachusetts – Docket No. DPU 09-30
Columbia Gas of Massachusetts (formerly Bay State Gas) received approval of its Targeted Infrastructure Reinvestment Factor (TIRF) as part of its last base rate case in October 2009.

The TIRF allows for the recovery of the revenue requirement associated with bare steel capital additions for the previous calendar year, including: mains, services, service tie-ins, meters, meter installations, regulators, and industrial measuring and regulating equipment. The revenue requirement reflects an offset of estimated O&M savings associated with the infrastructure replacement. The initial filing is made on May 1 of each year, with new rates going into effect each November.

The TIRF tracking mechanism costs are recovered as a component of Columbia's Local Distribution Adjustment Clause mechanism. There is a revenue recovery cap of 1% of total revenue (including gas costs). The replacement time period is expected to be 10-15 years.

Massachusetts – National Grid Massachusetts – Docket No. DPU 09-30
In November 2010, the Massachusetts Department of Public Utilities (DPU) issued a decision in a rate case for National Grid Massachusetts companies Boston Gas, Essex Gas and Colonial Gas. The DPU adopted targeted infrastructure recovery factors for the companies. The TIRFs provide for the recovery of costs associated with the accelerated replacement of gas mains, and the companies are allowed to surcharge customers up to 1% of total revenue.

Massachusetts – New England Gas – Docket No. DPU-10-114
On March 31, 2011, New England Gas received authorization from the Massachusetts Department of Public Utilities to implement a TIRF to provide recovery of incremental expenditures associated with reinforcing the system and meeting public safety goals.

Michigan – SEMCO Energy – Docket No. U-16169
On Jan. 6, 2011, the Michigan Public Service Commission adopted a settlement that establishes a main replacement program rider. This mechanism will enable SEMCO Energy to recover the incremental capital-related costs associated with the accelerated removal and replacement of cast iron and unprotected steel service lines and mains. Pipe replacement began in 2011 and the cost recovery surcharge mechanism will begin June 2012. The new program will reduce the replacement time from 60 years to 25 years.

The program expires in 5 years unless extended by order in a new rate case. The surcharge is $0.25 per residential customer per month, $0.54 per month for the smallest commercial customers, and up to $500 per customer per meter for large transportation customers. A minimum of 13 miles of incremental main replacement is required (approximately $4.5 million new investment per year), and there is no cap on the amount of money or miles of pipe that may be replaced in one year.

Missouri State Wide Legislation
The Infrastructure System Replacement Surcharge (ISRS) mechanism was the result of a revision to Missouri Statute 393.1009-1015. The ISRS allows the rates of a gas utility to be adjusted twice per year to provide for the recovery of costs of eligible infrastructure system replacements. Companies using the ISRS must file a rate case at least every 3 years. The legislation requires that the Missouri Public Service Commission approve a mechanism that produces total annualized ISRS revenue of no less than one million dollars or one-half of one percent of the gas utility's base revenue level, as approved in the company's last rate case. The legislation also requires that the mechanism be capped such that total annualized ISRS revenue is no greater than ten percent of the utility's base revenue level granted in the last rate case.

Missouri – Ameren – GT-2009-0413
Ameren Missouri filed its first ISRS in 2007. The program is a surcharge to rates, covers only replacement pipe, and has the rate case parameters and revenue floors and caps specified in the Missouri legislation. On Jan. 19, 2010, the Missouri Public Service Commission adopted a settlement in the company's rate case authorizing a transfer to base rates of $3.4 million that was being recovered through the infrastructure system replacement surcharge.

Missouri – Atmos Energy - Rule CSR 240-3.265
Atmos implemented the ISRS mechanism in its Missouri jurisdiction in 2008. The mechanism follows the requirements of the enabling Missouri legislation.

Missouri – Laclede Gas – Docket No. GR-2007-0208
In 2004, Laclede Gas implemented the ISRS as a result of its 2003 rate case. In a July 9, 2007 announcement of the settlement of its 2006 rate case, Laclede agreed to transfer to base rates the $5.5 million that was the cumulative amount that had been added to rates since the 2003 rate case and that was being collected in the ISRS. In November 2007, Laclede added an additional $1.64 million of new costs to the surcharge account. In a settlement of its 2009 rate case, Laclede agreed in August 2010 to transfer to base rates $10.9 million of costs currently being collected through the ISRS.

Missouri – Missouri Gas Energy – Docket No. GR-2009-0355
Missouri Gas Energy's mechanism follows the requirements of the enabling Missouri legislation. As part of its 2007 rate case, Missouri Gas Energy transferred $3.7 million from the ISRS account into base rates.

Nebraska State Wide Legislation
The Infrastructure System Replacement Surcharge (ISRS) mechanism was the result of a revision to Nebraska Statutes 66-1865, 66-1866, and 66-1867, effective Aug. 30, 2009. The ISRS allows the rates of a gas utility to be adjusted twice per year to provide for the recovery of costs of eligible infrastructure system replacements. Companies using the ISRS must file a rate case at least every 5 years. The legislation authorizes a range of program cost recovery of at least one million dollars or one-half percent of the jurisdictional utility's base revenues approved by the commission in the utility's most recent general rate proceeding, up to but not exceeding ten percent of the utility's base revenues approved during the last rate proceeding. No utility has yet implemented an ISRS mechanism.

Nevada – Limited Program - Southwest Gas – Docket No. 11-03029
In 2011, Southwest received approval of a limited mechanism that allows the company to defer the depreciation expense and rate of return associated with specific replacement projects the company undertook as a result of the bonus depreciation that was available in 2011 and 2012. As part of its 2012 rate case (see pending mechanisms below), Southwest has petitioned to consolidate the current, limited program, with a second program to replace early vintage plastic pipe and steel pipe.

New Hampshire – National Grid NH/Energy North Natural Gas – Docket No. DG 10-017
Energy North Natural Gas has had a Cast Iron Bare Steel (CIBS) Replacement Program for several years. In its 2009 rate case, Energy North proposed to modify its annual CIBS rate adjustment mechanism to include public works projects and to eliminate the $0.5 million annual threshold required prior to cost recovery. However, on March 10, 2011, in a settlement, the New Hampshire PUC called for the CIBS rate adjustment mechanism, as currently structured, to remain in effect.

New Jersey – State Wide Program of the Board of Public Utilities

On April 16, 2009, the New Jersey Board of Public Utilities (BPU) approved accelerated infrastructure programs for five of the seven major utilities that had filed such plans. In aggregate, the approved plans provide for the utilities to invest $956 million in incremental infrastructure and energy efficiency programs over the next two years. For the most part the costs of these programs are to be recovered through separate adjustment mechanisms.

The proposals were tendered following discussions among state leaders and comport with then Gov. Jon Corzine's (D) economic stimulus plan. The expenditures outlined in these programs are incremental to the level of investment that the utilities had planned as part of their ongoing business operations.

New Jersey – New Jersey Natural Gas – Docket No. GO09010052

In 2009, New Jersey Natural Gas received approval to invest $71 million in new infrastructure and system upgrades; construction was completed in August 2011. In 2011, the BPU granted New Jersey Natural approval to invest an additional $60 million in new infrastructure and upgrades, with an expected completion date of October 2012. The recovery mechanism is not a typical tracker or surcharge. New Jersey Natural is recovering the costs of its infrastructure projects through adjustments to base rates.

New Jersey – Elizabethtown Gas – Docket No. GO09010053

Elizabethtown Gas implemented its Utilities Infrastructure Enhancement Program in 2009. Part of the state-wide economic incentive plan, the program includes both the costs of replacing cast iron pipes and investments in specified new main extensions. While no rate case is required to implement the plan, expenditures on the approved projects are subject to a prudency review. In the 2009 decision, Elizabethtown Gas agreed to expend an incremental $60.4 million on infrastructure upgrades during the period. The recovery mechanism was through a surcharge.

In 2011, Elizabethtown Gas was granted approval for an extension of the program through 2012 with additional capital investment of $40 million. The recovery mechanism continued to be a surcharge through September 2011. Effective October 2011, the surcharge rolled into base rates. Projects completed and placed in service in the interim through October 2012 would be accounted for as a deferral and rolled into base rates effective January 2013.

The company's previous replacement program was a deferral account. The mechanism allowed for the recovery of up to $1.5 million of costs associated with the accelerated replacement of about 60 miles of elevated pressure 8-inch cast iron main. Those costs were rolled into rates as part of the company's 2009 rate case.

New Jersey – Public Service Electric and Gas – Docket No. GO09010050

In April 2009, Public Service Electric and Gas Co. (PSE&G) received BPU approval of an infrastructure investment program. The settlement identified several qualifying projects totaling $273 million of investments over a 24-month period. The recovery mechanism, the Capital Adjustment Charge (CAC), is a deferral account that is adjusted each January based on forecasted program expenditures. Between adjustment periods, over and under-recovered program balances are subject to interest at the short-term debt rate, net of tax.

PSE&G spent $83 million on approved infrastructure projects in 2009 and collected approximately $5.7 million through the CAC. The CAC was adjusted on a provisional basis on January 1, 2010. At the conclusion of PSE&G's base rate case in July 2010, the infrastructure projects that were placed in service through the end of 2009 were removed from the deferred account and rolled into rate base, and the CAC was adjusted accordingly, again on a provisional basis. PSE&G spent $170 million on approved infrastructure projects and collected approximately $11.6 million through the CAC in 2010.

In November 2010, PSE&G made its second annual filing to update the CAC to cover the remaining infrastructure investments under the program. The company also filed for an extension of the Capital Stimulus program, seeking BPU approval for an additional $78 million in infrastructure investments from May 2011 through April 2012. The company proposed to remove from the deferred account the unrecovered Capital Stimulus expenditures for projects that would be placed in service by June 30, 2011 and roll into base rates the associated costs. If approved, PSE&G expects the roll-in will result in an increase in base rates of $22 million, with a corresponding reduction in the CAC. A decision is expected soon.

New Jersey – South Jersey Gas – GR 09110907, GR 10100765, GO 11100632
In April 2009 the New Jersey Board of Public Utilities approved the Capital Investment Recovery Tracker (CIRT) mechanism for South Jersey Gas. At that time, the BPU approved an investment of $103 million to be made in specific infrastructure projects that were incremental to the company's 2009 and 2010 capital budgets.

As part of a base rate case order in September 2010, South Jersey rolled into rate base approximately $81 million of completed CIRT investments. This resulted in an increase to base rates and a tracker reduction. The rate case order also provided for a Phase II proceeding in which the remaining $23 million of projects are to be rolled into rate base in October 2011. The rate case order created a nexus between the CIRT and base rate case proceedings.

On March 31, 2011, the BPU approved the continuation of the accelerated infrastructure programs for South Jersey Gas. The company will invest approximately $60 million to accelerate previously planned capital projects that must be completed by October 31, 2012. These CIRT–II projects are scheduled to be rolled into rate base on October 1, 2011 and January 1, 2013. In March 2011 order, the BPU extended Phase II of the base rate case to facilitate the CIRT–II roll-in.

On May 1, 2012, the Board ordered the company to allocate an incremental $35 million of capital expenditures for the accelerated replacement of unprotected steel and cast iron mains and to establish a CIRT III rate of $0.0107 per therm (including sales and use tax), effective March 1, 2013, for the cost recovery of the additional investment.

The criteria for CIRT–I, CIRT–II and CIRT III projects are the same: 1) they must assist the company in providing safe, adequate and proper service to customers; 2) project expenditures must be incremental to SJG's annual capital budget; 3) and they must support New Jersey's economic stimulus objectives, including creating jobs in New Jersey. Projects being rolled into rate base will be subject to a prudency review. The CIRT programs reduce the time period over which infrastructure is replaced from 46 years to 20 years.

New York – Limited Program - Corning Natural Gas – Docket No. 08-G-1137
Corning Natural Gas has had a limited pipeline replacement cost recovery mechanism since 2006. The company has replaced nearly 36 miles of older mains and 1,900 services. The company replaces about 7 miles of pipe per year, and expects the program to require another 10-15 years to complete. The company is also relocating gas meters that are inside the house to a location on the outer wall of the structure that is as close to the main as possible and safe.

New York – Limited Program - National Grid Long Island – Docket No. 06-M-0878
National Grid Long Island has had a limited infrastructure replacement tracker program since 2008. The program allows the utility to track only the costs of new or replacement infrastructure

that are necessitated by city and state construction projects. These costs are deferred to be recovered in the future. No other infrastructure investment costs are allowed this treatment. There are no caps on the amount of money that may be deferred.

New York – Limited Program - National Grid NYC – Docket No. 06-M-0878
The limited infrastructure replacement tracker at National Grid NYC is similar to the one at National Grid Long Island. The program has been in place since 2008 and covers only those costs that are necessitated by city and state construction projects.

New York – Limited Program - National Grid Niagara Mohawk – Docket No. 06-M-0878
Niagara Mohawk has had a limited pipeline replacement cost recovery mechanism since 2008. Prior to that time, the company had replaced approximately 20 miles of leak-prone pipe annually. The limited program, which is scheduled to run for 5 years, ordered the company to replace a cumulative total of at least 150 miles of pipe and not less than 25 miles in any one year. Failure to meet the cumulative or any of the annual minimum targets would result in a revenue adjustment of $840,000.

Ohio – Columbia Gas of Ohio – Case No. 08-72-GA-AIR
Columbia Gas of Ohio received approval of its Infrastructure Replacement Program (IRP) tracker as part of its last base rate case that was approved December 2008. The IRP allows for the recovery of calendar year investments to replace: 1) bare steel and cast iron mains and associated service lines, 2) prone to fail risers, 3) hazardous customer service lines, and 4) installation of automated meter reading devices. The IRP also allows for recovery of post-in-service carrying costs, property taxes, and depreciation, and reflects O&M savings as a result of the program. Columbia earns a return on its investment at the rate allowed in its last base rate case and is subjected to rate caps, set at the anticipated investment level projected by the company. The initial filing is made each November 30 of the investment year, with actual data filed on February 28 of the recovery year. New rates go into effect each May.

Columbia's IRP is a fixed surcharge capped at the following amounts for small general service customers: $1.10 per month in year 1; $2.20 per month in year 2; $3.20 in year 3, $4.20 in year 4; and $5.20 in year 5. The cap on small commercial customers (less than 300 Mcf/month) is the same as the small general service customer. There is no cap on customers taking more than 300 Mcf per month.

The IRP is authorized for an initial five year period, and no rate case is required. Columbia may request the IRP be renewed through the filing of a base rate case or pursuant to an alternative rate design method as provided for in Section 4929.05 of the Revised Code of Ohio.

Ohio – Dominion East Ohio – Case No. 09-458-GA-RDR
Dominion East Ohio's Pipeline Infrastructure Replacement (PIR) tracker program was initially approved in the company's rate case on October 15, 2008 for costs associated with infrastructure replacements starting July 1, 2008. The program primarily covered bare steel, cast iron, wrought iron and copper pipeline replacements, but ongoing infrastructure investments could be included provided the rate cap was not exceeded. Dominion East Ohio's program specified a fixed monthly surcharge for most rate schedules and a volumetric charge for the industrial class; annual adjustments required an application supported by rate schedules and involved an expedited procedural schedule. Under the program as initially approved for the first five years, the monthly surcharge for residential and small commercial customers could be no greater than $1.12 per customer in year 1, with annual increases to the monthly charge of no greater than $1.00 thereafter.

On March 31, 2011, Dominion East Ohio filed a motion with the Public Utilities Commission of Ohio requesting approval to modify the program due to an increase in the identified scope of the program and in response to recent increased national concern about pipeline safety. The company proposed an increase in annual investment from approximately $100 million per year to more than $200 million per year. A rate case was not required for the proposed modification of the program. In August 2011, the Ohio Commission approved a stipulation filed jointly by Dominion East Ohio, the Staff of the Ohio Commission and other interested parties in the accelerated PIR proceeding. The stipulation provides for an increase in annual PIR capital investment from the current level to approximately $160 million by 2013, and a change from a fiscal year ending June 30 to a calendar year. In addition, the stipulation provides for cost recovery over a new five-year period commencing upon the approval of the Public Utilities Commission, with the monthly cost recovery charge for residential and small commercial customers to increase by no more than $0.65 per customer in May 2012 for the transitional half-year filing through December 31, 2011; no more than $1.15 in May 2013 for the calendar year 2012 filing; and no more than $1.40 annually thereafter. Although there is no specified annual cap in miles, the miles of replacement are limited by the cap on the cost recovery charge. The modified program no longer includes ongoing infrastructure investments and continues the approved infrastructure replacements over the original program estimate of 25 years.

Ohio – Duke Energy – Case No. 01-1228-GA-AIR

Duke Energy (previously Union Light Heat and Power) has had an accelerated main replacement tracker in place for all sales and transportation customers in Ohio since 2000. All customers except interruptible transportation customers are assessed a monthly charge in addition to the customer charge component of their applicable rate schedule. Interruptible customers are assessed a throughput charge in addition to their commodity delivery charge for accelerated main replacement. The maximum monthly charge for any interruptible transportation customer is $500.00 per account. The tracking mechanism is updated annually in order to reflect the impact on the company's revenue requirements of net plant additions, as offset by operations and maintenance expense reductions during the most recent twelve months ended December.

Ohio – Vectren Ohio - Case No. 07-1080-GA-AIR

In 2009, the Public Utilities Commission of Ohio approved the establishment of a tracking mechanism for Vectren Energy Delivery of Ohio that allows for the recovery of costs associated with an accelerated bare steel and cast iron pipeline replacement program. The program is in effect for 5 years or until rates are approved in a subsequent rate case, whichever occurs sooner. The mechanism covers: 1) bare steel and cast iron pipeline replacements; 2) replacement of certain types of risers that had previously been determined as “prone to failure” in Ohio; 3) expenses that have been previously deferred during the company’s investigation of those risers; and 4) incremental costs attributable to the company assuming responsibility for service lines. Prior to 2009, the portion of the service line from the property line to the meter was owned and maintained by the customer. That ownership continues until the service line is actually replaced by the company, but Vectren has assumed maintenance responsibility for all service lines. The costs of the mechanisms are offset by O&M savings realized as a result of retirement of the older infrastructure.

The program was proposed in the company’s last rate case as a 20-year program, during which all cast iron mains and bare steel mains and service lines would be replaced. There is a cap on cost recovery. Residential customers pay a fixed charge per month under the rider, and the annual increase to the monthly charge is limited to $1.00 per month.

Oregon – Avista – Docket No. UG-201
The Oregon Public Utility Commission's March 10, 2011, settlement of Avista's 2010 rate case provides for deferred accounting treatment for two capital additions. The two projects include the second phase of the Roseburg Reinforcement Project and the Medford Integrity Management Pipe Replacement Project that was completed in 2011. A subsequent incremental rate adjustment of approximately $0.6 million will be made on June 1, 2012, to recover the costs of the two projects.

Oregon – NW Natural – Case No. UG-177
The NW Natural program is a tracker than recovers the cost of the acceleration of bare steel pipe replacement, transmission pipeline integrity costs, and distribution pipeline integrity costs. The tracker adjusts rates to recover these costs for the most recent 12-month period November 1 through October 31, and the adjustments are made at the same time as the company's annual purchased gas adjustment filing. The company is required to allocate 70% of the cumulative investment of the bare steel pipe replacement portion of the program costs to residential and commercial firm sales and transportation customers. The total program is capped at $12 million per year, with $8.2 million of that considered incremental and recoverable through the tracking mechanism.

The program is in effect through the effective date of the new rates adopted in the current general rate case (expected in September 2012). Upon expiration of the program, the bare steel replacement tracker will remain in effect through December 31, 2021.

Pennsylvania State Wide Legislation
In February 2012, the General Assembly of the Commonwealth of Pennsylvania amended Title 66 (Public Utilities) of the Pennsylvania Consolidated Statues to provide an additional mechanism for distribution systems (gas, electric, water, wastewater) to recover costs related to the repair, improvement and replacement of eligible property. For natural gas systems, eligible property includes mains, services, fittings, valves, couplings, risers, meters, meter bars, and unreimbursed costs related to highway relocation programs. The new mechanism allows a surcharge to be added to customers' bills to fund the accelerated replacements.

In order to be eligible to recover costs, a utility must submit a long-term infrastructure improvement plan that identifies the types and ages of the structures to be replaced, location of property, an estimate of the quantity of property to be improved, projected annual expenditures, and the manner in which the replacement will be accelerated, among other plan elements. In addition, the statute instructs the commission to develop regulations for periodic review at least once every five years of the plans.

Rhode Island State Wide Legislation
In 2010, the Rhode Island General Assembly amended Chapter 39-1 of the Rhode Island General Laws entitled, "Public Utilities Commission." The amended statute added sections (R.I.G.L. §39-1-27.7.1) allowing the Rhode Island Public Utilities Commission to approve revenue decoupling and infrastructure investment tracking mechanisms.

Rhode Island – National Grid Narragansett Gas – Docket No. 4034
Narragansett Gas' replacement program began in 2009, and a new, legislatively established program that covers both replacement and new safety and reliability pipeline infrastructure went into effect April 2011. There is no cap on the dollars that may be recovered through the surcharge mechanism, and while there is no cap on the miles of pipe that may be replaced, the plan must be approved before the start of the program. No rate case is required.

Texas – State Wide Legislation[1]

The Gas Reliability Infrastructure Program (GRIP) statute became effective for all Texas natural gas utilities on September 1, 2003. The legislation allows a gas utility to file with the regulatory authority a tariff that provides for an adjustment to the utility's rates. The adjustment is implemented through changes to the monthly customer charge or meter charge, but a utility can choose to adjust the first consumption block as an alternative. The tariff may be implemented without action by the regulatory authority. The tracking program allows for the recovery of new infrastructure investment, as well as the recovery of costs associated with replacement investments.

There is no cap on the amount of investment that may be recovered. However, if a gas utility's annual earnings monitoring report shows that it is earning a return on invested capital of more than 75 basis points above the return authorized for it in the area in which the interim rate adjustment was implemented, a report to the commission is required as to why rates are not unreasonable or in violation of law. After the first GRIP filing, the utility must file a rate case within the next 5 years.

Texas – State Wide Program of the Railroad Commission

On February 25, 2011, The Texas Railroad Commission adopted a comprehensive pipeline safety rule that requires all Texas natural gas distribution companies to survey their pipeline distribution systems for the greatest potential threats for failure and make replacements. Natural gas distribution operators must develop risk-based programs of prioritized replacements of pipeline and associated appurtenances. The rule also allows for the recovery of the costs of the program via a deferral mechanism. This state wide rule is in addition to the Texas GRIP statute of 2003 that provides for annual interim rate increases for a utility's infrastructure investment in excess of annual depreciation with no requirements as to replacement of pipe.

Texas - Atmos Energy – Docket No. 9560

Atmos implemented the GRIP program in its Mid-Tex service territory in 2004. Capital related costs are recovered on the change in net investment from year-to-year. The mechanism covers replacement pipe, new pipe, pipeline integrity capital and any other capital investment. The adjustment is interim in nature and subject to refund until the next general rate case, which must be filed every 5 years.

In addition to the GRIP program, Atmos has a separate surcharge mechanism that was implemented in 2010 pursuant to a rate order for the purpose of replacing 100,000 high priority steel service lines over a two year period. The surcharge may be used with an annual true-up mechanism.

Texas – CenterPoint Energy – GUD 10067

CenterPoint made its first GRIP filing on March 31, 2011 for the company's Houston Division. The GRIP tracker amount changes annually, is applied to the customer charge (subject to refund), and is trued up in the next general rate case.

Texas – Texas Gas Service

Texas Gas Service implemented its program under the Texas GRIP statute in 2003. State law limits the amount of infrastructure cost that may be recovered in a year to the amount of new infrastructure investment in the previous year, that is, the mechanism tracks the level of new investment.

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[1] Title 3. Gas Regulation; Subtitle A. Gas Utility Regulatory Act; Chapter 104. Rates and Services; Subchapter G. Interim Cost Recovery and Rate Adjustment; Sec. 104.301. Interim Adjustment for Changes in Investment.

Utah – Questar Gas – Docket No. 09-057-16

On June 3, 2010, the Utah Public Service Commission authorized Questar Gas to implement a three-year pilot Infrastructure Replacement Adjustment (IRA) mechanism to track and recover between rate cases the costs associated with the replacement of high-pressure natural gas feeder lines. The approved IRA mechanism is to be adjusted at least annually and has an annual budget cap of $55 million, adjusted for inflation. While operating under the mechanism, the company is required to file a general rate case at least every three years.

Virginia – State Wide Legislation

In Virginia, legislation supporting infrastructure investment was enacted on March 11, 2010. The SAVE (Steps to Advance Virginia's Energy Plan) Act allows utilities to petition the State Corporation Commission for a separate rider to recover a return on and of certain investments, including natural gas facility replacement projects that enhance safety and reliability, or have the potential to reduce greenhouse gas emissions by reducing system integrity risks.

The SAVE Act provides for prospective recovery of eligible infrastructure replacement costs, including a return based on the weighted average cost of capital established in the utility's last base rate case proceeding. The recovery also includes an allowance for income taxes; bad debt expense; depreciation; property taxes; and carrying costs on the over- or under-recovery of the eligible infrastructure replacement costs. No other O&M adjustments are included in the revenue requirement calculation.

Investment means costs incurred on eligible infrastructure replacement projects including planning, development, and construction costs; costs of infrastructure associated therewith; and an allowance for funds used during construction.

At the end of each 12-month period the SAVE rider is in effect, the utility reconciles the difference between the recognized eligible infrastructure replacement costs and the amounts recovered under the SAVE rider, and submits the reconciliation and a proposed SAVE rider adjustment to the Commission to recover or refund the difference, as appropriate, through an adjustment to the SAVE rider.

Virginia – Columbia Gas of Virginia – Case No. PUE-2011-00049

In November 2011, the Virginia State Corporation Commission approved an accelerated gas main replacement program for Columbia Gas of Virginia. Columbia plans to invest approximately $20 million per year for the years 2011–2015, for a total rate base addition of $82 million. The company will phase-in an $11.1 million rate increase over the years 2012 through 2016; a $1.3 million rate increase that became effective on January 1, 2012, represents the first annual adjustment under the SAVE rider.

Virginia – Washington Gas - Case No. PUE-2010-00087

In April 2011, the Virginia State Corporation Commission authorized Washington Gas to implement a tracking mechanism for recovery of replacement infrastructure investment costs as authorized by the Virginia SAVE legislation. Four infrastructure replacement programs totaling $116.5 million are planned for the years 2010-2014, and the company received approval for cost recovery for five years of plan expenditures with varying capital expenditures in any given year. The company will phase-in a $15.6 million rate increase over the years 2011 through 2014, and the annual true-up mechanism is subject to review.

PENDING INFRASTRUCTURE COST RECOVERY RATE MECHANISMS

California – San Diego Gas and Electric

On Dec. 15, 2010, San Diego Gas & Electric filed a request with the California Public Utilities Commission for a gas base rate increase. In addition to the base rate increase, the company proposes a post-test-year ratemaking mechanism for the three years, 2013 through 2015, under which the company's revenue requirement would be adjusted to reflect increases in capital-related and other expenses. A ruling is expected in the third quarter of 2012.

California – Southern California Gas

On Dec. 15, 2010, Southern California Gas filed a request with the California Public Utilities Commission for a gas base rate increase. In addition to this base rate increase, SoCal proposes a post-test-year ratemaking mechanism for the three-year period 2013 through 2015, under which the company's revenue requirement would be adjusted to reflect increases in capital-related and other expenses. The company did not request specific rate increases under the mechanism. A ruling is expected in the third quarter of 2012.

District of Columbia – Washington Gas – Case No. 1093

On February 29, 2012, Washington Gas Light filed a rate case with the District of Columbia Public Service Commission in which it proposed an expansion of its existing pipe replacement program approved in 2007. Specifically, the company proposed a 5-year accelerated pipeline replacement program and a surcharge for recovery of $119 million to be invested in replacement infrastructure. Washington Gas proposes to spend $19 million in year 1 and $25 million in years 2-5. This is the initial phase of a proposed 50-year, $749 million plan to replace 400 miles of pipeline and 37,000 services.

Michigan – Michigan Consolidated Gas – Cast No. U-16999

On April 20, 2012, Michigan Consolidated Gas filed a rate case in which it proposed to establish a cost tracker for recovery of the costs associated with $387 million in capital investment for the company's meter move-out, main renewal, and pipeline integrity programs. The capital investment would take place in the five years 2013 through 2017; any expenditures prior to January 2013 would be included in rate base. The infrastructure charge would increase annually to reflect incremental tracked costs and would remain in effect until the company's next rate case, at which time the rider amounts would be rolled into base rates.

Nevada – Limited Program - Southwest Gas – Docket Nos. 12-04005 and 12-02019

In 2012, Southwest Gas filed with the Nevada Public Service Commission a general rate case and a separate petition pursuant to its current limited infrastructure replacement program. In compliance with the provisions of the current replacement program, Southwest filed to recover the depreciation, return and property tax associated with the $12.5 million it has spent on infrastructure replacement of early vintage plastic pipe. With the subsequent rate case filing, the company is seeking approval of a surcharge mechanism that will allow the company to invest a maximum of $40 million per year for the replacement of early vintage plastic pipe and steel pipe. The proposed plan would require the development and approval of an annual budget. Southwest would recover through a surcharge an amount equal to the revenue requirement associated with the additional plant put in service each year. Rates will be capped and will not exceed one cent per therm per year. The rate case filing also seeks to consolidate the current limited program with the proposed full replacement mechanism.

ADDITIONAL INFORMATION

If you would like more information about a particular program or would like to speak to another AGA member regarding the details of the program, please contact: Cynthia Marple, AGA director of rates and regulatory affairs, cmarple@aga.org or 202-824-7228.

U.S. Department of Transportation Call to Action To Improve the Safety of the Nation's Energy Pipeline System

Executive Summary

Today, more than 2.5 million miles of pipelines are responsible for delivering oil and gas to communities and businesses across the United States. That's enough pipeline to circle the earth approximately 100 times.

Currently, these liquid and gas pipelines are operated by approximately 3,000 companies and fall under the safety regulations of the U.S. Department of Transportation's Pipeline and Hazardous Materials Safety Administration (PHMSA). PHMSA has engineers and inspectors around the country who oversee the safety of these lines and ensure that companies comply with critical safety rules that protect people and the environment from potential dangers. While PHMSA directly regulates most of the hazardous liquid pipelines in the nation, states take over when it comes to intrastate natural gas pipelines. Every state, except Hawaii and Alaska,is responsible for the inspection and enforcement of state pipeline safety laws for the natural gas pipeline systems within their respective state. Some states – about 20 percent - also regulate the hazardous liquid lines within state borders.

In the wake of several recent serious pipeline incidents, U.S. DOT/PHMSA is taking a hard look at the safety of the nation's pipeline system. Over the last three years, annual fatalities have risen from nine in 2008, to 13 in 2009 to 22 in 2010. Like other aspects of America's transportation infrastructure, the pipeline system is aging and needs a comprehensive evaluation of its fitness for service. Investments that are made now will ensure the safety of the American people and the integrity of the pipeline infrastructure for future generations.

For these reasons, Secretary LaHood is issuing a call to action for all pipeline stakeholders, including the pipeline industry, the utility regulators, and our state and federal partners. Secretary LaHood brought together PHMSA Administrator Quarterman and the senior DOT leadership to design a strategy to achieve that goal. The action plan below is the result of those deliberations.

Background

Much of the nation's pipeline infrastructure was installed many decades ago, and some century-old infrastructure continues to transport energy supplies to residential and commercial customers, particularly in the urban areas across our nation. Older pipeline facilities that are constructed of obsolete materials (e.g., cast iron, copper, bare steel, and certain kinds of welded pipe) may have degraded over time, and some have been exposed to additional threats, such as excavation damage.

On December 4, 2009, PHMSA issued the Distribution Integrity Management Final Rule, which extends the pipeline integrity management principles that were established for hazardous liquid and natural gas transmission pipelines, to the local natural gas distribution pipeline systems. This regulation, which becomes effective in August of 2011, requires operators of local gas distribution pipelines to evaluate the risks on their pipeline systems to determine their fitness for service and take action to address those risks. For older gas distribution systems, the appropriate mitigation measures could involve major pipe rehabilitation, repair, and replacement programs. At a minimum, these measures are needed to requalify those systems as being fit for service. While these measures may be costly, they are necessary to address the threat to human life, property, and the environment.

In addition to the many pipelines constructed with obsolete materials, there are also early vintage steel pipelines in high consequence areas that may pose risks because of inferior materials, poor construction practices, lack of maintenance or inadequate risk assessments performed by operators. The lack of basic information or incomplete records about these systems is also a contributing factor. The U.S. DOT is seeking to make sure these risks are identified, the pipelines are assessed accurately, and preventative steps are taken where they are needed.

Action Plan

The U.S. DOT and PHMSA have developed this action plan to accelerate rehabilitation, repair, and replacement programs for high-risk pipeline infrastructure and to requalify that infrastructure as fit for service. The Department will engage pipeline safety stakeholders in the process to systematically address parts of the pipeline infrastructure that need attention, and ensure that Americans remain confident in the safety of their families, their homes, and their communities. The strategy involves:

- <u>A Call to Action</u> – Secretary LaHood is issuing a "Call to Action" to engage state partners, technical experts, and pipeline operators in identifying pipeline risks and repairing, rehabilitating, and replacing the highest risk infrastructure. Secretary LaHood is also asking Congress to expand PHMSA's ability to oversee pipeline safety.
    - Secretary LaHood and PHMSA Administrator Quarterman have already met with the Federal Energy Regulatory Commission (FERC), the National Association of Regulatory and Utility Commissioners (NARUC), state public utility commissions, and industry leaders to ask all parties to step up efforts to identify high-risk pipelines and ensure that they are repaired or replaced.
    - Secretary LaHood is asking Congress to increase the maximum civil penalties for pipeline violations from $100,000 per day to $250,000 per day, and from $1 million for a series of violations to $2.5 million for a series of violations. He is also asking Congress to help close regulatory loopholes, strengthen risk management requirements, add more inspectors, and improve data reporting to help identify potential pipeline safety risks early.

  - The U.S. DOT and PHMSA are convening a Pipeline Safety Forum in April to engage in a working session around the actions that the Department, states, and industry can take to drive more aggressive actions to raise the bar on pipeline safety. The U.S. DOT and PHMSA will compile a report based on ideas, opportunities and challenges presented at the Forum and take action on solutions.

- Aggressive Efforts – The U.S. DOT and PHMSA are calling on pipeline operators and owners to review their pipelines and quickly repair and replace sections in poor condition.

  - PHMSA has asked technical associations and pipeline safety groups to provide best practices and technologies for repair, rehabilitation and replacement programs, and has asked industry groups for commitments to accelerate needed repairs.

  - PHMSA will review all data received from pipeline operators to identify areas with critical needs.

  - PHMSA's Distribution Integrity Management rule will become effective in August, requiring all operators of gas distribution pipelines to evaluate the risks on their pipeline systems and take action to address those risks.

- Transparency - U.S. DOT and PHMSA will execute this plan in a transparent manner with opportunity for public engagement, including a dedicated website for this initiative, and regular reporting to the public.

  - PHMSA will launch a public website with ongoing pipeline rehabilitation, replacement and repair initiatives.

  - All materials from the Pipeline Safety Forum will be publicly posted to the web, followed by a Draft Report for Notice and Comment. Once public input has been collected, PHMSA will publish a final Pipeline Safety Report to the Nation.

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U.S. Department of Transportation
Pipeline and Hazardous Materials Safety Administration

1200 New Jersey Ave, S.E.
Washington, D.C. 20590

December 9, 2011

The Honorable Robert Garagiola
Member, Senate Finance Committee
James Senate Office Building, Room 104
11 Bladen Street
Annapolis, MD 21401

RE: Letter concerning STRIDE Gas Infrastructure Bill

Dear Senator Garagiola:

The Pipeline and Hazardous Materials Safety Administration (PHMSA) understands that Maryland is considering alternative cost recovery methodologies for pipeline replacement programs for gas distribution systems.

As the pipeline systems across our country age, it is prudent to contemplate this issue. Properly maintained pipelines can and have remained in place for many decades without posing undue risk to people and the environment. In some cases, however, depending on many factors including the materials and methods used to construct and maintain the pipe and the environment in which it operates, replacement of pipeline systems is the most effective – or only – method to effectively mitigate risk. During the last several years, PHMSA has issued integrity management regulations that require pipeline operators to systematically identify and address threats to public safety and pipelines using risk-based models. For gas transmission and hazardous liquid pipeline systems, this increased level of assessment has already provided results that have improved safety. The integrity management Final Rule for the gas distribution sector was issued December 4, 2009, and we anticipate that this rule will have similar results for local distribution companies in that it will guide companies to address the most serious threats to the various pipeline systems.

PHMSA recognizes the criticality of providing safe and reliable gas service at affordable rates to the end users. Clearly, it is vital to ensure that the cost of replacement programs do not place an undue burden on ratepayers. However, it is even more important to ensure that the pipeline operates safely. We are encouraged by State efforts to provide for an expedited means to facilitate pipeline replacement programs outside of traditional ratemaking when appropriate. It is important that operators are able to take prompt remedial steps to correct threats to pipeline systems and safety, and it appears that the Maryland Strategic Infrastructure Development and Enhancement (STRIDE) bill could provide a means to reduce such risk and improve safety.

Thank you for the opportunity to provide comments. Please feel free to contact me with questions.

Sincerely,

Jeffrey D. Wiese
Associate Administrator for Pipeline Safety

U.S. Department of Transportation

Pipeline and Hazardous Materials Safety Administration

1200 New Jersey Ave, S.E.
Washington, D.C. 20590

December 9, 2011

The Honorable Charles Barkley
Member, Senate Finance Committee
House Office Building, Room 413
6 Bladen Street
Annapolis, MD 21401

RE: Letter concerning STRIDE Gas Infrastructure Bill

Dear Senator Barkley:

The Pipeline and Hazardous Materials Safety Administration (PHMSA) understands that Maryland is considering alternative cost recovery methodologies for pipeline replacement programs for gas distribution systems.

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Sincerely,

Jeffrey D. Wiese
Associate Administrator for Pipeline Safety

U.S. Department of Transportation
Pipeline and Hazardous Materials Safety Administration

1200 New Jersey Ave, S.E.
Washington, D.C. 20590

December 9, 2011

The Honorable Dereck E. Davis
Chairman, House Economic Matters Committee
House Office Building, Room 231
6 Bladen Street
Annapolis, MD 21401

RE: Letter concerning STRIDE Gas Infrastructure Bill

Dear Delegate Davis:

The Pipeline and Hazardous Materials Safety Administration (PHMSA) understands that Maryland is considering alternative cost recovery methodologies for pipeline replacement programs for gas distribution systems.

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Sincerely,

Jeffrey D. Wiese
Associate Administrator for Pipeline Safety

U.S. Department of Transportation
Pipeline and Hazardous Materials Safety Administration

1200 New Jersey Ave, S.E.
Washington, D.C. 20590

December 9, 2011

The Honorable Thomas "Mac" Middleton
Chairman, Senate Finance Committee
Miller Senate Office Building, 3 East Wing
11 Bladen Street
Annapolis, MD 21401

RE: Letter concerning STRIDE Gas Infrastructure Bill

Dear Senator Middleton:

The Pipeline and Hazardous Materials Safety Administration (PHMSA) understands that Maryland is considering alternative cost recovery methodologies for pipeline replacement programs for gas distribution systems.

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Sincerely,

Jeffrey D. Wiese
Associate Administrator for Pipeline Safety

U.S. Department of Transportation
Pipeline and Hazardous Materials Safety Administration

1200 New Jersey Ave, S.E.
Washington, D.C. 20590

December 9, 2011

Mr. Robert Glidewell
Manager, Government and Business Relations
Washington Gas
101 Constitution Avenue, NW
Washington, DC 20080

RE: Letter concerning STRIDE Gas Infrastructure Bill

Dear Mr. Glidewell:

The Pipeline and Hazardous Materials Safety Administration (PHMSA) understands that Maryland is considering alternative cost recovery methodologies for pipeline replacement programs for gas distribution systems.

As the pipeline systems across our country age, it is prudent to contemplate this issue. Properly maintained pipelines can and have remained in place for many decades without posing undue risk to people and the environment. In some cases, however, depending on many factors including the materials and methods used to construct and maintain the pipe and the environment in which it operates, replacement of pipeline systems is the most effective – or only – method to effectively mitigate risk. During the last several years, PHMSA has issued integrity management regulations that require pipeline operators to systematically identify and address threats to public safety and pipelines using risk-based models. For gas transmission and hazardous liquid pipeline systems, this increased level of assessment has already provided results that have improved safety. The integrity management Final Rule for the gas distribution sector was issued December 4, 2009, and we anticipate that this rule will have similar results for local distribution companies in that it will guide companies to address the most serious threats to the various pipeline systems.

PHMSA recognizes the criticality of providing safe and reliable gas service at affordable rates to the end users. Clearly, it is vital to ensure that the cost of replacement programs do not place an undue burden on ratepayers. However, it is even more important to ensure that the pipeline operates safely. We are encouraged by State efforts to provide for an expedited means to facilitate pipeline replacement programs outside of traditional ratemaking when appropriate. It is important that operators are able to take prompt remedial steps to correct threats to pipeline systems and safety, and it appears that the Maryland Strategic Infrastructure Development and Enhancement (STRIDE) bill could provide a means to reduce such risk and improve safety.

Thank you for the opportunity to provide comments. Please feel free to contact me with questions.

Sincerely,

Jeffrey D. Wiese
Associate Administrator for Pipeline Safety

BEFORE THE

PUBLIC UTILITY COMMISSION OF OREGON

UG 221

NW Natural

Reply Testimony of John Sohl

PAYROLL EXPENSES
EXHIBIT 2300

June 15, 2012

EXHIBIT 2300 – REPLY TESTIMONY – PAYROLL EXPENSES

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Rates & Regulatory Affairs
NW NATURAL
220 N.W. Second Avenue
Portland, Oregon 97209-3991
1-503-226-4211

I. INTRODUCTION AND SUMMARY

Q. Are you the same John Sohl who provided direct testimony on behalf of Northwest Natural Gas Company ("NW Natural" or "the Company") in this proceeding?

A. Yes, as Exhibit NWN/700.

Q. What is the purpose of your reply testimony?

A. The purpose of my testimony is to respond to the adjustments proposed by Deborah Garcia and Brian Bahr on behalf of Commission Staff ("Staff") and Hugh Larkin Jr. on behalf the Citizens' Utility Board of Oregon (CUB) and the Northwest Industrial Gas Users (NWIGU) related to payroll expenses. Specifically, I address the parties' adjustments to the number of full-time employees (FTEs), medical benefits, overtime, payroll tax, depreciation expense, and O&M expense factor.

Q. Do any other NW Natural witnesses address the appropriate FTE levels to include in the test year, which consists of the 12 months ending October 31, 2013 ("Test Year")?

A. Yes. Lea Anne Doolittle discusses this issue in her reply testimony[1].

Q. Please provide a summary of your reply testimony.

A. In my testimony, I:

- Explain why Staff and NWIGU-CUB's payroll adjustments are based on an inappropriate FTE level, demonstrate the calculation errors in Staff's payroll

[1] Exhibit NWN/2400 Doolittle.

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adjustments, and present the Company's revised payroll level based on a reduced FTE count;

- Explain the errors in Staff's and NWIGU-CUB's medical benefits and workers' compensation adjustments and provide an updated amount for these items that reflects the Company's revised FTE count;
- Explain the errors in Staff's payroll tax, overtime, and depreciation expense adjustments and present the updated amount for these items that reflect the Company's revised FTE count; and
- Demonstrate that NWIGU-CUB's proposed O&M expense factor adjustment does not appropriately reflect the Test Year O&M expense factor, and that their proposed adjustment is also inconsistent with those parties' other adjustments.

II. FULL-TIME EMPLOYEES

Q. Do the other parties propose adjustments related to the appropriate number of Test Year FTEs?

A. Yes. Staff proposes to calculate payroll based on 1,000 FTEs,[2] which Staff calculates would reduce Oregon Test Year O&M by $6.6 million, and rate base by $2.8 million. NWIGU-CUB proposes to calculate payroll based on 1,071 FTEs, which NWIGU-CUB calculates would reduce Oregon Test Year O&M by $2.7 million.

Q. How many FTEs did the Company use to calculate Test Year payroll costs?

[2] Staff's 1,000 FTE proposal reflects its view of the appropriate number of regulated FTEs, whereas NWIGU-CUB's number, like NW Natural's, refers to total Company FTEs.

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A. In its initial filing the Company used 1,130 FTEs in its calculations. The Company calculated this number by starting with the estimate for FTEs expected to be on the payroll by the end of the historical base period, the 12-months ended December 31, 2011 ("Base Period"), which was 1,072 FTEs for calendar year 2011. From this starting point, the Company added positions for which we were currently recruiting, and positions related to specific programs like service window appointments (SWA) and safety. These additional 58 positions were added to the projected FTE level at the end of the Base Period, resulting in the requested FTE level of 1,130 that was reflected in the Company's direct case filing.

Q. Were some of the 1,130 FTEs assigned to non-regulated operations and appropriately excluded from the payroll costs in the Company's revenue requirement?

A. Yes. As shown in the table below, the costs for an equivalent of 19.2 FTEs were assigned to below-the-line accounts and were not included in the revenue requirement stated in the Company's direct case filing.

Employee Equivalents	
(0.2)	Reduction of System Ops Unregulated Activity
(10.0)	Reduction of Appliance Center Unregulated Activity
(1.0)	Reduction of Service Solutions Unregulated Activity
(0.6)	Reduction of Public Policy & Government Affairs Unregulated Activity
(0.8)	Reduction of Community & Civic Affairs Unregulated Activity
(3.9)	Reduction of Interstate Storage Activity
(2.4)	Reduction of Shared Services Activity to Subsidiaries
(0.4)	Reduction of Admin Transfer Activity
(19.2)	Total Below the Line Reduction to Total NW Natural FTE

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Q. How did the Company calculate these 19.2 FTEs?

A. Each employee was assigned, either in part or in full, to unregulated operations based on their work portfolio which resulted in the costs of 19.2 FTE equivalents being removed from revenue requirements in this case. My Exhibit NWN/2301, Sohl/1 shows the FTEs for which the cost was removed from payroll expenses included in this case.

Q. How did the Company then use the number of FTEs to calculate payroll?

A. To calculate payroll in the Test Year, I began with total payroll, including payroll associated with unregulated activities. I then removed the payroll associated with the 19.2 FTEs devoted to unregulated activities, as described above. Removing these unregulated FTEs decreased the Company's payroll by 1.78 percent. My Exhibit NWN/2302, Sohl/1 demonstrates how the Company calculated Test Year payroll based on 1,130 FTEs and reduced this payroll to account for unregulated activities.

Q. How did Staff calculate the proposed adjustment to Test Year FTEs?

A. Staff began with a figure of 1,030 FTEs for 2011, which represented the average FTE count for the year. Staff then added 13 FTEs for the SWA program, resulting in 1,043 FTEs. Next, Staff subtracted 42.6 FTEs to account for what was perceived as unregulated FTEs, for a result of 1,000 Test Year FTEs.

Q. Do you agree with Staff's calculation?

A. No, I do not. Staff's calculation contains three problems.

Q. Please explain.

A. First, Staff inappropriately begins their calculation with the average FTEs for 2011.

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Second, Staff inappropriately removed costs associated with 42.6 FTEs whose titles seem to have suggested to Staff that they do not perform regulated activities. In fact, about 32 of these removed employees spend their time on regulated activities and thus should be included in utility payroll costs.

Third, because Staff removed the costs of these 42.6 employee from payroll costs from which unregulated employee time had already been removed, the adjustment constitutes a "double count" of costs associated with unregulated operations.

Q. Please explain why it is not appropriate for Staff to begin the estimate of Test Year FTEs by reference to the average number of employees in the Base Period.

A. As explained in Lea Anne Doolittle's reply testimony[3], at the time the Company was preparing this case, the Company was in the process of adding positions, primarily to address safety concerns and other necessary business functions. Staff's use of the 2011 average FTE count, which is lower than the FTE count at the end of 2011 and lower than the FTE count as of March 31, 2012, particularly when the Company is engaged in a documented hiring effort, is unreasonable.

Q. Please explain why Staff's designation of 42.6 employees as unregulated is inappropriate.

A. As justification for the removal of costs associated with 42.6 employees, Staff simply states that positions in Business Development, Marketing Strategy, Appliance Center, Service Solutions, Marketing, and Conversion are related to "non-utility, below-the-line, areas," but does not explain how it was determined that these positions relate to

[3] Exhibit NWN/2400 Doolittle

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unregulated activities or how it was determined that costs associated with those positions were not already removed.

Q. Is Staff's analysis of these positions correct?

A. No. Staff removed 42.6 employees based on job title or cost center name and directly assigned all of their costs to unregulated activities. Staff's approach has no correlation to the actual process of determining and assigning costs to unregulated activities.

Q. Do you have an exhibit that demonstrates that Staff removed FTEs whose job functions relate to regulated activities?

A. Yes. My Exhibit NWN/2303, Sohl/1 provides a list of the 42.6 positions Staff removed on the basis that they relate to unregulated activities. Included in the 42.6 positions are 11 FTEs that the Company removed in its initial filing. As the descriptions of these positions shows, Staff removed positions whose job functions relate to regulated operations, such as assisting new customers that have requested gas service. Staff's removal of these 42.6 positions should therefore be rejected.

Q. How does Staff's removal of costs associated with these FTE equivalents double count costs that the Company has already removed from the filing?

A. As I explained above, in its initial filing the Company already removed from payroll, for purposes of the revenue requirement, the costs associated with the 19.2 FTEs devoted to unregulated activities. Removing costs associated with these 19.2 FTEs through Staff's adjustment removes these costs a second time.

Q. In addition to the problem of not properly allocating FTEs to unregulated operations, does Staff's adjustment contain any additional flaws?

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A. Yes. As I explain above, the Company already removed 1.78 percent of total payroll to reflect the 19.2 FTEs related to unregulated operations. By applying the Company's 1.78 percent unregulated payroll allocation to Staff's regulated payroll amount, Staff's adjustment triple counts unregulated payroll amounts that the Company removed from total payroll in the first instance, and that she removed a second time through her adjustment of 42.6 unregulated FTEs.

Q. Have you prepared an exhibit that demonstrates the removal of these unregulated costs and shows that this amount is consistent with the labor costs Natasha Siores uses in her revenue requirement model?

A. Yes. My Exhibit NWN/2302, Sohl/1 walks through all of the components of total operations and maintenance expense included in this case and ties to line 7 of Exhibit NWN/302, McVay-Siores/1. As can be seen on the Total FTE Payroll line of my Exhibit NWN/2302, $2.5 million of labor costs, or 1.78 percent of total FTE labor, has been removed from the total O&M expense requested in this case. Any further reduction would constitute a double reduction of these costs.

Q. Please explain how NWIGU-CUB adjusted the number of FTEs in the Test Year.

A. NWIGU-CUB begins with the actual FTEs in place as of March 31, 2012, which was 1,058, and added 13 FTEs for the SWA program for a proposed FTE level of 1,071.

Q. Do you agree with the NWIGU-CUB adjustment?

A. No, I do not. While it is correct that the Company had 1,058 FTEs in place as of March 31, 2012, the adjustment does not account for the one additional SWA supervisory employee needed to implement that program and the additional FTEs that the Company

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will add before the beginning of the Test Year. As Lea Anne Doolittle explains in her reply testimony, the Company is currently in the process of filling 56 positions, 27 of which are new positions that have not previously been filled. Twenty-three of these positions are related to safety and compliance and, as explained by Ms. Doolittle, are reasonably expected to be hired prior to the rate effective date in this proceeding and will be performing functions that are necessary for prudent and safe operation of the Company.

Q. Please summarize the Company's view of Staff's and NWIGU-CUB's FTE positions based on the above discussion.

A. Once the double and triple counting of unregulated employees is removed from Staff's proposal and Staff's FTE count is updated to March 31, 2012, both parties recommend an FTE level of 1,071. Neither party included one of the SWA employees, as explained in Ms. Doolittle's testimony, which when included brings the starting point of both positions to 1,072 FTEs.

Q. How many FTEs does the Company expect to have in place during the Test Year?

A. For the reasons discussed in my reply testimony and in Lea Anne Doolittle's reply testimony, the Company expects to have 1,114 FTEs in place at the start of the Test Year. My Exhibit NWN/2304 reflects the adjustment to the Company's direct case to reflect the appropriate payroll to be included in this case. Adjusting the Company's payroll costs to reflect this number of FTEs results in a total Company wage and salary amount of $79.9 million, or a reduction in Oregon allocated O&M of $0.7 million, and a reduction to rate base by $0.3 million.

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Staff Payroll Modeling Adjustment

Q. Does Staff also include an adjustment to payroll on the basis of Staff's three-year wage and salary model?

A. Yes. Staff argues that the Company's calculation of the appropriate level of wages and salaries is not based on Staff's model and is therefore unreasonable. Staff proposes to reduce the Company's O&M by $0.9 million, and to reduce rate base by $0.4 million to reflect Staff's calculation.

Q. Does Staff's wage and salary model contain methodological problems?

A. Yes. A review of Exhibit Staff/501 demonstrates the problems with the Staff model. Specifically:

- First, line 4 of the model in the union section, has an escalation factor of 1.34 percent. This percentage increase for union employees is inconsistent with the cumulative contractual 8.14% percentage awarded to union employees over this time period and is inconsistent with Staff's opening testimony which states that because union negotiations are considered to be arms' length transactions, Staff accepts these union increases.[4]
- Second, and more important, once again Staff continues to adjust labor costs by the same 1.78 percent unregulated factor. On Line 8 of Exhibit Staff/501, Garcia/2, the 1.78 percent reduction results in a removal of approximately $1.4 million in labor cost before allocation to Oregon and capital. As I have discussed above, this amount has already been removed from the Company's

[4] Staff/500, Garcia/5, lines 11-17.

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original filing and to do this again would result in a double count of these costs. Following this same calculation through to line 14 of the same page, which shows Staff's proposed adjustment, this $1.4 million is used as the adjustment to payroll costs.

Q. If this double count is corrected, is the Staff payroll adjustment eliminated?

A. Yes. This means that once this double count is corrected, the application of Staff's model does not show that an adjustment is warranted.

Q. Staff argues that the Company's Base Period payroll costs should be escalated by applying the Actual/Forecast Consumer Price Index – All Urban Consumers U.S. (CPI) to wages and salaries from three years before the Test Year to the Test Year. Do you address this issue in your reply testimony?

A. No. Because Staff's wage and salary model does not result in an adjustment to the Company's labor costs after the corrections described above are made, this issue is not relevant. However, Lea Anne Doolittle explained in her direct testimony[5] why the use of CPI to escalate wages is not appropriate and market-based increases should be used. Staff does not present any rebuttal to Ms. Doolittle's direct testimony on this issue.

III. MEDICAL BENEFITS AND WORKERS' COMPENSATION

Q. Please explain the parties' proposed adjustments to costs associated with medical benefits and workers' compensation.

A. Staff and NWIGU-CUB propose adjustments to the Company's proposed medical benefits and workers' compensation expenses to account for their respective

[5] Exhibit NWN/800 Doolittle/5-7

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adjustments to FTEs. The parties also adjust the medical benefits and workers' compensation amounts to reflect unregulated amounts. The adjustments proposed by Staff and NWIGU-CUB would reduce the Company's Oregon O&M by $2.1 million and $1.1 million respectively.

Q. Does any party object to the Company's proposed medical benefits and workers' compensation calculations for any other reason.

A. No. The Staff and NWIGU-CUB adjustments follow directly from their FTE adjustments.

Q. Please explain Staff's adjustment.

A. Staff first reduced the amount of medical benefits and workers compensation expense by 11.5 percent to reflect Staff's 11.5 percent reduction in FTEs. Staff then reduced the medical benefits expense for active employees and workers compensation expense by the 1.78 percent unregulated factor.

Q. Is the NWIGU-CUB adjustment similar?

A. Yes. NWIGU-CUB reduced the Company's medical benefits and workers compensation expense by 1.78 percent to reflect work in unregulated segments of the Company's business and then reduces that amount by 5.22 percent to reflect NWIGU-CUB's proposed reduction in FTEs.

Q. Are the parties' adjustments to medical benefits and workers' compensation appropriate?

A. No. The Staff and NWIGU-CUB adjustments are incorrect for two reasons. First, as discussed above, the parties' adjustments to FTEs are unreasonable. If their medical benefits and workers' compensation expense adjustments reflected the appropriate level

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of FTEs proposed by the Company, 1,114 FTEs, the Oregon O&M adjustment would be $0.5 million.

Second, as shown in my Exhibit NWN/2302, as with payroll expense discussed above, the Company's medical benefits and worker's compensation level in this case already includes the removal of 1.78% of these expenses to reflect expenses related to work in unregulated aspects of the Company. Therefore, Staff's and NWIGU-CUB's proposed adjustments on this basis would double count the amount of medical benefits and workers' compensation expense associated with the unregulated 19.2 FTEs the Company has already removed from revenue requirement.

Q. Have you prepared an exhibit that presents the appropriate adjustment to employee benefits consistent with the Company's proposed FTE level?

A. Yes. Exhibit NWN/2304 is a detailed calculation of the reduction in employee benefits costs which is consistent with the Company's proposed reduction of 16 FTEs from its requested increase. The Company's reductions to payroll result in a $0.2 million decrease to Oregon O&M, and approximately $67,000 to rate base.

IV. PAYROLL TAX, OVERTIME, AND DEPRECIATION EXPENSE

Q. Do Staff and NWIGU-CUB propose adjustments to payroll tax, overtime, and depreciation expense based on their FTE adjustments?

A. Yes, they do. Staff's total Oregon adjustments for these three items is $0.6 million to O&M, and approximately $1,000 to rate base, while the NWIGU-CUB proposed adjustment to Oregon O&M is $0.6 million.

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Q. Does Staff use the same flawed approach in adjusting these three items by using the 1.78 percent factor as I discuss above?

A. Yes. Staff witness Garcia states that she uses the same methodology as for the wage and salaries adjustment to make these adjustments. For all of the reasons I explain above, I would urge the Commission to reject these adjustments because they would constitute a double count of costs already removed from the case.

Q. Does NWIGU-CUB use a different approach for the payroll adjustment?

A. Yes. NWIGU-CUB removes an amount associated with payroll tax and depreciation expense in proportion to the number of removed FTEs.

Q. Do you agree with the methodology used by NWIGU-CUB?

A. While I disagree on the number of FTEs used in the NWIGU-CUB calculation, the method itself is sound.

Q. Have you prepared an exhibit that updates the Company's payroll expense adjustment to correspond to the revised number of proposed FTEs currently in the case?

A. Yes. My Exhibit NWN/2305 represents the calculation of the appropriate adjustment to payroll cost when reflecting the reduction of 16 FTE positions from the Company's direct case filing. I used a similar methodology as used by NWIGU-CUB in calculating this amount. The Company's reductions to payroll result in an O&M decrease of approximately $97,000, a rate base decrease of approximately $10,000, and a depreciation expense decrease of approximately $11,000.

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V. O&M EXPENSE FACTOR

Q. What is the O&M expense factor?

A. The O&M expense factor represents the proportion of employee labor that is charged to O&M expense as opposed to a capital project. It is not a factor that is applied to payroll costs, but is the factor that results as labor costs are charged to either O&M or capital. Over time this percentage changes for a variety of reasons, such as the use of outside contractors for construction projects and work functions of new employee hires. The Company labor charged to O&M for the Test Year resulted in 69.3 percent in its direct case filing.

Q. How did the Company determine the O&M labor expense for the Test Year?

A. The Company's 2011 actual charges to O&M were approximately 67.2 percent of total labor. The FTEs being added are focused on safety and customer service, which are O&M functions. These additions increase the projected O&M percentage for the test year to 69.3 percent of total labor costs.

Q. Given that the Company has reduced the number of FTEs included in this reply filing, have you taken into account the impact on this adjustment?

A. Yes. All impacts related to employee count adjustments in this case are taken into account through the FTE adjustment and removal of those costs from the Test Year in the same manner they were included. See Exhibit NWN/2304,Sohl/1 and Exhibit NWN/2305, Sohl/1.

Q. How do NWIGU-CUB propose adjusting the O&M expense factor?

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A. NWIGU-CUB propose applying an O&M expense factor of 63.7 percent based on a three-year average of actual O&M expense from 2008-2010. NWIGU-CUB argues that the Company has included an increase in capital expenditures in the Test Year, so the O&M expense factor of 69.3 percent used by the Company is too high. The NWIGU-CUB adjustment would reduce Oregon O&M by $4.4 million.

Q. Is NWIGU-CUB's proposal to use the three-year average of O&M expense from 2008-2010 reasonable?

A. No, for a number of reasons. First, it ignores the 2011 actual O&M expense, which was 67.2 percent. This level is much closer to the Company's proposal of 69.3 percent than the NWIGU-CUB proposal of 63.7 percent. In other NWIGU-CUB adjustments in this case, such as in the case of the FTEs, uncollectibles, customer deposits, and contribution in aid of construction, the latest actual data is used to develop the starting point for the proposed adjustments. The 2008-2010 average approach is inconsistent with these adjustments. NWIGU-CUB makes reference to construction projects as a possible rationale for decreasing the level of O&M expense, but the vast majority of these projects are being done through third party contracts. Therefore, the increased capital project activity would have an insignificant impact on O&M expense levels.

Second, the historical O&M factor used by NWIGU-CUB does not account for the changes occurring during this period. During the period 2008-2010, the Company reduced 107 FTEs by reducing 110 FTEs in the union and non-exempt categories and increasing exempt FTEs by three. Union and non-exempt FTEs are those most likely to

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be working on capital projects. Eliminating these FTEs, therefore, shifted the labor allocation more to O&M than had been the case in previous years.

Third, the NWIGU-CUB adjustment fails to add the labor disallowed in O&M to the capital side of labor and depreciating this capitalized labor. Correcting this aspect of his adjustment would add $4.4 million to rate base.

Finally, the table below shows that more capital main and service installation work has been conducted by contract labor than internal labor from 2009-2011. This results in a lower proportion of internal labor being allocated to capital and, correspondingly, a higher proportion being allocated to O&M. For this reason, using 2008-2010 does not appropriately reflect this higher proportion being allocated to O&M.

Table 1

Contract Labor vs Internal Labor
2009 - 2011

	2009		2010		2011	
710 Mains						
Internal	$ 1,272,008	54%	$ 508,580	47%	$ 494,728	20%
Contract	$ 1,099,049	46%	$ 582,222	53%	$ 1,966,372	80%
	$ 2,371,057	**100%**	**$ 1,090,802**	**100%**	**$ 2,461,101**	**100%**
720 Services						
Internal	$ 4,334,936	54%	$ 2,651,882	38%	$ 1,899,266	28%
Contract	$ 3,647,695	46%	$ 4,312,770	62%	$ 4,974,791	72%
	$ 7,982,630	**100%**	**$ 6,964,652**	**100%**	**$ 6,874,057**	**100%**

Q. If the FTEs are allocated to the proper accounts and you start with your actual 2011 experience of labor allocation, is there any need for an adjustment to O&M expense?

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A. No. If the employees are allocated to the proper function, the only adjustment necessary is to the FTE payroll level. NWIGU-CUB has not claimed that employees were not categorized in the correct function.

Q. What would the impact of the NWIGU-CUB adjustment be on the Company's recovery of its labor costs?

A. The NWIGU-CUB adjustment would prevent the Company from recovering its full labor costs in the Test Year. The evidence demonstrates that the NWIGU-CUB proposed O&M expense level of 63.7 percent is unreasonably low and cannot be expected to occur in the Test Year. An example of how application of the NWIGU-CUB adjustment would prevent full recovery of labor costs is with respect to the 14 SWA FTEs. Those FTEs are allocated fully to O&M expense and will increase the O&M expense factor. Without this increase being reflected in the Test Year O&M expense factor, the Company would under-recover the labor costs associated with these positions. Specifically, at the NWIGU-CUB proposed level of 63.7 percent O&M, the Company would recover only approximately $955,000 of the $1.5 million O&M associated with these positions that NWIGU-CUB agrees should be reflected in labor costs.

Q. Does this conclude your testimony?

A. Yes, it does.

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BEFORE THE

PUBLIC UTILITY COMMISSION OF OREGON

UG 221

NW Natural

Exhibits of John Sohl

PAYROLL EXPENSES
EXHIBITS 2301-2305

June 15, 2012

EXHIBITS 2301-2305 - PAYROLL EXPENSES

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NW Natural Company

Unregulated FTE Labor Allocation

FTEs		Total Payroll including Payroll Overhead
1,130.00	Total NW Natural FTE's during Test Year period	$139,991,268

Employee Equivalents		
(0.2)	Reduction of System Ops Unregulated Activity	($16,918)
(10.0)	Reduction of Appliance Center Unregulated Activity	($1,190,024)
(1.0)	Reduction of Service Solutions Unregulated Activity	($105,044)
(0.6)	Reduction of Public Policy & Government Affairs Unregulated Activity	($132,347)
(0.8)	Reduction of Community & Civic Affairs Unregulated Activity	($157,560)
(3.9)	Reduction of Interstate Storage Activity	($425,663)
(2.4)	Reduction of Shared Services Activity to Subsidiaries	($425,913)
(0.4)	Reduction of Admin Transfer Activity	($32,519)
(19.2)	Total Below the Line Reduction to Total NW Natural FTE	($2,485,988)

NW Natural Company **UG 221**

O&M / Labor in Revenue Requirement Model

	O&M	COH	Merchandise	Other	Clearing	Capital	Total
Total FTE Payroll $ (including Payroll Overheads)	$95,427,905	$5,651,537	$1,344,505	$1,141,483	$2,308,616	$34,117,222	$139,991,268
Total FTE Payroll as a %	68.17%	4.04%	0.96%	0.82%	1.65%	24.37%	100.00%
LTIP (removed in Regulatory Adustments) [1]	$1,099,952						
Total Payroll	$96,527,857 [2]	$5,651,537 [3]	$1,344,505 [4]	$1,141,483 [5]	$2,308,616 [6]	$34,117,222 [7]	$141,091,220
Total Non-Payroll [8]	$41,283,992						
Total O&M for Test Year prior to adjustments	$137,811,849						
Regulatory Adjustments [9]	($5,256,103)						
Removal of Uncollectible [10]	($2,110,394)						
Rate Case Expense [11]	$234,667						
Total System O&M [12]	$130,680,019						
OR Effective Allocation [13]	90.46%						
Total OR O&M in Rev. Requirement [14]	$118,219,444						

$2,485,988 unregulated labor (1.78% of total FTE payroll) not included in Revenue Requirement Calculation

Footnotes

[1] This can be found in O&M Workpaper “700 – Sohl Workpaper”, worksheet “O&M Payroll”, cells AE1741 through AP1741.

[2] This can be found in O&M Workpaper “700 – Sohl Workpaper”, worksheet “O&M Payroll”, sum of cells AE1769 through AP1769.

[3] This can be found in O&M Workpaper “700 – Sohl Workpaper”, worksheet “COH Payroll”, sum of cells X48 through AI48.

[4] This can be found in O&M Workpaper “700 – Sohl Workpaper”, worksheet “Merchandise Payroll”, sum of cells X67 through AI67.

[5] This can be found in O&M Workpaper “700 – Sohl Workpaper”, worksheet “Other Income Payroll”, sum of cells X85 through AI85.

[6] This can be found in O&M Workpaper “700 – Sohl Workpaper”, worksheet “Clearing Payroll”, sum of cells X52 through AI52.

[7] This can be found in O&M Workpaper “700 – Sohl Workpaper”, worksheet “Capital Payroll”, sum of cells X316 through AI316.

[8] This can be found in O&M Workpaper “700 – Sohl Workpaper”, worksheet “O&M Non Payroll”, cell AK5.

[9] These expenses are for exclusions of unrecoverable O&M expenses. This can be found in O&M Workpaper “700 – Sohl Workpaper”, worksheet “O&M by Cost Center”, cell AP228.

[10] This is removed from O&M and shown seperately in the revenue requirement calculation. This can be found in O&M Workpaper “700 – Sohl Workpaper”, worksheet “O&M by Cost Center”, cell AP251.

[11] This can be found in O&M Workpaper “700 – Sohl Workpaper”, worksheet “O&M by Cost Center”, cell AP252.

[12] This can be found in O&M Workpaper “700 – Sohl Workpaper”, worksheet “Test Year FERC Allocation”, cell AC126.

[13] This can be found in O&M Workpaper “700 – Sohl Workpaper”, worksheet “Test Year FERC Allocation”, cell AE126.

[14] This can be found in O&M Workpaper “700 – Sohl Workpaper”, worksheet “Test Year FERC Allocation”, cell AG126. Also can be found in detail in NWN/306, McVay-Siores/1 and in summary at line 7 of NWN/302, McVay-Siores/1.

Cost Center	Position Focus	FTEs	In NW Natural Rev Req?
BUSINESS DEVELOPMENT	Evaluate and develop programs to efficiently meet customer's need for natural gas. Evaluate, recommend and develop programs and tariffs to ensure customers have access to renewable options including biogas, recycled heat and hybrid renewable onsite technologies. This emphasis is consistent with integrating renewable energy options for electric utilities supported by the Oregon Renewable Energy Act (SB 838). Evaluate and execute options to reduce customers' exposure to volatility of natural gas prices such as the purchase of long term gas supplies. Evaluate, recommend, and develop programs to ensure natural gas customers are fully considered and protected as electric utilities expand their use of natural gas for generation and their demand for natural gas infrastructure. Evaluate recommend and develop programs and tariffs to respond to customer interest for natural gas for new end uses such as transportation. Ensure customers have access to natural gas options by forming alliances with strategic business partners to ensure gas end-use technologies are available in our markets.	5.0	Yes
CUSTOMER CHOICE PROGRAM ADMIN. POSITIONS IN BUSINESS DEVELOPMENT COST CENTER	Evaluate and develop programs to efficiently meet customer's need for natural gas. Evaluate, recommend and develop programs and tariffs to ensure customers have access to renewable options including biogas, recycled heat and hybrid renewable onsite technologies. This emphasis is consistent with integrating renewable energy options for electric utilities supported by the Oregon Renewable Energy Act (SB 838). Evaluate and execute options to reduce customers' exposure to volatility of natural gas prices such as the purchase of long term gas supplies. Evaluate, recommend, and develop programs to ensure natural gas customers are fully considered and protected as electric utilities expand their use of natural gas for generation and their demand for natural gas infrastructure. Evaluate recommend and develop programs and tariffs to respond to customer interest for natural gas for new end uses such as transportation. Ensure customers have access to natural gas options by forming alliances with strategic business partners to ensure gas end-use technologies are available in our markets.	3.0	Yes
MARKETING STRATEGY	Develop and recommend strategies to respond customer's interest in new uses for natural gas such as transporation and onsite generation.	2.0	Yes
DIR, ACQUIRE CUSTOMERS	Process Director, oversees activities related to connecting new customers. Develops performance standards and interfaces with operations departments that play a role in connecting new customers. Plans and implements process efficiency improvements to reduce cost, enhance service levels and meet customer expectations.	0.6	Yes
APPLIANCE CENTER	Activities relating to the direct sale of natural gas service and equipment to new and existing residential, commercial, and small industrial customers.	10.0	No
SERVICE SOLUTIONS	Direct referrals connecting NW Natural customers with approved contractors who can repair and service all gas equipment in homes throughout our service area.	1.0	No
MARKETING	Activities related to promoting high efficiency natural gas products and enhancing customer experience. Includes measuring performance, and program development & delivery through product channels.	5.0	Yes
CONVERSION	Respond to inquiries to bring natural gas service to residential and commerical consumers that are not currently customers. They identify cost and construction constraints in order to determine feasibility and perform analysis to meet prudent investment requirements. They also answer questions related to programs, incentives and operational equipment cost comparisons.	16.0	Yes
		42.6	

Impact on Wages & Salaries

	Officers	Exempt	Non Exempt	Union	Total
Test Year Wages and Salaries	**$2,777,472**	**$38,767,484**	**$1,699,422**	**$37,852,290**	**$81,096,668**
Average # of FTE Test Year	10	449	29	643	1,130
Adjusted Average Salary	277,747	86,380	59,629	58,896	
Revised Average # of FTE Test Year	10	441	29	635	1,114
Revised Test Year Wages & Salaries	**$2,777,472**	**$38,076,442**	**$1,699,422**	**$37,381,124**	**$79,934,460**
Net Payroll Adjustment	**$0**	**($691,042)**	**$0**	**($471,166)**	**($1,162,208)**
O&M Expense as % of Payroll Expense					70%
O&M Expense Adjustment - Systemwide					($813,546)
Oregon Allocation Factor					90%
O&M Adjustment - Oregon					**($729,751)**
Capitalized Labor as % of Payroll Expense					30%
Rate Base Adjustment - Systemwide					($348,663)
Oregon Allocation Factor					90%
Rate Base Adjustment - Oregon					**($312,750)**

Impact on Benefits & Workers Comp

	Bargaining Unit Health - Active Employees	Bargaining Unit Health - Retirees	Non-Bargaining Unit Health - Active Employees, plus Other Benefits for Active Employees*	Workers Comp	Total
Test Year Expense (DR 63 & 384c)	**$ 8,455,751**	**$ 913,387**	**$ 7,586,596**	**$ 1,428,928**	**$18,384,662**
FTE Adjustment (see box A)	98.6%	100.0%	98.6%	98.6%	
Revised Test Year Expense	8,336,024	913,387	7,479,176	1,408,695	**$18,137,281**
Net Payroll Adjustment	**(119,727)**	**-**	**(107,421)**	**(20,233)**	**($247,381)**
O&M Expense as % of Payroll Expense					70%
O&M Expense Adjustment - Systemwide					($173,167)
Oregon Allocation Factor					90%
O&M Adjustment - Oregon					**($156,023)**
Capitalized Labor as % of Payroll Expense					30%
Rate Base Adjustment - Systemwide					($74,214)
Oregon Allocation Factor					90%
Rate Base Adjustment - Oregon					**($66,570)**

Other Benefits include: Long Term Disability Insurance, Short Term Disability Administration, Flexible Spending Administration, and Employee Assistance Programs

A. FTE Adjustment

Original FTE in Test Year	1,130
Revised FTE in Test Year	1,114
%	98.6%

Impact on Overtime

	Officers	Exempt	Non Exempt	Union	Total
Test Year Overime (DR 95)	**$0**	**$0**	**$21,452**	**$3,028,183**	**$3,049,635**
Average # of FTE Test Year	10	449	29	643	1,130
Average Overtime per FTE	$0	$0	$753	$4,712	$5,464
Revised Average # of FTE Test Year	10	441	29	635	1,114
Revised Test Year Overtime	**$0**	**$0**	**$21,452**	**$2,990,490**	**$3,011,942**
Net Payroll Adjustment	**$0**	**$0**	**$0**	**($37,693)**	**($37,693)**
O&M Expense as % of Payroll Expense					70%
O&M Expense Adjustment - Systemwide					($26,385)
Oregon Allocation Factor					90%
O&M Adjustment - Oregon					**($23,668)**
Capitalized Labor as % of Payroll Expense					30%
Rate Base Adjustment - Systemwide					($11,308)
Oregon Allocation Factor					90%
Rate Base Adjustment - Oregon					**($10,143)**

Impact on Payroll Taxes

	Source	Company-Wide	OR Allocated
Test Period Total Wages & Salaries	Exhibit NWN/2303, Sohl/1	$81,096,668	$72,743,711
Revised Test Period Wages & Salaries Adjustment	Exhibit NWN/2303, Sohl/1	$79,934,460	$71,701,211
Net Wages & Salaries Adjustment		($1,162,208)	($1,042,501)
% Reduction in Wages & Salaries	(3)/(1)		-1.4%
O&M Payroll Taxes	NWN/308/McVay-Siores/1		$5,117,689
Payroll Tax Adjustment - Oregon	(4)*(5)		**($73,342)**

Impact on Depreciation

Adopted Staff's Depreciation adjustment model

	Source	Company-Wide	OR Allocated
Rate Base Wages and Salary Adjustment	Exhibit NWN/2303, Sohl/1	($348,663)	($312,751)
Rate Base Benefit & Work Comp Adjustment	Exhibit NWN/2303, Sohl	($74,214)	($66,570)
Rate Base Overtime Adjustment	Above	($11,308)	($10,143)
		($434,185)	($389,464)
O&M Depreciation associated with Capital Adjustments			
Gross Plant	NWN/310/McVay-Siores/1	$2,227,108	
Annual Test Year Depreciation	NWN/309/McVay-Siores/1	$60,094	
% Avg. Depreciation to RB		2.70%	2.70%
Depreciation Expense Adjustment - Oregon			**($10,509)**

BEFORE THE

PUBLIC UTILITY COMMISSION OF OREGON

UG 221

NW Natural

Reply Testimony of Lea Anne Doolittle

FULL-TIME EMPLOYEES
EXHIBIT 2400

June 15, 2012

EXHIBIT 2400 – REPLY TESTIMONY – FULL-TIME EMPLOYEES

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Rates & Regulatory Affairs
NW NATURAL
220 N.W. Second Avenue
Portland, Oregon 97209-3991
1-503-226-4211

I. INTRODUCTION AND SUMMARY

Q. Are you the same Lea Anne Doolittle who filed direct testimony in this proceeding on behalf of Northwest Natural Gas Company ("NW Natural" or "the Company")?

A. Yes, as Exhibit NWN/800.

Q. What is the purpose of your reply testimony?

A. I respond to the adjustments proposed by Deborah Garcia on behalf of Commission Staff ("Staff") and Hugh Larkin Jr. on behalf of the Citizen's Utility Board of Oregon (CUB) and the Northwest Industrial Gas Users (NWIGU) related to the level of full-time employees (FTEs) for which NW Natural seeks cost recovery.

Q. Do any other NW Natural witnesses respond to the parties' opening testimony on payroll costs?

A. Yes. John Sohl provides a detailed rebuttal to the Staff's and NWIGU-CUB's FTE calculations and discusses how the Company calculated its current proposal of 1,114 FTEs. Mr. Sohl also responds to the parties' other adjustments related to medical benefits and workers' compensation, payroll taxes, overtime, depreciation expense, and O&M expense factor. He also outlines the methodological problems with Staff's application of its wage and salary model.[1]

Q. Please summarize your reply testimony.

A. In my reply testimony, I explain why Staff's and NWIGU-CUB's proposed FTE levels are unreasonably low, and demonstrate that the Company expects to have 1,114 FTEs on its payroll at the beginning of the test year.

[1] See Exhibit NWN/2300.

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II. FULL-TIME EMPLOYEES

Q. Please briefly describe the context for NW Natural's proposed FTE level in this case.

A. As explained in the direct testimony of David Anderson, the Company has experienced reductions in employees over the last several years, some related to implementation of the Operations Model and Automated Meter Reading, but also related to the Company's attempt to reduce labor costs in the face of the deepest recession since the Depression. Due to these efforts, the Company kept costs down and these actions assisted the Company in avoiding a general rate increase for close to ten years.[2] The Company is now in a process to ensure an appropriate, sustainable level of FTEs.

Q. How many FTEs were used to develop the payroll costs in the Company's direct case filing?

A. The Company's direct case included 1,130 FTEs to calculate test year payroll costs. Mr. Sohl explained how the Company calculated this number in his direct testimony.[3] As explained below, and in more detail in Mr. Sohl's reply testimony (NWN/2300), the Company is now proposing to collect the payroll costs associated with 1,114 FTEs.

Q. How did the Company calculate that it expects to have 1,114 FTEs at the beginning of the test year?

A. After further scrutiny and analysis, the Company determined that it can reallocate resources to allow it to manage with five fewer positions. Additionally, the Company

[2] Exhibit NWN/200 Anderson.
[3] Exhibit NWN/700 Sohl.

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determined an average number of vacancies of 11 FTEs. The removal of these 16 FTEs from the 1,130 described in the Company's initial filing results in 1,114 FTEs.

Q. Is the Company currently in the process of hiring for additional positions?

A. Yes. The Company is currently in the hiring process for critical new positions that will be filled prior to the beginning of the test year.

Q. How many positions is the Company in the process of filling?

A. There are two groups of positions that the Company is currently in the process of filling, New Positions and Backfill Positions. As can be seen from the chart below, the majority of the New Positions are needed for compliance and safety reasons. The second group, Backfill Positions, is for positions that will backfill existing positions that were vacated due to attrition from retirements and others types of turnover. The chart also identifies the current stage in the recruiting process for each of the positions.

<u>Positions Currently in Process</u>

NEW POSITIONS

	RECRUITING STATUS						
PURPOSE	**Planning**	**Posted/ Advertised**	**Screening/ Testing**	**Interviewing**	**Offer Accepted**	**FTEs to be hired as a class**	**Total**
Safety	8	2			1	7	**18**
Compliance	1	3		1			**5**
Other		3			1		**4**
TOTAL	**9**	**8**	**0**	**1**	**2**	**7**	**27**

BACKFILL POSITIONS

	RECRUITING STATUS						
	Planning	**Posted/ Advertised**	**Screening/ Testing**	**Interviewing**	**Offer Accepted**	**FTEs o be hired as a class**	**Total**
TOTAL	9		7	7		3	**26**

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Q. Please elaborate on the recruiting status of the 27 new positions described above.

A. As the chart above shows, nine of these positions have been advertised and one of those positions is in the interviewing stage. The job postings that relate to those nine positions are provided as my Exhibit NWN/2401. Two employees have accepted offers and will be starting by July 2, 2012. In addition, the Company will post an additional nine positions by June 19, 2012, seven of which are FTEs that will be hired as a class of Customer Field Service Technicians and two are safety related positions that are shown in the Planning column of the chart above. The remaining seven positions are still in the planning stage.

Q. What do you mean by the "planning stage" of the hiring process?

A. After the Company determines that there is a need for a new position, or has decided to refill an existing position, there are a number of steps the Company must complete before that position is posted for recruitment. For example, the human resources department must draft or update a job description, analyze the compensation market to determine an appropriate compensation level for the position, and, in the case of positions hired in a class, must prepare the training class. Positions in the planning process are those for which the Company expects to move forward on hiring, but for which additional work must be completed before the position can be posted.

Q. How many of the 26 Backfill Positions has the Company included in its proposed level of 1,114 FTEs?

A. The Company has proposed to recover the costs associated with 15 FTEs that are currently being recruited as backfills, because this number exceeds our average vacancy rate of 11.

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Q. Why is the number of Backfill Positions that the Company is currently recruiting higher than its average?

A. As explained above, the Company is now, and has been, recruiting for certain new positions. Some of these new positions are filled with internal candidates which means that the Company then has a backfill position it needs to recruit. The fact that the current number of backfills is higher than average, therefore, is explained by the fact that the Company is actively recruiting for new positions. Once these positions are filled, we would expect to return to an average level of vacancies.

Q. If the positions the Company will fill between now and the beginning of the test year are critical, why have they not already been filled?

A. The Company has been steadily recruiting to fill these open positions. As previously mentioned, each of these positions is in one of several stages in the recruiting process. How quickly we can move to fill open positions depends upon a number of factors including:

- If it is a position that requires several months to move through one of the Company's in-house training programs, the Company waits to recruit until it has realized a critical mass of vacancies in order to make the training class as cost effective as possible. Typically, positions in Construction, Customer Field Service (CFS) and Customer Contact Center (CCC) are filled and trained in larger classes. The Company is currently in one of the phases of the hiring process for a construction class of 12, two CFS classes of 12 and a CCC class of approximately 10. It is expected that the hiring of the Construction class will be completed by early July and the first CFS class by early September. These will

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be followed closely by the completion of a CCC class and the second CFS class. In short, these types of hires are often made in somewhat of a lumpy fashion.

- We have found some positions are very difficult to recruit for and it has taken more than one attempt to find a qualified and interested candidate. Examples of these occupational groups include experienced Engineers and specialized Financial and Accounting positions.

Q. How many FTEs do Staff and NWIGIU-CUB claim that the Company can be expected to employ in the test year?

A. In opening testimony, Staff testifies that the regulated utility can be expected to have 1,000 FTEs at the beginning of the test year, while NWIGU-CUB testifies that the correct number of FTEs for the Company is 1071.[4]

Q. Are these proposed FTE levels reasonable?

A. No. As I mentioned, Mr. Sohl testifies in detail as to the calculation errors included in the parties' proposals (See NWN/2300). Even beyond those calculation errors, however, the proposed FTE levels are unreasonably low.

Q. Please explain.

A. With respect to Staff's proposed FTE level of 1,000 for the regulated utility, this number is about 39 FTEs fewer than the Company's actual regulated utility FTE level as of March 31, 2012.[5] Moreover, Staff's calculation includes an additional 13 FTEs to implement the Company's proposed service window appointment (SWA) program during

[4] Staff's 1,000 FTE proposal reflects its view of the appropriate number of regulated FTEs, whereas NWIGU-CUB's number, like NW Natural's, refers to total Company FTEs.

[5] As explained in more detail in the testimony of John Sohl, the Company had 1058 FTEs as of March 31, 2012. To arrive at a regulated utility payroll amount, the total payroll amount is reduced by 1.78%, which is the equivalent of 19.2 FTEs.

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the test year, which would have to be added to current levels of actual FTEs to make an appropriate comparison. Thus, Staff is claiming that in the test year the utility can operate with 52 fewer FTEs than is now the case. Staff has presented no testimony supporting this claim other than to state that implementation of automated meter reading is complete, the Company has outsourced meter installation, and 2011 is the most current actual information. Staff does not explain why it is reasonable to assume that the Company can operate with 52 fewer FTEs than existed on March 31, 2012.

NWIGU-CUB's proposed FTE level is more reasonable than Staff's in that it is based on the Company's actual FTEs in place as of March 31, 2012 and adds 13 additional SWA program FTEs, resulting in 1,071 FTEs for the Company for the test year. However, NWIGU-CUB's proposal does not account for additional FTEs that will be in place and performing functions essential to the prudent operation of the utility in the test year.

Q. NWIGU-CUB argues that it is inappropriate to reflect new positions in the test year, because other employees may have left the Company in the meantime. Is this a valid criticism?

A. Not in this case. The NWIGU-CUB argument that natural attrition would balance out the FTE levels between now and the test year could be valid under normal circumstances. However, the Company has demonstrated that it is currently in the process of hiring for 27 new positions in addition to replacing 26 backfill positions. The 27 new positions will not be canceled out by natural attrition. In addition, the current vacancy rate is higher than the Company has experienced in the past and the Company expects that this will be corrected by the beginning of the test year. However, as explained above, the

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Company does recognize that there is an average vacancy rate of 11 FTEs, and has also eliminated five proposed FTE positions that we have accounted for in the total FTE count of 1,114.

Q. Based on these considerations, what do you propose as the FTE level the Company can reasonably expect to experience in the test year?

A. I expect that the Company will have an FTE count of 1,114 by the rate effective date (but for the 14 employees to be hired for the SWA program, which will be hired shortly after approval by the Commission). Mr. Sohl explains this calculation in detail in his reply testimony, but in summary this number was calculated by beginning with FTEs in place as of March 31, 2012 (1,058) then adding to that the 14 SWA FTEs and the 27 new positions and 15 backfill positions I discussed earlier. The Company's revised FTE number reflects only those positions that the Company currently has in place or is actively recruiting for and believes will be hired before the beginning of the test year, with the exception of the 14 SWA FTEs which carry a different timeline as discussed in the direct testimony of Mr. David Williams (See NWN/900). I believe that this approach addresses the concerns raised by NWIGU-CUB related to accurately predicting the number of FTEs in the test year.

Q. Both Staff and NWIGU-CUB add 13 FTEs to implement the SWA program. Why do you add 14 FTEs for this program?

A. Staff and NWIGU-CUB agree with the Company's proposal to include additional FTEs in the test year to implement the proposed SWA program. However, Staff and NWIGU-CUB state that the requested FTE count was 13, when in fact the Company requested an additional supervisor position that is necessary to coordinate and oversee the 13

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FTEs required for the service appointment work. The correct number of FTEs to account for the SWA program is 14.

Q. Is the Company's proposed overall FTE level of 1,114 for the test year reasonable?

A. Yes. The Company has taken a hard look at each of the positions being requested and has reduced that list of requested increases to only those we view as absolutely critical to operating the Company in the test year. The Company's labor costs per customer are among the lowest in the nation, indicating that the Company's proposed FTE level is objectively reasonable. Therefore, I strongly urge the Commission to allow recovery of this revised level of payroll cost in this general rate case.

Q. Does this conclude your testimony?

A. Yes.

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BEFORE THE

PUBLIC UTILITY COMMISSION OF OREGON

UG 221

NW Natural

Exhibits of Lea Anne Doolittle

FULL-TIME EMPLOYEES
EXHIBIT 2401

June 15, 2012

EXHIBIT 2401 – FULL-TIME EMPLOYEES

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NW Natural®

Fueling the Future

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Accounting Analyst 3 (Focused on Tax)
Non-Bargaining Position
Accounting; OPS
Regular; Full-Time
Posting #50071475

NW Natural offers an **Accounting Analyst 3 (Focused on Tax)** opportunity to interested applicants. The following is a summary of the position specifics along with the overarching job description.

Purpose of Position:
Support the tax function in terms of compliance, tax planning and accounting while adhering to corporate values of accuracy, integrity and collaboration.

Position Essential Functions:

- Assist Tax Director with preparation of all aspects of internal and external tax reporting and SEC filings including preparation of monthly, quarterly and annual GAAP financials.
- Prepare federal and state tax returns; estimated tax payments; calculations of state apportionment and responding to notices from taxing jurisdictions.
- Assist Tax Director with preparation of annual property tax filings and payment processing
- Involvement in and resolution of regulatory matters related to income taxes.
- Prepare and assist with all aspects of development and submission of responses to federal and state audit inquires, including preparation of responses to Information Document Requests and Notices of Proposed Adjustments; data retrieval and validation; tax research; position paper preparation and analysis of revenue agent reports. Assist in resolving disputed issues.
- Analysis of tax issues and transactions, identification and development of tax savings ideas, tax technical research and analysis, and participation in transactions and projects.
- Book tax differences, deferred tax balances and other financial and regulatory reconciliations.
- Budgeting and forecasting, project management, SOX compliance, FERC reporting, preparation of reports for senior management, deadline management, assist in identification and implementation of process improvements.

Position Qualifications:

- Bachelor's degree in Accounting with a minimum of 5-7 years' accounting/auditing and tax experience with a minimum of 3 years' tax experience. CPA preferred.
- In depth knowledge of federal and state tax law and income tax reporting along with experience in public accounting.
- Knowledge and experience in regulated utility accounting and taxation highly desirable.
- Strong knowledge of generally accepted accounting principles.
- Must combine attention to detail with the ability to envision the big picture.
- Strong analytical skills, including the ability to think logically and present decisions based on relevant information; understanding impacts of decisions made.
- Requires outstanding ethical standards and values consistent with those of the company.
- Ability to function in a team environment, provide information and training to users while treating them with respect and dignity.
- Acts as a technical resource for others.
- Excellent verbal communication skills and ability to facilitate group meetings and presentations.

- Strong writing skills including process documentation and report generation.
- Strong PC skills for word processing, spreadsheet and database applications. Skill and experience using SAP, Excel and Word, BNA Corporate Tax Analyzer, ProSystems and depreciation software strongly preferred.

JOB DESCRIPTION

Job Title: Accounting Analyst 3
Job Code: 502133

General Purpose
Conducts analysis through research, gathering and interpretation of data, development of alternatives and recommendations. Presents analysis and recommendations to management and may implement selected alternative. Analyses include feasibility studies, cost/benefit analysis, trending/forecasting, financial analysis, budget analysis, and reporting.

Competencies
- Data gathering, analysis, interpretation, trending, forecasting, and modeling skills.
- Project management skills including project leadership, task identification, scheduling, and cost/expenditure identification.
- Utilize personal computers including spreadsheet, database, word processing, and presentation applications to gather, analyze, and model information.
- Program and/or policy development skills.
- Communication and interpersonal skills including ability to consult with internal and external customers regarding matters/issues which may be sensitive in nature; ability to work with all levels of an organization including people with different styles and backgrounds; ability to work as a member of a team; ability to present alternatives and recommendations.
- Knowledge of data gathering, analysis, forecasting, and modeling techniques; applicable Company policies and procedures; applicable federal, state, and local governmental laws and regulations.

Decision Making/Impact
- Provides alternatives and recommendations to management and influences their decisions regarding courses of action.
- May provide advice and counsel to management.

Education/Experience
Bachelor's degree in Business Administration, Marketing, Finance, Human Resource Management or other applicable fields or an equivalent combination of education and experience which contributed to the development of proven data/information gathering, analysis, modeling and interpretation skills.

Special Requirements
May require special certifications or advanced degrees.

Discipline: Accounting
Activities related to making a financial record of business transactions and financial statements related to assets, liabilities, operating results, taxes and revenues.

Level 3:
Under general guidance performs complex assignments lacking precedent and requiring creativity. Serves as an expert in the discipline, provides advice or functional direction, and/or assumes a lead role in the work group.

Reports To:	Karen Wassenberg, Tax Manager
Salary Range:	$69,500 - $100,800 (Grade 21)
Application Process:	Submit your eRecruit materials: Completed application wizard, including a cover letter and attached resume.
Deadline:	April 17, 2012

Once you submit your eRecruit application, cover letter, and resume you will be sent a confirmation email message. If you do not receive a confirmation by the posting close date, please contact Employment at ext. 5403 or by email employment@nwnatural.com.

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Automotive 1
Bargaining Unit Position
Transportation; Tualatin
Regular; Full-Time
Posting #50076204

General Purpose:

Repairs and maintains a variety of fleet vehicles and equipment.

General Essential Functions:

- Inspects and maintains vehicles and heavy equipment.
- Diagnoses and repairs mechanical, electrical, and automotive computer problems.
- Orders necessary parts to successfully repair vehicles, heavy equipment, tools, and CNG powered equipment.
- Documents work progress.
- Enters/retrieves information using the computer.
- Trains, assists, and provides feedback to less-experienced workers at the direction of supervisor, which may include providing feedback to supervisor on progress of training.
- Performs other tasks as required, including those in lower levels, and in General Task Bar #2 as identified in the Job Description JAG, with training as needed.
- Wears required Company-issued protective equipment and safety gear.
- Operates Company vehicles in compliance with state/local laws and Company policies and procedures.
- Acquires and maintains OQ qualifications.
- Acts and communicates in a professional, respectful, and cooperative manner in connection with all activities associated with NW Natural.
- Follows supervisory instructions and is flexible and adaptable to changing conditions and expectations.
- Maintains punctual, regular, and reliable attendance.
- Demonstrates the Company's core values and complies with all Company policies and procedures.

Essential Function Requirements:

- Four years' experience working in a dealership, fleet maintenance, or similar environment.
- Knowledge of basic hydraulic operation and welding practices for non-structural repairs.
- Basic math and reading skills.
- Ability to access, input, and retrieve information from a computer.
- Basic knowledge of the Company's organization, inter-relationships, policies, procedures, processes, and department/work specific requirements.
- Ability to interface with employees and customers to answer questions or resolve issues with tact and diplomacy.
- Ability to perform physically demanding work involving walking, standing, bending, twisting, wrist turning, grasping, lifting, squatting, kneeling, or reaching for 8+ hours.
- Ability to hear normal voice at 3 feet; warning signals/horns during field operations.
- Near/distant vision for driving and reading information to complete work assignments.
- Moderate/severe exposure to uneven surfaces, noise, vibration, high-speed rotating machinery, and odorant inhalation.
- Manual dexterity adequate to effectively use basic hand tools including, but not limited to, wrenches, screwdrivers, etc.
- Ability to repair, troubleshoot, maintain, modify, and install parts and equipment.
- Ability to do precision work requiring visual acuity, fine motor skills, and concentration.
- Must be able to lift a maximum of 100 lbs.

- Ability to safely operate Company vehicles/equipment and perform inspections and minor maintenance as necessary and in compliance with Company policies and state/local laws.
- Valid OR/WA driver's license, any required certifications and/or endorsements, and satisfactory driving record.
- Moderate exposure to chemical/gas vapors.
- ASE certification preferred.
- Must obtain CDL (commercial driver's license) within 90 working days.
- Subject to random drug testing.

Qualification Period:

6 months

ACT Testing:

Locating – Level 5
Applied Technology – Level 5

Reports To:	Steve Cole, Transportation Supervisor
Hourly Wage:	$25.59 (Grade 53)
Application Process:	Submit your eRecruit bid
Deadline:	June 5, 2012

Once you submit your eRecruit bid, you will be sent a confirmation email message. If you do not receive a confirmation by the posting close date, please contact Employment at ext. 5403 or by email employment@nwnatural.com.

*OQ qualifications may vary by position, location, and other factors, including changing regulations and work requirements. Employees must also qualify on Abnormal Operating Conditions (AOCs) associated with the above procedures. These qualifications cover ability to recognize and respond to AOCs. For a comprehensive listing of Operator Qualifications Covered Tasks by job title, please access the list on the NW Natural Intranet or contact **OQ Program Administrator ext 4394.**

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Compliance Administrator 3
Non-Bargaining Position
Legal & Business Integrity; OPS
Regular; Part-Time < 20 hours
Posting #50076370

NW Natural offers a **Compliance Administrator 3** opportunity to interested applicants. The following is a summary of the position specifics along with the overarching job description.

Purpose of Position:

Activities related to the management, maintenance, design, analysis, coordination, implementation, and monitoring of various processes, data, and systems within Legal and the Business Integrity Program.

Position Essential Functions:

- Conducts special studies and analyses, develops alternatives, presents recommendations to management and influences management decisions with regard to budget and integrity/compliance activities. Communicates with all levels of Company staff and managers.
- Conducts internal investigations and interviews where appropriate and creates relevant and appropriate records for documentation.
- Implements process improvements and revisions, including writing proposals and project plans to develop, test, and roll out new and/or updated processes.
- Researches and analyzes issues associated with these processes to determine cause in order to recommend changes or resolve issues.
- Proactively develop and recommend communication plans to carry out and sustaining Business Integrity Messaging and program objectives. This includes website design, maintenance and all employee communications as well as training development.
- Develops and monitors measures to ensure projects and/or activities are meeting objectives and timelines.
- Creates and manages integrity/compliance documentation of processes, policies, procedures and training materials; conducts training for department on processes and systems. Provides technical assistance to team.
- Administers department processes to ensure standardization and implementation.
- Coordinates Business Integrity Team meetings and works with others across various departments to facilitate implementation and completion of follow up action items.
- Works on special projects and initiatives with department manager, supervisors, project teams, or others.
- Uses independent judgment and decision making in addressing individual and system issues and to facilitate program objectives.
- Ensures compliance with existing controls and Company policies, procedures, and federal and state laws.
- Familiarity with regulatory and legal policies and requirements, Company policies, Corporate Code of Ethics and all procedure and systems within the Business Integrity Program.
- Maintains the highest standards of conduct and ethical behavior; exercises sound professional judgment and demonstrates professional knowledge and proficiency in a variety of settings.
- Communicates effectively and provides timely and efficient customer service.

Position Qualifications:

- Bachelor's degree in Business, Legal, Paralegal or applicable field and a minimum 5 years of compliance, regulatory or financial experience or equivalent combination of education and experience.
- Understanding of corporate ethics, regulations and laws as they pertain to the utility industry. Corporate In-house legal or HR/employee relations experience preferred.

- Understanding and/or experience with complex regulations and legal procedures including governance, financial and regulatory issues for a public company and utility desired.
- Excellent communication and interpersonal skills including effectively consulting with internal and external customers regarding issues which may be sensitive in nature; proven ability to work with all levels of an organization with diplomacy, including people with different styles and backgrounds; proven ability to work as a member of a team; proven ability to present alternatives and recommendations.
- Strong analytical and diagnostic skills; ability to collect, interpret, and summarize data; including the ability to think logically and present recommendations based on relevant information; understanding impacts of recommendations and decisions made.
- Strong writing skills, including some experience in developing training and training materials, as well as report writing and process documentation for a variety of user groups. Knowledge of training concepts and methods. Ability to use expertise to identify needs, advise management, provide one-on-one coaching and group training.
- Strong research skills and experience with standard business, ethics and legal research engines.
- Advanced skills using a PC, including word processing, spreadsheet, and website applications.
- Skills and/or experience in process design and improvement.
- Proven ability to facilitate, coordinate, and manage projects; skill in organizing multiple tasks and managing time effectively to meet deadlines and balance priorities.
- Demonstrated skill multi-tasking, organizing and managing time effectively to meet deadlines and balance priorities. Proven background in being self-managed, and application of advanced problem-solving and decision-making techniques.

JOB DESCRIPTION

Job Title: Administrator

Job Code: 513123

General Purpose

Manages a program or process through the review of contracts and/or requests for service to ensure that applicable standards or guidelines are met and that the integrity of the program/process is maintained.

Competencies

- Analysis, assessment and investigatory skills to determine appropriateness of contracts and/or requests given Company or program policies, procedures, and/or practices; ability to develop alternatives and provide recommendations pertaining to requests beyond applicable standards.

- Program or policy management and development skills.
- Communication and interpersonal skills including ability to consult and resolve internal customer issues which may be sensitive in nature; ability to work with all levels of an organization including people with different styles and backgrounds; ability to work as a member of a team; ability to present alternatives and recommendations.
- Utilize personal computers including spreadsheet, database, word processing, and presentation applications.
- Knowledge of program and contract administration rules, regulations, policies, procedures and practices; applicable federal, state, and local governmental laws and regulations.

Decision Making/Impact

- Determines appropriateness and applicability of requests; presents recommendations pertaining to requests beyond applicable standards and influences decisions.
- Recommends and influences Company positions related to program management, development, policies, and procedures.

Education/Experience

Bachelor's degree in applicable field or an equivalent combination of education and experience which contributed to the development of proven program management and development skills, and appropriate knowledge level pertaining to governmental and regulatory laws and regulations.

Special Requirements

Compliance or other legal certifications or similar certifications not required but desired

Discipline: Compliance

Activities related to ensuring adherence to Company policies and procedures and to federal, state, local and other regulatory/governing bodies policies, procedures, guidelines, regulations and standards.

Level 3

Under general guidance performs complex assignments lacking precedent and requiring creativity. Serves as an expert in the discipline, provides advice or functional direction, and/or assumes a lead role in the work group.

Reports To:	MardiLyn Saathoff, Deputy General Council & Corporate Sect
Salary Range:	$53,700- $77,900 (Grade 18) depending on qualifications
Application Process:	Submit your eRecruit materials: Completed application wizard, including a cover letter and attached resume.
Deadline:	June 5, 2012

Once you submit your eRecruit application, cover letter, and resume you will be sent a confirmation email message. If you do not receive a confirmation by the posting close date, please contact Employment at ext. 5403 or by email employment@nwnatural.com.

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Compliance System Supervisor
Non-Bargaining Position
Engineering; OPS
Regular; Full-Time
Posting #50074179

NW Natural offers a **Compliance System Supervisor** opportunity to interested applicants. The following is a summary of the position specifics along with the overarching job description.

Purpose of Position: Manage the Compliance System, currently Advantica, to assure all assets are tracked, inspected and reported in a timely manner consistent with required Federal and State regulations.

Position Essential Functions:

- Supervises administrative staff in their assigned tasks and job functions including training, mentoring, and performance in the management of the code compliance inspection monitoring and work assignment system.
- Work with departments throughout the company to coordinate and improve management of assets and inspections.
- Responds to and evaluates situations, analyzing required action and directing appropriate response; maintains proper response procedure for P-CAD work orders generation, completion of P-CAD orders and adherence to inspection frequencies required for assets within the code compliance inspection monitoring and work assignment system.
- Serves as the primary liaison to the Resource Management Center (RMC) to maintain asset inspection compliance.
- Assure proper management of asset creation and maintenance.
- Define system reports and assure reports are adequate to demonstrate compliance of inspection of assets.
- Troubleshoot system user issues and work with Information Services to resolve in a timely manner.
- Participate as a subject matter expert for external audit preparation, data gathering in order to demonstrate compliance.
- Adheres to and promotes the philosophies and directives of the Joint Accord.
- Develops, trains, and mentors individual and team members with documentation and ongoing performance feedback; recognizes accomplishments and provides cross-training opportunities when applicable.
- Demonstrates appropriate leadership and decision-making behaviors; maintains technical job knowledge and personal skill development. Committed to coaching and developing employees.
- Supports Company's commitment to a culture of safe work practices.

Position Qualifications:

- Bachelor's degree in a related field or an equivalent combination of education/experience leading to proven skills to perform the essential functions of the position.
- Minimum of 7 years of current experience in gas operations (field or clerical) which includes a minimum of 3 years in a leadership role and/or technical equipment training, resource management, training or quality assurance or equivalent of experience/education.
- Experience in the natural gas industry and pipeline safety regulation highly desirable. In-depth knowledge of industry codes and standards or a technical background a plus.
- Must be able to work with technical experts and have a high level of ability to translate technical information into non-technical terms in order to identify options and facilitate decision making.
- Ability to effectively manage and analyze technical data/records.
- Ability to learn and apply negotiation and mediation skills in contentious situations.
- Strong technical and writing skills needed to prepare summary reports, write company policy, and provide information to senior management.
- Strong PC skills including spreadsheet, database, word processing and presentation applications to compile, maintain, and present information. This includes the ability to learn Company proprietary applications.
- Verbal communication skills, including the ability to apply group facilitation techniques and make group presentations.
- Demonstrated skill and ability in delegating and coordinating employee activities consistent with Company strategy to balance customer satisfaction with shareholder value.

- Acts as a technical resource for others.
- Strong analytical skills, including the ability to think logically and present decisions based on relevant information; understanding impacts of decisions made.
- Proven ability to function in a highly cohesive team environment to complete department goals and act independently to accomplish personal responsibilities while treating others with respect and dignity.
- Subject to random drug testing.

JOB DESCRIPTION

Job Title: Supervisor
Job Code: 526059

General Purpose
Supervises a location or functional unit. Implements business objectives, and plans and oversees daily work functions. Responsible for selecting, coaching, and developing employees. Implements and supports Company programs and policies. Must have full supervisory responsibility for three or more employees. Typically reports to a Manager, Director or Officer.

Competencies
- Management skills including the ability to implement action plans for achieving objectives, and to oversee daily operations.
- Leadership and teamwork skills to develop and promote cooperative working relationships within and among departments.
- Communication and interpersonal skills to communicate expectations, coach employees, provide feedback, and work collaboratively with other departments.
- Knowledge of strategic plan and objectives for area, day-to-day operations of specific area, Company policies, procedures and practices, and federal, state, and local laws and regulations.

Decision Making/Impact
- Makes hiring and pay decisions for employees in assigned area.
- Oversees and monitors departmental operations and employee activity in support of business objectives.

Education/Experience
Bachelor's degree or equivalent education and experience in a specific location or functional unit, resulting in the ability to effectively oversee the day-to-day operations of that area.

Special Requirements
Some travel may be required.

Levels
No levels apply to this role.

Discipline: Activities related to ensuring adherence to Company policies and procedures and to federal, state, local and other regulatory/governing bodies policies, procedures, guidelines, regulations and standards.

Reports To:	Steve Nelson, Manager, Engineering Services
Salary Range:	$63,800-$92,500 (Grade 20)
Application Process:	Submit your eRecruit materials: Completed application wizard, including a cover letter and attached resume.
Deadline:	May 22, 2012

Once you submit your eRecruit application, cover letter, and resume you will be sent a confirmation email message. If you do not receive a confirmation by the posting close date, please contact Employment at ext. 5403 or by email employment@nwnatural.com.

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Economics Analyst 3
Financial Planning; OPS
Regular; Full-Time
Posting # 50075118

NW Natural offers an **Economics Analyst 3** opportunity to interested applicants. The following is a summary of the position specifics along with the overarching job description.

Purpose of Position:
Analyzes data and statistics relevant to demand and price forecasts, gas rates, gas resource portfolio modeling and analysis for management review; prepares project financial analysis as needed; prepares or assists in preparation of integrated resource plan, maintains customer data bases; prepares or assists in preparation of rate design or other special studies as needed; contributes to a team environment responsible for assuring adequate Company revenue from utility operations.

Position Essential Functions:
- Prepares and assembles various data, calculations, and chart preparations needed for management review and decision making.
- Prepares econometric models and analyses for utility forecasts, integrated resource planning, and other regulatory activities.
- Prepares supply-side resource portfolio modeling and analysis.
- Prepares or assists in preparing integrated resource plan.
- Performs financial modeling and analysis including IRR, NPV, ROI, and ROE calculations to evaluate project economics.
- Maintains and updates monthly histories of residential, commercial, industrial and transportation customers by state and rate schedule; and produces special project studies from these data bases.
- Builds and manages relationships with outside regulators and interested parties, responds to data requests, prepares reports for regulatory review.
- Performs economic analysis and other special studies.
- Performs other duties as assigned by Manager.
- Ability to work a flexible schedule to accommodate peak periods.
- Supports Company's commitment to a culture of safe work practices.

Position Qualifications:
- Bachelor's degree in economics or related field. Masters preferred.
- 5-7 years' experience in economics, financial analysis, business or a related field. Experience in a regulated business environment preferred. Discipline or coursework and experience in accounting helpful but not required.
- Knowledge of technical and economic characteristics of energy business preferred. Familiarity with economic regulation of public utilities, energy industry terminology, and utility tariffs and rate structures preferred.
- Must have experience building and utilizing econometric models.
- Must have experience managing complex projects across disciplines.
- Must have advanced computer skills including advanced skills in Excel spreadsheet, Access data base and Word applications.
- Must have excellent written and oral communication skills.
- Must be self-motivated and able to work independently to accomplish personal responsibilities.

JOB DESCRIPTION

Job Title: Analyst

Job Code: 521133

General Purpose

Conducts analysis through research, gathering and interpretation of data, development of alternatives and recommendations. Presents analysis and recommendations to management and may implement selected alternative. Analyses include feasibility studies, cost/benefit analysis, trending/forecasting, financial analysis, budget analysis and reporting.

Competencies

- Data gathering, analysis, interpretation, trending, forecasting, and modeling skills.
- Project management skills including project leadership, task identification, scheduling, and cost/expenditure identification.
- Utilize personal computers including spreadsheet, database, word processing, and presentation applications to gather, analyze and model information.
- Program and/or policy development skills.
- Communication and interpersonal skills including ability to consult with internal and external customers regarding matters/issues which may be sensitive in nature; ability to work with all levels of an organization including people with different styles and backgrounds; ability to work as a member of a team; ability to present alternatives and recommendations.
- Knowledge of data gathering, analysis, forecasting, and modeling techniques; applicable Company policies and procedures; applicable federal, state, and local governmental laws and regulations.

Decision Making/Impact

- Provides alternatives and recommendations to management and influences their decisions regarding courses of action.
- May provide advice and counsel to management.

Education/Experience

Bachelor's degree in Business Administration, Marketing, Finance, Human Resource Management or other applicable fields or an equivalent combination of education and experience which contributed to the development of proven data/information gathering, analysis, modeling and interpretation skills.

Special Requirements

May require special certifications or advanced degrees.

Discipline: Economics

Activities related to collecting and analyzing data on economic conditions that affect the Company including preparing reports discussing economic forecasts and their impact on the industry and the Company.

Level 3: Under general guidance performs complex assignments lacking precedent and requiring creativity. Serves as an expert in the discipline, provides advice or functional direction, and/or assumes a lead role in the work group.

Reports To:	Keith White, VP Business Development & Energy Supply
Salary Range:	$69,500 - $100,800 (Grade 21) depending on qualifications
Application Process:	Submit your eRecruit materials: Completed application wizard, including a cover letter and attached resume.
Deadline:	May 29, 2012

Once you submit your eRecruit application, cover letter, and resume you will be sent a confirmation email message. If you do not receive a confirmation by the posting close date, please contact Employment at ext. 5403 or by email employment@nwnatural.com.

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Process and Technology Design and Training Analyst
Non-Bargaining Position
RMC; OPS
Regular; Full-Time
Posting # 50076378

NW Natural offers a **Process and Technology Design and Training Analyst** opportunity to interested applicants. The following is a summary of the position specifics along with the overarching job description.

Purpose of Position:
The Process and Technology Design and Training Analyst is responsible for interfacing with RMC and RMC stakeholders to identify and implement best practices in process and technology to use across all RMC teams.

Position Essential Functions:
- Build and maintain effective working relationships within the RMC and with RMC stakeholders.
- Primary liaison with RMC leaders and stakeholders on process and technology changes. Facilitate process change and measure change progress.
- Troubleshoot system user issues and work with Business Systems and Information Services to resolve in a timely manner.
- Collect and analyze input from RMC for process and technology trends and issues; create and communicate related action plans to RMC leaders.
- Participate in or lead projects for developing and implementing new/changed processes and technology
- Coordinate and follow-up within RMC and with stakeholders to assure successful application of process and technology changes.
- Act as a SME on RMC processes and technology, and provide leadership, support and feedback on issues in a timely manner.
- Plan, create, oversee documentation and maintenance of RMC processes and related guides, training and materials, checklists and other documents to ensure compliance with company policy and regulatory statutes.
- Support RMC and team goals by providing support to other RMC leaders, performing special projects and integrating continuous improvement activities into daily work. Back up RMC supervisors as needed.
- Demonstrate appropriate leadership and decision-making behaviors; maintains technical job knowledge and personal skill development. Committed to coaching and developing employees.
- Perform other duties as assigned to support the Department.
- Support Company's commitment to a culture of safe work practices.

Position Qualifications:
- Bachelor's degree in a related field or an equivalent combination of education/experience leading to proven skills to perform the essential functions of the position.
- Minimum of 7 years of current experience in gas operations (field or clerical) which includes a minimum of 2 years in a leadership role and/or technical equipment training, resource management, training or quality assurance or equivalent of experience/education.
- Minimum of 2 years' experience with process or technology design
- Must be able to work with technical experts and have a high level of ability to translate technical information into non-technical terms in order to identify options and facilitate decision making.
- Ability to effectively manage and analyze technical systems and data
- Ability to learn and apply negotiation and mediation skills in contentious situations.
- Ability to communicate written and verbally to all levels of management across the organization
- Strong technical and writing skills needed to prepare summary reports, write processes and training materials, and provide information to RMC leadership and senior management.
- Strong PC skills including spreadsheet, database, word processing and presentation applications to compile, maintain, and present information. This includes the strong knowledge of RMC applications and processes.

- Verbal communication skills, including the ability to apply group facilitation techniques and make group presentations.
- Demonstrated skill and ability in delegating and coordinating employee activities consistent with Company strategy to balance customer satisfaction with shareholder value.
- Ability to conduct group training classes and provide one-on-one coaching; ability to provide leadership/guidance to other trainers.
- Data and business process analysis skills
- Ability to organize and multi-task with appropriate time management and scheduling skills
- Subject to random drug testing
- Position may require travel within and beyond service territory, including international (Canada).

JOB DESCRIPTION

Job Title: Process Analyst 2

Job Code: 544132

General Purpose

Conducts analysis through research, gathering and interpretation of data, development of alternatives and recommendations. Presents analysis and recommendations to management and may implement selected alternative. Analyses include feasibility studies, cost/benefit analysis, trending/forecasting, financial analysis, budget analysis and reporting.

Competencies

- Data gathering, analysis, interpretation, trending, forecasting, and modeling skills.
- Project management skills including project leadership, task identification, scheduling, and cost/expenditure identification.
- Utilize personal computers including spreadsheet, database, word processing, and presentation applications to gather, analyze and model information.
- Program and/or policy development skills.
- Communication and interpersonal skills including ability to consult with internal and external customers regarding matters/issues which may be sensitive in nature; ability to work with all levels of an organization including people with different styles and backgrounds; ability to work as a member of a team; ability to present alternatives and recommendations.
- Knowledge of data gathering, analysis, forecasting, and modeling techniques; applicable Company policies and procedures; applicable federal, state, and local governmental laws and regulations.

Decision Making/Impact

- Provides alternatives and recommendations to management and influences their decisions regarding courses of action.
- May provide advice and counsel to management.

Education/Experience

Bachelor's degree in Business Administration, Marketing, Finance, Human Resource Management or other applicable fields or an equivalent combination of education and experience which contributed to the development of proven data/information gathering, analysis, modeling and interpretation skills.

Special Requirements.

May require special certifications or advanced degrees.

Discipline: Process

Activities related to the review, study, analysis, redesign and implementation of business processes.

Level:

Level 2: Under general supervision performs moderately complex assignments requiring analysis, integration and creativity

Reports To:	Cathy Reynolds, Manager, Resource Management
Salary Range:	$58,500-$71,700-$84,800 (Grade 19) depending on qualifications
Application Process:	Submit your eRecruit materials: Completed application wizard, including a cover letter and attached resume.
Deadline:	June 5, 2012

Once you submit your eRecruit application, cover letter, and resume you will be sent a confirmation email message. If you do not receive a confirmation by the posting close date, please contact Employment at ext. 5403 or by email employment@nwnatural.com.

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Business Development
Non-Bargaining Position
Business Development; OPS
Regular; Full-Time
Posting # 50075172

NW Natural offers a **Business Development** opportunity to interested applicants. The following is a summary of the position specifics along with the overarching job description.

Purpose of Position:
The position will be an integral member of the Business Development team and will be involved in all aspects of the business development process with direct responsibility for structuring and analysis of business development opportunities.

Position Essential Functions:
- Leading teams or performing essential functions independently, depending on project.
- Formulating, developing and analyzing business concepts and strategies.
- Fully evaluating potential opportunities and transactions including assessing and quantifying risks.
- Gathering data, extracting market intelligence and performing diligence and analyses. .
- Conducting program design and developing program evaluation and implementation plans.
- Designing regulatory strategies and obtaining regulatory approval of proposed programs.
- Analyzing, modeling and structuring complex financing and business structures including state and federal tax implications.
- Identifying counterparties and leading negotiations of customized structured transactions.
- Developing and evaluating pricing strategies.
- Supporting the Company's commitment to a culture of safe work practices.

Position Qualifications:
- MBA or equivalent combination of education and experience.
- Minimum 3+ years of proven business development experience for Level 1 position. Additional years of experience required for Level 2 or 3 position.
- Qualitative and quantitative analytical skills including ability to analyze a wide variety of business opportunities related to the energy industry.
- Understanding of advanced modeling using Excel.
- Understanding of strategic planning, corporate finance, statistics and economics.
- Understanding of LDC rate regulation strongly preferred.
- Demonstrated negotiation skills.
- Knowledge of business plans and strategies.
- Demonstrated ability to develop a concept into business/program.
- Demonstrated ability to organize and direct the work of a team to development a concept into a business/program.
- Demonstrated ability to self-direct, analyze, evaluate, and form independent judgments.
- Strong written and oral communication skills.
- Strong interpersonal skills to function effectively in a small collaborative team environment.
- Excellent organizational skills and a strong attention to detail

Once you submit your eRecruit application, cover letter, and resume you will be sent a confirmation email message. If you do not receive a confirmation by the posting close date, please contact Employment at ext. 5403 or by email employment@nwnatural.com.

JOB DESCRIPTION

Job Title: CONSULTANT
Job Code: 574183

General Purpose

Conducts special studies and analyses, develops alternatives, presents recommendations to management and influences management decisions. Researches, analyzes, develops, and implements new strategies, programs, and/or processes in response to changing internal and external conditions.

Competencies

- Research and analysis skills including ability to obtain relevant data, evaluate complex situations, develop creative alternatives, provide recommendations, and negotiate and influence outcomes.
- Program design skills including development of interventions, processes, or new or modified programs to meet customer needs.
- Communication and interpersonal skills involving the ability to establish trust, maintain confidence, and understand social behavior and interactions. Ability to work with all organizational levels, to influence actions and negotiate outcomes. Ability to listen and communicate effectively through oral and written means.
- Use of personal computer to gather, analyze, and summarize data.
- Project management and leadership skills, including ability to work as a team member, to maintain project timelines, budgets, and deliver on commitments.
- Knowledge of research, analysis, and consulting techniques, Company policies, procedures, practices, and applicable federal, state, and local governmental laws and regulations.

Decision Making/Impact

- Provide alternatives and recommendations regarding development or enhancement of programs or processes.
- Provide advice and counsel; negotiate and influence outcomes.

Education/Experience

Bachelor's degree in Business Administration, Marketing, Finance, Human Resource Management, or other applicable fields or an equivalent combination of education and experience resulting in proven consulting skills.

Special Requirements

May require advanced degrees or travel.

Level 1: Under close/general supervision, performs work requiring the application of standard techniques, procedures and criteria.

Level: 2

Under general supervision performs moderately complex assignments requiring analysis, integration and creativity.

Level: 3

Under general guidance performs complex assignments lacking precedent and requiring creativity. Serves as an expert in the discipline, provides advice or functional direction, and/or assumes a lead role in the work group.

Discipline: Business Development

Activities related to business development including analyzing, modeling, and structuring complex business opportunities.

Reports To:	Barbara Summers, Business Development Director
Salary Range:	$63,800-$92,500 (Level 1 Grade 20); $80,000-$116,000 (Level 2 Grade 22) ;$88,200-$127,800 (Level 3 Grade 23) depending on qualifications
Application Process:	Submit your eRecruit materials: Completed application wizard, including a cover letter and attached resume.
Deadline:	May 29, 2012

Once you submit your eRecruit application, cover letter, and resume you will be sent a confirmation email message. If you do not receive a confirmation by the posting close date, please contact Employment at ext. 5403 or by email employment@nwnatural.com.

BEFORE THE

PUBLIC UTILITY COMMISSION OF OREGON

UG 221

NW Natural

Reply Testimony of Russell A. Feingold

LONG-RUN INCREMENTAL COST STUDY / RATE DESIGN
EXHIBIT 2500

June 15, 2012

EXHIBIT 2500 – REPLY TESTIMONY – LONG-RUN INCREMENTAL COST STUDY / RATE DESIGN

Table of Contents

Rates & Regulatory Affairs
NW NATURAL
220 N.W. Second Avenue
Portland, Oregon 97209-3991
1-503-226-4211

I. INTRODUCTION AND SUMMARY

Q. Please state your name and business address.

A. My name is Russell A. Feingold and my business address is 2525 Lindenwood Drive, Wexford, Pennsylvania 15090.

Q. Are you the same Russell A. Feingold who filed direct testimony on behalf of Northwest Natural Gas Company ("NW Natural" or "the Company") in this docket?

A. Yes. My Exhibits NWN/1100-1102 support the Company's Long-Run Incremental Cost (LRIC) Study, its proposed class revenue allocation, and the various rate design proposals filed by NW Natural in this proceeding.

Q. What is the purpose of your reply testimony in this proceeding?

A. The purpose of my reply testimony is to respond to the various positions set forth in the opening testimony of the Commission Staff (the "Staff"), the Citizens' Utility Board of Oregon (CUB), the NW Energy Coalition (the "Coalition"), and the Northwest Industrial Gas Users (NWIGU) as it relates to NW Natural's LRIC Study, its proposed class revenue allocation, and the proposed rate design for its residential, commercial, and industrial service classes. I will specifically respond to the claims made in the opening testimonies of Staff witnesses Jorge D. Ordonez, Steve Storm, and George R. Compton, CUB witnesses Bob Jenks and Gordon Feighner, Coalition witness Nancy Hirsh, and NWIGU witness Donald W. Schoenbeck.

Q. How is your reply testimony organized?

A. My reply testimony is organized into the following six sections:

I. Introduction and Summary;

II. Issues Related to NW Natural's LRIC Study;

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III. Issues Related to NW Natural's Class Revenue Proposal;

IV. Issues Related to NW Natural's Residential Rate Design Proposal;

V. Issues Related to NW Natural's Other Rate Design Proposals; and

VI. Conclusions.

Q. Please summarize your conclusions based on your evaluation of the parties' evidence filed to date in this proceeding.

A. I conclude that there is no reason to require any changes to NW Natural's LRIC Study filed in this proceeding, as it is grounded in sound economic theory and reflective of the fundamental principle of cost causation. I will demonstrate that the Company's LRIC Study recognizes cost causation on both theoretical grounds and on the basis of empirical analysis related to the customer component of distribution mains. I will further demonstrate that NW Natural's ongoing investment in distribution mains is not caused by annual throughput volume, nor does it explain changes in the Company's cost and installed footage of distribution mains.

In addition, I conclude that the Company's proposed class revenue allocation is consistent with, and supportive of, its LRIC Study results. It strikes a reasonable balance between the various criteria or guidelines that relate to the design of utility rates that I discussed in my direct testimony, and is a preferred method compared to Staff's alternate class revenue proposal.

Finally, I conclude that NW Natural's proposed rate design should be approved by this Commission because the unrefuted evidence in this case supports the conclusion that relying on volumetric rates to recover the Company's fixed distribution costs is

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unduly discriminatory because it charges different rates to residential customers that have the same costs. The proposed rates that recover distribution costs through a monthly fixed charge is the appropriate remedy for the Commission to adopt. Therefore, the Company's rate design proposal for Rate Schedules 1 and 2 which gradually moves the rate structure from a strongly volumetric recovery of fixed delivery service costs to one that is primarily based upon a monthly Customer Charge that properly reflects the fixed nature of these costs is not only correct on economic and cost grounds, it is desirable to achieve just and reasonable rates as I previously discussed in my direct testimony, and as I will discuss later in my reply testimony.

II. ISSUES RELATED TO NW NATURAL'S LRIC STUDY

Q. Please discuss Staff's position related to the LRIC Study filed by NW Natural in this proceeding.

A. Staff recommends that the Commission accept NW Natural's LRIC Study as being reasonable, with the exception that the distribution mains component of the Company's minimum system costs should be allocated to individual customer classes based on the "existing" length of distribution mains installed by rate or customer class.[1,2] Staff also contends that a portion of the Company's transmission-related LRIC should be allocated to its interruptible classes of service.[3] Finally, Staff has proposed to "allocate" the Company's total revenue requirement among its rate classes by first disaggregating it

[1] See Exhibit Staff /1400 Ordonez/2, lines 14-17.
[2] Based on a study that Staff would require NW Natural to conduct.
[3] See Exhibit Staff 1400 Ordonez/10-11.

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into its functionalized cost components and then allocating each component to the rate classes based on the respective LRIC results.[4]

Q. Do you agree with Staff's proposed methodological changes to NW Natural's LRIC Study?

A. No. I believe the changes proposed by Staff are not based upon sound costing principles and are not reflective of the Company's actual operating and system design practices. I will discuss in detail below the reasons supporting this conclusion for each of the cost elements in the Company's LRIC Study that are addressed by Staff.

Costing Treatment of Distribution Mains

Q. Please explain why the costing method used in the Company's LRIC Study to treat distribution mains is superior to the alternative method recommended by Staff.

A. Using Staff's recommended method would not properly reflect scale economies among the Company's commercial and industrial classes because it would allocate more customer-related costs to the larger customers and less to the smaller customers. In effect, Staff's cost allocation method would change the impact of scale economies on the unit costs of the Company's larger customers, which is an inappropriate outcome based on cost causation principles.

In using the cost of the minimum size of distribution main (i.e., a 2-inch main) to develop the customer-related costs of its gas delivery system, the Company has recognized that the higher total costs of distribution mains for its larger customers (i.e., its commercial and industrial customers) are appropriately allocated on the basis of their

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[4] See Exhibit Staff/1400 Ordonez 20-21.

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generally higher design day demands. And by attributing no design day demand to its smallest customers (i.e., its residential and small general service classes) for cost allocation purposes, NW Natural has avoided the issue that the minimum system concept can result in a double-counting of some costs for these smaller customers. An important assumption inherent in the Company's approach is that the $1,120 per customer amount[5] which Staff has challenged was derived to represent the customer component of distribution mains for all of NW Natural's rate classes, not just for its residential and small general service rate classes (i.e., Rate Schedules 1 and 2).

The Company's approach is theoretically and operationally sound because, as I demonstrated in my direct testimony, the smallest size of pipe installed by NW Natural to connect customers to its gas distribution system also serves the design day requirements of all its residential customers at the average density of its gas system. Using the resulting cost level as the customer component of distribution mains for the Company's other rate classes causes all of the additional investment for the other rate classes to be related to design day demand, as it should be, to recognize the impact of scale economies.

Q. Can you please explain why Staff's recommended method would not properly reflect the scale economies of distribution mains for the Company's commercial and industrial customers?

A. Yes. As his basis for criticizing the Company's costing treatment of distribution mains, Mr. Ordonez claims that there is a clear distinction between the length of distribution

[5] See Exhibit NWN/1101, Feingold/7, line 27, column A.

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mains among the Company's customer classes.[6] On that basis, Mr. Ordonez recommends that the Commission require NW Natural to provide a study of its Oregon service and customer locations that explores whether, and to what extent, there is a correlation between the existing length of distribution mains as a function of the Company's rate schedules. He further states that if Staff's assumption is correct, then the Company's next LRIC Study can differentiate distribution mains by customer class.[7]

It is true that the Company provided data in response to Staff data requests which indicated that the unit cost of installing distribution mains to serve NW Natural's new commercial and industrial customers was different than the unit cost for serving its new residential customers, and the average length of distribution main installed per customer for each of these two customer groups also was different. However, this data does not provide any useful insights into how LRIC for distribution mains should be classified between the customer and demand cost components for purposes of assigning these costs to NW Natural's rate classes.

The Company's customer cost component for distribution mains under Staff's recommended method of using length of main by customer class would equal $2,131 per commercial and industrial (C&I) customer[8], which is almost twice the amount utilized by the Company in its LRIC Study for the same purpose. Referring to Exhibit NWN/1101 Feingold/7, by substituting Staff's amount of $2,131 at line 27, column A, the resulting Total C&I Customer Component at line 31 would equal $901,413, and the

[6] See Exhibit Staff /1400 Ordonez/15, lines 15-16.
[7] See Exhibit Staff 1400/ Ordonez/16, lines 5-9.
[8] $25.07 per foot times 85 foot/customer = $2,131 per customer

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resulting Total C&I Demand Component would equal $388,484 (Line 21 minus $901,413). This means that approximately 70% ($901,413/$1,289,897) of the Company's LRIC related to distribution mains would be classified as customer-related and allocated to the C&I classes based on the number of customers in each rate class, while only 30% of the costs would be allocated on a peak demand basis. This is in sharp contrast to the Company's method, which resulted in only approximately 47% of the costs being allocated to the C&I classes on a customer basis and 53% allocated on a peak demand basis.

Under Staff's recommended approach, the greater economies of scale experienced by the Company when installing larger diameter distribution mains to serve the higher daily demands of its C&I customers cannot properly be reflected in its LRIC Study when 70% of the costs are assigned by Staff equally to these classes on a per customer basis. While I demonstrated in my direct testimony that a minimum size (2-inch) distribution main can serve the design day load characteristics of the Company's smallest and largest residential customers, which means that the cost per customer is the same on average, that same mains investment cannot serve the higher and varying design day load characteristics of a diverse group of C&I customers. Therefore, it is necessary to apply a much greater weighting to the demand cost component when allocating such costs to the Company's C&I rate classes. In my view, the 30% demand weighting under Staff's recommended method will not adequately reflect the greater economies of scale inherent in serving the design day loads of C&I customers, and will

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result in a skewing of the LRIC related to distribution mains that are assigned to these rate classes.

Q. Was Staff's recommended method for the costing of distribution mains utilized in its LRIC analysis presented in Exhibit Staff/1402?

A. No. Staff has proposed to allocate the functionalized cost of distribution mains to the Company's rate classes on the basis of both distribution services and design day sales. Specifically, Staff allocated 94% of the functionalized cost of distribution mains based on the Company's LRIC Study results for distribution services and allocated the remaining 6% based on design day sales (excluding residential customers).[9]

Q. Do you agree with the method proposed by Staff for the treatment of the functionalized cost of distribution mains within the context of its LRIC analysis?

A. No. In my view, Staff has distorted the results of its LRIC analysis because the allocation methods that were chosen do not properly capture the planning, design, and operating conditions of NW Natural's gas distribution system. By utilizing a combination of distribution services and design day sales by rate class as proxies for the cost causative factors for the LRIC related to distribution mains, Staff has overallocated the largest portion of the functionalized cost of distribution mains to the Company's non-residential rate classes using distribution services as the basis for the allocation. In addition, Staff has under allocated the smallest portion of this cost element to the Company's non-residential firm rate classes because Staff used a design day allocation basis that excluded the design day loads of the firm transportation service rate classes.

[9] See Exhibit Staff/1400 Ordonez/25-26.

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The Company's firm transportation service customers also require distribution mains to enable the delivery of gas to their premises even though they procure gas commodity supplies from third-party suppliers. By moving away from cost causation, Staff violates the fundamental principle that rates reflect cost causation. This principle has broad acceptance in both regulation and judicial review of rates.[10]

Q. Do you agree with the rationale presented by Staff to support his use of distribution services to allocate 94% of the functionalized cost of distribution mains?

A. No. Staff claims that because "the frontage of length of distribution mains is proportional to the length of setback from the distribution mains for different classes of customers," it is appropriate to use the LRIC related to distribution services by rate class in the Company's LRIC Study as the basis to allocate almost all of the functionalized cost of distribution mains to rate classes in Staff's LRIC analysis. Staff offers no evidence that his assumption is correct. To the contrary, even in residential developments with identical size lots, homes have different setbacks just based on the topography of the lot and the types of facilities being constructed. In my opinion, this method is much too crude an attempt to capture cost causation because there are numerous factors that impact the relationship between the frontage of length of distribution mains and the length of setback for services for different customers across the Company's rate classes. Notably, Staff's proposed method which attempts to isolate

[10] The U.S. Court of Appeals for the District of Columbia Circuit (D.C. Circuit) has defined the cost causation principle as follows: "[I]t has been traditionally required that all approved rates reflect to some degree the costs actually caused by the customer who must pay them." (See *K N Energy, Inc. v. FERC*, 968 F.2d 1295, 1300 (D.C. Cir. 1992) (*K N Energy*).)

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cost responsibility for distribution mains to each customer within a rate class was soundly criticized by Staff witness Compton when he discussed the cost causative factors and cost classification methods associated with distribution mains.[11]

Moreover, Staff's proposed method is premised on the assumption that "the length of setback establishes the cost of services,"[12] but that assumption has no basis in fact. Staff fails to recognize that the Company's cost of distribution services is also a function of the diameter of the service line and is influenced by other important construction conditions besides the length of the service, including the proximity of the customer's location to major transportation arteries, excess rock formations, the need for hard surface cuts, and other physical impediments which are factors that do increase the incremental cost for each new customer installation.

Costing Treatment of NW Natural's Interruptible Service Customers

Q. Does Staff propose allocating a portion of NW Natural's delivery service costs to its interruptible service customers?

A. Yes. Staff claims that 25% of NW Natural's total transmission-related LRIC should be allocated to all customers on an annual throughput basis, which means that the Company's interruptible service customers will receive a portion of those costs by virtue of the fact that they consume gas throughout the year.[13]

Q. Why should Staff's proposal be rejected?

[11] See Exhibit Staff/1500 Compton/15-16 and, in particular, footnote 14.
[12] See Exhibit Staff/1400 Ordonez/26, lines 15-18.
[13] See Exhibit Staff /1400 Ordonez/24.

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A. By the very nature of interruptible service, the Company does not currently design its gas distribution system to provide any delivery of gas to interruptible customers on a design day. As a result, the design day factor for interruptible service customers is zero. This does not mean that interruptible customers will make no contribution to the cost of delivery service. It means they do not cause any of the Company's future costs and, therefore, should not be included in the calculation of the transmission-related LRIC for NW Natural's gas system. The basis for the Company providing interruptible service is to utilize its unused mains capacity available on non-design days to deliver a lower quality of service to certain customers who agree not to use the service on the few days in each year when weather conditions create design day demand requirements from the LDC's firm service customers. The types of extreme low temperatures that result in service interruption are weather driven. Those temperatures may not occur at all; even in a year with normal weather or colder than normal weather. As a result, interruptible service customers may not experience interruptions in their service every year depending on the weather. Nevertheless, interruptible service customers still have the obligation to interrupt their use of gas when the Company requires the capacity to serve its firm gas loads.

Q. Staff supports its costing treatment of interruptible customers based on the Company's statement related to justification of the Corvallis Loop Project that curtailments of its interruptible customers were occurring at 32 degrees

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Fahrenheit.[14] Does this mean that capacity is being built to serve the Company's interruptible load?

A. Absolutely not. The Company's need to curtail interruptible load at modest temperatures (as opposed to extreme temperatures) is an indication that firm load growth has "used up" the available capacity of the gas system and that a design day load could not be served without system reinforcement. The interruptions with adequate firm capacity would not ordinarily occur until much lower temperatures were experienced. This benchmark of early interruptions indicates substantial design day capacity growth that the Company would not be able to meet without additional capacity. The curtailment of interruptible customers at the moderately cold temperature is an indication of the magnitude of the growth in firm load, and should not be viewed as a concern for capacity needs to serve interruptible load.

Q. To support its claim regarding the costing treatment for interruptible service, Staff also relies upon a Company statement made in Exhibit NWN/600 Yoshihara/3, lines 4-20. Has Staff acknowledged all of the Company's evidence it has presented to address this issue?

A. No. While Staff made reference to the Company's direct testimony and included as an exhibit the Company's response to Staff Data Request 274, it failed to acknowledge that the Company also submitted a Supplemental Response to Staff Data Request 274. I have included the Company's supplemental response (and its Attachment) as my Exhibit NWN/2501 Feingold/1-3 with the section highlighted which is relevant to this issue. The

[14] See Exhibit Staff/1400 Ordonez/11, lines 13-18.

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highlighted section of that response addresses the apparent conflict perceived by Staff between my conclusion that no transmission-related LRIC should be assigned to the Company's interruptible customers and Company witness Yoshihara's statement in his direct testimony referenced above. Very simply, the highlighted section of Exhibit NWN/2501 Feingold/2 explains that Mr. Yoshihara's statement was not intended to mean that the reduction of curtailments for interruptible customers in the area where the Corvallis Loop Project will be installed was the purpose of the project. Rather, the Company experiencing curtailments of its interruptible customers in that area over the past several years was an operational outcome which indicates that insufficient <u>firm</u> capacity currently exists on NW Natural's gas pipeline system to accommodate all of its <u>firm</u> demand requirements.

Because Staff has misinterpreted the Company's operational situation related to the Corvallis Loop Project and, as a result, has misunderstood the reason why this project is required, I believe Staff's proposed costing treatment of NW Natural's interruptible customers should be rejected.

Q. Does Staff also claim that the Company's interruptible service customers should receive a portion of the transmission-related LRIC because those customers were infrequently interrupted over the last five-year period[15]?

A. Yes. However, the Company's relatively low level of curtailment of these customers over the last five years is simply a function of the relatively low level of firm demands of the other customers actually served by NW Natural over that time period (due to warmer

[15] See Exhibit Staff/1400 Ordonez/11, lines 23-30.

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than planned for peak day weather and other factors), and not any indication that the Company currently plans and designs its gas delivery system to accommodate serving its interruptible customers during peak day periods.

Interestingly, though, despite Staff's belief that the lack of gas curtailment activity for the Company's interruptible service customers justified the allocation of transmission-related LRIC to these rate classes, Staff did not allocate to the Company's interruptible classes of service any distribution LRIC related to distribution mains.[16] This apparent inconsistency on the part of Staff either suggests a computational error in its LRIC analysis or a different type of conceptual support for transmission LRIC compared to distribution LRIC that Staff has not revealed in its opening testimony.

Q. What is the impact of Staff's proposed costing treatment of the Company's interruptible service customers on its other rate classes?

A. Staff's proposed costing approach effectively shifts more fixed costs to the Company's interruptible rate classes, which decreases the LRIC levels used to evaluate how NW Natural's proposed revenue increase should be allocated among its firm rate classes. If Staff desires to achieve this objective, it should be justified by Staff on non-cost grounds by proposing that interruptible service rates should be higher on the basis of value of service or equity considerations related to the level of contribution from interruptible service to firm service customers who bear the cost of mains.

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[16] See Exhibit Staff/1402 Ordonez/1-2, line 18.

<u>The Recognition of Customer-Related Costs in NW Natural's LRIC Study</u>

Q. Does CUB properly characterize the cost classification methods used in NW Natural's LRIC Study?

A. No. CUB claims that NW Natural classifies nearly all of its costs, except for the gas commodity, to the customer component and not to the demand or capacity component.[17] This statement mischaracterizes my direct testimony related to the nature of the demand or capacity cost components. My direct testimony addressing the Company's LRIC Study carefully explains that for its small customers, the smallest size mains (2-inch) installed by the Company not only connect the customer (customer-related costs) to the Company's gas distribution system, but also fully serves the design day capacity requirements of all of residential and small commercial customers (served under Rate Schedules 1 and 2) at the average density of service (demand or capacity-related costs). The demand or capacity cost component also applies to all the Company's other rate classes because the minimum size of distribution mains is not large enough (at standard operating pressure) to serve their design day demands. In addition, the Company's LRIC Study classifies the LRIC costs of transmission and storage as demand-related.

Q. Does the treatment of design day capacity as part of the customer cost of connecting small customers to NW Natural's gas system ignore that its gas system is designed to meet design day demand as claimed by CUB?

A. No. CUB mistakenly interprets the statement in my direct testimony that design day demand being satisfied by a 2-inch distribution main used by NW Natural to connect the

[17] See Exhibit CUB/100 Jenks-Feighner 3-4.

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customer as not assuring that its gas system will be able to meet the design day demands of its residential customers. Nothing could be further from the truth. In deciding to install 2-inch pipe to connect these customers, the Company's system planners have determined that this pipe size will meet the design day demand as an integral part of connecting the customer to the gas distribution system. Practically speaking, the economics of a utility's gas system are such that the smallest pipe serves both the customer and the demand function at the same time. It also turns out that the demand cost function is largely irrelevant for residential customers because the range of demands served by the customer connection through the installed mains investment is extremely broad under typical customer density and operating conditions. That means that the costs need not be allocated based on customer demands because the larger demand customers served off of the smallest main do not cause any more costs to be incurred than do the smallest customers. However, CUB misses this important distinction entirely in concluding that demand alone drives the investment in distribution mains. In fact, as I will demonstrate below, the number of customers that the Company connects to its existing gas distribution system is the most critical factor explaining the ongoing incurrence of distribution mains costs by the Company.

Q. Is there a basis for illustrating that the number of customers served by a gas utility influences its investment in distribution mains from a planning perspective?

A. Yes. My Exhibit NWN/2502, Feingold/1 presents a simplified diagram of a Local Distribution Company's (LDC) gas system. The city gate is the point of interconnection of the LDC with its interstate gas pipeline supplier. The diagram shows how larger

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industrial customers may be connected by their own line as a direct feed off of the larger transmission or distribution portion of the gas system. The diagram also shows how larger commercial customers are connected off of larger mains that move gas for these customers, and for smaller customers further downstream from the city gate. In some instances, a single residential customer may be served off of larger mains with higher pressures because it is more convenient to do so for the utility, as shown in the middle left portion of the diagram. This arrangement is often referred to as a farm tap. In that case, the utility incurs added costs for regulation because of the greater pressure drop to serve a customer off of these larger and typically higher pressure mains. More commonly, residential and small customers are served from a network of pipes that run throughout the neighborhood. This is illustrated by the residential neighborhood in the lower right hand corner of the diagram. I would also note that the development might also include small general service customers.

The important point to be made is that the diagram illustrates an LDC must provide sufficient footage of distribution mains to cover a larger area based on the density of its customer mix. It is easy to see from the diagram that there is more footage of mains simply because of the existence of smaller customers. This conclusion is also consistent with many existing residential line extension policies that provide for a designated length of main to connect new residential customers. Essentially, the gas system expands distribution mains to connect new areas of customers and that growth in the miles of main is related to extending the network to add new customers. It is obvious that customers cause investment in distribution mains from a planning

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perspective just by reviewing the diagram. It is also clear that customers cause mains investment from a review of the supporting data used to develop the Company's LRIC Study since on average seventy-seven (77) feet of distribution main is added for each new residential customer, as indicated in NW Natural's LRIC Study workpapers.

Q. Does the use of a customer component of distribution mains reflect the fundamental principle of cost causation?

A. Yes. We see from the above discussion that customers cause distribution mains from the utility's planning perspective, and it is also possible to test empirically the hypothesis that the number of customers served by a gas utility cause its investment in mains.

Q. How did you test empirically the hypothesis that there is a causal relationship between the number of customers served by NW Natural and its investment in distribution mains?

A. I analyzed the relationship over time between the number of customers served and the installed footage of mains (serving as a proxy for investment costs) on the NW Natural gas distribution system. My Exhibit NWN/2503, Feingold/1 presents the results of this analysis for the period 1990 through 2011. The annual data utilized was on a total company basis and included miles of distribution mains installed and numbers of customers. Using the number of customers as the independent variable and the miles of distribution main as the dependent variable, I conducted a regression analysis to determine the portion of the variation in the dependent variable (distribution mains) explained by the independent variable (number of customers). The data shows that a regression model using

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customers as the independent variable explained 99.7% of the variation in the dependent variable which is miles of distribution mains.

I also ran a regression analysis with the Company's annual throughput in Mcf included as the independent variable. My Exhibit NWN/2503, Feingold/3 presents the results of this analysis. The regression model explained only 46% of the variation in the dependent variable which is miles of distribution mains. This variable does not serve to explain the ongoing investment in distribution mains made by NW Natural.

Finally, Exhibit NWN/2503, Feingold/2 and Feingold/4 presents graphic analyses of the results of the two regression analyses I just described, and clearly shows that the independent variable "customers" is the strongest and most accurate cost causative factor associated with the Company's investment in distribution mains.

Q. What does this evidence confirm from a costing perspective?

A. The evidence confirms that the Company's LRIC Study correctly derived the LRIC for distribution mains by using a combination of a customer-related minimum system and a demand-related design peak, and only assigned demand-related costs to the larger classes of customers. There is no reason to alter the Company's LRIC Study or the class allocation of its proposed total revenue requirement that was guided by the LRIC Study results.

Q. In discussing Staff's proposed changes to the Company's current revenue decoupling mechanism, does Staff witness Steve Storm reach an incorrect conclusion on the Company's LRIC related to distribution mains?

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A. Yes. After acknowledging that fixed costs do not vary in the short-run with the volume of gas used[18], Mr. Storm goes on to conclude that some categories of fixed distribution costs in the long-run do not vary with customer, but instead vary as a result of, "the additional usage associated with additional customers."[19] As I have explained, even in the long-run, volume or usage does not determine the Company's cost of distribution mains. As long as the smallest pipe being installed by NW Natural continues to meet the design day requirements of its residential customers, the LRIC is caused by customers and not by volume. Mr. Storm cannot separate design day demand from customers and makes the same error in interpretation made by CUB, namely that the pipe installed to connect the customer also serves its design day demand. There is no volumetric component of cost causation associated with this investment. This faulty conclusion causes Mr. Storm to reach an incorrect conclusion related to the Company's revenue decoupling mechanism, as explained in the reply testimony of Natasha Siores. The fundamental error made by Mr. Storm leads to a Staff recommendation related to revenue decoupling that provides the Company with no reasonable opportunity to earn its allowed rate of return. His recommendation should be rejected.

Q. Will you please comment on the NARUC quote related to revenue decoupling mechanisms presented in Mr. Storm's opening testimony?[20]

A. The NARUC quote highlighted by Mr. Storm explains that decoupling on a per customer basis increases a gas utility's earnings where customer growth occurs with little or no

[18] Exhibit Staff/1300 Storm/27, lines 14-16.
[19] Exhibit Staff/1300 Storm/30, lines 1-5.
[20] See Exhibit Staff/1300 Storm/36, lines 13-20.

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investment in distribution mains. It is true that the infill of mains (i.e., where no new main is installed) is generally more profitable for a gas utility, with or without a revenue decoupling mechanism, so long as the added customer produces revenue in excess of the incremental costs of adding the customer in the short-run. Mr. Storm demonstrates that NW Natural has grown faster than the overall population of Oregon. This is an important point because it is obvious that this growth requires new investment in mains to connect these customers to the Company's gas system. However, it cannot all be accomplished through the infill of mains. As a result, the average installed footage of mains for new customers reflects a mix of infill and main extensions, as does the Company's total revenue requirements that must be recovered through rates. The Company's LRIC Study quantifies the cost impact per customer of a combination of main extensions and mains infill and already results in a lower LRIC per customer related to distribution mains.

Q. Are the CUB witnesses correct when they state that distribution assets do not vary with the number of customers in the short-run?[21]

A. No. Every time NW Natural adds a new customer to its gas distribution system at a location that requires a new service, or new service and main, the investment in its distribution system increases. It may also increase when an existing facility is reoccupied and a new meter and regulator is set for the initiation of gas service.

Q. Does the minimum system concept utilized in the Company's LRIC Study ignore the impact of demand on its gas distribution system?

[21] See Exhibit CUB/100 Jenks-Feighner 5-6.

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A. No. I have been very clear in the evidence I have provided in this proceeding that the minimum system also serves the design day demand of residential customers, on average. It does not matter if the customer has a design day demand of one therm or 25 therms, the same 2-inch main will serve the full peak demand requirements of the customer. Further, the LRIC cost of demand or capacity is the same as the customer LRIC based on a 2-inch distribution main up to about 125 therms of design day demand at average system density and assuming all of the customers were served off the same distribution main. As a result, the customer-related LRIC mains investment meets the design day demand for essentially all the Company's residential customers.

Q. Are the CUB witnesses correct that declining use per customer frees up capacity in the existing system for use by others?[22]

A. While CUB is correct in theory, it is only true under limited circumstances for NW Natural's gas system. This is because the Company's service area is relatively dispersed compared to more urban-based gas utilities which places greater importance on the specific location where the decline in use per customer has occurred. In most cases, the location of the new customer will not be in close operational proximity to where the decline in use has occurred, which means that new investment will still be required by the Company to serve this new gas load. In that case, the new investment represents the cost of extending the Company's gas distribution system to connect the new customer.

[22] See Exhibit CUB/100 Jenks-Feighner/6, lines 4-17.

For discussion purposes, if we accept CUB's conclusion, this essentially means that in the short-run the marginal cost of distribution mains for adding a new customer to the Company's existing gas distribution system is zero. In the long-run, the marginal cost of distribution mains for that customer is also zero until such time as the system must be replaced, and at that point the cost is the cost of a 2-inch main for the customers - just as it is today if we assume constant technology. If we are talking about an existing customer adding gas load, the marginal cost is also zero for distribution mains. This conclusion is consistent with the fact that the reduced gas use by an existing customer does not save the Company any costs. The only positive marginal cost in the long-run relates to adding new distribution main to serve new customers. As a result, the Company's LRIC Study correctly estimates the marginal cost and is theoretically consistent. It is important to note that sunk costs (i.e., the historical costs of the Company's existing distribution main are sunk) have no impact on marginal costs.

Q. Are the CUB witnesses correct when they state that distribution mains on the margin are "neither fully customer-related or capacity-related?"[23]

A. No. As I have demonstrated above, this conclusion is incorrect. Distribution mains for residential and other small customers are most certainly customer-related in terms of the factor that causes costs to be incurred by the Company and based on empirical analysis. There is no logical basis for CUB's conclusion. Adding a new customer does not depend on energy conservation from existing customers as a general principle. When gas LDCs plan for system expansion they take into account the need to be able to serve

[23] See Exhibit CUB/100 Jenks-Feighner/7, lines 11-14.

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customers along a distribution mains segment for the entire life of the main because it makes no sense to add only capacity for existing customers and to have to replace the facilities every few years while there is still useful life in the assets. This characteristic is referred to as "lumpy investments" and it occurs for both gas and electric utilities. It recognizes that because of scale economies, it is more appropriate for the utility to invest in assets that will serve its customers for the life of the asset rather than to reinvest year after year in smaller projects that do not provide sufficient long-run project scale.

Q. Is the minimum size concept discussed by CUB relevant to the discussion related to the Company's LRIC Study?[24]

A. The concept of minimum size as discussed in NARUC's Electric Utility Cost Allocation Manual relates to classifying electric system costs between the capacity and customer components. The key point in relation to the minimum size and the minimum system approach used in the Company's LRIC Study is to avoid double-counting of the capacity cost component of the minimum-sized facilities. In developing the minimum system based on the actual planning and design of a least-cost gas system, we have explicitly taken into account the fact that the most economical design of the gas distribution system serves all of the design day demands of residential customers at average system density. It is an elegant, simple, and cost-effective solution to ensuring that there is no double-counting of the capacity component in the Company's LRIC Study. Furthermore, it demonstrates that the expansion of NW Natural's gas system based on least-cost

[24] See Exhibit CUB/100 Jenks-Feighner/7, lines 15-25.

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principles serves the design day demands of residential customers with the same facilities that connect each customer to its gas system. The result of this process is that it costs the same to deliver gas to every residential customer, on average, because they use the same meter, regulator, service, and distribution main, on average, across that rate class.

Q. Should LRIC be based on a utility's hypothetical gas system that is more costly to build rather than the actual gas system to be built as implied by CUB?[25]

A. No. LRIC determination should be based on the actual facilities that will be included in the Company's future revenue requirements. This is not a hypothetical exercise, but a forecast of the actual system planning and resulting costs that the Company expects to incur in the future.

Q. Does precedent related to marginal costing in the electric industry apply equally to the gas industry as the CUB witnesses claim?[26]

A. No. There are a number of specific fact-based differences between LRIC for gas as compared to electricity. Specifically, the load characteristics of the utilities' distribution system differ because for electricity the system is designed on a peak hour while the gas system is designed and allocated to rate classes on a peak day. This causes the class Non-Coincident Peak (NCP) demands and the sum of the customers' NCP demands for a gas utility's rate class to be equal. This is not true for electric utilities where the class NCP is far less than the sum of the customer NCPs. Also, almost all customer classes

[25] See Exhibit CUB/100 Jenks-Feighner 7-8.
[26] See Exhibit CUB/100 Jenks-Feighner 4.

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for the gas system have Coincident Peak (CP) demands equal to the class NCP. It is rare for an electric utility that any class has NCP and CP demands that are equal. Also, there are differences in the operating rating characteristics for the two utility systems because gas moves by pressure through the pipes while electricity flows on the path of least resistance. Finally and perhaps most importantly, the minimum size gas system serves the design day demand of the residential and small commercial classes at standard pressure and density. In contrast, there are many more considerations related to the minimum system for electric service.

Q. Does CUB's discussion of distribution-related LRIC for Portland General Electric Company (PGE) also apply to NW Natural's LRIC Study?

A. No. As I have noted above, there is a fundamental difference between gas and electric utilities related to the diversity of loads on their delivery systems. This difference is fundamental to the development of the customer and demand related LRIC. Different levels of diversity impact the resulting costs for electricity, but not so for gas. For gas, there is no intra-class diversity since all customers have their maximum demand at the time of the utility's design peak. Importantly, the use of volumetric recovery of delivery costs for residential customers results in undue discrimination that should be remedied when it is demonstrated.

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Q. CUB argues that the treatment of costs of an electric utility serves as a basis for setting volumetric rates for gas utilities such as NW Natural.[27] How do you respond to this argument?

A. CUB refers to transformers and feeder lines that are treated as common costs and billed on a volumetric basis for electricity service. However, this point does not translate to the gas-side of the utility business for ratemaking purposes for several reasons. First, the analogous gas equipment to the electric transformer is the regulator that transforms the delivery pressure from the higher pressure of distribution mains to house pressure. Every customer has a regulator at the meter site and its costs are customer-related in nature. This is an obvious difference between electric and gas systems. Feeder lines are designed to deliver the diversified demand of the customers on the feeder at the peak hour with the diversity that exists in the electric system. For the gas system, there is no diversity for distribution mains with respect to residential customers because all customers are consistent with respect to the design day demand occurring at the utility's design temperature. The design day demand is served by the same 2-inch pipe, not different sizes for different customers as may be the case for electric feeder lines. Even though these costs are common costs within a specific geographic area, each customer is responsible for the average cost of distribution main based on the fact that connecting the customer to the gas distribution system with this main also results in meeting the customer's design day demand.

[27] See Exhibit CUB/100 Jenks-Feighner 9-10.

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III. ISSUES RELATED TO NW NATURAL'S CLASS REVENUE PROPOSAL

Q. Do you have any comments related to Staff's alternate class revenue proposal presented by Mr. Ordonez?[28]

A. Yes. I believe the Commission should reject Staff's proposal because it is guided by the results of its LRIC analysis, which I have already concluded is deficient. The Company's proposed class revenue allocation is consistent with, and supportive of, its LRIC Study results. It strikes a reasonable balance between the various criteria or guidelines that relate to the design of utility rates that I discussed in my direct testimony, and is a preferred method compared to Staff's alternate class revenue proposal.

IV. ISSUES RELATED TO NW NATURAL'S RESIDENTIAL RATE DESIGN PROPOSAL

Q. Please summarize the positions of the parties that have addressed the Company's rate design proposal for its residential rate classes.

A. Staff, CUB, and the Coalition have recommended that the Company's rate design proposal for its residential rate classes be replaced by different types of rate design proposals that address various issues deemed to be relevant by these parties.

- Staff proposes a monthly customer charge of $10.00 for all residential customers, with the remaining class revenue requirement recovered through volumetric charges that are seasonally differentiated using a winter-summer differential of approximately $0.25 per therm.[29]

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[28] See Exhibit Staff/1400 Ordonez/31-32.
[29] See Exhibit Staff/1500 Compton 4-5.

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- CUB proposes that the Commission deny NW Natural's residential rate design proposal and "reaffirm that the customer charge can only be used to recover the direct costs of that customer, not the shared cost of the distribution system."[30]
- The Coalition proposes that the Commission reject NW Natural's residential rate design proposal and instead adopt a two-tiered inclining block rate structure for the Company's residential rate schedules set on the basis of a low use first block of 20-30 therms per month and a second block for usage above 30 therms per month.

Q. Is the opposition to the Company's residential rate design proposal by the parties based on a complete analysis of its proposal?

A. No, it is not.

Q. What component is missing from the other parties' discussions of the Company's rate design that is critical to a proper evaluation of this rate concept?

A. The critical missing component is a recognition that the Company's current volumetric rates are unduly discriminatory and that this deficiency should be remedied by a suitable rate design that the Commission can approve. Just and reasonable rates must not be unduly discriminatory and the courts have found that regulatory commissions have an obligation to eliminate undue discrimination when it is identified. Historically, this issue has not been raised related to utilities' volumetric rates. Based on recent analyses of cost causation and the recognition that capacity is made available through the utility's minimum gas distribution system to serve all residential customers, this issue has

[30] See Exhibit CUB/100 Jenks-Feighner 26.

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become an important element of gas utility ratemaking. The criticality of this issue is elevated for NW Natural because it has uniform delivery rates for a service territory with widely varying climate conditions. Since I have demonstrated in my direct testimony that it costs the same on average to provide gas delivery service to residential customers, regardless of annual gas consumption or location on the Company's gas system, volumetric rates for its residential service customers are unduly discriminatory because they collect a different level of revenues for the exact same delivery service provided by the meter, regulator, service line, and distribution main. The issue of undue discrimination is paramount relative to all of the other arguments against adopting NW Natural's proposed residential rate design.[31]

Q. Does Staff and CUB mischaracterize the Company's proposed residential rate design in their opening testimonies?

A. Yes. Staff claims that I propose to include all of NW Natural's "own" costs (defined as the Company's total revenue requirements excluding purchased gas costs) in the fixed portion of the rate structure.[32] CUB's witnesses make a similar claim by asserting that only gas costs would be recovered in the Company's proposed volumetric charge.[33] These claims are simply incorrect. The fixed portion of the Company's proposed residential service rate includes only the delivery-related costs associated with the distribution portion of LRIC. I maintain a volumetric charge in the rate structure to

[31] For example, see F&R Lazarus & Co. v. Pub. Util. Comm'n, 162 Ohio St, 223, 230, 122 N.E. 2d 783,786 7 P.U.R. 3d 319, 330 (1954) in which the following statement was made, "…a utility may charge but one rate for a particular service, and any discrimination between customers as to the rate charged for the same service under like conditions is improper."
[32] See Exhibit Staff/1500 Compton/5, line 20 through Compton/6, line 2, and Compton/20, lines 3-20.
[33] See Exhibit CUB/100 Jenks-Feighner/10, lines 10-13.

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recover LRIC related to the storage and transmission functions.[34] Although these costs are fixed, they would not be the same for customers using different amounts of gas assuming the customers have the same annual load factor. Ideally, to reflect these costs in rates there would be a demand charge, assessed on a peak demand basis, rather than a volumetric charge. However, this preferred approach requires a demand billing basis which is not currently available from the meter reading capabilities within the residential service class.

Staff also concludes that I have assumed costs are uniform across the customers in the residential class. This is also an incorrect statement on his part. I simply assumed based on an assessment of the Company's LRIC that the costs were uniform, on average, across the residential class. This assumption recognizes that there are variations in the cost from one customer to the next. For example, there are many factors that cause the costs of an individual customer to be different from the average customer. These factors include, among other things, whether the customer has a long-side or short-side service line. Mains are typically located on one side of the street, thus, if two customers are located across the street from each other, one customer has a shorter service line than the other just by virtue of the side of the street that the customer lives on.

In addition, distribution mains installed in suburban areas are typically less expensive to install than mains installed in urban areas where main is co-located with

[34] See Exhibit NWN/1102 Feingold/1, line 16 where a total revenue requirement excluding storage and transmission costs is computed for the residential rate classes for purposes of deriving cost-based monthly customer charges

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water, sewer, electric, and telephone lines. Mains are more expensive to install where the soil is rocky than where it is sandy. All these differences in costs are not directly reflected in utility rates because it would create far too many classes of service based on factors such as the side of the street you live on or the type and location of the main that serves the customer.

Mains costs also differ based on when the main was installed. Older main is more depreciated than newer main, yet we do not have vintaged rates. Mains costs differ based on the front footage of the lots where the homes are located and even differ within the same residential development when lots are not uniform in size. The Company does not go down the street and measure each lot to determine which rate classification to use for each customer.

Absent having a unique rate for every different customer based on all these different factors, designing rates to recover the average costs for a particular rate class is how utility regulators have addressed this issue. The Company's residential rate should be the same for all customers based on average costs for the customer class where a rate class is shown to be homogeneous. Further, since it costs the same to serve the Company's residential customers regardless of size, so long as they are served from its minimum gas distribution system, charging the same rate for every customer does, in fact, reflect the costs to serve each customer. Staff recognizes this

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fact as evidenced by Mr. Compton's view that, "utility ratemaking is far from an exact science: for example, much cost averaging is inevitable."[35]

<u>The Impact of Customer Density on Distribution Costs</u>

Q. Does the Coalition contend that density and the cost of distribution mains and services are directly related?[36]

A. Yes. However, the Coalition offers no evidence to support this conclusion - just the simple assertion that it is true. As I discussed above, the cost of distribution mains for a gas utility is more expensive to install and maintain in urban areas compared to suburban areas. The facts do not support the Coalition's assertion and even if it were true, volumetric rates are not the solution since there would still be undue discrimination in rates based on the Company's geographic areas that are served with less costly distribution mains. The solution would be to set rates on the basis of geographic zones that have materially different costs, and to have a different cost-based monthly customer charge for each zone to avoid discrimination within zones, as I will demonstrate below.

Q. Can you demonstrate by example that volumetric rates are unduly discriminatory for a gas utility's residential customers?

A. Yes. Consider the following examples: Subdivision A is located in a Portland suburb. The first three houses in the subdivision are identical in terms of size, thermal envelopes, and equipment efficiencies and they have identical meters, regulators, and mains length per household, and were all built at the same time to the same building

[35] See Exhibit Staff/1500 Compton/19, lines 15-16.
[36] See Exhibit NW Energy Coalition/100 Hirsh/7, lines 5-13.

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code requirements. Homes 1and 2 have long-side services while Home 3 has a short-side service. Homes 1 and 2 are occupied by a family of four with the same age distribution for its family members. Home 3 is occupied by a family of six with an identical age distribution because they have two sets of twins. Home 1 has gas heat and hot water. Home 2 has a dual-fuel gas heat pump as the only gas appliance. Home 3 has gas heat, water heating, cooking, drying, and a gas grill. On an annual basis, these homes use gas in the following quantities:

Home	Annual Gas Usage (Therms)
1	700
2	250
3	800

The gas delivery costs are identical for Homes 1 and 2 while the actual cost for Home 3 is lower because of the short-side service line. Since we have already concluded that it is not reasonable to distinguish costs based on which side of the street the customer is located, these three customers have identical costs to serve based on the utility's average costs of delivery service. If we assume a monthly customer charge of $10.00 and a delivery-related volumetric charge of $0.40 per therm, each home will pay a different amount for annual gas service even though the costs to serve are identical: Home 1 will pay $400 annually; Home 2 will pay $220 annually; and Home 3 will pay $440 annually. It is obvious that Home 3 will pay more than the average cost to serve

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and Home 2 will pay almost half the average cost to serve[37]. From these results, we have demonstrated that rates are unduly discriminatory without even addressing the issue of different Heating Degree-Days (HDDs) across the utility's service area.

If we assume an identical house to House 1 that is located in The Dalles, we would expect annual consumption of about 850 therms based on higher HDDs, and an annual bill of $460. This is 15% more in annual costs for the identical delivery service without any difference in the average cost to serve (I should also note that the Company's installed unit cost of mains for new projects in The Dalles averages $16 per foot compared to the system average of $23 per foot. Absent an averaging of costs, rates should be lower than the average cost for this area). Yet, no party addressed this critical issue in their opening or direct testimony. Each party opposing the Company's proposed rate design recommended a volumetric rate that perpetuates the undue discrimination that results from such a rate structure.

Q. Does Staff also argue that density should be a factor to be considered in rate design?

A. Yes. Staff argues that density translates into significant cost differences and assumes that the costs are lower in areas with higher density.[38] Unfortunately, Staff offers no evidence that density actually means lower costs for the gas utility. In fact, density results in higher distribution-related costs for a number of reasons, including: more expensive maintenance because of the myriad of facilities (electric conduit, cable

[37] The annual average cost to serve in this example is equal to approximately $353 [(1,750 therms x $0.40 per therm) +($10.00 x 3 customers x 12)]/3
[38] See Exhibit Staff/1500 Compton/15-19.

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conduit, water lines, unused steam lines, and telephone conduit) that are buried near or co-located with gas mains; the rules and regulations applicable to service in urban areas typically impose extra costs on the utility for excavation (often requiring hand digging and removal of all materials) and monitoring of repairs; strict requirements related to backfill and paving and requirements that limit how and when work can be done to install, maintain, repair and replace distribution system components; the need for a traffic control plan, and additional safety-related requirements placed on operators of a natural gas distribution system. Finally, rural areas that are less densely populated may be the least costly to serve because of their proximity to the interstate gas pipelines that supply natural gas to the LDC through "city gates" and the lower installation and maintenance costs associated with distribution facilities located in rural and undeveloped areas. Thus, it is fair to conclude that Staff's contention is not reflective of any of these considerations.

Further, if density is in fact an issue to be considered for rate design purposes, it is inappropriate to continue a rate design that is unduly discriminatory for all customers in a rate class when the issue is really creating the need for separate classes that are more homogeneous in nature. This would mean having rate classes based on geographic zones, as Staff suggests,[39] because of his belief that customers in areas with greater density would have lower costs. Even in that type of situation, however, volumetric rates would be unduly discriminatory for any one particular geographic area.

[39] See Exhibit Staff/1500 Compton/19, footnote 17.

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Q. Does the Company have evidence that the unit cost of installing distribution mains is greater in geographic areas that have higher density?

A. Yes. In conjunction with its review of Staff's opening testimony, the Company compiled actual cost data of its recent main extensions and distribution system expansions. The Company defines "Main Extensions" as typically associated with residential conversions in established neighborhoods where the density is reflected by the fact that these projects require installation activities that require hard surface cuts, paving or working with other utilities' assets, and other issues such as traffic controls during construction. This is typical of denser, urban installations in general and this result is consistent with our findings in other jurisdictions as well with the more conceptual discussions I presented above.

"System Expansions" are typically associated with new housing developments in suburban areas where there is no need to deal with paving or other utilities' assets, traffic controls, and the trench is open for easier and less costly installation. Further, there is a productivity advantage due to the greater amount of footage typically installed in this type of situation. This result also is consistent with our findings elsewhere and with our conceptual discussions above. Based on a review of the costs incurred by the Company to install distribution mains under these two types of situations, we find that the cost of installing distribution main in the urban areas of the Portland District is approximately $48 per foot, while in the suburban areas of the Portland District the cost is approximately $15 per foot. This means that the average customer density in the urban area would need to be more than 3.2 times as great for the cost of mains to be

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lower in NW Natural's urban areas than in the more rural areas of the Company's gas distribution system.

Based on the information Staff relied upon to reach its conclusion concerning density[40], only Coos Bay has a density greater than 3.2 times that of Portland. Thus, both Staff and the Coalition are incorrect in their contention that NW Natural's average cost of distribution mains differs based on customer density. As we have shown theoretically and empirically, the cost of distribution mains per customer is the same on average throughout the Company's gas system. For all eight of the Company's geographic areas, the urban installations averaged $44 per foot while the suburban installations averaged $16 per foot. Applying the same monthly customer charges across the Company's gas system for distribution delivery service to its residential customers is cost-based because, on average, the fixed costs of distribution are the same for residential customers irrespective of the volume of gas they consume on either a peak day or annual basis.

Q. Staff witness Compton refers to multi-family dwellings in his discussion of customer density and rate design.[41] Is it possible to demonstrate by example that volumetric rates are unduly discriminatory for multi-family residential customers?

A. Yes. Consider the following example: two identical apartment buildings in an urban setting are located across the street from each other. Both were built 40 years ago. Building 1 has been completely remodeled and updated while Building 2 has not.

[40] See NW Natural's response to Staff Data Request 207.
[41] See Exhibit Staff/1500 Compton/17-18.

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Building 1 has a long-side service of 160 feet to the back wall of the structure. Building 2 has a short-side service from another street to its back wall. Both buildings have the same length and age of distribution main, meter, and regulator. Each building has 8 units. The units are designated by building number and the units have identical occupants as indicated below.

In this example, we use the same gas rates as in the other example above and recognize that the renovated apartment building uses less gas commodity than the apartment that has not been renovated. The costs to serve the two apartments are identical except for the service investment, and we have no basis for designing rates on the basis of individual service line costs. Instead, rates are based on the average service length, so the two buildings have identical costs to serve.

Building and Unit	**Occupants**	**Annual Gas Usage (Therms)**	**Annual Gas Bill**
1-1	Single Male	150	$180
1-2	Single Female	200	$200
1-3	Retired Couple	400	$280
1-4	3 Roommates	375	$270
1-5	Couple	350	$260
1-6	Family with Infant	400	$280
1-7	Family with 2 children	400	$280
1-8	Family with 2 children and mother-in-law	450	$300
Total – Bldg. 1		2,725	$2,050
2-1	Single Male	250	$220
2-2	Single Female	300	$240
2-3	Retired Couple	600	$360
2-4	3 Roommates	375	$270
2-5	Couple	400	$280
2-6	Family with Infant	650	$380
2-7	Family with 2 children	500	$320
2-8	Family with 2 children and mother-in-law	650	$380
Total – Bldg. 2		3,725	$2,450

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Using volumetric rates, Building 1 pays $2,050 annually for gas service while Building 2 pays $2,455 annually for gas service based on the same cost and delivery service. This rate premium of almost 20% represents unduly discriminatory rates.

Q. How does the residential service rate structure proposed by NW Natural remedy this type of rate discrimination?

A. In each case, the delivery rate for a homogeneous class of service such as the Company's residential class will collect the same level of non-gas revenue for distribution delivery service from each customer on an annual basis, which is reasonable and appropriate because, on average, the costs are the same. Under the Company's rate proposal, the volumetric cost recovery associated with its storage and transmission functions varies with gas usage so larger customers who use more storage will pay more for that service, just as they should.

Q. Please discuss Staff's concern that differences in density translates to large differences in the Company's costs of distribution mains to serve different neighborhoods.[42]

A. First, Staff's concern is not supported by either empirical data or specific cost analysis, so it is a conclusion without any support. And as I have shown above, this conclusion is factually incorrect. Second, unless we are going to take into account all the differences in the cost of mains across the Company's service area based on other factors besides density, it is an irrelevant concern for ratemaking purposes. For example, the cost differences between newer and older distribution mains overshadows the cost

[42] See Exhibit Staff/1500 Compton/18.

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differences associated with any differences in the length of main per customer. Based on the Company's LRIC Study, the annual unit LRIC of distribution mains is approximately $1.43 per foot,[43] and this number is significantly higher than the embedded unit cost that is reflected in the Company's total revenue requirement. The annual unit embedded cost of distribution mains is approximately $0.64 per foot. Third, this is the average cost of mains and does not account for differences in costs as I discussed above related to different installation locations.

This discussion points out that there are not real differences in the Company's cost of distribution mains based on the density of its different neighborhoods to be a determining factor for rate design purposes. Ultimately, that same conclusion was the basis for the Company grouping residential customers into a single homogeneous rate class, and for using average costs per customer as the basis for the cost to serve each customer. With those costs being the same, on average, for each customer of the rate class, this is the manner in which rates are set for all of the Company's rate schedules.

Q. How do you respond to Staff's argument that customer density is inversely related to per customer gas usage?[44]

A. First, this is an assumption that Staff has not tested empirically. This argument against the implementation of fixed monthly rate structures is not new. Rather, I have demonstrated in my testimony in other jurisdictions that density increases the installed cost of mains to more than offset the additional density, and as I show above, the same

[43] See Exhibit NWN/1101 Feingold/9, column C divided by 77 feet.
[44] See Exhibit Staff/1500 Compton/16, lines 12-13.

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is true for NW Natural. Second, even if the implied assumption of lower costs for higher density is correct, volumetric rates are not a reasonable basis to reflect the claimed differences in costs between customers in the higher density areas, as I have demonstrated above. The volumetric charges would still create undue rate discrimination between below-average customers who would pay less than the indicated costs and above-average customers who would pay more than their indicated costs.

Q. How does Staff support the conclusion that locations with higher density have lower distribution main costs if he has provided no empirical evidence?

A. Staff's support is simply to discuss categories of customers that have higher density such as apartments, townhomes, and duplexes and concludes (without any specific evidence) that the dwelling requires less than 77 feet of distribution main. In my view, his statement is, at best, only half true. Consider an apartment complex with 20 buildings, each with eight apartments. If you only examine an individual building, the average density is higher than for the entire complex. However, if you consider the distribution main that is run throughout the entire complex to move gas from building to building, the density begins to decline. Further, the cost of installation and maintenance of that particular distribution main will likely be higher because of the co-location of gas mains with other utility services in a relatively restricted area. Thus, density results in higher distribution-related mains investment and maintenance costs even though there are more customers per mile of main. Thus, his example fails to provide evidence to support his claim.

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Q. Do single family homes in less densely populated areas have higher costs for distribution mains and services than for apartments?

A. As I discussed in detail earlier in my reply testimony, many factors influence the cost of installing mains and service lines so there is no clearcut answer to this question. Obviously, more feet of pipe costs more than less feet of pipe, but the material cost of the pipe is minor compared to the cost of installation. Installing services in subdivisions occur before the surrounding yard space has been completed and landscaped, so there is no cost to the utility to restore the property. The installation typically uses a power trenching tool with no hand digging required.

The important point here is that the total cost of distribution mains and services may be higher or lower than average for shorter length mains and services based on the type of installation required, and the same is true for longer than average mains and services. Nevertheless, as I discussed previously, we do not design rates based on actual costs for each customer, but instead utilize the average cost of mains and services for customers in the same rate class. Staff certainly agrees with this averaging concept in light of the statement he made related to utility ratemaking that "much cost averaging is inevitable."[45] The evidence I have presented demonstrates conclusively that the average cost of distribution service is the same for all customers within NW Natural's residential class.

<u>The Economic Principles of Utility Ratemaking</u>

[45] See Exhibit Staff/1500 Compton/19. Lines 15-16.

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Q. Mr. Compton states an opinion about what he views as a "perfect" residential customer charge."[46] Is his opinion of that charge grounded in sound economic theory?

A. No. His opinion of the "perfect" residential customer charge virtually ignores economic theory related to the efficiency of two-part rates and Ramsey Pricing for economic efficiency. He states that the only mains-related costs to be recovered in the customer charge are the costs associated with mains dedicated to particular customers. That view is wholly inconsistent with the concept of an optimal two-part tariff. The literature on two-part tariffs demonstrate that the optimal tariff recovers short-run marginal costs in the volumetric charge and the remaining revenue requirement is recovered in the fixed charge, which includes the embedded cost of mains that are common to customers in the gas utility's residential class. Under Ramsey Pricing, the variable rate recovers the marginal cost and the infra-marginal charge, and the customer charge recovers the remainder of the revenue requirement because it is the least elastic element of the rate structure.

Q. Does Staff's opening testimony support NW Natural's proposal to implement a cost-based monthly customer charge for its residential customers from the standpoint of economic efficiency and equity?

A. Yes. Staff describes the impact of prices in excess of marginal cost as under consumption of the service and over consumption when prices are less than marginal

[46] See Exhibit Staff/1500 Compton/7, lines 1-15.

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cost.[47] He defines equity in terms of cost causation and notes that problems exist when customers within a rate schedule subsidize other customers on the same schedule. Despite getting the economic definitions correct, Staff discards the theory and reverts to rates that exceed marginal cost for the volumetric rate component, and that foster a cross-subsidy between large and small use customers within the residential class. His own rate proposals violate the very standards he endorses as a basis to judge rates. The Company's proposed residential rates gradually transition from inefficient and inequitable rates to efficient and equitable rates using the principle of gradualism espoused by Staff as an element for setting rates.

Q. Does Mr. Compton base Staff's rejection of higher monthly customer charges for the Company's residential service customers on accepted regulatory principles?

A. No. Mr. Compton states that a "customer charge should cover only those costs which each customer, unambiguously, imposes on the system."[48] He also states that "the upshot is to recover many of the generic, not easily classified costs through volumetric charges rather than through fixed monthly customer charges."[49] Neither of these concepts are principles of rate design that have acceptance anywhere except among those who advocate positions designed to meet a particular form of rate discrimination. That type of rate discrimination forces larger-use customers to subsidize smaller use customers on the mistaken belief that this promotes energy conservation and assists consumers at the poverty income level. From a theoretical perspective, the literature of

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47 See Exhibit Staff/ Compton/28-29.
48 See Exhibit Staff/1500 Compton/14, lines 8-10.
49 See Exhibit Staff/1500 Compton/14, lines 19-21.

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economics is absolutely clear with regard to efficient prices. Economic efficiency results from setting prices equal to short-run marginal costs. Efficiency properties of the competitive model depend on this pricing prescription. Consider the unambiguous statement of Alfred Kahn (a preeminent authority on the economics of regulation and former Chairman of both state and federal regulatory agencies) regarding efficient pricing:

> "It is short-run marginal cost to which price should at any given time—hence always—be equated, because it is short-run marginal that reflects the social opportunity cost of providing the additional unit that buyers are at any given time trying to decide whether to buy."[50]

The principle of marginal cost pricing provides the prescription for economically efficient prices. In this case, the adoption of cost-based monthly customer charges for residential customers is a requisite for economic efficiency. As I demonstrated above, this type of cost-based rate design is not only efficient, it avoids undue discrimination by charging each customer the average cost actually incurred by the utility to serve that customer. Further, the recovery of fixed costs in the monthly customer charge, rather than through volumetric charges, results in rates that are just and reasonable and not unduly discriminatory. It is fundamentally incorrect for Staff to argue that the costs to serve customers identified in the Company's LRIC Study (which Staff accepts for the most part as being reasonable), which have been proven by costing and empirical analysis to be customer-related, should somehow be dumped into a "catch-all" cost

[50] The Economics of Regulation, Alfred E. Kahn, the MIT Press, 1995 (Sixth Printing), Vol. I, page 71.

classification category and recovered volumetrically. In fact, Staff acknowledges that those costs do not change at the margin.

I would note that this point is particularly relevant to the cost of distribution mains because absent losing customers so that distribution mains need not be replaced, even in the long-run, 2-inch pipe will be replaced by the Company with 2-inch pipe. Further, the cost of connecting a new customer at the margin (i.e., marginal customer costs) is, on average, the cost of a meter, regulator, service line of average length, and 77 feet of distribution main. By accepting the positions of Staff, CUB, and the Coalition, the Commission will knowingly perpetuate the condition of undue discrimination in NW Natural's residential service rates contrary to law, and will approve rates that fail the test of economic efficiency by sending poor price signals to customers.

Q. Does Staff acknowledge that there is an economic argument in support of minimizing the Company's volumetric charges for residential service?

A. Yes. Staff states that there is an economic argument based on marginal costs for lower volumetric rates for gas service.[51] I should note the assumptions he has made because he mistakenly attributes elements to the NW Natural residential rate proposal that do not exist. For example, NW Natural's proposed residential rates do not recover storage and transmission costs in the monthly customer charge.

Additionally, the Company's proposed residential rates do not assume that the costs of distribution mains and service are the same for every customer simply because that is not a required assumption to support this rate proposal. We know that the costs

[51] See Exhibit Staff/1500 Compton/28, line 16 through Compton/29, line 4.

of distribution mains and services are not the same for every customer for all the reasons I discussed above. Rather, the average costs of distribution mains and services are the same across all customers, and rates out of necessity must be based on average costs because the factors that drive cost differences cannot be incorporated into rates without having a different rate for each customer. Since there is no relationship between the annual volume of gas consumed and the level of distribution-related costs incurred by the Company, it follows that volumetric rates cannot recover these costs in a just and reasonable manner. In fact, other regulatory agencies, such as the Public Utility Commission of Ohio, have reached this conclusion and its finding has been upheld by the Ohio Supreme Court in several decisions, even though the opponents made the same density argument presented by the Staff and the Coalition in this proceeding.

Finally, there is no basis in law or regulation for the claim made by Staff that the monthly recovery of fixed costs should be in direct proportion to customers' gas usage. That statement even fails to recognize the fixed costs of distribution-related plant facilities that Staff acknowledges are the same for every customer, such as the meter and regulator. In short, even though Staff mischaracterizes NW Natural's residential rate proposal and related assumptions, his acknowledgement of the economic rationale for a fully cost-based monthly customer charge is correct and is supported by the theoretical literature of economics.

Q. Does Staff suggest that economically efficient rates threaten rate equity?

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A. Yes.[52] However, it appears that Staff confuses efficient marginal cost-based rates, such as the Company's residential rate proposal, with the issue of recovery of a utility's revenue requirement based on embedded costs by assuming that the recovery of embedded costs requires a different rate design based on a fair allocation of costs among the utility's customers. Even on an embedded cost basis, recovering the average cost of delivering natural gas to residential and other smaller customers (for whom the minimum sized main installed on the utility's gas delivery system not only connects the customer, but also satisfies the design day demands of the average customer) on a volumetric basis will result in unduly discriminatory rates. Therefore, it becomes an obligation of the Commission to remedy the undue discrimination present in the Company's current residential rates that arises from the volumetric recovery of its fixed distribution-related costs. This is most directly accomplished by adopting NW Natural's residential rate proposal.

Q. Do you acknowledge that there is an aspect of economic inefficiency to be addressed through the proposed redesign of the Company's current residential service rates?

A. Yes. However, it should be recognized that the inefficiency occurred in the past when customers were added to the Company's gas distribution system at a cost that far exceeded the revenues that the customer would generate under its then current rates. As the Company transitions from volumetric rates to fully cost-based customer charges, certain of these customers will terminate their gas service and possibly leave behind

[52] See Exhibit Staff/1500 Compton/29, lines 5-17.

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some level of stranded costs (depending on the extent to which a new customer will decide to initiate gas service at the same location). These stranded costs were incurred under a pricing scheme that was not economically efficient, but it was the only one available to the Company at that time. These customers will have to decide if the higher monthly customer charge, and the continuing access to natural gas, creates benefits greater than the energy alternative available to replace gas service. The important point here is that on a going forward basis, the decision to connect to the Company's gas system and to use natural gas will be made based on rates that reflect the full marginal cost of serving a new customer, and other customers' rates will not have to be increased because the new customers added to the Company's gas system will not have to be subsidized.

Q. Does the Coalition and CUB support the use of long-run marginal cost as the basis for setting gas prices?

A. Yes.[53] As I have noted above, there is no basis in economic theory for setting rates at long-run marginal cost. CUB's position is quite surprising given their intent to increase the Company's volumetric gas rates because from a theoretical viewpoint, long-run marginal cost is below short-run marginal cost for a company like NW Natural that exhibits economies of scale. Setting gas rates on long-run marginal cost would result in lower, not higher volumetric charges. The apparent confusion on the part of consumer advocates such as CUB results from a misunderstanding of the assumptions underlying the development of long-run marginal costs and average costs within the context of

[53] See Exhibit NW Energy Coalition/100 Hirsh/11, lines 25-28 and Exhibit CUB/100 Jenks-Feighner/13-14.

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utility regulation. Long-run marginal costs assume that both technology and input prices are fixed consistent with those occurring in the short-run. The fact that costs curves shift upward vertically over time because of inflation and shift downward vertically over time because of technology contributes to this confusion. The important point is that with scale economies, as acknowledged by Staff, long-run marginal cost will continue to be below short-run marginal cost until such time that all scale economies are exhausted. This is one of the reasons that short-run marginal cost must be the basis for any efficient price signal.

Q. Does the Coalition rely on other industry sources for its economic conclusions?

A. Yes. The Coalition relies on information from the Regulatory Assistance Project (RAP). RAP is a non-profit advocacy group that supports policies to promote long-term economic and environmental sustainability of the power and natural gas sectors.[54] Unfortunately, the conclusions cited by the Coalition with respect to rate designs similar to the Company's proposal are incorrect and fail to recognize the economic inefficiency and undue discrimination that results from volumetric rates for natural gas utilities.[55] Specifically, under the Company's residential rate design proposal, energy prices are <u>not</u> set far below long-run marginal cost for the reasons I explained above. Since small users and apartment dwellers, on average, have the same delivery costs, horizontal equity requires that they pay the same amount as larger users for the delivery service, while vertical equity is satisfied by the volumetric recovery of the costs of storage,

[54] See www.raponline.org for a description of RAP's statement of purpose.
[55] See Exhibit NW Energy Coalition/100 Hirsh/12.

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transmission, and the gas commodity. Bill savings are adequate and fully supportable under a fully cost-based customer charge since the delivered cost of gas plus the recovery of storage and transmission costs still provide an appropriate, efficient, and equitable price signal to consumers.

The independent academic research that I cited in my direct testimony by Severin Borenstein and Lucas W. Davis entitled, “The Equity and Efficiency of Two-Part Tariffs in U.S. Natural Gas Markets,” supports the conclusion that volumetric rates impose efficiency losses. Finally, if gas usage increases as the result of the Company’s rate design proposal, that increase can be caused by customers’ economically efficient decisions such as replacing electric water heating with gas, which reduces the inefficiency of the indirect use of gas at the margin for electricity supply. I should add that Staff witness Mr. Compton noted this same point in his opening testimony.[56]

Q. Do CUB’s witnesses rely on other arguments in support of their claim that the Company’s rates should be based on long-run marginal costs?

A. Yes. CUB’s witnesses discuss at length the Integrated Resource Planning (IRP) process and the role of long-run marginal costs in the IRP process. The fundamental disconnect between their discussion and NW Natural’s proposed rate design is that as long as the Company continues to serve customers, the cost of a 2-inch main cannot be avoided since that size main primarily serves residential customers in a least cost manner. Further, as I noted above, long-run marginal cost is below short-run marginal cost in the presence of economies of scale.

[56] See Exhibit Staff/1500 Compton/28-29.

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<u>Cost Causation Principles and Utility Rates</u>

Q. Does Staff's theory of "rough justice"[57] comport with the theory of cost causation which states those who cause the cost should pay the cost?

A. No. In fact the opposite is the case. Even though the costs are the same on average for gas delivery service, the "rough justice" concept would by Staff's own admission, have larger customers paying more for the same service received by lower use customers. On average, all residential customers have the same cost for the meter, regulator, service line, and main to meet the design day capacity they require because the same facilities are used for all customers. There is no justice, "rough" or otherwise, in Staff's proposed volumetric rate recovery of distribution costs because it is unduly discriminatory, as I demonstrated above.

Q. Please respond to the observation Staff claimed you made concerning the Company's gas distribution system not being sized to reflect the level of design day demand?

A. Staff witness Mr. Compton states that I have "observed that standard-diameter mains are not sized to reflect the levels of demand they are expected to accommodate."[58] By levels of demand, I assume that Mr. Compton means design day demand. Nonetheless, his statement is both false and nonsensical. Throughout my direct testimony, I have stated that utilities' gas distribution systems are designed specifically to meet the design day demand of all customers. The important point missed by Mr. Compton is that the

[57] See Exhibit Staff/1500 Compton/7-8 and 19.
[58] See Exhibit Staff/1500 Compton/15, lines 9-10.

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minimum size of main installed (2-inch) not only connects the typical residential customer to NW Natural's gas delivery system, it simultaneously meets the design day demand requirements of all its residential customers. This means that there is no additional cost for satisfying the design day capacity requirements of the Company's residential customers beyond the cost incurred to connect the customer to its gas distribution system. I have demonstrated previously that from both a theoretical and empirical perspective, these costs are deemed to be customer-related. I have also shown that there is no relationship between the cost of mains and annual volume, as Mr. Compton has attempted to assert.[59]

Q. Does Staff conclude that the costs of distribution mains are not demand or energy driven once the main is installed?[60]

A. Yes. Staff's conclusion fully supports the recovery of these costs in the Company's monthly customer charge because the only remaining category for costs that are not caused by demand or energy is the customer cost component. This is a correct conclusion because neither design day demand nor the volume of gas consumed on an annual basis changes the Company's distribution cost of service at the margin. Indeed, this is the conclusion of economists who developed the theory of two-part rates to recover marginal costs in a volumetric rate and fixed costs in a fixed charge. I have explained in detail in my direct testimony and above the concept of cost causation. I have also shown that for the Company, as well as for other gas utilities, the investment

[59] For example, see Exhibit Staff/1500 Compton/16, lines 11-12.
[60] See Exhibit Staff/1500 Compton/15, lines 12-14.

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in distribution mains is primarily caused by customers, and not by volume. To argue for volumetric recovery of fixed costs by denying that such costs exhibit customer-related cost causative characteristics, as Staff has done, is to accept undue discrimination in rates as a reasonable utility ratemaking and regulatory policy.

Q. Do any recognized authorities in the utility regulatory field respond to Staff's contention that it is improper to characterize a portion of a gas utility's distribution mains on a customer basis?

A. Yes. In Principles of Public Utility Rates,[61] Professor Bonbright notes that the use of a two-part rate structure is based on the assumption that one part of the total cost of a utility's business is a function of the output or energy of the system, whereas another part is a function of plant capacity and hence of all costs related to this capacity. Professor Bonbright goes on to point out, however, that "this two-fold distinction overlooks the fact that a material part of the operation and capital costs of a utility business is more directly and closely related to the number of customers than to energy consumption on the one hand or maximum kilowatt demand on the other hand." (Emphasis added).

In addition, in this section dealing with the criteria of a sound rate structure, Professor Bonbright states that, "customer costs incurred to serve a customer are invariant with respect to consumption. They are the costs incurred to serve a customer even if the customer does not use the service at all. The most obvious examples of

[61] Principles of Public Utility Rates, Second Edition, James C. Bonbright, Albert L. Danielson, David R. Kamerschen, Public Utility Reports, Inc., 1988.

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these customer costs are the expenses associated with local connection facilities, metering equipment and meter reading, billing and accounting, and a portion of the distribution system." Finally, at page 492, Professor Bonbright states that, "in actual practice the vast majority of utilities utilized some form of minimum system to classify costs, which is in line with FERC accounts."

In his widely utilized text, The Regulation of Public Utilities,[62] Dr. Charles F. Phillips, Jr. states that, "customer costs vary with the number of customers. These costs include a portion of the distribution system, local connection facilities, metering equipment, billing and accounting. Customer costs, moreover, are independent of consumption."

In Gas Rate Fundamentals,[63] published by the American Gas Association (AGA), it is stated that customer-related costs are primarily distribution and customer accounting costs. In conjunction with its discussion of various utility cost components, it is further stated that, "the closer a plant item (e.g., a meter and service line) is located to a customer, the more that particular item is related to the specific requirements of that customer. Thus, the customer component of distribution costs reflects the theoretical distribution system that would be needed to serve customers at nominal or minimum load conditions." Additionally, in discussing the various functions and cost causative components attributable to the operations of a gas distribution utility, it is stated that for distribution costs, the prime cost causation component is one that is customer-related.

[62] The Regulation of Public Utilities, Charles F. Phillips, Jr., Public Utility Reports, 1984.
[63] Gas Rate Fundamentals, Fourth Edition, American Gas Association, 1987.

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Q. Mr. Compton makes the statement that when one customer uses twice as much as another "it is normally regarded as quite appropriate for the former's bill to be roughly twice the level of the latter's."[64] How do you respond to this statement?

A. I cannot state what is "normally regarded" because Mr. Compton does not indicate by whom this is "normally regarded." It is certainly not the case when one focuses on the concept of cost causation and economies of scale as it relates to the cost of gas delivery service. In fact, this statement may only be true with respect to a utility's gas commodity costs, and only then if the two customers have equal annual load factors. In my opinion, it is far more likely that, with a emphasis on cost causation and economies of scale, one would conclude that paying the same rate for gas delivery service, as proposed by NW Natural, in this case is much more equitable an outcome than causing larger customers to subsidize smaller customers which occurs under volumetric rates.

Q. Please discuss the Coalition's contention that the Company's monthly customer charge for its residential customers should only cover "the cost of bimonthly metering and billing."[65]

A. First, I must assume that the Coalition meant to include the investment in the meter and regulator, meter reading, and billing when it was addressing what costs should be recovered through the monthly customer charge. Aside from not acknowledging all of the other cost elements that are directly related to the number of customers served by the Company (such as expenses for customer service, credit and collections, and

[64] See Exhibit Staff/1500 Compton/19, lines 20-21.
[65] See Exhibit NW Energy Coalition/100 Hirsh/11, lines 2-3.

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remittance processing), the Coalition fails to note that there is also investment in a service line for each customer. By the Coalition endorsing the volumetric rate recovery of the cost of service lines, customers using more than the average amount of gas will subsidize the service line costs of smaller use customers even though each has an identical size service and similar associated costs. Where customers have identical facilities and costs, it is unreasonable to knowingly charge customers different rates. Yet that is the result of the Coalition's recommendation. When it fails to include the recovery of investment costs for services in a fixed monthly charge, the Coalition produces the same geographic discrimination that it insists does not exist. There is no reason to believe that main density in different communities also means that services are of different length, or cost more in colder geographic areas. In fact, it is true that suburban services are less costly to install, and less costly to maintain, compared to services in urban areas.

As a result of the Coalition's proposed rate treatment of these costs, it will be creating unduly discriminatory gas rates for the Company's residential customers by charging marginal prices that are far above any reasonable definition of marginal cost, and by collecting more revenue from larger customers compared to the underlying costs they cause the Company to incur.

Q. The Coalition expresses concern that the Company's proposed "high customer charge" creates discrimination.[66] Do you believe that is a valid concern?

[66] See Exhibit NW Energy Coalition/100 Hirsh/13-14.

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A. No. The definition of discrimination is based on the difference between a utility's costs and the revenues generated through its rates. The customers who are likely to leave the gas system have been receiving significant subsidies and are the beneficiaries of rates that are unduly discriminatory. The cure for such discrimination, as prescribed by the courts, is to increase rates for those who are not paying for the costs they are causing the utility to incur and to decrease rates for those paying more than their costs. The Company's residential rate design proposal accomplishes this goal by phasing-in cost-based rates recognizing that large immediate bill impacts would violate the concept of rate gradualism. I should note that curing undue discrimination in utility rates may be one case where gradualism is not as critical a consideration, but by phasing-in the necessary change in rates, it allows customers to adjust to the elimination of the existing rate subsidy in a more reasonable manner.

Q. Does the Coalition conclude that a gas utility's delivery system costs are primarily volume-related?

A. Yes. The Coalition's support for this position is based on its agreement with a statement from RAP.[67] This statement is not supported, however, on either theoretical grounds or empirically, as I have demonstrated above.

Q. In the statement the Coalition quotes from RAP, it is claimed that, "regulators should be careful in considering higher basic monthly charges to recover costs that are incurred for utility infrastructure." Are you familiar with other views

[67] Exhibit NW Energy Coalition/100 Hirsh/14, lines 26-31.

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expressed by utility regulators that support the recovery of a utility's fixed costs of its gas infrastructure through cost-based monthly fixed charges?

A. Yes. For example, the Missouri Public Service Commission (MPSC) approved a Straight Fixed-Variable (SFV) rate design for the residential and small general service customers of Missouri Gas Energy (MGE) in its last rate case completed in February 2010 (Case No. GR-2009-0355). In its Report and Order, the MPSC provided a number of reasons why it adopted a SFV rate design for these rate classes.

- "Straight Fixed Variable rate design best reflects the actual costs customers impose upon MGE's system."[68]
- "SFV Rate Design Reduces Spikes in Winter Bills and Moderates Bill Fluctuations Throughout the Year."[69]
- "SFV Rates Represent Economically Efficient Pricing."[70]
- "SFV Rate Design Simplifies Customers' Bills."[71]
- "SFV Rate Design Stabilizes MGE's Revenues."[72]
- "State Energy Policy Strongly Favors Revenue Decoupling Rate Design."[73]

The Public Utilities Commission of Ohio (PUCO) has approved a SFV rate design for all of the gas utilities that it regulates. In its Opinion and Order approving a SFV rate design for the small general service class (which contains its residential customers) of Columbia Gas of Ohio, Inc., the PUCO summarized the reasons why it adopted this type of rate structure:

[68] Missouri Public Service Commission, Case No. GR-2009-0355, Report and Order, page 41.
[69] *Id*. at page 42.
[70] *Id*. at page 44.
[71] *Id*. at page 45.
[72] *Id*. at page 46.
[73] *Id*. at page 48.

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"The Commission has determined previously in *Duke Energy* and *Dominion East Ohio* that a rate design that separates or decouples a gas company's recovery of its cost of delivering the gas from the amount of gas customers actually consume is necessary to align the new market realities with important regulatory objectives. The Commission also determined in those cases that an SFV rate design is more appropriate tha[n] a sales decoupling rider. After considering the record on rate design issues presented in this case for the Commission's consideration, we again conclude that an SFV rate design is the most appropriate rate design based on the current circumstances. We find that the SFV rate design is preferable to a sales decoupling rider (the alternative recommendation of OCC witness [Glenn A.] Watkins) because it benefits customers by producing more stable bills throughout the year, it is easier for customers to understand, better price signals are sent to consumers, and it provides a more equitable cost allocation among customers regardless of usage. It is in the interest of all customers that Columbia has adequate and stable revenues to pay for the costs of its operations and capital to ensure the continued provision of safe and reliable service. Under current circumstances, the SFV rate design will best provide that stability. There is also a societal benefit to engage Columbia to promote conservation. This is best accomplished by removing from rate design the current built-in incentive that Columbia has to increase revenues through increased gas sales. The SFV rate design, which decouples recovery of fixed costs from sales of gas, clearly eliminates any disincentive that Columbia has to promote conservation."[74]

[74] The Public Utilities Commission of Ohio, Case No. 08-72-GA-AIR, Opinion and Order, pages 19-20.

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Q. Is CUB correct that the Company's monthly customer charges should only include costs that have a direct impact of an individual customer?[75]

A. No. CUB's claim is incorrect on economic grounds, practical rate design grounds, and importantly on the grounds that the Company's resulting rates must be just and reasonable and non-discriminatory in nature. On theoretical grounds, a two-part tariff consists of a volumetric charge set at short-run marginal costs and the fixed charge (e.g., a monthly customer charge for residential customers) that recovers the remainder of the utility's revenue requirement assigned to that rate class. From a practical rate design perspective, a rate design with a cost-based customer charge, as proposed by NW Natural, provides better price signals and is much more efficient than the current volumetric rate design and is consistent with the results of its LRIC Study. Finally, as I will demonstrate later in my reply testimony, volumetric rates are not just and reasonable and are unduly discriminatory because they charge more than the actual gas delivery costs to customers with greater than average gas use, and charge less than the actual gas delivery costs to customers with less than average gas usage.

<u>Energy Efficiency and Rate Design</u>

Q. Does the Coalition properly describe the issues relating the volumetric recovery of fixed costs to the incentives for promoting energy efficiency?

A. Yes. The Coalition develops the underlying rationale for revenue decoupling in its opening testimony and further supports the concept of revenue decoupling for the Company.[76]

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[75] See Exhibit CUB/100 Jenks-Feighner 9, lines 12-15.

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Q. So on what basis does the Coalition oppose the Company's residential rate design proposal?

A. The Coalition believes that the Company's proposed residential rate design "seriously erodes the ratepayers' economic incentive to invest in energy efficiency."[77]

Q. Please explain why the Coalition's position on this issue is unfounded.

A. The proper incentive for energy conservation from an economic incentive is to base rates on marginal cost as I have discussed, and as Mr. Compton has also discussed. The Coalition appears to ignore this issue because it fails to acknowledge that the investment in energy conservation uses scarce resources just like the consumption of more or less natural gas relies upon scarce resources.

A simple example will illustrate this result. The tankless gas water heater reduces gas consumption to provide hot water for the home. Under volumetric gas rates, the customer would save the embedded cost of service, the commodity cost of gas, and the associated delivery costs from the interstate pipeline supplier. For our purposes, we will assume that the volumetric price signal makes it worthwhile for the customer to replace the traditional water heater with a tankless water heater. It turns out that because of its usage pattern, the tankless water heater requires the Company to install a larger service line to meet the maximum hourly demand for gas within the home required by this gas appliance. There are no savings related to the service line and, in fact, new resources are required. Furthermore, increasing the maximum hourly load on

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[76] See Exhibit NW Energy Coalition/100 Hirsh/3-6.
[77] See Exhibit NW Energy Coalition/100 Hirsh/4, line 30 through Hirsh/5, line 1.

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the gas system may cause the utility to choose between adding pipeline contract demand or increasing peak hour capability through on-system storage because pipeline contracts typically limit the maximum hourly take to a percentage of the utility's contract demand. In this example, there are no savings except for the reduction in the commodity cost of gas and the costs for other resources actually increase.

Admittedly this is a unique example, but a similar result from a societal perspective occurs even for investing in more home insulation. When a customer invests in additional insulation because the savings from the commodity cost of gas and the volumetric delivery charges make it economic to do so, other customers must pay for the lost recovery of fixed delivery costs. This means that bills will increase for all customers through revenue decoupling, and customers must then allocate more resources to cover the higher cost of their natural gas purchases, and allocate less to their other purchases.

Q. Can you please indicate from a ratemaking perspective how you believe residential customers respond to the price signals provided by the Company's volumetric rate structure?

A. The current price signal from the Company's residential rates tells the customer that costs may be saved (through lower gas bills) that, in fact, cannot be saved (such as the cost of distribution mains that are recovered volumetrically). Under this view, suppose all customers undertook to simultaneously invest in a new conservation measure with a cost of $100 and a savings of $25 per year on their gas bills. Each customer is satisfied with a four-year simple payback of his investment. However, under revenue decoupling,

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the actual savings to the customer will only consist of the commodity cost of gas, which is about half of the average residential cost of service (i.e., as reflected in the gas bill), so the actual benefit to the customer will only be $12.50 per year, because the Company recovers the lost fixed costs through subsequent rate adjustments under its revenue decoupling mechanism. So now the customer is frustrated because the increase to an eight-year simple payback means that the customer must now forego the $12.50 of annual savings and suffer this loss of expected income - making this investment less economic than other alternatives available at the time. This is both inefficient and wasteful from a customer and societal perspective.

Q. Are the consequences of NW Natural's residential rate design proposal "severe, unintended but known" as the CUB witnesses claim?[78]

A. No. The consequences are not severe at all. In fact, as I just explained, we know that customers respond to price signals and that the current price signals are inefficient from an economic perspective. Consider the following statement from a recent academic study of natural gas rates concluding that the recovery of fixed costs through volumetric rates that are set above marginal cost, "… impose deadweight loss by leading existing natural gas customers to consume too little natural gas, and imply that high volume customers pay a larger share of fixed costs than low volume customers."[79] I would suggest it is the losses in efficiency under NW Natural's current rates that are severe, yet CUB has put forward a position that urges the Commission to increase the

[78] Exhibit CUB/100 Jenks-Feighner/10, lines 18-19.
[79] The Equity and Efficiency of Two-Part Tariffs in U.S. Natural Gas Markets, by Severin Borenstein and Lucas W. Davis NBER Working Paper Series, Working Paper 16653, December 2010, p. 1

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Company's volumetric rates even further from their current levels, which is entirely contrary to the efficiency and rate discrimination remedies inherent in the Company's residential rate design proposal.

Q. Do you believe that Mr. Jenks' "investment in home insulation" was wrong and inefficient as the CUB witnesses claim?[80]

A. Of course not. I assume that Mr. Jenks made a rational decision when he invested in home insulation based on his own economic calculus. And there is no reason to believe that the Company's proposed residential rate design would have changed that decision either. Under the Company's proposed rate design, the savings from added insulation would still accrue to Mr. Jenks, albeit at a slower pace – but one that is justified from an economic efficiency perspective.

Q. Why is the short-run marginal cost of gas the appropriate price signal even for investments that have a long life such as energy conservation measures?

A. In evaluating an investment in capital such as home insulation, the evaluation is not based solely on the short-run marginal price signal from natural gas. It is, in fact, the expected cost of gas over the extended period required to justify the investment. This is an individual calculus made by each consumer based on the current gas price signal at short-run marginal cost and other factors such as the expected rate of inflation, interest rates, and so forth. The end result of this evaluation is efficient because consumers make their own tradeoffs in light of their personal welfare maximizing evaluations. Even though their decision may not be rational to CUB, it is fundamental to our economic

[80] Exhibit CUB/100 Jenks-Feighner/15, lines 2-8.

system that customers be allowed to make their own independent decisions based on their own assessment of the best decision for their circumstances.

Other Rate Impacts of the Company's Residential Rate Design Proposal

Q. The Coalition and CUB argue that certain customers will be lost under the Company's proposed residential rate design.[81] Are there any flaws in their arguments?

A. Yes. There are serious flaws in the arguments presented by the Coalition and CUB. The Coalition states that the Company's proposed monthly customer charge for residential customers will cause customers with bills lower than $30 per month to leave the utility system and switch to alternate fuels. For example, the Coalition assumes that it is cost-free for a customer to switch between sources of energy. That is obviously not the case since switching from one energy source to another requires new capital investment by the customer to substitute propane for natural gas. In addition, the cost of propane must be converted to an equivalent natural gas price to determine its comparative cost. The Energy Information Administration (EIA) reports a weekly propane price delivered to residential customers at $2.869 per gallon for the week of March 19, 2012. A gallon of propane has 91,500 BTUs. This means that the equivalent price of natural gas is $3.13 per therm. In the first year of the residential rate phase-in proposed by NW Natural (under full rate relief), a customer with a monthly average use of 17.74 therms would have a monthly bill of $31.18. Ms. Hirsh assumes that this customer would leave the Company's gas system, but the customer's monthly bill for

[81] See Exhibit NW Energy Coalition/100 Hirsh/12-14 and Exhibit CUB/100 Jenks-Feighner/20-22.

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propane service would be $55.62, so it would not be economic for the customer to incur any capital cost to switch energy sources. In fact, even in Year 3 of the Company's rate phase-in plan, the customer would continue to prefer utilizing gas because his monthly bill of $41.39 would still be less than the monthly cost of propane.

The Coalition also discusses replacing gas with electricity. The least expensive substitute would be resistance heating that would cost about $57 per month from PGE. If the customer replaced its gas equipment with an electric heat pump, the equivalent monthly cost would be about $28.50 from PGE and produce a savings of about $13 per month, or $156 annually. Given that the least costly electric heat pump costs more than $1,500 installed, and has an average life of ten (10) years, the customer would be making an irrational decision to abandon gas service from NW Natural for electric service. This is an example of the Coalition's failure to properly understand the economics of energy price signals and their impact on free market-based decisions by consumers.

CUB's witnesses question whether the Company will ultimately require a policy to deal with summer shut-offs to avoid its proposed higher monthly customer charge. In fact, that type of provision is already common with other gas utilities because the costs are spread equally and recovered throughout the year in their rates, but the cost obligation arises as a result of the customer connecting to the utility's gas system. As the Company's proposed residential rate is phased-in over time, it will assess the need for this type of provision to avoid year-round gas customers providing a rate subsidy to winter-only gas customers.

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Q. Doesn't the Company acknowledge the loss of billing units as a result of implementing its residential rate design proposal?

A. Yes, and it is appropriate to do so. Price signals can induce changes in consumer behavior which will result in fewer gas bills, and in the loss of some customers. For example, landlords who are willing to switch gas service to their name when a tenant vacates an apartment or a home because of the low level of the Company's current monthly customer charge will cease to do so when that charge is higher reflecting the actual cost to serve. This means that for the period the rental unit is vacant, there will be no billing units for natural gas. Further, owners of foreclosed homes that are vacant may continue to pay $6.00 per month (plus the prevailing volumetric charges) to avoid the cost of weatherizing the home for the winter, but may change that business strategy when faced with a fully cost-based monthly customer charge depending on the cost/ benefit ratio of closing and reopening the home before its sale compared to the ongoing monthly costs. There may also be some customers who use no gas in the winter and these are not really customers at all in the truest sense of the term. These customers would be expected to leave the Company's gas system.

While initially there will be fewer billing determinants (as the Company has forecast), this is a one-time behavioral response with the impacts reflected in the Company's current rate filing. Importantly, the results over the long-term will be better price signals to customers and more efficient utilization of the Company's existing and new gas distribution facilities.

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Q. Will the implementation of the Company's proposed residential rate design create a "double dip" for low use customers based on NW Natural's current extension policy, as claimed by the Coalition?[82]

A. No. The average costs of distribution mains and services reflect the impact of customer contributions, and also of refunds for construction contributions. Unless we now begin to differentiate between customers individually, there is no reason to assume that rates will be different from the average.

Q. The Coalition claims that low income customers use less gas than other customers and, therefore, the Company's proposed residential rate design will disproportionately impact its low income users.[83] **Please comment on this claim.**

A. First, the correlation between income and gas use is weak at best. I have previously shown that the average use of customers that qualify as below the poverty level is not statistically different from the population as a whole. Yet, the Coalition claims that this analysis does not reflect the low income population. To the contrary, data from the 2005 Residential Energy Consumption Survey shows that customers below the poverty level use more BTUs of natural gas on average than the rest of the population who use gas for space heating.[84]

<u>Other Issues Related to the Company's Residential Rate Design Proposal</u>

Q. Does the Coalition support the combination of the Company's WARM and decoupling ratemaking mechanisms?

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[82] Exhibit NW Energy Coalition/100 Hirsh/15.
[83] Exhibit NW Energy Coalition/100 Hirsh/16-17.
[84] Table SH8 Average Consumption for Space Heating by Main Space heating Fuel Used 2005, Residential Energy Consumption Survey

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A. Yes.

Q. Does NW Natural's proposed residential rate design accomplish the same end result as well as provide other advantages?

A. Yes. NW Natural's proposed residential rate design not only accomplishes the same result (i.e., the recovery of the Company's fixed costs of delivery service) as the combination of WARM and revenue decoupling: the rates also eliminate undue discrimination between climate zones and between larger and smaller residential customers. The Company's proposed rates also send better, more economically efficient price signals to its customers. The overall result also improves social welfare.

Q. Do you agree with CUB's recommendation that the Company's current revenue decoupling mechanism should be eliminated if its proposed residential rate design is approved by the Commission?[85]

A. No. Revenue decoupling will remain a critical component of the Company's future complement of rates because its rates will continue to recover a portion of its fixed costs on a volumetric basis. As a result, the decoupling mechanism is necessary to provide NW Natural with a reasonable opportunity to earn its allowed rate of return. This is a fundamental principle of utility regulation which will not change with the Company's implementation of its residential rate design proposal.

Q. The Coalition also claims that the Company's proposed residential rate design conflicts with state energy policy.[86] How do you respond to this claim?

[85] See Exhibit CUB/100 Jenks-Feighner/22, lines 13-15.
[86] Exhibit NW Energy Coalition/100 Hirsh/18-19.

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A. Based on the information provided by the Coalition in support of its claim, I have concluded that there is no conflict with Oregon's state energy policy. The Coalition states that promoting increased use of gas is not consistent with long-standing legislative intent. However, the goal of Oregon is to promote "efficient use" of energy resources. The Company's proposed residential rate design actually meets this goal by setting its gas distribution rates at marginal cost and allowing the market to decide whether an increase in natural gas use is "efficient." Certainly for some uses it is far more resource efficient to use gas directly than to have to produce electricity with natural gas to be able to utilize electricity.

Oregon energy policy also mandates the elimination of "wasteful and uneconomical uses of energy." By basing prices on marginal cost, as the Company has done in its proposed residential rate proposal, this policy will be satisfied. The Coalition quotes from a 2009 resolution by the Coalition Board to justify its opposition to the Company's residential rate design proposal. However, even the Coalition Board's statement makes clear that SFV rate design is not an acceptable solution only if the rates create a disincentive to conserve. Since I have already demonstrated that the Company's residential rate design proposal does not create a disincentive for customers to invest in energy efficiency, but instead promotes efficient energy investments, the Company's rate design proposal is not an unacceptable solution under the terms of the Coalition Board's resolution.

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Q. The Coalition recommends changes to the Company's current residential rate design as an alternate to its rate design proposal. Do you have comments on that proposal?

A. Yes. The Coalition's alternate rate design proposal is comprised of three elements: (1) maintain the Company's existing WARM and revenue decoupling mechanisms; (2) maintain the Company's current monthly customer charge of $6.00 for its residential rate classes; and (3) adopt a two-tiered rate structure that has an inclining block rate for the second tier of higher monthly gas usage.[87] The basic problem with the rate design elements of the Coalition's proposal is that it is based on an incorrect assumption that very few costs vary with the number of customers served by the Company. I have already demonstrated empirically, as well as logically, that this assumption is false for the two largest components of gas distribution investment - mains and services. In addition, there is no credible evidence that she offers indicating that meters and regulators are not customer-related. Next, the Coalition assumes that baseload uses of gas cost less to serve than other uses. This statement is also incorrect because the Company makes the same investment in distribution mains to serve a residential customer's baseload usage as it does to serve its peak day heating usage. This means that the unit cost for providing baseload service alone is higher than for a heating customer requiring both baseload and peak day service. This is why gas utilities historically used declining block rates to charge smaller customers more per unit of gas consumed than for larger customers. Based on technological changes in the Company's

[87] Exhibit NW Energy Coalition/100 Hirsh/20-21.

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gas system related to pipe size and delivery pressures and the importance of economies of scale, as I have discussed, even declining block rates would not be equitable because low use customers would not pay the actual cost of delivery service as they would under the Company's proposed residential rates. In fact, it would appear that the Coalition's argument relates strictly to purchased gas costs and not to the cost of gas delivery service.

The Coalition also recommends an inverted block rate to apply to the Company's residential customers. However, its evidence related to this concept does not appear to be based on the costs of gas delivery service, but instead is related solely to gas supply resources (e.g., the reference to "peaking resources").[88] Even here, though, the Coalition's logic fails because gas pipeline capacity is more expensive at the margin than storage or liquefied natural gas (LNG), otherwise utilities would not acquire these resource to meet their customers' heat-sensitive gas loads. Furthermore, every residential customer has a design day capacity requirement and is equally responsible for the utility's cost of storage or LNG by virtue of their load occurring during the peak periods. All sales customers, regardless of their load factor, use these resources and benefit from the lower annual gas commodity cost associated with storage and LNG facilities. This is not the basis, however, for determining the appropriate rate design for a utility's gas delivery service.

Q. Is there a fundamental flaw in the rate design proposed by the Coalition?

[88] See Exhibit NW Energy Coalition/100 Hirsh/12, lines 4-8.

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A. Yes. The rate design the Coalition proposes is more discriminatory compared to the Company's current rate design. In addition, that type of rate design would force consumers to make inefficient decisions relative to energy conservation. Making those decisions on the basis of the Coalition's proposed rates design would have the impact of increasing NW Natural's rates at a later point in time through the rate adjustments under its revenue decoupling mechanism (as I described earlier), which would be to the detriment of both the customer conserving and all other customers.

Q. Aside from the deficiencies you just discussed, can an inclining or inverted block design of the type proposed by the Coalition cause other unintended consequences that would disadvantage a utility's residential customers?

A. Yes. For example, in a 2008 rate case filed by CenterPoint Energy in Minnesota,[89] the Minnesota Public Utilities Commission (MPUC) authorized the utility to conduct a pilot revenue decoupling program and to implement an inverted block rate (IBR) structure for the utility's residential and smaller commercial and industrial customers.[90] On March 1, 2011, CenterPoint Energy issued its first Revenue Decoupling Evaluation Report which discussed, among other things, the customers activities associated with its IBR structure. An excerpt from the utility's report is provided below:

> "Customers have raised issues and concerns regarding the Inverted Block Rate (IBR) structure with the Company, regulatory agencies, legislators, and media; especially in the winter months in which the colder months have led to increased

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[89] MPUC Docket No. G-0008/GR-08-1075.
[90] Findings of Fact, Conclusions of Law, and Order issued by the MPUC dated January 11, 2010.

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> usage by our customers. Although some of the customers that raised IBR related concerns stated that they supported the goal of conservation, some high usage customers have raised concerns about the impact of IBR under particular situations such as customers with large homes, pool heaters, older homes, large families, multi-unit premises, medical conditions, those on fixed incomes, those home all day and those that have already undertaken conservation initiatives. We have also heard from some low use customers who thought they would see higher bills under the IBR structure than they would under a traditional rate structure."[91]

On June 1, 2011, the Residential and Small Business Utilities Division of the Minnesota Office of the Attorney General petitioned the MPUC to suspend CenterPoint's IBR structure, and subsequently, the Department of Commerce, the Surburban Rate Authority, and Community Action of Minneapolis also asked the MPUC to suspend this rate structure. On September 16, 2011, CenterPoint Energy, the Energy CENTS Coalition, Minnesota Center for Environmental Advocacy, and the Izack Walton League of America to suspend the utility's IBR structure and to convene a working group to develop a new rate design. On October 4, 2011, the MPUC issued an order suspending CenterPoint Energy's IBR structure and authorizing the creation of the working group. In its Order, the MPUC stated, "Parties have identified unintended hardships arising from the inverted block rate structure, but have yet not been able to identify appropriate remedies. Based on a review of the record and the unanimous

[91] Revenue Decoupling Evaluation Report of CenterPoint Energy dated March 1, 2011, page 48.

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recommendations of the parties, the Commission concludes that the practical challenges posed by the inverted block rate structure requires suspension of the program."[92]

Finally, the IBR structure working group issued its report on March 1, 2012. To summarize, the report discussed the use of customer exemptions or "opt-outs" as a potential modification to the IBR program. The report also detailed the many new challenges and potential pitfalls of a new IBR program utilizing multiple opt-outs. Of particular relevance was that the report revealed IBR had no measurable impact on energy conservation and indicated that IBR may not be beneficial to low income ratepayers.[93]

Based on these findings, the utility and a number of other parties recommended to the MPUC that a flat volumetric rate be maintained and that the IBR program formally be terminated. A final decision on this matter is pending before the MPUC.

Q. Is CUB's criticism related to energy efficiency that builds gas load for NW Natural valid?[94]

A. No. Staff witness Compton correctly recognizes that the direct consumption of natural gas is more efficient than its indirect consumption through the generation of electricity. This issue is not about load building, but about the optimal use of society's scarce resources.

[92] Order issued by the MPUC dated October 4, 2011, page 3.
[93] IBR Modification Workgroup Report dated March 1, 2012, pages 12,13, and 16.
[94] See Exhibit CUB/100 Jenks-Feighner/20, lines 1-9.

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Q. CUB suggests that approval of NW Natural's residential rate design will encourage electric utilities to seek the same rate treatment.[95] Will you please comment on that concern?

A. The Company's WARM tariff has been in effect for some time, yet CUB asserts that electric utilities will want the same provision. However, CUB provides no evidence that any of the electric utilities in Oregon have sought the electric equivalent. Further, electric utilities are currently free to seek approval of any type of rate that improves economic efficiency, eliminates undue discrimination, and reflects cost causation more appropriately regardless of what the Company files for, or implements after Commission approval.

Q. Will you comment on CUB's proposal which would disallow an increase in the Company's reconnection charge?[96]

A. Yes. NW Natural's current charge does not recover the underlying costs. As such, there is a subsidy flowing to customers who disconnect and reconnect. There is no reason for all customers to absorb the reconnection costs that result from specific customers who are reconnecting to the Company's gas system.

Q. Please comment on the Staff proposal to include a seasonal rate component in the volumetric rates.

A. First, there are no seasonal costs associated with the Company's gas delivery system. The recovery of these costs through cost-based monthly customer charges is the most

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[95] See Exhibit CUB/100 Jenks-Feighner/23, lines 9-14.
[96] See Exhibit CUB/100 Jenks-Feighner/22-23

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efficient and reasonable rate recovery method to reflect cost causation. With respect to storage and transmission costs that are recovered in base rates, the view that the costs of these resources is solely for winter utilization is far too narrow. These assets are used year round for balancing the Company's gas system and the injection of gas into storage occurs in the summer and relies upon the gas transmission system to deliver gas to storage, and uses the storage assets to inject gas into storage. In addition, the carrying cost of gas in storage is incurred year round for both cushion gas and for the current gas inventory. If one recognizes the use of storage and transmission on an annual basis there is no justification for a winter summer commodity differential particularly when the costs themselves are allocated to the winter volumes unless the customer only uses gas in the summer. By recovering annual costs annually, we avoid distorting the winter volumetric price signal. Staff's seasonal recommendation is also largely based on the cost of pipeline transportation which should not be reflected in base rates, but is properly included in the gas cost component. Further, pipeline costs are properly reflected on an annual basis since the level of pipeline capacity use is more nearly uniform as a result of the injection season for storage.

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V. ISSUES RELATED TO NW NATURAL'S OTHER RATE DESIGN PROPOSALS

Q. Please comment on Mr. Schoenbeck's recommendation not to change the Company's current customer charges under Rate Schedules 31 and 32.[97]

A. While I recognize that the Company has not proposed revenue increases for these two rate schedules, Mr. Schoenbeck's reliance on this point as an argument not to reflect cost causation through their rate structures is misplaced. The Company's current monthly customer charges for certain customer groups within these rate schedules are at levels that are different from the associated customer-related costs derived under its LRIC Study. As a result, it is reasonable and appropriate to change the levels of these customer charges and maintain revenue neutrality in each rate class by reflecting slight volumetric price changes. As a matter of principle and consistent with my direct testimony, the Company's proposed changes in the Company's current customer charges are required for rates to track costs and to eliminate intra-class cross subsidies.

VI. CONCLUSIONS

Q. What do you conclude regarding the Company's LRIC Study?

A. NW Natural's LRIC Study is sound both in theory and in its reflection of cost causation. In addition, I have shown empirically that investment in distribution mains is caused by the gas utility's numbers of customers and design day demand. As such, there is no volumetric or commodity cost component related to the costs of NW Natural's gas distribution system. The Company's LRIC Study should be accepted by this Commission as filed.

[97] See Exhibit NWIGU/100 Schoenbeck/22.

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Q. What do you recommend the Commission should adopt as NW Natural's rate design for its residential and small general service customers?

A. Based on the entirety of the evidence before the Commission on this important issue, the Company's rate design proposal for these customer classes is the best proposal to achieve just and reasonable rates for all of the reasons that I presented in my direct and reply testimonies. There is no evidence presented in this proceeding to refute my conclusion that the cost to provide gas delivery service to the Company's residential customers is the same on average regardless of their level of annual gas consumption. I should note that both the Staff and the Commissioners of the Public Utility Commission of Ohio have reached this same conclusion for the gas LDCs they regulate, and that conclusion has been affirmed by the Ohio Supreme Court in multiple appeals related to different gas LDCs. There is no evidentiary basis for rejecting the Company's rate design proposal as it meets all of the requirements for horizontal and vertical equity, economic efficiency, and most importantly, it eliminates the undue discrimination that exists under NW Natural's current rates.

Q. Does this conclude your testimony?

A. Yes, it does.

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BEFORE THE

PUBLIC UTILITY COMMISSION OF OREGON

UG 221

NW Natural

Exhibits of Russell A. Feingold

LONG-RUN INCREMENTAL COST STUDY / RATE DESIGN EXHIBITS 2501 - 2503

June 15, 2012

EXHIBITS 2501-2503 – LONG-RUN INCREMENTAL COST STUDY / RATE DESIGN

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Oregon General Rate Case – December 2011

Data Request Response
SUPPLEMENTAL

Request No. GR1-OPUC-DR 274**:**
INCREMENTAL TRANSMISSION COSTS

Regarding Northwest Natural's Exhibit NWN/600 Yoshihara/3, lines 4-20:
"The Corvallis Loop Project is driven by the need for increased firm delivery capacity to serve residential, commercial, and firm industrial load, as well as future long-term growth, in this portion of the service territory. The existing delivery capacity to the area was constructed in 1963 and also provides primary service to the Albany area. The existing feeder consist of a 10-inch diameter, 400 psig transmission line from the Albany Gate Station to a point just east of Corvallis, which then sequentially becomes an 8-inch and 6-inch, 225 psig transmission line serving Corvallis and Philomath. Over the past 47 years, steady residential, commercial, and industrial customer load growth has consumed all of the area's firm delivery capacity, and the pressure drop along the feeder during the winder already exceeds normal design requirement. For the past several years, interruptible customers in this area have experienced partial curtailment as temperatures in the area drop below 32 degrees Fahrenheit, with full curtailment generally occurring as temperatures drop below 32 degrees Fahrenheit. For these reasons, the Company determined that it needed to increase capacity to this service area by the fourth quarter of 2012 [(with the Corvallis Loop Project)], and also begin to move forward on the Mid-Willamette Valley Feeder Project that will increase peak day delivery capability in the west end of the Albany-Corvallis corridor" [emphasis added].
and
Regarding Northwest Natural's Exhibit NWN/1101 Feingold/5, where the Company provided the "Forecasted Transmission Investment per Design Day Dth" of $1,107, which was derived by dividing the Total Investment of $45,400,000 by the "Total Additional Design Day Capacity for both Projects" of 41,000 Dth/day,
Please explain why the Company assumed an Annual Cost of "$0" for interruptible service customers as represented in Exhibit NWN/1101 Feingold/4, since one of the stated reasons the Company has proposed the Corvallis Loop and the Mid-Willamette Valley Feeder projects is because interruptible customers have experienced curtailment.

Response: Supplemental 2/20/2012

From discussions with Staff, NW Natural understands that Staff perceives a conflict between Mr. Feingold's determination that $0 of the Corvallis Loop Project should be allocated to interruptible customers and Mr. Yoshihara's statement: ". . . For the past several years, interruptible customers in this area have experienced partial curtailment as temperatures in the area drop below 42 degrees Fahrenheit, with full curtailment generally occurring as temperatures drop below 32 degrees Fahrenheit. For these reasons, the Company determined that it needed to increase capacity to this service area . . ."

NW Natural believes these statements are consistent, and provides a further explanation below.

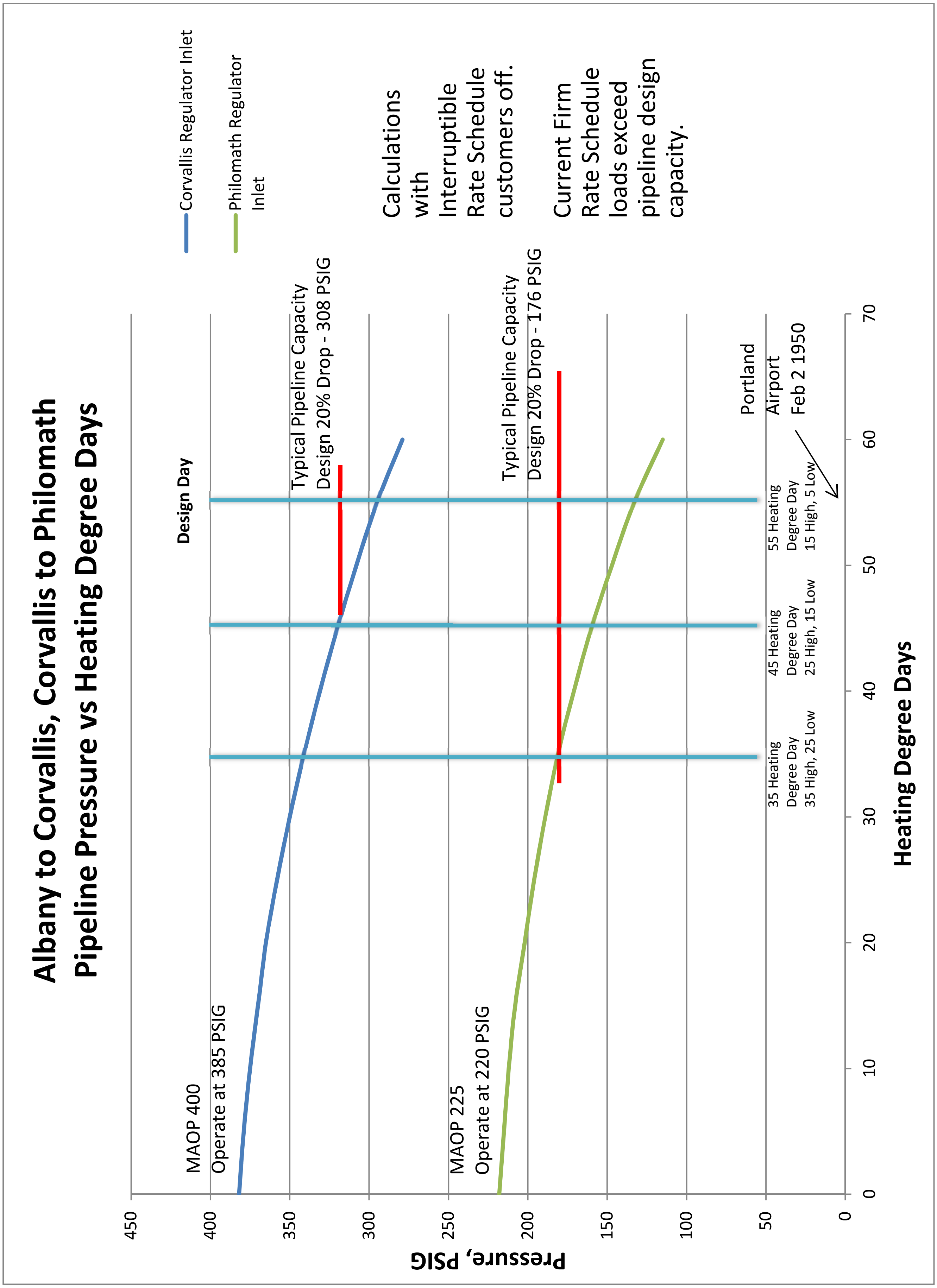
NW Natural has not proposed to construct the Corvallis Loop and Mid-Willamette Valley Feeder projects based on the fact that its interruptible service customers have been curtailed for the past several years. Instead, this situation is an operational outcome which indicates that insufficient firm capacity currently exists on NW Natural's gas pipeline system to accommodate all of its *firm* demand requirements. As a result, it is inappropriate to view interruptible service as the cause of this incremental firm pipeline capacity need.

By definition, a gas utility such as NW Natural does not install firm pipeline capacity to serve its interruptible customers. The existence of interruptible customers enables the gas utility to serve the full capacity requirements of its firm service customers. Therefore, within the context of NW Natural's LRIC Study, an increase in interruptible service does not cause NW Natural to incur incremental firm capacity costs to serve this interruptible load because it does not design and expand its gas pipeline system over time to serve interruptible customers.

Exhibit NWN/600 points out with regard to the Corvallis Loop Project that there is inadequate firm delivery capacity to meet its current firm capacity requirements as evidenced by pressure drops along this feeder during the winter that exceed normal design requirements. OPUC DR 274 Attachment-1 shows a graphic that depicts the relationship between pipeline pressure and heating degree days at the Corvallis and Philomath primary regulator stations using firm customer load requirements only. The analysis shows that the pressure drop occurring on the existing system will begin to exceed the design pressure drop standard at 35 heating degree days for Philomath and 45 heating degree days for Corvallis.

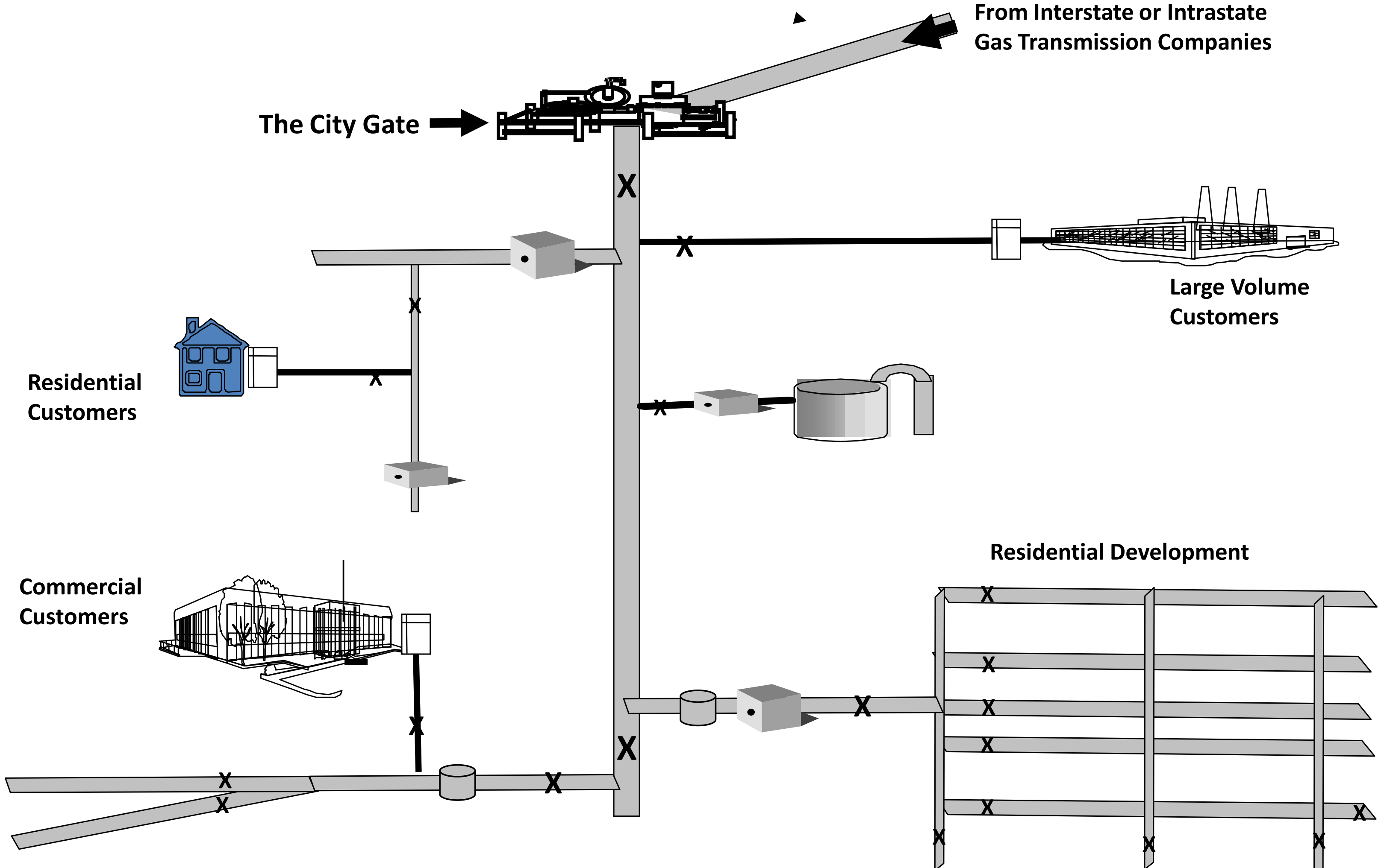
The investment in firm capacity from these pipeline projects is lumpy and designed to meet firm capacity requirements over the life of the assets. While it is true that NW Natural's interruptible customers will receive an ancillary benefit in the form of reduced exposure to service interruptions in the early years of the projects, this is an outgrowth of the addition of firm capacity to serve future firm demands rather than a strict design objective of these pipeline projects.

Mr. Yoshihara's statements in Exhibit NWN/600 Yoshihara/3, lines 4-20 describe that the driver for the Corvallis Loop Project is "the need for increased firm delivery capacity to serve residential, commercial, and firm industrial load, as well as future long-term growth, in this portion of the service territory." *See* lines 4-6. It then goes on to recognize, as is described above, that "[f]or the past several years, interruptible customers in this area have experienced partial curtailment as temperatures in the area drop below 42 degrees Fahrenheit, with full curtailment generally occurring as temperatures drop below 32 degrees Fahrenheit." *Id*. at lines 14-16. However, this last statement was intended to add further support to the statement that the project is needed because of increasing *firm* requirements, since the requirement of curtailments beginning at relatively high temperatures is *indicative* of a lack of capacity to reliably meet firm requirements. It was not intended to mean that the reduction of curtailments in the area for interruptible customers is the *purpose* of the project. In other words, the statement "[f]or these reasons" on lines 16-17 refers to the descriptions of the current system being inadequate to serve firm loads in the area, and projected increases in firm loads.


Albany to Corvallis, Corvallis to Philomath
Pipeline Pressure vs Heating Degree Days
Corvallis Regulator Inlet
Philomath Regulator Inlet
Calculations with Interruptible Rate Schedule customers off.
Current Firm Rate Schedule loads exceed pipeline design capacity.
Design Day
Typical Pipeline Capacity
Design 20% Drop - 308 PSIG
Typical Pipeline Capacity
Design 20% Drop - 176 PSIG
MAOP 400
Operate at 385 PSIG
MAOP 225
Operate at 220 PSIG
35 Heating Degree Day 35 High, 25 Low
45 Heating Degree Day 25 High, 15 Low
55 Heating Degree Day 15 High, 5 Low
Portland Airport Feb 2 1950
Pressure, PSIG
Heating Degree Days

NW Natural

Gas Distribution System Behind the City Gate



Source: American Gas Association and Black & Veatch Corporation

NW Natural

Relationship between Miles of Main and Customers

Year	Miles of Main	Customers
1990	8,867	319,962
1991	9,049	336,358
1992	9,333	352,978
1993	9,574	372,427
1994	9,900	391,638
1995	10,185	409,949
1996	10,514	433,169
1997	10,816	458,021
1998	11,180	477,407
1999	11,539	501,163
2000	11,744	523,406
2001	12,324	540,931
2002	12,529	560,067
2003	12,725	578,150
2004	12,655	596,635
2005	13,275	617,163
2006	13,580	636,584
2007	13,713	652,012
2008	13,878	662,341
2009	13,907	667,794
2010	13,958	673,997
2011	13,983	679,543

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.99842588
R Square	0.99685425
Adjusted R Square	0.99669696
Standard Error	101.945121
Observations	22

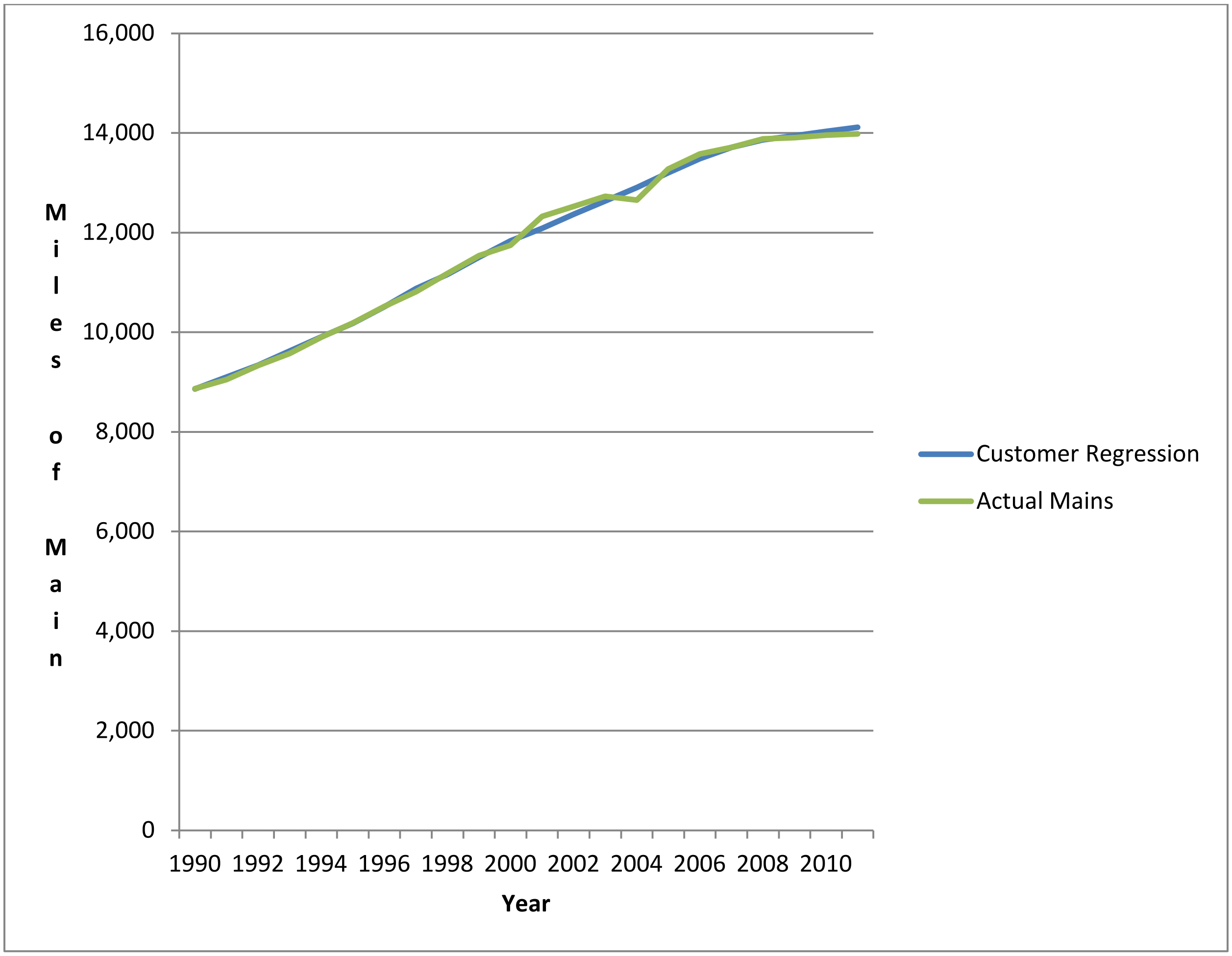
ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	65867270.18	6.6E+07	6337.774	1.6744E-26
Residual	20	207856.1544	10392.8		
Total	21	66075126.33			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	4184.80641	97.88574285	42.752	3.91E-21	3980.62033	4388.9925	3980.62033	4388.9925
X Variable 1	0.0146097	0.000183516	79.6101	1.67E-26	0.01422689	0.0149925	0.01422689	0.0149925

NW Natural

Relationship between Miles of Main and Customers



NW Natural

Relationship between Miles of Main and Throughput

Year	Miles of Main	Throughput - MMcf
1990	8,867	1,009,731
1991	9,049	1,075,381
1992	9,333	1,065,343
1993	9,574	1,043,629
1994	9,900	990,332
1995	10,185	1,004,378
1996	10,514	1,099,629
1997	10,816	1,114,124
1998	11,180	1,138,416
1999	11,539	1,214,146
2000	11,744	1,179,773
2001	12,324	1,123,287
2002	12,529	1,126,084
2003	12,725	1,099,752
2004	12,655	1,131,866
2005	13,275	1,157,567
2006	13,580	1,192,649
2007	13,713	1,214,969
2008	13,878	1,260,751
2009	13,907	1,131,365
2010	13,958	1,061,969
2011	13,983	1,152,354

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.677838587
R Square	0.45946515
Adjusted R Square	0.432438407
Standard Error	1336.336569
Observations	22

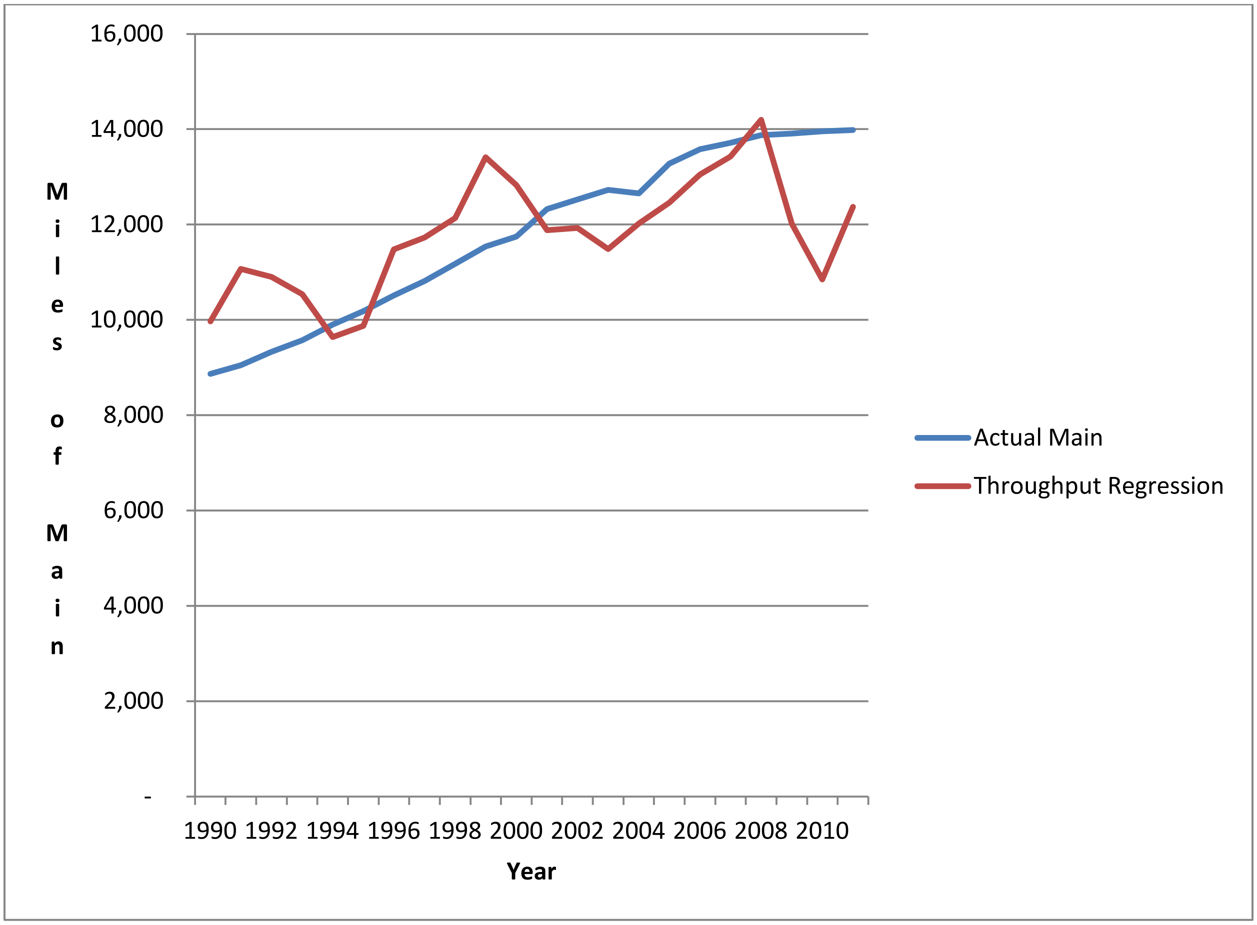
ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	30359217.81	3E+07	17.00039	0.000527476
Residual	20	35715908.52	1785795		
Total	21	66075126.33			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-7050.10426	4576.51737	-1.5405	0.139113	-16596.55218	2496.343667	-16596.5522	2496.343667
X Variable 1	0.016851157	0.004086959	4.12315	0.000527	0.00832591	0.025376405	0.00832591	0.025376405

NW Natural

Relationship between Miles of Main and Throughput



BEFORE THE

PUBLIC UTILITY COMMISSION OF OREGON

UG 221

NW Natural

Reply Testimony of C. Alex Miller

SITE REMEDIATION COST RECOVERY MECHANISM
EXHIBIT 2600

June 15, 2012

**EXHIBIT 2600 – REPLY TESTIMONY –
SITE REMEDIATION COST RECOVERY MECHANISM**

Table of Contents

Rates & Regulatory Affairs
NW NATURAL
220 N.W. Second Avenue
Portland, Oregon 97209-3991
1-503-226-4211

I. INTRODUCTION AND SUMMARY

Q. Are you the same Alex Miller who provided direct testimony on behalf of Northwest Natural Gas Company ("NW Natural" or "the Company") in this proceeding?

A. Yes.

Q. What is the purpose of your reply testimony?

A. My reply testimony responds to the testimony offered by Judy Johnson, on behalf of the Staff of the Public Utility Commission of Oregon ("Staff"), and Hugh Larkin Jr., on behalf of the Northwest Industrial Gas Users (NWIGU) and the Citizens' Utility Board (CUB), regarding NW Natural's proposed recovery of prudently incurred expenses of environmental remediation through a "Site Remediation Recovery Mechanism" (SRRM).

Q. Please provide a summary of your testimony.

A. In my testimony, I:

- Recap the Company's proposed SRRM, and the evidence offered by the Company in this proceeding;
- Summarize the positions of Staff and NWIGU-CUB on NW Natural's proposal for cost recovery; and
- Explain the reasons why the Commission should reject their invitation to require the Company's shareholders to bear costs prudently incurred by the utility.

II. NW NATURAL'S PROPOSED SRRM

Q. Please provide a brief summary of the Company's proposed SRRM, and the reasons for which the Company made this proposal.

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A. The Company proposes that the Commission adopt a rate mechanism through which prudently incurred costs of environmental remediation would be recovered in rates over time, and through which insurance receipts and other potential recoveries would be passed on to customers. As I explained in my direct testimony,[1] the Company proposed the SRRM because it (1) is tailored to flow through costs to customers in a manner that mitigates the burden on customers, (2) controls the size of deferral balances, (3) accommodates uncertainty regarding future costs and recoveries from insurance and other parties, and (4) helps preserve the financial integrity of the Company.

Q. What evidence has the Company provided to the Commission and parties that would justify the adoption of the SRRM?

A. The Company has provided a significant amount of evidence in this proceeding, including evidence on every point the parties and Commission should consider in evaluating the Company's proposal. For example, the Company provided:

- **Extensive testimony from Dr. Andrew Middleton, a recognized expert on manufactured gas plant (MGP) operations and history**. In his testimony, Dr. Middleton describes the historical context for the operation of manufactured gas plants in general, and specifically the history of the plants operated by NW Natural's predecessors and the practices that were used at those plants. He also provides his expert opinion that the operations were prudently conducted, consistent with standards and practices at the time. Finally, he describes the legal framework that existed at the time of the operation of the manufactured gas

[1] See NWN/1500, Miller/8-17.

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plants, and the changes in that framework that have led NW Natural to incur substantial current costs for mandated environmental remediation.[2]

- **Testimony from Company witness Sandra K. Hart relating to the Company's diligence in pursuing recoveries for environmental mitigation expenses from insurance companies**. Ms. Hart's testimony describes the litigation that NW Natural is pursuing against those companies, and its efforts at ensuring the best outcome possible.[3]
- **Testimony from Company witness Robert J. Wyatt, describing the details of NW Natural's mitigation efforts and the associated requirements**. Mr. Wyatt describes the process of environmental remediation in general, the operations that led to the required remediation by NW Natural, the statutory framework that requires NW Natural's efforts, the costs NW Natural has incurred, and the actions NW Natural has taken to control these costs and future costs.[4]
- **My own testimony regarding the details of the SRRM mechanism, as well as the Company's efforts to tailor the mechanism to appropriately address good regulatory policy.[5]**

In addition, the Company provided the parties with detailed explanations of its accounting for the costs it has incurred, including:

- **Spreadsheets detailing the specific expenditures and cost categories;** and
- **Over 2,000 invoices related to its remediation efforts.[6]**

[2] NWN/1600, Middleton.
[3] NWN/1400, Hart.
[4] NWN/1300, Wyatt.
[5] NWN/1500, Miller.

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The Company also notes that even before it filed this proceeding, it met regularly with Staff, and also met with CUB and NWIGU to update them on its remediation efforts and to respond to any questions.

The Company believes that the evidence it has offered in this proceeding is substantial and more than sufficient to allow the Commission to determine that the Company's costs are prudently incurred and should be recovered through the mechanism the Company has proposed.

III. SUMMARY OF STAFF AND NWIGU-CUB POSITIONS

Q. What is Staff's response to the evidence NW Natural offered?

A. Staff does not contend that any of the environmental remediation costs NW Natural seeks to recover are imprudent or unreasonable. Nor does Staff dispute that the MGP operations that resulted in the Company's environmental remediation costs were engaged in for NW Natural's customers' benefit. In fact, Staff's opening testimony confirms the Company's statements that the byproducts from its historic operations were sold and the revenues were used to reduce the cost of gas to customers at the time of the manufactured gas plant operations.[7] Staff also does not dispute that NW Natural is being required by federal and state agencies to incur the costs for which it is seeking recovery.

Nevertheless, Staff provides brief testimony, asserting that the Commission should:

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[6] *See* Exhibit NWN/2601, which is the Company's response to NWIGU-CUB Data Request 96.
[7] *See* Staff/300 Andrus.

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- Cause NW Natural to absorb ten percent of the costs it has incurred to date, as well as ten percent of ongoing costs, regardless of whether such costs are prudently incurred; (Staff/200 Johnson/7)

- Cause NW Natural to absorb additional costs by limiting the return on the capital invested by the Company to finance these expenses to an amount far below the cost of capital determined by the Commission; (Staff/ 200 Johnson/7) and

- Limit NW Natural's recovery of its expenses through the mechanism by an annual earnings review (Staff/200 Johnson/8).

Finally, Staff recommends that the Company's recoveries should be limited to no more than three percent of NW Natural's revenues for the preceding year.

Q. What are the other parties' responses to the evidence NW Natural offered?

A. Like Staff, NWIGU-CUB does not challenge the prudence of any costs incurred by NW Natural in its environmental remediation. Nevertheless, NWIGU-CUB states that the Company should be required to absorb *half* of its past costs and future costs, regardless of whether those costs were prudently incurred. NWIGU-CUB also asserts that the Company should be denied recovery of its cost of capital, even though the Company uses significant capital to finance these expenses. Instead, NWIGU-CUB proposes that the Company absorb additional costs by recovering only its cost of debt on such uses of its capital.

IV. RESPONSE TO PARTIES' PROPOSALS

Q. What is your response to Staff's and NWIGU-CUB's proposals?

A. Their proposals are unreasonable and unsupported by the record in this case. Their proposals would impose grave financial consequences on NW Natural, and are inexplicably punitive in nature. They also should be rejected because they are an unfounded departure from the regulatory compact.

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"Sharing" proposals

Q. Please explain how the parties' specific proposals to require the Company to bear ten, or fifty percent of all of its costs for environmental remediation would inappropriately impose negative financial consequences on NW Natural.

A. The parties characterize their proposals as "sharing" because costs would be borne by both customers and shareholders. The effect of this sharing, however, would be very significant and would produce consequences that are highly unusual under normal utility regulation.

Under generally accepted accounting principles, a utility is required to write off costs that are not likely to be recovered.[8] This occurs at the time the utility determines that the costs are not likely to be recovered. If the Commission adopts Staff's proposal, NW Natural would be required to write off approximately $11 million in 2012[9]. This represents about eleven percent of the utility income the Company would otherwise expect to earn this year. Adoption of Staff's proposal would also require the Company to write off ten percent of all future incremental expenses. If NWIGU-CUB's proposal were adopted, the Company would be required to write off around $56 million[10] in 2012, and fifty percent of all future incremental expenses. This would reduce NW Natural's net income by over half in that year, and could significantly damage the Company over the long-term.

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[8] Accounting Standard Code No. 480-340, *Regulated Operations – Other Assets and Deferred Costs*
[9] $11 million represents ten percent of the $112 million regulatory asset balance (net of insurance recoveries) as of March 31, 2012.
[10] This is fifty percent of the $112 million regulatory asset balance.

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These write-offs would significantly reduce the Company's earnings. Even more detrimental for customers, such write offs would be virtually certain to result in credit downgrades that could significantly increase the utility's cost of debt, resulting in more costly financings, higher customer rates and a weaker Company over time.

Write-offs at a utility normally occur only where the Commission finds that an expense was unwise, excessive, unaccounted for, or caused by a lack of proper foresight. Imposing write-offs for costs that are agreed to be reasonable, necessary, and required by law, such as NW Natural's costs for environmental remediation, flies in the face of accepted Commission policy. As described in the direct testimony of Andrew Middleton (NWN/1600), NW Natural faces an unusually large environmental liability for the size of Company, making the effects of the parties' sharing proposals even more harmful than they would be for other companies that have manufactured gas plant remediation obligations.

Q. Please explain why you state that the Staff and NWIGU-CUB "sharing" proposals are not well-reasoned.

A. Staff's reasoning for why the Commission should impose "sharing" on NW Natural is limited to the following:

> Staff believes that a sharing mechanism between customers and shareholders provides NW Natural an incentive to appropriately manage remediation costs, while at the same time maximizing any proceeds. (Staff/200 Johnson/8).

Thus, the entirety of Staff's rationale for imposing sharing appears to be that sharing would provide an "incentive" to NW Natural to control costs and pursue as much recovery from insurance as possible.

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Q. Don't you agree that the sharing proposals would provide some incentive for NW Natural to manage its costs and receive as much insurance recovery as possible?

A. A better characterization, in my opinion, is that it would provide a penalty that barely distinguishes between desirable or undesirable behavior by the utility. To the extent that the proposals penalize undesirable future behavior, I suppose that does create some negative incentive. However, overall, the sharing proposals are both poor and blunt mechanisms to use to incent good management of environmental remediation by the utility.

Q. Please explain further why sharing would be a poor mechanism to provide an incentive for good utility management of its remediation actions.

A. There are at least four reasons why sharing would be a poor mechanism for trying to provide an incentive with respect to remediation costs.

First, it is illogical to suggest that a disallowance of *past* costs could create an incentive to the Company to manage costs and insurance recoveries. Those costs have already been incurred, and the recoveries have been received. The Company clarified through discovery that it was, in fact, Staff's proposal that a disallowance of past costs be implemented.[11] This portion of Staff's proposal should be dismissed out of hand. There is no possibility that it could provide the "incentive" upon which Staff claims it is founded. And, NW Natural has offered substantial testimony demonstrating that its past actions were prudent, and no party has offered contradicting evidence of *any* imprudent

[11] *See* Staff Response to NW Natural's DR 14, Exhibit NWN/2602.

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past actions, let alone evidence that ten, or fifty percent of its past costs were unreasonable.

Second, sharing is a poor incentive mechanism because the level to which it would distinguish between “good” behavior (*e.g*. keeping remediation costs low) and “bad” behavior (*e.g*. overspending on remediation costs) is minimal when compared to the financial effect that the sharing itself has on the utility. For example, if the utility had a choice between taking two actions with similar effectiveness, one of which cost $2.1 million, and the other which cost $2.0 million, the difference in the sharing between the two actions would be $10,000 under Staff’s proposal. But, the impact of the sharing itself would be $210,000 or $200,000. To impose a mechanism that has such brute force, where the effect of the mechanism itself so much outweighs the “incentive” associated with the “good” behavior is not sound policy and is unwarranted.

Third, sharing is a poor incentive mechanism because it is not calculated to produce the type of behavior that the Commission should expect of the utility. For example, under Staff’s theory, the mechanism would incent NW Natural to spend as little as possible on environmental remediation. Additionally, it would incent the Company to delay spending money as long as possible. Even assuming that the utility could influence such costs or timing, neither of these actions are necessarily consistent with a prudent approach to remediating the current environmental harms associated with past manufactured gas plant operations. Rather than providing an incentive for prudent management of its cleanup obligations, sharing more likely incents a utility to avoid or delay its remediation obligations in ways that are detrimental to the quality of the environment, the health of the general public for whom the remediation is being performed, and the longer term interests of ratepayers (through increased cleanup costs or the imposition of penalties by regulatory agencies), even though the actions may make financial sense to the utility in the short-term.

Fourth, it makes little sense to impose sharing as a form of incentive because, as explained in the direct testimony of Robert J. Wyatt (NWN/1300), the Company ultimately has very little control over the requirements that are imposed on it by the federal and state agencies with jurisdiction over NW Natural's cleanup activities. Imposing sharing as an incentive mechanism related to environmental mitigation costs would therefore be comparable to imposing sharing on utilities' tax payments in order to incentivize the utility to pay as little taxes as possible, or imposing sharing on pipeline demand charges, which are determined by FERC in proceedings where utilities exercise similarly limited influence and do not make the decisions.

Q. Does NWIGU-CUB offer any other rationales for their sharing proposal?

A. Yes. NWIGU-CUB's Mr. Larkin testifies that "it seems apparent that the Company's management accepted the risk from the operation of manufactured gas that was reflected in the rate of return that they received."[12] Mr. Larkin is apparently referring to the Company's predecessor, Portland Gas & Coke, during the operation of the manufactured gas plant, and implies that the Company must have been rewarded by a high rate of return that recognized the environmental risks associated with their operations.

Q. What is your response to Mr. Larkin's testimony on this topic?

[12] NWIGU-CUB/100, Larkin/52.

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A. His argument fails in light of Dr. Middleton's direct testimony, which establishes that plant operations during the "MGP era" were not viewed as risky from an environmental perspective, and that Companies were not subjected to broad environmental laws at that time. The Company and its regulators therefore could not have anticipated either the health or environmental harms we recognize today or the cleanup obligations that exist under today's current laws. Mr. Larkin's testimony also cannot be squared with NW Natural's direct testimony, confirmed by Staff's testimony, that the Company's predecessors applied the proceeds from byproduct sales to reduce the costs of gas to customers, rather than to add to its profits. In short, Mr. Larkin's statements are hypothetical, and do not have any foundation or application to NWIGU-CUB's sharing proposal.

Q. Does NWIGU-CUB offer any other rationale to support their 50/50 sharing proposal?

A. Mr. Larkin testifies that "the cost of remediating these sites are not necessary to providing current service" and that "NW Natural is now requesting that current ratepayers be held responsible for costs associated with providing manufactured gas to a group of unknown and unrelated ratepayers." [13]

Q. What is your response to this argument?

A. It ignores the fact that the expenses NW Natural is incurring are current expenses, required by regulatory agencies that are exercising their authority under current laws. There is no other generation of ratepayers to which these costs relate. Additionally, NW

[13] NWIGU-CUB/100, Larkin/51.

Natural has researched and found that in *every* case, except one, commissions around the country have found that prudent manufactured gas plant-related environmental remediation costs are recoverable from current ratepayers, even though the costs relate to cleanup for historic operations. In the one case where costs were not allowed, the utility could not establish that the historic operations were related to the provision of utility service.[14] In NW Natural's case, a nexus with utility operations is indisputable.

Q. If the Commission declines to adopt sharing, as proposed by Staff and NWIGU-CUB, how will the utility be incentivized to manage its costs and seek to maximize insurance recoveries?

A. The utility does not need a sharing mechanism in order to have an incentive to manage costs and maximize recoveries. The utility already has an incentive to do that because its actions are always subject to review for prudence by the Commission, with the engagement of the parties as well. The Company understands that it is expected to manage its costs well, and has provided extensive evidence on how it has done that. *See* NWN/1300 Wyatt. Additionally, the Company understands that it is expected to maximize insurance recoveries, and has provided extensive evidence on how it is doing that. *See* NWN/1400 Hart.

It is noteworthy that despite providing the parties a very high level of transparency into NW Natural's remediation actions, no party has raised any arguments that NW Natural has failed to manage its costs or that it has been ineffective in maximizing insurance recoveries. Under these circumstances, the Commission should

[14] The Indiana Regulatory Commission (IURC), 1995 WL 447073 and Westlaw 675 N.E.2d 739, Util. L. Rep. P26, 591

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decline to impose sharing on any past costs, and should continue to rely on ongoing prudency reviews as NW Natural has proposed to ensure that the Company continues to manage its costs well and maximize insurance recoveries.

Q. Please explain why you stated that the Staff and NWIGU-CUB proposals are an unsupported departure from the regulatory compact.

A. Under the regulatory compact, utilities are required to provide safe, adequate, and reliable service, and in return, they are allowed to recover prudently incurred costs, as well as a return on their investment. In the case of NW Natural's environmental remediation costs, however, the Staff and NWIGU-CUB proposal is to disallow recovery of those expenses, even though they are required by law and prudent, and even though they are financed by the Company. Staff and NWIGU-CUB have offered no valid justification for such a departure from the regulatory compact.

Q. Didn't Staff provide testimony from others explaining why it is reasonable to impose manufactured gas-related remediation costs on utilities?

A. Staff did provide testimony from a group of intervenors in a New York state regulatory proceeding who argued that utilities should not be allowed to recover all prudently incurred costs associated with manufactured gas plant site remediation.[15] The intervenors, like Staff and NWIGU-CUB, characterize their proposal as "sharing" of costs between ratepayers and customers, and, like Staff and NWIGU-CUB, advocated that sharing is a necessary incentive to get utilities to manage costs and maximize insurance recoveries.

[15] See Staff/202

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Q. Do you believe the testimony Staff offered from the intervenors' testimony in the New York proceeding is relevant to the case of NW Natural?

A. It is relevant to this case because those intervenors made the same arguments that Staff is making now (*i.e.* that sharing should be imposed as a matter of practice). However, the testimony of the New York regulatory commission staff (NY Staff), including the White Paper it submitted, and the recommended decision from the Administrative Law Judge (NY ALJ) in that proceeding, are also relevant in this case.[16] The NY Staff's testimony and the ALJ's decision quite clearly rebut the intervenors' testimony and the arguments Staff is now advancing.

Q. Can you explain more about how the New York ALJ decision and New York Staff positions actually rebut the arguments that Staff is advancing here?

A. It is first important to note that New York has over 200 MGP sites and that the New York Commission's proceeding is the most comprehensive review of statewide policy regarding the recovery of MGP site remediation costs in recent years. In that proceeding, the NY Staff recommended that sharing *not* be adopted for New York utilities with manufactured gas plant remediation, in contrast with the intervenor group's recommendation. The ALJ agreed, and has recommended to the Commission, that sharing not be adopted. The ALJ's recommendation and the NY Staff provide a thorough discussion of the pros and cons of sharing, and find that, among other things:

- Sharing creates perverse incentives for a utility to delay the remediation process and to avoid its cleanup responsibilities. These actions could be detrimental to

[16] The NY Staff White Paper issued June 24, 2011, as well as the NY ALJ's recommendation issued November 3, 2011 are available at http://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterCaseNo=11-M-0034 for the Commission's consideration and the parties' review.

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the public interest and result in higher costs over the long term (NY ALJ pp. 36,46; NY Staff p. 28);

- Sharing would result in write-downs of regulatory assets and could lead to adverse financial consequences such as credit downgrades (NY Staff p. 28);
- Any "savings" ratepayers may realize through sharing could be lost in the form of higher capital costs (NY Staff p. 28); and

- Sharing imposed as a general rule is inappropriate because there is no consideration of the financial consequences to the utility and resultant harm to ratepayers and the general public (ALJ pp. 3, 46)

Q. Staff asserts in their opening testimony that "[i]n all cases, some level of sharing was authorized and in at least one case, the Company's shareholders were directed to pick up all the costs." Is that statement accurate?

A. It is unclear whether Staff made the statement with respect to only the cases cited by the intervenors in the New York proceeding, or whether Staff intended to assert that all commissions around the country impose sharing. To the extent that Staff was implying that all state commissions require utilities to absorb some of the costs of environmental remediation for manufactured gas plant operations, their statement is incorrect.

NW Natural is aware of many utilities that are allowed to recover the costs of environmental remediation through rates. Examples of utilities that are allowed recovery of environmental remediation costs related to MGP operations without sharing include:

- Connecticut Natural Gas Corp.
- Southern Connecticut Gas Co.
- Washington Gas Light Co.
- Chesapeake Utilities Corp.
- Ameren Illinois Co.
- North Shore Gas Co.
- Commonwealth Edison Co.
- Northern Illinois Gas Co.
- People's Gas Light & Coke Co.
- Baltimore Gas and Electric Co.

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- Consumers Energy Co.
- DTE Energy Co.
- Michigan Consolidated Gas Co.
- Consolidated Edison Co. of New York, Inc.
- National Fuel Gas Distribution Corp.
- Central Hudson Gas & Electric Corp.
- KeySpan Gas East Corp.
- Brooklyn Union Gas Co.
- Orange and Rockland Utilities Inc.

V. RECOVERY OF CARRYING COSTS ON FINANCED EXPENSES

Q. What did Staff and NWIGU-CUB propose with respect to the recovery of carrying costs?

A. Staff proposed that the Company should recover only the modified blended treasury rate (1.47 percent for 2012) as a cost of financing environmental expenses. NWIGU-CUB proposed that NW Natural receive only a "debt rate." [17]

Q. What reasons do Staff and NWIGU-CUB offer for their proposals?

A. Staff states that providing the Company something less than its cost of capital is appropriate because "the Commission would be agreeing to allow[] cost recovery, subject to a prudence review and an earnings review . . . [and] [a]s a result, it would be appropriate to only charge ratepayers the modified blended treasury rate as interest versus the Company's authorized ROE." [18] NWIGU-CUB's position is that because the Company would be allowed to recover its expenses through the SRRM, "[t]here would be no risk associated with the recovery of this amount by the Company, and therefore no equity investment would be necessary." [19]

[17] NWIGU-CUB/100, Larkin/52.
[18] Staff/200, Johnson/8.
[19] NWIGU-CUB/100, Larkin/53.

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Q. What is your view of the reasons offered by Staff and NWIGU-CUB?

A. These positions are not factually correct. Although Staff and NWIGU-CUB attempt to characterize the utility as somehow being able to finance its environmental expenditures at the cost of debt, rather than its cost of capital, their reasons do not offer any rational support for such a conclusion.

Whether the Company has an expectation of cost recovery does not dictate how the utility can or should finance a major expense. Especially in cases, such as this, where financed expenses are large and recovery extends for many years, the utility cannot fund them with debt alone, and must rely, as is the case with all major capital investments, on a mixture of debt and equity to finance them. This is the very definition of the Company's cost of capital, and it is the cost that should be recovered by the utility.

NW Natural does not use separate financing strategies for individual obligations. Instead, over the long-term, we manage our debt and equity based on the allowed capital structure, as the Commission expects of us. To do otherwise would cause the Company to become overly leveraged, which reduces the strength of the Company, increases its borrowing costs, and could jeopardize the Company's credit ratings.

Additionally, it is worth noting that, contrary to Staff's and NWIGU-CUB's assertions, under NW Natural's proposal, the Company does not have a surety that it will recover its costs, because such costs are subject to ongoing prudency reviews.

Neither Staff nor NWIGU-CUB have offered a credible explanation as to how the utility is to finance on a long-term basis the significant expenses associated with environmental remediation over many years at only its cost of debt. If Staff's and NWIGU-CUB's arguments were sound, then they would apply to all utility investments,

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which involve the investment of capital and the recovery of such amounts plus a return, where investments are found to be prudent. Their arguments to treat environmental expenses differently are not sound, and would lead to incongruous results.

Q. Are the arguments you make above regarding the parties' sharing proposals applicable to the parties' positions that the Company should be limited to the cost of debt as a carrying charge?

A. Yes. The parties' proposal that the Company should receive less than its cost of capital as a carrying cost are essentially just another mechanism through which they seek to have the Company bear significant amounts of prudently incurred costs.[20] It is also worth noting that the NY Staff and NY ALJ in the proceeding referred to by Staff note that denying carrying charges doesn't, "…appear to be equitable to utility shareholders or sound regulatory policy…" (NY Staff p. 29) and that "…if the underlying expenses have been found to be reasonable and prudent, [the ALJ sees] little justification for denying recovery of carrying charges, as those charges result from a Commission determination to defer in order to mitigate rate impacts on customers." (NY ALJ p. 29)

VI. APPLICATION OF AN EARNINGS TEST TO LIMIT RECOVERIES

Q. What did Staff propose with respect to an annual earnings test?

A. Staff proposes that amortization of environmental remediation expenses be limited by an annual earnings review under ORS 757.259(4).

Q. What is your position on this proposal?

[20] For instance, if the Company incurred $100 million in environmental costs over the next five years with a five year rolling recovery period, under Staff's proposal, the Company would collect approximately $28 million *less* in carrying costs than if the Company were allowed its full cost of capital.

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A. Staff's proposal appears to overlook the provisions of ORS 757.259(e)(5), which specifies that an annual earnings test is not applicable to automatic adjustment clauses. ORS 757.210 clarifies that the SRRM would be an automatic adjustment clause because it represents a "rate schedule that provides for rate increases or decreases or both, without prior hearing, reflecting increases or decreases or both in costs incurred . . . [or] the collection of ongoing current expenses . . . that is subject to review by the commission at least once every two years."

Moreover, even if the SRRM were not exempted from the application of an annual earnings review, nothing in ORS 757.259 dictates that the Commission could not, or should not, allow amortization of such amounts. NW Natural believes that limiting recovery of such expenses in the event that the Company exceeded its return on equity would be inappropriate and punitive, and that given the magnitude of the costs it would affect a permanent cap on earnings.

Staff does state in its opening testimony, however, that the earnings tests would be "performed using the years when the costs were incurred."[21] If this approach were adopted by the Commission, NW Natural asserts that it would be necessary to include the environmental expenses in the earnings tests for those years, in order to gain an accurate picture of whether the Company was in fact over-earning in those prior years.

Q. Are there other aspects of Staff's proposed application of an earnings test that you would like to address?

[21] Staff/200, Johnson/7.

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A. Yes. Many utilities around the country recover the costs of environmental remediation through adding such amounts to rate base, and deferring them in between general rate cases. NW Natural opted not to take such an approach, in response to Staff's stated concerns about the size of the deferred balances that result from ongoing deferrals without concurrent amortization.[22] It would be unfair to cut off recovery of these amounts through the application of an earnings test, when the Company could have opted to seek recoveries through rate base additions which would not be subjected to an annual earnings review.

VII. LIMITATION ON RECOVERIES OF 3% OF PRIOR YEAR REVENUES

Q. What did Staff propose with respect to the three percent limitation on recoveries of environmental expenses?

A. Staff cites ORS 757.259(6) in proposing that NW Natural's amortization of amounts in the deferral account be limited to an amount equal to three percent of NW Natural's revenues for the preceding year.

Q. What is the Company's position on this proposal?

A. The Company is not opposed to this cap, because it understands that any amounts that would have been amortized but for the cap would be deferred for recovery in later years. The Company believes it is unlikely that this cap would be regularly exceeded in any event.

Q. Do you have any other statements that you would like to make on this topic?

[22] *See, e.g., Re. Application for Deferred Accounting of Unrecovered Environmental Costs Associated with Gasco, Wacker, Portland Gas, Portland Harbor and Eugene Water and Electric Board*, Docket UM 1078, Order No. 10-117 Appendix A at 5 (Apr. 2, 2010) ("Staff remains concerned since this is the seventh year since [NW Natural] first requested authorization to defer unrecovered environmental expenses.").

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A. Yes. In the Company's direct case, it credited against rate base the deferred tax balances that it has related to environmental remediation, in accordance with Commission practice. If the Commission determines, contrary to the Company's position, that shareholders should bear some of the costs the Company incurs for environmental remediation, the Commission would need to provide for the removal of an appropriate amount of such deferred tax balances as a credit to rate base. Additionally, as explained in the Company's direct case, the fact that the Company credited against rate base the deferred taxes associated with environmental recoveries means that upon amortization, amounts collected from customers should be adjusted to ensure that there is a matching between changes in deferred taxes and amortizations of environmental remediation costs. Finally, if the Commission were to adopt Staff's or NWIGU-CUB's sharing proposal, despite the reasons NW Natural has offered for rejecting them, the Company would expect that a sharing of insurance proceeds would also apply, such that the Company had an opportunity to offset some of its losses associated with those proposals.

Q. Does this conclude your testimony?

A. Yes it does.

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BEFORE THE

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NW Natural

Exhibits of C. Alex Miller

SITE REMEDIATION COST RECOVERY MECHANISM
EXHIBITS 2601 - 2602

June 15, 2012

EXHIBITS 2601-2602 – SITE REMEDIATION COST RECOVERY MECHANISM

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Oregon General Rate Case – December 2011

Data Request Response

Request No. GR1-NWIGU-CUB-DR 96**:**
Environmental Remediation. Please refer to Mr. Miler's testimony, page 2, line 15. Please provide a detailed listing and supporting cost documentation for the $51.8 milion of remediation expenditures referred to in the testimony

Response: 4/23/2012

The transactional support for the $51.8 million of remediation expenditures from SAP is provided at NWIGU-CUB DR 96 Attachment-1.

Additionally, copies of invoices associated with these transactions are being provided on CD to NWIGU and CUB. Please note that NW Natural has withheld legal invoices, which contain attorney-client privileged information in the form of notations regarding legal services provided.

Also attached is a spreadsheet (NWIGU-CUB DR 96 Attachment-2) that NW Natural uses to help track costs, which may be helpful in reviewing and characterizing cost information.

CUB-NWIGU DR 96 Attachment 1 (excerpt of over 3,000 lines)

Data Source	Object	Account	Cost Elem.	Amount	Year	Per	Name	DocumentNo	Purch.Doc.	Document Header Text	Purchase order text
PowerPlant		186145		19,397.27	2006	11	STOEL RIVES LLP				
SAP CJI3	200392-03-04	186149	505100	19,386.70	2011	5	5.12.11 inv 25509	1002598981	4500006653	5.12.11 inv 25509	Upland Invest 2nd Ph Implement
PowerPlant		186147		19,361.30	2005	11	HAHN AND ASSOCIATES INC				
SAP CJI3	200391-01-13	186145	506200	19,286.10	2011	8		1002806989	4500006440	8.26.11 inv HSRAF12-0112	Gasco Uplands Site Remedy
PowerPlant		186145		19,278.77	2006	1	STATE OF OREGON				
SAP CJI3	200391-01-01	186145	505100	19,272.42	2010	12		1002220861	4500006404		Final RI
SAP CJI3	200391-04-02	186147	505100	19,246.25	2011	4		1002475795	4500006436	3.24.11 inv # 24977	RI Investigations/Reporting
Lawson		186145		19,240.21	2005	5	102601HAHN AND ASSOCIATES I				
SAP CJI3	200394-01-07	186145	505000	19,204.48	2011	5		1002569860	4500007038	4.20.11 inv no 2357875	L190-Case Admin/Client Comm
SAP CJI3	200394-01-07	186145	505000	19,204.00	2011	4	K&L Gates	1002546995		JV AP Accrual PT 1 April	
SAP CJI3	200394-01-07	186145	505000	19,204.00	2011	5	K&L Gates	1002600698		JV AP Reversal Accrual PT	
SAP CJI3	200391-03-02-02	186145	505100	19,201.25	2011	7		1002735374	4500006451	7.21.11 inv #26322	Area Ident and Gaps Report
PowerPlant		186151		19,187.70	2007	7	ANCHOR ENVIRONMENTAL LLC				
PowerPlant		186147		19,061.06	2005	4	HAHN AND ASSOCIATES INC				
SAP CJI3	200391-04-02	186147	505100	19,045.67	2011	7		1002721990	4500006422	7.15.11 inv #5237119	RI Investigations/Reporting

CUB-NWIGU DR 96 Attachment 2

SUMMARY OF ENVIRONMENTAL COSTS

Vendor	Central Holder	Gasco Site	Portland Harbor Site	Portland MGP Site	Santosh Landfill	Siltronics Site	Oregon Steel Site	
Anchor Environmental		$17,471,991.72		$1,401,911.57		$225,463.12		
Barnes & Thornburg LLP			$93,000.00					
Bateman Seidel			$21,906.54					
Cherokee General Corp.		$1,448,515.40						
City of Portland		$167,947.31						
Clean Environment		$138,122.86						
DEQ	$34,865.23	$1,613,700.48		$37,218.53		$131,232.37		
DOI Restoration Fund			$295,780.49					
Environmental N.W.		$68,223.00						
Foss Environmental		$6,109.10						
Geo Tech Explorations, Inc.		$57,656.00						
Hahn & Associates	$510,019.28	$3,871,005.02				$1,867,509.87		
Lower Willamette Group			$9,507,213.01					
Miscellaneous		$17,862.86	$13,946.10			$6,376.00		
Misc. NRD Costs			$710,385.03					
Natural Resource Restoration Group			$193,004.00					
North Creek		$52,127.45						
Pearl Legal Group		$295,361.77	$912,613.78	$28,367.96	$75.00	$3,130.00	$960.00	
Schwabe	$1,577.51	$628,312.81	$1,892,295.01	$18,673.45	$13.50	$152,597.60	$29,154.05	
Sediment Mgmt Work Group			$40,000.00					
Sevenson		$8,220,215.95						
Stoel Rives		$293,323.62				$32,561.82		
Test America		$21,022.52						
Tribes		$400,221.45						
Van Ness Feldman			$7,199.60					
Willamette Restoration			$117,996.00					
Wyatt, Robert			$5,113.97					
U.S. EPA		$1,309,269.98						
SITE TOTALS	**$546,462.02**	**$36,080,989.30**	**$13,810,453.53**	**$1,486,171.51**	**$88.50**	**$2,418,870.78**	**$30,114.05**	
GRAND TOTAL								**$54,373,149.69**

TO: Mark R. Thompson
Manager, Rates & Regulatory Affairs
NW Natural
220 NW 2nd Avenue
Portland, OR 97209

FROM: Judy Johnson
Electric and Natural Gas Division

OREGON PUBLIC UTILITY COMMISSION
Northwest Natural (NWN) Data Request to OPUC
Due May 21, 2012
NWN Data Request No DR 14

NWN Request:

14. Reference Staff/200, pgs. 7-8: Please clarify if Staff's proposal of a 90/10 sharing is intended to apply to all deferred environmental expenditures sought to be recovered by NW Natural, or if Staff is proposing that such a sharing would only be applied to future expenditures.

OPUC Response:

14. Staff's proposal of the 90/10 sharing was meant to apply to all expenditures from the beginning on through the future.

BEFORE THE

PUBLIC UTILITY COMMISSION OF OREGON

UG 221

NW Natural

Reply Testimony of Keith White

INTERSTATE STORAGE AND OPTIMIZATION
EXHIBIT 2700

June 15, 2012

EXHIBIT 2700 – REPLY TESTIMONY – INTERSTATE STORAGE AND OPTIMIZATION

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I. INTRODUCTION AND SUMMARY

Q. Please state your name and position with Northwest Natural Gas Company ("NW Natural" or "the Company").

A. My name is Keith White. I am Vice President of Business Development and Energy Supply, and the Company's Chief Strategic Officer.

Q. Please summarize your educational background and business experience.

A. I joined NW Natural in 1996 and I have served in my current position since 2007. Prior to that, I was employed for 20 years at Portland General Electric. I have an undergraduate degree in Business from Oregon State University.

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to respond to recommendations made on behalf of Staff of the Public Utility Commission of Oregon ("Staff") by Ken Zimmerman regarding NW Natural Schedules 185 and 186, which govern the credits to our customers flowing from the Company's Mist non-utility storage services and asset optimization activities.

Q. Please summarize your reply testimony.

A. In my testimony I:

- Provide background facts summarizing the history of the Company's Mist non-utility storage services and asset optimization activities that are the subject of Schedules 185 and 186,
- Describe the benefits that customers have realized from the Company's non-utility storage and asset optimization activities;
- Describe Staff's proposal to alter the sharing of net margins flowing from these activities;

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- Explain why Staff's proposal is flawed, and in particular why it would significantly hamper the Company's non-utility storage and asset optimization activities to the detriment of customers and shareholders;
- Explain why the current sharing framework is fair and reasonable; and
- Provide the Commission with an alternative sharing framework that is fair to customers and shareholders and will allow both groups to continue to benefit from the Company's non-utility storage and optimization activities.

II. BACKGROUND ON STORAGE AND PIPELINE OPTIMIZATION

Q. Please provide some background on the storage and pipeline optimization activities that are the subject of Schedules 185 and 186.

A. Beginning in 1999 NW Natural became aware that there was interest in underground gas storage services among energy companies in the Pacific Northwest, and after studying the issue became convinced that there was a market opportunity for the Company and its customers. NW Natural analyzed the potential demand, as well as alternatives for serving that market. In the end, the Company concluded that the best approach would be to use shareholder dollars to incrementally expand capacity from the then existing Mist storage and related transmission facilities.

By taking an incremental investment approach, NW Natural was able to leverage sunk costs and limit constructing otherwise unnecessary duplicative facilities. The Company's view was that these new potential non-utility revenues could then be used to not only cover its incremental investment and operating costs, but also could be partially shared with core customers to help offset some of the sunk costs already imbedded in their rates. Moreover, core customers would benefit from the Company's early

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development of additional capacity by having the ability to recall storage capacity in the future, as might be needed to serve them.

In the course of investigating the business opportunity for storage services, the Company also became interested in the potential for creating even further value by contracting for third party optimization of storage, and, consequently, included this within the business activity.

The Company brought the idea to Commission Staff and the stakeholders, and proposed that, given that the business would use some existing Mist and LDC transmission infrastructure, the Company should share any profits from the business activity with customers. After some discussion, the parties agreed and the Commission ordered that the sharing should be set on a 20/80 basis, with 20 percent of net margin shared with customers, and 80 percent being retained by the Company. The Company was pleased with the opportunity to expand its non-utility business, and Staff and stakeholders were pleased with an arrangement that allowed them to benefit without incurring cost or risk.

At the time the Company entered into the 20/80 sharing agreement, it expected that nearly all of the margins would come from storage services, which were enabled by the incremental non-utility investment. Over the first year of the new business implementation, the Company discovered that not only were the margins from storage optimization, which includes core as well as non-utility Mist capacity, greater than initially expected, but that there was a further opportunity to also optimize its upstream pipeline capacity. With this experience it became evident that the margins coming from optimization were going to be much larger than anticipated. Unlike storage services from expanding Mist, which was funded entirely by shareholder dollars, the majority of the

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Company's storage and pipeline capacity optimization involves resources included in customer rates. Accordingly, the Company approached Staff and the parties and suggested that an increased customer sharing percentage be adopted for core Mist and upstream pipeline optimization—one that more accurately recognized the customers' contribution in rates. The parties concluded that it would be appropriate for the Company to be able to retain the maximum weighted average cost of gas (WACOG) sharing percentage available to it through the Purchased Gas Adjustment mechanism (PGA) for optimization of core storage and upstream pipeline capacity. Accordingly, the parties proposed, and the Commission ordered, 67/33 sharing for core Mist and upstream pipeline capacity optimization activities, with 67 percent of the net margins being shared with customers and 33 percent of profits being retained by the Company.

Q. Please describe how these sharing arrangements are reflected in the Company's tariff schedules.

A. Schedule 185, which is titled "Special Annual Interstate and Intrastate Storage and Transportation Credit," applies to the Company's core customers receiving firm sales service, whose rates include costs related to the Mist Storage facility. The purpose of this schedule is to credit these core customers for the Oregon share of net margins received by the Company for (a) interstate storage and related transportation services provided under FERC jurisdiction; (b) intrastate storage activities and related transportation services under Rate Schedule 80; and (c) optimization of total Mist storage capacity (core and non-utility allocated in accordance with the schedule).

Q. How are these revenues allocated under Schedule 185?

A. Schedule 185 provides that NW Natural will share with eligible customers the net margin received from non-utility interstate and intrastate storage services on a 20/80 basis, with

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20% to be credited to customers, and 80% to be retained by NW Natural. In addition, Schedule 185 provides that NW Natural will also share with eligible customers the net margin that is attributable to optimization of Mist storage capacity. Net margins from Mist storage optimization are shared a) 20/80 for the proportion of non-utility Mist capacity not included in the rates and, b) 67/33 for the proportion of core Mist capacity that is included in the rates, with 67% being credited to customers and 33% being retained by NW Natural.

Q. Please describe Schedule 186.

A. Schedule 186, which is titled "Special Annual Core Pipeline Capacity Optimization Credit," applies to the core customers whose rates include costs related to upstream pipeline capacity gas processing, commodity supply contracts and non-Mist storage capacity. It includes all of the firm service customers eligible under Schedule 185, plus those customers receiving interruptible sales service. The purpose of Schedule 186 is to credit eligible customers with the Oregon share of net margins received by NW Natural for the optimization of core customer pipeline, gas processing, commodity supply, and non-Mist storage capacity. This includes all off-system pipeline, commodity, gas processing and storage capacity. It does not include any optimization activities of Company-owned on-system storage – Mist, Newport LNG or Portland Gasco LNG.

Q. Do these optimization activities require more expertise and resources than normal utility gas purchasing practice?

A. Yes. They require both a sophisticated trading floor operation and a broader North American gas market presence. Because NW Natural would be unable to realize these benefits by itself, over time it has negotiated a series of agreements with various third party national energy marketing companies, which require close collaboration. These

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activities go beyond the savings the Company also attempts to realize through its annual gas purchasing activities, which are passed through to customers via the PGA.

Q. How are revenues allocated under Schedule 186?

A. Schedule 186 provides that NW Natural will share with eligible customers the net margin attributable to this third party optimization for the entire portfolio of upstream capacity contracts. Specifically, under Schedule 186 the Company will share revenues with its firm and interruptible sales customers on a 67/33 basis, with 67% to be credited to customers 33% to be retained by NW Natural.

Q. Are the sharing percentages reflected in current Schedules 185 and 186 the same sharing percentages that have been approved by the Commission since 2001?

A. Yes.

Q. Have these schedules resulted in credits to NW Natural's customers over the years?

A. Yes. Since the time these credits were instituted, NW Natural's customers have received a total of $72,147,472. Thus, despite the fact that our customers have incurred virtually no risk or cost as a result of our storage services and optimization activities, customers have greatly benefitted.

Q. Did the Company address Schedules 185 and 186 in its direct testimony filed in this case?

A. No. The Company did not address these schedules in its direct testimony because it was not proposing any changes, and because the level of sharing does not affect revenue requirements or base customer rates.

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III. <u>DISCUSSION OF STAFF'S RECOMMENDATIONS</u>

Q. Please describe Staff's recommendations regarding the Company's Mist Interstate Storage activities.

A. Staff has made three recommendations:

First, Staff recommends that the Commission order the Company to initiate an independent investigation of Mist operational and financial history;

Second, Staff recommends that the Commission re-allocate the customer credit for storage optimization from Schedule 185 to Schedule 186; and

Third, Staff recommends that the Commission revise the proportion of sharing between Company shareholders and its customers as follows.

- For storage services: from 20/80 to 50/50;
- For storage optimization: from 20/80 to 90/10 for Interstate capacity, with 90 percent to be shared with customers, and 10 percent to be retained by the Company; and from 67/33 to 90/10 for Core capacity with 90 percent shared with customers and 10 percent retained by the Company; and
- For upstream optimization: from 67/33 to 90/10 with 90 percent shared with customers and 10 percent retained by the Company.

Q. Does the Company agree with any of these recommendations?

A. No, the Company does not agree with any of Staff's recommendations. Overall, these recommendations reflect a lack of understanding on Staff's part as to how Mist is operated, and the important role it plays in ensuring safe and reliable gas service for our customers. Further, Staff's specific recommendation to reallocate the sharing percentages would damage the Company's efforts in these areas, which have accrued to

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the benefit of customers, and cause the economic pie available for sharing between customers and shareholders to shrink.

Q. Please respond to Staff's argument that the Commission should order the Company to initiate an independent investigation of the Mist operations.

A. Staff's recommendation that the Company initiate an investigation rests upon two faulty conclusions: First, Staff has concluded that that there is an approximate $10 million "difference" in the Company's financial records; and second, Staff has concluded that NW Natural's core customers have more Mist storage capacity than needed. Both of these conclusions are erroneous.

Q. Please address the $10 million "difference".

A. Staff's view that there is a difference appears to be the result of a misinterpretation of the Company's response to OPUC Data Request 370. In that data request, Staff asked that the Company provide its Mist storage non-utility "plant" investment. That is what we did. Unfortunately, Staff then compared this plant investment to the *total* investment reported in the 2011 Interstate Storage report. This report includes not only the Mist plant investment, identified in the Company's response to Data Request 370, but also non-utility transmission & distribution plant as well as recoverable cushion gas.[1] As a result of this error, Staff has incorrectly identified a difference when none exists. In fact, the Mist plant investment balances provided in the Company's response to OPUC Data Request 370 are identical to the Mist plant balance included as a subset in the 2011 Interstate Storage report.

1 It should be noted that for accounting purposes, recoverable cushion gas is classified as inventory. Only non-recoverable cushion gas is classified as plant.

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Q. Please address Staff's second conclusion that core customers have more Mist capacity than is needed.

A. Staff's view is at odds with the findings of the Company's acknowledged Integrated Resource Plan (IRP) and seems to be the result of some confusion as to the distinction between average peak weather and peak design weather.

Q. Please explain.

A. In its opening testimony, Staff adds up the total deliverability from Mist and other storage facilities available to NW Natural core customers, and determines that the Company has 611,000 Dth/d available, constituting 122 percent of the deliverability needed to meet the 500,000 Dth/day normal peak demand identified in the IRP. Based on this information, Staff states that it is concerned that NW Natural may have too much daily storage deliverability under contract. There are two basic problems with Staff's logic. First, in making this argument, Staff suggests that the Company needs only to have available resources sufficient to meet an average winter peak. This suggestion is absolutely contrary to any responsible approach to load resource planning. Indeed, if the Company planned its available resources on such an assumption, it would only have enough resources to meet load in the 50% of warmest winters and would be unable to meet its customers' peak in the 50% of coldest winters. This approach would be catastrophic from a reliability standpoint.

Q. What is the second problem with Staff's logic?

A. In calculating the 611,000 Dth/day that Staff believes is available to serve core customers, Staff has incorrectly assumed that the Company can instantaneously recall capacity currently being used to serve interstate and intrastate off-system storage customers. Staff appears to misunderstand the distinction between interruptible

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contracts, and firm contracts that are subject to future year recall. In the Interstate storage market, firm capacity has value; interruptible capacity has only limited value. For this reason, the Company's non-utility contracts are for firm capacity subject to future year recall. Firm contracts need to be honored and are governed by the Company's FERC authorized Operating Statement. The Company cannot interrupt these firm contract Interstate Storage customers to meet a resource deficiency of core customers in the event of a colder-than-average peak event. To recall capacity, the Company must wait for the term of the firm Interstate Storage contract to expire.

Q. How has the Company determined the amount of Mist storage capacity required to reliably serve its core customers?

A. The Company has determined the Mist storage requirements for core customers through the IRP process—a comprehensive process that provides for participation by Staff and other interested outside parties. Staff has provided no valid explanation as to why the Company should deviate so significantly from the resource plan determined through the IRP process.

Q. But doesn't it make sense for the Commission to initiate an investigation—even if it is only for the purpose of clearing up some of Staff's questions?

A. No, not in my opinion. Of course it is always the Commission's prerogative to order an investigation when it feels one is warranted. However in this case, an investigation would not be the best path for resolving Staff's questions.

Q. Why is that?

A. Based on Staff's opening testimony, it is apparent Staff and the Company do not share a common understanding as to the fundamental facts and issues related to Mist storage. The cause of this misunderstanding may be the turnover of Staff over time. I would note

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on that point that none of the current Staff members was at the Commission when Mist was first developed and when the customer sharing agreement was later negotiated. Moreover, I would point out that – at the request of the Commission-- the Company commissioned an independent evaluation of Mist storage by Altos Management Partners ("Altos") as recently as 2007. A copy of the investigation report is attached as my Exhibit NWN/2701. Among its findings, the report found that "NW Natural's strategy to capitalize on arbitrage opportunities, provided there are adequate storage opportunities, has paid off for ratepayers." See Exhibit NWN/2701, White/5 and 29. Ultimately, the report encouraged an expansion of Mist capacity, and related improvements in the Company's infrastructure. See Exhibit NWN/2701, White/4 and 29.

There is no reason to believe that the findings of the Altos report are no longer valid. And we do not believe that it makes sense to commission new investigations of the Company's Mist Storage operations every five years. Relying upon an outside party for an independent investigation is not an effective way to build institutional memory within Commission Staff. For these reasons, I suggest that a more constructive approach would be for the Company to work with Staff to build a shared working knowledge on this topic, particularly given the incorrect assumptions that appear to underlie Staff's desire for an investigation. The Company would look forward to an opportunity to meet with Staff and customer groups to review Mist history, and increase shared understanding.

<u>Allocation of Customer Credit between Schedule 185 and 186</u>

Q. Please describe Staff's recommendation that the Commission order the Company to reallocate customer credits between Schedule 185 and Schedule 186.

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A. Staff takes the position that Schedule 186 needs to be rewritten because: (a) the inclusion of 67/33 sharing of revenues from optimization of core storage and pipeline assets by NW Natural in both 185 and 186 is duplicative; and (b) deliverability optimization needs to be added to core storage and pipeline service because core customers receive the benefits of deliverability optimization.

Q. Is Staff correct?

A. No. Making these changes would improperly alter the sharing among customer tariff classes for two reasons. First, Staff's recommended reallocation would result in a mismatch of customer costs and benefits. Second, I do not believe that the change would even achieve what Staff is intending.

Q. Please explain why Staff's recommendation would result in a mismatch of customer costs and benefits.

A. The best way to explain this point is to review the development of the schedules over time. Back in 2000-01, when the Company first began its customer sharing from interstate storage services and optimization, it anticipated that most all of the net margins would be derived from Mist storage. Schedule 185 was created in order to credit core firm sales customers who were paying for Mist storage in their rates.

Over time, as the Company continued to expand its activities, the magnitude of the customer credits grew and increasingly more of the optimization margins were realized from pipeline and other upstream resource activities not related to Mist. Consequently, the customer groups brought up the issue that the customer tariff classes eligible to receive the annual credit needed to be expanded. The Company agreed, with the effect being to both expand those customers eligible for Schedule 185 and to create Schedule 186. As currently constituted, Schedule 185 includes those firm sales

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customer who have Mist storage costs included in their tariff rate schedule. In addition to the firm sales customers on these tariffs, Schedule 186 also includes interruptible sales customers on Schedules 31CSI, 31ISI, 32CSI and 32ISI2, who while not paying for any Mist storage costs in their rates, do have costs included for pipeline and upstream commodity supplies.

For these reasons, Schedules 185 and 186 are divided by the activities from which the credits flow. Schedule 185 relates to activities at Mist; Schedule 186 relates to non-Mist upstream activities. If we were to reallocate the credits as Staff recommends, interruptible sales customers, who are not paying for Mist, would begin to receive a credit for Mist storage optimization, resulting in a mismatch between costs and benefits.

Q. And why do you say that the recommended change would not achieve what Staff is intending?

A. It appears that Staff believes all storage-related optimization is currently shared 20/80 and that by moving the credit to Schedule 186 that it would be shared at either the existing 67/33 proportion or the Staff's proposed new proportion of 90/10. If this is Staff's belief, it is incorrect. Optimization from Mist storage is allocated between Interstate and core capacity based on their respective proportions of Mist deliverability capacity. The proportion allocated to Interstate is shared 20/80, consistent with sharing on storage services. This is appropriate because the investment in this capacity is not included in core customer rates. On the other hand, the proportion allocated to core customers is shared 67/33, consistent with the sharing for pipeline and upstream resources distributed under Schedule 186.

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2 The predecessor schedules to Schedules 31 and 32 were Rate Schedules 5, 6, 10, 21 and 23

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Proportion of Shareholder/Customer Sharing

Q. Please respond to Staff's recommendation for revisions to sharing percentages for Storage Services, as reflected in Schedule 185.

A. Staff proposes to revise the sharing percentages currently reflected in Schedule 185 by significantly lowering the proportion of net margin that the Company's shareholders would retain from 80% to 50%. This proposal is based on faulty assertions, and ignores the actual risks and benefits attendant to the storage services and optimization activities.

Q. What are the faulty assertions that serve as the basis for Staff's proposal?

A. Staff makes three faulty assertions in support of this proposal—all of which serve to incorrectly minimize the actual risks associated with the Company's storage activities.

Q. What is Staff's first assertion?

A. First, Staff asserts that the Company is "incorrect" in claiming that there is a price risk in this business activity, because it provides service under FERC cost-based rates rather than market-based rates.

Q. Why do you state that this assertion is erroneous?

A. Contrary to Staff's belief, none of the Interstate Storage contracts the Company currently has, or has had in the past, are priced at the full FERC cost-based rate. All of them, without exception, have had to be discounted from the FERC rate in order to meet the market price. This market discounted price varies from year-to-year and contract-to-contract. Further, the contract terms that the Company is able to enter into have ranged between 1 year and 10 years. Consequently, in most years there is a roll-over of capacity that needs to be re-contracted at whatever the new prevailing market price is. This is not like utility investments that once placed into service generally stay in rate base at full cost recovery.

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Q. **What is Staff's second assertion?**

A. Staff asserts that the Company has never experienced difficulty in contracting capacity from Mist.

Q. **Why do you say that this second assertion is erroneous?**

A. As I explained above, in order to meet market prices, the Company has always been required to discount its FERC cost-based rate. Thus, the difficulty is not in *whether* the capacity can be sold, but rather *at what price*. This fact significantly affects the profitability of this business activity. This point is illustrated in my Exhibit NWN/2702, White/1 CONFIDENTIAL, which is taken from the 2011 Interstate Storage report filed with the Commission. As shown, in 2011, the Company had capacity that it was forced to re-contract at a significant discount. My Exhibit NWN/2702, White/2 CONFIDENTIAL shows how steep this discount had to be relative to the average price of its prior year contracts.

Q. **What is Staff's third assertion?**

A. Staff asserts that the value of storage is increasing in the market.

Q. **Do you agree?**

A. No. Staff is, again, relying on faulty assumptions.

Q. **Please explain**.

A. In support of its argument, Staff provides a chart showing the growth in U.S. storage capacity between 2001 and 2010.[3] Staff reasons that this upward trend in capacity will continue to grow as a result of the increase in natural gas production and the replacement of coal plants with natural gas plants, and from there concludes that the value of storage will then continue to improve. This logic ignores entirely the actual

3 Staff/1000, Zimmerman/20.

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experience in the industry since 2010. In particular, all of the projects brought into service between 2001 and 2010 were permitted, contracted and developed back when gas prices and volatility were high. This enabled these projects to get started at prices that were sufficient to support the investment. However, as anyone following the industry knows, in fact, storage values over the last two years have fallen precipitously due to the shale gas supply that has swept throughout the country. As a result, new development has slowed drastically and re-contracting risk on existing projects has increased.

Q. What do you conclude about the risks the Company takes on in conducting its storage business?

A. I conclude that, contrary to Staff's assertions, this business activity clearly has greater risk than that associated with its utility service.

Q. You say that Staff has understated the benefits to customers of the Company's Mist storage activities. Please discuss those benefits.

A. NW Natural's customers realize substantial benefits from the Company's storage activities at Mist. First, Oregon customers have benefitted from the annual credit under Schedules 185 and 186 totaling $72 million over the last 11 years. While Staff has acknowledged this sharing benefit, it has completely ignored the second significant benefit, which is that NW Natural's core customers benefit from the Company's ability to recall capacity for their use, as needed in the future. There are several aspects to this second benefit:

- Customers save by being able to recall small capacity increments that are better sized to the gradual growth in their capacity needs. In contrast, development at Mist comes in lumpy increments. If not for Interstate Storage, customers would

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be required to pay for the full investment upfront and then gradually grow into it over time.

- Customers can better time when they need capacity and pay for it only as needed. New storage projects typically have a 3-4 year lead time. Because the amount to recall is updated each year, the Company was able to reduce the amount of storage capacity paid for by customers when core growth slowed dramatically due to the recession.
- Customers' recall is at depreciated original cost; they do not have to pay full replacement cost when they begin paying for capacity.

All of these factors make the Mist storage sharing and recall agreement a great deal for customers. If anything, a case can be made that the current 20% sharing to core customers is too high and should be reduced, when considering the benefits of recall and that core customers do not bear any of the risks or costs of the activity.

Q. Please respond to Staff's recommendation for revisions to sharing percentages for Storage Services, as reflected in Schedule 186.

A. Staff has provided little justification for dramatically decreasing the proportion of optimization sharing from resources that are included in core customer rates to the Company's shareholders from 33% to only 10% beyond arguing the Company should be doing it anyway. In making this recommendation, Staff has failed to deal with the issue of what is a reasonable and fair sharing level.

Q. Has the Commission set any precedent in the past that might suggest the appropriate sharing level?

A. Yes, there are two available reference points:

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- *The PGA*: Under the PGA, the Company has the option of either selecting 80/20 or 90/10 sharing This sharing is designed to serve as an incentive to encourage the Company to secure the lowest prices for customers consistent with its obligation to provide safe and reliable service.
- *Pipeline capacity release*: Under Schedule P, there is an 80/20 sharing of savings. This sharing is intended to serve as an incentive for the Company to release on a short-term seasonal basis capacity not required to meet customer load requirements. What the Company has determined is that it can create greater value by using this pipeline capacity as part of a more complex third party optimization arrangement than via a more simplistic vanilla capacity release.

Q. Why is the current 67/33 sharing appropriate for the Company's optimization activities of resources included in core customer rates?

A. As discussed above, the Company's optimization activities are much more complex than those associated with a standard pipeline capacity release or more traditional gas supply activities, requiring the employment of a third party to employ active financial hedging strategies. Thus, it is important to note that the level of optimization benefit the Company has experienced cannot be achieved without taking on these risks and greater complexity beyond typical utility practice. For these reasons, any incentive for optimization should be more than the 80/20 that is available on more traditional utility gas supply activities. It is also worth noting that Staff also failed to look at the level of sharing on optimization for these resources within the context of the broader agreement. In particular, the 20% customer sharing on Mist storage services is probably excessively skewed towards customers given the benefits of recall. This needs to be taken into consideration if the level of core resource optimization sharing is to be revisited.

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Q. You said early on in your testimony that adoption of Staff's proposal would render the Company's non-utility storage and optimization activities uneconomic. Can you explain?

A. Yes. Staff's proposal would so significantly reduce the upside benefit to the Company of participating in non-utility storage and optimization activities that it would no longer be in shareholders' interests to continue these activities. Most significantly, Staff's proposal would render any further Mist expansions entirely uneconomic. As a consequence, as customer loads increase, the Company will of necessity be required to recall increasing amounts of storage volume, and so storage service revenues will decrease until they cease altogether. The result would be that both the Company's customers and its shareholders will lose out on an arrangement that has benefited both groups for over a decade.

<u>Potential Option Acceptable to the Company</u>

Q. What are your conclusions regarding the current sharing framework reflected in Schedules 185 and 186?

A. Based on all of the facts, I conclude that the current sharing agreement has served customers very, very well. As mentioned above, they have realized over $70 million of bill credits since the Company began this activity in 2000/01—all without their incurring any additional costs or risks. In addition, it has allowed the Company to build additional storage capacity in advance of core customer need, creating a potential for future recall. For these reasons, any change to the current agreement should be only made after thoughtful and informed consideration.

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Q. Does the Company object to making any adjustment to the sharing?

A. No. However, to do so responsibly requires that we have clear guiding principles in mind. The Company would suggest two important principles for consideration. *First*, any change should be designed with the goal of increasing the size of the economic pie. The Company's view is that a primary reason this business activity has been so successful for shareholders and customers alike is that it was crafted as a "win/win". To the degree that the Company can increase the economic value of this activity, both of its key stakeholders – customers and shareholders – share in the benefit. *Second*, the relative slices of this pie as proportioned between customers and shareholders needs to be perceived as "fair." I realize of course that fairness is always in the eye of the beholder. However, I would note that the current sharing was perceived as fair at the time it was entered into. Accordingly, it makes sense to require that any change in sharing be accomplished through mutual agreement.

Q. Does Staff's proposal comply with your principles?

A. No. Staff's proposal position fails on both principles. First, and most importantly, as I mentioned above, Staff's proposal would make any further development at Mist uneconomic. The Company would cease to invest in new capacity. This would have the effect of shrinking the pie available to be shared between shareholders and customers as capacity is recalled into core rates on a potentially accelerated basis. Second, it would substantially decrease the potential upside from innovating and taking on the risks of new complex resource optimization strategies. Because the market is always evolving and adjusting, today's strategies gradually become dated and need to be refreshed by new emergent hedging and optimization opportunities. In effect, Staff's proposal would shrink the economic pie, resulting in less being available to be shared with customers. As

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to the second principle, it goes without saying that the Company does not perceive it as fair and would not agree to its implementation.

Q. Does the Company have an alternative position in mind?

A. Yes. The Company is open to adjusting the sharing as follows:

i.	Storage services:	20/80 to 10/90
ii.	Storage optimization:	20/80 to 10/90 for Interstate capacity
		67/33 to 75/25 for Core capacity
iii.	Upstream optimization:	67/33 to 75/25

Q. What is the Company's rationale for increasing the Company share of profits from resources that are not in customer rates?

A. The main reason is that it will allow the Company to continue to expand its Mist storage capacity, and innovate its optimization activities, all to the benefit of both customers and shareholders. Unfortunately, the Company has reached the point where the cost of developing new non-utility capacity is considerably more expensive than in the past. This is true primarily because capacity at both the Miller Station compression station and LDC transmission takeaway capacity have been maxed out, so both an entirely new second compression station and additional transmission lines are required. This means that the use of any shared use of existing facilities in core customer rates is negligible for new development. Consequently, the Company is finding it extremely difficult to make any further expansions work financially. Given these facts, the proposed arrangement would improve the incentive to the Company for developing additional non-utility Mist storage capacity and increase the size of the economic pie to be shared.

Moreover, the proposed arrangement makes more sense from the perspective of basic fairness. The current 20% sharing with core customers from non-utility storage

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services and its proportion of storage optimization is probably disproportionately too high, particularly when considering the value of recall. Reducing the customer sharing to 10% would bring it more in line with what is appropriate in addition to improving the incentive to increase the size of the overall economic pie.

Q. What is the Company's rationale for increasing customers' share of profits from optimization of resources in customer rates?

From a fairness perspective, we believe that any sharing from optimization of resources in core customer rates should be in the range of from 67/33 to 80/20, with 67/33 representing the sharing that was previously arrived at through mutual agreement, and 80/20 representing the incentive level potentially available to the Company's shareholders from more traditional utility gas supply activities, which involve less risk and complexity relative to optimization activities.

Within this range, the Company would find moving to 75/25 sharing acceptable for several reasons. First, when combined with a change to 10/90 sharing for storage services and optimization, the total combined sharing would be about the same as it is currently. My Exhibit NWN/2703, White/1 CONFIDENTIAL shows what the sharing would have been under this new proposal in comparison to the existing percentages on average over the last three years. Moreover, the new proposal would yield basically the same amount to customers, while offering two potential advantages: it would support increasing the size of the economic pie from storage services and optimization; and it increases the proportion of customer sharing from optimization of resources whose costs are included in core customers rates, which is what the Company perceives is the primary fairness concern of the customer groups.

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Q. Does this conclude your testimony?

A. Yes.

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BEFORE THE

PUBLIC UTILITY COMMISSION OF OREGON

UG 221

NW Natural

Exhibits of Keith White

INTERSTATE STORAGE AND OPTIMIZATION
EXHIBITS 2701 - 2703

June 15, 2012

EXHIBITS 2701-2703 – INTERSTATE STORAGE AND OPTIMIZATION

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Final Report

ASSESSMENT OF THE EFFECTIVENESS AND EFFICIENCY OF NORTHWEST NATURAL STORAGE OPERATIONS

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September 4, 2007

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1 EXECUTIVE SUMMARY

In light of the growing demand in the Pacific Northwest and heavy volatility in natural gas commodity prices, NW Natural agreed to a request by the Oregon Public Utility Commission (OPUC) to contract for an independent study of its storage operations. As stated in the RFP, the study is to:

> "Examine and assess the Company's operation of storage facilities it owns at Mist, Newport, and Portland, Oregon, and its storage services under contract from Williams Gas Pipeline-West at Jackson Prairie and Plymouth, Washington. Consider how effectively and efficiently the Company's operations meet the goals of supporting reliability of supply while providing price arbitrage for customers."

The study will also "examine the physical set-up of NW Natural-owned storage facilities in light of the goals noted above."

Altos Management Partners was commissioned to conduct the study and has prepared this report of its findings. Using our MarketBuilder software, Altos developed with NW Natural staff a model representation of NW Natural's service territory including demand areas, storage facilities, and pipeline backbone network. We also represented the interconnections to upstream supplies and off-system storage facilities that NW Natural has contracted. The resulting model enabled us to analyze the adequacy of the system to handle a wide range of possible load scenarios and analyze the efficiency of past storage operations performance.

The key findings of our analysis are:

- NW Natural's supply and storage portfolio is adequate to ensure reliability. It was fully adequate to meet actual firm load during the past several years. Furthermore, it would have been adequate to handle any load distribution that could reasonably be expected.
- The existing physical setup is adequate to serve firm load requirements. NW Natural's ability to accept deliveries at gates located at multiple sites and adjust nominations to suit load requirements reduces NW Natural's pipeline infrastructure requirements.
- In order to better capitalize on price arbitrage opportunities and better meet durational issues, an expansion of Mist storage capacity would be desirable. It will also mitigate the impact of storage withdrawal ratchets by prolonging the duration of maximum or near maximum withdrawal rates. However, a cost/benefit analysis needs to be conducted before a decision is made.
- Finally, NW Natural's storage operations during the past few years realized through price arbitrage a net savings of over $40 million. Storage was efficiently dispatched to capitalize on price arbitrage opportunities, as well as meet load.

> NW Natural's strategy to capitalize on arbitrage opportunities, provided that there are adequate storage inventories, has paid off for its ratepayers. The amount saved represents almost half of the theoretical maximum savings with perfect foreknowledge of future prices and loads which we find is truly impressive.

2 STORAGE AND SUPPLY PORTFOLIO

In order to provide reliable service, pipeline capacities are reserved for the entire year through pipeline firm transportation (FT) contracts to deliver the supplies to markets. Pipeline FT capacity and contracted supplies, called contract demand, are sufficient to meet NW Natural's load during most of the year. Pipeline FT capacity is typically the least cost alternative to meet firm deliverability requirements as long as its utilization is sufficiently high. However, because a reservation charge must be paid even if the pipeline capacity is not utilized, storage contracts are used by local distribution companies, such as NW Natural, as a more efficient means of meeting peak demand periods. Since NW Natural's load is highly seasonal, pipeline capacity is augmented with storage capacity that can be dispatched to cover seasonal peak loads.

NW Natural also maintains a small amount of recallable supply for added flexibility to meet extremely high demand days. The supplies allow NW Natural to interrupt deliveries to specified industrial customers when deliverability is needed. However, they come at a high cost and therefore are reserved only for rare occasions of extremely high demand.

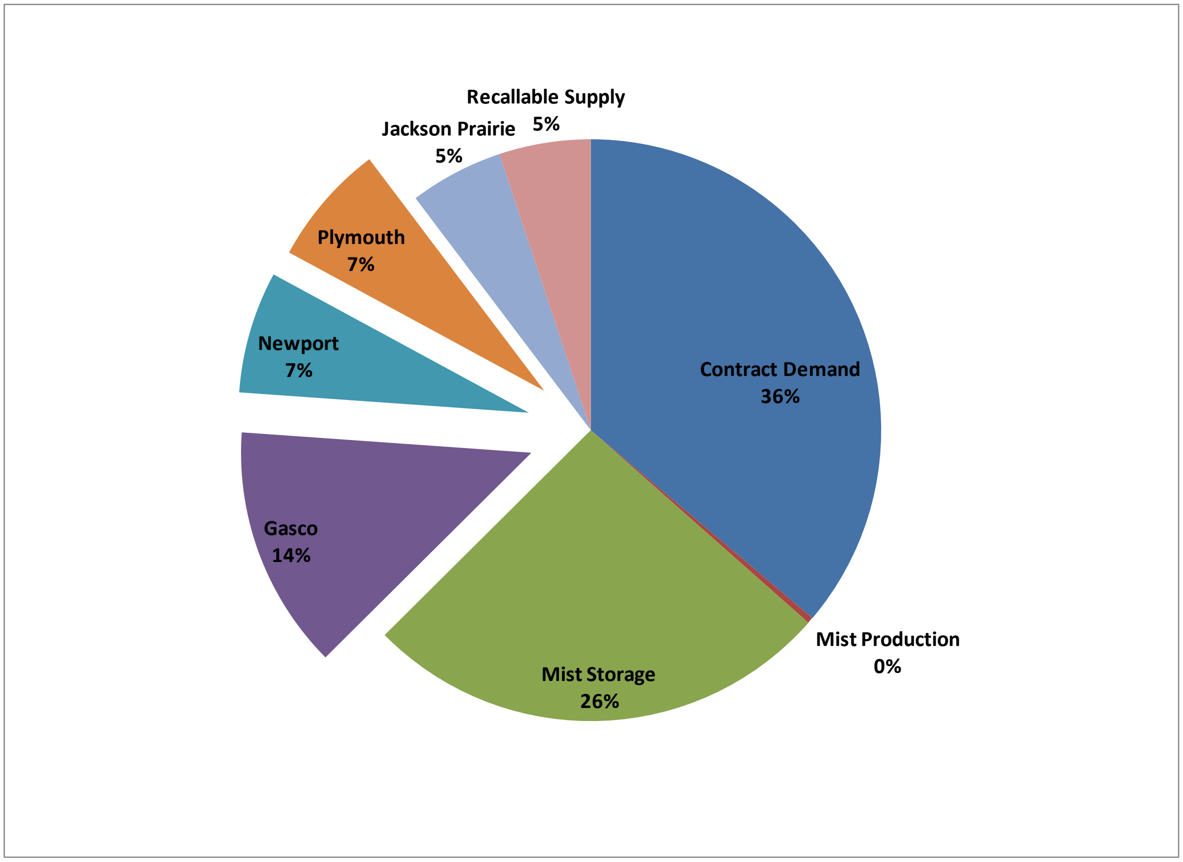
NW Natural's supply assets must be adequate to meet design day requirements and firm load throughout the year. Table 1 summarizes the pipeline and storage assets in NW Natural's supply portfolio since 2004. The total, including recallable supply, sums up to 888,000 dekatherms, adequate to meet NW Natural's design day requirement of 880,000 dekatherms.

Table 1 NW Natural's Supply Portfolio

Supply Resource	Daily Deliverability (MDth/day)	Annual Capacity (MDth)	Days at Maximum Rate
Contract Demand	326	118,714	365
Mist Production	1	438	365
Mist Storage	230	8,000	42
Gasco	120	600	5
Newport	60	1,000	17
Jackson Prairie	46	1,120	24
Plymouth	60	479	8
Recallable Supply	45	1,785	40
Total Supply	888		

Figure 1 shows the share of each supply asset of the total maximum daily deliverability. Although its total capacity is fairly low, LNG storage facilities (Gasco, Newport, and Plymouth) comprise a fairly large fraction of the total peak day deliverability. Because of their high deliverability and low capacities, these facilities are well suited to cover needle peak demand spikes, but are inadequate to cover prolonged periods of elevated demand. Hence, how the load is distributed throughout the year is extremely important.

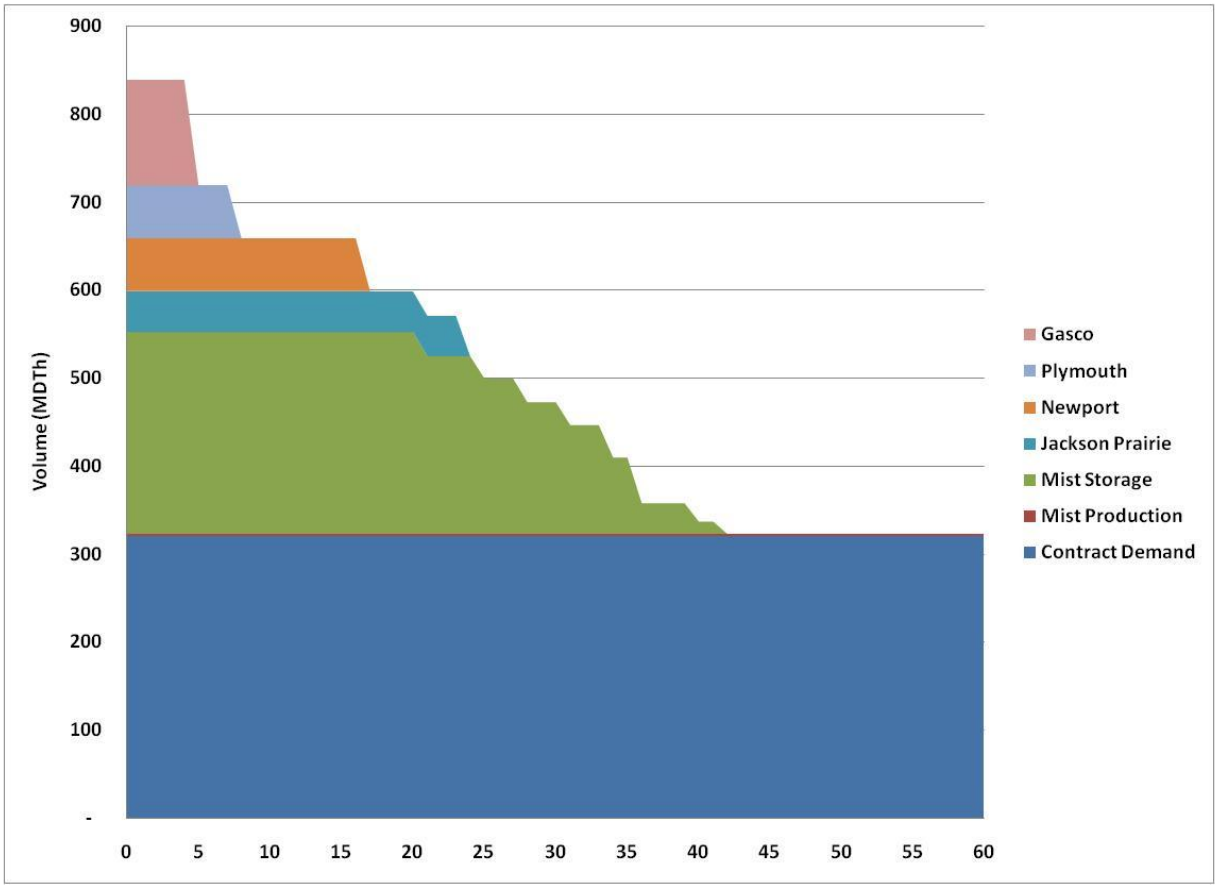
Figure 1: Share of Maximum Deliverability



The supply portfolio needs to address not only the peak day requirement, but also the year-round load requirements. Most of the year is adequately covered by contract demand of 325,000 dekatherms. During the peak winter periods, storage assets are required to make up for the firm load that exceeds contract demand. Figure 2 shows the "supply stack" available to meet the top 60 days of demand. Each layer in the figure shows the maximum deliverability from each asset and the duration at which the asset is available at the maximum rate. During the peak day in which all assets are available at their maximum deliverability, the total matches the design day criteria. As the days increase, total deliverability drops off as storage assets are depleted. For example, Gasco is available only for five days at its maximum deliverability of 120,000 dekatherms. After 25 days of maximum deliverability, all storage assets except for Mist have been fully utilized and maximum deliverability falls to less than 500,000 dekatherms. Mist storage deliverability shows a ramp down because of withdrawal ratchets that indicate how the maximum withdrawal and injection rates vary by the level of storage inventory (e.g., maximum withdrawal rates decline with the level of storage inventory while injection rates increase with a decline in storage inventory).

Of course, storage dispatch is not so simple because future load is not known and injections into storage are possible in between withdrawal periods. How the load falls during the year is crucial to knowing the adequacy of storage. For a more complete and accurate analysis, we analyzed historical load volumes and distribution patterns.

Figure 2: NW Natural Supply Portfolio

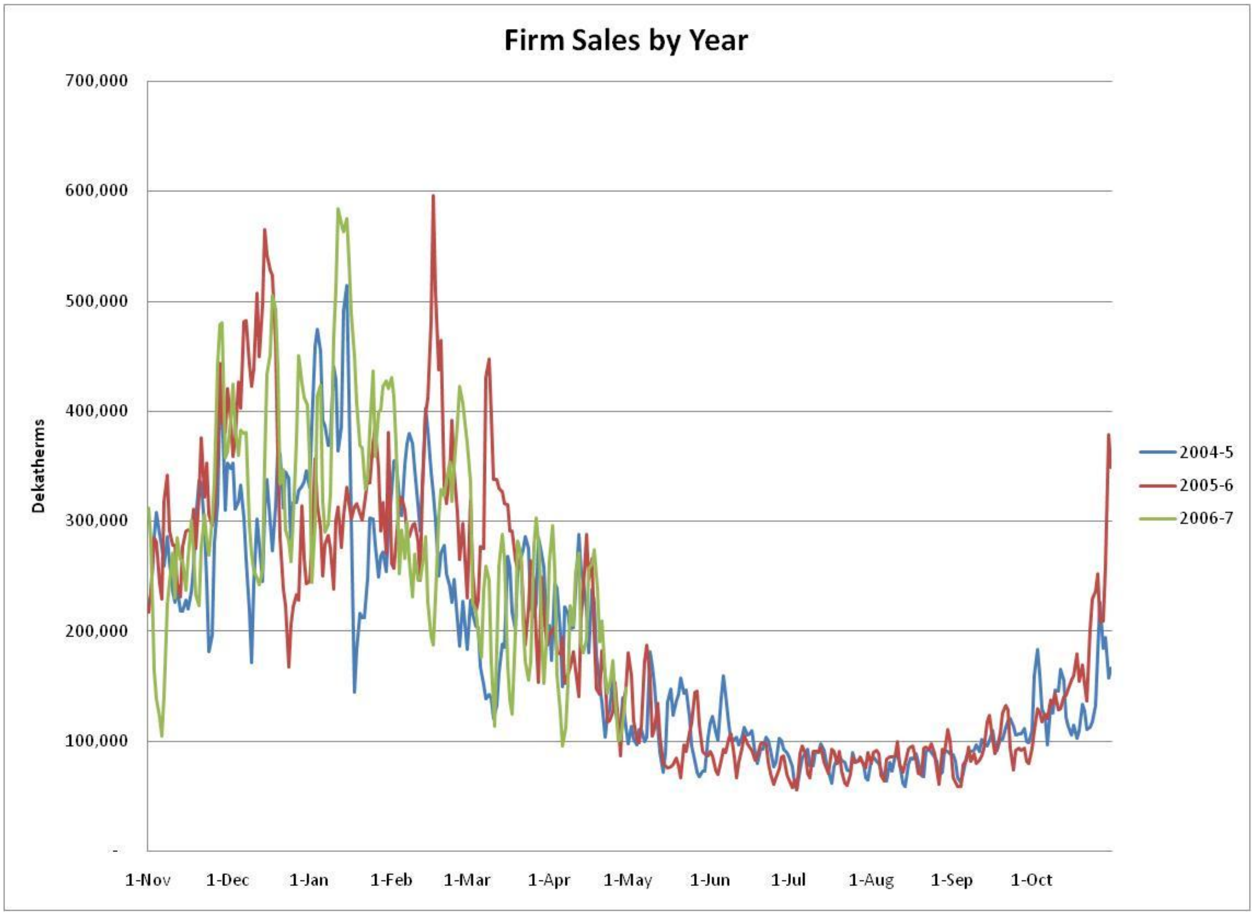


3 HISTORICAL PERFORMANCE OF STORAGE ASSETS

3.1 Firm Load

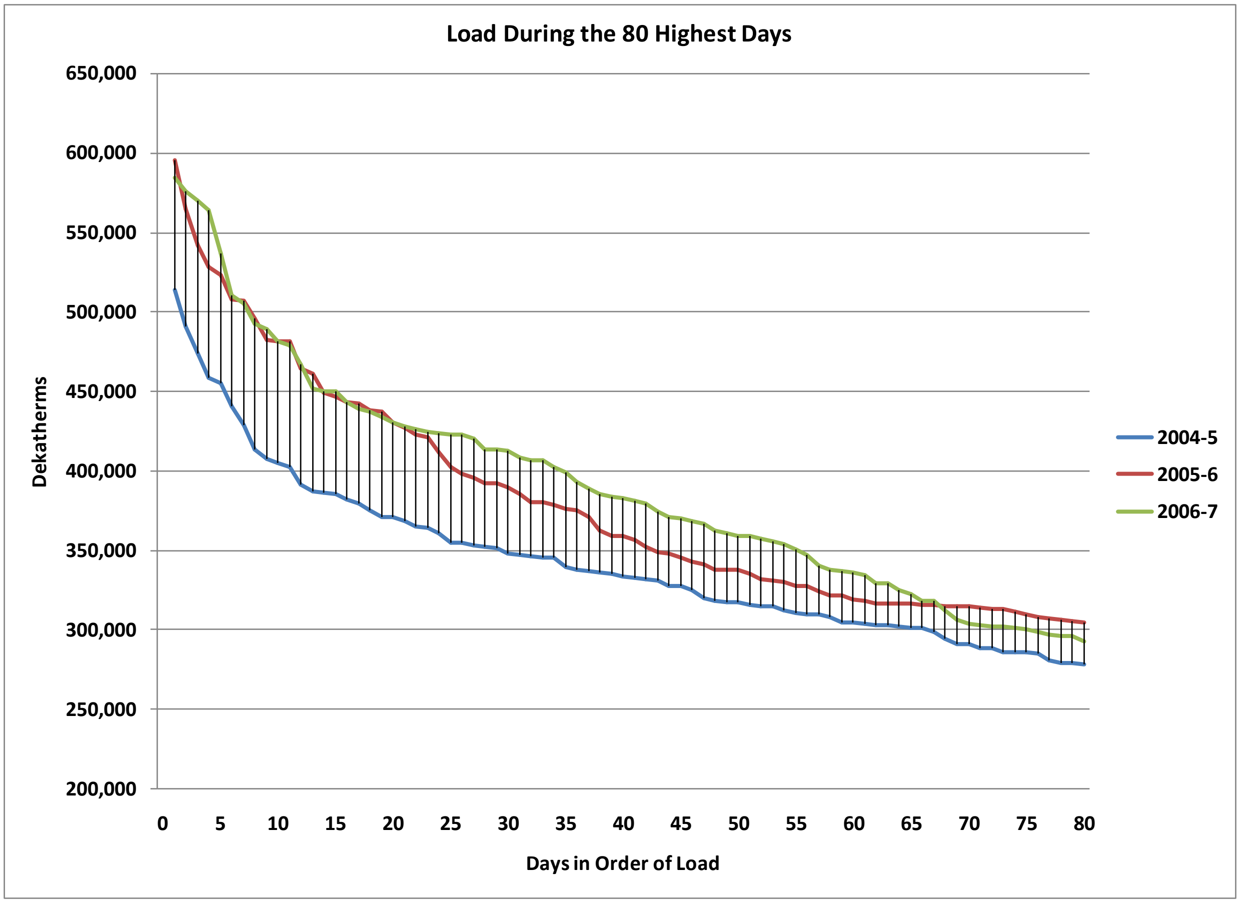
Figure 3 shows how seasonal and variable NW Natural firm load has been over the past few years. Demand on any given winter day can vary several-fold from year to year. This makes planning and operating storage extremely difficult. Because of the uncertainty in load, NW Natural has to plan for severe peaks in order to ensure safe and reliable service to firm customers. The design day requirement provides a safety factor so that demand even during an extremely cold winter, defined as a winter that would occur on average only once in twenty years, can be met. Hence, the load during most winters will not come close to approaching the design day capacity. For example, firm load during past three years never exceeded 600,000 dekatherms, well below the design day requirements.

Figure 3: Firm Sales by Year



As the first cut in our analysis of the adequacy of storage capacity, we sorted, from the highest to lowest, the load during each year to create a load duration curve. We can then compare the available supply to the load duration curve for adequacy. Obviously, this is a gross simplification that ignores timing, but it provides a useful initial view of how well the supply assets stack up to load requirements. Figure 4 shows the load duration curves for past three years. Each year starts on November 1 and goes to October 31 of the following year. For ease of viewing, only the 80 highest load days are shown since the remainder of days can easily be met by contract demand.

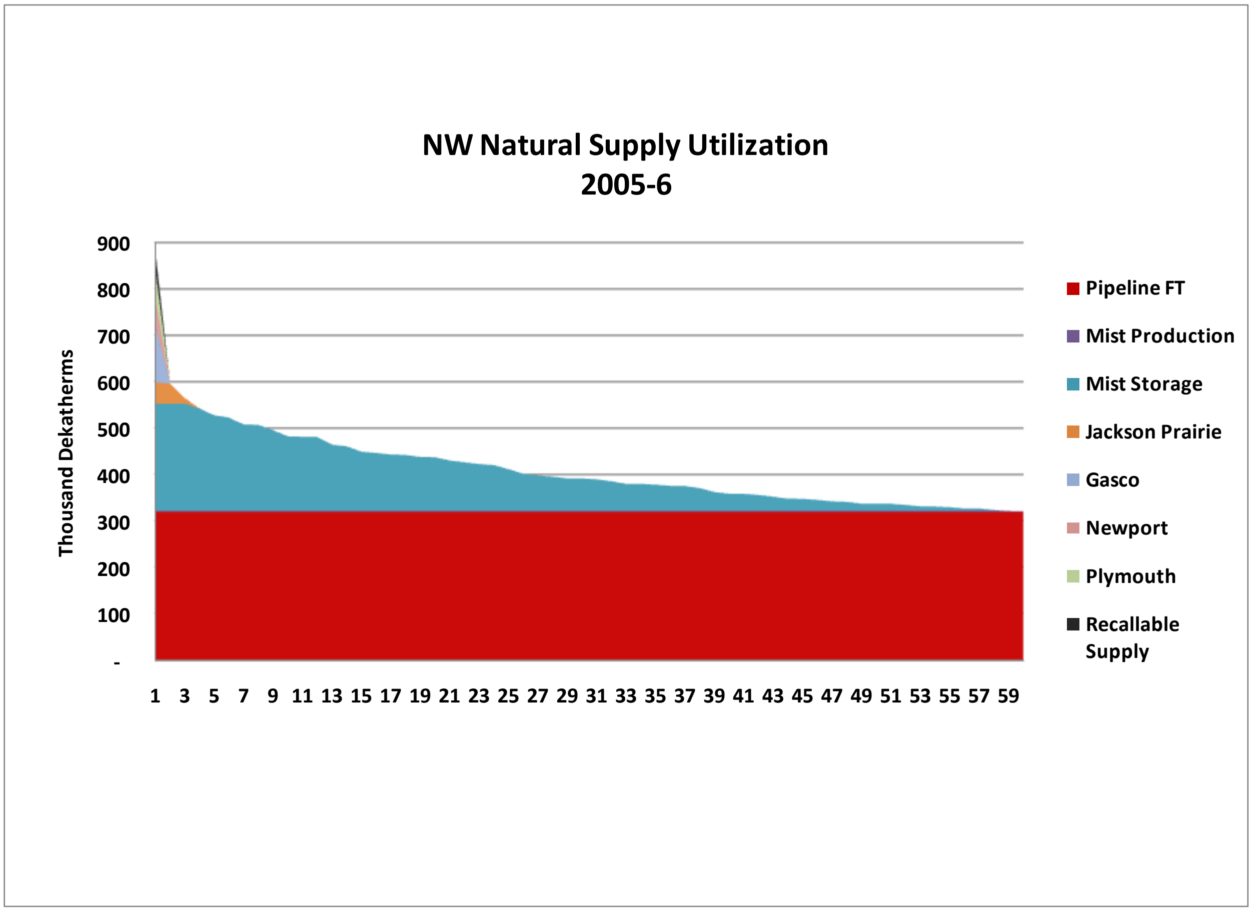
Figure 4: NW Natural's Load Duration Curve



3.2 Supply Utilization in Load Duration Curve

Figure 5 shows that the existing portfolio was more than adequate to meet the design day and load duration curve during 2005-6. In the figure, the first day represents the design day requirement, which did not actually occur but NW Natural is required to have available in any case, while the other days represent actual firm load. As the figure shows, firm load in 2005-6 could have been met without having to resort to high cost LNG storage or recallable supply. Even Jackson Prairie is not used to its full capacity. (The supply utilization chart for 2004-5 is not shown because firm demand during this period was even lower due to a rather mild winter.)

Figure 5: Supply Utilization in Load Duration Curve



This simple analysis does not take into account how the load is distributed over a year. NW Natural must not only ensure adequacy of deliverability to meet demand in the peak days, but also sufficiency of capacity to meet demand during prolonged periods of high demand. A long winter with a series of high demand days will deplete storage inventories since they are required to cover the shortfall between firm load and contract demand. Also, a run of high demand days will leave no opportunity to inject gas into storage. The durational problem is often more difficult to solve than meeting peak day requirements since it requires a careful analysis of how the load is distributed during a winter rather than simply estimating demand during the highest day. For a complete analysis, we used our MarketBuilder software to simulate storage dispatch, including price arbitrage, to meet firm load requirements.

4 REPRESENTATION OF THE NW NATURAL SERVICE TERRITORY IN MARKETBUILDER

Working with NW Natural staff, we developed a representation of the NW Natural service territory that captures its essential characteristics. Our goal was to be able to forecast the primary flows within the system and identify any potential system pinch points so that storage operations can be accurately analyzed.

NW Natural's service territory is primarily in Oregon, but it also includes parts of Washington. It receives all of its supply deliveries through Northwest Pipeline Corporation (NPC) at gates at various locations in NW Natural's service territory. NW Natural has supply contracts for Canadian production in Alberta and British Columbia and domestic production in the Rockies. The Canadian supplies are delivered to NW Natural through Canadian pipelines that interconnect with NPC in the United States. The Rockies supplies are delivered directly by NPC pipelines.

NW Natural's pipeline system receives gas from NPC delivered at gate stations and transports it to market areas. The load is concentrated around the Portland area, but the service territory covers a triangular area that stretches from Astoria in the northwest, Coos Bay in the southwest, and The Gorge in the east. Clark County, Washington is also served by NW Natural.

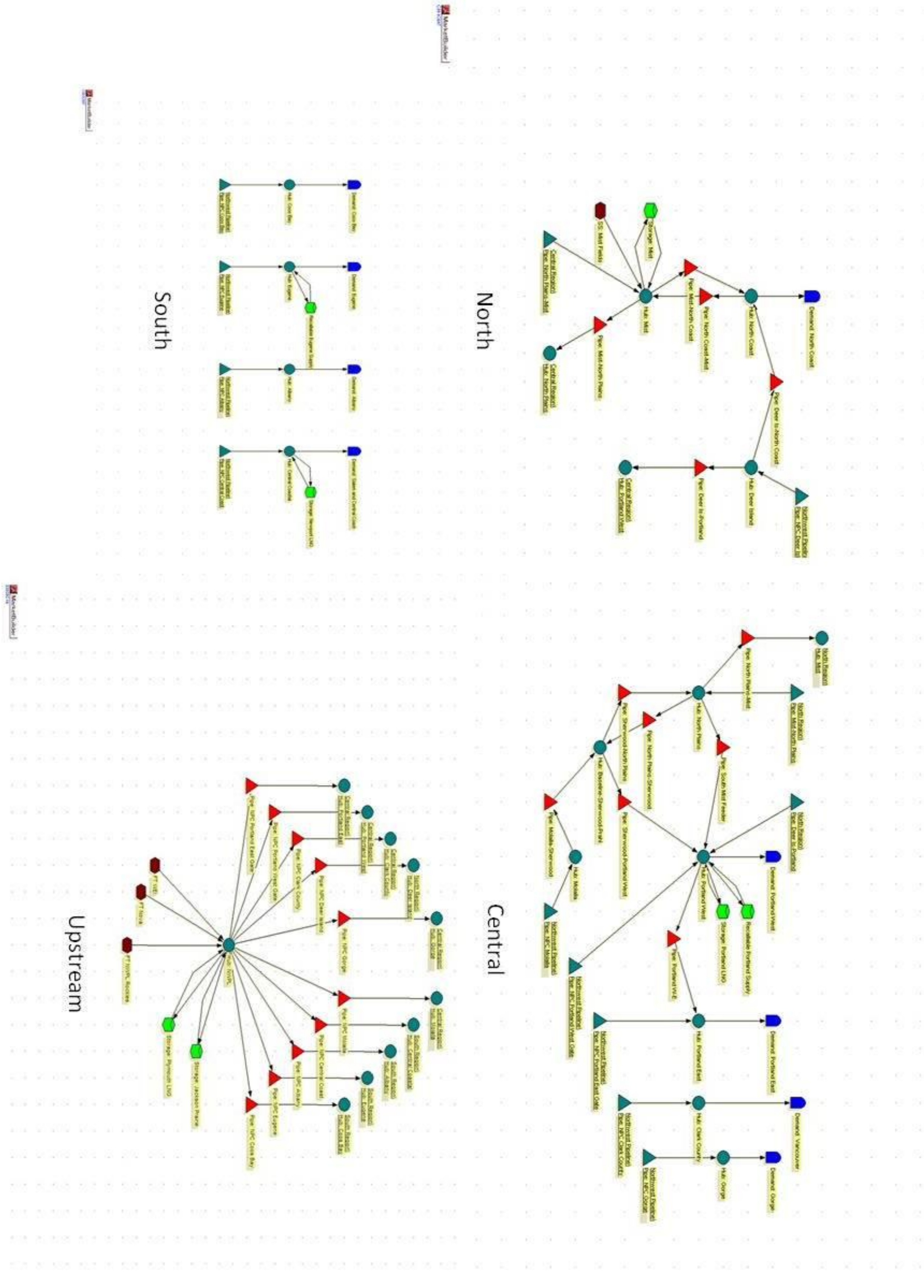
NW Natural has its own storage facilities at Mist, as well as two LNG storage facilities that liquefy natural gas for highly condensed storage. NW Natural also has contracts for additional storage capacity from NPC at Jackson Prairie and Plymouth LNG, both located in the state of Washington on NPC's system. There is also a small amount of year round natural gas production, which NW Natural has acquired, from gas fields at Mist.

One important characteristic of the NW Natural system is that it is currently not a completely interconnected system. That is, there are areas that are isolated from the rest of the NW Natural system and can only be served by deliveries from NPC. One implication of this characteristic is that storage dispatched from Mist or an LNG facility cannot physically flow to all parts of the NW Natural system. There potentially could be deliverability constraints to meeting peak loads.

We represented the NW Natural service territory in three regions plus a region representing upstream supplies and interconnections, as shown in figure 6. The diagrams are actual outputs from the MarketBuilder model developed for this study. Demand regions are represented by blue "tombstones," pipelines are represented by triangles, market hubs or pipeline interconnections are represented by circles, and storage facilities are represented by green boxes. Arrows show the direction of possible flow of gas. Storage nodes have arrows pointing both into and out of the node to represent injection and withdrawal of gas. Every type of node includes a particular economic logic that describes a particular type of economic agent. For example, a storage node represents a storage operator who will find a schedule of injection and withdrawal volumes that maximize revenue over time. The model computes the overall economic solution including a set of market clearing prices and volumes for every point in time and for every location.

Using MarketBuilder, we developed an annual model of NW Natural's operations including historical daily load levels and prices. For prices, we used the Sumas, which is in Washington near the Canadian border, price as a proxy for prices within NW Natural's service territory. (We could have used another the regional pricing point and the results would not have been significantly different since the prices are highly correlated.) Given the load levels and prices, the model solves for the optimal daily dispatch of storage from Mist and other storage facilities owned or reserved by NW Natural. The model enabled us to determine the efficiency of past storage operations, as well as the adequacy of the supply portfolio.

Figure 6: Network Diagrams in MarketBuilder



5 ADEQUACY OF SUPPLY AND EFFICIENCY OF PAST STORAGE OPERATIONS

We analyzed the adequacy of supply in meeting the actual load from the past three years. We represented the contract demand and storage assets available to NW Natural, as described in section 2, in the MarketBuilder model and simulated the load patterns during each year. The results showed that the supply portfolio was more than adequate to meet load in each of the past three years. This is not surprising since the actual system had little difficulty meeting firm load during that period, which did not include any extremely cold winter.

Figure 7 shows the model computed dispatch of storage and pipeline deliveries for the winter of 2005-6 (November 1 through February 28). During most periods, pipeline deliveries were adequate in meeting firm load. During peak days, pipeline FT delivery is augmented by withdrawals from storage, primarily Mist storage. Notice that other storage assets are not heavily utilized in what was a fairly moderate winter. Also, Mist storage displaced some of the contract demand because winter prices shot up and presented a great arbitrage opportunity. The model correctly determined adequacy of NW Natural’s supply to meet peak days and duration of load during the 2005-6. The results were similar for 2004-5, as shown in figure 8. Note that the 2004-5 year had even fewer peak demand days but the pipeline deliveries are higher than for 2005-6. The reason for that is prices during the winter of 2004-5 were soft and hence price arbitrage opportunities for storage were limited. With low prices, it is more economical to use contract demand rather than draw on storage.

Figure 7: Model Predicted Asset Utilization in 2005-6

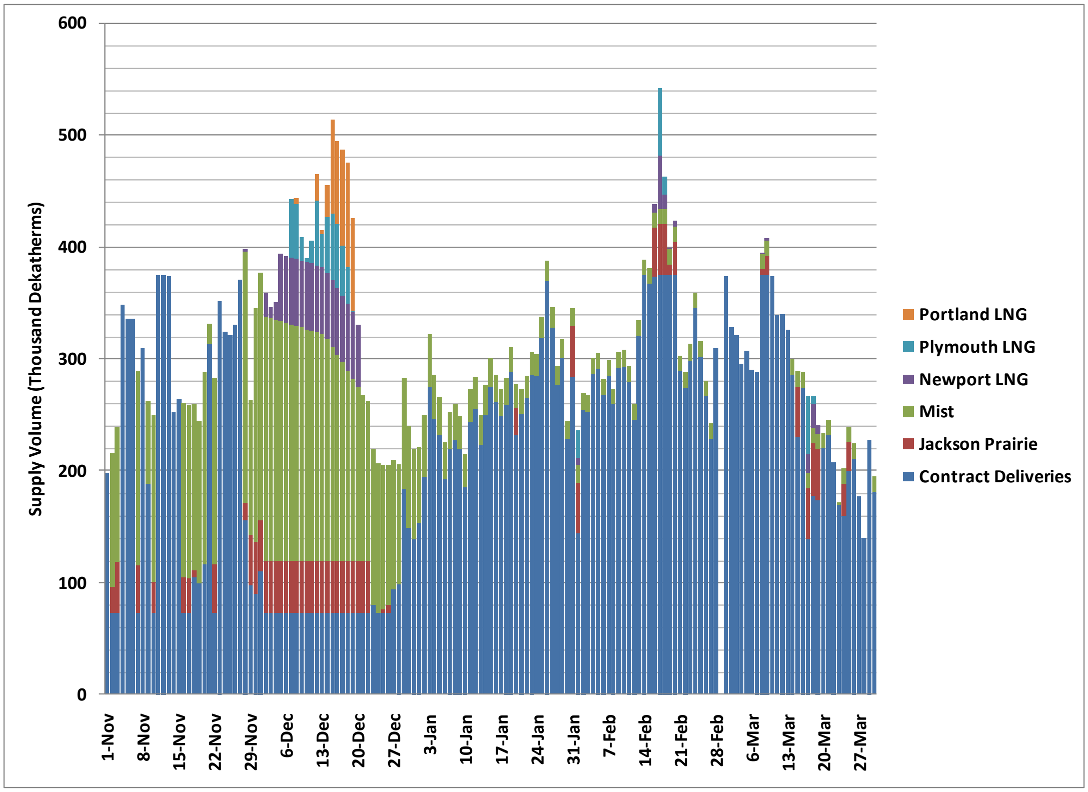
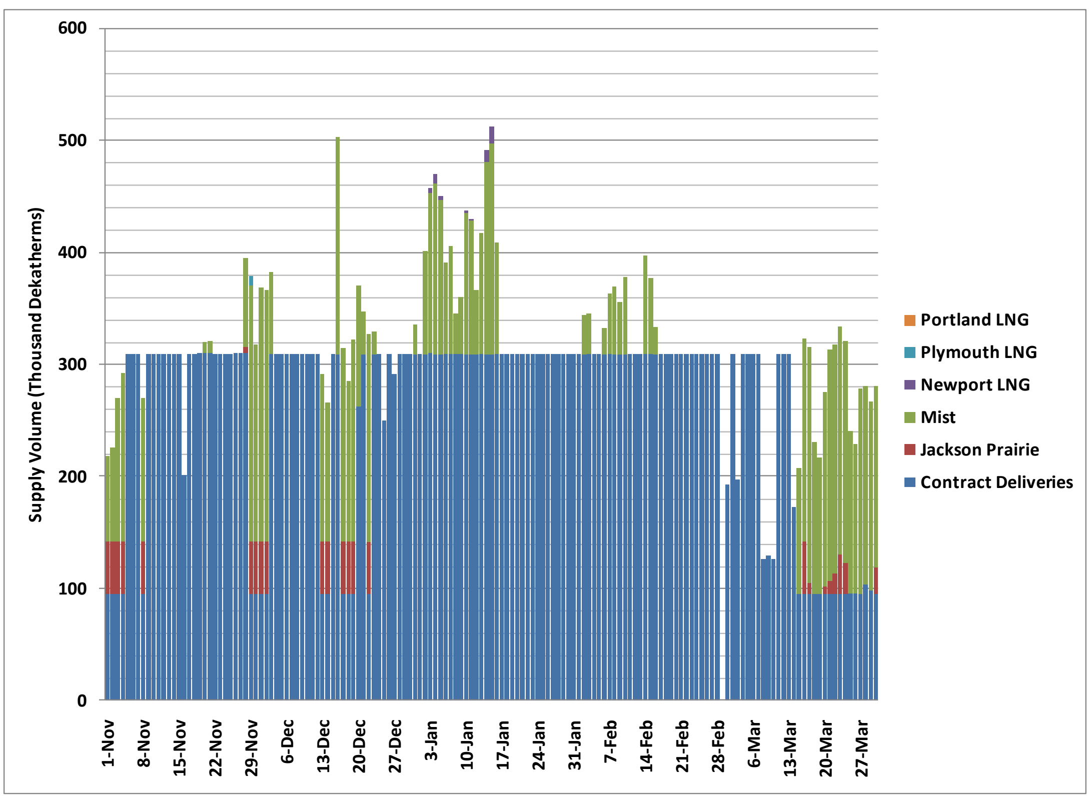
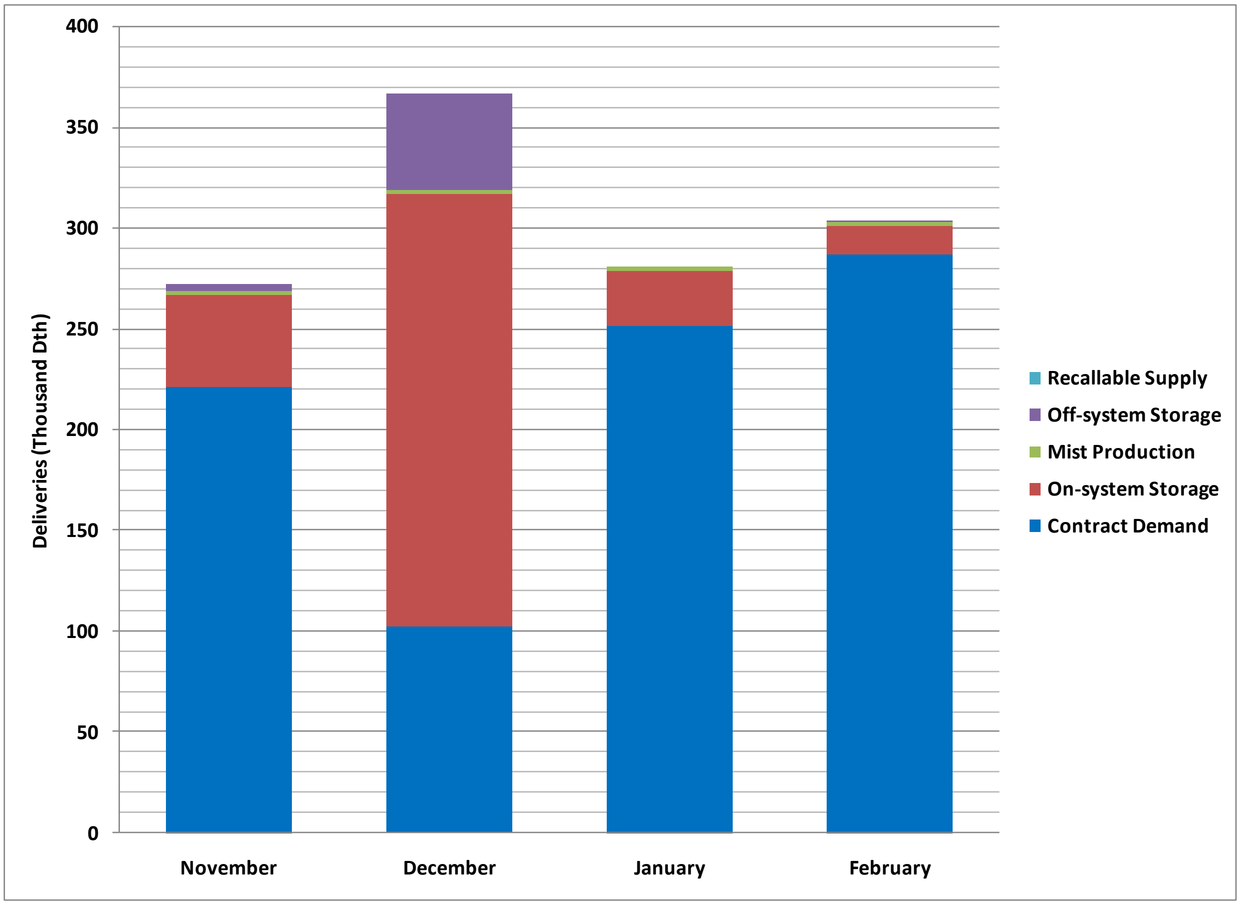


Figure 8: Model Predicted Asset Utilization in 2004-5



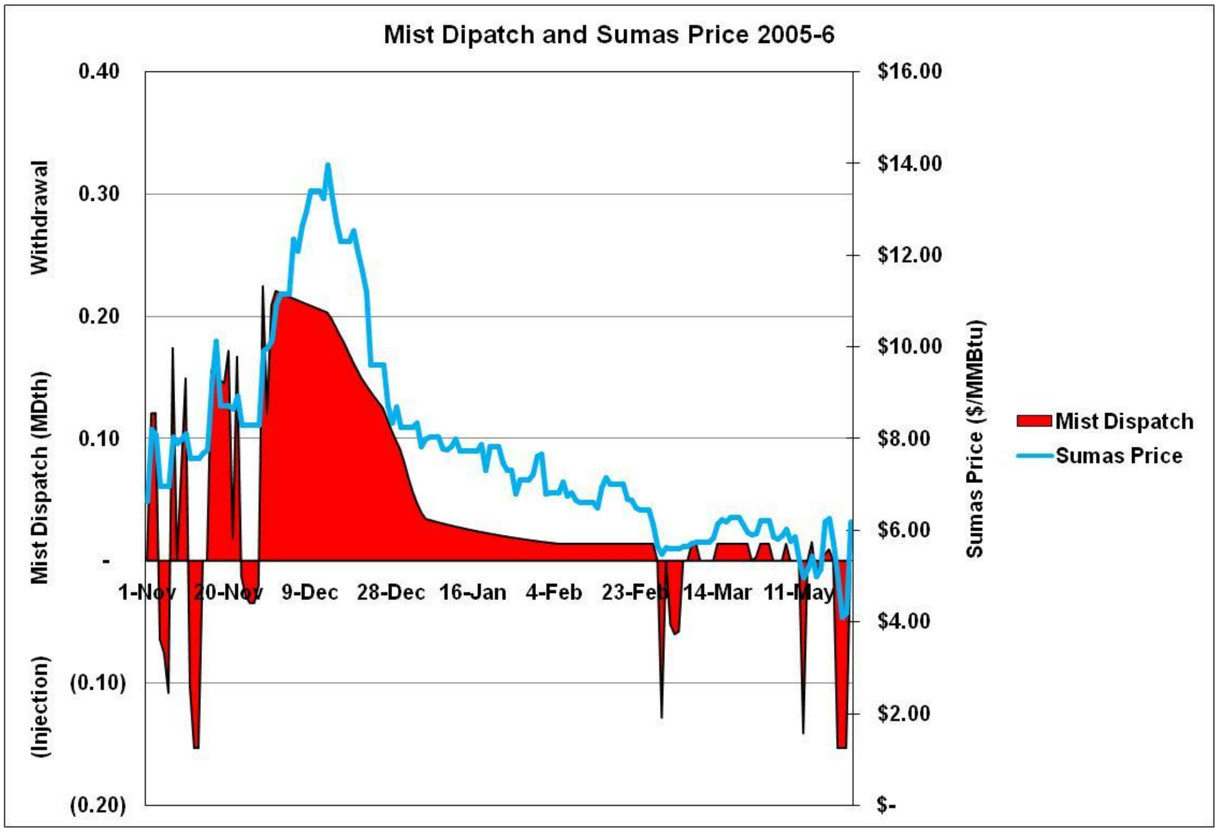
By averaging the supplies by month, we clearly see that contract demand and on-system storage (i.e., Mist) is adequate for all but the peak month in December during the 2005-6 year. On-system storage displaced contract demand during December because of heavy storage withdrawal to take advantage of prices that peaked over $10/MMBtu.

Figure 9: Sources by Month during 2005-6



In order to better understand the storage economics and price arbitrage, we can examine the predicted storage dispatch and actual prices, as shown in figure 10. Optimal dispatch of storage will fully anticipate future prices and dispatch storage so that the annual revenue is maximized. That is, it will fulfill the merchant function of buying low and selling high. Notice in the figure that storage is injected when price is low and withdrawn when price is high. The winter of 2005-6 featured a strong price surge in December when Sumas price reached $14/MMBtu, substantially higher than the previous month or later that summer when prices sank to the $4-5/MMBtu range. This sharp price run-up presented a golden price arbitrage opportunity to savvy traders. However, it required traders to realize when prices were at their peak in order to capitalize on them. Too often, when prices rise sharply traders anticipate even higher prices and wait (or even buy more) and lose out on the opportunity.

Figure 10: Model Predicted Optimal Mist Dispatch and Prices in 2005-6



Besides helping to meet peak loads in a low cost manner, storage also affords price arbitrage opportunities. We can compare the net savings given the actual storage dispatch compared to the model computed the optimal dispatch. Obviously, actual dispatch cannot compete with optimal dispatch since no one has perfect foresight into future prices. However, it will serve as a benchmark to see how effectively storage operations were able to arbitrage prices.

Figure 11 shows how well NW Natural did by comparing the predicted to actual storage dispatch. Clearly, the model is highly predictive. Further, the close match demonstrates that the actual dispatch of storage was extremely efficient, since the model predicted optimal dispatch fully anticipates future prices, as well as future load. Even without perfect foreknowledge, NW Natural did almost as well as the optimal behavior computed by the model in dispatching storage during the peak of winter. The model predicted dispatch is more aggressive during the peak December and January months because it knows that a late winter demand surge will not occur. NW Natural, in contrast, has to maintain more storage in reserve for the possibility of a late winter cold spell. Hence, actual dispatch during late winter (late February and March) is higher than the predicted optimal dispatch as working gas that was held in reserve is finally withdrawn to clear space for spring and summer injections.

Figure 11: Comparison between Model Predicted and Actual Storage Dispatch

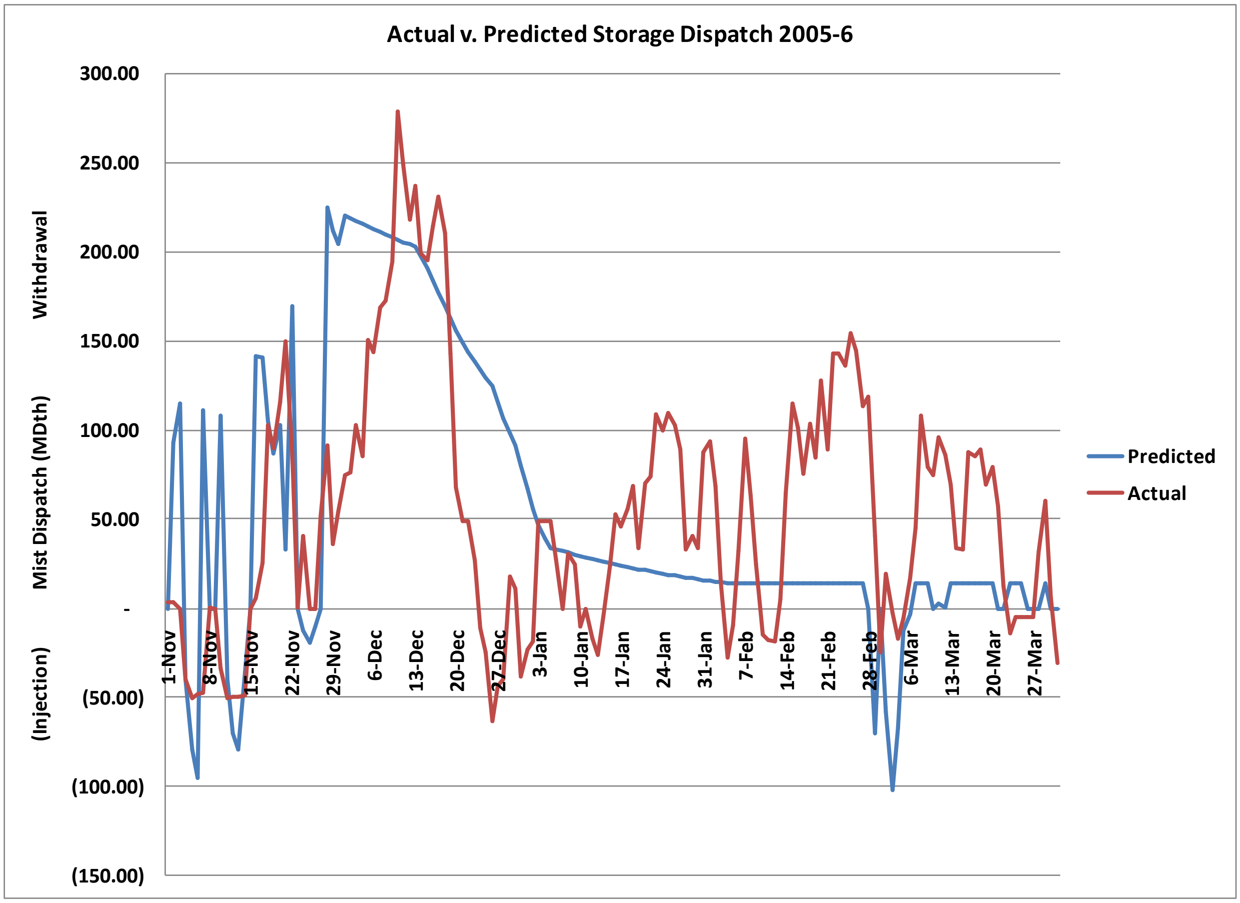
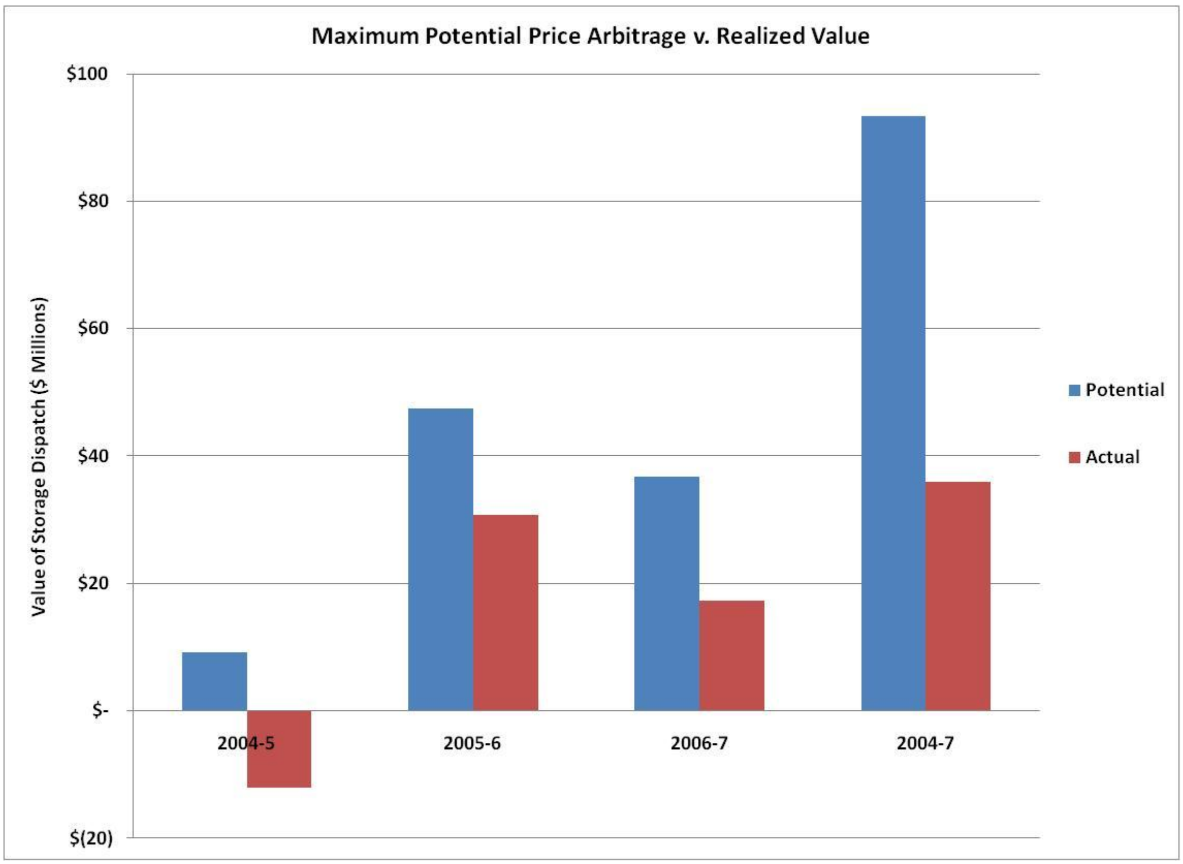


Figure 12 shows the total potential savings compared with actual realized savings. Each was computed by subtracting the cost of injections from the value of withdrawals. The figure shows that NW Natural was able to capture an amazingly high fraction of the total potential savings in 2005-7. Remember, the optimal dispatch has the advantage of being able to optimize given perfect knowledge of future prices. In 2004-5, storage dispatch was not able to nearly as well. In fact, the net value of dispatch was negative, compared to a small potential gain. The reason for this is that the winter prices, when storage has to be dispatched to meet load, were actually lower than summer prices. This is not something that could be foreseen. In fact, even if it were foreseen, a net loss would probably be unavoidable since storage had to be dispatched during the winter to meet load. This demonstrates how storage arbitrage value is closely tied to the price distribution. The optionality value of storage can greatly fluctuate by year depending on the price path. The total savings during the past several years, shown by the two bars on the right, is about $35 million, which represents almost 40% of the maximum potential price arbitrage value. Remember, the maximum potential gain assumes that storage dispatch is made with a crystal ball that makes the future known. We feel that this is an extremely high percentage since storage operators do not have the advantage of perfect market foresight and the primary goal of storage for NW Natural is to ensure reliability.

Figure 12: Comparison between Maximum Potential and Realized Gain



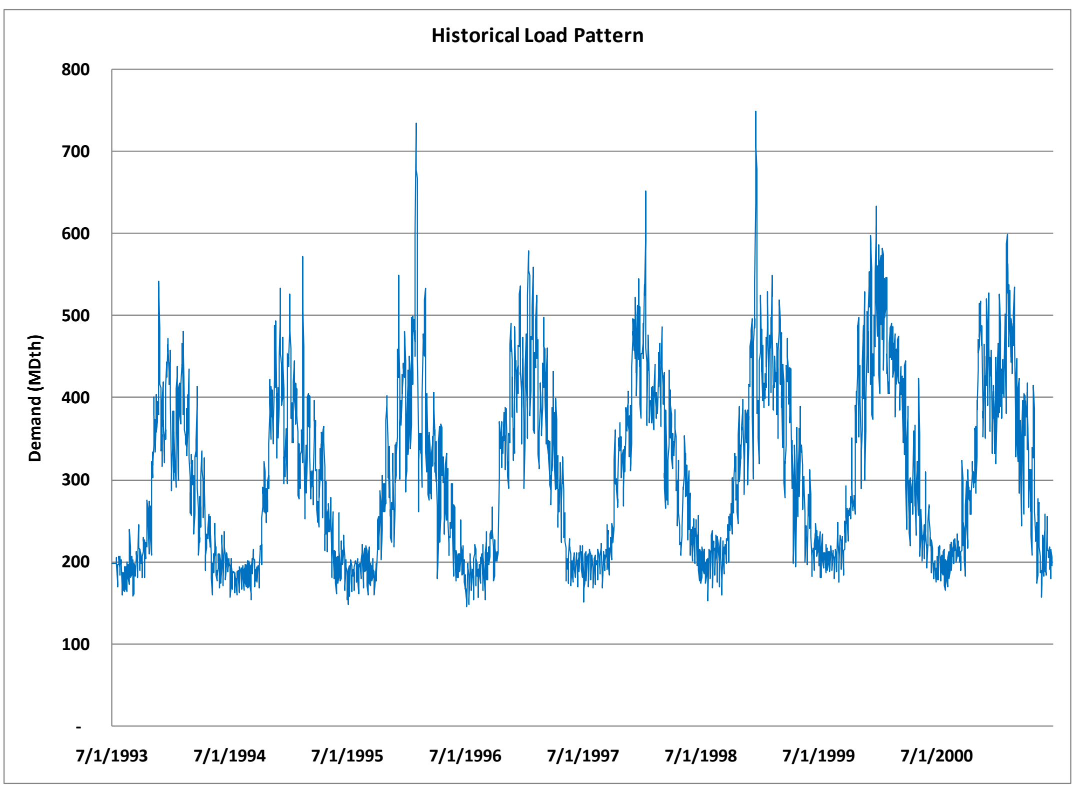
Overall, the efficiency with which storage operations were able to capture arbitrage opportunities is quite impressive. Storage operations were able to efficiently meet load requirements and also capture price arbitrage opportunities. NW Natural's strategy to capture high prices through storage dispatch as long as adequate inventories remain is an effective strategy that has and will benefit firm customers.

6 UNCERTAINTY ANALYSIS

We have shown that NW Natural's supply and storage assets were adequate and efficiently operated during the past three years. However, none of the winters during those years were extremely cold and therefore firm load never approached design day capacities. In order to fully assess the adequacy of the supply portfolio, we need to perform an uncertainty analysis to ascertain how well the storage assets would have performed under a wide range of possible demand scenarios. We therefore analyzed historical load patterns to project a distribution of possible loads. If it can be shown that the supply portfolio can adequately handle a reasonable range of possible loads, we can confidently assert the adequacy of the supply portfolio.

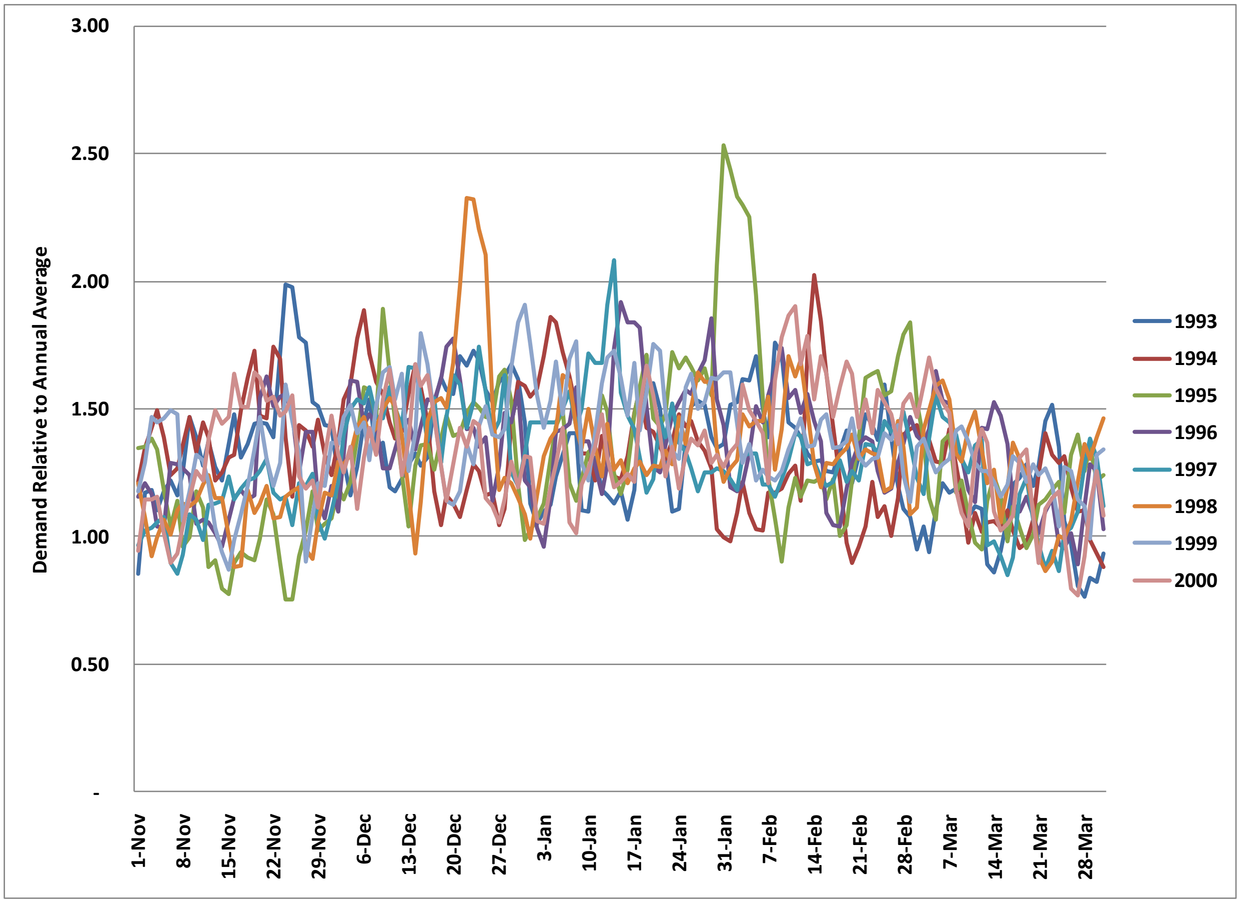
We obtained historical daily demands for 1993 through 2000. Figure 13 shows the daily demand during that period. Again we see strong seasonality within years and great volatility within seasons and across years. Also, the load has grown by about 2.5%/year during this time frame. As is often the case for energy demand, the peak grew slightly faster than did the average load.

Figure 13: NW Natural Daily System Load 1993-2000



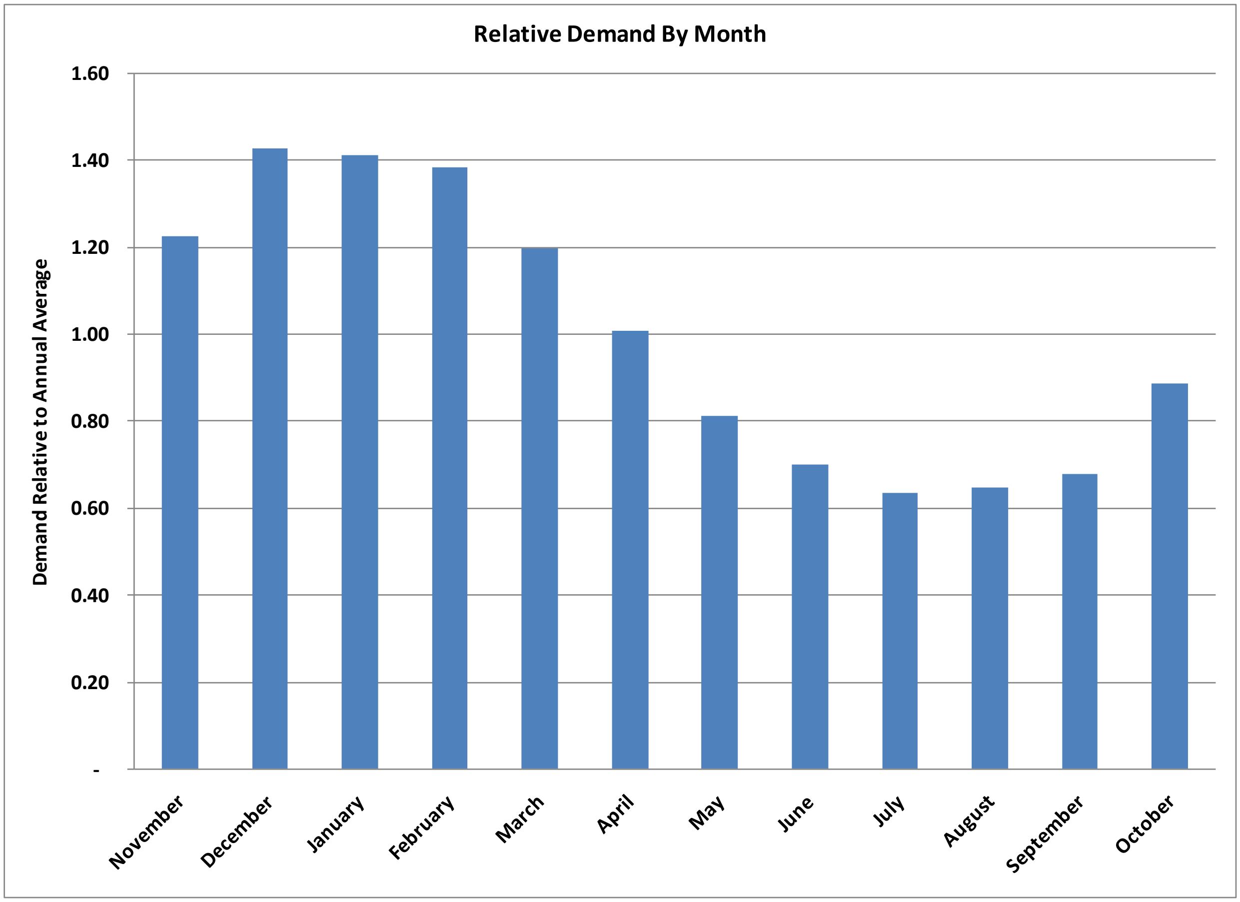
To tease out the impact of load growth from the load variability, we normalized demand for each year to obtain the annual volatility. We can then apply this volatility to the projected load to capture both load growth and historical volatility. Figure 14 shows the winter demand daily variability. As the diagram shows, demand has spiked to over twice the annual average on several occasions. We want to apply the actual distribution to capture the likelihood of coincidental peaks which are typically challenging to meet for LDCs such as NW Natural.

Figure 14: Comparison of Normalized Demand by Year



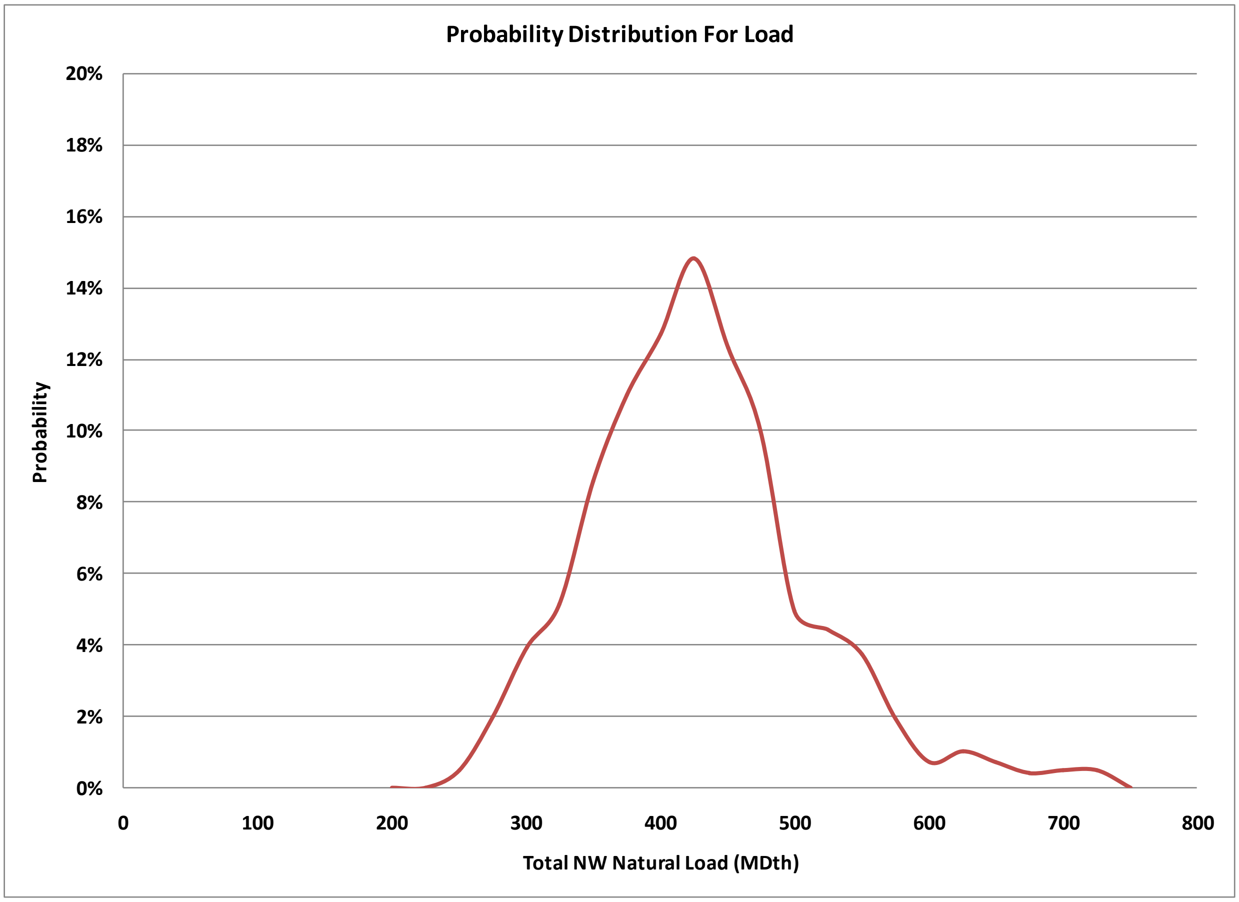
To see average monthly distribution, we compared the average load by month to the annual average in figure 15. Because winter demand gradually tails off in February and March, adequate storage has to be maintained through the peak months of December and January. That is, storage cannot chase peak loads and spiking prices without concern for future needs. NW Natural's target storage levels recognize this fact by maintaining a minimum level during each month.

Figure 15: Normalized Demand by Month



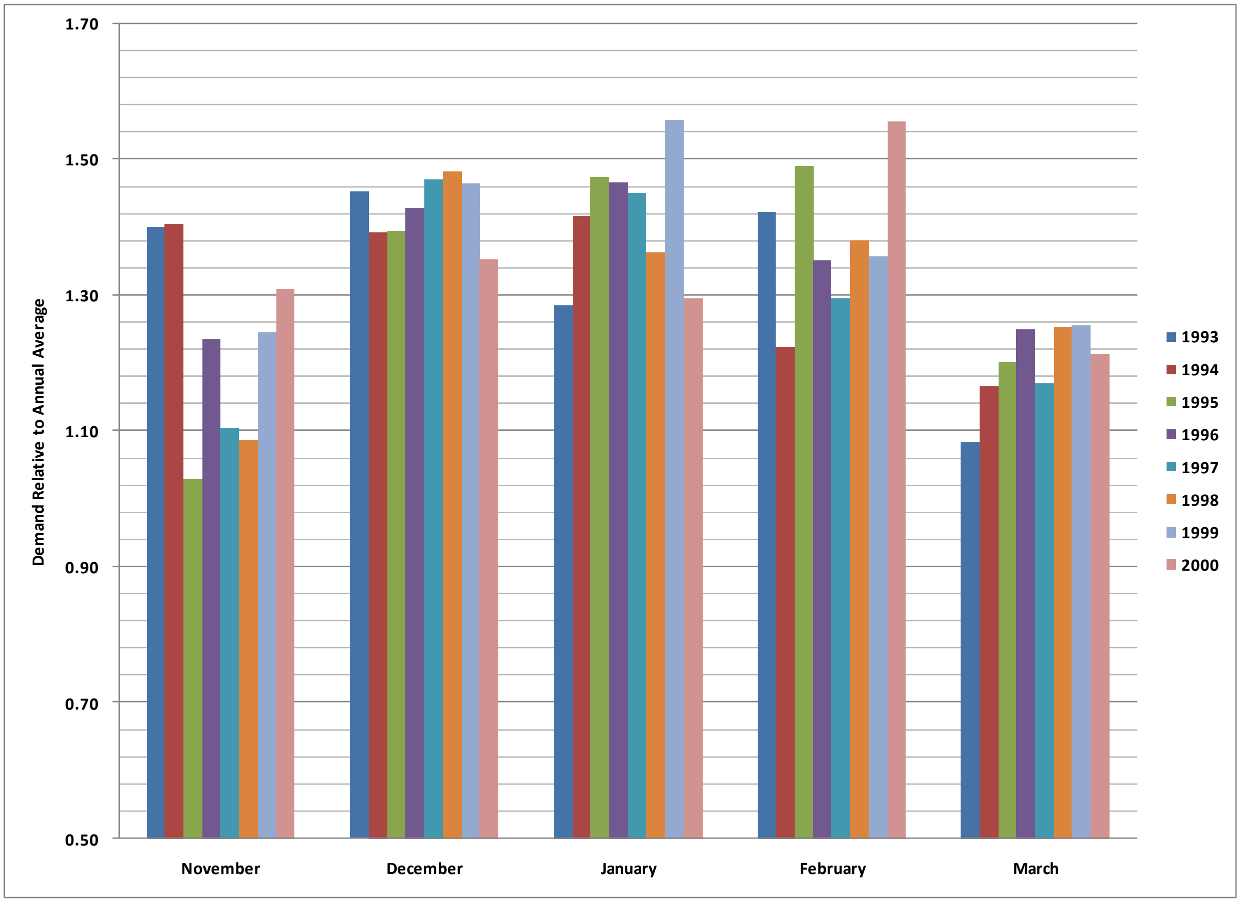
What is more interesting is the probability distribution for demand. Again we used the historical load distribution which we normalized to the annual average for each year so that we can apply it to the projected annual average so that we can account for both demand growth and uncertainty. The resulting probability distribution for 2004 and 2005 is shown in figure 16. Notice that the distribution is skewed left and has a long tail to the right. That means that demand during most of the year is fairly tightly clustered around the mean, but there is a small, but significant, probability of extremely high demand levels. Notice, however, the peak never approaches the design day capacity of 880,000 dekatherms.

Figure 16: Probability Distribution for Load



We performed analysis of storage dispatch given historical load distributions to determine whether the storage and supply portfolio could meet demand under a wide range of scenarios. The results indicate that the supply portfolio can adequately meet a wide range of possible load scenarios. In fact, during most years the combination of Mist and Jackson Prairie was adequate to meet peak load requirements. In none of the scenarios did NW Natural have to resort to exercising its high cost recallable supply deals. The most challenging load scenario was one in which the annual load distribution was based on the year 2000 load distribution. As figure 17 shows, the load in that year peaked in February when Mist inventory had been drawn down to meet demand during typically cold December and January months. This provides a warning against too aggressively dispatching storage during early winter months. NW Natural's practice of maintaining target storage inventory volumes is a prudent exercise in restraint.

Figure 17: Normalized Demand in Recent Years



7 EXAMINATION OF PHYSICAL SET-UP

7.1 NW Natural Pipeline System.

NW Natural's pipeline system capacity appears to be adequate to handle a wide range of demand scenarios. NW Natural's ability to accept deliveries at gates located at multiple sites and shift nominations to suit load requirements reduce NW Natural's pipeline infrastructure requirements. In fact, the sum of NW Natural's gate capacities far exceeds the contract demand volume on NPC which in effect affords NW Natural built in flexibility to shift deliveries as needed. The only gates that might have tight capacities on peak days are those directly feeding the western Portland market. However, NW Natural can meet peak demand in Portland through withdrawals from Mist transported through the Mist extension. Gas can also reach Portland through receipts at the Molalla Gate and transported through the Sherwood. Hence, the system capacity appears to be adequate to meet the current range of demand levels. However, after a significant amount of demand growth, system requirements should be re-analyzed.

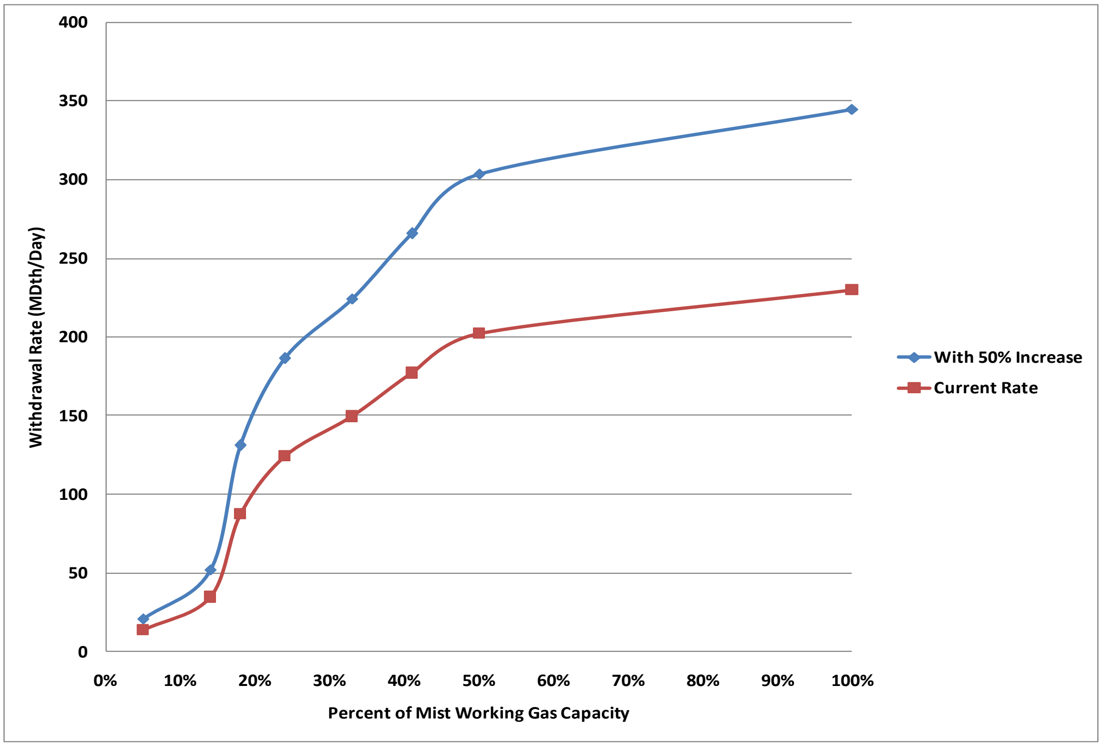
7.2 Mist Storage Facility.

Since storage fulfills a dual role as load leveler and price arbitrager, the value of system expansion is not simply from being able to meet load requirements, but also from enabling the most economical choice of supply for each time period. For example, if gas from Mist must be withdrawn to meet load requirements in a given day, that gas will not be available, unless it is restored by injection, when arbitrage opportunities arise on future days. Hence, Mist should not be sized just to meet load requirements, but also to provide price stability.

The takeaway capacity out of Mist storage and the total working gas capacity limit the extent to which Mist can arbitrage prices. During days with extremely high prices but low or moderate demand, Mist can only withdraw up to the level of demand, not necessarily up to the limit of its withdrawal rate. Given that Portland represents the bulk of NW Natural's load, this limitation will only probably apply on only a few days a year when prices are high and accessible demand is below Mist's withdrawal capacity.

For non-traditional storage operators trying to arbitrage prices rather than smooth seasonal loads, rapid injection and withdrawal rates are often the key storage constraint and therefore they are more valuable to expand than cavern capacity. Storage ratchets, which represent the physical impact of inventory levels on injection and withdrawal rates, are typically blamed for limiting storage value since they often reduce deliverability during crucial times. Figure 18 shows the Mist withdrawal ratchets as a function of storage inventory in the base and with 50% increase in withdrawal capacity. As inventory levels decline, there is less pressure in storage caverns and therefore withdrawal rates decline. For example, when the storage inventory falls to 20% of capacity, the maximum withdrawal rate falls to 54% of the maximum rate. We analyzed cases with alternative storage performance parameters to shed light on the type of system enhancements (e.g., add injection wells or increase pressure) that would be most valuable.

Figure 18: Mist Withdrawal Ratchets



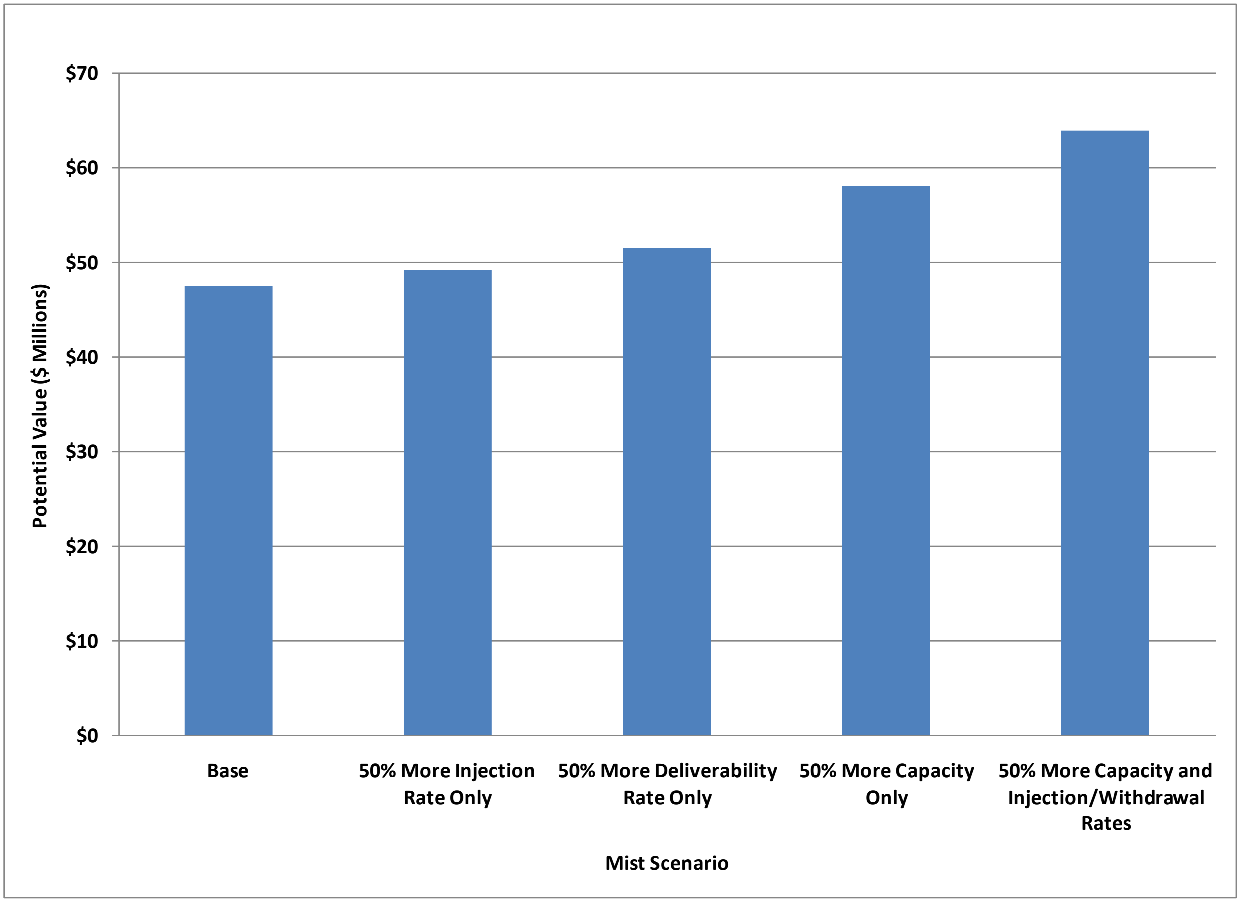
We conducted sensitivity analyses on Mist working gas capacity and rates to see how expansions would change value and understand which characteristic of storage is most crucial to Mist. We simulated four cases with alternative Mist configurations in addition to the base case, as shown below. Each case analyzed the potential price arbitrage value of Mist dispatch during 2005-6.

1. Base case with current facility;
2. 50% increase in injection rate only;
3. 50% increase in injection and withdrawal rates but no change in capacity;
4. 50% increase in working gas capacity but no change in rates;
5. 50% increase in working gas capacity alone and a 50% increases in injection and withdrawal rates.

The maximum deliverability rates were of particular interest to us because we had found that increasing deliverability was often the most valuable for storage operators trying to capture arbitrage value.

We found that any expansion of Mist capacity or increase in rates is valuable, as shown in figure 19. However, the most valuable enhancement is an expansion of storage capacity. Expanding Mist capacity enables price arbitrage to be performed over a longer duration. Also, added capacity eases the effects of storage ratchets which diminish deliverability as storage inventories decline, as shown in figure 18. Hence, even though the rates were not changed in the 50% higher Mist capacity case, the peak withdrawal rates are in effect for a greater duration with a capacity increase.

Figure 19: Mist Sensitivity Results



Adding Mist storage capacity also makes sense since NW Natural already has LNG storage facilities and recallable supply to meet requirements on extreme peak load days. Having greater Mist storage capacity will help NW Natural better cope with prolonged periods when firm load exceeds contract demand volumes. However, this analysis only examined the benefits of storage enhancements. The costs also need to be considered before a decision is made.

8 KEY FINDINGS AND RECOMMENDATIONS

Our analysis showed that NW Natural's supply and storage portfolio was fully adequate to meet actual firm load during the past several years and would have been adequate to handle any load pattern that could reasonably be expected. Indeed, when we simulated load distributions based on actual sales over the past decade, the portfolio proved to be completely adequate. Firm load could be met without having to exercise high cost recallable supply, a last resort for NW Natural. Given the range of load distributions seen in the past decade and the current average load level, the existing portfolio is completely adequate. Only after significant demand growth would the supply portfolio really get stretched.

The existing physical setup appears adequate to serve firm load requirements. NW Natural's ability to accept deliveries at gates located at multiple sites and adjust nominations to suit load requirements reduces NW Natural's pipeline infrastructure requirements. The only potential shortcoming is takeaway capacity out of Mist storage because it limits the extent to which Mist can arbitrage prices. During days with high prices, but low or moderate demand, Mist can only withdraw to the level of demand in the Portland area. Remember, price is set at a continent-wide basis, not just on a regional basis. Therefore, a price spike could occur during times of relatively moderate demand in the Pacific Northwest.

In order to better capitalize on price arbitrage opportunities and better meet durational issues, an expansion of Mist storage capacity would be desirable. It will also mitigate the impact of storage withdrawal ratchets by prolonging the duration of maximum or near maximum withdrawal rates. Given the large peak volumes of high deliverability but low capacity LNG storage facilities, expansion of Mist capacity is far more valuable than just increasing the injection or withdrawal rates. However, this analysis did not take into account the cost of storage expansion and therefore a cost-benefit analysis needs to be conducted before a decision is made.

Finally, storage was efficiently dispatched to capitalize on price arbitrage opportunities. The winter of 2005-6, which featured soaring winter prices in the region, presented a prime opportunity and NW Natural was able to capture an impressive fraction of the total potential gains. NW Natural's strategy to capitalize on arbitrage opportunities, provided that there are adequate storage inventories, has paid off for its ratepayers. Given adequacy of storage to meet a wide range of load scenarios, NW Natural can and should take opportunities without risking its ability to meet firm load. Of course, past performance is no guarantee of future performance and how much arbitrage value that will actually be captured is strongly a function of commodity prices that NW Natural cannot control. However, the past is a strong validation of NW Natural's storage operations strategy.

Exhibit 2702

CONFIDENTIAL
SUBJECT TO MODIFIED PROTECTIVE ORDER

Exhibit 2703

CONFIDENTIAL
SUBJECT TO MODIFIED PROTECTIVE ORDER

BEFORE THE

PUBLIC UTILITY COMMISSION OF OREGON

UG 221

NW Natural

Reply Testimony of Onita R. King

CUSTOMER SERVICE and TARIFFS
EXHIBIT 2800

June 15, 2012

EXHIBIT 2800 – REPLY TESTIMONY – CUSTOMER SERVICE and TARIFFS

Table of Contents

Rates & Regulatory Affairs
NW NATURAL
220 N.W. Second Avenue
Portland, Oregon 97209-3991
1-503-226-4211

I. INTRODUCTION AND SUMMARY

Q. Are you the same Onita R. King who filed direct testimony in this case on behalf of Northwest Natural Gas Company ("NW Natural" or "the Company").

A. Yes. My Exhibits NWN/1700–1701 supported the Company's requested tariff revisions.

Q. What is the purpose of your reply testimony?

A. I present testimony in response to Commission Staff ("Staff")'s, the Citizens' Utility Board of Oregon's (CUB), and the Northwest Industrial Gas Users' (NWIGU) opening testimony related to the Company's four-hour service window appointment proposal (SWA) and these parties' opening testimony on changes to various tariff schedules.

Q. Please summarize your reply testimony.

A. In my testimony, I:

- Explain why Staff's proposed service window appointment guarantee is unreasonable;
- Show that Staff's proposed changes to the Company's revisions to Schedule C reconnection charges are not based on actual costs of providing the reconnection services and are inconsistent with OAR 860-021-0328(7)(b);
- Explain the Company's revised position on Rate Schedule 31 and Rate Schedule 32 interruptible service based on NWIGU's proposals;
- Explain why Staff's proposal to make the Industrial DSM tariff permanent should not be adopted in this case; and
- Respond to Staff's recommendation that the Company investigate existing customer demographics as it pertains to customer connection charges under Schedule X.

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II. SERVICE WINDOW APPOINTMENTS

Q. What did the Company propose with regard to service window appointments in the initial filing?

A. The Company presented a proposal to make four-hour service window appointments available to residential and small commercial customers, contingent upon the Commission allowing recovery of the additional cost of providing the service. The direct testimony of NW Natural witness David Williams[1] discussed the purpose for the Company's proposal, the proposed program cost, and the implementation details associated with the Company's proposal to offer service window appointments to customers.

Q. Have any other parties submitted testimony with regard to the SWA proposal?

A. Yes. Staff and NWIGU-CUB submitted opening testimony on the number of Test Year full-time employees and agreed that 13 service technician FTEs should be added to account for the SWA program. Staff also expressed support for the Company's SWA proposal, but conditions their support on the Company's agreement to instigate a $100 service guarantee for each service appointment window it fails to meet, with $25 to be provided directly to the affected customer and $75 to be paid to customers as a group (Staff/700 Gorsuch/3-4).

Q. Does the Company agree with the Staff and NWIGU-CUB's position on the number of FTEs necessary to implement the SWA?

A. The Company agrees that the Test Year revenue requirement should reflect the necessary service technician FTEs to implement the program, but the correct number of

1 Exhibit NWN/900, Williams.

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FTEs is 14. Staff and NWIGU-CUB did not include the one additional supervisor FTE that would be necessary to coordinate the work of the employees that will be necessary to implement the SWA proposal. The supervisor FTE was one of the 58 FTEs identified in the direct testimony of NW Natural witness John Sohl.[2]

Q. Does the Company agree to the Staff's condition regarding the $100 service guarantee?

A. No. Staff's proposed service guarantee is problematic for a number of reasons.

First, it appears that Staff assumes that 100% of all appointments must be met. This is an unrealistic assumption and does not consider the many variables faced by field personnel that could cause an appointment to be missed. Variables include things such as the Company's need to redirect resources for emergency response, traffic accidents, inclement weather conditions, or even the situation where a customer is not home when the technician arrives. Especially given the Company's commitment to safety, it is not reasonable to assume that the Company could, or should meet 100% of its SWAs, given that it would dispatch employees to handle a safety situation (such as an odor call) rather than try to meet a SWA, which would not represent a safety hazard.

Second, Staff does not identify when the service guarantee would be effective. As stated in the direct testimony of David Williams (NWN/900, Williams/9), there will be a minimum ten-month period following the date that rates go into effect in this proceeding before the Company can begin to implement the SWA program. The Company actually expects that the full implementation period could be as long as 18 months due to the time needed to hire and train new service technicians simply due to the fact that many

2 NWN/700, Sohl/4.

new hires do not complete training, causing the hiring and training period to extend even further. In addition, it may take as long as six months to receive the new vehicles needed to support the new service technicians. If an appropriate implementation period is not considered, any service guarantee would be inappropriate, since it would penalize the Company for expectations that are beyond its ability to fulfill.

Third, Staff does not identify how long the proposed service guarantee would be in effect. Staff states that a service guarantee is necessary because there should be some accountability metric to make sure ratepayers get delivery of what they have paid for in their rates (Staff/700 Gorsuch/3). Clearly customers pay for many things in their rates without service guarantees attributable to each service. This is because over time, services such as those that are to be offered through the SWA ultimately become an embedded component of the Company's standard customer service platform. For this reason, any service guarantee that is specific to the implementation of the SWA program should only carry a term that is representative of the time period required to fully integrate the SWA program into the Company's standard customer service platform.

Finally, the method used by Staff to derive the $100 service guarantee is arbitrary and has no basis of support, and is unreasonably large. In addition, a guarantee that includes a participant paid guarantee component does not work because, as discussed earlier in my testimony, it is unreasonable to assume that 100% of its SWAs can be met due to the Company's commitment to safety. The administrative challenges of establishing an appropriate customer guarantee payment in an environment that inherently has a less than 100% threshold would be challenging and likely not worth the time and cost to develop.

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Q. Does the Company object to a service guarantee associated with its SWA proposal?

A. No. The Company could support a service guarantee, provided that it was structured to address the Company's concerns stated above. Specifically, a service guarantee must (1) allow for an appropriate implementation period – ideally 18-months, but not less than ten-months, from the date that rates are effective; (2) recognize a realistic service level for met appointments; (3) have a defined term; (4) be simple and easy to administer; and (5) be based on a reasonable guarantee amount. The Company would agree to work with the parties to establish a service guarantee that adequately meets all of these conditions.

III. SCHEDULE C RECONNECT CHARGES

Q. What did the Company propose with regard to the reconnect charges proposed under Schedule C?

A. The Company proposed two things. First, it proposed to change the charge structure from a two-tier to a three-tier structure. Second, the Company proposed to increase the customer reconnection charges for the two existing tiers and to add a new charge for the new third tier. See NWN/1700 King.

Q. Why did the Company propose changes to its Schedule C reconnection charges?

A. The Company proposed changes to update the charges to more closely reflect the cost of performing reconnection services. The Schedule C reconnection charges have not been updated since May 1995 and the cost of performing reconnections has since increased. In addition, the Company's proposed changes better reflect OAR 860-021-0328(7)(b), which states "[f]or an After Hours Reconnect that is completed the same day

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as the request, the reconnection fee may be higher than for an After Hours Reconnect scheduled for a subsequent day." The Company's current reconnection charges do not differentiate between same-day after-hours reconnections and after-hours reconnections on subsequent days, while the proposed changes to the reconnection charges do make this differentiation.

Q. What are the charges for each tier the Company is proposing?

A. The first tier is for reconnections scheduled during business hours and the charge is $40. The second tier is for after-hours reconnections scheduled for the next business day, Monday through Friday, and the charge is $80. The third tier is for any same-day reconnection and for reconnections on Saturdays, Sundays, or holidays.[3] Typically, same day requests for reconnection will occur after normal business hours because the prior days' calls will have filled the regular business hours schedule.

Q. Have any parties submitted testimony with regard to NW Natural's proposed Schedule C Reconnect Charges?

A. Yes. CUB and Staff both addressed the proposed Schedule C reconnection charges. In its opening testimony, CUB (See Jenks-Feighner/2) requested that the Commission deny NW Natural's request to raise the reconnect charges. CUB provides no explanation for their request, but presumably believes the change is connected with the Company's rate design proposal, which it opposes. Because I believe CUB's concern is related primarily to rate design, I do not address it in my testimony.

Q. What is Staff's proposal with respect to reconnection charges?

3 The Company notes that in its initial filed Tariff at Sheet C-1 (See NWN/1701 King), the description for this charge was incorrect, and should read "Same Day after 5:00 p.m. Mon-Fri or on Saturday, Sunday, or Holidays".

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A. Staff (Staff/700 Gorsuch/5) agrees that the Company should increase its service reconnection charges, but Staff proposes different charges than proposed by the Company. In addition, Staff changed the applicability of each charge tier from what the Company proposed.

Q. Does the Company agree with the Staff proposal?

A. No. The Company does not agree with Staff's proposed changes.

Q. Please explain Staff's proposed changes to Tier 1 reconnection and why Staff's proposal is inappropriate.

A. Tier 1 applies to service reconnections performed during regular business hours. The charge proposed by the Company is based on the Company's actual cost of residential reconnections as of June 2011. The actual cost for a residential reconnection is calculated as $55.25. See NWN/2801, King/1. The Company's proposed charge is $40.00, which is $15.25 less than the Company's actual costs. This is comparable to the cost differential of $15.51 that existed when the Company last adjusted these charges in May 1995. The 1995 filing showed an actual cost of $40.51 and a resulting charge of $25.00. See NWN/2802, King/2. The Company applies the same charge to both residential and commercial customers. Staff's proposal makes the differential more than $25.00—the difference between the cost of $55.25 and the $30 Staff proposes—without providing any reason for this change. The Company's proposal more closely aligns with the actual cost of providing the service and is not so high as to be an undue burden on customers. Staff's proposal should therefore be rejected.

Q. Please explain Staff's proposed changes to Tier 2 reconnection.

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A. The Company's proposed Tier 2 applies to service reconnections that are scheduled for completion the next day after normal business hours at a customer's request. Staff does not propose any changes to the charge amount for Tier 2, but proposes to change the applicability of the charge to "same day or after 5:00 p.m. Mon-Fri or on a Holiday."[4]

Q. Why is Staff's proposed formulation of Tier 2 inappropriate?

A. As I discussed above, OAR 860-021-0328(7)(b), provides that reconnect fees may differentiate between after-hours, same-day reconnections and after-hours connections on a subsequent day. The Company believes that making such a differentiation is appropriate because there is a differentiation in the costs to provide such services. Staff's proposal does not make this differentiation, and Staff's opening testimony provides no explanation as to why it does not. As shown in my Exhibit NWN/2801, the cost of reconnecting service on the same day is significantly higher than after-hours connections on a subsequent day. Staff has provided no reason why this difference should not be reflected in rates.

Q. Please explain Staff's proposed changes to Tier 3 reconnection and why Staff's proposal is inappropriate.

A. Staff proposes to change the applicability of Tier 3 to reconnection on a Saturday, Sunday, or holiday, and does not include after-hours, same-day requests. As I mention above, Staff's proposal should be rejected because it does not align with OAR 860-021-0328(7)(b), which provides for a price differentiation that the Company believes is important to reflect.

4 Staff/704, Gorsuch/1.

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Staff also proposes to reduce the Tier 3 charge to $175.00, down from the Company's proposed $185.00. The Company's proposed $185.00 is based upon a combination of (a) actual costs for this type of unscheduled work; (b) the assumption that this work will always be incremental to the Company's costs of performing the daily scheduled work both during and after business hours; and (c) a need to fairly and effectively manage the volume of requests for this type of reconnection. The proposed $185.00 falls between the cost of a residential reconnection of $179.71 and the cost of a commercial reconnection of $186.89 for call-out work. See NWN/2801. Because the work performed under this charge is the highest cost work, if the cost is reduced below the Company's actual cost then there is risk that the Company will not be able to meet the volume of requests for this type of reconnect charge. For these reasons, Staff's proposed change to $175.00 should be rejected.

Q. Are there any other concerns with Staff's proposed changes?

A. Yes. Staff's proposed changes to Sheet C-2 (See Staff/704, Gorsuch/3) should not be adopted for the same reasons described above.

IV. SCHEDULE 31/32 INTERRUPTIBLE SERVICE

Q. What did the Company propose with regard to Schedule 31 and Schedule 32 interruptible service?

A. The Company proposed to eliminate the interruptible service option from Rate Schedule 31 and proposed to make changes to Rate Schedule 32 that enable the Company to consider system parameters in the consideration of a customer's request for interruptible service, and to invoke a periodic five-year review of the continued need for interruptible

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service on the Company's system. These changes are discussed in more detail in my direct testimony, NWN/1700, King/10-12.

Q. Have any other parties submitted testimony with regard to NW Natural's proposed changes to Schedule 31 and Schedule 32?

A. Yes. Mr. Schoenbeck for NWIGU submitted opening testimony opposing the Company's proposed tariff changes.[5] NWIGU recommends that the Commission reject the Company's proposal to eliminate a customer's ability to elect interruptible service under Schedule 32, leaving the existing service selections process and procedures in place. NWIGU further states that if the Commission accepts this recommendation, NWIGU would support the Company's request to discontinue the offering of interruptible sales service under Schedule 31 provided these customers may elect Schedule 32 interruptible service.[6]

Q. What is the Company's position with regard to the recommendations made by NWIGU?

A. The Company appreciates the position of NWIGU with regard to the proposed changes to Rate Schedule 32, and can agree to some extent with the proposed recommendations. The Company continues to believe that the ability to evaluate system requirements in reviewing requests from customers for service is important. In an effort to address NWIGU's concerns, the Company submits with this testimony proposed revisions to Schedule 32. See NWN/2803 King/1-4.

Q. Please summarize the Company's proposed revisions.

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5 See NWIGU/100, Schoenbeck/16-21.
6 See NWIGU/100, Schoenbeck/21.

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A. The Company has revised the Service Availability section to refer to the provision titled "SERVICE TYPE SELECTION – PROCESS AND PROCEDURE". In that provision, the Company has included new language to represent the guidelines that will be used to determine the availability of firm and interruptible service under Schedule 32. See NWN/2803, King/1. In addition, the Company has removed in its entirety the section titled "SPECIAL CONDITIONS FOR INTERRUPTIBLE SERVICE", and has removed references related to the five-year review of interruptible service qualification at Sheets 32-3 and 32-4. See NWN/2803 King/2-3.

Q. Please describe the guidelines proposed to be used to determine the availability of firm and interruptible service under Rate Schedule 32.

A. The guidelines are based on the Company's determination as to the ability of its distribution system to meet a Customer's hourly load requirements. New requests for interruptible service are considered based on the Company's determination that there is a system benefit associated with the interruptible load. This determination will consider load size, location, existing system demand, and other system operating parameters.

Q. Will the addition of these guidelines affect existing Rate Schedule 31 customers that decide to transfer to Rate Schedule 32 as part of the elimination of interruptible service on Rate Schedule 31?

A. No. As part of the transition process, any existing Rate Schedule 31 interruptible customer will be allowed to transfer to Rate Schedule 32 interruptible service provided the transfer is made within 60 days of the effective date of the tariff change. Once they transfer, they will be subject to these guidelines if they subsequently request to change to firm service.

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Q. How will the addition of these guidelines affect existing Schedule 32 Customers?

A. Existing Schedule 32 customers will not be affected provided they do not submit a request to transfer to a different service type at a later date. The Company proposes to apply these guidelines to any Schedule 32 customer that subsequently requests to transfer to a different service type. However, the Company will not require any customer to transfer to a different service type, which alleviates the concerns expressed by NWIGU in opening testimony.

Q. What does the Company propose with regard to this issue?

A. The Company proposes that the Commission adopt the tariff revisions included with this testimony in resolution of the concerns expressed by NWIGU with regard to Schedule 32, and adopt the Company's original changes to Schedule 31 to eliminate the interruptible service option on that rate schedule.

V. INDUSTRIAL DSM PROGRAM

Q. What did the Company propose with regard to the industrial DSM program?

A. The Company did not address the industrial DSM program in its initial filing.

Q. Please explain the issues with the industrial DSM program.

A. In its opening testimony, Staff [7] states that a permanent tariff rate should be implemented for this program, instead of the current deferral mechanism, because the industrial DSM program transitioned from a pilot program to a permanent program effective in March 2011. Staff also proposes that the revised program be subject to a balancing account. In support of this proposal, Staff states that customers will see cost savings because of the different interest rate impacts between the two types of mechanisms. Staff's

7 Staff/1100, Sobhy/22.

proposal would continue to assume that the program funding would be consistent with the budget requirements of the program administrator, currently the Energy Trust of Oregon (ETO).

Q. Does the Company agree with the Staff proposal?

A. It is not entirely clear how Staff's proposed balancing account approach would work, but the Company is not opposed to examining alternatives to the current tariff structure. However, because any changes to this program would have an impact on the Company's industrial customers, NW Natural would hope that any changes that are made to this industrial DSM program (Schedule 360) are supported by NWIGU. In addition, there are likely process and other logistical issues that will require additional review by the Company, NWIGU, and ETO.

Q. Are changes to the industrial DSM program contingent upon the outcome of this proceeding?

A. No. The Company is prepared to work with the parties to revise this program outside of this proceeding.

VI. SCHEDULE X

Q. What did the Company propose with regard to Schedule X, which governs distribution facilities extensions and main extensions?

A. The Company made a number of editorial changes to Schedule X, none of which result in any material change in purpose or intent. In addition, the Company proposed changes to the Construction Allowance provisions that pertain to residential applicants.

Q. Have any parties submitted testimony with regard to Schedule X?

A. Yes. Staff addresses Schedule X in opening testimony.

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Q. What does Staff recommend with respect to Schedule X?

A. Staff recommends that the Commission address two items as part of the final order in this docket which I summarize here as follows: (1) instruct the Company to examine its existing customer demographics as it pertains to differences among customers classes or schedules and length of main, and examine the relationship within customer schedules between costs of main and customer usage levels; and (2) instruct the Company to coordinate with Staff and other interested parties in its efforts to refine Schedule X to account for the resulting outcome on residential rate design and decoupling.[8]

Q. Does the Company agree with Staff's recommendation?

A. No. With regard to item (1), the Company does not agree that there is cause for the final order in this proceeding to direct the Company to perform additional examination of differences between customer classes, cost to serve, and usage levels. With regard to item (2), it is not clear if Staff is recommending a separate proceeding or if Staff's recommendation is to request that the Commission require that the Company make any revisions to Schedule X as a result of the final rate design and decoupling structures adopted in this proceeding as part of the Company's compliance filing.

Q. What does the Company propose with regard to Staff's recommendations?

A. The Company requests that the Commission reject Staff's recommendation to direct the Company to perform additional examination of differences between customer classes, cost to serve, and usage levels address in its final order. To the extent that revisions to Schedule X are required as a result of the final rate design and decoupling structures

8 Staff/1500, Compton/31.

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adopted in this proceeding, the Company requests that the Commission direct that such revisions be addressed as part of the Company's compliance filing in this proceeding and not as part of a separate subsequent proceeding.

Q. Does this conclude your testimony?

A. Yes, it does.

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BEFORE THE

PUBLIC UTILITY COMMISSION OF OREGON

UG 221

NW Natural

Exhibits of Onita R. King

CUSTOMER SERVICE and TARIFFS
EXHIBITS 2801 - 2803

June 15, 2012

EXHIBITS 2801-2803 – CUSTOMER SERVICE and TARIFFS

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RECONNECTION CHARGES - 2011

#	Item	Option	Value	Total
	Hourly Rates			
1	Field Grade C - Experienced June 2011		28.44	
2	Benefits Loading @ 80%	☐ Add OverHead	-	
3	Unloaded Field Hourly Rate (1 + 2)			28.44
4	Vehicle per Hour	2010 Actuals		5.04
5	Super-Dispatch-Admins			10.53
	Non-Payroll CFS Costs			2.07
	Other Charges			
	CUSTOMER CONTACT CENTER		18.83	
6	ACCOUNT SERVICES		0.32	
7	Call Center Labor Only >>>>>			18.41
8	Acct Services Labor Only >>>>>			0.30
9	**total other charges**		**19.15**	
A	**Daytime Reconnect**		Com +:	17%
10	travel to & on-site: minutes (Using 2010 Actuals)		32.00	
11	travel back: minutes		-	
12	total time: minutes (10 + 11)		32.00	
13	total time: hours (12 / 60min)		0.53	
14	unloaded field hourly rate (3)		28.44	
15	multiplier (day=1, OT=1.5, CO=2)		1.00	
16	subtotal - field labor (13 * 14 * 15)			15.17
17	vehicle (4 * 13)			2.69
18	Super-Dispatch-Admin nonlabor (5+6 * 13)	☑ Include Charges		6.72
19	**total daytime reconnect** (16 + 17 + 18)			**24.58**
B	**Overtime Reconnect**			
20	travel to & on-site: minutes		32.00	
21	travel back: minutes		10.00	
22	total time: minutes (20 + 21)		42.00	
23	total time: hours (22 / 60min)		0.70	
24	unloaded field hourly rate (3)		28.44	
25	multiplier (day=1, OT=1.5, CO=2)		1.50	
26	subtotal - field labor (23 * 24 * 25)			29.86
27	vehicle (4 * 23)			3.53
28	Super-Dispatch-Admin nonlabor (5+6 * 13)	☑ Include Charges		8.82
29	**total overtime reconnect** (26 + 27 + 28)			**42.21**
C	**Call Out Reconnect**			
30	2 hour call-out: hours		2.00	
31	unloaded field hourly rate (3)		28.44	
32	multiplier (day=1, OT=1.5, CO=2)		2.00	
33	subtotal - field labor (30 * 31 * 32)			113.76
34	vehicle (4 * 30)			10.08
35	Super-Dispatch-Admin nonlabor (5+6 * 13)	☑ Include Charges		25.20
36	**total call out reconnect** (33 + 34 + 35)			**149.04**
D	**Daytime Shut-Off**			
37	travel to & on-site: minutes		15.00	
38	travel back: minutes		-	
39	total time: minutes (37 + 38)		15.00	
40	total time: hours (39 / 60min)		0.25	
41	unloaded field hourly rate (3)		28.44	
42	multiplier (day=1, OT=1.5, CO=2)		1.00	
43	subtotal - field labor (40 * 41 * 42)			7.11
44	vehicle (4 * 40)			1.26
45	Super-Dispatch-Admin nonlabor (5+6 * 13)	☑ Include Charges		3.15
46	**total daytime shut-off** (43 + 44 + 45)			**11.52**
E	**After Hours Regular Time Reconnect**			
47	travel to & on-site: minutes		32.00	
48	travel back: minutes			
49	total time: minutes (47 + 48)		32.00	
50	total time: hours (49 / 60min)		0.53	
51	unloaded field hourly rate using actual Cnts x OT		36.20	
52	multiplier (day=1, OT=1.5, CO=2)		1.00	
53	subtotal - field labor (50 * 51 * 52)			19.31
54	vehicle (4 * 50)			2.69
55	Super-Dispatch-Admin nonlabor (5+6 * 13)	☑ Include Charges		6.72
56	**total regular time after hours reconnect** (53 + 54 + 55)			**28.71**

Calculation	Daytime	After Hours Today	After Hours Tomorrow
Reconnect	24.58	28.71	28.71
Shut-Off (46)	11.52	11.52	11.52
Other (9)	19.15	19.15	19.15
Total RES	**55.25**	**59.38**	**59.38**
Total COM	**59.42**	**66.56**	**66.56**
Current	25.00	75.00	75.00

Commercial Calculation	REG TIME (9 + 19 + 46)	OT (29 + 36 + 56)	Call Out (29 + 36 + 56)
Reconnect	24.58	42.21	149.04
Shut-Off (46)	11.52	11.52	11.52
Comm +	4.18	7.18	7.18
Other (9)	19.15	19.15	19.15
Total	**59.42**	**80.06**	**186.89**

Residential Calculation	REG TIME (9 + 19 + 46)	OT (29 + 36 + 56)	Call Out (29 + 36 + 56)
Reconnect	24.58	42.21	149.04
Shut-Off (46)	11.52	11.52	11.52
Other (9)	19.15	19.15	19.15
Total	**55.25**	**72.88**	**179.71**

NWN/2802
King/1

COST OF DELINQUENT TURN-ON

Jobs	Number of Units	Actual Time (Minutes)	Adjust Factor	Time Per Unit(Minutes)	Cost Per Unit
Senior Reps ($15.99/hr. = $.27/min.)					
Phone/Processing time to issue order.	1	10		10	
Order issued to close account after disconnect.	1	4	0.30	1.2	
		SubTOTAL	**0.30**	**11.2**	**$2.98**
Billers (approximate $)					
Process payment collected (to deposit or arrears)	1	3		3	
Enter billing charge for DTO fee	1	5		5	
Keypunch Order	1	2		2	
		SubTOTAL		**13**	**$3.17**
Supervisory ($20/hr – 19 people)					
($20 divided by 60 min = .33) dividied by 19 = $0.02					$1.26
Approximate overhead					$2.35
		SubTOTAL			**$3.61**
		OFFICETOTAL			**$9.76**
Dispatcher/Field ($17.91/hr. = $.30/min.)					
Burst order from printer	177	30		0.17	
Route order	177	120		0.68	
Review order for completion (money pickup)	177	30		0.17	
				1.02	
		SubTOTAL			**$0.31**
Clerk ($14.27/hr. = $.24/min.)					
Update completed order		45			$0.18
Return incomplete orders to Dispatcher for re-routing		20			$0.08
Cancel date expired orders and return to CAS		10			$0.04
		SubTOTAL			**$0.30**
Field ($16.75/hr. = $.28/min.)					
Labor (Job standard time 22 minutes) Source: Prod Report		22			$6.16
Payroll Overhead Rates (15% Company-wide overhead)					
Vacation (9.1%), Sick (2.1%) & Holiday (3.8%)					
determined by Accounting Dept					
($2.88 (labor) x .15% (OH) = $.92)					$0.92
Company Wide Overhead Rates (28% determined by Acctg)					
Health and Life Ins. (12.6%), Pensions (2.8%)					
Payroll Taxes (9.6%) and Workman's Comp (3.0%)					
($2.88 (labor) x .28% (OH) = $.81)					$1.72
Travel Time Source: Fld Op Manday Recap		12			$3.36

COST OF DELINQUENT TURN-ON

Jobs	Number of Units	Actual Time (Minutes)	Adjust FActor	Time Per Unit(minutes)	Total Cost Per Unit
Field (continued)					
Travel Time Payroll Overhead (see OH explanation above)					$0.50
Travel Time Company Overhead (see OH explanation above)					$0.94
Truck Expense ($3.75 provided by Acctg Dept)					
Depreciation, Fuel taxes (50% of the cost of gas), gasoline,					
and maintenance costs.					$1.38
		SubTOTAL			**$14.99**
	FIELD TOTAL				**$15.60**
Cost of Disconnect Visit					**$15.15**
	GRAND TOTAL				**$40.51**

NOTE: All salary figures used are contractual for April 1994 thru April 1995

NORTHWEST NATURAL GAS COMPANY

P.U.C. Or. 25 Original Sheet 32-1

RATE SCHEDULE 32
LARGE VOLUME NON-RESIDENTIAL SALES AND TRANSPORTATION SERVICE

SERVICE AVAILABILITY:
Service under this Rate Schedule is available on the Company's Distribution System to Non-Residential Customers in all territory served by the Company under the Tariff of which this Rate Schedule is a part provided that adequate supply and capacity exists to accommodate a Customer's service requirements. The Company will determine the availability of Firm and Interruptible Service under this Rate Schedule as set forth in the 'SERVICE TYPE SELECTION – PROCESS AND PROCEDURE" provision of this Rate Schedule.

~~Firm Service under this Rate Schedule is available provided that the Company determines, in its sole judgment, that adequate supply and capacity exists to accommodate a Customer's service requirements. The Company, in its sole discretion, will determine the availability of Interruptible Service under this Rate Schedule in cases where supply and capacity are adequate to provide Firm Service. A Customer request for an Interruptible Service Type will be considered on a case-by-case basis.~~ Service under this Rate Schedule cannot be combined with service under any other Rate Schedule.

~~**SPECIAL CONDITIONS FOR INTERRUPTIBLE SERVICE:**~~
~~Any Customer served under an Interruptible Service Type as of November 1, 2012 will be allowed to continue service on such Interruptible Service Type after November 1, 2012 for a period of five (5) consecutive PGA Years. Thereafter, the eligibility for Interruptible Service shall be determined in accordance with the "SERVICE AVAILABILITY" and "DESCRIPTION OF SERVICE TYPES AND REQUIREMENTS FOR SERVICE" provisions of this Rate Schedule. If a Customer to which this special condition applies transfers to a Firm Service Type in accordance with the "OUT-OF-CYCLE TRANSFERS" or "ANNUAL SERVICE ELECTION DATE" provisions of this Rate Schedule before the end of five (5) PGA Years, then any subsequent request for Interruptible Service will be subject to the conditions for approval as set forth above under 'SERVICE AVAILABILITY". This special condition will carry to any subsequent Customer at the same service address following a change in business name or a change of ownership. In all other situations, a subsequent Customer must submit a Service Election Form to request Interruptible Service, subject to approval as set forth above under 'SERVICE AVAILABILITY".~~

APPLICATION FOR SERVICE AND SELECTION OF RATE SCHEDULE AND SERVICE TYPES:
An application for service must be made in accordance with the provisions of **Rule 2** of this Tariff, including the requirements to establish or re-establish credit.

It is the responsibility of the Customer to select the Rate Schedule and Service Type that best meets the Customer's individual service requirements. A Customer's requested Service Type must be stated on the Service Election Form, and is subject to the Company's approval as described in "SERVICE SELECTIONS – PROCESS AND PROCEDURE" of this Rate Schedule and in the Company's applicable policies and procedures.

PRE-REQUISITES TO SERVICE:

1. A Customer may be required to pay the Company, in advance, for costs related to the Company's installation of any new or additional Distribution Facilities necessary to provide service to Customer under this Rate Schedule. See **Schedule X**.
2. When the installation of new or additional Distribution Facilities is necessary to provide service to Customer, the Company may require Customer enter into a written service agreement.

(continue to Sheet 32-2)

NORTHWEST NATURAL GAS COMPANY

P.U.C. Or. 25 Original Sheet 32-3

RATE SCHEDULE 32
LARGE VOLUME NON-RESIDENTIAL SALES AND TRANSPORTATION SERVICE
(continued)

DESCRIPTION OF SERVICE TYPES AND REQUIREMENTS FOR SERVICE:

Service under this Rate Schedule requires one Service Type Selection per billing meter set assembly. All Service Types are subject to approval by the Company. The following Service Types are available under this Rate Schedule:

1. Firm Sales Service
2. Interruptible Sales Service
3. Firm Transportation Service
4. Interruptible Transportation Service
5. Combination Sales Service
6. Combination Transportation Service
7. Combination Sales and Transportation Service

The respective requirements of each Service Type are described below and elsewhere in this Rate Schedule, including, without limitation," PRE-REQUISITES TO SERVICE":

Sales Service Types:

Firm Sales Service. This is Firm Service on the Company's Distribution System. The availability of this service is dependent upon the Company's determination that adequate supply and capacity exists to provide Firm Service to the Customer. The Commodity Component applicable to gas usage is as set forth in the "ANNUAL SERVICE ELECTION DATE" provision of this Rate Schedule. Customer must select one of two Pipeline Capacity Charge options:

(a) **Volumetric**. For the volumetric choice, the rate stated for the Firm Pipeline Capacity Charge – Volumetric option in the Monthly Rates provision of this Rate Schedule is multiplied by all therms used by Customer each Billing Month.

(b) **Maximum Daily Delivery Volume (MDDV)**. For the MDDV choice, each therm of Customer's MDDV is multiplied by the Firm Pipeline Capacity Charge- Peak Demand option each Billing Month. The provisions for determination of a Customer's MDDV are described under "DETERMINATION OF MDDV" in this Rate Schedule.

Interruptible Sales Service. . The approval of a request for Interruptible Service is subject to the "SERVICE TYPE SELECTION – PROCESS AND PROCEDURE" provision of this Rate Schedule. This is Interruptible Service on the Company's Distribution System and is subject to Curtailment of Service, as set forth in **Rule 13** and **Rule 14** of this Tariff. The Commodity Component applicable to gas usage is as set forth in the "ANNUAL SERVICE ELECTION" provision of this Rate Schedule~~. The initial term for an Interruptible Sales Service option is five (5) consecutive PGA Years. Thereafter, Interruptible Sales Service may continue on a year-to-year basis, subject to approval by the Company under the "SERVICE AVAILABILITY" provisions of this Rate Schedule. The determination for continued service shall be made coincident with the "ANNUAL SERVICE ELECTION DATE" to be effective November 1. Should a Customer transfer to a Firm Service Type before the end of the initial term and subsequently request Interruptible Sales Service, then the request will be subject to approval by the Company and if approved, a new initial term will begin.~~

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Effective with service on
and after ~~February 1, 2012~~

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RATE SCHEDULE 32
LARGE VOLUME NON-RESIDENTIAL SALES AND TRANSPORTATION SERVICE
(continued)

DESCRIPTION OF SERVICE TYPES AND REQUIREMENTS FOR SERVICE (continued):

Transportation Service Types:

Firm Transportation Service. This is Firm Service on the Company's Distribution System. The availability of this service is dependent upon the Company's determination that adequate capacity exists to provide Firm Service to the Customer.

Interruptible Transportation Service. The approval of a request for Interruptible Service is subject to the 'SERVICE TYPE SELECTION – PROCESS AND PROCEDURE" provision of this Rate Schedule. This is Interruptible Service on the Company's Distribution System and is subject to Curtailment of Service, as set forth in **Rule 13** and **Rule 14** of this Tariff. ~~The initial term for an Interruptible Transportation Service option is five (5) PGA Years. Thereafter, Interruptible Transportation Service may continue on a year-to-year basis, subject to approval by the Company under the "SERVICE AVAILABILITY" provisions of this Rate Schedule. The determination for continued service shall be made coincident with the "ANNUAL SERVICE ELECTION DATE" to be effective November 1. Should a Customer transfer to a Firm Service Type before the end of the initial term and subsequently request Interruptible Sales Service, then the request will be subject to approval by the Company and if approved, a new initial term will begin.~~

Customer must secure the purchase and delivery of gas supplies to be transported on the Company's Distribution System from an Authorized Supplier/Agent of Customer's choosing. Customer must complete the Company's Transportation Service: Supplier/Agent Authorization Form and name such Authorized Supplier/Agent not less than five (5) Business Days prior to the effective date of service. The Transportation of Customer-owned gas supplies is governed by the Terms and Conditions set forth in **Schedule T** of this Tariff, and the Company's Gas Transportation Operating Policies and Procedures.

Combination Service Types:
The approval of a request for a Combination Service Type is subject to the 'SERVICE TYPE SELECTION – PROCESS AND PROCEDURE" provision of this Rate Schedule. For all Combination Service Types, Customer must specify the exact daily delivery volume to be billed for the Service Type that is billed first through the meter. Customer may choose to specify an hourly delivery volume on the Service Election Form. An hourly delivery volume that exceeds 1/24 of the MDDV does not supersede the specified MDDV.

~~The initial term for a Combination Service Type that included Interruptible Sales or Interruptible Transportation Service is five (5) PGA Years. Thereafter, the Interruptible Service portion of the Combination Service Type may continue on a year-to-year basis, subject to approval by the Company under the "SERVICE AVAILABILITY" provisions of this Rate Schedule. The determination for continued service shall be made coincident with the "ANNUAL SERVICE ELECTION DATE" to be effective November 1. Should a Customer transfer to a Firm Service Type before the end of the initial term and subsequently request Interruptible Sales Service, then the request will be subject to approval by the Company and if approved, a new initial term will begin.~~

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RATE SCHEDULE 32
LARGE VOLUME NON-RESIDENTIAL SALES AND TRANSPORTATION SERVICE
(continued)

SERVICE TYPE SELECTION – PROCESS AND PROCEDURE (continued):
When considering each Service Type request under this Rate Schedule, the following guidelines will be used by the Company: ~~approval will be based upon the~~

Requests for Firm Service will be approved when the Company determines that there is sufficient distribution system capacity to serve 100% of the requesting Customer's load during design peak conditions ("Peak Day"), as defined in the Company's most recently acknowledged Integrated Resource Plan (IRP). When a request for Firm Service is denied, Interruptible Service will be available.

Requests for Interruptible Service will be denied if Firm Service is available, as determined above. Requests for Interruptible Service will be approved when, in the Company's determination, the avoided cost benefit associated with not making additional distribution system improvements is beneficial to all customers.

In some cases, a combination of Firm and Interruptible Service may be allowed to better match a Customer's service request with available Company capacity.

~~Company's determination, in its sole judgment, that: (a) adequate supply and capacity is available to accommodate any request for Firm Service, (b) there is a system benefit or other reasonable basis upon which to approve a request for Interruptible Service, if applicable, and (c)~~

In all cases, the requesting Customer must ~~has~~ satisfactorily establish~~ed~~ or ~~has satisfactorily~~ re-establish~~ed~~ credit under the terms and conditions of **Rule 2** of this Tariff.

A Customer that is approved for an Interruptible Service Type **must** complete the Company's Customer Emergency Contact List Form stating the names and telephone numbers for all authorized emergency contacts. At least one authorized emergency contact must be accessible for notification 24-hours per day, 7-days per week. Following each Annual Service Election Date, the Company will provide the Customer Emergency Contact List Form to Customers that elected an Interruptible Service Type. It is the Customer's responsibility to notify the Company within five (5) Business Days of any change to Customer's authorized emergency contact information. The Company will provide the required Customer Emergency Contact List Form to Customer upon request.

ANNUAL SERVICE ELECTION DATE– July 31 Election for November 1 Service:
The Annual Service Election Date is the date by which a Customer may request to change all or a portion of their current Service Type to be effective the following November 1 through October 31 period (PGA Year). Except for a change in Rate Schedule, or an election of Winter Sales WACOG, any out-of-cycle transfer approved to be effective after the Annual Service Election Date but prior to the start of the new PGA Year will automatically terminate on October 31.

To request a change in Service Type under this provision, Customer must complete and submit the Service Election Form in accordance with the terms and conditions of the 'SERVICE TYPE SELECTION – PROCESS AND PROCEDURE" provision of this Rate Schedule. A Customer need not submit a Service Election Form for the next PGA Year if the Customer desires to retain the Service Type Selection that is in effect on July 31.

The following changes may be requested under this provision:

Change in Sales Service Type
(1) Change in Transportation Service Type

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(3) Transfer to a Sales Service Type
(4) Transfer to a Transportation Service Type
(5) Selection of a Combination Service Type
(6) Selection of Winter Sales WACOG (Sales Service Types only);
(7) Change in Pipeline Capacity Charge billing option (Firm Sales Service Type only)
(8) Change to Firm Sales Service Maximum Daily Delivery Volume (MDDV) (Combination Service Type only)
(9) Change in Rate Schedule

Requests to transfer to a Sales Service Type or to change a Sales Service Type are subject to the Company's determination that such service is available at the requested location based on the conditions set forth in the "SERVICE AVAILABILITY" provision of this Rate Schedule.

Transfers between Sales Service and Transportation Service are further subject to the "APPLICATION OF TEMPORARY ADJUSTMENTS TO RATES (ACCOUNT 191 ADJUSTMENTS)" provision of this Rate Schedule.

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