NORTHWEST NATURAL GAS COMPANY

APPLICATION
FOR
AMENDMENT NO. 9
TO THE
MIST UNDERGROUND NATURAL GAS
STORAGE SITE CERTIFICATE

Submitted to the
Oregon Energy Facility Siting Council
September 12, 2003

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APPLICATION FOR AMENDMENT NO. 9 TO THE MIST UNDERGROUND NATURAL GAS STORAGE SITE CERTIFICATE

I. INTRODUCTION

Pursuant to OAR 345-027-0050, Northwest Natural ("NW Natural") proposes to amend the site certificate for its underground natural gas storage facility at the Mist Site in Columbia County, Oregon. NW Natural requests approval of deletion of an existing ground vibration monitoring condition, installation of gathering lines, and an expansion of the existing Miller Station facilities to increase the combined total Mist storage peak-day delivery to 515 MMcfd from the current maximum capability of 317 MMcfd.

II. COUNCIL JURISDICTION

When the Energy Facility Siting Council (the "Council" or "EFSC") approved the underground natural gas storage facility at the Mist Site in 1981, its jurisdiction included both the surface and underground components of the facility. In 1993, the siting law was amended to include within the Council's jurisdiction only the "surface facility related to an underground gas storage reservoir that, at design injection or withdrawal rates, will receive or deliver more than 50 million cubic feet of natural or synthetic gas per day, and require more than 4,000 horsepower of natural gas compression to operate." ORS 469.300(9)(a)(H). The underground storage facility now exceeds this 50-million-cubic-feet threshold and is subject to Council jurisdiction.

The Project, as described more fully below, includes (1) adding well facilities to utilize additional underground reservoirs; (2) installing gathering lines; and (3) expanding the existing Miller Station facilities to increase the combined total Mist storage peak-day delivery to 515 MMcfd from the current maximum capability of 317 MMcfd. The latter two items fall within the Council's jurisdiction under OAR 345-027-0050(1). However, the underground storage reservoir, as well as the injection, withdrawal and monitoring wells and the individual wellhead equipment, remains under the Oregon Department of Geology and Mineral Industries' ("DOGAMI") authority. ORS 469.300(9)(a)(H)(i)-(ii); *see* Or Laws 1993, ch 544, § 3.

On March 13, 1998, the Council approved a request to amend the storage site certificate by replacing the amendment provisions in the site certificate with requirements that future site certificate amendments be governed by the "duly adopted rules of the Energy Facility Siting Council for the amendment of site certificates." This Amendment No. 9 request is set forth pursuant to OAR 345-027-0060.

III. CERTIFICATE HOLDER INFORMATION (OAR 345-027-0060(1)(a))

Name and Address of Certificate Holder.

Northwest Natural Gas Company
220 NW Second Avenue
Portland, OR 97209

Names, Addresses and Telephone Numbers of Persons Responsible for Submitting Amendment.

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IV. DESCRIPTION OF THE FACILITY (OAR 345-027-0060(1)(b))

A. Nature of the Facility.

NW Natural is a gas utility that delivers energy to more than 550,000 customers. Energy needs generally change significantly on a daily, monthly and seasonal basis due to changes in space-heating requirements, harvest processing, annual production cycles and other factors. In Oregon, however, gas usage is generally lowest during summer months and peaks during December, January and February. Underground gas storage provides the most efficient means of balancing relatively constant pipeline gas supplies with widely fluctuating seasonal, daily and hourly market requirements. Gas is injected into storage during off-peak periods when market requirements are less than supply availability, and is withdrawn from storage when market demand exceeds available supplies from other sources. Storage reservoirs usually are replenished from April through September and are drawn down between October and March.

Underground reservoir storage requires suitable underground geological conditions in a specific geographic area. These conditions occur in depleted oil or gas pools like the pools in the Calvin Creek storage area. An underground storage reservoir, reduced to simplest terms, is little more than a gas production reservoir retrofitted to inject gas back into the ground and withdraw it on a cyclical basis.

The principal differences between a natural gas production field and an underground storage reservoir are operational. The gas wells in a production field are designed to produce gas at flow rates that permit the efficient drainage of the reservoir over time. DOGAMI regulates the spacing of gas wells. Generally, no more than one well per quarter section (160 acres) is allowed. Closer well spacing could result in higher development costs with negligible increase in overall gas production. Competing wells could also cause the premature demise of a reservoir, leaving behind gas that is uneconomical to produce.

A different operating concept applies to a storage reservoir. Instead of producing the major portion of the underground gas by careful management of field pressures and auxiliary compression over a period of years, the goal changes to that of an annual fill-and-empty cycle. In order to rapidly fill and withdraw from a reservoir without harming it, a more closely spaced

pattern of wells designed for high rates of injection and withdrawal is used for storage operations. Compressors allow the storage pressure to be restored during a six-month injection period and provide for sustained high delivery rates during withdrawal as the reservoir pressure depletes.

B. Existing Site Certificates and Facilities.

On September 30, 1981, EFSC issued a site certificate to the Oregon Natural Gas Development Corporation ("ONG"), a wholly owned subsidiary of NW Natural, for an underground natural gas storage facility near Mist, Oregon in Columbia County (the "Mist Storage Site Certificate" or "Site Certificate"). The Site Certificate has been amended eight times.

The Site Certificate authorized ONG to construct and operate "two naturally existing underground gas reservoirs (the Flora and Bruer pools) * * *; Miller Station with attendant equipment (including, but not limited to, compressors), gathering lines, access roads, existing natural gas wells, monitoring wells and proposed injection/withdrawal wells," located in rural Columbia County in parts of Sections 2, 3, 4, 10 and 11 of Township 6 North, Range 5 West, Willamette Meridian (the "Mist Site"). (1981 Mist Storage Site Certificate at 2.)

In 1990, ONG assigned the Site Certificate to its parent, NW Natural. The Council approved three amendments to the Site Certificate, in 1987 (Amendment No. 1), 1988 (Amendment No. 2) and 1990 (Amendment No. 3). The amendments modified several terms of the Site Certificate and authorized the construction and replacement of wells.

In 1997, the Council approved Amendment No. 4. That amendment approved an expansion of the Mist Site that increased the combined total Mist storage peak-day delivery capability from 100 MMcfd to 145 MMcfd. The expansion included (1) improvements to the Miller Station gas-processing facility, including the replacement of two older 550-horsepower compressor units with one larger, more efficient unit; (2) total available compression of 6,650 brake horsepower ("BHP"); (3) construction of a building for the new compressor and updates to related equipment; (4) natural gas storage in one additional naturally occurring underground pool, Al's Pool, in the Calvin Creek storage area; (5) up to four new sites for injection/withdrawal wells, including one to four wells at each site; (6) approximately one mile of buried eight-inch and six-inch gathering pipeline; and (7) approximately two and one-half miles of buried twin 16-inch transmission pipeline.

On March 13, 1998, the Council approved Amendment No. 5, which replaced the amendment provisions in the Site Certificate with a requirement that future site certificate amendments be governed by the Council's amendment rules.

In 1999, the Council approved Amendment No. 6, increasing the capacity of the Mist storage facility. The gas storage portion of that project included (1) upgrades to the dehydration and metering systems at Miller Station; (2) natural gas storage in one additional naturally occurring underground pool, the Reichhold Pool, within the existing site boundary; (3) up to four new sites for injection/withdrawal wells, including one to four wells at each site; (4) approximately 6,500 feet of buried gathering pipeline no greater than 12 inches in diameter;

and (5) the removal of the 6,650 compressor horsepower limitation currently in place for the Miller Station facility. Approval of Amendment No. 6 allowed Miller Station to operate at rates of up to 190 MMcfd without any restriction on the use of the three existing compressor units, which have a total rating of 8,200 BHP.

On May 17, 2001, the Federal Energy Regulatory Commission ("FERC") granted NW Natural a limited jurisdiction blanket certificate under Section 284.224 of FERC's regulations. Under that certificate, NW Natural is authorized to use existing and expanded facilities at Mist to provide FERC jurisdictional bundled firm and interruptible storage and related transportation services in interstate commerce. Northwest Natural Gas Company, 95 FERC ¶ 61,242 (2001). FERC's jurisdiction, however, only extends to the interstate services themselves. NW Natural provides the interstate storage services using existing and expanded facilities at Mist that are not needed to serve its core LDC customer needs. NW Natural also has agreements in place with its state utility regulators regarding this use. To make increased capacity available to the interstate market, NW Natural amended its site certificate (Amendment No. 7) by increasing the permitted throughput of the Mist facility to 245 MMcfd. Amendment No. 7 was approved on November 17, 2000.

In Amendment No. 8, approved October 26, 2001, the Council authorized an increase of the permitted daily throughput from 245 MMcfd to 317 MMcfd. This involved the installation of new metering facilities, new interconnect piping to the South Mist and North Mist pipelines and a new gas-turbine-driven compressor. The new compressor added 7,800 horsepower, bringing the total compression capability to 16,000 horsepower.

C. Site Selection.

Underground storage facilities can be developed only in rare locations where the underground geological conditions are right. The Mist gas field (the "Mist Field") is such a place. The Mist Site, located in rural Columbia County in parts of Sections 2, 3, 4, 10, 11, 21, 22, 23, 26 and 27 of Township 6 North, Range 5 West, Willamette Meridian, is located in the Mist Field.

Millions of years ago, the present gas-producing sands in the Mist Field were laid down by a large river delta advancing into the ocean (analogous to the modern Mississippi River delta). The delta subsided and water depths increased, resulting in mud being deposited over the sand. Compaction from the weight of the material consolidated the sand and muds into sandstone and mudstone. Decomposition of the organic remains in the rock formed natural gas. Large amounts of natural gas migrated into the sandstone and accumulated in areas where the gas could be trapped and displace the water from between the sand grains, forming a "bubble." The compressed layers of clay that form the seal (caprock) over the sand prevent further vertical gas migration. Tectonic forces generated by the collision of the North American Plate with segments of the Pacific Plate created the folds and faults in the sandstone that form the compartments that trap the gas and prevent lateral migration. The fact that gas remains in these reservoirs at high pressure (up to 1,000 pounds per square inch) after millions of years demonstrates the stable nature of these reservoirs. No man-made structures have been so thoroughly tested.

Gas storage facilities have been constructed in similar sandstones in Washington, where no native gas was present. That made exploration and development of the structures much more risky and expensive. It was necessary to pump salty water out of the sandstone and to inject gas produced in other states and transported to the site. There was no guarantee that the injected gas would stay put or that it would be recoverable. The gas reservoirs in the Mist Field are the only producing gas reservoirs discovered to date in Oregon and Washington, and thus they are the only "pretested" storage reservoirs, a rare and valuable resource.

D. Site Background.

By the late 1970s, NW Natural had anticipated its need for natural gas storage capacity in the Portland metropolitan area. NW Natural believed the area around Mist, in rural Columbia County, Oregon, might be one of the few areas in the state containing sandstones of reservoir quality that could be used to store natural gas. These sandstone zones, surrounded by impermeable rock, are referred to as underground "reservoirs," although they are not large caverns. The small spaces between sand grains are in excess of 30 percent of the volume of the rock and can be filled with compressed natural gas. NW Natural recognized that the Mist area would be an excellent location for storage facilities to serve the region.

Reichhold Energy Company and Diamond Shamrock Exploration Company were exploring the Mist area with the hope that underground reservoirs containing commercial gas deposits would be discovered. NW Natural formed a subsidiary, ONG, to participate with those two companies in exploring the Mist area by drilling exploration wells to depths of several thousand feet below the surface. From NW Natural's perspective, simply finding a good underground reservoir, even without commercial gas deposits, would have been satisfactory. The discovery of natural gas at Mist was a bonus.

The Mist Field was discovered in April 1979. Natural gas production was established in December of that year when the first volumes of natural gas were transported to a connection with the NW Natural pipeline system about nine miles away, near Clatskanie. Subsequently, producing wells from the commercial discoveries in the Mist Field were connected by buried gathering lines to the natural gas processing equipment located at Miller Station. At Miller Station, the produced natural gas was collected, measured, treated and odorized before its transmission to NW Natural pipelines. Since 1979, more than $100 million worth of natural gas has been produced from numerous separate gas reservoirs in the Mist Field.

Through the 1980s and into the 1990s, gas exploration and production in the Mist Field was carried on by ONG and a variety of industry participants including Reichhold Energy Company, Diamond Shamrock Exploration Company, ARCO Oil & Gas Company, Nahama & Weagant Energy Company and Enerfin Resources NW-LP ("Enerfin"). Gathering pipelines connecting individual production wells to Miller Station were constructed and operated by ONG until December 1995 and by Enerfin thereafter. During these same time periods, ONG and Enerfin also operated the production wells under contract with the well's various owners.

By the early 1980s, ONG had produced most of the economically recoverable natural gas in the Bruer and Flora pools, two of the first production reservoirs at Mist. In anticipation of that

depletion, in 1981, ONG applied for the permits necessary to convert the Bruer and Flora pools into an underground natural gas storage facility. As noted above, the original Site Certificate authorized the Mist Site to utilize the Bruer and Flora pools in the Bruer/Flora storage area. Later amendments expanded the Mist Site to include similarly produced pools in the Calvin Creek storage area, Al's Pool and the Reichhold Pool. Additional pools (Schlicker and Busch) in and adjacent to the Calvin Creek storage area are included as part of this expansion, although no site boundary amendment is requested or required as a part of this Amendment No. 9 request.

V. PROJECT DESCRIPTION (OAR 345-027-0060(1)(c))

A. Gas Storage Facility.

The Project will (1) add two new well facilities in the Busch and Schlicker pools so that additional storage capacity can be made available for use by interstate customers in the near term, pursuant to the FERC Section 284.224 certificate, and eventually to NW Natural's LDC customers as their needs grow;[1] (2) install additional gathering lines; and (3) expand the existing Miller Station facilities to increase the combined total Mist storage peak-day delivery to 425 MMcfd under normal operating conditions and to 515 MMcfd during peak-day free-flow conditions from the current maximum capability of 317 MMcfd. The modifications at Miller Station and the gathering lines that connect the wells to the existing pipeline system are under Council jurisdiction. All of the facilities under Council jurisdiction are located within the existing site boundary.

1. Miller Station Improvements.

Amendment No. 8 allowed NW Natural to increase the existing Miller Station facility throughput so that an additional 72 MMcfd of storage capacity could be initially made available to interstate customers under NW Natural's FERC Section 284.224 certificate. That expansion increased the total permitted Mist storage peak-day delivery to 317 MMcfd from the previously permitted maximum of 245 MMcfd. This was accomplished by installing new metering facilities, new interconnect piping to the South Mist and North Mist pipelines and a new gas-turbine-driven compressor. The current need for the additional throughput arose because of the increased regional demand for gas supplies and storage services. A drawing of the proposed Miller facility modifications is attached as Exhibit 2 to this Amendment No. 9 request. A map of the proposed gathering lines is attached as Exhibit 3 to this Amendment No. 9 request.

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[1] For the purposes of providing the Council with a complete picture of the Project, the well facilities and underground storage reservoirs are described. However, as noted above, DOGAMI has jurisdiction over the wells (and associated facilities) and underground reservoirs. The expansion will require one additional high-capacity injection/withdrawal well in each pool. The Schlicker Pool well site received approval from DOGAMI and conditional approval from Columbia County. NWN will seek separate approval from DOGAMI and conditional use approval from Columbia County for the Busch well site.

The Busch underground storage reservoir is located outside of the existing site boundary. Because all surface facilities associated with this reservoir will be located within the existing site boundary, no site boundary expansion is requested in this Amendment No. 9 request.

The existing compressor capacity consists of one ISO-rated 7,800-BHP gas-turbine-driven compressor, one ISO-rated 5,500-BHP gas-turbine-driven compressor and two 1,350-BHP reciprocating compressors. The 7,800-BHP gas-turbine-driven compressor was installed in 2001 and the 5,500-BHP unit in 1998. Both units are equipped with low-emission burners and controls to minimize NOx emissions. The two reciprocating compressors have engines that utilize clean-burn technology, which also reduces NOx emissions.

The withdrawal capacity of Miller Station will be expanded to 425 MMcfd during normal operating conditions and using the existing compression facilities, and to 515 MMcfd for a peak-day withdrawal capacity, which could only occur early in the withdrawal season under free flow conditions. In other words, the compression driven withdrawal capacity at Miller Station with the proposed improvements is 425 MMcfd; however, NW Natural is also seeking the flexibility to withdraw 515 MMcfd during peak-day free-flow conditions. To accomplish this increase in withdrawal capacity, no new compression facilities are required. Rather, Miller Station improvements will include additional gas dehydration facilities, new interconnect piping and valves to accommodate the new dehydration facilities, new fuel gas piping and additional gas quality and monitoring equipment. The primary additions will be the installation of an additional dehydration train to "parallel" the existing dehydration equipment. This additional train will be designed such that it can operate independently or in combination with the existing dehydration equipment. Independent operation of this new dehydration train will allow deliveries to be made from Miller Station to either the 12" North Coast Feeder pipeline, to the 16" and 24" South Mist Feeder pipelines or to both the north and south feeder systems. (*See* Exhibit 2.)

In particular, the new dehydration train will consist of the following major components:

- A new dehydration train "vortex" type inlet separator (approximately 36" OD x 15' S/S)
- A glycol contactor (approximately 66" OD x 25' S/S, fitted with approximately 14' of structured packing)
- A "vortex" type glycol overhead separator (approximately 36" OD x 15' S/S)
- A new glycol regeneration skid, approximately 12 gpm capacity with 1.0 MMBtu/hr reboiler, complete with glycol circulation pumps fitted on a skid of approximately 12' x 25' to be installed in the existing "old" regenerator building
- A new glycol aftercooler
- A replacement control device on the TEG reboiler

Installation of the gas quality and monitoring equipment includes the following components:

- A new odorant injection pump connected to the existing odorant storage tank (air powered, station PLC-controlled)
- A new two-channel gas chromatograph
- New remotely initiated actuators on the existing 12" valves

Again, under normal operating conditions, the Miller Station withdrawal capacity is 425 MMcfd. Accordingly, the operating model used to determine CO_2 emissions utilizes only the existing compression and represents the use of these facilities during both the withdrawal and

injection cycles. The need to deliver the peak-day rate of 515 MMCfd would only occur early in the withdrawal season, prior to the use of compression facilities and does not impact CO_2 emissions in any way.

2. Reservoir Development Phase.

The Calvin Creek storage area is located two and one-half miles south of NW Natural's Miller Station compressor plant near Mist, Oregon. The Calvin Creek storage area has multiple reservoirs located within its boundaries, some of which are potentially suitable for storage development. NW Natural drilled an observation/monitoring well as part of the Reichhold Pool storage development. The observation well, positioned between the Reichhold and Al's pools, encountered gas in an existing depleted reservoir, Schlicker Pool. The discovery of additional volume allows the development of this reservoir for storage. The Schlicker Pool reservoir will require one high-capacity horizontal injection/withdrawal well (IW 43a-22-65). (*See* Exhibit 3.)

Immediately adjacent to the Calvin Creek storage area to the northwest is the Busch Pool. This reservoir was depleted in 1988 and later used for testing. The reservoir was filled and subsequently "topped off" by utilizing the original production well. To develop this reservoir for storage will require one high-capacity horizontal injection/withdrawal well. The well and associated gathering lines will be located within the existing Calvin Creek storage area and site boundary. (*See* Exhibit 3.)

3. Gathering System.

The existing Calvin Creek gathering system will be expanded for the two additional wells. The Schlicker Pool gathering line will consist of a 10-inch pipeline from the location of the Schlicker Pool injection/withdrawal well to the Calvin Creek gathering header located approximately 2,000 feet to the northeast. The Busch Pool gathering line will consist of a single eight-inch pipeline from the southern terminus of the twin 16-inch gathering pipelines (the Calvin Creek gathering header) to the location of the Busch Pool injection/withdrawal well approximately 4,000 feet west. NW Natural investigated two corridors for the Busch Pool gathering line. Due to habitat concerns, NW Natural has selected the more easterly route. Both gathering lines will be located within the existing site boundary. (*See*, Exhibit 3.)

4. Vibration Monitoring Program.

In approving Amendment No. 1 to the Mist Storage Site Certificate, the Council imposed a condition of approval specifying a vibration monitoring program for the Mist underground storage facility. That monitoring program has accordingly been in place since 1987. The vibration monitoring program was to determine if there was any correlation between underground storage operations and earthquake-like events that may occur in the vicinity of storage operations. Survey forms for reporting any events were distributed to residents of Mist, Birkenfeld and Natal. Since the program began in 1987, no relationship has been established between commercial storage operations and earthquake-like events. The program approved by the Council covered one full year of commercial operation, after which the program could be terminated upon Council approval. (*See* Exhibit 16.) NW Natural requests that this condition be removed from the Site Certificate because the 16-year history of the vibration monitoring

program demonstrates that there is no correlation between storage operations and earthquake-like events.

B. Construction and Operation.

The construction improvements at Miller Station will take approximately five months and are scheduled to commence June 1, 2004. Construction impacts will be minimal in that the new equipment will either be added to existing structures or be installed immediately adjacent to existing facilities and will not expand the footprint of the station. The additional throughput and operation of the new equipment at Miller Station will not require any additional staff. The new dehydration equipment connects with existing piping to allow for maximum operational flexibility. The new monitoring and control equipment will replace existing equipment or improve the existing operational flexibility such that no additional operations staff would be required.

The 2,000-foot-long, 10-inch Schlicker Pool gathering line will be placed in a 36-inch-wide trench, five to six feet deep. Construction will be conducted on reforested timberlands in a 40-foot right-of-way (20 feet of permanent easement and 20 feet of temporary construction easement). The trench will be backfilled with native materials and compacted. Topsoil will be placed back on top. If native materials are not acceptable for backfill, six inches of special granular bedding material will be placed around the pipe before backfill. Construction areas will be revegetated after construction in a manner that will permit necessary maintenance of the pipeline during operation. The proposed Schlicker Pool gathering line route is adjacent to an existing forest road, which will be utilized for construction. Maintenance personnel will access the Schlicker gathering line and well via the existing road. Construction of the Schlicker Pool gathering line will take approximately two months and is scheduled to commence in August 2004.

The 4,000-foot-long, eight-inch Busch Pool gathering line will be placed in a 30-inch-wide trench, five to six feet deep. Construction will be conducted on reforested timberlands in a 40-foot right-of-way (20 feet of permanent easement and 20 feet of temporary construction easement). The trench will also be backfilled with native materials, and topsoil will be placed on top and the construction areas will be revegetated. The Busch Pool gathering line also follows an existing forest road for .5 mile. The remaining portion is cross-country (approximately 600 feet), and temporary equipment access will be required for construction. Construction of the Busch Pool gathering line will take approximately two months and is scheduled to commence on September 1, 2004.

Gathering line (and well site) maintenance activities are minimal. Operators travel in pickup trucks and visit the well sites daily. The gathering line routes will be surveyed four times annually, two times by foot and two times aerially. The gathering system block valves are inspected and maintained annually as part of NW Natural's ongoing maintenance. Crews also control right-of-way vegetation using hand tools while performing one of the annual visits.

Two temporary staging areas will be required for the Busch Pool gathering line and will be revegetated after construction. Each site measures approximately 100' x 400' and will lie

immediately adjacent to the 40-foot right-of-way and within the 200-foot study corridor. The Schlicker Pool gathering line will require only one temporary staging area, and it will also be revegetated after construction. The site measures approximately 100' x 400' and will lie immediately adjacent to the 40-foot right-of-way and within the 200-foot study corridor. All sites will be restored. A 1200-C erosion control permit will be obtained for construction activity, and best management practices will be utilized to reduce construction impacts.

VI. SPECIFIC LANGUAGE OF THE SITE CERTIFICATE REQUESTED (OAR 345-027-0060(1)(d))

OAR 345-027-0050(1) requires a site certificate amendment in the following circumstances:

> "To change the site boundary or otherwise to design, construct, operate or retire a facility in a manner different from the description in the site certificate, the certificate holder shall submit an amendment request, as described in OAR 345-027-0060, to the Office of Energy if the proposed change:
>
> "(a) Could result in a significant adverse impact that the Council did not evaluate and address in the final order granting a site certificate affecting any resource protected by applicable standards in divisions 22 and 24 of this chapter;
>
> "(b) Could result in a significant adverse impact that the Council did not evaluate and address in the final order granting a site certificate affecting geographic areas or human, animal or plant populations;
>
> "(c) Could impair the certificate holder's ability to comply with a site certificate condition; or
>
> "(d) Could require a new condition or a change to a condition in the site certificate."

The changes NW Natural proposes require site certificate amendments under subsections (a) through (d). NW Natural's proposed changes to site certificate conditions are attached as Exhibit 1.

VII. DIVISION 22 STANDARDS (OAR 345-027-0060(1)(e), (f))

A. Organizational, Managerial and Technical Expertise (OAR 345-022-0010).

Under this standard, the Council determines whether the applicant has the organizational, managerial and technical expertise to construct and operate the facility. To conclude that the applicant has the necessary expertise, the Council must determine that the applicant has "[a] reasonable probability of successful construction and operation of the facility considering the

experience of the applicant, the availability of technical expertise to the applicant, and, if the applicant has constructed or operated other facilities, the past performance of the applicant, including but not limited to the number and severity of regulatory citations, in constructing or operating a facility, type of equipment, or process similar to the proposed facility." OAR 345-022-0010(1).

Discussion.

1. NW Natural's Underground Storage and Pipeline Experience.

NW Natural is a 140-year-old company whose core business is the local distribution of natural gas. Around 1980, NW Natural began developing the natural gas fields in the Mist area for the reinjection and storage of natural gas. Since 1988, NW Natural has operated its underground natural gas storage operation at Mist under the Mist Storage Site Certificate. NW Natural also has a site certificate authorizing it to build and operate the South Mist Feeder pipeline, which brings natural gas to and from the storage facility.

The storage facility allows NW Natural to store natural gas that it purchases from the interstate pipeline and to withdraw that gas when it is needed. Company personnel who have been managing the existing storage operation will continue to operate the expanded facility. Many of the individuals now working for NW Natural who are involved in the design and construction of Mist facilities have been with the underground storage project at Mist since its inception, as described below.

There are no third-party permits or ISO programs associated with the Project.

2. Technical Expertise Available to NW Natural.

NW Natural has assembled an experienced team of professional, technical and administrative personnel to manage all phases of the Project. Following is a brief description of several key members of the Project Team:

Charlie Stinson, General Manager, Engineering Services and Storage Development. Mr. Stinson is an Oregon-registered petroleum engineer who has been continuously involved in the Mist development since discovery of the Mist gas fields in 1979. His specific experiences at Mist include management of the Bruer/Flora storage reservoir development, supervision of the installation and operation of the gas-production gathering system and management of various gas-development ventures. Mr. Stinson was responsible for the addition of the Calvin Creek reservoirs and expansion of Miller Station, which were approved by EFSC as Amendment No. 4 to the Site Certificate, and for the modifications to Miller Station and the new 27 miles of the South Mist Feeder approved in Amendment No. 6 and Amendment No. 2 to the South Mist Feeder Site Certificate. Mr. Stinson is also responsible for the South Mist Pipeline Extension Site Certificate which was approved this March.

Todd Thomas, Storage Project Manager. Mr. Thomas is a certified project manager professional and has a degree in geology. Previously he served as a drilling superintendent and field operations engineer for 16 years. Mr. Thomas was a member of the reservoir development

teams for both the Bruer/Flora project and the Calvin Creek project. He has supervised the drilling of all the storage wells in the Mist Field. Mr. Thomas managed the on-site construction activity for the South Mist Feeder expansion completed in 1999 and the Miller Station work in 2000 and 2001. Mr. Thomas is responsible for the overall management of the Project.

Nick Potts, Project Engineer. Mr. Potts has a B.S. in mechanical engineering technology and has worked for NW Natural in design and operations for 22 years. For the past 17 years Mr. Potts has directed the company's gas storage activities, which include liquefied natural gas facilities and the Mist storage operations.

Kishore Duwadi, Director of Storage and Engineering Supervisor, Miller Station Storage Operations. Mr. Duwadi has a degree in mechanical engineering and has worked for NW Natural for the past 12 years in design and plant operations. Mr. Duwadi's plant supervisory experience includes three years at the company's Newport Liquefied Natural Gas Plant and three years at his current position as supervisor of the Mist storage operations.

Jack Meyer, Reservoir Development. Mr. Meyer is an Oregon-registered geologist with more than 27 years of geological and geophysical mapping and interpretation experience. Mr. Meyer has worked on the Mist project for both exploration purposes and underground storage development at the Bruer and Flora pools continuously for the past 22 years.

The past performance of NW Natural is well known to the Council and its staff, and has not changed since the approval of Amendment No. 6 except for the successful completion of 27 miles of 24-inch pipe permitted in 1999. (*See* Application for Amendment No. 6 at 17-18.)

Conclusion. In its Order approving Amendment No. 7, the Council stated:

> "NWN's experience to date in the Mist Storage Facility, its successful completion of the Calvin Creek expansion in 1997, and the fact that the proposed throughput increase would involve activities identical to those currently authorized provide reasonable assurance that NWN can successfully continue to operate and retire the facility. No new conditions are required."

In approving Amendment No. 8, the Council recognized that based on NW Natural's prior experience constructing and operating the Mist storage facility, and the successful completion of the Calvin Creek expansion in 1997 and the South Mist Feeder extension in 1999, NW Natural demonstrated its ability to successfully construct, operate and retire the facility. Added to that is the successful completion of the Miller Station expansion approved in Amendment No. 8. Amendment No. 9 does not request approval for a new type of facility, but the expansion of facilities that are already operating. The NW Natural personnel who have been managing the existing facility will continue to operate the expanded facility. Given this prior experience and the continued expertise of key personnel, NW Natural has demonstrated that it has a reasonable probability of successful construction and operation of the Project.

B. Structural (OAR 345-022-0020).

Under the structural standard, the Council determines whether

> "(a) The applicant, through appropriate site-specific study, has adequately characterized the site as to seismic zone and expected ground motion and ground failure, taking into account amplification, during the maximum credible and maximum probable seismic events; and
>
> "(b) The applicant can design, engineer, and construct the facility to avoid dangers to human safety presented by seismic hazards affecting the site that are expected to result from all maximum probable seismic events. As used in this rule 'seismic hazard' includes ground shaking, landslide, liquefaction, lateral spreading, tsunami inundation, fault displacement, and subsidence;
>
> "(c) The applicant, through appropriate site-specific study, has adequately characterized the potential geological and soils hazards of the site and its vicinity that could, in the absence of a seismic event, adversely affect, or be aggravated by, the construction and operation of the proposed facility; and
>
> "(d) The applicant can design, engineer and construct the facility to avoid dangers to human safety presented by the hazards identified in subsection (c)." OAR 345-022-0020(1).

Discussion.

1. Miller Station Improvements

Dames & Moore prepared geotechnical investigations of the Miller Station site that fully characterized it as to soils, geology, seismicity and slope stability. These reports were attached to Amendment No. 4 as Exhibits 10, 11 and 12. The reports also included recommendations for construction, including specific recommendations for earthwork, fill placement and compaction, slope inclination, foundation support, bearing capacity, lateral resistance and mat foundations which were adopted as conditions of approval. (*See* Application for Amendment No. 4, Exhibit 11 (January 24, 1997 Dames & Moore Geotechnical Investigation Report).) The Council has based its approval of Amendment Nos. 4, 6 and 8 on these baseline studies, recommendations and updates. This reliance has been based on the conclusion that the proposed project would not change Dames & Moore's predicted ground response at Miller Station during the maximum credible seismic events or change Dames & Moore's conclusion that the Miller Station facilities, if designed to meet Uniform Building Code Seismic Zone 3 requirements, can be constructed to avoid danger to human safety.

The seismic zone for Miller Station has not changed. NW Natural relies on the baseline seismic studies in Exhibits 10, 11 and 12 of Amendment No. 4. Those studies were reviewed

and updated by GeoEngineers for this Amendment No. 9 request and the GeoEngineers' report is included as Exhibit 4. Like Amendment No. 6, addition of the dehydration facilities, new interconnect piping and valves and replacement of the TEG reboiler control device will not require major new buildings or other major site alteration. The proposed change to the allowable throughput to increase it to 515 MMcfd does not change Dames & Moore's predicted ground response at Miller Station during the maximum credible seismic events or change Dames & Moore's conclusion that the Miller Station facilities, if designed to meet Uniform Building Code Seismic Zone 3 requirements, can be constructed to avoid danger to human safety. The GeoEngineers' report (Exhibit 4) concludes that the geotechnical engineering recommendations provided in the January 24, 1997 Dames & Moore report (Application for Amendment No. 4, Exhibit 11) are appropriate for use in the design and construction of this Project. NW Natural will follow those recommendations. Taken together, these reports characterize the Miller Station site and conclude that the minor modifications to Miller Station can be designed and constructed with very low risk of any damage from seismic hazards and, therefore, very low risk of any danger to human safety.

2. Gathering Lines.

NW Natural retained GeoEngineers to prepare a Geologic Hazard Evaluation for the proposed gathering lines and well sites. This report, attached as Exhibit 5, investigated the entire Schlicker Pool gathering line corridor and investigated two potential corridors for the Busch Pool gathering line. Due to habitat concerns, NW Natural has selected the more easterly route. The report describes the site's seismic and nonseismic geologic and soil characteristics. For nonseismic geologic and soil characteristics, GeoEngineers discussed potential hazards from soil erosion, groundwater, landslides and slope stability and concluded that these potential hazards were either minimal (low potential to occur) or that the gathering lines could be designed and constructed to avoid adverse impacts to soils and risks to human safety posed by such hazards.

NW Natural also retained GeoEngineers to characterize the general seismicity of the gathering area, and discuss the selection of the maximum credible earthquake ("MCE") and maximum probable earthquake ("MPE") used to evaluate seismic vulnerability and consequently the seismic hazards caused by the selected MCE and MPE. The Mist Site is located in Seismic Zone 3 as defined by the 1998 Oregon Structural Specialty Code. GeoEngineers described the three main seismic sources (interplate, Cascadia Subduction Zone ("CSZ") MW 9.0 MCE; intraplate, CSZ 7.5 MW MCE; and a random crustal earthquake located four miles from the site with a MW of 6.0 MCE). The MPE used for the evaluation had a magnitude of 7.9 and an epicentral distance of 30 miles from the site vicinity. Seismic hazards related to ground shaking, site amplification, landslides, differential soil compaction and settlement, liquifaction and surface fault rupture were discussed. GeoEngineers concluded that these hazards presented a very low risk to the integrity of the gathering lines and that the gathering lines could be designed and constructed to avoid danger to human safety. Indeed, GeoEngineers explained that "[a] detailed study of the Southern California Gas Company's transmission and distribution system (O'Rourke, 1996) found that there are no reported cases of damage to steel pipelines with arc-welded joints (post World War II construction techniques) due to ground shaking." (Exhibit 5 at 17.)

3. Vibration Monitoring Program.

As a condition of approval of Amendment No.1, the Council imposed a ground vibration monitoring program. (*See* Exhibit 16.) NW Natural requests that this condition be removed. In the nearly 16 years of monitoring, no relationship has been established between commercial storage operations and earthquake-like events. Therefore, removal of the program will not adversely impact NW Natural's compliance with the structural standard.

Conclusion. Taken together, the Dames & Moore reports prepared in conjunction with Amendment No. 4, and the GeoEngineers reports attached as Exhibits 4 and 5 to this Amendment No. 9 request demonstrate that NW Natural has adequately characterized the Miller Station and gathering line (and well) sites as to seismic and nonseismic geological and soil hazards. Further, these reports conclude that there is either a low potential for such hazards or that the facility improvements can be designed and constructed so as to avoid risks to human health and safety.

C. Soil Protection (OAR 345-022-0022).

Under this standard, the Council determines whether the design, construction, operation, and retirement of the facility, taking mitigation into account, are likely to result in a significant adverse impact to soils.

Discussion.

1. Soil Types: Miller Station; Effect on Soils.

NW Natural has submitted detailed soils analysis and construction recommendations for Miller Station by Dames & Moore and GeoEngineers in conjunction with Amendment Nos. 4, 6 and 8. NW Natural relies on those reports in this Amendment No. 9 request. In approving Amendment No. 4, the Council found:

> "Impacts at Miller station will not be significant because the station is already an industrial site and the planned equipment locations are already covered by crushed rock. NWN has committed to adding additional crushed rock where there will be heavy traffic. Dames & Moore has provided detailed recommendations for the earthwork associated with Miller Station improvements (Exhibit 11, Section 7) including recommendations for excavation, fill placement and compaction, fill suitability, slope inclinations, subgrade preparation and protection, and dewatering. Dames & Moore provided additional recommendations concerning foundation support, lateral earth pressures, mat foundations, seismic design parameters and dynamic load considerations. These recommendations will prevent significant adverse impact on soils at Miller Station." (Amendment No. 4 Order at 11.)

The Dames & Moore recommendations were made a condition of the Site Certificate.

In approving Amendment No. 6, the Council noted that NW Natural provided a soils investigation and report from GeoEngineers that identified "five soil types that will be subject to project construction activities. The soil types are characterized in terms of soil depth, permeability, water capacity, effective rooting depth, runoff, and water erosion hazard." (Amendment No. 6 Order at 7.) The Council further found:

> "The additional gas dehydration and metering facilities associated with [Amendment No. 6] will not involve significant earthwork. The planned equipment locations are already covered with crushed rock. Therefore, NWN has concluded, and we concur, that there will be no significant new adverse impact on soils at the Miller station site." (Amendment No. 6 Order at 8.)

The Council made similar conclusions with respect to Amendment No. 8.

As in Amendment Nos. 6 and 8, there will be very little earthwork at Miller Station for the new dehydration and gas quality and monitoring equipment and no significant increased loading of soils in the area. The dehydration equipment and control device on the TEG reboiler will require an engineered foundation. The gas quality and monitoring equipment will be either in an existing building or supported with pipe supports. No significant cutting or trenching is expected. The planned equipment locations are already covered with crushed rock and NW Natural will comply with the recommendations provided by GeoEngineers in Exhibit 4 (incorporating recommendations of Dames & Moore provided in 1997 as Exhibit 11 to Application for Amendment No. 4) Therefore, there will be no significant new adverse impact on soils at the Miller Station site.

2. Gathering Lines; Effect on Soils.

NW Natural engaged GeoEngineers to update the soil study performed by Dames & Moore (1997) for Amendment No. 6. Its report is included as Exhibit 6. GeoEngineers investigated the entire Schlicker Pool gathering line corridor and investigated two corridors for the Busch Pool gathering line. Due to habitat concerns, NW Natural has selected the more easterly route. The report identifies and describes the soil types associated with the gathering lines. The project area outside of Miller Station is occupied by commercial timber operations.

The report identifies little to no potential for adverse impacts to soils from operations and identifies some potential for adverse impacts to soils from construction. However, GeoEngineers concluded that with proper erosion-control measures, restoration and revegetation, the impact to the soils will be minimal. NW Natural commits to meeting the recommendations provided by GeoEngineers. Further, as noted above, the pipeline trench will be backfilled and topsoil will be placed back on top. If native materials are not acceptable for backfill, six inches of special granular bedding material will be placed around the pipe before backfill. Construction areas will be revegetated after construction in a manner that will permit necessary maintenance of the pipeline during operation. A detailed erosion and sediment control plan will be completed to fulfill requirements of the National Pollutant Discharge Elimination System permit 1200-C.

Conclusion. Given the scope of the improvements at Miller Station, there will be no significant new adverse impact on soils at the station. Similarly, operations of the facility pose little potential for significant adverse impacts to soils. Last, taking into account mitigation measures to be implemented as part of the Project's construction and operation practices, the Project will not significantly adversely impact soils.

D. Land Use (OAR 345-022-0030).

Under this standard, the Council must determine whether the facility complies with the statewide planning goals adopted by the Land Conservation and Development Commission. A facility may show compliance either by securing necessary local approvals or demonstrating to the Council that the proposal can meet all applicable land use criteria. NW Natural elects to address this standard by obtaining a land use determination from the Council pursuant to ORS 469.504(1)(b) for the components of the Project under Council jurisdiction, not including the underground reservoirs or well sites.

Discussion.

1. Well Sites.

The Schlicker Pool well site, IW 43a-22-65, has been permitted by both DOGAMI and Columbia County. (*See* Exhibit 7 (county approval).) The new well site for the Busch Pool has not yet been approved by Columbia County, and NW Natural plans to obtain approval before development of the well. Obtaining Columbia County approval of the Busch Pool well site and associated equipment is proposed as a condition of approval to this Amendment No. 9 request.

2. Miller Station Improvements.

Miller Station is located in the PF-76 zone of Columbia County. The PF-76 zone conditionally permits "[o]perations conducted for the exploration, mining and processing * * * of mineral or other subsurface resources not permitted outright." Columbia County Zoning Ordinance ("CCZO") § 503.2. In Amendment No. 6, NW Natural demonstrated that its activities at Miller Station, pipelines, storage wells and reservoirs are approved by conditional use permit from Columbia County as well as approved through EFSC land use decision in Amendment No. 6. Similarly, the expansion of capacity at Miller Station approved under Amendment No. 8 did not require additional land use permits from Columbia County. (*See* Amendment No. 8, Exhibit 4; *see* Exhibit 7.) Because the new compressor and other equipment approved under Amendment No. 8 were added to existing structures, Columbia County determined that the expansion fell within the scope of the existing conditional use permits:

> "[T]he original permit approval would encompass the modifications you are now seeking. You are not proposing to construct any new buildings and the use of the property is remaining the same. No new land use applications are required * * *." (August 14, 2001 Letter from Glen Higgins, Chief Planner Columbia County, to Peter Mostow, Stoel Rives LLP (Exhibit 7).)

Personal communications with Glen Higgins in preparation of Amendment No. 9 indicate that the expansion of the withdrawal capacity at Miller Station to 515 MMcfd should be viewed similarly. (Pers. Communication July 31, 2003 with Steve Abel, Stoel Rives.) Although new equipment will be installed, no new buildings will be constructed or expanded and the use of the property will remain the same. Accordingly, no new conditional use or site design review should be conducted for the Miller Station improvements.

3. Gathering Lines.

The Busch Pool and Schlicker Pool gathering lines have, unlike Miller Station, not yet obtained conditional use approval. The gathering lines are located in the PF-76 zone, which conditionally permits "[o]perations conducted for the exploration, mining and processing * * * of mineral or other subsurface resources not permitted outright." CCZO § 503.2. The gathering lines will be underground facilities and construction areas will be backfilled and revegetated. Minor above ground pipes and valve stations will be located at the wellhead locations. This amendment addresses the conditional use criteria of the PF-76 zone for the gathering lines.

a. 503 Conditional Uses.

> *"In the PF Zone the following conditional uses and their accessory uses are permitted subject to the provisions of Section 504 and 505. A conditional use shall be reviewed according to the procedures provided in Section 1503.*
>
> "* * * * *
>
> *".2 Operations conducted for the exploration, mining, and processing of geothermal, aggregate, and other mineral or subsurface resources not permitted outright."*

Response. The gathering lines are necessary components for the development of underground reservoirs for natural gas storage operations. They are primarily underground pipelines that carry natural gas to be injected into and that have been withdrawn from underground natural gas storage reservoirs. They connect injection withdrawal wells that are drilled to access the underground gas pools with associated pipelines and other portions of the storage facility for ultimate distribution to consumers. Accordingly, the pipelines are part of "[o]perations conducted for the exploration, mining, and processing of * * * other mineral or subsurface resources."

b. 504 All Conditional Uses Permitted in the PF-76 Zone Shall Meet the Following Requirements.

> *".1 The use is consistent with forest and farm uses and with the intent and purposes set forth in the Oregon Forest Practices Act."*

Response. The Oregon Forest Practices Act states:

"[I]t is declared to be the public policy of the State of Oregon to encourage economically efficient forest practices that ensure the continuous growing and harvesting of forest tree species and the maintenance of forestland for such purposes as the leading use on privately owned land, consistent with sound management of soil, air, water, fish and wildlife resources and scenic resources within visually sensitive corridors as provided in ORS 527.755 and to ensure the continuous benefits of those resources for future generations of Oregonians." ORS 527.630(1).

Commercial timber activities occur within and around the Mist Site. Columbia County and the Council have recognized that the conduct of gas storage operations within the Mist Site is consistent with the surrounding farm and forest uses. (*See, e.g.*, Amendment No. 6 Order at 9-10.) The proposed gathering lines within the existing site boundary will not change how the facility operates. The above ground valves are minor and the gathering lines will be buried and the construction area regraded and vegetated. Timber activities may continue with only minor modifications: a 20-foot-wide maintenance easement for each of the gathering lines will be obtained from the surface owner and vegetation will be controlled for pipeline safety and access. Operations and maintenance activities are minor (site visits approximately two times a year on foot and two times a year aerially). In other words, operations on site will not interfere with ongoing timber operations.

"*.2 The use will not significantly increase the cost, nor interfere with accepted forest management practices or farm uses on adjacent or nearby lands devoted to forest or farm use.*"

Response. Operation of the gathering lines within the existing Mist Site boundary will not interfere in any way with accepted forest management practices on adjacent or nearby lands devoted to forest use. In other words, operation will have no off-site impacts to forest uses. On-site impacts will not significantly interfere with forest practices. The lines will be buried and construction areas regraded, backfilled with native materials and revegetated. Ongoing timber production will be limited only within the 20-foot-wide easement for safety and access. This area (approximately 3.2 acres) is not significant in terms of commercial timber production value and will not conflict with adjacent forest management activities. Longview Fibre, one of the largest timber owners in the area, has previously submitted a letter explaining that gas operations, including gathering line construction and operation, are "very compatible" with timber management. (*See* Amendment No. 6 Order at 9.)

"*.3 The use will be limited to a site no larger than necessary to accommodate the activity, and as such will not materially alter the stability of the overall land use pattern of the area or substantially limit or impair the permitted uses of surrounding properties. If necessary, measures will be taken to minimize potential negative effects on adjacent forest lands.*"

Response. The gathering lines are locationally dependent. They must connect from the locationally dependent well sites (to access the underground pool) to existing pipeline facilities for processing through Miller Station. The gathering line maintenance easements are the accepted minimum necessary to protect the pipeline from invasive root vegetation and to enable access for maintenance activities. The gathering lines are located within the existing approved site boundary for storage operations and will not alter the land use pattern in any way or have any off-site impacts.

> "*.4 The use does not constitute an unnecessary fire hazard, and provides for fire safety measures in planning, design, construction, and operation.*"

Response. NW Natural has operated underground storage facilities since 1988 without causing any fires or other hazards. In siting the present Project, NW Natural has considered a number of safety issues, including soil stability, seismic issues, landslide potential and fire safety. The Project has been designed to avoid or minimize the risk of all hazards, and the current and future facilities incorporate numerous safety features, including relief valves and automatic shutdown systems. Trained personnel monitor the facilities from Miller Station. NW Natural meets or exceeds the pipeline safety standards of the U.S. Department of Transportation. Last, the Mist-Birkenfeld Rural Fire Protection District has submitted a letter in support of the Project. (*See* Exhibit 13.)

> "*.5 Public utilities are to develop or utilize rights-of-way that have the least adverse impact on forest resources. Existing rights-of-way are to be utilized wherever possible.*"

Response. There are few public rights-of-way within the Mist Site. NW Natural has proposed to utilize where possible existing private forest access roads and private rights-of-way. The Schlicker Pool gathering line will be constructed entirely along the existing forest road, which will be used for construction and maintenance access. The Schlicker Pool gathering line will then interconnect with the existing Busch Valve Station. The Busch Pool gathering line will also use existing private roads for construction and maintenance access for the majority of the route. The route, however, must take a cross-country route for approximately 600 feet in order to connect the gathering line from the Busch Pool well site to the tie-in to the existing pipeline right-of-way.

> "*.6 Development within major and peripheral big game ranges shall be sited to minimize the impact on big game habitat.*
>
> *"To minimize the impact, structures shall: be located near existing roads; be as close as possible to existing structures on adjoining lots; and be clustered where several structures are proposed.*"

Response. The Mist Site is located within a big-game range. Columbia County has determined in the past that storage operations in the Mist Field will not unduly impact big-game habitat. (*See* CU-2-97; Amendment No. 6 Order at 11.) The proposed gathering lines are being sited to

minimize impact on big-game habitat. They will be located adjacent to existing roads as possible and will be buried. The area will be graded and revegetated and should not interfere with the range. Further, NW Natural will plant vegetation within the gathering line easement that will provide forage for big game species. (Pers. Communication, September 9, 2003 between Jim Grimes, ODFW, and Michael Hayward, NW Natural.)

c. Section 506 Standards.

*".1 The minimum lot or parcel size for new land divisions shall be 76 acres. New land divisions of less than 76 acres shall be allowed only for uses permitted under Sections 502.5 through 502.9, 503. through 503.8, and 503.10. New land divisions for the uses permitted under these sections shall be limited to the minimum size necessary to accommodate the proposed use. * * **

".2 The minimum lot or parcel width and minimum lot or parcel depth shall be 100 feet.

".3 The minimum front yard, minimum rear yard, and minimum side yards shall all be 50 feet.

".4 There shall be no height limitations on buildings."

Response. No land division is requested in this Amendment No. 9 request. To the extent yard requirements apply to underground facilities, the gathering lines will be well within the established setback requirements.

d. Section 1503.5 Conditional Use Criteria.

"A. The use is listed as a Conditional Use in the zone which is currently applied to the site;"

Response. The use is listed as "[o]perations conducted for the exploration, mining, and processing of * * * other mineral or subsurface resources" under CCZO § 503.2.

"B. The use meets the specific criteria established in the underlying zone;"

Response. For the reasons described above, the gathering lines meet the criteria established in the underlying zone, PF-76.

"C. The characteristics of the site are suitable for the proposed use considering size, shape, location, topography, existence of improvements, and natural features;"

Response. The Mist Site has been approved and deemed appropriate for conducting gas storage activities. The gathering lines will be constructed and operated wholly within the existing site

boundary. In any event, the underground gathering line routes are locationally dependent and follow existing roads and reasonably direct routes to interconnect well site and existing pipeline facilities.

> *"D. The site and proposed development is timely, considering the adequacy of transportation systems, public facilities, and services existing or planned for the area affected by the use;"*

Response. For the reasons described in Section VII.L below, the proposed use is timely in regards to public services. The operation of the use itself will require no new public utilities.

> *"E. The proposed use will not alter the character of the surrounding area in a manner which substantially limits, impairs, or precludes the use of surrounding properties for the primary uses listed in the underlying district;"*

Response. For the reasons described above, the proposed use will not alter the character of the surrounding area in a manner that substantially limits, impairs or precludes the use of surrounding properties for the primary uses—forest uses—listed in the PF-76 zone.

> *"F. The proposal satisfies the goals and policies of the Comprehensive Plan which apply to the proposed use;"*

Response. In its Final Order approving Amendment No. 6 (1999), the Council identified two goals (and policies) that applied to NW Natural's proposal for Miller Station improvements and reservoir development facilities, such as gathering lines. Those same goals apply to the current amendment proposal:

Forest Lands Goal: To conserve forest lands for forest uses.

Forest Lands Policy 1: To conserve forest lands for forest uses, including:

A. The production of trees and the processing of forest products;

B. Open space;

C. Buffers from noise;

D. Visual separation from conflicting uses;

E. Watershed protection;

F. Wildlife and fisheries habitat;

G. Soils protection from wind and water;

H. Maintenance of clean air and water;

I. Compatible recreational activities; and

J. Grazing land for livestock.

Although not required to address these for Miller Station, the improvements at Miller Station nevertheless meet this goal and policy. In the PF-76 zone, the station is permitted as a conditional use and is a dedicated industrial area. All of the proposed improvements will occur within the existing dedicated Miller Station site. No impacts to the forest land outside of this site are expected. As described in this Amendment No. 9 request, the Miller Station improvements will not impact any existing timber production activities located outside of the site. The improvements will not alter any existing open space or buffers located outside of the site. No increase in noise levels is expected. The visual impacts will be minimal, as the equipment will blend in with existing equipment and will not be visible from any protected area resource. Taking mitigation into account, development within the graveled site will not impact watershed, wildlife or fishery resources and will not adversely impact soils. The improvements will remain within NW Natural's existing Oregon Department of Environmental Quality ("DEQ") air permit, and NW Natural plans no water usage. The improvements will not impact the existing or planned recreational resources, hunting or fishing within the area.

The gathering lines meet this goal and policy. These facilities will be buried and not visible and will not impact open space, existing noise buffers or recreational opportunities. Trenches created during construction will be backfilled with native materials and will be revegetated to protect soils. The permanent easement created for the gathering lines will prevent only deep-rooted vegetation, including trees within 10 feet on either side of the pipeline, for a total of 20 feet. This is consistent with forest product industry tree spacing practices. Accordingly, little if any loss in timberland will result from construction of the gathering lines. NW Natural has selected gathering line routes that will not adversely impact fish or wildlife resources, and NW Natural will plant vegetation that will provide forage for big game species. (Pers. Communication, September 9, 2003 between Jim Grimes, ODFW, and Michael Hayward, NW Natural.) As mitigated, the construction and operation of gathering lines will not adversely impact water resources or watersheds, and the gathering lines will not have any air impacts.

In approving Amendment No. 6, the Council noted that a letter from Longview Fibre, a major landowner and operator in the site boundary and vicinity, stated that "the exploration, production and underground storage of natural gas has proven to be a very compatible land use with our forest management operations." (Amendment No. 6 Final Order at 13.)

Energy Sources Goal: To protect deposits of energy materials in Columbia County and prevent injury to surrounding lands and residents.

Energy Sources Policy 1: To rely on DOGAMI to require that wells are drilled, cased and plugged in such a manner as to ensure public safety.

NW Natural's storage operations protect and utilize underground natural gas and reservoirs. The storage operations utilize the reservoirs that have been depleted of native gas from production to store natural gas for its operations and customers. The integrity of the reservoirs is vital to NW Natural's storage operations. NW Natural relies on DOGAMI for

approval of its well sites. The Schlicker Pool well site has a DOGAMI approval, while NW Natural is seeking approval for the Busch Pool well site. In Columbia County's conditional use approval, CU 2-97 and CU 53-96, Columbia County recognized that gas storage and timber operations were not incompatible. Rather, in exchange for very minimal surface impacts, surrounding property owners receive significant compensation for both producing and storage operations. (Amendment No. 6 Final Order at 12.) Further, the primarily subsurface nature of the storage operations coexist with little to no conflict with the surface operations of the timber operator.

> *"G. The proposal will not create any hazardous conditions."*

Response. As noted above, NW Natural has operated underground storage facilities since 1988 without causing any fires or other hazards. In siting the present Project, NW Natural has considered a number of safety issues, including soil stability, seismic issues, landslide potential and fire safety. The Project has been designed to avoid or minimize the risk of all hazards, and the current and future facilities incorporate numerous safety features, including relief valves and automatic shutdown systems. Trained personnel monitor the facilities from Miller Station. NW Natural meets or exceeds the pipeline safety standards of the U.S. Department of Transportation. Last, the Mist-Birkenfeld Rural Fire Protection District has submitted a letter in support of the Project. (*See* Exhibit 13.)

e. Section 1503.6 Design Review

> *"The Commission may require the Conditional Use be subject to a site design review by the Design Review Board or Planning Commission."*

Response. Site design review is not appropriate in this context. The gathering lines will be underground facilities and construction areas will be backfilled and revegetated. Minor valve stations located at the well head locations are the only aboveground facilities associated with the underground gathering lines. The Miller Station improvements likewise do not require site design review, as the equipment additions are not considered structures or development—those requiring building permits from Columbia County—under the Columbia County Code. (Pers. Communication August 2003 between Glen Higgins, Columbia County, and Steve Abel, Stoel Rives.)

Conclusion. For the foregoing reasons, the Project complies with the statewide planning goals and the Columbia County zoning ordinance and comprehensive plan.

E. Protected Areas (OAR 345-022-0040).

This standard prohibits the siting of an energy facility in any of the protected areas listed in the rule. The standard permits the siting of a facility outside the listed protected areas so long as the "design, construction and operation" of the facility "is not likely to result in significant adverse impact to" any of the protected areas. OAR 345-022-0040(1).

Discussion. Protected areas are defined in OAR 345-022-0040 and include national parks, national monuments, wilderness areas, national and state wildlife refuges, national coordination areas, national and state fish hatcheries, national recreation and scenic areas, state parks and waysides, state natural heritage areas, state estuarine sanctuaries, scenic waterways, experimental areas established by the Rangeland Resources Program, agricultural experimental stations, research forests, Bureau of Land Management ("BLM") areas of critical environmental concern and state wildlife and management areas.

To identify protected areas in the vicinity of the Project area, NW Natural's consultant, URS Corporation, reviewed a set of maps created by the Oregon Office of Energy covering national, state, BLM and Oregon State University ("OSU") protected areas. Their report is attached as Exhibit 8. Information from the Oregon Department of Fish and Wildlife was used to identify state hatcheries. Oregon Natural Heritage Program staff provided location information on state natural heritage areas.

Miller Station and the Calvin Creek (including the gathering lines) areas are not located in any protected area. An OSU research forest is located about five miles northwest of the Mist storage facility, north of Mist. Other protected areas are found from 10 to more than 20 miles from the Project area.

None of the new facilities will have off-site impacts on these protected areas. The gathering lines will be buried and not visible. Temporary construction impacts for the gathering lines, such as ground disturbance, construction activity and noise, are not expected to impact the closest protected area resource. Last, the Miller Station improvements will be within the existing industrial site and similarly will not impact protected resources.

Conclusion. Accordingly, the design, construction and operation of the Project will not have any adverse impact on any of the areas listed as protected by OAR 345-022-0040.

F. Retirement and Financial Assurance (OAR 345-022-0050).

Under this standard, EFSC determines whether

> "(1) The site, taking into account mitigation, can be restored adequately to a useful, non-hazardous condition following permanent cessation of construction or operation of the facility.
>
> "(2) The applicant has a reasonable likelihood of obtaining a bond or letter of credit in a form and amount satisfactory to the Council to restore the site to a useful, non-hazardous condition." OAR 345-022-0050.

Discussion. The estimated facility life is indefinite because it is not anticipated that the natural reservoirs will lose their storage capacity and the process equipment will be replaced as needed. The original Mist storage facility has been fully operational since 1988. The integrity of the formation and capacity of the reservoir have not changed in nearly 15 years of operation. However, if retirement is necessary, the site can be restored to a useful nonhazardous condition.

The storage facility is composed of (1) the gas processing facility, (2) the gathering lines and (3) the injection/withdrawal wells. Retirement would be conducted in accordance with the nature of the equipment and structures. The retirement process for these facilities would be the same as for those described in NW Natural's 1997 application and approved in 1999 in Amendment No. 6. The approved plan from Amendment No. 6 is summarized below.

1. Gas Processing Facility.

The gas processing facility at Miller Station is located on a 12-acre site and contains the gathering line manifold and six buildings, including the new compressor building. A chain-link fence surrounds the site. The buildings are steel prefabricated structures mounted on a concrete slab. The buildings house process equipment such as compressors, a gas dehydration system, control systems and safety equipment. The gathering line manifold consists of a series of aboveground pipes and valves.

Upon decommission, the process equipment would be removed and sold as used equipment or scrap. Any hazardous materials stored in the buildings or located within the process equipment would be removed and disposed of following the applicable state hazardous materials statutes and rules. The building would be disassembled and the steel siding and frames would be sold as scrap metal. The concrete slabs would be broken up and the concrete would be disposed of at an appropriate landfill. The gathering line manifold and the aboveground portion of the pipelines would be removed and sold as scrap metal. The fence would be removed and sold as scrap metal. If necessary, NW Natural would revegetate the area to prevent erosion and encourage habitat redevelopment.

2. Gathering Lines.

The existing and proposed gathering lines extend underground from the processing facility at Miller Station to the existing and planned wellheads. Upon decommission, the pipelines would be left in place because removing the pipelines would cause unnecessary disruption to the environment. Before abandoning the pipelines, NW Natural would inspect them and would remove any hazardous materials in the pipelines. The aboveground portions of the pipelines would be removed and sold as scrap metal. If necessary, NW Natural will revegetate the right-of-way in the area above the pipelines to encourage habitat redevelopment.

3. Injection/Withdrawal and Monitoring Wells.

The injection/withdrawal and monitoring wells are composed of an aboveground portion, the wellhead, and a below-ground portion, the encased well. With approval of this Project there will be 37 wells. An injection/withdrawal wellhead is installed on a concrete base; a monitoring wellhead is not. Upon decommission, the wellhead would be removed and the well would be plugged in compliance with DOGAMI regulations. The wellhead would be sold as scrap metal. The concrete base would be broken up, and the concrete would be disposed of at an appropriate landfill. The well would be capped at a point below ground level. If necessary, NW Natural would revegetate the wellhead area to prevent erosion and encourage habitat redevelopment and would otherwise reclaim the well site in accordance with DOGAMI regulations.

4. Cost of Restoration.

The costs of retirement are nearly all associated with Miller Station. The restoration cost of the Miller Station plant site is equal to its salvage value less the removal and disposal cost of all the structures and foundations.

The major items that have significant salvage value are the station compressors, which consist of two turbine-driven centrifugal compressors, one 5,035-horsepower and one 7,800-horsepower, and two 1,350-horsepower reciprocating compressors. The nominal salvage value of these units is estimated to be 15 percent of their cost. The remaining items are the buildings, valves, pressure vessels, aboveground piping and all other auxiliary equipment. All of these items will also have some intrinsic value, but it is assumed they will be removed and disposed of for their salvage value.

The demolition and disposal cost will consist of the labor costs of disassembling the aboveground equipment and the disposal costs for the foundations. It is assumed that all gravel would be left on location and the grade left as is. It is also assumed that all buried piping will be purged, then cut and capped below grade and left in place.

NW Natural estimates the restoration costs attributable to Amendment No. 9 to be approximately $500,000 in 2003 dollars. This amount will be offset by an estimated salvage value of installed equipment of $1.65 million.

5. Bond or Letter of Credit.

Attached is evidence that NW Natural has a reasonable likelihood of obtaining the proposed bond, security or other financial instrument in the amount identified above before beginning construction of the facility. Exhibit 9 includes a copy of NW Natural's annual report for 2002. The 2002 report shows a net operating revenue of $287 million in 2002. Exhibit 10 includes a copy of the bond issued to NW Natural from SafeCo Insurance Company of America for Amendment No. 8. NW Natural will either update this existing bond or obtain an additional bond in a substantially similar format to cover the retirement costs associated with Amendment No. 9. Last, NW Natural in August of this year obtained a bond in the amount of $700,000 for retirement of the South Mist Pipeline Extension, providing additional evidence that it is likely that NW Natural can obtain a bond in the amount necessary for Amendment No. 9. As the site certificate holder, NW Natural can and will comply with all conditions of approval related to the financial assurance standard.

Conclusion. Together, Amendment No. 6 and Exhibits 9 and 10 demonstrate that the cost to restore the portions of the gas storage and pipeline sites related to the amendments proposed in this Amendment No. 9 request is small relative to the value of the existing certificated facilities at Mist and their salvage value. There is therefore no question that there is a reasonable likelihood that NW Natural may obtain a bond or that NW Natural can restore the gas storage site to a useful nonhazardous condition.

G. Fish and Wildlife Habitat (OAR 346-022-0060).

For this standard, the Council must find that "the design, construction, operation and retirement of the facility, taking into account mitigation, is consistent with the fish and wildlife habitat mitigation goals and standards of OAR 635-415-0025 in effect as of September 1, 2000."

Discussion. The mitigation goals and standards define six categories of habitat in order of their value for fish and wildlife species. As is discussed below, the habitats affected by the Project are either Category 4 or Category 6.

Habitat Category 4 is "important habitat for fish and wildlife species." OAR 635-415-0025(4). The mitigation goal is no net loss of existing habitat quantity or quality. The implementation standard recommends or requires avoidance of impacts through alternatives to the proposed development action; or mitigation of impacts, if unavoidable, through reliable in-kind or out-of-kind, in-proximity or off-proximity habitat mitigation to achieve no net loss in either pre-development habitat quantity or quality.

Habitat Category 6 is "habitat that has low potential to become essential or important habitat for fish and wildlife." OAR 635-415-0025(6). The mitigation goal is to minimize impacts to the habitat. The implementation standard recommends or requires actions that minimize direct habitat loss and avoid impacts to off-site habitat.

To ensure compliance with the fish and wildlife habitat mitigation goals and standards, NW Natural engaged URS Corporation ("URS") to conduct a biological resource investigation and evaluation of the Project area and proposed Project. URS conducted studies of the proposed gathering line routes and well sites. The URS Environmental Studies Report ("URS Report") identifies the habitat types and categories affected by the Project, the potentially affected fish and wildlife species, and evaluates the potential impacts to habitat and recommended mitigation measures. (Exhibit 8.)

As part of the studies, URS wetland, wildlife, and fisheries biologists conducted a site-specific biological resource investigation during the weeks of June 16 and 23, 2003. Using previous reports and studies for the area as points of reference, they conducted a field reconnaissance of a 200-foot wide corridor the entire length of the proposed gathering lines. URS mapped the habitats within the study corridor using aerial photographs, field observations, and professional judgment (See Exhibit 8, Appendix A, Figure 1).

The URS Report studied and evaluated two alternate routes for the Busch Pool gathering line (Alternate 1 and Alternate 2 for Line 2 in the URS Report). Because one of those alternate routes (Alternate 1) passes approximately 80 feet from a bald eagle nest site (see discussion in Section H below) NW Natural rejected that route and it is not included in the proposed Project. The effect of the rejected alternate route on habitat is discussed in the URS Report but is not discussed further here.

The study area did not include the 12-acres Miller Station site because it is completely fenced, most of the site is paved with gravel or covered with buildings and the remainder is of no habitat value due to continuous human activity in the area.

Habitats affected by the Project are discussed separately below.

1. Habitat Types: Habitat Categories.

The proposed natural gas gathering pipelines extend through a limited variety of ecological communities or habitat types. The entire proposed gathering line routes cross privately owned tree farms dominated by recent clearcuts, and early-seral, or semi-mature commercial Douglas-fir forests. No wetlands or perennial streams were found in the Project area during field investigations. The habitat types and categories crossed by the two gathering lines and at the two well sites are discussed below.

a. Conifer (Douglas-Fir) Forest Stands

The forest stands found along the gathering line routes are second or third generation stands (20-50 years old) dominated by Douglas-fir. Private timber companies manage the majority of these forest stands for timber production. Other trees in these forest stands include western red cedar, western hemlock, and red alder. The canopy is closed, and the understory is sparse. The habitat is two layered with a tree canopy layer and an understory herb and low shrub layer. Dominant understory plants include sword fern, salal, Oregon grape, deer fern, red huckleberry, trailing blackberry, salmonberry, and vine maple.

Category 4. This habitat is considered Category 4 because these forest stands provide important habitat for a variety of wildlife, but are managed as commercial timber land and undergo intensive management and periodic harvest. The stands are in early- to mid-seral stages and not allowed to approach mature conditions. The older stands along the route are reaching harvest age. Older conifer forest stands along the pipeline routes provide habitat for a variety of wildlife species. Certain species such as deer and elk and forest birds (chickadees, thrushes, crossbills, jays, woodpeckers, etc.) are abundant, but overall plant and wildlife species diversity is relatively low, and habitat structures like snags and woody debris are sparse in these second growth stands. None of these areas provide locations of special importance for deer fawning or elk calving. Future timber harvesting will continue to affect the habitat value of these stands.

b. Early-Seral Forest Stands

As a forest stand develops, it goes through stages or "seres" in the process of succession back to a mature forest. Early-seral forest stands are in the beginning stages of succession. The more recent timber harvest areas have been replanted with Douglas-fir trees. Other conifer and deciduous tree seedlings are also present in places. The trees are mostly 10 to 20 years old. The open canopy during the first few years of succession allows for more vigorous growth of shrubs and herbs than in older conifer stands. Common understory species include salal, bracken fern, sword fern, Oregon grape, oceanspray, and a variety of berries in the genus Rubus. The earliest seral forest stands provide abundant forage for elk and black-tailed deer, and seeds and berries for birds and black bears. As the canopy of the stand begins to close (typically between 10 and 20 years) the vigor and abundance of, as well as the accessibility of, the understory begins to decline. In most areas there is limited wildlife cover during the earliest stages except for logs and log piles left over from logging operations.

Category 4. Early-seral forest stands along the pipeline route are Category 4 habitats. They provide important foraging habitat for deer and elk, as well as other species that forage on berries or other understory plant material. However, the early-seral stands are probably the least valuable for most of the wildlife species of all of the seral stages because the forest canopy closes and the understory diminishes over time. Pre-commercial and commercial thinning of trees add periodic disturbance, and the trees are too small to provide habitat for cavity nesting birds or large birds that need sturdy nest structures.

c. Forest Clearcuts

The last several hundred feet of the Busch Pool gathering line traverses a recent clearcut, adjacent to early-seral habitat. Clearcuts provide very limited wildlife cover and less forage than the early-seral conifer forest habitat. The ground is covered with branches and woody debris. Plants recolonizing these clearcut areas include red alder, scotch broom, salal, sword fern, trailing blackberry, foxglove, ox-eye daisy, and a variety of other shrubs and herbs.

Category 4. Recent clearcuts are Category 4. Shrubs, grasses, and herbaceous plants reestablish growth typically within a year to the point where they provide important forage for several wildlife species. For deer and elk, some of the best forage areas are clearcuts in the first few years of regrowth, when the new forest trees are small and there is no forest canopy to diminish production of herb and shrub layers. These areas are typically lacking habitat structures for wildlife species, and the species that use the clearcuts either require cover and breeding habitat elsewhere (nearby, more mature forest stands, typically). Clearcuts are generally not as important to as many species for as much of the year as mature forest stands.

d. Non-fish Bearing Ephemeral Stream

The Busch Pool gathering line crosses an ephemeral stream near its extreme headwaters (identified as Crossing 2 in the URS Report). The point at which the gathering line will cross the ephemeral stream has a small (< 1 foot wide) distinct stream channel, a gradient of about 12%, and steep sideslopes, but appears to only contain water during storm events. Below the headwaters the stream connects to another ephemeral stream that does not have a distinct channel over most of its length, less than a 1% gradient, gentle sideslope, and probably only contains water during periods of extreme runoff. Except during storms, the two ephemeral streams are dry for their entire lengths. The stream gradient becomes significantly less below the confluence of the two ephemeral streams and there is no evidence of sediment transport, despite the fact that the entire drainage of the tributary has been clearcut.

Category 6. The ephemeral streams in the project area are Category 6 because they do not provide spawning or rearing habitat for fish and are unlikely to transport sediment to fish-bearing streams. The channel below the confluence of the two ephemeral streams has a gradient less than 1% with little evidence of sediment or large woody debris transport over the remaining 1,500 feet to the confluence with Calvin Creek. The channel of the ephemeral stream is typically dry, and flow would be intermittent for the entire distance to Calvin Creek. It is unlikely that the ephemeral stream provides essential or important habitat for aquatic or riparian species or delivers a significant amount of water or nutrients to Calvin Creek. The habitat alongside the

ephemeral stream is typical Category 4 conifer forest in various stages of seral growth (clearcut, early-seral, or semi-mature).

2. Potentially Affected Fish and Wildlife Species.

Most of the wildlife species that use the habitats in the Project area are common to the coastal region of Oregon. Large mammals like elk and deer may use the older conifer forests for forage and cover. Common mammal predators are coyote, black bear, cougar, weasels, and mink. Small mammals include Douglas squirrels, mountain beaver, deer mice, jumping mice, shrews, moles, voles, and other small rodents.

Birds in the Project area included American robin, song sparrow, western tanager, steller's jay, black-headed grosbeak, red crossbill, and American goldfinch. Red-tailed hawks and turkey vultures were observed soaring over several portions of the gathering line routes. Pileated woodpecker, Swainson's thrushes, and winter wrens were common in the older conifer forests. Northwestern garter snakes, common garter snakes, and northern alligator lizards are common in early-seral forests and clearcut areas where openings exist for foraging and basking. Pacific tree/chorus frogs also are found the Project area.

There also are sixteen (16) federal species of concern that the U.S. Fish and Wildlife Service believe may occur in the Project area. Those species that may be found in the habitats in the vicinity of the Project include band-tailed pigeon, olive-sided flycatcher, mountain quail, Townsend's big-eared bat, silver-haired bat, long-eared myotis, fringed myotis, long-legged myotis, yuma bat, northern red-legged frog, and red tree vole. The distribution and abundance of these species in the Project area and surrounding vicinity are discussed in the URS Report. (Exhibit 8). Although these species may occur in the Project area, none were observed by URS biologists during their field investigations.

3. Potential Impacts: Compliance with Goals and Standards.

The Schlicker Pool and Busch Pool gathering lines will be placed in trenches five to six feet deep. Construction will be conducted on reforested timberlands in a 40-foot right-of-way (20 feet of permanent easement and 20 feet of temporary construction easement). The trench will be backfilled with native materials and compacted. Topsoil will be placed back on top. If native materials are not acceptable for backfill, six inches of special granular bedding material will be placed around the pipe before backfill. Construction areas will be revegetated after construction in a manner that will permit necessary maintenance of the pipeline during operation. The proposed Schlicker Pool gathering line route is adjacent to an existing forest road, which will be utilized for construction. The Busch Pool gathering line also follows an existing forest road for .5 mile. The remaining portion is cross-country (approximately 600 feet), and temporary equipment access will be required for construction. Construction of the Schlicker Pool gathering line will take approximately two months and is scheduled to commence in August 2004. Construction of the Busch Pool gathering line will take approximately two months and is scheduled to commence on September 1, 2004.

Two temporary staging areas will be required for the Busch Pool pipeline project and will be revegetated after construction. Each site measures approximately 100' x 400' and will lie

immediately adjacent to the 40-foot right-of-way and within the 200-foot study corridor. The Schlicker Pool gathering line will require only one temporary staging area, and it will also be revegetated after construction. The site measures approximately 100' x 400' and will lie immediately adjacent to the 40-foot right-of-way and within the 200-foot study corridor. All sites will be restored. Construction activities will affect the following habitats.

Category 4:

- Conifer (Douglas-fir) Forest
- Early-Seral Forest
- Recent Clearcuts

Category 6:

- Non-fish Bearing Ephemeral Stream

Impacts to these habitats include the removal of vegetative cover and temporary disturbance of the soil in the trench and of the adjacent surface from movement of construction equipment. The vegetation cover will be allowed/encouraged to grow back in the construction corridor with the exception of trees and large shrubs in the 20-foot wide area directly over the gathering lines. This maintenance corridor must be kept clear of tall vegetation to allow for visual inspections and to avoid deep root interference with the gathering lines.

There will be no permanent impact to any habitats in the temporary construction easement for the two gathering lines or the temporary staging areas. The removal of vegetation will be minimized as much as practicable, and best management practices will be used to prevent erosion of soil into ephemeral stream channels and to prevent the spread of weeds. Following construction, native vegetation will be allowed and encouraged to grow back in the temporary construction easement. Thus, there will be no net loss of existing habitat quantity or quality in these areas.

In the permanent easement for each gathering line, trees that may cause root interference with the gathering lines will be discouraged, but other vegetation will be allowed and encouraged to prevent erosion and provide habitat value. Discouraging tree growth in the permanent easement will not result in lost habitat quantity or quality, however, because the easement width is similar to the tree spacing maintained on commercial forest lands and NW Natural will plant vegetation that will provide forage for big game species. (Pers. Communication, September 9, 2003 between Jim Grimes, ODFW, and Michael Hayward, NW Natural.)

Construction will not occur at the ephemeral tributary stream crossing if water is present (there is little evidence of surface water flow in this stream except during periods of extreme precipitation). Construction will not require a removal fill permit from the Division of State Lands as it will involve less than 50 cubic yards. Any stream channel present within construction corridors will be restored to pre-construction conditions, including grades, contours, morphology, and substrate. Stream slopes within construction areas will be covered with a

biodegradable jute matting to prevent scouring and wood debris will be added where practicable. Erosion/sediment control procedures within construction areas will be implemented to minimize sediment input in streams.

Gathering line (and well site) maintenance activities are minimal. Operators travel in pickup trucks and visit the well sites daily. The gathering line routes will be surveyed four times annually, two times by foot and two times aerially. The gathering system block valves are inspected and maintained annually as part of NW Natural's ongoing maintenance. Crews also control right-of-way vegetation using hand tools while performing one of the annual visits. No habitat impacts are anticipated for maintenance or retirement of the facility.

Conclusion. For these reasons, the design, construction, operation and retirement of the requested modifications, taking mitigation into account, are consistent with the habitat mitigation goals and standards of OAR 635-415-0025.

H. Threatened and Endangered Species (OAR 345-022-0070).

Under this standard, the Council determines, with respect to plants, whether the design, construction, operation and retirement of a facility will be consistent with applicable conservation programs adopted pursuant to ORS 564.105(3) (plants). If no conservation program applies, the Council determines, for both plants and wildlife, whether the facility is likely to significantly reduce the survival or recovery of any threatened or endangered species listed under ORS 496.172(2) (wildlife) or ORS 564.105(3) (plants).

Discussion. This standard is met for plant species because no populations of plant species listed as threatened or endangered under ORS 564.105(2) were found in the Project area. This standard also is met for wildlife species. Bald eagle is the only listed species (threatened) found in the Project area. Although one bald eagle nest is present in the Project area, the species and its habitat is not likely to be adversely affected by the Project.

This discussion is organized in accordance with the application requirements contained in OAR 345-021-0010(1)(q):

1. Subsection (A)

> "Information about threatened and endangered plant and animal species that may be affected by the proposed facility, providing evidence to support a finding by the Council as required by OAR 345-022-0070. The applicant shall include:
>
> "(A) Based on appropriate literature and field study, identification of all threatened or endangered species listed under ORS 496.172(2), ORS 564.105(2) or 16 USC § 1533 that may be affected by the proposed facility[.]"

To evaluate the potential for the Project to affect threatened or endangered species, NW Natural's consultant, URS Corporation, contacted the U.S. Fish and Wildlife Service ("FWS"),

the National Marine Fisheries Service of the National Oceanic and Atmospheric Administration, and the Oregon Natural Heritage Information Center. Responses to those requests are attached as Appendix B to the URS Report. (*See* Exhibit 8.) One plant and three wildlife species listed as threatened or endangered were identified as potentially occurring in the Project area: Nelson's checker-mallow (state and federal listed as threatened); Columbia white-tailed deer (federal listed as endangered); northern spotted owl (state and federal listed as threatened); and bald eagle (state and federal listed as threatened).

URS also conducted a field study to determine the presence of threatened and endangered species in the Project area. Fisheries and wildlife biologists surveyed the Project area for evidence of use by any threatened or endangered species. Of the four threatened and endangered species potentially occurring in the Project area, URS only found evidence of bald eagle presence and use. In addition, the URS field study confirmed that there is no suitable habitat to support the presence or use of the Project area by Nelson's checker-mallow, Columbia white-tailed deer, or northern spotted owl.

2. Subsection (B)

> "(B) For each species identified under (A), a description of the nature, extent, locations and timing of its occurrence in the analysis area and how the facility might adversely affect it[.]"

The closest point of the Project—a corner of the well pad for the Busch injection withdrawal well—will be located approximately 350 feet from a single bald eagle nest (*See* Exhibit 8.) The nest is located in a mature Douglas-fir at the edge of a semi-mature forest stand. URS field biologists did not observe bald eagle activity or use of the nest during their field survey in June 2003. However, local landowners report use of the nest in the last two years and it is therefore considered an active nest. For the reasons described below, the Project is not likely to adversely affect bald eagles. The other three species identified do not occur in the Project area and therefore will not be adversely affected.

3. Subsection (C)

> "(C) For each species identified under (A), a description of measures proposed by the applicant, if any, to avoid or reduce adverse impact[.]"

The FWS applies certain guidelines for the protection of bald eagles during critical periods of their annual cycle. Under those guidelines, construction activities should be confined to a seasonal window between September 1 and December 31. Some flexibility is allowed if eagles are not present and a FWS biologist concurs in operating outside the seasonal window. In addition, no activity should occur within a 300-foot no-touch buffer of a bald eagle site. NW Natural will meet these guidelines by confining construction of the Busch Pool gathering line and well to the seasonal window and avoiding any activity within a 300-foot buffer around the bald eagle nest.

4. Subsection (D)

> "(D) For each plant species identified under (A), a description of how the proposed facility, including any mitigation measures, complies with the protection and conservation program, if any, that the Oregon Department of Agriculture has adopted under ORS 564.105(3)[.]"

No listed plant species are present or use the Project area and no conservation programs adopted under ORS 564.105(3) apply to the Project area.

5. Subsection (E)

> "(E) For each plant species identified under paragraph (A), if the Oregon Department of Agriculture has not adopted a protection and conservation program under ORS 564.105(3), a description of significant potential impacts of the proposed facility on the continued existence of the species and on the critical habitat of such species and evidence that the proposed facility, including any mitigation measures, is not likely to cause a significant reduction in the likelihood of survival or recovery of the species[.]"

There will be no impacts to listed plant species because none occur in the Project area.

6. Subsection (F)

> "(F) For each animal species identified under (A), a description of significant potential impacts of the proposed facility on the continued existence of such species and on the critical habitat of such species and evidence that the proposed facility, including any mitigation measures, is not likely to cause a significant reduction in the likelihood of survival or recovery of the species[.]"

There will be no significant impacts of the Project on any listed species. Three of the four species identified do not occur in the Project area. Bald eagle, the only species present, will not be impacted because NW Natural will conduct construction of the Busch Pool gathering line and well according to the FWS guidelines discussed above. Accordingly, construction will not adversely affect or cause a significant reduction in the likelihood of survival or recovery of the bald eagle.

7. Subsection (G)

> "(G) The applicant's proposed monitoring program, if any, for impacts to threatened and endangered species[.]"

No monitoring program is proposed because the Project will not have on-going impacts on listed species.

Conclusion. The threatened and endangered species standard is met for plant species because no population of plant species listed as threatened or endangered occur in the Project area. The standard is also met for wildlife species. One bald eagle nest exists in the Project area, but the Project will not adversely impact it.

I. Scenic/Aesthetic (OAR 345-022-0080).

Under this standard, the Council determines whether "the design, construction, operation and retirement of the facility, taking into account mitigation, is * * * likely to result in significant adverse impact to scenic and aesthetic values identified as significant or important in applicable federal land management plans or in the local land use plan for the site or its vicinity." OAR 345-022-0080.

Discussion. This standard is discussed in detail in the application for Amendment No. 6 at 102-06. As described in the order approving Amendment No. 6, the Council concluded that there is no federally owned land in the vicinity of the gas storage facility. The applicable local land use plan is still Columbia County's Comprehensive Plan. No new resources have been identified by Columbia County since the approval of Amendment No. 6. The Columbia County plan contains an inventory of five "County Scenic Resources." The gas storage facility is not visible from (or within the viewshed of) any area identified by Columbia County as a scenic resource.

The plan also identifies portions of Highway 47 as a state-designated scenic highway. Miller Station is visible from two points along Highway 47. The modifications proposed at Miller Station will include additional gas dehydration facilities, new interconnect piping and valves to accommodate the new dehydration facilities, and additional gas quality and monitoring equipment. The additional equipment proposed for Miller Station will be housed within the existing facility complex permitted under Amendment No. 4. Neither the new dehydration equipment nor the TEG reboiler control device will be visible from Highway 47. Further, this equipment will blend in with existing dehydration contact towers and facilities at Miller Station. The new equipment will match the existing equipment both in scale and in material.

All of the planned well sites, equipment and gathering lines will be located within the existing site boundary. Vegetation disturbance necessary for construction of the gathering lines will not be visible from Highway 47 and, after construction, the additional gathering lines will be buried and not visible in any event. The construction areas will be graded and revegetated.

Conclusion. Amendment No. 9 will not adversely impact any scenic or aesthetic value identified as significant or important in any applicable federal land management or local land use plan for the site or its vicinity.

J. Historic, Cultural and Archeological Resources (OAR 345-022-0090).

Under this standard, the Council considers whether the construction, operation and retirement of a facility, taking mitigation into account, are likely to result in significant adverse impacts to:

- Historic, cultural or archaeological resources that have been listed on, or would likely be listed on, the National Register of Historic Places;
- For a facility on private land, "archaeological objects" as defined in ORS 358.905(1)(a) or "archaeological sites" as defined in ORS 358.905(1)(c); and
- For a facility on public land, "archaeological sites" as defined in ORS 358.905(1)(c).

ORS 358.905(1)(a) defines an "archaeological object" as an object that (1) is at least 50 years old, (2) comprises "the physical record" of any culture and (3) is "material remains of past human life or activity that are of archaeological significance."

ORS 358.905(1)(c) defines "archaeological site" as any location that "contains archaeological objects and the contextual associations of the archaeological objects" with each other or biotic or geological remains or deposits.

Discussion. No previously recorded archeological sites have been identified in the gas storage facility site boundary, including the Miller Station location. NW Natural's consultants, URS Corporation, reviewed previous research covering the project area and conducted field investigations covering the proposed pipeline and disturbance locations within the expanded site boundary. Their report is attached as Exhibit 8.

Studies reviewed include an archaeological inventory conducted by Dames & Moore in 1997, in conjunction with previous gas storage operations in the Miller Station vicinity (Dames & Moore 1997) and a series of studies conducted in conjunction with the construction and expansion of the South Mist pipeline, south of Miller Station. These latter investigations include the 1987-88 studies conducted in for the initial pipeline construction (Gaddis 1987; Hibbs and Ellis 1988a, 1988b) and more limited studies along portions of the same route (Dames & Moore 1998). The pipeline corridor studies did result in the identification of a number of archaeological sites; these were largely confined to the floor of the Nehalem Valley and other areas to the south of the current Project, primarily along Dairy Creek. No additional archaeological inventories have been conducted within a one-mile radius of the Project area, and no previously recorded archaeological sites are known in the immediate area. A review of these reports indicates that cultural resources are present in the general vicinity of the Project and may be present within the Project area.

URS reported one previously recorded historic homestead. During its field investigation of the gathering line routes, URS found no physical evidence of the homesite, and URS concluded that the homesite is likely located near the Nehalem River downslope from Project facilities. No previously recorded or newly recognized cultural resources were identified during

inventory of the proposed facility components/disturbance areas. Although ground visibility was generally poor, the proposed gathering lines lie largely within areas of low archaeological sensitivity. Consequently, the presence of unidentified archeological resources is also low. Should any potential archaeological resources be encountered during Project construction, however, all work in the immediate vicinity will cease until a qualified archaeologist can evaluate the find and recommend an appropriate course of action.

A monitoring plan was proposed and approved in Amendment No. 6 and would be applicable to Amendment No. 9:

> "If any artifacts or other cultural materials that might qualify as 'archaeological sites' or 'archaeological objects' are identified during monitoring, all ground-disturbing activities in the area will cease until the archaeologist can evaluate their potential significance. If the materials are potentially eligible for listing on the National Register of Historic Places or likely to qualify as archaeological sites or objects, NWN will consult with the SHPO and comply with archaeological permit requirements administered by the SHPO (currently set forth in OAR chapter 736, division 51)."

Conclusion. Taking into account mitigation, Miller Station improvements and gathering line facilities are not likely to result in significant adverse impacts to historic, cultural and archeological resources.

K. Recreation (OAR 345-022-0100).

Under this standard, the Council determines whether the "design, construction and operation" of a facility will result in "significant adverse impact to important recreational opportunities in the impact area." OAR 345-022-0100. Factors considered in judging the importance of a recreational opportunity include:

> "(a) Any special designation or management of the location;
>
> "(b) The degree of demand;
>
> "(c) Outstanding or unusual qualities;
>
> "(d) Availability or rareness; and
>
> "(e) Irreplaceability or irretrievability of the opportunity."

Id.

Discussion. URS Corporation reviewed the vicinity within one mile of the Project area for recreational resources and found only light usage by hunters. (*See* Exhibit 8.) NW Natural had previously evaluated recreational impacts within five miles of the site boundary. The

existing and proposed recreational facilities in Columbia County are described in the application for Amendment No. 6 at 112 and 113. The existing resource within five miles is Big Eddy Park. Proposed recreational facilities include construction of a bike trail along Highway 202. The Nehalem River supports fishing, and the storage site is within a major big-game habitat.

The Project will not cross or otherwise impact the Nehalem River. Changes planned for Miller Station pursuant to Amendment No. 9 are all within the current fenced Miller Station site, and planned operations will not further impact existing and planned resources. There will be no increase in noise levels. The remainder of the Project is underground. Accordingly, the only impact to hunting is possible minor disturbance of hunting activities during construction.

To NW Natural's knowledge, there are no other recreational opportunities, important or otherwise, within the study area.

Conclusion. For these reasons, the Project will not result in a significant adverse impact to important recreational opportunities within the study area for this amendment.

L. Socioeconomic Impacts (OAR 345-022-0110).

Under this standard, the Council determines whether the construction and operation of a facility, taking mitigation into account, will result in significant adverse impact to the ability of communities within the study area to provide the following governmental services: sewers and sewage treatment, water, storm water drainage, solid waste management, housing, traffic safety, police and fire protection, health care and schools.

The study area for socioeconomic impacts of a surface facility related to an underground gas storage reservoir is the area within 30 miles of the site boundary. OAR 345-001-0010(50)(g)(G).

Discussion. Potential providers of governmental services in the Mist storage study area include Columbia County and the incorporated cities and towns within 30 miles of the site boundary. The nearest communities include Mist, which is unincorporated; Vernonia, which is approximately 15 miles away; and Clatskanie, which is approximately 12 miles away.

The population of Columbia County is approximately 44,547 (2000 Columbia County census information).[2] There will be approximately 50 construction workers assigned to the Project. Accordingly, even during peak construction periods, the Project will not have a significant impact on the population in the area.

1. Sewers and Sewage Treatment.

No community in the study area provides sewers or sewage treatment to the existing certificated energy facilities or the surrounding areas. For Miller Station, the existing and expanded facilities have been and will be served by on-site sewage disposal systems. The

[2] This census information is posted on Columbia County's Web site at www.co.columbia.or.us.

gathering lines do not implicate any usage of such facilities. The Project therefore will not have any adverse impact on any community's ability to provide sewers or sewage treatment.

2. Water.

No community in the study area provides water to the existing certificated energy facilities or the surrounding areas. The existing and expanded Miller Station facility has been and will be served by existing water wells. Hydrostatic testing is planned for construction of the gathering lines. Water for these tests will be obtained from the existing water wells at Miller Station. Disposal of that water will also occur at Miller Station. Accordingly, the Project will not have an adverse impact on the ability of any community to provide water.

3. Storm Water Drainage.

Again, no community in the study area provides storm water drainage to the existing certificated energy facilities or the surrounding areas. Storm water drainage will be handled on site by natural drainage and the existing collection system for facility pad runoff. Improvements at Miller Station will not impact the existing collection system, and the gathering lines will not add impervious surface. The Project therefore will not have an adverse impact on the ability of any community to provide storm water drainage.

4. Solid Waste Management.

No community in the study area provides solid waste management services to the existing certificated energy facilities or the areas around them. Current and future solid waste disposal for the energy facilities is and will be handled through private contracts with local service companies. There will therefore be no adverse impact on the ability of any community in the area to provide solid waste management services.

5. Housing.

At the peak of construction activity there will be approximately 50 workers assigned to work on the Project. NW Natural anticipates that fewer than 50 percent of this work force will require temporary housing. Even though there is very little temporary housing near Miller Station, there are numerous communities within a 30-mile distance that have a wide array of facilities. The cities of Vernonia, Clatskanie and St. Helens have motel facilities totaling approximately 100 rooms. Longview and Kelso, Washington, where there are several hundred motel rooms available, are also within 30 miles of Mist. Temporary housing in the area is therefore adequate to handle the number of construction workers for the Project. There will be no adverse impact on the ability of the communities in the area to provide housing.

6. Traffic Safety.

The only impact to local traffic will be from the construction activity associated with the Project. Once the Project is complete, there will be no additional traffic in the area.

For the Mist Site improvements, the principal roads in the vicinity of the Project are Highway 202, a two-lane highway that bisects the Project area as it runs generally southeast/northwest from Mist to Astoria, and Highway 47, a two-lane highway that runs generally north/south from Clatskanie, through Mist, to its intersection with Highway 26 west of Hillsboro. (*See* Application for Amendment No. 6, Exhibit 10.) The southeastern endpoint of Highway 202 occurs at its intersection with Highway 47 in Mist. The minor amount of construction activity in the Mist area will have minimal impact on these roads.

During the construction phases, Project-related traffic will access the Project area on either Highways 202 or 47, and then on the country roads in the area or other various local roads, including private logging roads controlled by Longview Fibre.

One of the roads that will host significant additional traffic is Longview Fibre's private Mainline Road. Access to this road is controlled through close cooperation between Longview Fibre and NW Natural. Longview Fibre expressed no concern about Project impacts on this road during construction of the Project in Amendment No. 6 and, in fact, expressed its support for the Project in a letter to Columbia County, noting the successful degree of cooperation between the two companies. (*See* Application for Amendment No. 6, Exhibit 24.)

As described in Application for Amendment No. 6 (at 116-117), area public roads are well within their capacity. Given the excess capacity of the existing roads, the negligible traffic associated with facility operation and the relatively light traffic associated with Project construction, the Project will not have a significant adverse impact on the ability of communities in the area to ensure traffic safety.

7. Police Protection.

Police protection in the area is provided by the City of Vernonia and the Columbia County Sheriff's Department. In Amendment No. 8, conversations with these police departments indicated that a 50 person work force would not create any significant concerns. (*See* Exhibit 11.) In preparing Amendment No. 9, NW Natural sought comments from these departments, and received a response from the City of Vernonia Chief of Police, Michael Cahill. (Exhibit 12.) Chief Cahill does not express concerns about the ability of the City to provide necessary services. Given the small work force associated with the Project (approximately 50) and the Columbia County Sheriff's Department's previous confirmation, the Project will also not place a significant burden on the abilities to provide police protection within Columbia County.

8. Fire Protection.

The Mist-Birkenfeld Rural Fire Protection District provides fire protection services in the Mist area. In a letter, District Chief Dave Crawford stated:

> "[NW Natural] has done a great job of keeping us informed of work locations and any special hazards we might encounter during response to or mitigation of an emergency incident. * * *. Our staff and volunteers look forward to working with you over the next few months during the construction period. As always,

the cooperation [NW Natural] has demonstrated with our fire district and the community spirit we share as neighbors has been exemplary." (*See* Exhibit 13.)

The Project will pose very little, if any, additional fire hazard in the area. NW Natural has operated its existing underground natural gas storage facility and the South Mist Feeder pipeline for approximately 15 years without causing any fires or other hazards. The wellhead and pipeline facilities have numerous safety features, including relief valves and automatic and emergency shutdown systems.

Finally, the facilities are monitored from the "nerve center" at Miller Station by NW Natural's trained personnel. Miller Station is regularly inspected by the Oregon Public Utilities Commission (the "PUC"); the last inspection was in September 2002 for compliance with the pipeline safety regulations of the U.S. Department of Transportation (49 CFR part 192). Accordingly, the Project will not have an adverse impact on the ability of communities in the area to provide fire protection.

9. Health Care.

The minimal number of permanent employees and the relatively small construction work force should place few additional demands on the health care facilities that serve the area. Local hospitalization needs are currently met by hospitals in the Portland area, Astoria and Longview, Washington. The communities in the area therefore currently provide very little in the way of health care.

However, to the extent that there are injuries or other health care needs associated with the Project, the Mist-Birkenfeld Rural Fire Protection District has a Multiple Casualty Incident Plan in place. The district has the supplies and materials necessary to support the plan and the resources available in connection with the Project. (*See* Application for Amendment No. 6, Exhibit 46.) The Project, therefore, will not have a significant adverse impact on the ability of the communities in the area to provide health care service.

10. Schools.

There are smaller communities in the area, such as Mist, that would not be able to accommodate as many as 15 additional students, but because of the limited amount of workers involved in the construction, few, if any, students would need this service. The Project therefore will not have a significant adverse impact on the ability of the communities in the area to provide schooling.

Conclusion. For the foregoing reasons, the Project will not adversely impact the surrounding communities' ability to provide services.

M. Waste Minimization (OAR 346-022-0120).

This standard requires an applicant, to the extent reasonably practicable, to "minimize generation of solid waste and wastewater in the construction, operation, and retirement of the

facility, and when solid waste or wastewater is generated, recycle and reuse such wastes." OAR 345-022-0120(1).

In addition, to the extent reasonably practicable, "the accumulation, storage, disposal and transportation of waste generated by the construction and operation of the facility must have minimal adverse impact on surrounding and adjacent areas." OAR 345-022-0120(2).

Discussion. NW Natural has in place a hazardous and nonhazardous waste reduction and recycling program for all of its facilities. Recycling and reuse is a priority for NW Natural and, as described below, will be implemented during the construction phases and during the day-to-day operations of the Project.

1. Minimization of Solid Waste.

There will be solid wastes generated during construction. These solid wastes will consist of nonhazardous construction materials such as straw bales and silt fencing. The silt fence material and straw bales will be transported to a local landfill.

There will be no generation of waste, hazardous or nonhazardous, during the operational phase of the Project beyond what was described in NW Natural's application for Amendment Nos. 4 and 6 to the Site Certificate and approved by the Council in those processes.

2. Minimization of Water Use.

Hydrostatic testing is planned during construction of the gathering lines. This water will be obtained from existing well facilities at Miller Station and tracked to the gathering line. The water will similarly be tracked back to and disposed at Miller Station. No water use is planned as part of Amendment No. 9 operation.

3. Impact on Surrounding Areas.

The accumulation and storage of Project waste will take place at Miller Station and transportation of it will be from Miller Station. Miller Station is fully fenced and virtually surrounded by second-growth forest with no neighbors nearby. Construction debris created from the gathering line construction is recycled on site; the woody and leafy material is piled within the 20 foot vegetation-restricted portion of the permanent easement which provides added protection for the pipeline from vehicles and added erosion control benefits. The accumulation, storage and transportation of Project waste will therefore have little impact, if any, on surrounding and adjacent areas.

Conclusion. For the foregoing reasons, the construction and operation of the Project will not significantly adversely impact the ability of surrounding communities to provide services.

VIII. DIVISION 23 STANDARDS (OAR 345-027-0060(1)(e), (f))

A. Applicability of Need for Facility Standard.

In general, an applicant for an amendment to an existing site certificate does not have to demonstrate compliance with the "Need for Facility" standard contained in OAR chapter 345, division 23. NW Natural will not address that standard in Amendment No. 9 of the Site Certificate, because underground storage was specifically exempted from the "need" standard by the former OAR 345-023-0010(1)(f) and no current "need" standard applies to surface facilities associated with underground natural gas storage.

IX. DIVISION 24 STANDARDS (OAR 345-027-0060(1)(e), (f))

A. Public Health and Safety Standards for Surface Facilities Related to Underground Gas Storage Reservoirs (OAR 345-024-0030).

This standard requires findings related to the following:

> "(1) The proposed facility is located at distances in accordance with the schedule below from any existing permanent habitable dwelling:
>
> "(a) Major facilities, such as compressor stations, stripping plants and main line dehydration stations– 700 feet;
>
> "(b) Minor facilities, such as offices, warehouses, equipment shops and odorant storage and injection equipment– 50 feet;
>
> "(c) Compressors rated less than 1,000 horsepower– 350 feet;
>
> "(d) Roads and road maintenance equipment housing– 50 feet.
>
> "(2) The applicant can construct and maintain the facility in accordance with the applicable requirements of the U.S. Department of Transportation as set forth in 49 CFR, Part 192, and OAR 860-024-0020 in effect as of the date of this rule;
>
> "(3) The applicant has developed a program using technology that is both practicable and reliable to monitor the facility to ensure the public health and safety; and
>
> "(4) The applicant can design, construct and operate the facility so as not to produce or contribute to seismic hazards that

could endanger the public health and safety or result in damage to property." OAR 345-024-0030.

Discussion.

1. Siting Distances.

All major surface facilities are located at NW Natural's Miller Station. This facility is located in a second-growth conifer forest approximately 2,750 meters (9,000 feet) north-northwest of the town of Mist. The nearest permanent habitable dwelling is located approximately 1,980 meters (6,500 feet) south-southwest of the facility. The new equipment will be housed inside the existing facility complex at Miller Station. Therefore, there is no change that would affect the prior approval of EFSC for this standard. To the extent the gathering lines are considered either major or minor facilities under this rule, the proposed gathering lines are also located within a second-growth conifer forest. The nearest permanent habitable dwelling to either gathering line is approximately 2200 feet from the facility.

2. U.S. Department of Transportation Standards.

The facilities will be constructed and maintained in accordance with the applicable requirements of the U.S. Department of Transportation as set forth in 49 CFR part 192 and OAR 860-024-0020. The existing underground storage facility at Mist was constructed and is maintained in accordance with the same regulations. The PUC, which administers these rules under a delegation from the federal government, last inspected the current facility and its operation and maintenance procedures in September 2002. That inspection resulted in no citations and identified no probable violations.

3. Monitor Public Health and Safety.

The subject facilities will be designed, constructed, operated and maintained so as not to allow natural gas leakage that endangers public health and safety. The facilities will be designed, constructed and operated in accordance with federal pipeline safety regulations enforced by the PUC. Among other things, these regulations require measures to prevent leakage, including factory-installed pipeline coating, individual joint wrap, effective cathodic protection systems and isolation from other pipes that could cause inadvertent electrical contact.

The wellhead and pipeline facilities' numerous safety features include relief valves and automatic shutdown systems. In addition, the facilities are monitored by trained personnel from NW Natural's "nerve center" at Miller Station.

U.S. Department of Transportation Pipeline Safety Regulation, 49 CFR part 192, subpart D (Design of Pipeline Components), specifically addresses the design and operational safety requirements for compressor plants. These requirements have been strictly adhered to in the original plant design, completed modifications and the current proposed additions.

An emergency shutdown system is in place that can be either manually or automatically activated. It stops all active plant processes, closes all plant inlet and outlet valves, shuts off

engine fuel and start gas systems and, upon closure of necessary valves, vents to the atmosphere all process and fuel gas within the plant. As methane is lighter than air, the safest procedure is to vent vertically. These systems are maintained on a regular basis and tested at least annually to ensure proper response.

In place are systems that monitor compressor, process and control building atmospheres for the presence of flammable vapors, as well as systems that detect the presence of a fire. These instruments will trigger an alarm or plant shutdown when certain preset levels are reached.

The plant has a staff of six operators and maintenance personnel working rotating shifts and one full-time supervisor working the day shift. A communication link is maintained between the plant and the NW Natural operations control room in Portland.

In addition, the following items are indications of NW Natural's commitment to public health and safety:

(1) Fire training school for plant operators and maintenance personnel, generally on an annual basis;

(2) Written action emergency procedures for company gas dispatchers and plant personnel; and

(3) Maintenance of both Life Flight and C-Com procedures and phone numbers.

(4) The existing emergency plan will be expanded to include the proposed equipment at Miller Station. This program will continue and will apply to the new facilities approved in Amendment No. 9.

(5) The facility will be designed, constructed and operated so as not to produce or contribute to seismic hazards.

4. Seismic Hazards.

In approving previous site certificates and amendments, the Council has concluded that the existing storage facilities will not produce or contribute to seismic hazards that could endanger the public health and safety or result in property damage. In particular, the application for Amendment No. 6 fully described this standard at 18-21. As described in the response to the Council's structural standard at Section VII.B above, no changes to the facility proposed in this Amendment No. 9 request alter that conclusion.

Conclusion. The public health and safety standards in OAR 345-024-0030 satisfied by Amendment No. 6 are satisfied for Amendment No. 9.

B. Carbon Dioxide Offsets for Nongenerating Energy Facilities. Standard for Nongenerating Energy Facilities (OAR 345-024-0620).

To issue a site certificate for a nongenerating energy facility that emits carbon dioxide, the Council must find that "the net carbon dioxide emissions rate of the proposed facility does not exceed 0.504 pounds of carbon dioxide per horsepower hour." OAR 345-024-0620.

Discussion.

1. Subsection 1.

> "The Council shall determine whether the carbon dioxide emissions standard is met as follows:
>
> "(1) The Council shall determine the gross carbon dioxide emissions that are reasonably likely to result from the operation of the proposed energy facility. The Council shall base such determination on the proposed design of the energy facility. In determining gross carbon dioxide emissions for a nongenerating facility, the Council shall calculate carbon dioxide emissions for a 30-year period unless the applicant requests, and the Council adopts in the site certificate, a different period. The Council shall determine gross carbon dioxide emissions based on its findings of the reasonably likely operation of the energy facility. The Council shall use a rate of 117 pounds of carbon dioxide per million Btu of natural gas fuel * * *." OAR 345-024-0620.

The Miller Station compression facility consists of two existing internal combustion engine-driven compressors and two existing turbine-driven compressors. The proposed facility will increase withdrawal capacity from 317 to 425 MMcfd during normal operating conditions and using the existing compression facilities. The KC7 turbine-driven compressor is subject to the rules of OAR 345 Division 24. With the proposed increase in facility capacity, the KC7 operations will increase. With this amendment, the peak-day withdrawal capacity of Miller Station will be expanded to 515 MMcfd. Under current conditions, the peak-day rate could only occur early in the withdrawal season under free flow conditions and would not impact CO_2 emissions.

An injection and withdrawal model was developed to estimate the amount of horsepower needed during a typical injection and withdrawal cycle. The horsepower requirements were then allocated among the four pieces of compression equipment available for use in a manner that used each piece of equipment in a reasonable manner for overall plant efficiency. Under the updated 425 MMcfd annual injection and withdrawal scenario, the KC7 turbine would be used for approximately 84 additional days per year, during the withdrawal and injection cycles.

Because the KC7 turbine is projected to operate at part loads during portions of the withdrawal and injection cycles, the following calculations are based on operation at expected actual horsepower with ambient temperature conditions of 40 degrees F for 84 days per year over

a 30-year period. The projected fuel use for the operating scenario is 141,841 MMBtu per year. This is a conservative estimate of the reasonably likely operation and allows for an operational increase of 25 percent in future years.

$$141{,}841 \text{ MMBtu} \times 30 \text{ years} \times \frac{117 \text{ lb } CO_2}{\text{MMBtu}} \times \frac{\text{ton}}{2{,}000 \text{ lbs}} = \frac{}{\text{year}}$$

248,931 tons carbon dioxide emissions reasonably likely over a 30-year period.

The following calculation uses the same operating assumptions to calculate the allowable carbon dioxide emissions based on 0.504 pounds of carbon dioxide per horsepower hour (hp-hr):

$$17{,}666{,}346 \text{ hp-hrs} \times 30 \text{ years} \times \frac{0.504 \text{ lb } CO_2}{\text{hp-hr}} \times \frac{\text{ton}}{2{,}000 \text{ lbs}} = \frac{}{\text{year}}$$

133,558 tons of carbon dioxide allowable under the standard.

Therefore, the remaining emissions reduction needed to meet the standard under a conservative estimate of the reasonably likely operations is:

248,931 tons CO_2 - 133,558 tons of CO_2 = 115,373 tons over 30 years.

22,715 tons of CO2 from the KC7 were previously offset. The balance of the remaining emissions reduction to be offset is 92,658 tons over 30 years.

2. Subsection 2.

> "(2) For any remaining emissions reduction necessary to meet the applicable standard, the applicant may elect to use any of the means described in OAR 345-024-0630, or any combination thereof. The Council shall determine the amount of carbon dioxide emissions reduction that is reasonably likely to result from the applicant's offsets and whether the resulting net carbon dioxide emissions meet the applicable carbon dioxide emissions standard[.]" OAR 345-024-0620.

NW Natural wishes to meet the applicable standard by means of OAR 345-024-0630(2) by providing offset funds at the rate of 85 cents for each ton of remaining carbon dioxide emissions reduction needed, pursuant to the rate established in OAR 345-024-0580. This would result in a carbon dioxide offset fund of $78,759. This fund is allocated for the increase in carbon dioxide emissions resulting from the increase in capacity for the turbine at the energy facility subject to OAR 345 Division 24.

3. Subsection 3.

"(3) If the applicant elects to comply with the standard using the means described in OAR 345-024-0630(1) * * *." OAR 345-024-0620.

NW Natural does not elect to comply in this manner.

4. Subsection 4.

"(4) Before beginning construction, the certificate holder shall notify the Office in writing of its final selection of an equipment manufacturer and shall submit a written design information report to the Office sufficient to verify the facility's designed rate of fuel use and its nominal capacity for each fuel type. In the site certificate, the Council may specify other information to be included in the report. The Office shall use the information the certificate holder provides in the report as the basis for calculating, according to the site certificate, the amount of carbon dioxide emissions reductions the certificate holder must provide under OAR 345-024-0630[.]" OAR 345-024-0620.

The Design Information Report is attached as Exhibit I4.

5. Subsection 5.

"(5) In the site certificate, the Council shall specify the schedule by which the certificate holder shall provide carbon dioxide emission offsets. In the schedule, the Council shall specify the amount and timing of offsets the certificate holder must provide to a carbon dioxide emissions offset credit account. In determining the amount and timing of offsets, the Council may consider the estimate of total offsets that may be required for the facility and the minimum amount of offsets needed for effective offset projects. The Office shall maintain the record of the offset credit account." OAR 345-024-0620.

NW Natural assumes that the emission offset credit will be paid in a single installment.

Conclusion. As described above and below, taking into account offsets, the net carbon dioxide emissions rate of the Project will not exceed 0.504 pounds of carbon dioxide per horsepower hour. The Project complies with the standard for nongenerating energy facilities.

C. Means of Compliance for Nongenerating Energy Facilities (OAR 345-024-0630).

To comply with the carbon dioxide emissions standard for nongenerating energy facilities, an applicant may elect to use one of several listed methods.

Discussion.

1. Selection of Method; Monetary Path.

"(1) Implementing offset projects directly or through a third party * * *;

"(2) Providing offset funds, directly or through a third party, in an amount deemed sufficient to produce the reduction in carbon dioxide emissions necessary to meet the applicable carbon dioxide emissions standard according to the schedule set forth pursuant to OAR 345-024-0620(5). The applicant or third party shall use the funds as specified in OAR 345-024-0710. The Council shall deem the payment of the monetary offset rate, pursuant to OAR 345-024-0580, to result in a reduction of one ton of carbon dioxide emissions. The Council shall determine the offset funds using the monetary offset rate and the level of emissions reduction required to meet the applicable standard. If the Council issues a site certificate based on this section, the Council may not adjust the amount of the offset funds based on the actual performance of offsets;

"(3) Any other means that the Council adopts by rule * * *." OAR 345-024-0630.

NW Natural will provide offset funds directly, as outlined in Section IX.B.2 above.

2. Reporting.

"(4) Each year after beginning commercial operation, the certificate holder shall report to the Office data showing the amount and type of fossil fuels used by the facility and its horsepower-hours of operation. The Council shall specify in the site certificate how the Office shall use those data to calculate the gross carbon dioxide emissions from the facility during the report year and the net emissions in excess of the carbon dioxide emissions standard. The Office shall then subtract excess emissions from the carbon dioxide emissions offset credit account. The Council shall specify in the site certificate the minimum amount of carbon dioxide offset credits that a certificate holder shall provide to establish the offset credit account. The Council

may specify an amount of offset credits equal to the total offsets required for the facility. The Council shall specify the minimum amount of carbon dioxide offset credits that a certificate holder must maintain in the account and the minimum amount of carbon dioxide offset credits the certificate holder shall provide to replenish the account. The Office shall notify the certificate holder when it must replenish its offset credit account according to the conditions in the site certificate. The certificate holder shall maintain a positive balance in the offset credit account for 30 years, unless the Council specifies a different period in the site certificate[.]" OAR 345-024-0630.

NW Natural recommends the use of the simple equations outlined above to determine compliance, using the actual annual horsepower hours and actual annual million Btu of fuel consumption. NW Natural will increase the balance of the offset account by 92,658 tons of carbon dioxide. This is the projected increase in the 30-year offset for the Project operations for the updated operating scenario. For compliance calculations NW Natural will continue to use the 0.522 lb CO2/hp-hr allowable emission rate, until the previous allocation of offset tonnage is used completely. Given the relatively small amount of offset credits in comparison to that for a power plant, a single deposit with no future adjustments would be most practical in terms of the effort expended by the Council and NW Natural for compliance.

3. Offset Account.

"(5) If the certificate holder is replenishing its offset credit account by meeting the monetary path payment requirement described in OAR 334-024-0710, the certificate holder may replenish its offset credit account without amending the site certificate by using the calculation methodology detailed in conditions that the Council adopts in the site certificate[.]" OAR 345-024-0630.

NW Natural suggests increasing the balance of the offset account by 92,658 tons of carbon dioxide. This is the projected increase in the 30-year offset for the Project operations. Given the relatively small amount of offset credits in comparison to a power plant, a single deposit with no future adjustments would be most practical in terms of the effort expended by the Council and NW Natural for compliance.

4. Replenish Offset Account.

"(6) If the certificate holder proposes to replenish the offset credit account under OAR 345-024-0630(1), the Council may amend the site certificate conditions to ensure that the proposed offset projects are implemented[.]"

NW Natural does not wish to use this compliance method.

Conclusion. As described above, taking into account offsets, the net carbon dioxide emissions rate of the Project will not exceed 0.504 pounds of carbon dioxide per horsepower hour. The Project complies with the standard for nongenerating energy facilities.

X. OTHER STANDARDS AND PERMITS

A. Noise.

Discussion. OAR 340, division 35, contains the Oregon Noise Control Regulations. The Oregon Noise Control Regulations limit the allowable sound emissions of industrial and commercial noise sources in several ways: specifically, limits on allowable statistical sound levels, limits on allowable octave band sound pressure levels and limits on impulsive sound levels. For new noise sources located on previously unused sites, there is an additional limit on the allowable increase in two statistical noise descriptors. As demonstrated in the application for Amendment No. 8, Miller Station operations currently comply with the Oregon Noise Control Regulations. The Miller Station modifications proposed in this Amendment No. 9 request, while increasing the hours of certain operations, will not produce any increase in noise levels.

Conclusion. The Project will not increase noise levels and meets applicable noise regulations.

B. Air Quality.

Discussion. NW Natural has an existing air quality permit from the Department of Environmental Quality ("DEQ"), which was issued in 2001. This permit covers the facility modifications made in connection with Amendment No. 8. Likewise, the permit covers the planned activities proposed in this Amendment No. 9 request. Expected emissions of criteria pollutants as a result of Amendment No. 9 will not exceed the permit limits for these pollutants.

Conclusion. The Project will comply with its air quality permit.

XI. NOTICE LIST (OAR 345-027-0060(g))

OAR 345-027-0060(g) requires:

> "For an amendment to change the site boundary or to extend the deadlines for beginning or completing construction of the facility, an updated list of the owners of property located within or adjacent to the site of the facility, as described in OAR 345-021-0010(1)(f)."

Discussion. This Amendment No. 9 request does not propose a change to the site boundary. However, NW Natural reviewed the existing property owner list on file at the Office of Energy to ensure that the current owners are reflected. Attached as Exhibit 15 is a revised list.

Conclusion. This criterion is inapplicable. However, for convenience, NW Natural provides an updated property owner list.

XII. CONCLUSION

For the foregoing reasons, NW Natural respectively requests approval of Amendment No. 9.

LIST OF EXHIBITS

1 - Proposed Changes to Site Certificate
2 - Site Plan of Miller Station
3 - Project Vicinity Map
4 - GeoEngineers Structural Report for Miller Station
5 - GeoEngineers Structural Report for Gathering Lines
6 - GeoEngineers Soil Report for Gathering Lines
7 - Columbia County Land Use Approvals
8 - URS Environmental Studies Report
9 - NW Natural Annual Report
10 - Amendment No. 8 Bond
11 - Letters from Columbia County and City of Vernonia
12 - Letter from City of Vernonia
13 - Letter from Mist-Birkenfeld Rural Fire Protection District
14 - CO2 Design Information Report
15 - Property Owner list
16 - Approved Vibration Monitoring Program

Exhibit 1—Proposed Changes to Site Certificate

NW Natural requests the following amendments to the Site Certificate.

1. Adopt language authorizing the Project:

> "This amendment authorizes NWN to increase the allowed throughput at the Mist storage facility from 317 million cubic feet per day (MMcfd) to 515 MMcfd. The amendment authorizes the construction of improvements at Miller Station, including installation of new dehydration train facilities and gas quality and monitoring equipment. This amendment also authorizes NWN to develop related and supporting facilities associated with new underground storage reservoirs in the Calvin Creek storage area."

2. Amend the site-specific conditions under OAR 345-027-0023 to read:

> "Site Specific Conditions Under OAR 345-027-0023: Pursuant to amendment ~~8~~ 9, the permitted daily throughput of the facility is ~~317~~ 515 million cubic feet per day."

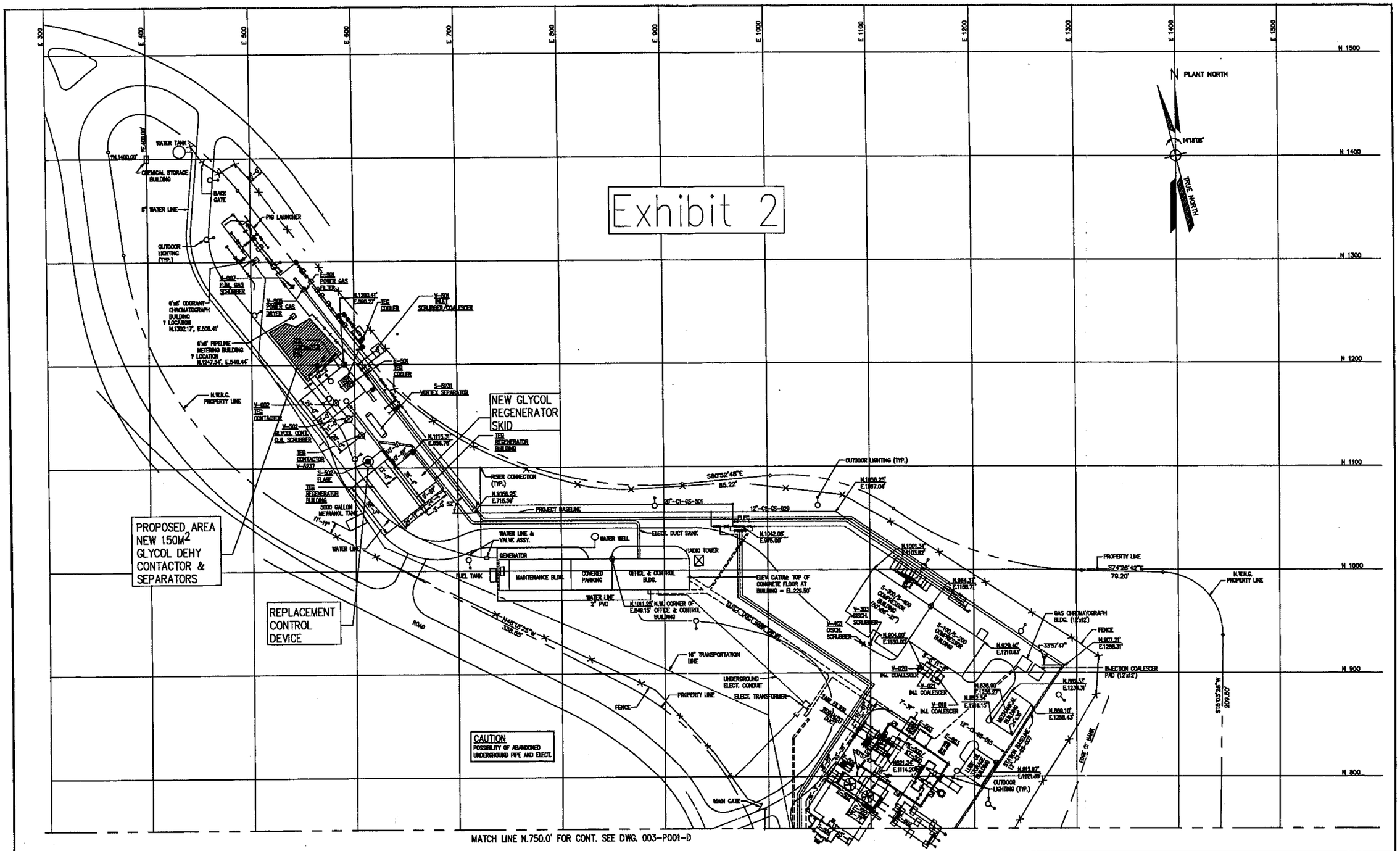
3. Amend the monitoring conditions, set forth in Amendment No. 1 to the Underground Storage Facility Site Certification Agreement for the Mist Site, as follows:

> "[4]d. Section IV.C.5 is amended to read as follows: "Design, construction, and operation of the underground storage reservoir and related supporting facilities shall incorporate a monitoring program to ensure the public health and safety and to detect leakage using the best available technology and testing procedures available as of the date of this Certificate or as described in ONG's application and supporting testimony relating to OAR 345-100-040(6) and (7). ~~ONG shall recommend for EFSC approval a program to evaluate reported local unusual vibrations. The program shall include reports not less than annually to EFSC. If ONG or EFSC believes there is a correlation between reported vibration and storage reservoir activity, ONG shall recommend to EFSC a program to install and monitor seismic instruments.~~"

4. Adopt a condition of approval:

> "Before construction or operation of the Busch gathering line and associated facilities, NWN will obtain conditional use approval from Columbia County authorizing the injection/withdrawal well site 24H-15-65."

Exhibit 2



REFERENCE DRAWINGS	No.	DATE	REVISIONS	REV.BY	CHK.BY	EQ.APP.	PROJ.APP.
	7	3/14/02	REVISED PER AS-BUILT	DDSI	JLC		

No.	DATE	REVISIONS	REV.BY	CHK.BY	EQ.APP.	PROJ.APP.
0	6/27/88	ISSUED FOR CONSTRUCTION	KCB	RTS		
1	7/20/88	DWG. OF RECORD	JPG	RTS		
2	8/18/97	REDRAWN & REVD. FOR KTIF JOB 2383 (IFA)	VMH	DKB	JMF	DC
3	8/11/97	ISSUED FOR CONSTRUCTION- KTIF JOB 2383	VMH	JMF	DB	DC
4	9/18/97	REVISED FOR CONSTRUCTION	DKB	JF	DB	DC
5	4/16/01	AS-BUILD, PHASE III EXPANSION	GB	JC	RLB	
6	6/25/01	REVISED FOR MILLER STATION 317 MMSCFD EXP.	GW	FJR		GDS

ENGINEERING RECORD		DATE
DRAWN BY	MBB	6/20/88
CHECKED BY	KCB	6/21/88
TECH. APP.	RTS/DGF	6/21/88
PROJECT APP.	DC	6/18/97
SCALE: 1"=40'-0"		
CAD: P002		

Northwest Natural Gas
220 N.W. Second Avenue / Portland, Oregon 97209

PROJECT:
MIST GAS STORAGE PROJECT
MILLER STATION
EXPANSION

KTI FISH
A MANNESMANN COMPANY
KTI FISH INC.
HOUSTON, TEXAS

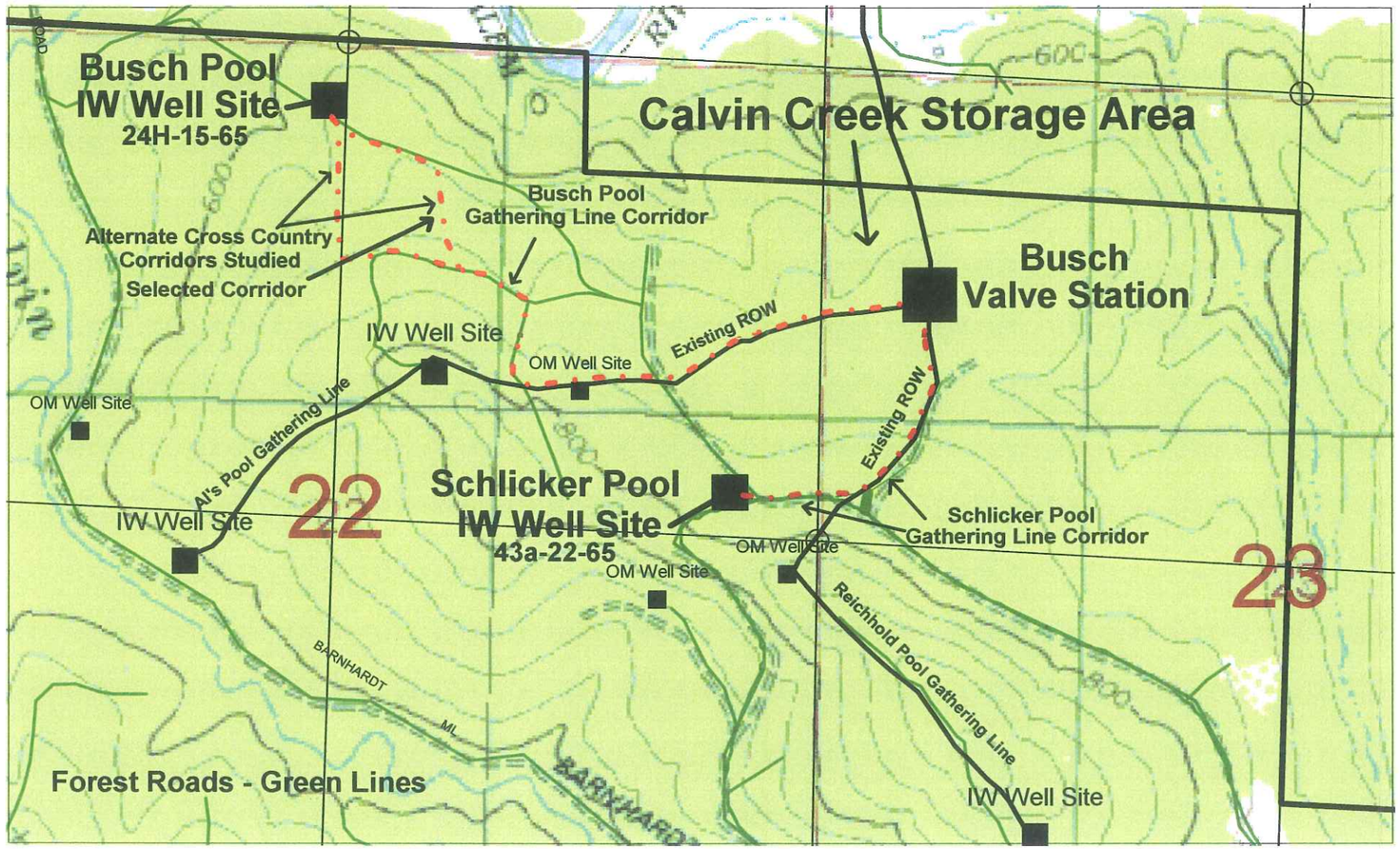
SITE PLAN

JOB NO.	DWG. NO.	REV.
2383.00R	003-P002-D	7

DKB 08/22/97 10:58 P002.dwg

X/Y:
Feet

N



NW Natural
Exhibit 3 - Amendment 9 Calvin Creek Storage Area
Scale = 1:9600 0 800 1600 2400 ft
Project Vicinity Map

AA 0

GeoEngineers

August 20, 2003

Northwest Natural
220 Northwest Second Avenue
Portland, Oregon 97209

Attention: Jack Meyer

Foundation Report Update
Miller Station Gas Compression Facility
Mist, Oregon
File No. 6024-040-01

We understand that Northwest Natural plans to expand the Miller Station Gas Compression Facility (Miller Station) to increase the gas withdrawal capacity of the Mist Gas Storage System from 317 million standard cubic feet per day (MMscfd) to 515 MMcfd. As part of the expansion project, the following equipment will be added to Miller Station: (1) a contact tower; (2) contact tower inlet vortex separator; (2) contact tower outlet vortex separator; and (3) a glycol after cooler heat exchanger. Table 1 presents the anticipated equipment loads provided by Northwest Natural.

Table 1
Equipment Load Summary

Description	Weight (kips)
Contact Tower	62
Contact Tower Inlet Vortex Separators	6
Contact Tower Outlet Vortex Separators	6
Glycol After Cooler Heat Exchanger	3

This letter summarizes our geotechnical review of the planned Miller Station Gas Compression Facility Expansion relative to the foundation design and construction recommendations provided in the following documents:

1. Dames & Moore, "Geotechnical Investigation, Miller Station Expansion and Calvin Creek Pipeline Alignment, Mist Underground Storage Project, Mist, Oregon." January 24, 1997.
2. Dames & Moore, "Exhibit G – Geology, Slope Stability, and Seismicity, Mist Underground Storage Project, Mist, Oregon." February 21, 1997.

GeoEngineers, Inc.
7504 SW Bridgeport Road
Portland, OR 97224
Telephone (503) 624-9274
Fax (503) 620-5940

3. GeoEngineers, "Foundation Report Update, Miller Station Gas Compression Facility, Mist, Oregon." August 6, 2001.

The January 24, 1997 report addresses the installation of two 80 kip turbine driven compressors, a 95 kip glycol dehydration unit and other appurtenant equipment similar to the planned equipment listed in Table 1. From a geotechnical perspective, the proposed foundation loads are similar for both the existing and proposed equipment. Consequently, the geotechnical engineering recommendations provided in the January 24, 1997 geotechnical report are appropriate for use in design and construction of the proposed expansion.

The seismicity and seismic zone at Miller Station are unchanged since the January 1997 report was written. However, the Uniform Building Code (UBC) method of computing spectral accelerations has been changed. GeoEngineers provided the updated seismic parameters in the August 6, 2001 Foundation Update Report. The updated parameters are provided in Table 2.

Table 2
Updated Seismic Design Parameters

Parameter		1997 UBC
Seismic Zone Factor	Z	0.30
Soil Profile Type	S	S_c
Seismic Coefficient	C_a	0.33
Seismic Coefficient	C_v	0.45

It is our opinion that the recommendations in the January 24, 1997 geotechnical report and the August 6, 2001 Foundation update report remain appropriate for use in design of the proposed expansion. Furthermore, it is our opinion that proposed construction will not produce or contribute to seismic hazards.

We trust that this information meets your current needs. Please do not hesitate to call if you have any questions or if we can be of further assistance.

Yours very truly,

GeoEngineers, Inc.

EXPIRES: 6-30-04

Brett A. Shipton P.E.
Project Engineer

Timothy W. Blackwood, P.E., C.E.G.
Associate

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Four copies submitted

GeoEngineers

August 8, 2003

Northwest Natural
220 Northwest Second Avenue
Portland, Oregon 97209

Attention: Mr. Jack Meyer

GeoEngineers is pleased to submit four copies of our Geologic Hazard Evaluation intended to fulfill the requirements of the Energy Facility Siting Council (EFSC) site certificate amendment submittal for the proposed Busch and Schlicker Pool Development Project. This work was performed in accordance with our June 5, 2003 proposal.

We appreciate the opportunity to be of continued service. Please call if you have any questions or if we can be of further assistance.

Yours very truly,

GeoEngineers, Inc.

T. W. Blackwood

Timothy W. Blackwood, P.E.
Associate

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APPENDIX

GEOLOGIC SEISMIC HAZARD EVALUATION
BUSCH AND SCHLICKER POOL DEVELOPMENT
MIST, OREGON
FOR
NORTHWEST NATURAL

1.0 INTRODUCTION

This report presents the results of a geologic and seismic hazard evaluation for the proposed Busch and Schlicker Pool Development project. This evaluation was performed to meet Northwest Natural's requirements for siting the proposed Busch and Schlicker Pool Development. Northwest Natural's standards meet or exceed the Energy Facility Siting Council's (EFSC) certificate application requirements. Recommendations for mitigating geologic and seismic hazards are provided in each section, where appropriate. This report was prepared by qualified GeoEngineers' personnel. Appendix A provides a biosketch of each person that has performed work on this study.

The information used in this evaluation is based on available geologic maps, geologic and geotechnical reports pertinent to the alignment, historical aerial photographs, a geologic surface reconnaissance of the planned alignment and nearby subsurface explorations completed for a related project. Section 10.0 provides a list of references reviewed for this evaluation.

2.0 PROJECT DESCRIPTION

The Busch and Schlicker Pool Development project includes construction of two injection well sites and connecting pipelines. Approximately 4,000 feet of potential gathering line corridors are included in this evaluation. Figure H-1 shows the proposed location of the well sites and potential gathering line corridors.

3.0 GEOLOGIC CONDITIONS

3.1 GEOLOGIC SETTING

The proposed facility is located within mountainous terrain of the Oregon Coast Range. In Oregon, the Coast Range is a belt of moderately high mountains, extending along a north-south axis between the Columbia River and the Klamath Mountains. This anticlinal structural chain is underlain by early Tertiary pillow basalts, lavas, and basalt breccias, erupted underwater and as oceanic islands, and later accreted onto the western edge of the North American continent by the subduction of the Juan de Fuca tectonic plate.

Because of the presence of natural gas in economic quantities, Columbia County has been subject to several generations of geologic research. The understanding of rock units and structures has progressed from the earlier work of Warren and Norbisrath (1946); to more intensive study in the 1970s by Van Atta (1971), Niem and Van Atta (1973), and Newton and Van Atta (1976); through the master's theses of Kelty (1981), Kadri (1982), and Ketrenos (1986); and most recently to the compilations of Niem and others (1990, 1994). Geologic mapping has been aided

by the large number of wells drilled and geophysical surveys conducted in support of natural gas exploration.

3.2 STRATIGRAPHY

In the Mist area, basement rocks of the Tillamook Volcanics (upper to middle Eocene), which are remnants of a large mid-ocean volcanic complex, are overlain by several thousand feet of marine sedimentary rocks deposited on the emerging continental shelf. These marine sedimentary rocks have been divided into a number of formations, three of which are significant to this project: the Cowlitz Formation, Keasey Formation, and the informal Sager Creek Formation. The Cowlitz Formation (upper Eocene) occurs deep in the sedimentary sequence; it includes shallow-marine to deltaic sandstones that serve as the primary hydrocarbon reservoir rocks, capped by overlying deep-water mudstones and siltstones. The unconformably overlying Keasey Formation (upper Eocene) is composed of thinly bedded tuffaceous mudstone (and some sandstone) deposited in outer-shelf marine waters. Rocks of the Sager Creek formation (informal; upper Eocene) consist of thinly bedded siltstone, mudstone, and some sandstone, deposited by deep-marine turbidite flows channelized into Keasey Formation sediments. The project site is mapped as being underlain by the Sager Creek Formation and the area to the east of the project site is underlain by the Keasey Formation. A geologic map of the site is presented in Figure H-2.

The Keasey Formation, typically about 1,300 to 1,600 feet thick, is composed of gray tuffaceous claystone and mudstone, derived largely from volcanic ash transported from the ancestral Cascade volcanoes. The deposit is generally massive, with no open joints and few thin shear planes. The Sager Creek formation, also up to several thousand feet thick, is of approximately the same depositional age as the Keasey, but contains interbedded deep-marine sandstones and mudstones deposited by turbidite flows in channels cut into the Keasey shelf sediments. Keasey and Sager Creek materials can be considered either soft rock or stiff soil.

3.3 GEOLOGIC STRUCTURE

The Mist area is located on the Nehalem arch, a high area within the basement Tillamook Volcanics connecting the Willapa Hills and Northern Coast Range uplifts (north and south, respectively), and separating the sediment-filled Nehalem and Astoria forearc basins (east and west, respectively; Niem and others, 1994). Uplift of the Nehalem Arch extending from the late Eocene slowly restricted the basins of marine deposition to the west and north and also created faulting which is present in the deeper rocks underlying the site. The latest uplift of the Coast Range occurred in the late Neogene.

Many faults have been identified in the Mist area, because of the intense drilling and geophysical work related to gas exploration; most (if not nearly all) are older faults, not exposed at the surface. A series of mostly NW-SE and W-E normal faults cuts across the Nehalem Arch, forming the Nehalem graben, generally coincident with the Nehalem River valley between Mist and Birkenfeld (Niem and others, 1990). Disruption of rock layers along faults causes zones of

weakness that are exploited by erosion, commonly becoming stream valleys; a fault seems to be responsible for the valley of Lindgren Creek (Ketrenos, 1986).

In general, major strata are only gently deformed. However, Ketrenos (1986) stated that dips in bedding planes are generally about 5 to 10° to the northwest, but that attitudes change abruptly. The extensive old faulting in the area has also contributed to some local dips, and probably to local fault-zone deformation.

3.4 SOIL

Near-surface soil conditions along the pipeline alignment were investigated by reviewing Soil Conservation Service (SCS) soil surveys and by field observation of road cuts. In general, the soils underlying the site consist of silt and clay derived from fine-grained marine sediments and are mapped by the SCS as Mayger silt loam (Smythe, 1988).

Mayger silt loam is a poorly drained soil on smooth, broad ridgetops of mountains with slope gradients of 3 to 30 percent. The soil consists of approximately 12 inches of grayish brown silt loam overlying yellowish brown silty clay loam and mottled silty clay to a depth of approximately 3 feet. Below 3 feet, the soil grades to grayish brown mottled clay to a depth of approximately 5 feet.

3.5 GROUNDWATER

Although regional groundwater is probably located at least several hundred feet below the ground surface, it is possible that perched groundwater conditions exist within lenses of granular marine sediments of the Sager Creek Formation underlying the site. Perched groundwater was encountered locally at a depth of approximately 9 feet in borings completed for a nearby geotechnical project located approximately 0.5 miles east of the project site at slightly higher elevation. Seeps and springs may be present in the project area, particularly during periods of prolonged rainfall.

4.0 TOPOGRAPHY

4.1 GENERAL

The area is located about 2 to 3 miles west of Mist, Oregon along gentle to moderate slopes south of the Nehalem River Valley. The site is at about 600 to 800 feet elevation on the north flank of a ridge located south of the confluence of Calvin Creek and the Nehalem River. Figure H-1 shows the topographic contours of terrain within the project area. In general, the natural slopes have gradients typically between 10 and 40 percent and locally up to 60 percent approaching stream channels and valley walls. Much of the proposed pipeline corridors follow established logging roads, however, where gradients are between 0 and 10 percent.

Landforming processes in the project area has mainly involved weathering, stream erosion, and mass wasting, producing the current dissected topography. In general, the soft Sager Creek rocks are relatively weak, and have been eroded into mostly moderate-gradient slopes by stream incision, soil creep and sliding.

Based on review of aerial photographs and site reconnaissance, we identified large landslide complexes along the south (left) valley wall of the Nehalem River as shown in Figure H-2. These landslides were likely caused by erosion and undercutting of the relatively weak sedimentary bedrock along the valley wall by the Nehalem River. Section 5.3 provides a discussion of landslide hazards that could affect the planned facility.

5.0 GEOLOGIC AND SOIL HAZARD ASSESSMENT

This section addresses Section (G) of the Exhibit H requirements, which concerns non-seismic geologic hazards, which could affect the planned construction.

5.1 EROSION

Erosion can be caused by air or water. Wind erosion is not a significant concern because of the fine-grained surface soils, tree cover along and adjacent to most of the alignments, post construction revegetation of the pipeline trench strip, and the subgrade protection measures that will be implemented to provide equipment access.

The soils at the project area are highly susceptible to water erosion. However, where the alignment follows the existing roadways, water erosion will be minimal because of existing surface water drainage systems and crushed rock road surfacing. In overland segments, the pipeline alignment will be relatively narrow and will be protected from erosion using current erosion control best management practices (BMPs). A detailed erosion and sediment control plan will be completed to fulfill requirements of the National Pollutant Discharge Elimination System (NPDES) permit 1200-C. Erosion control measures to be employed during construction include:

- Installing sediment fence/straw bale barriers at downslope side of excavations and disturbed areas.
- Straw mulching and discing at locations adjacent to the road that have been affected.
- Providing temporary sediment traps downstream of intermittent stream crossing.
- Planting designated seed mixes at affected areas adjacent to the road.

Exposed soil areas that are affected by the construction will be seeded when there is adequate soil moisture. They will be reseeded in the spring if a healthy cover crop does not grow. The sediment fences and check dams will remain in place until the affected areas are well vegetated. Whenever feasible, overland corridors will be constructed with waterbars so that surface drainage continues to natural drainage patterns, with minimal diversions through ditches and culverts. Regular maintenance of drainage facilities will ensure continued proper operation.

5.2 GROUNDWATER

The backfilled pipeline trench can intercept near-surface ground water and rainfall infiltration. The relatively higher hydraulic conductivity of the trench backfill creates a preferential flow path along the pipeline. Significant hydraulic head can develop at the toe of sloping segments, where water can be impounded in the backfill soils. We recommend that water

breaks be installed along the pipeline to retard ground water flow along the pipeline and to reduce the potential for backfill erosion.

A pipeline water break typically consists of densely placed sandbags surrounding and covering the pipe to near the ground surface. Waterbreaks will be constructed and spaced according to Northwest Natural's standard construction procedures.

Outlet pipes should be provided in very wet areas and areas affected by springs identified during construction, to dispose of water trapped above a water break. The collection end of the outlet pipe can consist of either (1) a short segment of perforated drainage pipe wrapped with geotextile filter or (2) the open end of the non-perforated outlet pipe covered with geotextile filter. Filter fabric is necessary to reduce the potential for erosion of the backfill soils.

The outlet pipe should discharge collected water far from the pipeline at a location that will not cause erosion or allow the water to flow back to the pipe trench. Natural drainage features are the preferred location for outlet pipe discharge points. Energy dissipaters consisting of a few 6- to 24-inch-diameter boulders placed below the pipe should be considered if the outlet pipe must discharge near erodable soils.

5.3 SLOPE STABILITY

5.3.1 Landslides

GeoEngineers evaluated the presence of landslides in the project area based on historical aerial photograph interpretation and site reconnaissance of the entire alignment. We identified four landslides during our evaluation. In general, the landslides in the project vicinity occur within the oversteepened valley walls of the Nehalem River as shown in Figure H-2. The proposed pipeline corridors and wells were sited to avoid these landslides and/or unstable slopes. We classified the landslides based on our observations in general accordance with the Unified Landslide Classification System (modified from Wieczorek, 1984). The following table summarizes the landslides that we observed near the planned facilities.

Table H-1
Observed Landslides

Site ID	Location	Proximity to Proposed Pipeline	Landslide Classification	Description	Potential Risk
LS-1	Northwest directional well site.	Approximately 500 feet North.	Dormant-Mature, rotational earth slide	Characterized by weathered, subdued headscarp and slightly irregular, rolling topography. Vegetated with young trees and grasses following logging in 2001(?). No indications of recent movement.	Low
LS-2	North of gathering line corridors, east well site.	Greater than 100 feet to North.	Dormant-Mature, rotational earth slide	Small feature with weathered headscarp, possibly along previous Nehalem River cutbank. Vegetated with young trees. No indications of recent movement.	Low
LS-3	Nehalem River Cvalley wall north of gathering line corridors	Approximately 110 feet northeast.	Dormant-Mature, rotational earth slide	Characterized by steep, unstable scarp and hummocky slide mass. Scarp has been sculpted by several recent debris slides, as indicated by shallow, unvegetated slide scars. However, no indication or recent movement of slide mass, which was deposited within the Nehalem River flood plain.	Low
LS-4	Southeast directional bore area	Approximately 600 feet south of well site.	Dormant-Mature, rotational earth slide	Characterized by midslope bench situated below weathered, subdued headscarp inclined at gradients of approximately 50%. Landslide margins are vegetated with timber and scattered old growth stumps. No indications of recent movement.	Low

Landslide LS-3 appears to be a dormant-mature landslide with a relatively low potential for future activity. An outside meander of the Nehalem River is currently at the toe of the slide mass, but we did not observe significant erosion at the time of our visit. The oversteepened scarp is unstable and prone to shallow, rapid debris sliding as indicated by unvegetated, shallow debris slide scars throughout the slope. However, the shallow sliding is probably not related to large-scale movement of the primary slide mass. Exposures of laminated siltstone and sandstone

within the scarp, dip into slope at an angle of approximately 10 degrees. Because we did not observe adverse bedding, and the Nehalem River is not eroding the base of the hillside, it is our opinion that there is a low potential for large scale, deep-seated landsliding from the scarp slope. There is potential, however, for additional shallow sliding and surface erosion, particularly near the crown of the scarp, where the slope gradient is steepest at approximately 100 percent, and near vertical locally.

The proposed pipeline alignment is located approximately 110 feet west of the slide scarp crown. Based on our observations, it is our opinion that there is a low potential for damage to the pipe as a result of shallow sliding from the slide scarp.

5.3.2 Potential Adverse Impacts to Slope Stability

Steep, marginally stable slopes can be destabilized by grading activities associated with construction corridors. We did not identify any steep, marginally stable slopes along the proposed pipeline alignments or well sites. The proposed pipeline alignments traverse overland across moderately sloping ground or are located along existing roads where no grading will be required.

Although the slopes at the site appear stable, the following measures will be included in the final design of construction corridors along overland segments to minimize the potential to adversely affect slope stability:

- Permanent cut and fill slopes will be inclined at a maximum gradient of 2H:1V (Horizontal:Vertical).
- Fill slopes will be keyed into undisturbed, firm native material.

Corridors on sloping ground will be constructed with waterbars to prevent capturing, concentrating and rerouting surface water runoff. Waterbar spacing will be based on the slope gradient of the corridor in accordance with Northwest Natural's standard construction procedures.

6.0 SEISMICITY

This section describes the general seismicity of the alignment and summarizes the selection of the maximum credible earthquakes (MCE) and maximum probable earthquake (MPE) for use in evaluating seismic vulnerability. Earthquake hazards, including ground shaking caused by the selected MCE and MPE, are addressed in Section 7.0.

6.1 HISTORICAL SEISMICITY

EFSC requires that earthquakes generating Modified Mercalli (MM) shaking intensity of III or greater be evaluated. EFSC requires that earthquakes with epicentral distances less than and greater 50 miles from the site be considered separately. Historical records of regional seismicity indicate that several measurable, small earthquakes have occurred within 50 miles of the site since the mid-1800s. Table H-2 provides a list of the earthquakes that had a reported MM epicentral shaking intensity of III or greater.

Table H-3 provides a list of recorded earthquakes at a distance greater than 50 miles from the site that caused an MM III or greater shaking intensity at the site. As required by EFSC, the shaking intensities reported Table H-3 are epicentral shaking intensities. More recent earthquakes are reported in terms of Moment magnitude (M_w). For earthquakes that were reported in terms of moment magnitude (M_w), the Boore et al (1997) distance-attenuation relationship was used to calculate peak ground acceleration (PGA) at the site using the reported coordinates. A relationship between PGA and MM intensity (Kramer, 1996) was then used to estimate the MM shaking intensity at the site associated with the computed PGA for these events at the site. Review of earthquake databases yielded 339 such events associated with the 1980 Mt. St. Helens eruption that have an M_w of less than 5.0 that may have caused MM III or greater at the site. For conciseness and clarity only the earthquakes with a M_w of 5.0 and greater that are associated with the Mt. St. Helens eruption are included in Table H-3.

Information in Tables H-2 and H-3 was developed by screening earthquake databases developed by the Oregon Department of Geology and Mineral Industries (DOGAMI) (Johnson et al., 1994), the USGS National Earthquake Information Center (USGS, 2001) and the Advanced National Seismic System (ANSS, 2003).

TABLE H-2

RECORDED EARTHQUAKES WITHIN 50 MILES OF THE SITE WITH A REPORTED EPICENTRAL DISTANCE SHAKING INTENSITY OF MM III OR GREATER[1]

YEAR	MONTH	DAY	LATITUDE	LONGITUDE	MAGNITUDE	EPICENTRAL MM INTENSITY
1841	12	2	45.63	122.67	--	V
1877	10	12	45.43	122.80	--	III
1877	11	30	45.43	122.80	--	III
1879	0	0	45.43	122.80	--	IV
1882	5	1	45.43	122.78	--	III
1884	1	4	45.43	122.78	--	IV
1885	10	10	45.43	122.78	--	III
1892	2	4	45.43	122.80	--	VI
1897	12	6	45.53	123.10	--	V
1897	12	7	45.53	123.17	--	III
1898	2	22	45.43	122.80	--	IV
1898	2	22	45.43	122.80	--	III
1904	6	16	45.43	122.78	--	IV
1907	5	27	45.43	122.77	--	III
1909	12	31	45.45	122.80	--	IV
1910	2	15	45.45	122.78	--	IV
1914	3	22	45.45	122.78	--	IV
1914	9	5	45.45	122.78	--	III
1915	5	19	45.45	122.77	--	V
1915	11	18	45.87	122.67	--	V
1918	2	13	45.45	122.77	--	III
1920	11	9	45.48	122.80	--	III
1921	3	4	45.48	122.80	--	III
1921	9	22	45.48	122.78	--	IV
1922	3	27	45.48	122.78	--	IV
1922	5	15	45.48	122.77	--	IV
1924	9	19	45.73	122.55	--	IV
1927	3	28	46.30	124.07	--	IV
1932	1	14	45.48	122.77	--	IV

TABLE H-2

RECORDED EARTHQUAKES WITHIN 50 MILES OF THE SITE WITH A REPORTED EPICENTRAL DISTANCE SHAKING INTENSITY OF MM III OR GREATER[1]

YEAR	MONTH	DAY	LATITUDE	LONGITUDE	MAGNITUDE	EPICENTRAL MM INTENSITY
1933	11	23	45.48	122.77	--	III
1938	7	23	46.17	123.83	--	IV
1939	2	14	45.42	123.92	--	IV
1939	4	13	45.50	122.80	--	III
1939	11	15	45.50	122.80	--	III
1941	2	16	45.50	122.77	--	III
1941	7	26	45.40	122.92	--	IV
1941	10	31	45.53	122.62	--	IV
1941	12	29	45.50	122.77	--	VI
1942	11	1	45.60	122.70	--	V
1948	2	13	46.63	123.07	--	IV
1948	3	1	45.67	123.17	--	IV
1948	8	7	46.67	122.97	--	III
1953	12	15	45.50	122.77	--	VI
1954	11	11	46.68	123.73	--	III
1956	12	15	46.15	122.90	--	IV
1957	11	29	45.52	122.78	--	III
1959	8	4	45.52	122.78	--	III
1960	3	5	45.62	122.67	3.5	IV
1961	5	26	46.00	122.30	--	IV
1961	6	2	46.00	122.30	--	III
1961	11	7	45.50	122.67	--	V
1961	11	7	45.70	122.40	5	VI
1961	11	29	45.42	122.67	--	IV
1961	12	15	45.75	122.87	--	III
1962	8	11	46.00	123.50	--	VI
1962	11	3	46.00	122.30	--	IV
1962	11	5	45.55	122.60	5	VII
1963	3	2	45.50	122.60	--	IV
1963	12	27	45.70	123.40	4.5	VI

TABLE H-2

RECORDED EARTHQUAKES WITHIN 50 MILES OF THE SITE WITH A REPORTED EPICENTRAL DISTANCE SHAKING INTENSITY OF MM III OR GREATER[1]

YEAR	MONTH	DAY	LATITUDE	LONGITUDE	MAGNITUDE	EPICENTRAL MM INTENSITY
1964	1	26	46.10	122.40	--	V
1964	10	1	45.70	122.80	5.3	V
1964	10	12	45.70	122.80	4.3	--
1968	1	27	45.60	122.60	3.7	IV
1968	5	13	45.60	122.60	3.8	IV
1969	3	5	45.63	122.82	3.5	III
1970	6	25	45.50	122.75	3.6	IV
1972	11	17	45.87	122.63	3.1	--
1974	7	29	45.90	122.60	3	--
1977	7	23	46.30	123.28	3.6	--
1977	10	7	45.95	122.25	4.1	--
1978	6	29	46.10	122.92	3.8	--
1978	6	30	46.35	123.20	3.6	--
1979	3	11	46.44	122.40	3.9	--
1980	3	25	46.58	123.00	3.5	--
1980	3	25	46.60	123.07	3.8	--
1980	3	25	46.60	123.03	3.3	--
1980	3	26	46.58	123.02	3.7	--
1980	3	26	46.60	123.10	3.3	--
1980	3	26	46.60	123.07	3.3	--
1980	3	26	46.60	123.03	3	--
1980	3	26	46.60	123.03	3.3	--
1980	3	26	46.60	123.00	3.5	--
1980	3	26	46.22	122.30	3.8	--
1980	3	26	46.20	122.25	4.5	--
1980	3	27	46.08	122.43	4	--
1980	5	12	46.25	122.30	4.4	--
1984	6	4	46.21	123.01	3.7	--
1986	3	11	45.94	122.42	3.1	--
1987	10	2	45.63	122.65	3	--

TABLE H-2

RECORDED EARTHQUAKES WITHIN 50 MILES OF THE SITE WITH A REPORTED EPICENTRAL DISTANCE SHAKING INTENSITY OF MM III OR GREATER[1]

YEAR	MONTH	DAY	LATITUDE	LONGITUDE	MAGNITUDE	EPICENTRAL MM INTENSITY
1989	8	1	45.61	122.46	3.7	--
1990	4	6	45.47	123.55	3.2	--
1990	6	18	45.99	123.59	3	--
1991	3	5	45.79	122.68	3.1	--
1991	7	22	45.64	122.87	3.5	--
1991	10	18	45.63	122.90	3.1	--
1991	10	21	45.63	122.89	3	--
1992	3	15	46.22	123.25	3	--
1995	6	13	45.92	122.98	3	--
1999	7	16	45.65	122.77	3.1	--
2003	4	24	45.64	122.75	3.9	--

[1] PGA >0.008g is estimated to cause ground shaking equal to MMIII.

TABLE H-3

RECORDED EARTHQUAKES GREATER THAN 50 MILES FROM THE SITE ESTIMATED TO HAVE CAUSED GROUND SHAKING MORE INTENSE THAN MMIII AT THE SITE

YEAR	MONTH	DAY	LATITUDE	LONGITUDE	MAGNITUDE	EPICENTRAL MM INTENSITY
1859	4	2	47.00	123.00	--	V
1859	4	2	47.05	122.88	--	V
1877	10	12	45.50	122.50	--	VII
1885	10	9	47.00	123.00	--	V
1892	4	17	47.00	123.00	--	VI
1895	2	25	46.50	122.40	--	V
1896	4	2	45.20	123.20	--	VI
1914	9	5	47.00	123.00	--	V
1917	3	28	46.80	122.00	--	V
1917	6	9	46.80	122.00	--	V
1917	11	12	46.80	121.80	--	V
1917	11	14	46.80	121.80	--	V

TABLE H-3

RECORDED EARTHQUAKES GREATER THAN 50 MILES FROM THE SITE ESTIMATED TO HAVE CAUSED GROUND SHAKING MORE INTENSE THAN MMIII AT THE SITE

YEAR	MONTH	DAY	LATITUDE	LONGITUDE	MAGNITUDE	EPICENTRAL MM INTENSITY
1918	6	21	46.50	121.70	--	V
1926	10	17	45.73	121.48	--	V
1930	7	19	45.00	123.20	--	VI
1939	11	13	47.20	123.00	--	VII
1944	3	5	45.00	123.42	--	V
1944	3	31	47.00	123.00	--	V
1944	12	7	47.00	123.90	--	VI
1945	4	29	47.40	121.70	5.5	VII
1945	4	29	47.40	121.70	--	VII
1946	2	15	46.87	122.27	--	VI
1946	2	15	47.30	122.90	--	VII
1946	2	16	47.30	122.90	5.8	--
1946	2	23	47.05	122.87	--	VI
1947	4	2	47.05	122.88	--	V
1949	4	13	47.10	122.70	7.1	VIII
1957	11	16	45.30	123.80	4.5	V
1958	10	7	46.70	124.00	--	VI
1959	11	23	46.70	121.70	--	V
1960	1	7	46.70	122.70	--	VI
1960	11	8	45.10	125.20	4.9	--
1960	11	8	44.90	125.18	5.0	--
1961	1	4	46.00	122.10	--	V
1961	2	2	46.70	122.80	--	V
1961	9	16	46.00	122.00	--	VI
1961	9	17	46.00	122.00	--	VI
1961	11	6	45.70	122.70	5	VI
1962	12	31	47.10	122.00	5.0	VI
1963	3	7	44.90	123.50	4.6	V
1965	4	29	47.40	122.40	6.5	VIII

TABLE H-3

RECORDED EARTHQUAKES GREATER THAN 50 MILES FROM THE SITE ESTIMATED TO HAVE CAUSED GROUND SHAKING MORE INTENSE THAN MMIII AT THE SITE

YEAR	MONTH	DAY	LATITUDE	LONGITUDE	MAGNITUDE	EPICENTRAL MM INTENSITY
1968	11	30	46.50	122.40	4.3	V
1974	4	20	46.82	121.62	4.6	--
1978	3	11	47.42	122.71	4.8	--
1980	4	1	46.22	122.18	5.0[2]	--
1980	4	3	46.22	122.22	5.0[2]	--
1980	4	4	46.12	122.02	5.0[2]	--
1980	4	25	46.25	122.17	5.0[2]	--
1980	5	8	46.22	122.17	5.0[2]	--
1980	5	18	46.20	122.18	5.3[2]	--
1981	2	13	46.35	122.24	5.5	--
1981	5	13	46.36	122.25	4.5	--
1981	5	28	46.53	121.40	4.6	--
1981	5	28	46.53	121.39	5.0	--
1982	3	1	46.35	122.25	4.4	--
1989	12	24	46.65	122.12	4.9	--
1993	3	25	45.04	122.61	5.6	VI
1995	1	29	47.39	122.36	5.0	--
1999	7	3	47.07	123.46	5.8	--
2001	2	28	47.15	122.73	6.8	--
2001	6	10	47.17	123.50	5.0	--
2002	6	29	45.33	121.69	4.5	--

[1] PGA > 0.008g is estimated to cause ground shaking at the site equal to MMIII.
[2] Earthquakes associated with the Mt. St. Helens eruption that have a moment magnitude 5.0 or less are not included.

The intensity values reported in Tables H-2 and H-3 are the maximum values for the event at the epicenter. Shaking levels felt at the site are likely less than those reported in the tables. For reference, an earthquake with an epicentral intensity of V causes minor to moderate building damage at the epicenter and is generally felt by people up to about 50 to 90 miles away. Intensity VI earthquakes can ring church bells and move dishes off of shelves, but generally does not cause widespread structural damage to well constructed facilities.

As shown in Table H-2, recorded earthquakes within 50 miles of the site generally consist of small events with no apparent pattern or regular recurrence interval. The small magnitude of reported events suggests that the alignment area has relatively low seismic activity. Magnitudes are not reported for many pre-1962 earthquakes because seismic monitoring equipment had not yet been installed in the region. Where reported, the magnitudes for pre-1962 events are estimated based on correlations with the maximum severity of reported shaking.

6.2 DESIGN EARTHQUAKES

The current understanding of seismicity in Oregon considers three main seismic sources. Two of the possible earthquake sources are associated with the Cascadia subduction zone (CSZ), and the third source is comprised of shallow earthquakes that occur within the North American crust. These events are anticipated have different ground shaking effects on the site, each earthquake scenario should be considered individually as the maximum credible earthquake (MCE). The three earthquake scenarios are discussed in the following paragraphs.

6.2.1 Regional Events

The CSZ is the region where the Juan de Fuca Plate is being subducted beneath the North American Plate. This subduction is occurring in the coastal region that stretches from Vancouver Island to Northern California. Figure H-3 in Appendix H-1 shows the general geometry of the subduction zone. Figure H-4 shows a simple cross section through the subduction zone indicating possible sources for earthquake generation. The present body of evidence suggests that this subduction zone has generated eight great earthquakes in the last 4,000 years, with the most recent event occurring about 300 years ago (Weaver, 1991).

Two MCE subduction zone earthquake scenarios were considered in this study: (1) an earthquake on the seismogenic part of the interface between the Juan de Fuca Plate and the North American Plate on the CSZ with an M_w of 9.0 (interplate event), and (2) a deep earthquake with an M_w of 7.5 on the seismogenic part of the subducting plate of the CSZ (intraplate event). These magnitudes are the generally accepted maximum credible events for the CSZ, given the current level of information regarding subduction zone earthquakes in the Pacific Northwest.

6.2.2 Local Events

Seismic source maps of Oregon (Geomatrix Consultants, 1995) show several potentially active faults within a 50-mile radius of the site. None of the faults, however, have well-defined slip rates or have caused a recorded earthquake. Seismicity in the Northern Coast Range area is sparsely scattered with no defined pattern or association with known faults.

It is difficult to select a deterministic model of crustal seismicity without making unsupportable assumptions regarding fault activity, slip rate, and fracture length. We represent local seismicity by assigning regional source zones with uniform levels of seismic hazard. A magnitude 6 earthquake at a random location near the alignment is considered appropriate to represent the maximum credible crustal earthquake in the Northern Coast Range zone, which includes the planned alignment. The epicenter of the random earthquake is assumed to be 4 miles

from the closest part of the site at a depth of 6 miles. In our judgement, placing the epicenter closer to the alignment is unreasonably conservative in an area with no specific seismic sources. The selected magnitude of this event exceeds the magnitude of all recorded seismic events in northwest Oregon and southwest Washington.

6.2.3 Maximum Probable Earthquake

The maximum probable event (MPE) is defined by EFSC as the maximum earthquake that could occur under the known tectonic framework with a 10 percent chance of being exceeded in a 50-year period (475-year event). The USGS National Seismic Mapping Project (1996) reports that the MPE is equivalent to an earthquake that has a magnitude, M_W of 7.9 and an epicentral distance of 30 miles from the site vicinity. Figure H-5 in Appendix H-1 shows the probabilistic seismic hazard deaggregation for rock sites in the site vicinity. The USGS's National Seismic Mapping Project also provides a probabilistic response spectra for the 475-year return period event based on latitude and longitude. The response spectra for the MPE is shown in Figure H-6. The values in Figure 6 include amplification for the site soils.

6.2.4 Oregon Structural Specialty Code Seismic Design Parameters

The site area is located in Seismic Zone 3 as defined by the 1998 Oregon Structural Specialty Code (OSSC). Most of the soils in the study area consist of silty loam formed in colluvium derived from basalt and siltstone. The underlying rock formations are typically weathered and/or soft to a depth of more than 100 feet. Consequently, a soil profile type S_D is appropriate for use in design of the structures and equipment within the site boundaries. Table H-4 presents the design parameters provided by the OSSC for an S_D soil profile.

Table H-4
OSSC Seismic Design Parameters

Parameter		Value
Seismic Zone Factor	Z	0.30
Soil Profile Type	S	S_D
Seismic Coefficient	C_a	0.36
Seismic Coefficient	C_v	0.54

Near source coefficients are not required because of the lack of active faults near the alignment.

7.0 SEISMIC HAZARDS

This section summarizes the significant earthquake-related geologic hazards that could affect the construction and provides our conclusions and recommendations regarding mitigating the effect of these hazards. This section addresses EFSC Exhibit H requirements.

7.1 GROUND SHAKING

Table H-5 summarizes the computed horizontal peak ground accelerations (PGA) for the three design earthquakes and the maximum probable earthquake (MPE). The attenuation equation of Crouse (1991) was used to compute the site response for the two postulated CSZ events and the attenuation equation developed by Boore et al (1997) for the local event. The USGS 1996 Seismic Hazard Mapping Project was used to estimate the PGA and response spectra associated with the MPE. The values in Table H-5 include the effects of site amplification associated with an S_D soil profile as defined by the 1998 Oregon Structural Specialty Code (OSSC).

Table H-5
Calculated PGA Values

Earthquake Event	Moment Magnitude	Focal Depth (miles)	Epicentral Distance (miles)	PGA (g)
CSZ Interplate	9.0	15	45	0.31
CSZ Intraplate	7.5	30	6	0.22
Local	6	--	4	0.25
MPE	7.9	--	30	0.24

[1]PGA = peak ground acceleration
[2]g = equals acceleration of gravity = 32.2 ft/sec^2

Figure H-6 in Appendix H-1 shows that the expected surface ground motion levels from the three scenario events and MPE are enveloped with in the OSSC design response spectra for site soil profile S_D. Consequently, we conclude that the OSSC equivalent static force procedures are appropriate for design of structures and equipment within the site boundaries. An S_D soil profile was chosen based on the results of this geologic study and the borings performed for a nearby geotechnical evaluation located approximately 0.5 miles east of the project site at slightly higher elevation.

Modern buried pipes with welded joints have very low vulnerability to ground shaking without permanent ground deformation. A detailed study of the Southern California Gas Company's transmission and distribution system (O'Rourke, 1996) found that there are no reported cases of damage to steel pipelines with arc-welded joints (post World War II construction techniques) due to ground shaking. Therefore, it is our opinion that the gathering lines are not vulnerable to the expected levels of seismic ground shaking.

7.2 SITE AMPLIFICATION

Earthquake ground motions are modified as they propagate up from bedrock through the overlying soil deposits. Ground motion levels can amplify, particularly in the spectral range near the natural site period, due to conservation of energy between layers with different shear moduli. Ground motion levels can also attenuate due to energy losses associated with non-linear soil behavior. The earthquake accelerations discussed in Section 7.1 were computed for the ground surface and include the effects of site amplification. The soil and rock conditions along the

alignment are well represented by the OSSC classification scheme. Consequently, site amplification of earthquake ground motions beyond the values in Table H-5 and Figure H-6 is not considered a threat to the planned project.

7.3 LANDSLIDES

Earthquake forces can cause slope failures and movement of sloping ground. Active landslides are most susceptible to seismic slope failure, but very steep slopes and jointed rock outcrops are also vulnerable.

The injection wells and gathering lines are not located in areas of known active landslides. The slopes traversed by the gathering lines are generally flatter than 50 percent, and are comprised of stiff, cohesive soils and weathered sedimentary rock. Steep sections are generally short, and the alignments generally follow the slope gradient to reduce the sensitivity to movement. In our opinion, the proposed project has a low risk of damage from seismic induced landslides.

7.4 DIFFERENTIAL SOIL COMPACTION AND SETTLEMENT

Earthquake shaking can cause loose cohesionless soils to densify, resulting in surface settlements. Welded steel pipelines can generally deflect sufficiently without damaging strain so are not susceptible to broad settlement. Although seismically-induced settlement is possible in alluvium present in the Nehalem River Valley, the susceptible deposits are thin and the settlement magnitude would be small. The potential for abrupt differential settlement severe enough to damage the gathering lines is small.

7.5 LIQUEFACTION

Liquefaction is a term used to describe a sudden shear strength reduction in granular soils caused by earthquake shaking. The horizontal shear stresses induced by earthquake shaking cause the soil fabric to deform slightly, which results in a small volume decrease in loose soils, principally sands. Excess pore pressure can develop if the deformation occurs faster than ground water trapped in the spaces between sand grains can drain, resulting in reduced effective stress between particles and reduced shear strength. Liquefied soils can flow under gravity and seismic forces until the excess pore pressures drain and the shear strength increases to greater than the driving stress.

Loose sandy soils saturated by a shallow water table are the most prone to liquefaction. Clayey soils, which derive the majority of strength through cohesion, are not susceptible to liquefaction.

Liquefaction is not a significant concern along the mountainous portions of the planned project due to the high plasticity of the near-surface soils and lack of a continuous ground water table.

7.6 SURFACE FAULT RUPTURE

The proposed project area is located on the Nehalem arch, a high area in the basement Tillamook Volcanics, which has been created over millions of years of compressional tectonics. Many faults have been identified in the Mist area as a byproduct of the intense drilling and geophysical work related to gas exploration. Many are older faults from prior periods of tectonism and are not exposed at the surface. A series of primarily northwesterly and west-to-east striking normal faults cuts across the Nehalem Arch, forming the Nehalem graben, generally coincident with the Nehalem River valley between Mist and Birkenfeld (Niem et al., 1992).

The faults in the site area typically show minor vertical displacement in 30-million-year-old materials. The faults were probably formed during a period of intense uplift that formed the Coast Range during Miocene time (approximately 6 to 20 million years ago). The faults appear to have formed along the existing weak planes of existing faults in Eocene-age Tillamook volcanics. Although uplift of the Coast Range continues through the present, it does not appear to be causing the same degree of faulting caused during the Miocene. The presence of fault displacements through young (less than 1.6 million years old) Quaternary-age deposits is the best indicator of possible surface fault rupture within the design life of the planned facility. Although there are no mapped faults that extend through Quaternary materials, such young material is sparse in the mountainous segments of the alignment. The youngest materials in the site area are the weathered colluvial soils in the hillside areas and the alluvial deposits in the valley floors. The lack of surface faulting in these younger materials indicates that recent displacements have not occurred, although the scarcity of Quaternary material does not support a definitive conclusion. The lack of small earthquakes in the recent historical record also indicates a low probability of a future earthquake large enough to cause ground rupture.

The Tualatin Valley and surrounding area to the southeast of the site have several northwest-striking faults that have been identified below sedimentary cover (Blakely, et al., 2000). Of these, the Gales Creek Fault and the Portland Hills Fault are the closest to the site, approximately 20 miles south and southeast, respectively. Although, the faults have not generally been recognized as displacing Holocene age material (10,000 years old), a recent site was found in the northern Willamette Valley that is believed to represent displacement of Holocene aged deposits by the Portland Hills Fault. (Cascadia, Spring 2001). Despite this recent discovery no additional evidence exists that suggests surface faulting at the site is likely.

We conclude that the probability of fault displacement within the area proposed for project is low due to the low activity of major faults in the area. This is further reduced by the small probability that a fault would displace the ground surface at the location the gathering lines, injection wells.

Tsunami Inundation

Tsunami inundation is not considered a seismic hazard at the inland location of the Energy Facility.

8.0 CONCLUSIONS

Based on our geologic hazard evaluation, it is our opinion that there is a low potential for geologic hazards to have an adverse impact to the proposed Busch and Schlicker Development project.

9.0 LIMITATIONS

We have prepared this report for the exclusive use of Northwest Natural for Geologic Hazard Evaluation, their authorized agents and regulatory agencies.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted environmental science practices in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.

Any electronic form, facsimile or hard copy of the original document (email, text, table, and/or figure), if provided, and any attachments are only a copy of the original document. The original document is stored by GeoEngineers, Inc. and will serve as the official document of record.

We appreciate the opportunity to be of continued service to Northwest Natural. Please call if you have any questions regarding this report or if we can provide additional assistance.

Respectfully submitted,

GeoEngineers, Inc.

EXPIRES: 6-30-04

Brett A. Shipton, P.E.
Project Engineer

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Associate

TWB:BAS:gaw

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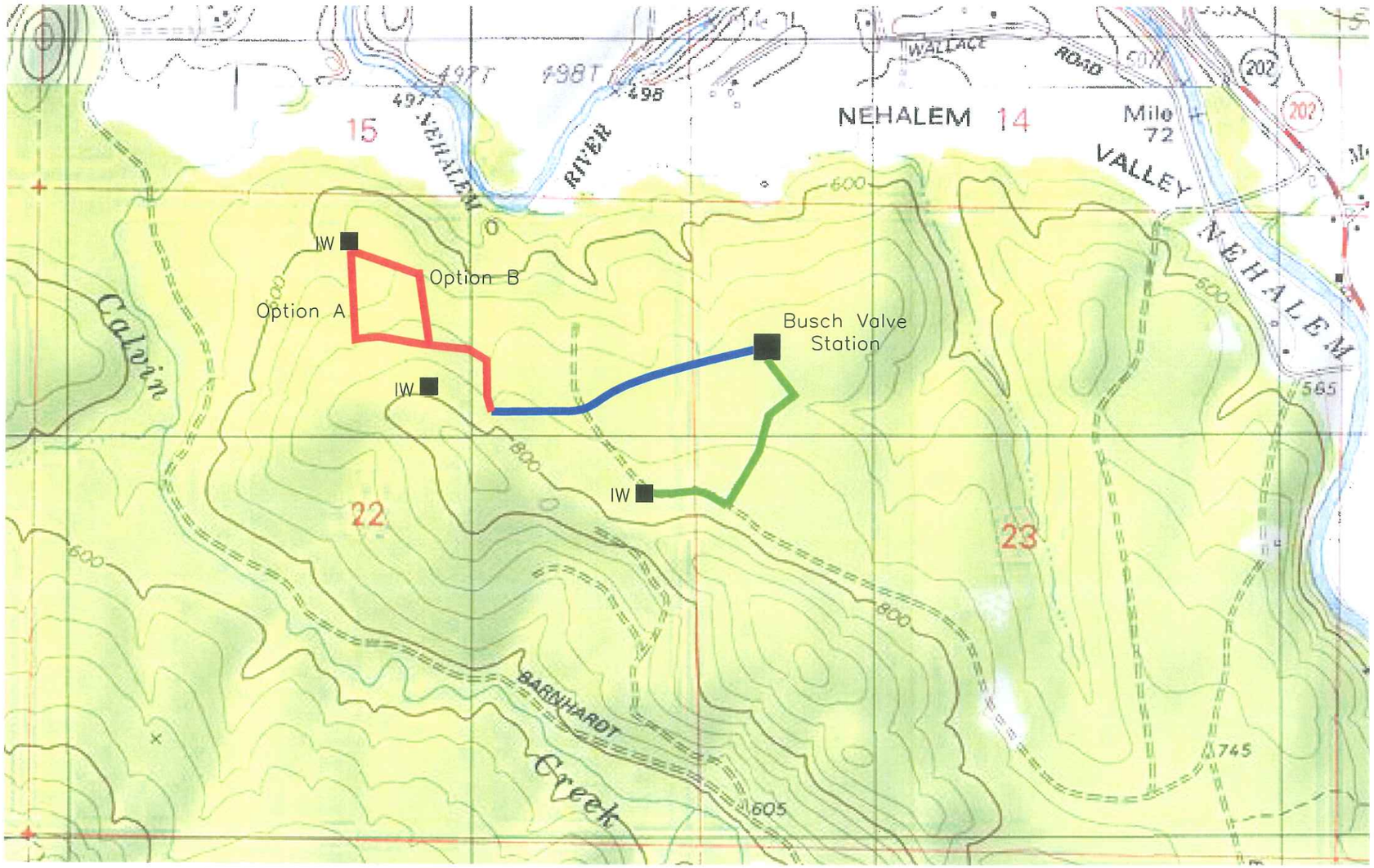

TN 18° MN

0 .5 1 Mile

0 1000 Feet 0 500 1000 Meters

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BUSCH AND SCHLICKER SITE PLAN

FIGURE H-1

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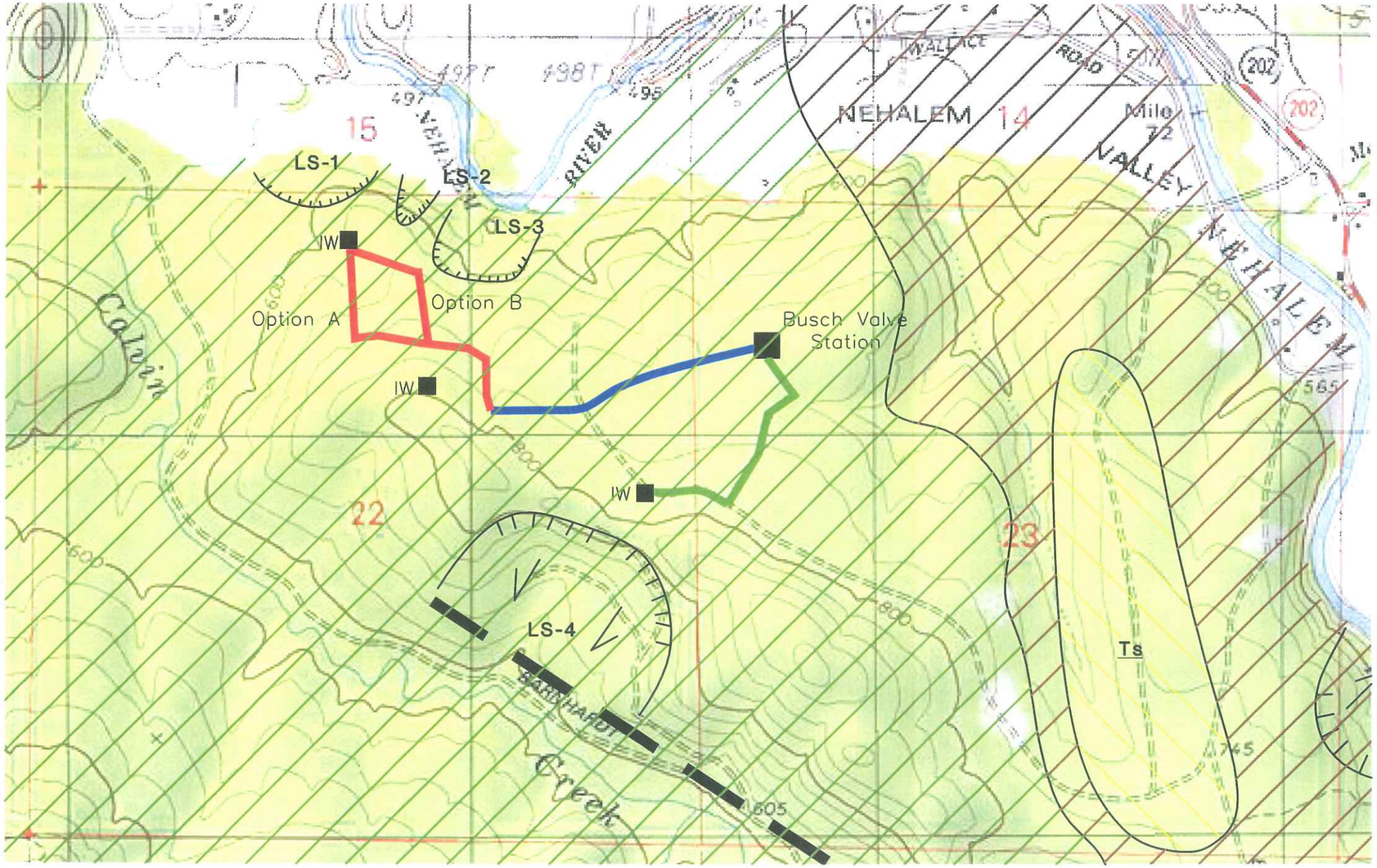

EXISTING PIPELINE RIGHT-OF-WAY

GATHERING LINE CORRIDORS

PROPOSED GATHERING LINE, TIES INTO PROPOSED 12 INCH LINE

DIRECTIONAL BORE

INFERRED FAULT

GEOLOGIC CONTACT

LS-4 LANDSLIDE AND SITE IDENTIFICATION NUMBER

Ts SCAPPOOSE FORMATION

Tsc SAGER CREEK FORMATION

Tk KEASEY FORMATION

IW INJECTION WELL

TN 18° MN

0 .5 1 Mile

0 1000 Feet 0 500 1000 Meters

Map created with TOPO!® ©2003 National Geographic (www.nationalgeographic.com/topo)

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GEOLOGIC CONDITIONS

FIGURE H-2

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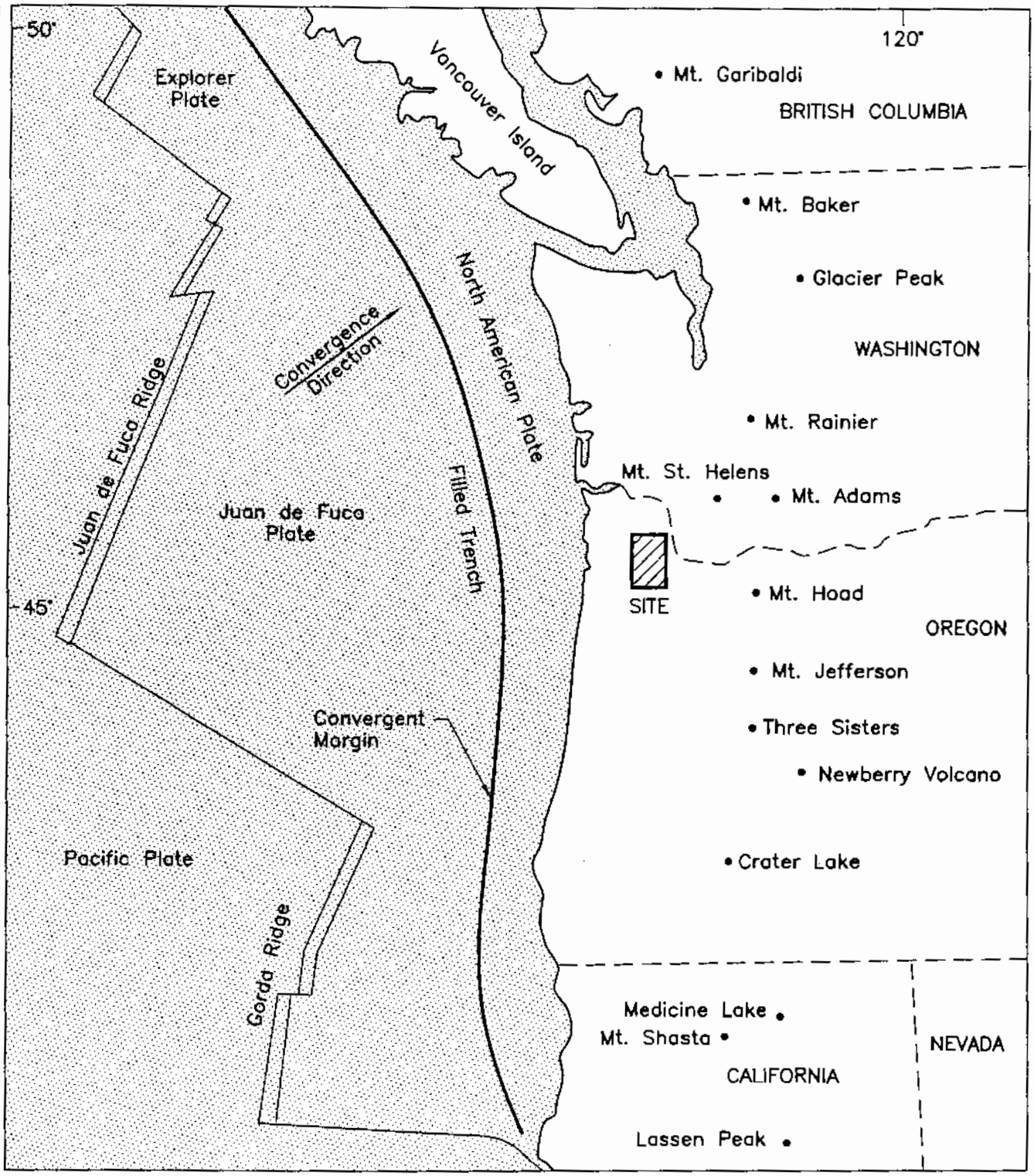

Reference: Perbix, T.W., and Noson L.L., 1996, Design Decisions, Methods and Procedures, B.F. Day Elementary School, Earthquake Engineering Research Institute.

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CONVERGENT MARGIN OF THE PACIFIC NORTHWEST

FIGURE H-3

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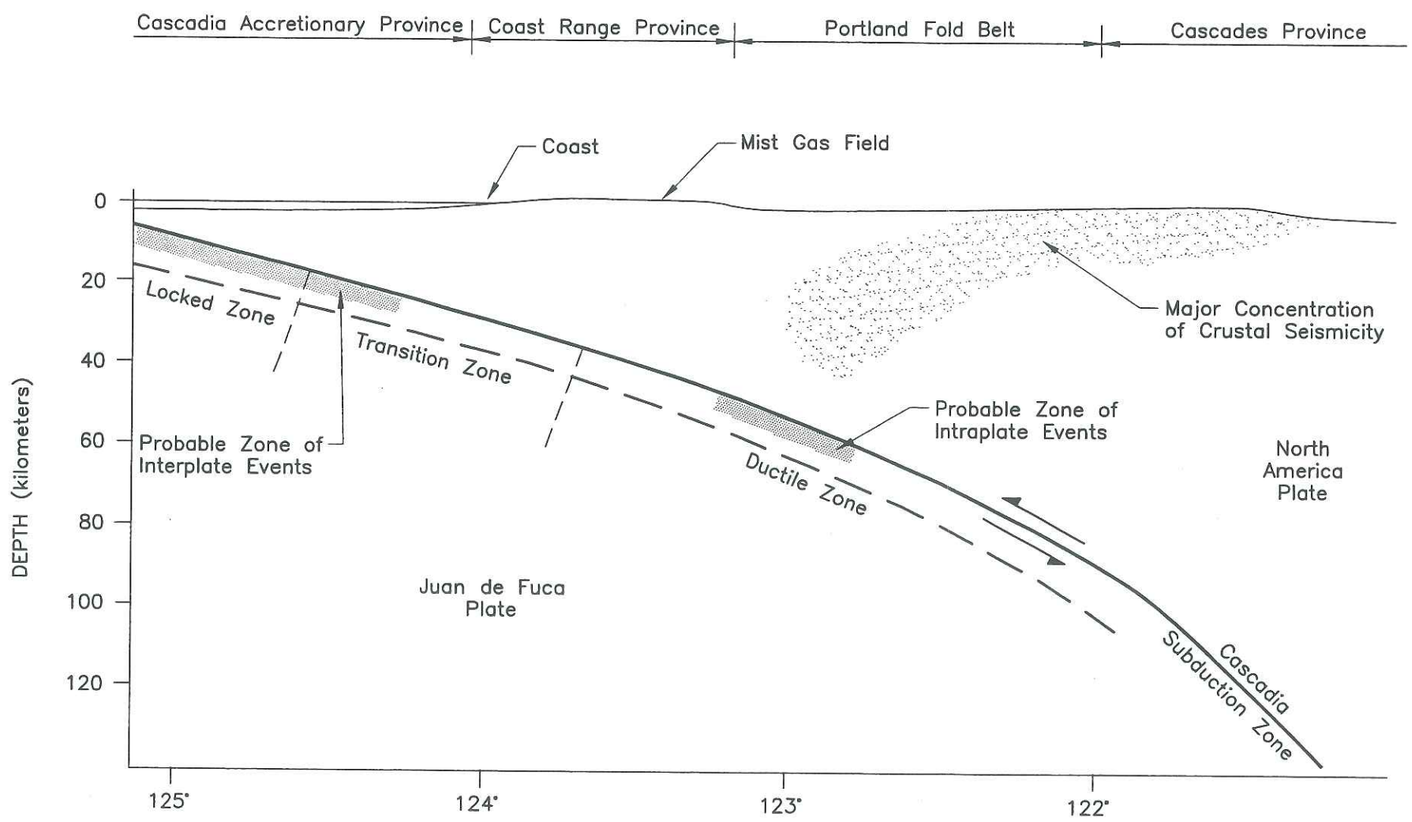
P:\6024060\00\CAD\GW_EL



N

NOT TO SCALE

Note: The locations of all features shown are approximate.

Reference: Niem, A.R., and Others, 1992, Onshore–Offshore Geologic Cross Section Northern Oregon Coast Range to Continental Slope, Oregon Department of Geologic and Mineral Industries Special Paper 26.

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CROSS SECTION OF THE SUBDUCTED JUAN de FUCA PLATE BENEATH NW OREGON

FIGURE H-4

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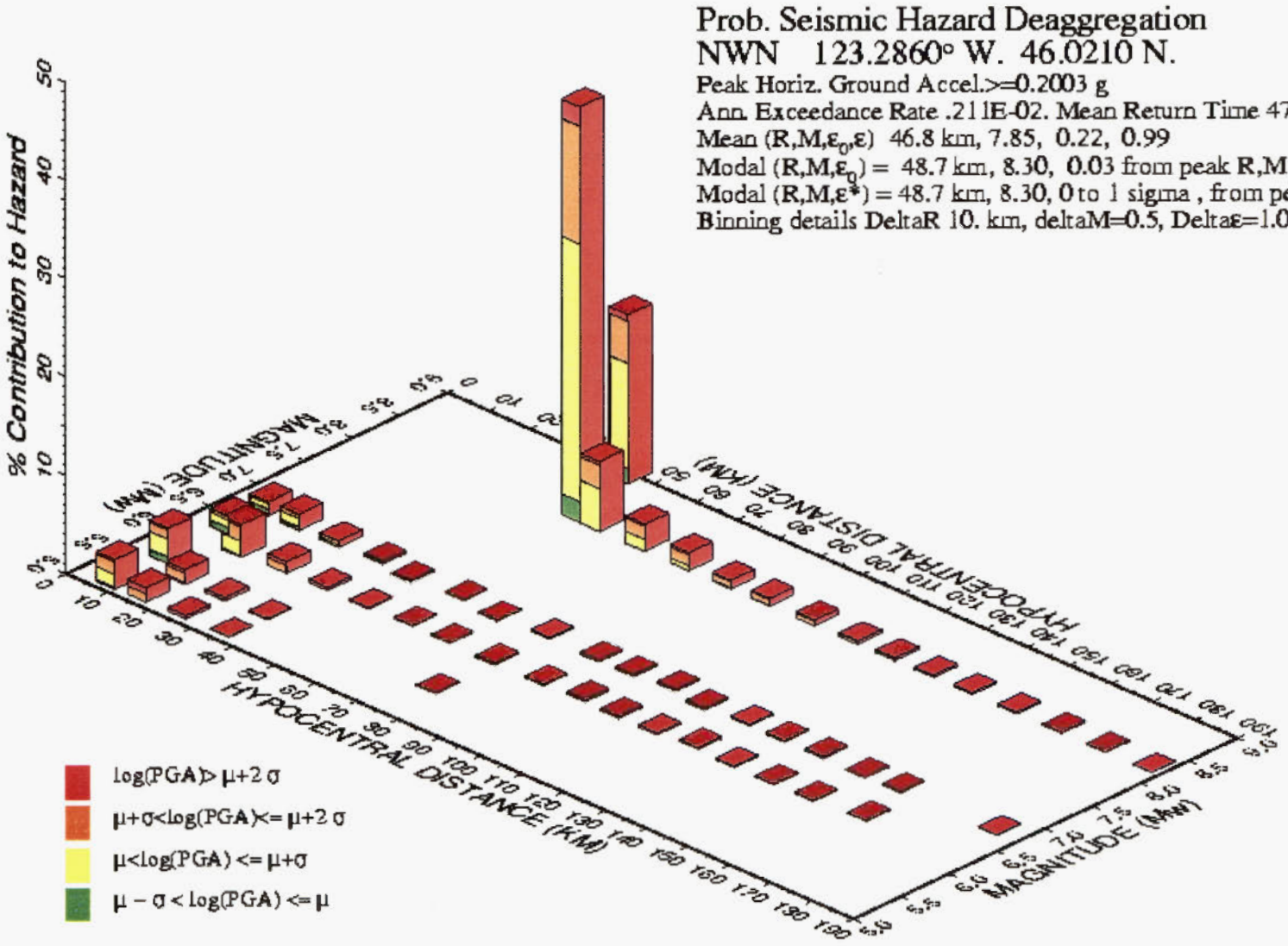

PROBABALISTIC SEISMIC HAZARD DEAGGREGATION

FIGURE H-5

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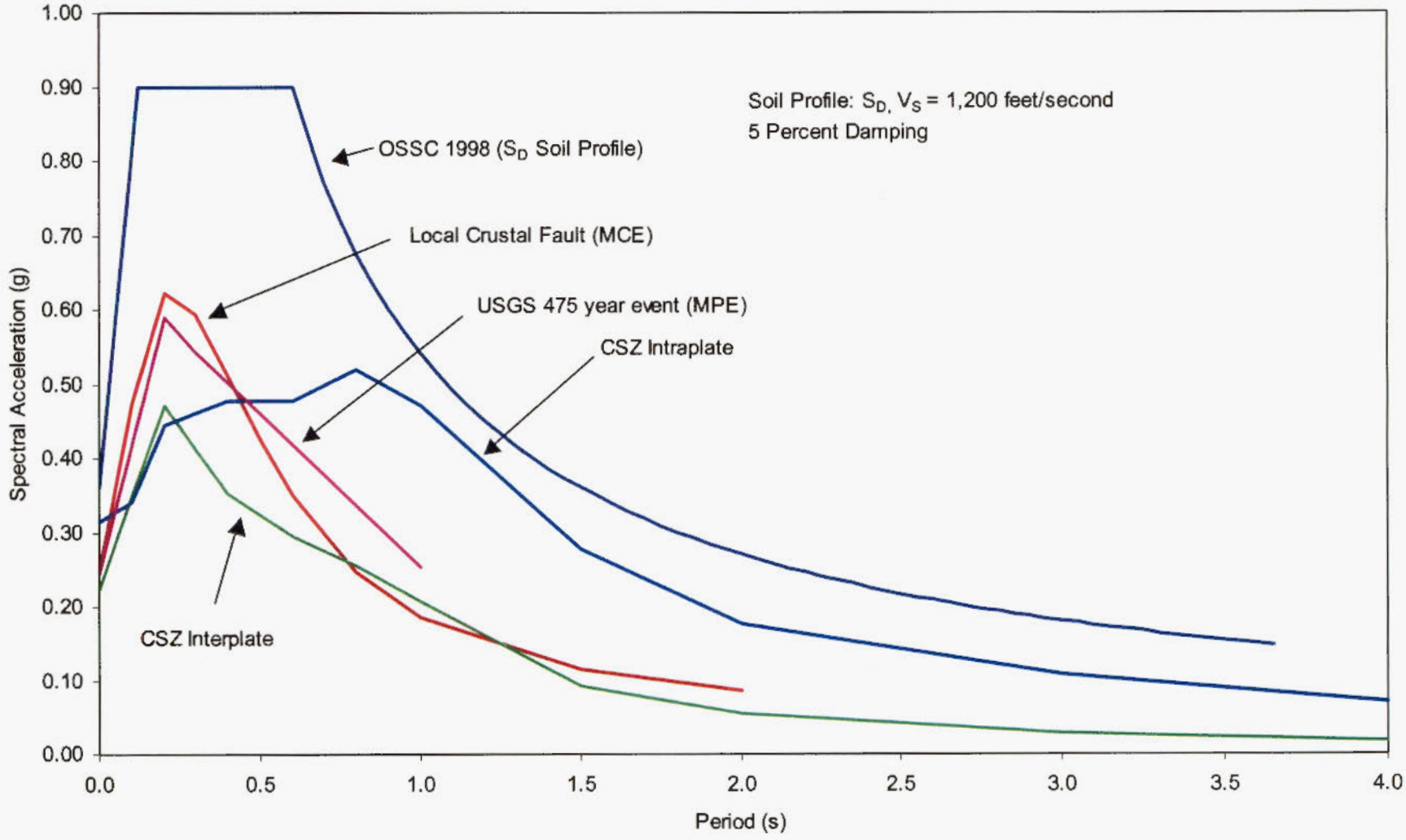

SITE RESPONSE SPECTRA

FIGURE H-6

APPENDIX A

PROFESSIONAL BIO-SKETCHES

APPENDIX A

PROFESSIONAL BIO-SKETCHES

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Doug Schwarm is an Associate at GeoEngineers and has more than 11 years of experience as a geotechnical engineering consultant. He is a graduate of the University of California at Berkeley with a B.S. in civil engineering and an M.S. in geotechnical engineering. Doug is registered as a professional civil engineer in Oregon, Washington and California.

Doug has significant experience in geotechnical components of numerous types of engineering projects. He specializes in geotechnical earthquake engineering, slope stability evaluation, and foundation support of significant structures. Doug has overseen geotechnical seismic design components of energy facilities.

TIMOTHY W. BLACKWOOD P.E., C.E.G.

Tim has over 10 years of professional geotechnical engineering and geologic experience in Oregon, Washington, California, Alaska, and Montana. His range of experience includes detailed site investigations and geotechnical engineering for municipal, commercial and industrial facilities, landslide mapping, and numerous geological engineering reconnaissance studies. Tim obtained a B.S. in geology and an M.S. in geotechnical engineering from Portland State University. Tim is registered as a professional civil engineer and certified engineering geologist in Oregon and Washington.

Tim has significant experience in geotechnical components in a wide range of engineering projects. He specializes slope stability evaluation, and foundation support of significant structures.

BRETT A. SHIPTON P.E.

Brett is a project engineer with more than 6 years of geotechnical consulting experience. He has a B.Eng. in civil engineering from the University of Pretoria and received an M.S. degree in civil engineering (geotechnical specialty) from Oregon State University. He is a registered civil engineer in Oregon, Washington and Idaho.

Brett has experience in the geotechnical components of various civil engineering projects. He specializes in geotechnical earthquake engineering and deep and shallow foundation design. Brett has managed various geotechnical components for several energy facilities.

TREVOR N. HOYLES, P.E., C.E.G.

Trevor is a project engineer with over 5 years of experience as a geotechnical/geological engineer in Oregon, Washington and California. He has a B.S. in geological engineering from the University of Idaho. Trevor is registered as a professional engineer in Oregon and as a licensed engineering geologist in Washington.

Trevor has experience in evaluating landslides and the potential impacts of road construction and timber harvesting activities on slope stability. These projects often require the development of recommendations for design and construction of roads, landslide repairs and erosion mitigation.

MATTHEW J. BRUNENGO, P.G., C.E.G.

Matt Brunengo is a professional geologist and engineering geologist with 25 years experience on significant geotechnical projects in the northwest. Matt has B.S. and M.S. in Environmental Earth Stanford University. Matt also earned a Ph.C. in geomorphology and hydrology from the University of Washington

Matt is a well-known and respected geologist in the area with extensive experience in the identification, mapping and analysis of geohazards. As a geologist for the Washington Department of Natural Resources for 12 years, Matt has spent many years in steep forested terrain in the Northwest and is an expert in slope stability processes in such terrain.

ERICK J. STALEY, G.I.T.

Erick is a geologist with 3 years of experience. He is received a B.S. in geology from the University of Wisconsin – Oshkosh and a M.S. in geology from the University of California at Berkeley. He is registered as a geologist-in-training in Oregon.

Erick has experience with detailed geologic site reconnaissance, including slope stability and other geologic hazards. He has evaluated field and laboratory information and prepared geologic reports for a wide variety of engineering projects.

GeoEngineers

August 4, 2003

Northwest Natural
220 Northwest Second Avenue
Portland, Oregon 97209

Attention: Mr. Jack Meyer

GeoEngineers is pleased to submit six copies of our Soils Evaluation intended to fulfill the requirements of the Energy Facility Siting Council (EFSC) site certificate amendment submittal for the proposed Busch and Schlicker Pool Development Project. This work was performed in accordance with our June 5, 2003 proposal.

We appreciate the opportunity to be of continued service. Please call if you have any questions or if we can be of further assistance.

Yours very truly,

GeoEngineers, Inc.

Timothy W. Blackwood, P.E.
Associate

TWB:gaw
Document ID: PORT\P:\6\6024061\00\Finals\602406100Appendix I.doc

GeoEngineers, Inc.
7504 SW Bridgeport Road
Portland, OR 97224
Telephone (503) 624-9274
Fax (503) 620-5940

CONTENTS

SOIL EVALUATION
BUSCH AND SCHLICKER POOL DEVELOPMENT
MIST, OREGON
FOR
NORTHWEST NATURAL

1.0 INTRODUCTION

This report presents the results of GeoEngineers soil evaluation for the proposed Busch and Schlicker Pool Development project. This evaluation was performed to update a previous study performed by Dames & Moore (1997) and to meet the Energy Facility Siting Council (EFSC) certificate application requirements for Exhibit I.

The information used in this evaluation included available geologic maps and the US Department of Agriculture, Soil Conservation Service (SCS) soil maps, since named the Natural Resource Conservation Service (NRCS). Section 10.0 provides a list of references reviewed for this evaluation.

2.0 PROJECT DESCRIPTION

The Busch and Schlicker Pool Development project includes construction of two injection well sites and associated gathering pipelines. Two potential routes for the proposed gathering pipelines are being considered totaling approximately 4,000 feet of potential gathering line corridors in this evaluation. Figure I-1 shows the proposed location of the well sites and potential gathering line corridors.

3.0 SOIL CONDITIONS

Shallow subsurface soil conditions in the proposed project site vicinity were identified using the Soil Conservation Service (SCS) Soil Survey of Columbia County, Oregon (Smythe, 1986). The soil survey describes soil conditions in the upper 5 feet and classifies land capability. Figure I-2 shows the SCS soil map units for the vicinity. No site-specific soil sampling or investigations were conducted as part of the exhibit preparation, although GeoEngineers completed a surface reconnaissance in the area for preparation of EFSC Exhibit H. Four soil units were identified throughout the project area. A general description of each unit is provided below.

3.1 KENUSKY SILTY CLAY LOAM

Kenusky silty clay loam occurs on a gentle slope along the alignment west of Busch Valve Station. The soil unit is typically in excess of 5 feet thick and is formed in clay. Permeability of the Kenusky unit is slow to very slow, runoff is medium to slow, and the hazard for water erosion is slight to medium. Groundwater often perches above a lower, more clayey part of the soil unit.

3.2 MAYGER SILT LOAM

Mayger silt loam occurs on gentle to moderate slopes throughout the gathering line corridors in the northern part of the project area. The soil unit is typically in excess of 5 feet thick and is formed in colluvium derived from shale. Permeability of the Mayger unit is moderately slow to very slow, runoff is medium, and the hazard for water erosion is medium. Groundwater often perches above a lower, relatively impermeable part of the soil unit, similar to the Kenusky soil.

3.3 SCAPONIA-BRAUN SILT LOAM

Scaponia-Braun silt loam occurs on moderate to steep, convex slopes north of the creek running through the gathering line corridors in the northern part of the project area. The soil unit, typically about 3.5 feet thick, is formed in colluvium derived from siltstone. Permeability of the Scaponia-Braun soil is moderate, runoff is very rapid, and the hazard of water erosion is high.

3.4 VERNONIA SILT LOAM

Vernonia silt loam occurs on gentle to moderate slopes along the southern proposed gathering line and along the road between the western Busch Valve Station easement and an injection well. The soil unit is typically 4.5 feet thick and is formed in colluvium derived from siltstone and shale. Permeability of the Vernonia unit is moderate, runoff is medium to rapid, and the hazard for water erosion is medium to high.

Figure I-2 shows the proposed construction relative to the soils types described above.

4.0 GROUNDWATER

Although regional groundwater is probably located at least several tens of feet below the ground surface, it is possible that perched groundwater conditions exist within lenses of granular marine sediments of the Sager Creek Formation underlying the site. Perched groundwater was encountered locally at a depth of approximately 9 feet in borings completed for a nearby geotechnical project located approximately 0.5 miles east of the project site at a slightly higher elevation. Seeps and springs may be present in the project area, particularly during periods of prolonged rainfall.

5.0 LAND USE

Land use within the project area has been limited to timber and natural gas production. Timber harvesting has required construction of skid roads and several gravel roads for operation and maintenance activities. Gravel roads have also been constructed for operation of the existing natural gas energy facilities in the area; for injections wells and pipelines. Native plant species and some non-native intrusive species currently grow in the harvest units of the project area and where gravel roads are not maintained.

6.0 POTENTIAL ADVERSE IMPACTS TO SOIL

The following section summarizes the potential impacts to soil from construction of the proposed injection wells and gathering lines.

6.1 CONSTRUCTION

Construction activities can introduce the potential for increased erosion due to soil disturbance, loss of vegetation, and changes to surface drainage patterns. Erosion can be caused by increasing exposure to wind or water. Wind erosion is influenced by the wind intensity, vegetative cover, soil texture, soil moisture, grain-size of unprotected soil surface, topography, and by the frequency of soil disturbance. Wind erosion is not a significant concern in the project area because of the fine-grained surface soils, tree cover along and adjacent to most of the alignments, and the erosion control measures that will be implemented to mitigate water erosion potential. Water erosion is a function of primarily soil type, vegetative cover, precipitation, and slope inclination. Erosion from rainfall will be a hazard during construction.

The runoff potential and water erosion hazard for the identified soils at the site range from slight to high with higher erosion potentials associated with steeper slopes. The NRCS reports that the site vicinity receives approximately 50 to 70 inches of rainfall per year. The erosion potential and available precipitation, therefore make site soils sensitive to water erosion during much of the year, particularly where slopes are steeper.

The proposed construction will disturb soil where excavations will be required for the buried pipeline systems, and from construction equipment. Construction will be performed within a 40-foot wide easement along the alignments. In roadway areas construction will primarily involve trenching, associated stock piling of excavation spoils, placing pipe and backfilling the trenches. However, vegetation will be removed along the overland segments, where some grading will be required for construction access. The graded construction corridors can modify drainage patterns by capturing, concentrating and rerouting surface water runoff. Such modifications can lead to increased erosion.

6.2 OPERATIONS

Operations activities will be limited to those areas directly related to the injection wells and gathering lines. Other parts of the project area will not be affected.

During operations, the gathering lines will have a 20-foot wide easement maintained free of large vegetation, such as trees and shrubs. Existing gravel roads will be used to access major components of the proposed project. We do not anticipate that significant soil disturbance or erosion will result from typical operations. There will be no land application of liquid wastes.

6.3 RETIREMENT

Retirement will consist of abandoning the injection wells in accordance with local ordinances and abandoning the pipelines and leaving them in place. Erosion hazards during decommissioning of the systems will be minimal.

7.0 MITIGATION OF POTENTIAL ADVERSE IMPACTS

Potential adverse impacts to soil from construction, operations and retirement of the systems should be mitigated by adhering to appropriate best management practices (BMP's) during construction and operations. Specific mitigation measures are included in the following sections.

7.1 CONSTRUCTION

Exposed soils at the project area will be susceptible to water erosion. However, where the alignment follows the existing roadways, water erosion will be minimal because of surface water drainage systems and crushed rock road surfacing already in place. In overland segments, the pipeline alignment will be relatively narrow and should be protected from erosion using current erosion control BMP's. A detailed erosion and sediment control plan will be completed to fulfill requirements of the National Pollutant Discharge Elimination System (NPDES) permit 1200-C. Erosion control measures to be employed during construction should include, but not necessarily be limited to the following:

- Installing sediment fence/straw bale barriers at downslope sides of excavations and disturbed areas.
- Straw mulching and discing at locations adjacent to the road that have been affected.
- Providing temporary sediment traps downstream of intermittent stream crossing.
- Planting designated seed mixes within affected areas.

Restoration and revegetation of disturbed areas that are not necessary for operations should be completed following construction. Roadway areas should be restored to their original grades, drainage condition and rock surface. Exposed soil in overland segments that are affected by construction should be seeded when there is adequate soil moisture, and reseeded in the spring if a healthy cover crop does not grow. Sediment fences and check dams should remain in place until the affected areas are well vegetated.

Overland corridors should be constructed with waterbars adequately spaced so that surface drainage continues to natural drainage patterns, with minimal diversions through ditches and culverts. Regular maintenance of drainage facilities must be conducted to ensure continued proper operation.

Possible contamination from construction equipment or supplies such as lubricant and fuel should be controlled in accordance with the applicant's plans to manage hazardous substances. Sanitary wastes generated during construction will be limited to portable toilets, be serviced regularly by a qualified sewage disposal vendor.

7.2 OPERATIONS

Operation of the injection wells and gathering lines will not have a significant impact on the soils. Consequently, no measures to mitigate adverse impacts to the soil are necessary. However, monitoring of the system will be completed annually by Northwest Natural staff as part of an in-house regular maintenance program. If problem areas are observed, appropriate mitigation and remediation measures will be implemented specific to the problem at that time.

7.3 RETIREMENT

The erosion hazard will be minimal during retirement; adequate erosion control measures will be implemented where necessary.

8.0 CONCLUSIONS

Construction of the project has some potential to adversely affect soils, primarily through water erosion. However, implementation of the mitigation measures outlined in this report will prevent significant adverse impacts to the soils during construction. Operation of the project is not expected to adversely impact soils.

9.0 LIMITATIONS

This report has been prepared for the exclusive use of Northwest Natural, their authorized agents and regulatory agencies. This report is not intended for use by others, and the information contained herein is not applicable to other sites. No other party may rely on the product of our services unless we agree in advance and in writing to such reliance.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted environmental science practices in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.

Any electronic form, facsimile or hard copy of the original document (email, text, table, and/or figure), if provided, and any attachments are only a copy of the original document. The original document is stored by GeoEngineers, Inc. and will serve as the official document of record.

10.0 REFERENCES

Dames & Moore, March 20, 1997, *Exhibit N, Major Ecological Communities and Soil Types, Miller Station Expansion and Pipeline Alignment, Mist Gas Storage Project, Mist, Oregon.*

Smythe, R.T., 1986, *Soil Survey of Columbia County, Oregon*: United States Department of Agriculture, Soil Conservation Service.

United States Department of Agriculture, National Cartography and Geospatial Center, 1999, *Oregon Annual Precipitation.*

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We appreciate the opportunity to be of service to Northwest Natural on this project. Please call if you have any questions or if we can be of further assistance.

Yours very truly,

GeoEngineers, Inc.

Trevor N. Hoyles, P.E.
Project Engineer

Timothy W. Blackwood, P.E., C.E.G.
Associate

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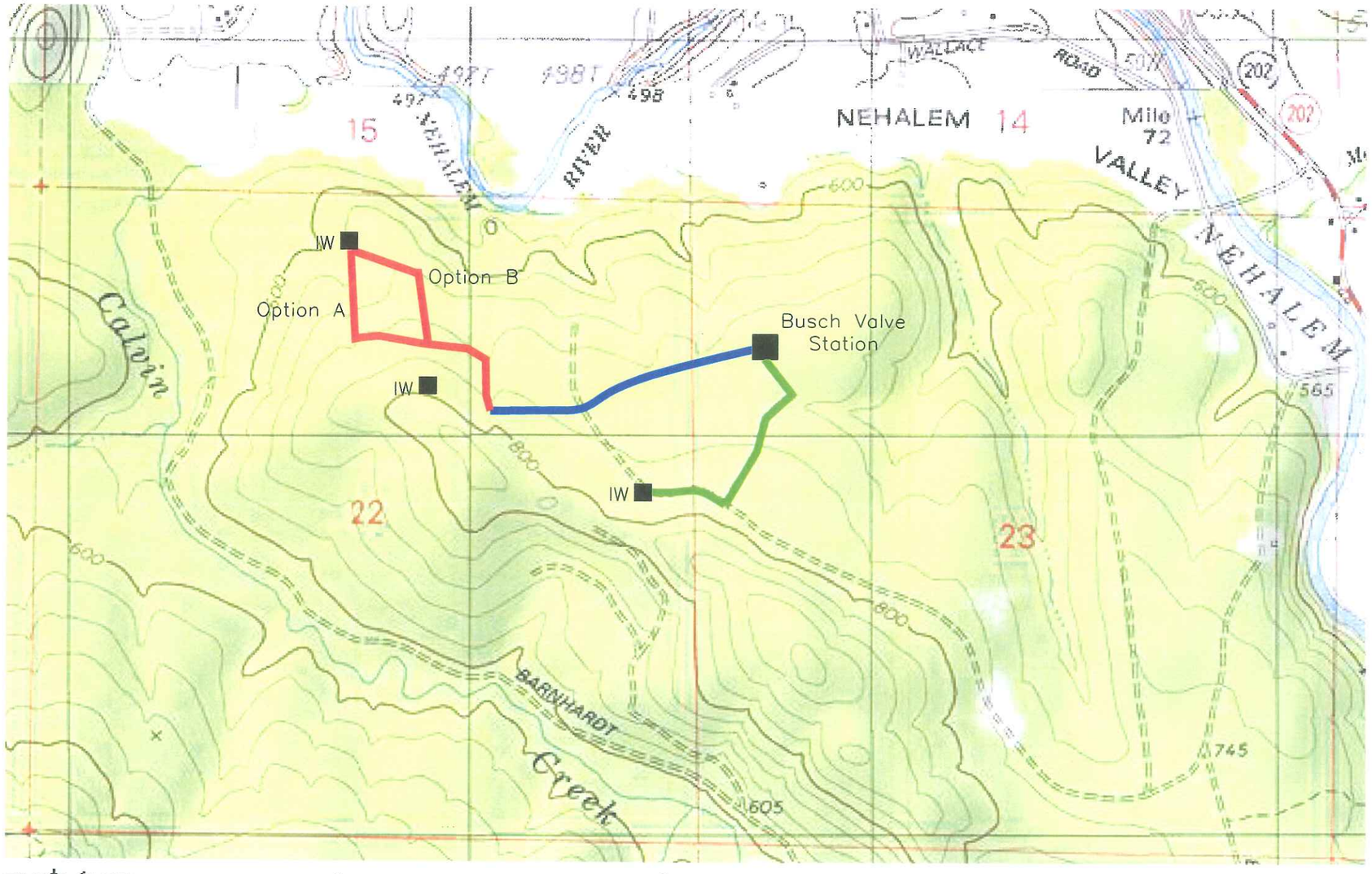

EXISTING PIPELINE RIGHT-OF-WAY

GATHERING LINE CORRIDORS

PROPOSED GATHERING LINE, TIES INTO PROPOSED 12 INCH LINE

IW INJECTION WELL

TN 18° MN

0 .5 1 Mile

0 1000 Feet 0 500 1000 Meters

Map created with TOPO!® ©2003 National Geographic (www.nationalgeographic.com/topo)

Note 1. This figure is for informational purposes only. It is intended to assist in the identification of features discussed in a related document. Data were compiled from sources as listed in this figure. The data sources do not guarantee these data are accurate or complete. There may have been updates to the data since the publication of this figure. This figure is a copy of a master document. The master hard copy is stored by GeoEngineers, Inc. and will serve as the official document of record.

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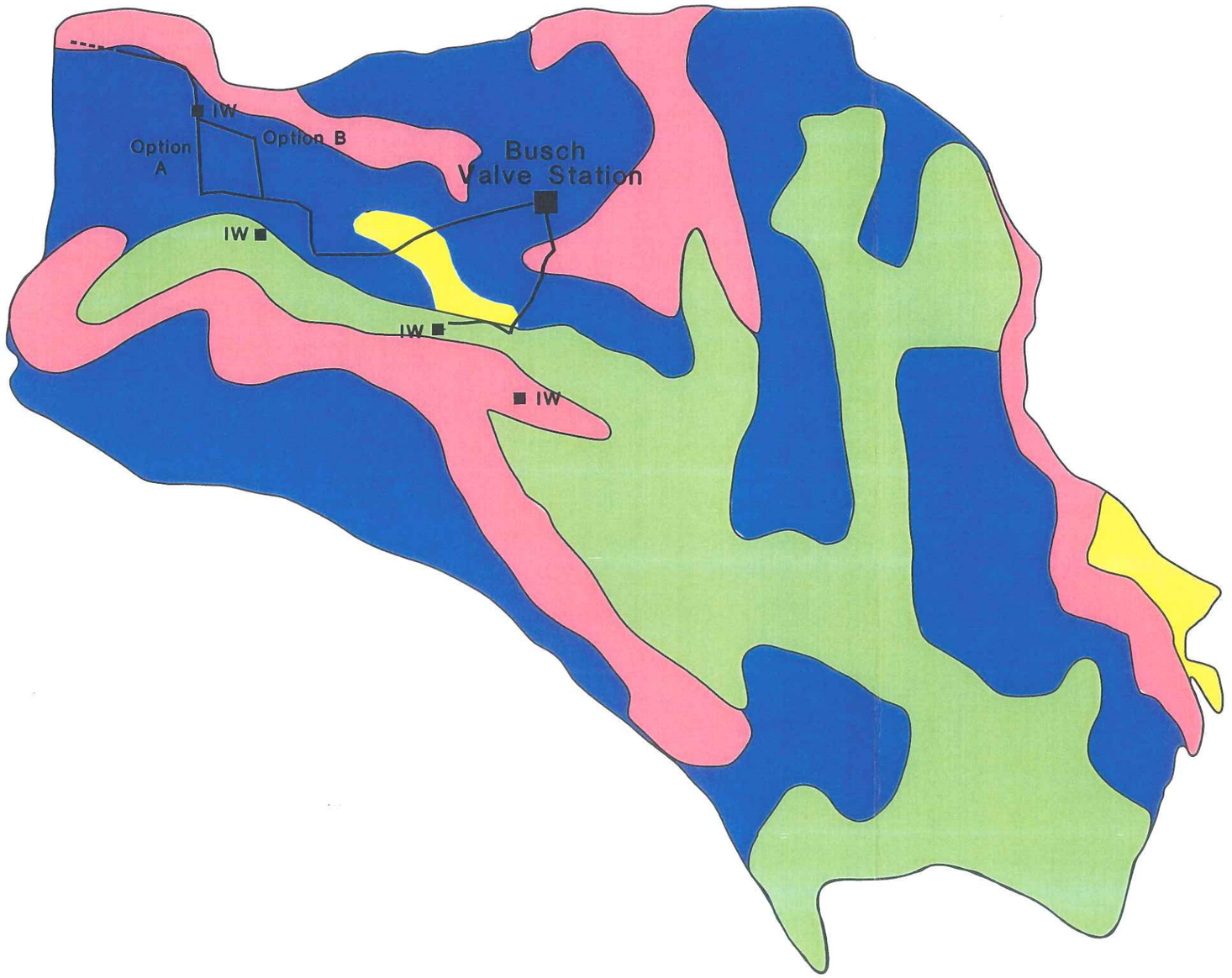
BUSCH AND SCHLICKER SITE PLAN

FIGURE 1-1



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SCALE IN FEET

SOIL MAP KEY:

- SCAPONIA–BRAUN SILT LOAM
- MAYGER SILT LOAM
- VERNONIA SILT LOAM
- KENUSKY SILTY CLAY LOAM
- IW ■ INJECTION WELL
- PROPOSED PIPELINE ALIGNMENT

Note 1. This figure is for informational purposes only. It is intended to assist in the identification of features discussed in a related document. Data were compiled from sources as listed in this figure. The data sources do not guarantee these data are accurate or complete. There may have been updates to the data since the publication of this figure. This figure is a copy of a master document. The master hard copy is stored by GeoEngineers, Inc. and will serve as the official document of record.

Reference: Base map adapted from Smythe dated 1986.

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SOIL MAP

FIGURE I-2

Portland:\6\6024061\00\Cad\Figure11.dwg ES2:RLF 07/29/03

EXHIBIT 7

COLUMBIA COUNTY
LAND DEVELOPMENT SERVICES
COURTHOUSE
ST. HELENS, OR. 97051
Phone: (503) 397-1501 Fax: (503) 366-3902

August 14, 2001

Peter Mastow
Stoel Rives LLP
900 SW 5th Ave., Suite 2600
Portland, OR 97204-1268

RE: NW Natural Compressor Modifications at Miller Station

Dear Peter:

This office has received your letter dated August 10, 2001 requesting confirmation that no land use or design review applications will be required by Columbia County for compressor processing capacity modifications at the NW Natural Gas Miller Station near Mist, Or. I understand that an application is being submitted to the Oregon Energy Facility Siting Council for this project later this month.

The facilities at Miller Station are the central point in the gathering system for natural gas at the Mist Field. On February 10, 1997 Columbia County approved a conditional use and design review, CU 53-96 and DR 21-96, for a metal building, compressor and related processing equipment at the Miller Station for gas in-put to the delivery system. The Commission found that the use was allowed in the Primary Forest Zone, after review, and that it would not interfere with accepted forest practices or otherwise have detrimental impacts on the area. Translated to your request, the original permit approval would encompass the modifications you are now seeking. You are not proposing to construct any new buildings and the use of the property is remaining the same. No new land use applications are required based on the information in your August 10, 2001 letter (attached).

We look forward to receiving a copy of your application to the Oregon Energy Siting Facility Council, when submitted. If I can be of further assistance, please contact me.

Sincerely,

Glen C. Higgins,
Chief Planner

cc: Mist-Birkenfeld CPAC
Mist-Birkenfeld RFPD

U 53-96

Columbia County Planning Commission
STAFF REPORT

Conditional Use Permit - PF-76 Zone

FILE NUMBER: CU 53-96

APPLICANT/OWNER: Northwest Natural Gas Company
220 NW Second Avenue
Portland, OR 97209

AGENTS: Michael C. Robinson
Peter D. Mostow
Stoel Rives LLP
900 SW Fifth Avenue, Ste. 2300
Portland, OR 97204-1268

PROPERTY LOCATION: Miller Station, about 3 miles northwest of Mist.

REQUEST: To replace two 550-hp compressors with one 3950-hp compressor at a gas processing facility on a parcel of 12.23 acres in the PF-76 zone, for which a Conditional Use Permit is required.

TAX ACCT. NUMBER: 6500-000-02501

ZONING: Primary Forest (PF-76)

APPLIC'N. COMPLETE: 1-6-97 **120 DAY DEADLINE:** 5-6-97
WAIVER SIGNED?: No.

BACKGROUND:

The applicants request approval to replace two 550-HP compressors with one 3950-HP compressor at a gas processing facility on a 12.23 acre parcel in the Primary Forest PF-76 zone.

Surrounding properties are in forest use. There are several existing structures on the property, which has access to South Mainline Road about 3 miles northwest of Mist. The topography of the property is fairly gentle, sloping up from the road and then leveling off at the compressor site.

There are no flood plains or wetlands on the property (FEMA map 41009C0125 C)(National Wetlands Inventory, Clatskanie quad map).

The property is within the Mist-Birkenfeld Rural Fire Protection District.

FINDINGS:

The following sections of the Zoning Ordinance and state laws are pertinent to this application:

Columbia County Zoning Ordinance Section 503 requires the following:

"Section 503 Conditional Uses: In the PF zone the following conditional uses and their accessory uses are permitted subject to the provisions of Sections 504 and 505. A conditional use shall be reviewed according to the procedures provided in Section 1503.

...

.2 Operations conducted for the exploration, mining, and processing of...mineral or subsurface resources not permitted outright."

Finding 1: In the PF-76 zone, an expansion of a mineral resources processing facility requires a Conditional Use Permit.

Zoning Ordinance Section 504 requires the following:

"Section 504 All Conditional Uses Permitted In The PF Zone Shall Meet The Following Requirements:

.1 The use is consistent with forest and farm uses and with the intent and purposes set forth in the Oregon Forest Practices Act."

The Oregon Forest Practices Act (ORS Chapter 527) includes the following:

"527.630 Policy. (1) ...it is declared to be the public policy of the State of Oregon to encourage economically efficient forest practices that assure the continuous growing and harvesting of forest tree species and the maintenance of forest land for such purposes as the leading use on privately owned land, consistent with sound management of soil, air, water and fish and wildlife resources that assures the continuous benefits of those resources for future generations of Oregonians."

Finding 2: The proposed use of the property is to replace two small compressors with one larger one, to increase the efficiency of the natural gas injecting operation. This is on a site which has been in non-forest use for many years. No forest land will be taken out of production and the site will not be expanded; all new facilities will be well within the boundaries of the site. The above criteria do not seem to apply to this request.

Continuing with Zoning Ordinance Section 504:

".2 The use will not significantly increase the cost, nor interfere with accepted forest management practices or farm uses on adjacent or nearby lands devoted to forest or farm use."

Finding 3: The proposed use will not interfere with farm or forest uses on adjacent lands if appropriate measures are taken to prevent fire from spreading to adjacent forests.

Continuing with Zoning Ordinance Section 504:

".3 The use will be limited to a site no larger than necessary to accommodate the activity and, as such will not materially alter the stability of the overall land use pattern of the area or substantially limit or impair the permitted uses of surrounding properties. If necessary, measures will be taken to minimize potential negative effects on adjacent forest lands."

Finding 4: The proposed compressor building will be limited to a small area in the north central part of the property. The overall land use pattern of the area is timber and natural gas production. Appropriate measures will need to be taken to minimize the danger of fire spreading to adjacent orest lands.

Continuing with Zoning Ordinance Section 504:

".4 The use does not constitute an unnecessary fire hazard, and provides for fire safety measures in planning, design, construction, and operation."

Finding 5: Fire safety measures will need to be strictly enforced in planning, design, construction and occupation of the new building. The site has many established fire detection and prevention facilities on the site, including gas leak detectors, alarms, fire extinguishers, a 20,000 gallon water tank and an onsite fire truck.

Continuing with Zoning Ordinance Section 504:

".5 Public utilities are to develop or utilize rights-of-way that have the least adverse impact on forest resources. Existing rights-of-way are to be utilized wherever possible.

Finding 6: All public utilities are in place.

Continuing with Zoning Ordinance Section 504:

".6 Development within major and peripheral big game ranges shall be sited to minimize the impact on big game habitat. To minimize the impact, structures shall: be located near existing roads; be as close as possible to existing structures on adjoining lots; and be clustered where several structures are proposed."

Finding 7: The area is a big game range, but this site is already developed into an industrial use; the new building will not expand the site and will be clustered with other structures on the site.

Zoning Ordinance Section 1503 requires the following:

"1503 Conditional Uses:

.5 Granting a Permit: The Commission may grant a Conditional Use Permit after conducting a public hearing, provided the applicant provides evidence substantiating that all the requirements of this ordinance relative to the proposed use are satisfied and demonstrates the proposed use also satisfies the following criteria:

A. The use is listed as a Conditional Use in the zone which is currently applied to the site;"

Finding 8: The PF-76 zone lists "Operations conducted for the exploration, mining, and processing of...mineral or subsurface resources not permitted outright" under Conditional Uses.

Continuing with Zoning Ordinance Section 1503.5:

"B. The use meets the specific criteria established in the underlying zone:"

Finding 9: The criteria of the PF-76 zone have been shown to be met in Findings 1 through 7.

Continuing with Zoning Ordinance Section 1503.5:

"C. The characteristics of the site are suitable for the proposed use considering size, shape, location, topography, existence of improvements, and natural features;"

Finding 10: The property is located about 3 miles northwest of Mist and is 12.23 acres. The lot is irregular in shape and the topography is gently sloping. There are many existing improvements on the property, and the new compressor and its building will be amidst the other structures. The property is within the Mist-Birkenfeld Rural Fire Protection District.

These appear to make the site suitable for the proposed new compressor.

Continuing with Zoning Ordinance Section 1503.5:

"D. The site and proposed development is timely, considering the adequacy of transportation systems, public facilities, and services existing or planned for the area affected by the use."

Finding 11: The only transportation system in the area is South Mainline Road, owned by Longview Fibre and used mostly for log trucking. Public facilities are electric power and telephone. These appear to make the proposed use timely, as no new facilities will be required by the new compressor.

Continuing with Zoning Ordinance Section 1503.5:

"E. The proposed use will not alter the character of the surrounding area in a manner which substantially limits, impairs, or precludes the use of surrounding properties for the primary uses listed in the underlying district;"

Finding 12: The surrounding area is in timber production. The proposed replacement compressor will not alter the character of the area, as it will be entirely within the existing plant site.

Continuing with Zoning Ordinance Section 1503.5:

"F. The proposal satisfies the goals and policies of the Comprehensive Plan which apply to the proposed use;"

Finding 13: The Columbia County Comprehensive Plan (CCCP) ENERGY SOURCES section includes these findings (p.224):

"Potential conflicting uses for natural gas wells in the County are minimized by the controls and regulations imposed by ODOGAMI [Oregon Department of Geology and Mineral Industries]. They are also minimized since wells are located in remote forested areas and surrounding property owners share in the profits of producing wells. The county will conserve forest lands for forest uses and allow operations conducted for the exploration, mining, and processing of subsurface resources as a conditional use. The County will rely on ODOGAMI to insure future protection of resources and surrounding lands."

The Energy Sources GOAL is (CCCP p.225):

"To protect deposits of energy materials in the County and prevent injury to surrounding lands and residents."

The new compressor will be regulated by DOGAMI rules, and will be used to pressurize natural gas for piping to and from Miller Station. This operation and the others at Miller Station have been previously approved by the County as a way to prolong the useful life of the gas fields.

Continuing with Zoning Ordinance Section 1503.5:

"G. The proposal will not create any hazardous conditions."

Finding 14: The proposed new compressor will not be hazardous, as suitable precautions have been taken to detect and control fire and to prevent its spread to surrounding forest lands. The new compressor will be housed in a new metal frame, metal clad building and should not be a fire hazard.

Continuing with Zoning Ordinance Section 1503:

".6 Design Review: The Commission may require the Conditional Use be subject to a site design review by the Planning Commission."

Finding 15: A Site Design Review is required for the new building; see DR 21-96.

The following state laws must also be met by this application:

Oregon Revised Statutes: ORS Chapter 527, the Oregon Forest Practices Act, contains no regulations for gas wells or their production facilities.

Oregon Administrative Rules: OAR 660-06-025(4) reads:

"The following uses may be allowed on forest lands subject to the review standards in section (5) of this rule:

....

(f) Mining and processing of oil, gas or other subsurface resources...not otherwise permitted under section (3)(m) of this rule (e.g., compressors, separators and storage serving multiple wells)..."

OAR 660-06-025(5) sets out the following requirements for non-forest uses in forest lands:

"(a) The proposed use will not force a significant change in, or significantly increase the cost of, accepted farming or forest practices on agricultural or forest lands;"

Finding 16: The new compressor will be housed in a new building in the midst of existing structures and facilities at Miller Station. There will be no new impacts on adjacent or nearby forest operations.

Continuing with OAR 660-06-025(5):

"(b) The proposed use will not significantly increase fire hazard or significantly increase fire suppression costs or significantly increase risks to fir suppression personnel; and"

Finding 17: The new building and compressor will include fire detection and suppression equipment integrated with the existing comprehensive equipment on the site. The fire fighting risks and costs should not be greater than the fire fighting risks and costs of the two compressors being replaced.

Continuing with OAR 660-06-025(5):

"(c) A written statement recorded with the deed or written contract with the county or its equivalent is obtained from the land owner which recognizes the rights of adjacent and nearby land owners to conduct forest operations consistent with the Forest Practices Act and Rules..."

Finding 18: The recorded leases between the applicant and adjacent and nearby property owners recognize their rights to conduct forest operations with regard for, and without unnecessary harm to, their forest and agricultural operations. Applicant has offered to enter into a "written contract with the ounty" if required by the Planning Commission.

COMMENTS:

1. Larry Oblack, member of the Mist Birkenfeld CPAC, has no objection to approval of the request as submitted.

2. Dan E. Wermiel, Petroleum Geologist; Oil, Gas and Geothermal Regulation; Geologic Services section; DOGAMI, has no objection to approval of the request as submitted.

No other comments have been received from government agencies or nearby property owners as of the date of this staff report (January 22, 1997).

CONCLUSION AND RECOMMENDATION:

Based on the above findings, staff recommends approval of this request, with no conditions.

Note: ORS 671.025 requires that the plans and specifications for certain buildings in Oregon must have the stamp on them of a registered architect or registered professional engineer. Exceptions are ORS 671.030(2):

1. Single family residential buildings.
2. Farm buildings.

3. Accessory buildings to single family residences and farm buildings.
4. Buildings of 4,000 sq.ft. or less ground area.
5. Buildings with an interior height of 20' or less (top surface of lowest floor to highest interior overhead finish).
6. Non-structural alterations or repairs to a building.

The structure proposed in this application may be subject to ORS 671.025; if so, the plans submitted for a building permit must have the stamp of a registered architect or registered professional engineer on them.

pw

COLUMBIA COUNTY PLANNING COMMISSION

"MODIFICATION OF PRIOR APPROVAL"

STAFF REPORT

8/22/02

Conditional Use Permit - PF-76 Zone

FILE NUMBER: MPA CU 03-02

APPLICANT: NW Natural Gas Company
220 NW Second Avenue
Portland, Oregon 97209

OWNERS: Longview Fiber Company
PO Box 667
Longview, WA 98630

LOCATION: Approximately 1½ miles SW of Mist, Oregon

REQUEST: Modify the identified property, for CU 03-02 to allow Natural Gas Well Injection/Withdrawal Operations for well 43a-22-65 in the PF-76 zone, for which Conditional Use Permits are required.

TAX ACCOUNT: 6500-000-05000 **ACRES:** 1203.36

ZONING: Primary Forest (PF-76)

BACKGROUND: This modification correctly identifies Tax Lot 6500-000-05000 instead of 6500-000-04900.

The applicant submitted a Conditional Use Permit application; CU 03-02; to drill an Injection/Withdrawal well; IW 43a-22-65 'Schlicker Pool" in the existing Calvin Creek Storage area on tax lot 5000 which is 1203.36 acres using abandoned well CC 42-22-65 in order to develop the gas storage reservoir. The area is generally known as the Mist Gas Fields where there are numerous existing gas production wells and gas storage structures. According to the Oregon Department of Geology and Mineral Industries (DOGAMI) map titled, "Geologic Map of the Upper Nehalem River Basin Oregon" dated 1976 the underlying geologic structure is described as "Keasey Formation" early Oligocene to late Eocene comprised predominantly of mudstone.

APPLICABLE CRITERIA: **PAGE:**

County Zoning Ordinance:
Section 503 Conditional Uses 3

Section 504	3 - 5
Section 1503.5 A - G	5 - 7
Section 1505.6	7

Oregon Administrative Rules:

OAR 660-06-025(3)(m)	7

FINDINGS:

The following sections of the Zoning Ordinance and state laws are pertinent to this application:

Columbia County Zoning Ordinance (CCZO) Section 503 permits the following in the PF-76 zone:

"Section **503** Conditional Uses: In the PF-76 zone the following conditional uses and their accessory uses are permitted subject to the provisions of Sections 504 and 505. A conditional use shall be reviewed according to the procedures provided in Section 1503.

.2 Operations conducted for the exploration, mining, and processing of geothermal, aggregate, and other mineral or subsurface resources not permitted outright."

Finding 1: Natural gas is considered a "subsurface resource". In the PF-76 zone, "mining" and "processing" subsurface resources are allowed as conditional uses which must be approved by the County Planning Commission.

Zoning Ordinance Section 504 requires the following:

"Section **504** All Conditional Uses Permitted In The PF Zone Shall Meet The Following Requirements:

.1 The use is consistent with forest and farm uses and with the intent and purposes set forth in the Oregon Forest Practices Act."

The Oregon Forest Practices Act (ORS Chapter 527) includes the following:

"**527.630** Policy. (1) ...it is declared to be the public policy of the State of Oregon to encourage economically efficient forest practices that assure the continuous growing and harvesting of forest tree species and the maintenance of forest land for such purposes as the leading use on privately owned land, consistent with sound management of soil, air, water and fish and wildlife resources that assures the continuous benefits of those resources for future generations of Oregonians."

Finding 2: The proposed use of the property is for the creation of a storage reservoir by drilling and opening up a former abandoned well, CC 42-22-65 that discontinued operation in the past. The storage of gas in the

ibsurface structure utilizing the former well should have minimal impact on the land or its forest resources. There will be no new roads or structures with significant footprints, no discharge of waste into the air, water or soil, and no large trees will be removed. The use shall follow DOGAMI guidelines and requirements and will be consistent with forest and farm uses and the intent and purpose set forth in the Oregon Forest Practices Act.

Continuing with Zoning Ordinance Section 504:

".2 The use will not significantly increase the cost, nor interfere with accepted forest management practices or farm uses on adjacent or nearby lands devoted to forest or farm use."

Finding 3: The development of the gas storage reservoir should have no effect on farm or forest uses on adjacent or nearby lands.

Continuing with Zoning Ordinance Section 504:

".3 The use will be limited to a site no larger than necessary to accommodate the activity and, as such will not materially alter the stability of the overall land use pattern of the area or substantially limit or unpair the permitted uses of surrounding properties. If necessary, measures will be taken to minimize potential negative effects on adjacent forest lands."

Finding 4: The proposed drilling location is in a remote part of the County with few inhabitants. There should be little temporary and no permanent effect on the overall land use pattern, which is primarily in timber production. The well site will be approximately 200' x 250' during drilling operations and be reduced to approximately 125' x 175' after drilling is complete. The applicant states, "An area of approximately .5 acres will be taken from the timber production."

The use of the existing retired gas well site should not materially alter the stability of the overall land use pattern of the area or substantially limit or impair the permitted uses of surrounding properties. Permitted uses allowed in the CCZO in the PF-76 zone include: commercial forest management; fish and wildlife management; structures necessary and accessory to the above; primary wood processing facilities; facilities and test sites for experimental and research activities associated with the propagation, management, or harvesting of forest tree species; forest tree nurseries and accessory facilities; rock quarries, including the crushing, screening, and stockpiling of materials, when the rock is used for a commercial forest operation or when an operating permit and reclamation are not required by state law (ORS 517.790). Commercial forest operations include construction, reconstruction, or maintenance of forest access roads, or supporting forest management activities such as riprapping, bridge wing wall diversions, culvert bedding, and other similar activities located on forest lands and conducted for the purpose of forest management; Helipad and balloon bedding areas necessary to commercial forest management; farm use as defined by ORS 215.203(2); rehabilitation, replacement, repair, and minor improvement of existing park structures and facilities.

Continuing with Zoning Ordinance Section 504:

".4 The use does not constitute an unnecessary fire hazard, and provides for fire safety measures in planning, design, construction, and operation."

Finding 5: Fire safety measures will need to be strictly enforced in planning, drilling, and operation of the proposed well. The 200' 300' by 300' - 500' clearing for the drill pad shall provide adequate fire breaks and fire safety. A condition of approval shall be that the Mist Birkenfeld fire district shall approved of a fire safety plan before drilling begins. The Mist-Birkenfeld Fire District stated, "it is important for the Fire District to be notified 3 days in advance of start of drilling."

Continuing with Zoning Ordinance Section 504:

".5 Public utilities are to develop or utilize rights-of-way that have the least adverse impact on forest resources. Existing rights-of-way are to be utilized wherever possible.

Finding 6: The applicant will not utilize public utilities. The applicant will use only existing county and logging roads. The applicant states, "Use of and access to subject property has been conveyed to applicant by Gas Storage lease of December 31, 1993 from Longview Fiber Company, Grantor to Northwest Natural Gas Company, Grantee."

Continuing with Zoning Ordinance Section 504:

".6 Development within major and peripheral big game ranges shall be sited to minimize the impact on big game habitat. To minimize the impact, structures shall: be located near existing roads; be as close as possible to existing structures on adjoining lots; and be clustered where several structures are proposed."

Finding 7: The area is a big game range, as is most of Columbia County. There will be unavoidable temporary disruption of big game activities, due to the intrusion of people and machines into the deep woods to drill the well and set up the gas recovery system. The well head and gas recovery system should not impact big game habitat in a manner that disrupts big game habits. The temporary intrusion should cause minimal short and long-term disruption.

Zoning Ordinance Section 1503 requires the following:

"**1503** Conditional Uses:

.5 Granting a Permit: The Commission may grant a Conditional Use Permit after conducting a public hearing, provided the applicant provides evidence substantiating that all the requirements of this ordinance relative to the proposed use are satisfied and demonstrates the proposed use

also satisfies the following criteria:

A. The use is listed as a Conditional Use in the zone which is currently applied to the site;"

Finding 8: "Operations conducted for the exploration, mining, and processing of geothermal, aggregate, and other mineral or subsurface resources not permitted outright" are a Conditional Use in the PF-76 zone under CCZO §503.2. The Gas well drilling and storage of gas is considered a conditional use in this zone.

Continuing with Zoning Ordinance Section 1503.5:

"**B.** The use meets the specific criteria established in the underlying zone:"

Finding 9: The criteria of the PF-76 zone have been shown to be met in Findings 1 through 8.

Continuing with Zoning Ordinance Section 1503.5:

"**C.** The characteristics of the site are suitable for the proposed use considering size, shape, location, topography, existence of improvements, and natural features;"

Finding 10: The drilling activity will be in the area generally known as the "Mist Gas Fields" where there are other gas production wells, well heads and gas trap structures used for gas storage in an area of steep and rugged topography. An abandoned former gas well will be drilled out and used for storage of gas. Use of existing site and subsurface structure characteristics make this gas storage site suitable for the proposed use.

Continuing with Zoning Ordinance Section 1503.5:

"**D.** The site and proposed development is timely, considering the adequacy of transportation systems, public facilities, and services existing or planned for the area affected by the use."

Finding 11: The general area known as the Mist Gas Fields supports other gas wells and gas collection and distribution and storage systems therefore the site and development will be timely since it will fit into this existing context. There will not be any need for public facilities or services. Existing county and logging roads will be used for vehicles. When the gas peters out the site will be restored to its natural state.

Continuing with Zoning Ordinance Section 1503.5:

"**E.** The proposed use will not alter the character of the surrounding area in a manner which substantially limits, impairs, or precludes the use of surrounding properties for the primary uses listed in the underlying district;"

Finding 12: The proposed gas well and subsurface storage should not alter the character of the area since the general area is known as the "Mist Gas Fields" and has similar types of uses to those that have existed and been in production for many years. The proposed drilling and operation of a gas well storage facility will not alter the character of the area and will fit well into the character of the area.

Continuing with Zoning Ordinance Section 1503.5:

"**F.** The proposal satisfies the goals and policies of the Comprehensive Plan which apply to the proposed use;"

Finding 13: The FOREST LANDS Goal and Policy 1, and the ENERGY SOURCES Goal of the Comprehensive Plan appear to apply to these gas well drilling and storage activities. The impacts of these activities are discussed at some length in the application project narrative found in the applicant's "Plan of Operations". These goals appear to be satisfied.

Continuing with Zoning Ordinance Section 1503.5:

"**G.** The proposal will not create any hazardous conditions."

Finding 14: The proposed drilling and operation activities will not be hazardous if suitable precautions are taken to prevent fire. The drill pad shall provide adequate fire breaks for the drilling and operation of the gas well.

Continuing with Zoning Ordinance Section 1503:

".6 Design Review: The Commission may require the Conditional Use be subject to a site design review by the Planning Commission."

Finding 15: A Site Design Review may be required by the Commission.

Following with the Oregon Administrative Rules:

OAR 660-06-025 Uses Authorized in Forest Zones

(3) The following uses may be allowed outright on forest lands:

(m) Exploration for and production of geothermal, gas, oil, and other

associated hydrocarbons, including the placement and operation of compressors, separators and other customary production equipment for an individual well adjacent to a well head;"

Finding 16: The proposed activities are permitted outright on forest lands by the Oregon Administrative Rules however the County Codes are more restrictive and require this type of activity to go through the Conditional Use Permit Process.

COMMENTS:

1. The County Roadmaster has reviewed the proposed application and has no objection to its approval as submitted.

2. The Mist-Birkenfeld Fire District has reviewed the application and has no objection to approval of the request as submitted but comments that, "It is important for the Fire District to be notified 3 days in advance of start of drilling."

No other comments have been received from government agencies or nearby property owners as of the date of this staff report (August 23, 2002).

CONCLUSION AND RECOMMENDATION:

Based on the above findings, staff recommends APPROVAL of this "Modification of Prior Approval" request to amend CU 03-02 for gas well drilling and gas storage on tax account 6500-000-05000 with the following conditions:

1. This permit shall become void 4 years from the date of the final decision if drilling activities have not begun on the property. Extensions of time may be granted by the Planning Director if requested in writing before the expiration date and if the applicant was not responsible for the failure to begin operations within the time period.

2. The applicant shall notify the Mist-Birkenfeld Fire District 3 days in advance of start of drilling.

3. Well sites shall be returned to its natural state if gas is not stored or produced on the site.

ENVIRONMENTAL STUDIES REPORT
Interstate Storage Project – Sapphire

Prepared for:
Northwest Natural

September 10, 2003

URS

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APPENDICES

ENVIRONMENTAL STUDIES REPORT
INTERSTATE STORAGE PROJECT – SAPPHIRE PHASE

Northwest Natural owns and operates an existing underground gas storage facility near Mist, Oregon. As part of its Interstate Storage Project, Northwest Natural has been expanding the facility in recent years through the expansion of the facilities at Miller Station and development of the Calvin Creek Storage Area. The Sapphire Phase of the Interstate Storage Project will add injection/withdrawal wells and the gathering lines to connect the wells in the Calvin Creek Storage Area.

URS Corporation conducted surveys for environmental resources in the project area. Environmental resources analyzed include: protected areas, fish and wildlife habitat, threatened and endangered species, cultural resources, recreation, and wetlands. This report presents the pertinent Oregon Administrative Rules (OAR) for each resource, existing conditions, and conclusions about project impacts.

The project area is located in rural Columbia County in parts of sections 22 & 23 of Township 6 North Range 5 West, Willamette Meridian.

This report is presented in five major sections covering: Protected Areas; Fish and Wildlife Habitat; Threatened and Endangered Species; Recreation; and Historical, Cultural, and Archaeological Resources. Each section is written as a stand-alone document to address different permit issues or permits.

1.0 PROTECTED AREAS

This standard prohibits the siting of an energy facility in any of the protected areas listed in the rule. The standard permits the siting of a facility outside the listed protected areas so long as the "design, construction and operation" of the facility "is not likely to result in significant adverse impact to" any of the protected areas. OAR 345-22-040(1).

Protected areas as defined in OAR 345-022-040 include national parks, national monuments, wilderness areas, national and state wildlife refuges, national coordination areas, national and state fish hatcheries, national recreation and scenic areas, state parks and waysides, state natural heritage areas, state estuarine sanctuaries, scenic waterways, experimental areas established by the Rangeland Resources Program, agricultural experimental stations, research forests, Bureau of Land Management areas of critical environmental concern, and state wildlife and management areas.

Several map sources were used for identifying protected areas in northwestern Oregon in the vicinity of the Project Area. Most of the protected areas in the region were found on a set of maps created by the Oregon Department of Energy covering national, state, BLM, and Oregon State University protected areas. Information from the Oregon State Department of Fish and Wildlife was used to identify state hatcheries. Oregon Natural Heritage Program staff provided location information on state natural heritage areas. Nearest protected areas of various kinds are

noted below even when they are at a distance greater than any potential impact from the proposed project.

An Oregon State University Research Forest is located about 5 miles northwest of the north end of the pipeline route, north of Mist, OR.

State wildlife areas are located 15 miles east and 15 miles west of the Project site. The state wildlife area west of the pipeline is Jewell Wildlife Area. Saddle Mountain State Park is located about 20 miles west of the pipeline route. A state estuarine sanctuary on the Columbia River is located about 15 miles from the Project site.

The Nehalem Fish Hatchery is located more than 20 miles from the project area along the Nehalem River. Several other state hatcheries are located over 20 miles north of the project area along the Columbia River.

Twenty-three state natural heritage areas are located in the northwestern portion of Oregon, in Clatsop, Multnomah, Tillamook, Clackamas, and Columbia Counties. Skull and Little Wallace Island, located in the Columbia River, is approximately 10 miles north of the Onion Peak and Nehalem Bay are over 20 miles west of the project area. The Blind Slough Swamp, established to protect an old growth Sitka spruce (*Picea sitchensis*) swamp, bald eagle (*Haliaeetus leucocephalus*) nests, and Columbian white-tailed deer (*Odocoileus virginianus leucurus*), is located near the mouth of the Columbia River, over 20 miles northwest of the project area (Stolzenburg 1998). All other heritage areas are also located over 10 miles away from the project area.

National protected areas within the study range include Mt Rainier National Park and Goat Rocks Wilderness at more than 90 miles, Mt. Hood Wilderness at 90 miles, Mt. St. Helens National Monument at 40 miles, and the Columbia Gorge National Scenic Area at 50 miles from the site. Several national wildlife refuges are located along the Columbia River over 20 miles from the project site.

The following types of protected areas were not identified within the range of the study: national coordination areas, national fish hatcheries, experimental range areas, scenic waterways, and agricultural experiment stations.

The design, construction, and operation of the pipeline will not have any adverse impact on any of the listed protected areas. Miller station and the Calvin Creek (including the gathering lines) and Busch areas are not located in any protected area. The closest protected area is the OSU research forest about five miles from the project area. Other protected areas are found from 10 to over 20 miles from the project area.

None of the new facilities will have off-site impacts on these protected areas. The gathering lines will be buried and not visible. Temporary construction impacts for the gathering lines, such as ground disturbance, construction activity and noise are not expected to impact the closest protected area resource. The Miller Station improvements will be within the developed area and similarly will not impact protected resources.

2.0 FISH AND WILDLIFE HABITAT

URS wetland, wildlife, and fisheries biologists conducted a site-specific biological resource investigation during the weeks of June 16 and 23, 2003. Using previous reports and studies for the area as points of reference, they conducted a field reconnaissance of a 200-foot wide corridor the entire length of the proposed pipeline segments. URS mapped the habitats within the study corridor using aerial photographs, field observations, and professional judgment (See Appendix A, Figure 1).

2.1 HABITAT IDENTIFICATION

The project proposes the construction of two natural gas gathering pipelines that will connect two well sites to existing permitted natural gas gathering lines (See Appendix A, Figure 1). The proposed natural gas gathering pipelines extend through a limited variety of ecological communities or habitat types. The entire proposed gathering line routes cross privately owned tree farms dominated by recent clearcuts, and early-seral, or semi-mature commercial Douglas-fir forests. No wetlands or perennial streams were found in the project area during field investigations.

The first proposed gathering line (Line 1) is approximately 1,750 feet long. It begins at Well 43aH-22-65 in the northeast quarter of Section 22 and follows a forest road in an easterly direction for about 500 feet through conifer (Douglas-fir) forest to an existing 12-inch gathering line in the northwest quarter of Section 23. Line 1 then turns north and parallels the existing line along the west side of another forest road until it reaches the Busch Valve Station, a distance of approximately 1,250 feet.

The second line (Line 2) connects an existing gathering line to a proposed well site (24H-15-65) in the northwest quarter of Section 22. From the interconnection point on the existing gathering line in the northeast quarter of Section 22, Line 2 traverses north along an overgrown forest road through early-seral forest approximately 400 feet to an intersection with another overgrown forest road, where it turns to the left and traverses roughly 420 feet to the west. At this point there are two alternate routes.

The western alternate route (Alternate 1) continues approximately another 400 feet to where the road bends to the south and continues in a westerly direction into a ravine for about 100 feet. At this point, Alternate 1 leaves the early-seral forest and enters a conifer (Douglas-fir) forest stand near a non-fish bearing ephemeral stream that drains north. Alternate 1 then turns north and traverses through the Douglas-fir stand, paralleling and about 50 feet from the ephemeral stream for a distance of approximately 500 feet. At this point, Alternate 1 crosses a tributary ephemeral stream (Crossing 1) that enters the first ephemeral stream from the east. Alternate 1 then enters a recent clearcut and continues another 300 feet through the clearcut to the proposed well site (connecting to the eastern alternative route approximately 100 feet from the well site).

The eastern alternative route (Alternate 2) is identical to Alternate 1 for about the first 1000 feet from the connecting point on the existing gathering line. It diverges from the overgrown forest road about 500 feet from the point where the combined route turns west and traverses north across an early-seral stand for about 650 feet until it connects with another overgrown forest

road. Just before reaching the second road, Alternate 2 crosses the extreme headwaters of the same ephemeral stream crossed by the western alternative route (Crossing 2). Alternate 2 then turns west and follows the second forest road about 300 feet until it emerges from the early-seral stand into the same recent clearcut area crossed by Alternate 1. Alternate 2 connects to Alternate 1 about 100 feet from the proposed well site. Habitats crossed by Alternate 1 and Alternate 2 are described below and are shown in Appendix A, Figure 1.

2.1.1 Conifer (Douglas-Fir) Forest Stands

The forest stands found along the pipeline route are second or third generation stands (20-50 years old) dominated by Douglas-fir (*Pseudotsuga menziesii*). Private timber companies manage the majority of these forest stands for timber production. Other trees in these forest stands include western red cedar (*Thuja plicata*), western hemlock (*Tsuga heterophylla*), and red alder (*Alnus rubra*). The canopy is closed, and the understory is sparse. The habitat is basically two layered with a tree canopy layer and an understory herb and low shrub layer. Dominant understory plants include sword fern (*Polystichum munitum*), salal (*Gaultheria shallon*), Oregon grape (*Mahonia nervosa*), deer fern (*Blechnum spicant*), red huckleberry (*Vaccinium parvifolium*), trailing blackberry (*Rubus ursinus*), salmonberry (*Rubus spectabilis*), and vine maple (*Acer circinatum*).

2.1.2 Early-Seral Forest Stands

As a forest stand develops, it goes through stages or "seres" in the process of succession back to a mature forest. Early-seral forest stands are in the beginning stages of succession. The more recent timber harvest areas have been replanted with Douglas-fir trees. Other conifer and deciduous tree seedlings are also present in places. The trees are mostly 10 to 20 years old. The open canopy during the first few years of succession allows for more vigorous growth of shrubs and herbs than in older conifer stands. Common understory species include salal, bracken fern (*Pteridium aquilinum*), sword fern, Oregon grape, oceanspray (*Holodiscus discolor*), and a variety of berries in the genus *Rubus*. The earliest seral forest stands provide abundant forage for elk (*Cervus canadensis rosevelti*) and black-tailed deer (*Odocoileus hemionus columbianus*), and seeds and berries for birds and black bears (*Ursus americanus*). As the canopy of the stand begins to close (typically between 10 and 20 years) the vigor and abundance of as well as the accessibility of the understory begins to decline. In most areas there is limited wildlife cover during the earliest stages except for logs and log piles left over from logging operations.

2.1.3 Forest Clearcuts

The last several hundred feet of Alternate 1 and Alternate 2 traverses a recent clearcut, adjacent to early-seral habitat. Clearcuts provide very limited wildlife cover and less forage than the early-seral conifer forest habitat. The ground is covered with branches and woody debris. Plants recolonizing these clearcut areas include red alder, scotch broom (*Cytisus scoparius*), salal, sword fern, trailing blackberry, foxglove (*Digitalis purpurea*), ox-eye daisy (*Leucanthemum vulgare*), and a variety of other shrubs and herbs.

2.1.4 Non-fish Bearing Ephemeral Stream

Alternate 1 closely parallels an ephemeral stream (tributary to Calvin Creek) and crosses a tributary stream entering the first stream from the east at Crossing 1. Alternate 2 crosses the same tributary near its extreme headwaters at Crossing 2. The ephemeral stream has a small (< 1 foot wide) distinct stream channel, a gradient of about 12%, and steep sideslopes, but appears to only contain water during storm events. The tributary stream crossed at Crossing 1 and Crossing 2 does not have a distinct channel over most of its length, less than a 1% gradient, gentle sideslope, and probably only contains water during periods of extreme runoff. Except during storms, the main ephemeral stream is dry for its entire length. The stream gradient becomes significantly less below the confluence of the two ephemeral streams and there is no evidence of sediment transport, despite the fact that the entire drainage of the tributary has been clearcut.

2.2 HABITAT CATEGORIES

As part of the site certification amendment process, habitats that will be impacted must be categorized. The Energy Facility Siting Council's (Council) Fish and Wildlife habitat standard states:

> "To issue a site certificate, the Council must find that the design, construction, operation and retirement of the facility, taking into account mitigation, is consistent with the fish and wildlife habitat mitigation goals and standards of OAR 635-415-0025 in effect as of September 1, 2000." OAR 345-022-0060."

OAR 635-415-0025 describes six categories of habitat based on their importance to fish and wildlife. The rule establishes mitigation goals and corresponding implementation standards for each habitat category. Project area habitats fall into Category 4 and Category 6. Category 4 habitat is defined in OAR 635-415-0025 as "important habitat for fish and wildlife species." Category 6 habitat is "habitat the has low potential to become essential or important" for fish and wildlife species. The rationale for categorizing the affected habitats as Category 4 and Category 6 is described below.

The habitat categories assigned are based on the habitat descriptions in OAR 635-415-0025 and best professional judgment, considering the common wildlife and fish species likely to use those habitats. Only forest habitat and non-fish bearing ephemeral stream habitat is present in the study area with no wetland habitat present. The habitat categories for each of the described habitats are:

> **Conifer (Douglas-fir) Forest Stands. Category 4.** This habitat is considered Category 4 because these forest stands provide habitat for a variety of wildlife, but are managed as commercial timber land and undergo intensive management and periodic harvest. The stands are in early- to mid-seral stages and not allowed to approach old-growth conditions. The older stands along the route are reaching harvest age. Older conifer forest stands along the pipeline routes, especially Line 1 and part of Alternate 1 of Line 2, provide habitat for a variety of wildlife species. Certain species such as deer and elk and forest birds (chickadees, thrushes, crossbills, jays, woodpeckers, etc.) are abundant, but overall plant and wildlife species diversity is relatively low, and habitat structures like

snags and woody debris are sparse in these second growth stands. None of these areas provide locations of special importance for deer fawning or elk calving. Future timber harvesting will continue to affect the habitat value of these stands. These stands are important habitat for a variety of forest-dwelling wildlife species.

Early-Seral Forest Stands. Category 4. Early-seral forest stands along the pipeline route are also Category 4 habitats. They provide important foraging habitat for deer and elk, as well as other species that forage on berries or other understory plant material. The early-seral stands are probably the least valuable for most of the wildlife species of all of the seral stages because the forest canopy closes and the understory diminishes over time. Pre-commercial and commercial thinning of trees add periodic disturbance, and the trees are too small to provide habitat for cavity nesting birds or large birds that need sturdy nest structures.

Recent Clearcuts. Category 4. Recent clearcuts also qualify as Category 4. Shrubs, grasses, and herbaceous plants reestablish growth typically within a year to the point where they provide important forage for several wildlife species. For deer and elk, some of the best forage areas are clearcuts in the first few years of regrowth, when the new forest trees are small and there is no forest canopy to diminish production of herb and shrub layers. These areas are typically lacking habitat structures for wildlife species, and the species that use the clearcuts either require cover and breeding habitat elsewhere (nearby, more mature forest stands, typically). Clearcuts are generally not as important to as many species for as much of the year as mature forest stands.

Non-fish Bearing Ephemeral Stream. Category 6. The ephemeral streams in the project area are Category 6 because they do not provide spawning or rearing habitat for fish and are unlikely to transport sediment to fish-bearing streams. The channel below the confluence of the two ephemeral streams has a gradient less than 1% with little evidence of sediment or large woody debris transport over the remaining 1,500 feet to the confluence with Calvin Creek. The channel of the ephemeral stream is typically dry, and flow would be intermittent for the entire distance to Calvin Creek. It is unlikely that the ephemeral stream provides essential or important habitat for aquatic or riparian species or delivers a significant amount of water or nutrients to Calvin Creek. The habitat alongside the ephemeral stream is typical Category 4 conifer forest in various stages of seral growth (clearcut, early-seral , or semi-mature).

2.3 POTENTIALLY AFFECTED FISH AND WILDLIFE SPECIES

Wildlife species that use the surrounding habitats are common to the coastal region of Oregon. Large mammals like elk and deer may use the older conifer forests for forage and cover. Common mammal predators are coyote (*Canis latrans*), black bear (*Ursus americanus*), cougar (*Felis concolor*), weasels (*Mustela spp.*), and mink (*Mustela vison*). Small mammals include Douglas squirrels (*Tamiasciurus douglasii*), mountain beaver (*Aplodontia rufa*), deer mice (*Peromyscus maniculatus*), jumping mice (*Zapus trinotatus*), shrews (*Microsorex hoyi* and *Sorex spp.*), moles (*Scapanus spp.*), voles (*Phenacomys spp. and Microtus spp.*), and other small rodents.

Birds observed or heard along the majority of the pipeline route included American robin (*Turdus migratorius*), song sparrow (*Melospiza melodia*), western tanager (*Piranga ludoviciana*), steller's jay (*Cyanocitta stelleri*), black-headed grosbeak (*Pheucticus melanocephalus*), red crossbill (*Loxia curvirostra*), and American goldfinch (*Carduelis tristis*). Red-tailed hawks (*Buteo jamaicensis*) and turkey vultures (*Cathartes aura*) were observed soaring over several portions of the pipeline route. Pileated woodpeckers (*Picoides pubescens*), Swainson's thrushes (*Catharus ustulatus*), and winter wrens (*Troglodytes troglodytes*) were common in the older conifer forests. Northwestern garter snakes (*Thamnophis ordinoides*), common garter snakes (*T. sirtalis*), and northern alligator lizards (*Elgaria coerulea*) are common in early-seral and clearcut forest, where openings exist for foraging and basking. Pacific tree/chorus frogs (*Pseudacris/Hyla regilla*) were heard and are known to be common in the forest understory near puddles, ponds, and other waters where they breed.

2.3.1 Federal Species of Concern

The USFWS noted 16 federal species of concern that may occur in the vicinity of the project area. Those species with preferred habitat occurring in the project vicinity, or those that have a likelihood of occurring in the project area, are discussed below.

Band-tailed Pigeon (*Columba fasciata*)

Status: The Band-tailed pigeon is a federal species of concern and is not listed or considered a sensitive species in Oregon.

Background Information: Band-tailed pigeons prefer to forage in open sites bordered by tall conifers, such as managed forests, city parks, or neighborhoods. In western Oregon, they prefer to nest in dense coniferous forests. They nest in small colonies near the tops of trees within thick conifer forest.

Populations in the Project Area: This species is found along much of the Pacific Coast. Band-tailed pigeons are possible in the project area, although none were observed during the June 2003 field investigation.

Olive-sided Flycatcher (*Contopus cooperi*)

Status: The Olive-sided flycatcher is a federal species of concern and is a sensitive (vulnerable) species in Oregon.

Background Information: Olive-sided flycatchers utilize recently logged forests, shrub dominated areas, and early-seral conifer forests. They commonly perch at tops of trees, conducting occasional flights to capture large insects, especially bees. The cause of species decline is unknown, but habitat loss on the wintering grounds (South America) is a possible threat. The most significant decrease in olive-sided flycatcher populations has occurred in eastern North America.

Populations in the Project Area: Olive-sided flycatchers are likely found throughout the project area during the breeding season; from mid-May to mid-August. None were observed during the June 2003 field investigation.

Mountain Quail (*Oreortyx pictus*)

Status: The Mountain quail is a federal species of concern and is not listed or sensitive in the Oregon Coast Range.

Background Information: Mountain quail prefer densely vegetated slopes often resulting from disturbance or logging activities. They require a source of water for breeding activities and often prefer alder thickets along streams and steep shrubby early-seral forest clearcuts. Development, agriculture, and overgrazing are major threats to this species.

Populations in the Project Area: The status of many mountain quail populations are not well known due to the species elusive and secretive nature. Known Oregon populations exist in the Coast Range, Cascade Mountains, near the Columbia River Gorge, and in the Blue Mountains. While mountain quail are still common in western Oregon, interior populations east of the Cascade Mountain crest have almost completely disappeared due to overgrazing in riparian areas and the spread of agriculture. This species is likely to occur in the project area. No mountain quail were observed during June 2003 field investigations.

Townsend's Big-eared Bat (*Corynorhinus townsendii townsendii*)

Silver-haired Bat (*Lasionycteris noctivagans*)

Long-eared myotis (*Myotis evotis*)

Fringed myotis (*Myotis thysandoes*)

Long-legged myotis (*Myotis volans*)

Yuma Bat (*Myotis yumanensis*)

Status: The Townsend's big-eared bat, silver-haired bat, and myotis bats are federal species of concern. Due to their dependence on caves and cave-like habitat for hibernation and sensitivity to the disturbance of hibernation caves, Townsend's big-eared bat is considered a critical (listing as threatened or endangered is pending or for which listing as threatened or endangered may be appropriate if immediate conservation actions are not taken) state sensitive species. Fringed myotis are considered a vulnerable state sensitive species, while the silver-haired, long-eared myotis, and long-legged myotis are considered state sensitive species of undetermined status (status is unclear, may be susceptible to population decline, but scientific study needed to determine if decline is of sufficient magnitude that they could qualify for listing as endangered, threatened, critical sensitive, or vulnerable sensitive species).

Background Information: Townsend's big-eared bats in western Oregon are associated with coniferous forests and are scattered in distribution. Caves and abandoned mines are considered critical habitat (Verts and Carraway 1998) for roosting and hibernation. They

will also use buildings if caves or mines are absent. This species is extremely sensitive to human disturbance while roosting or hibernating.

Silver-haired bats are also found in conifer forests and occasionally roost in caves and mines. For summer roosting, they use old growth snags. Similarly, myotis species are associated with conifer forests and were probably cave dwellers historically, but have adapted to using mines, buildings, and other man made structures.

Populations in the Project Area: The ONHIC database does not contain any records of colonies or roosting areas within 2 miles of the project area. None have been reported in the project vicinity and suitable roosting, breeding, and hibernation habitat is not present in the project vicinity. Incidental use of the existing habitats by foraging animals is possible with each bat species.

Northern Red-legged Frog (*Rana aurora aurora*)

Status: The northern red-legged frog is a federal species of concern and a state sensitive species with undetermined status in the Coast Range.

Background Information: In western Washington and Oregon northern red-legged frogs range from sea level up to 4,680' in the Umpqua National Forest, OR. They are also found in the Columbia Gorge (Leonard et al. 1996).

Northern red-legged frogs breed in fresh water marshes, ponds, lakes, and slow-moving streams. Eggs are laid in water on emergent vegetation or submerged branches in late winter or early spring (January or February near sea level). The embryos take about four weeks to develop into tadpoles, and tadpoles develop into frogs in about four to five months, in May, June, or July. Adult frogs are often found in upland forests near streams and wetlands (Leonard et al. 1996).

Populations in the Project Area: Northern red-legged frogs may occur in conifer and early-seral forested habitat within the project area, but are generally found in riparian forest in the vicinity of streams and ponds. Northern red-legged frogs were observed to be relatively common in forested habitat near ponds and streams in the vicinity of the project area. It is likely that none were observed along the pipeline route due to the lack of bodies of water within close proximity. The ONHIC database does not contain any records of red-legged frog populations within 2 miles of the project area.

Red Tree Vole (*Arborimus longicaudus*)

Status: The red tree vole is a federal species of concern.

Background Information: Red tree voles are endemic to Oregon and are found in the coastal and interior mountain ranges. They prefer dense, moist conifer forests and nest in large trees typically 50 feet above ground. Similar to its major predator the northern spotted owl, loss of preferred habitat due to timber harvest has had a significant effect on populations.

Populations in the Project Area: The ONHIC database does not contain any records of red tree vole populations within 2 miles of the project area. The mature conifer forest near the bald eagle nest is suitable for red tree voles. None were observed during the June 2003 field investigations.

2.4 POTENTIAL IMPACTS: COMPLIANCE WITH GOALS AND STANDARDS

In most areas, new gathering lines will be constructed within existing road corridors. Some new route sections will be created through more intact ecological communities. The permanent maintenance corridor is typically 40 feet wide for larger pipelines in the area with a temporary construction corridor of 80 feet (40 feet of permanent corridor plus 40 feet of temporary construction corridor). The pipeline is generally assumed to be in roughly the middle of both the temporary construction corridor and the permanently maintained corridor. However, with the small-diameter gathering pipelines planned for this project, the permanent corridor would be a maximum of 20 feet wide. Also, where new lines are installed adjacent to an existing forest road, the road could be part of the construction corridor if it is a little-used road. Where a new pipeline is installed adjacent to an existing one, the permanent corridor will only be 10 feet wider than the already existing one. These impact areas are applicable to the habitat categories discussed below.

Category 4. These habitats include:

- Conifer (Douglas fir) Forest
- Early-Seral Forest
- Recent Clearcuts

Category 6. This includes one habitat type:

- Non-fish Bearing Ephemeral Stream

The removal of vegetation will be minimized as much as practicable, and best management practices (BMPs) will be used to prevent erosion of soil into ephemeral stream channels and to prevent the spread of weeds. Impacts to these habitats include the removal of vegetative cover and temporary disturbance of the soil in the trench and of the adjacent surface from movement of construction equipment. The vegetation cover will be allowed/encouraged to grow back in the construction corridor with the exception of trees and large shrubs in the area directly over the pipe. This maintenance corridor must be kept clear of tall vegetation to allow for visual inspections and to avoid deep root interference with the pipe.

The impact to forest and clearcut forest habitat in the part of the corridor not containing the pipe will be temporary, and the habitat value would be restored to the level allowed in the surrounding tree farm operation. In the area directly over the pipe (typically 20 feet) trees will be discouraged, but other vegetation will be encouraged to prevent erosion and provide habitat value. The tree spacing in the tree farms is controlled to maximize growth, and the maintained pipeline corridor will be narrow enough that the overall spacing of trees in the stand will be unchanged. Therefore, the habitat value will not be diminished except for the temporary impact

from construction activities. The restoration of vegetation in place is therefore the mitigation, and the result is no net loss of habitat value.

Construction will not occur at either of the alternative crossings of the ephemeral tributary stream if water is present (there is little evidence of surface water flow in this stream except during periods of extreme precipitation). Any stream channel present within construction corridors will be restored to pre-construction conditions, including grades, contours, morphology, and substrate. Stream slopes within construction areas will be covered with a biodegradable jute matting to prevent scouring and wood debris will be added where practicable. Erosion/sediment control procedures within construction areas will be implemented to minimize sediment input in streams.

For these reasons, the design, construction, operation, and retirement of the project, taking mitigation into account, is consistent with the habitat mitigation goals and standards of OAR 635-415-030.

3.0 THREATENED AND ENDANGERED SPECIES

URS wildlife biologists and botanists conducted a site-specific field investigation during the weeks of June 16 and 23, 2003. Prior to the field work, lists of state and federally listed species expected to occur in the vicinity of the proposed project were obtained. Using those lists along with mapped information on the species, previous reports and studies for the area as points of reference, they conducted a field reconnaissance of a 200-foot wide corridor the entire length of the proposed pipeline.

3.1 AGENCY CONTACTS

Information concerning federally listed threatened and endangered species was requested and received from the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service. State-listed species [under ORS 564.105(2) and ORS 496.172(2)] were obtained from the Oregon Natural Heritage Information Center (ONHIC, which covers state-listed plants for the Oregon Department of Agriculture and state-listed animals for the Oregon Department of Fish and Wildlife). Their letters of response are enclosed in Appendix B.

3.2 LITERATURE REVIEW AND FIELD RECONNAISSANCE

After reviewing current literature on the distribution, habitats, identification and background for each listed or candidate species, field work was conducted. Field survey work for this project was conducted during the weeks of June 16 and June 23, 2003. Wildlife biologists and botanists walked the route to look for evidence of use of the area by any of the listed or candidate species likely to occur in the project area. Incidental observations of any other species of note, especially other status species, were noted. The survey findings for each listed or candidate species are covered under the "Populations in the project area" for each species discussed in 3.2.1 and 3.2.2 below.

3.2.1 Birds

Bald Eagle (*Haliaeetus leucocephalus*)

Status: The bald eagle is listed as threatened under the Oregon and federal Endangered Species Acts.

Background Information: The bald eagle population has been steadily increasing since the species received federal protection (endangered status) under the ESA in 1978 (USFWS 1978). I(It has been protected much longer under the Bald and Golden Eagle Protection Act) The federal ESA status of bald eagles was downgraded from endangered to threatened in 1995 (USFWS 1995). The USFWS proposed the removal of the bald eagle in the lower 48 states from the list of Endangered and Threatened Wildlife on July 6, 1999, but to date the species remains listed as threatened under the federal ESA. Protection under the Oregon ESA dates from 1987.

Bald eagles are large birds of prey that nest and forage along fish-bearing waters. They primarily consume fish, but will also feed on waterfowl and carrion. Bald eagles build large stick nests in conifer trees and occasionally in deciduous trees or on cliffs. Nests are most common near marine shorelines, but also occur on rivers and lakes. Nesting activity usually occurs in January and February with hatching occurring in April and May. Fledglings will typically leave the nest in mid-July, but usually remain at or near the nest until mid-August. Nests are often located near the top of the largest tree with an unobstructed view of open water.

Populations in the Project Area: A bald eagle nest is located approximately 50 feet east of the Line 2, Alternate 1 route. The nest is known to be active based on observations from the landowner during the previous two years. The nest is located in a mature Douglas-fir at the edge of a semi-mature conifer stand. No bald eagles were observed during the June 2003 field visit.

Other known bald eagle nests in the vicinity are located near the Columbia River, over 5 miles from the project area (Issacs and Anthony 2001).

Northern Spotted Owl (*Strix occidentalis caurina*)

Status: The northern spotted owl is listed as threatened under the Oregon and federal Endangered Species Acts. The USFWS has designated critical habitat for the northern spotted owl under the federal ESA.

Background Information: Northern spotted owls occur in mountainous and humid coastal forests from southwestern British Columbia, south through western Washington and western Oregon, to northern California (AOU 1983).

This subspecies is dependent on stands of mature and old-growth forest with a multi-layered canopy (Johnsgard 1988). Northern spotted owls occupy northern interior forests with a moderate to high canopy closure, a multi-layered multi-species canopy with large trees, a high degree of deformities in large trees, large snags, fallen trees and other debris

on the ground, and open space below the canopy (Jackson et al. 1995). Northern spotted owls prey on other forest species such as wood rats, deer mice, voles, rabbits, flying squirrels, bats, birds, and some reptiles and invertebrates (Johnsgard 1988) (Terres 1991).

Northern spotted owls generally nest in tree cavities, on stick platforms, or on other debris in old growth conifer trees. Resident owls start roosting near nesting territories in February or early March with actual egg laying occurring March to May (Terres 1991). Generally two eggs are laid and hatch about a month after being laid.

The primary threat to this subspecies is the loss of habitat from forest management practices (Johnsgard 1988).

Populations in the Project Area: There are no known northern spotted owl nests in the vicinity of the project area and the USFWS has not designated any critical habitat in Columbia or Washington Counties. Suitable habitat for northern spotted owls is extremely limited in the Oregon Coast Range due to extensive timber harvesting, forest fragmentation, and catastrophic fires followed by salvage of live and dead trees (USFWS 1992). The ONHIC database does not contain any records of northern spotted owl nests or populations within 2 miles of the project area.

The proposed natural gas pipelines passe through many second growth Douglas-fir stands. Although some of these stands are up to 50 years old, most lack a multi-layered canopy and other habitat features found in mature or old-growth stands preferred by northern spotted owls.

3.2.2 Mammals

Columbia white-tailed deer (*Odocoileus virginianus leucurus*)

Status: The Columbia River distinct population segment of the Columbia white-tailed deer is listed as endangered under the federal ESA. Until recently the entire species was listed as endangered under the federal ESA. On July 24, 2003, the USFWS identified the Douglas County and Columbia River distinct population segments (DPS) of the deer and removed the Douglas County DPS from the list of threatened and endangered species. The Columbia River DPS remains listed as endangered. 68 Federal Register 43647 (July 24, 2003).

Background Information: This white-tailed deer subspecies was federally listed in 1967 and state listed in 1987 as endangered. In 1995 the Oregon Fish and Wildlife Commission determined that the species has recovered and removed it from the state endangered list.

Their preferred habitat includes open riparian zones of lowlands where the deer forage on herbs and grasses. They will also forage along edges of habitat dominated by shrubs. Populations have decreased due to habitat destruction in riparian areas through the conversion of shrub and forest habitats to agricultural lands.

Populations in the Project Area: A small population (<1000 animals) occurs in riparian habitat along the Columbia River and islands of the Columbia River, north of the project. There is no riparian habitat in the project area, and Columbia white-tailed deer are not likely to occur within the Nehalem River watershed where the project area is located. None were observed during the June 2003 field investigation.

3.2.3 Plants

Nelson's checker-mallow (*Sidalcea nelsoniana*)

Status: Nelson's checker-mallow is listed as threatened under the Oregon and federal Endangered Species Acts.

Background Information: Nelson's checker-mallow is a regional endemic with a range from Lewis County, Washington south to Benton County, Oregon. This species was federally listed in 1993 and added to the Oregon list soon thereafter. Nelson's checker-mallow is generally found in areas where prairie or grassland remnants persist. Examples of such habitat include fencerows, drainage swales and at the edges of plowed fields adjacent to wooded areas. Fire suppression has facilitated the encroachment of woody species into the grasslands that Nelson's checker-mallow inhabits, while roadside herbicide spraying and untimely mowing may also contribute to this species' decline.

Populations in the Project Area: According to the ONHIC database, Nelson's checker mallow does not occur within 2 miles of the project area. The absence of native prairie habitat in the project area makes the likelihood of an occurrence of Nelson's checker-mallow very low.

3.3 CONCLUSIONS

3.3.1 Birds

Bald Eagle (*Haliaeetus leucocephalus*)

The effect of the proposed project on the bald eagle depends on which alternate route is selected for the cross-country portion of gathering Line 2. The eastern alternate route (Alternate 2) would extend northwest to southeast through early-seral conifer stands. At its closest point, this route is 300 feet or more from the bald eagle nest. Part of the western alternate route (Alternate 1) would extend directly north to south through a semi-mature Douglas fir stand. As proposed, this route would pass approximately 50 feet from the eagle nest.

USFWS timing restrictions for construction activities are meant to protect the bald eagle during critical periods of their annual cycle. Construction activities during the breeding season, designated by USFWS as January 1st to August 30th, have the following restrictions: 1) 300-foot no-touch buffer, 2) ¼ mile from nest tree if construction activities are not visible from nest (due to topography or other features), and 3) ½ mile

from nest tree if construction activities are visible from nest. The Oregon Forest Practices Act has the same restrictions. Construction activities outside the nesting period (between September 1 and December 31) would not have the ¼ mile or ½ mile restrictions.

If Alternate 2 is chosen for Line 2, construction and maintenance activities must take place outside of the timing restriction dates (after August 30 and before January 1st). However, some flexibility of the dates exists if the eagles are not present in the area. To start construction before the end of the timing restriction, a qualified biologist must visit the site and document that the eagles are no longer active in the area (Dhillion 2003). This documentation would need to be approved by the USFWS. If construction occurs between September 1 and December 31, or earlier if eagles are demonstrated not to be present, then there would be no effect on the eagles.

The western alternate route (Alternate 1) is likely to have a greater effect on the bald eagle due to the proximity of the nest to the proposed route. Although construction could occur outside the timing windows, it will be within the no-touch 300-foot buffer. The 80 foot construction buffer might damage the root system of the nest tree, and there may be important perch trees near the nest tree that could be damaged.

Northern Spotted Owl (*Strix occidentalis caurina*)

Will not be affected. The proposed gathering lines pass through a patchwork of early-seral forest stands and older second-growth stands (20-50 years old) that are not suitable for northern spotted owl nesting. These forest patches are small, surrounded by clearcuts and early-seral forest stands, and they lack the diversity of vegetation, snags, and other habitat features found in a more mature forest canopy preferred by northern spotted owls. The small amount of trees removed, primarily along existing roads, power line, and gas lines, are not habitat preferred by northern spotted owls, and their removal therefore will not affect the species.

3.3.2 Mammals

Columbia white-tailed deer (*Odocoileus virginianus leucurus*)

Will not be affected. There are no riparian areas in the project area and the project is over 7 miles from the closest known population of Columbia white-tailed deer occurring near the Columbia River.

3.3.3 Plants

Nelson's checker-mallow (*Sidalcea nelsoniana*)

Will not be affected. There is no habitat for this species in the project area.

4.0 RECREATION

Under its Recreation standard, the EFSC council determines whether the "design, construction and operation" of a facility will result in "significant adverse impact to important recreational opportunities in the impact area." OAR 345-022-0100.

Within the recommended analysis area of one mile beyond the proposed corridor, there are no recreation facilities. There is light recreation use of some of the area by hunters. The proposed project would have no effect on recreation opportunity or use. The project would therefore be consistent with the standards of OAR 345-022-0100.

5.0 HISTORIC, CULTURAL, AND ARCHAEOLOGICAL RESOURCES

Under this standard, the Council considers whether the construction, operation, and retirement of a facility, taking into account mitigation, is likely to result in significant adverse impacts to:

1. Historic, cultural, or archaeological resources that have been listed on, or would likely be listed on, the National Register of Historic Places

2. For a facility on private land, archaeological objects, as defined in ORS 358.905(1)(a), or archaeological sites, as defined in ORS 358.905(1)(c)

3. For a facility on public land, archaeological sites, as defined in ORS 358.905(1)(c)

ORS 358.905(1)(a) defines an archaeological object as an object that (1) is at least 50 years old, (2) comprises the physical record of any culture, and (3) is material remains of past human life or activity that are of archaeological significance.

ORS 358.905(1)(c)(A) defines archaeological site as any location that contains archaeological objects and the contextual associations of the archaeological objects with each other of biotic or geological remains or deposits.

5.1 Pre-field Investigation

To determine the extent of previous research in the project area, a record search was conducted at the State Historic Preservation Office, Salem, Oregon, on July 8, 2003. This review indicated that excluding previous studies conducted for Northwest Natural, few archaeological investigations have been conducted in this region of Oregon. Studies conducted for Northwest Natural include an archaeological inventory conducted by Dames & Moore in 1997, in conjunction with previous gas storage operations in the Miller Station vicinity (Dames & Moore 1997) and a series of studies conducted in conjunction with the construction and expansion of the Mist pipeline, south of Miller Station. These latter investigations include the 1987-1988 studies conducted in prior to initial pipeline construction (Gaddis 1987; Hibbs and Ellis 1988a, 1988b), and more limited studies along portions of the same route (Dames & Moore 1998). The pipeline corridor studies did result in the identification of a number of archaeological sites; these were largely confined to the floor of the Nehalem Valley and other areas to the south of the current

project, primarily along Dairy Creek. No additional archaeological inventories have been conducted within a one-mile radius of the project area and no previously recorded archaeological sites are known in the immediate area

The current project is sited along the relatively steep, forested slopes and ridges above Calvin, Adams, Beaver, and Lindgren creeks. Comprised of private timber lands, much of the area consists of thick, second-growth timber, intersected by numerous logging roads and skid trails. For the most part, project facilities will follow these corridors. In general, given the terrain and environment of the project area, overall archaeological sensitivity along much of the facility corridors is relatively low. A number of archaeological sites, however, including both historic and prehistoric resources, were recorded in conjunction with the surveys conducted for the Mist pipeline construction (Hibbs and Ellis 1988a). Twenty-three sites were recorded along the South Mist pipeline route, several were found in the Nehalem River Valley or along the East Fork of Dairy Creek, and consist of prehistoric artifact scatters and historic structures or homesteads. Limited subsurface testing was conducted at these sites, indicating the presence of some subsurface deposits at the sites in the Nehalem Valley. In addition, numerous cultural observations were made, including isolated artifacts, roads, fences, bridges, and logging railroad grades and trestles. These findings indicate that cultural resources are present in the general vicinity of the project and may be present within the project area.

5.2 Field Investigation

Prior to the field survey, research was conducted in an attempt to predict possible historic resources that might be expected during the field survey. A search of historic General Land Office maps indicated that at least one historic homestead was located within one half mile of the current project area in the NW ¼ of Section 22, Township 6 North, Range 5 West, and that sites or features related to this activity may be found during survey. The Eaton residence was noted on an 1872 map. The homesite itself would likely have been located well downslope of the nearest proposed project component, closer to the Nehalem River Valley.

Archaeological inventory of the proposed gathering line routes was conducted by URS archaeologists Michael Kelly and Sarah McDaniel between June 23-28, 2003. Where feasible, inventory was completed through use of two parallel transects on each side of the proposed centerline, spaced at 15-meter intervals. This methodology provided for coverage of a 60-meter (200-foot) corridor. In many areas, however, dense vegetation and steep slopes prevented such an approach, which was modified to provide as much coverage as possible. In these cases, areas of lesser vegetation, clearings, road corridors, cut banks, tree falls, and other areas of exposed soil were closely examined. Vegetation along some of the routes consists of dense forest, resulting in poor ground visibility. As noted above, a majority of proposed facility corridors follow existing, well-maintained roadways. Consequently, visibility along the shoulders of these roads was good.

5.3 Results and Recommendations

One previously recorded homesite was identified as likely within the Project vicinity, but will not be impacted by the Project components. However, no previously recorded or newly

recognized cultural resources were identified during inventory of the proposed facility areas. Although ground visibility was generally poor, the proposed gathering lines, and well locations lie largely within areas of low archaeological sensitivity. Consequently, the presence of unidentified resources is also low. As a result, no additional investigation is recommended. Should any potential archaeological resources be encountered during project construction, however, all work in the immediate vicinity should cease until a qualified archaeologist can evaluate the find and recommend an appropriate course of action.

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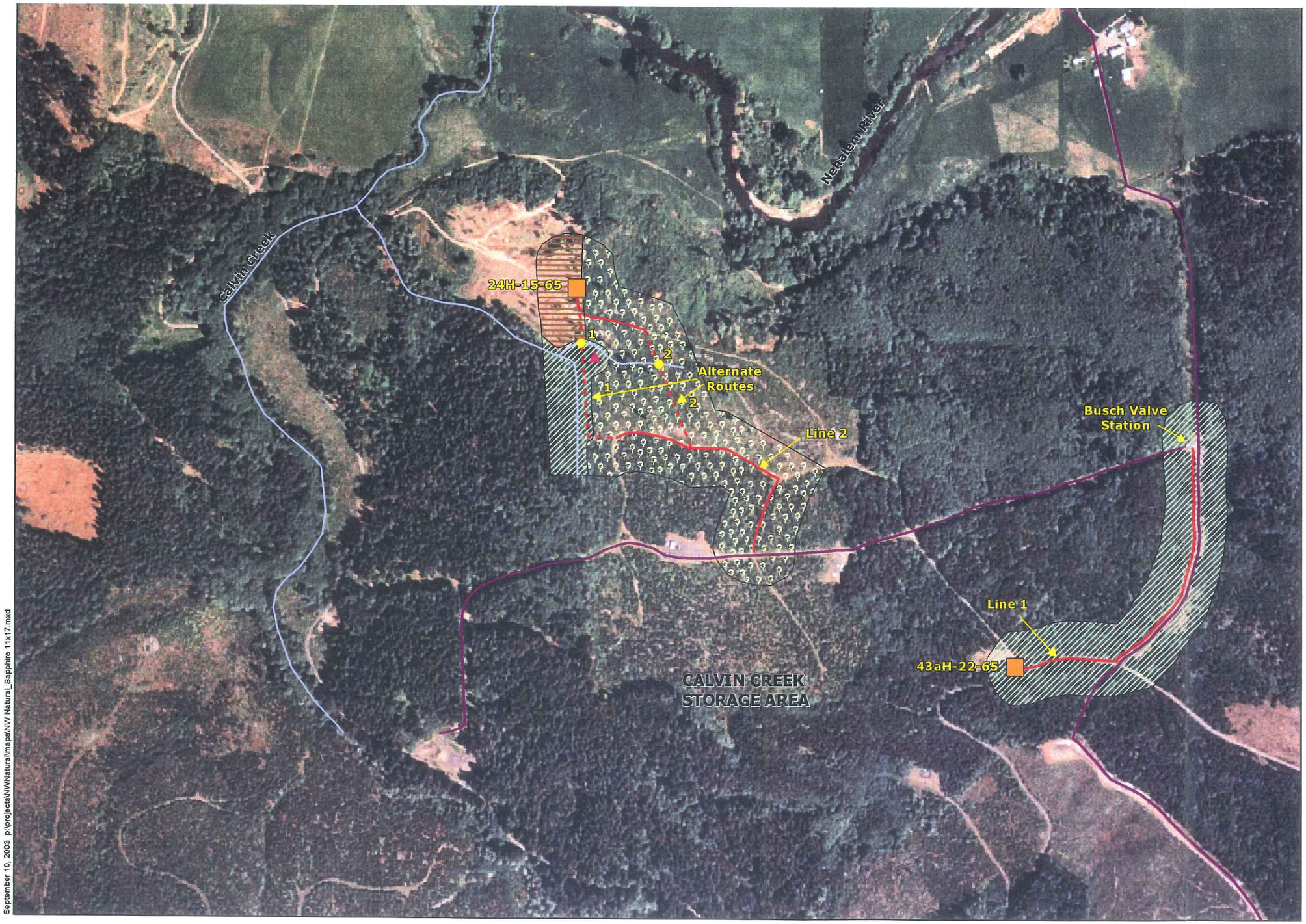
APPENDIX A

Figure 1



Legend

- Streams
- 1 Stream Crossing Number
- Bald Eagle Nest
- Proposed Gathering Line - Cross Country
- Proposed Gathering Line - Along Existing Road
- Existing Gathering Line
- Proposed Well Site

Cover Types

- Clear-cut
- Coniferous Forest
- Seral Forest

NT

0 500 1000
Feet

Figure 1

Gathering Line Locations
Interstate Storage Project - Sapphire
Northwest Natural

Job No. 33756195 URS

September 10, 2003 p:\projects\NW\Natural\mapsNW Natural_Sapphire 11x17.mxd

APPENDIX B

Agency Response Letters

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Oregon Fish and Wildlife Office
2600 S.E. 98th Avenue, Suite 100
Portland, Oregon 97266
(503) 231-6179 FAX: (503) 231-6195

Reply To: 8330.04451(03)
File Name: Sp0445.wpd
TS Number: 03-3844

June 12, 2003

Ilon Logan
URS Corporation
1501 4th Avenue, Suite 1400
Seattle, WA 98101

Subject: Northwest Natural - Interstate Storage Project: Ruby and Emerald Phases
USFWS Reference # (1-7-03-SP-0445)

Dear Mr. Logan:

This is in response to your Species List Request Form, dated May 30, 2003, requesting information on listed and proposed endangered and threatened species that may be present within the area of the Northwest Natural - Interstate Storage Project: Ruby and Emerald Phases in Columbia County. The U.S. Fish and Wildlife Service (Service) received your correspondence on May 30, 2003.

We have attached a list (Attachment A) of threatened and endangered species that may occur within the area of the Northwest Natural - Interstate Storage Project: Ruby and Emerald Phases. The list fulfills the requirement of the Service under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*). U.S. Army Corps of Engineers (COE) requirements under the Act are outlined in Attachment B.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems on which they depend may be conserved. Under section 7(a)(1) and 7(a)(2) of the Act and pursuant to 50 CFR 402 *et seq.*, COE is required to utilize their authorities to carry out programs which further species conservation and to determine whether projects may affect threatened and endangered species, and/or critical habitat. A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) which are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (NEPA) (42 U.S.C. 4332 (2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to the Biological Assessment be prepared to determine whether they may affect listed and proposed species. Recommended contents of a Biological Assessment are described in Attachment B, as well as 50 CFR 402.12.

If COE determines, based on the Biological Assessment or evaluation, that threatened and endangered species and/or critical habitat may be affected by the project, COE is required to consult with the Service following the requirements of 50 CFR 402 which implement the Act.

Attachment A includes a list of candidate species under review for listing. The list reflects changes to the candidate species list published June 13, 2002, in the Federal Register (Vol. 67, No. 114, 40657) and the addition of "species of concern." Candidate species have no protection under the Act but are included for consideration as it is possible candidates could be listed prior to project completion. Species of concern are those taxa whose conservation status is of concern to the Service (many previously known as Category 2 candidates), but for which further information is still needed.

If a proposed project may affect only candidate species or species of concern, COE is not required to perform a Biological Assessment or evaluation or consult with the Service. However, the Service recommends addressing potential impacts to these species in order to prevent future conflicts. Therefore, if early evaluation of the project indicates that it is likely to adversely impact a candidate species or species of concern, COE may wish to request technical assistance from this office.

Your interest in endangered species is appreciated. The Service encourages COE to investigate opportunities for incorporating conservation of threatened and endangered species into project planning processes as a means of complying with the Act. If you have questions regarding your responsibilities under the Act, please contact Stacy Sroufe at (503) 231-6179. All correspondence should include the above referenced file number. For questions regarding salmon and steelhead trout, please contact National Marine Fisheries Service, 525 NE Oregon Street, Suite 500, Portland, Oregon 97232, (503) 230-5400.

Sincerely,

Larry Rasmussen

for Kemper M. McMaster
State Supervisor

Attachments
1-7-03-SP-0445

cc: OFWO-ES
ODFW (nongame)

ATTACHMENT A

FEDERALLY LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES, CANDIDATE SPECIES AND SPECIES OF CONCERN THAT MAY OCCUR WITHIN THE AREA OF THE NORTHWEST NATURAL - INTERSTATE STORAGE PROJECT: RUBY AND EMERALD PHASES
1-7-03-SP-0445

LISTED SPECIES[1/]

Mammals		
Columbian white-tailed deer	*Odocoileus virginianus leucurus*	E
Birds		
Bald eagle[2/]	*Haliaeetus leucocephalus*	T
Northern spotted owl[3/]	*Strix occidentalis caurina*	CH T
Fish		
Coho salmon (Oregon Coast)[4/]	*Oncorhynchus kisutch*	**T
Plants		
Nelson's checker-mallow	*Sidalcea nelsoniana*	T

PROPOSED SPECIES

None

CANDIDATE SPECIES

Fish		
Coho salmon (Lower Columbia River)[5/]	*Oncorhynchus kisutch*	**CF
Steelhead (Oregon Coast)[6/]	*Oncorhynchus mykiss*	**CF

SPECIES OF CONCERN

Mammals	
White-footed vole	*Arborimus albipes*
Red tree vole	*Arborimus longicaudus*
Pacific western big-eared bat	*Corynorhinus (=Plecotus) townsendii townsendii*
Silver-haired bat	*Lasionycteris noctivagans*
Long-eared myotis (bat)	*Myotis evotis*
Fringed myotis (bat)	*Myotis thysanodes*
Long-legged myotis (bat)	*Myotis volans*
Yuma myotis (bat)	*Myotis yumanensis*
Birds	
Band-tailed pigeon	*Columba fasciata*
Olive-sided flycatcher	*Contopus cooperi (=borealis)*
Mountain quail	*Oreortyx pictus*
Purple martin	*Progne subis*

Amphibians and Reptiles	
Tailed frog	*Ascaphus truei*
Northern red-legged frog	*Rana aurora aurora*
Fish	
Pacific lamprey	*Lampetra tridentata*
Coastal cutthroat trout (Oregon Coast)	*Oncorhynchus clarki clarki*

(E) - Listed Endangered	*(T) - Listed Threatened*	*(CH) - Critical Habitat has been designated for this species*
(PE) - Proposed Endangered	*(PT) - Proposed Threatened*	*(PCH) - Critical Habitat has been proposed for this species*
(S) - Suspected	*(D) - Documented*	

Species of Concern - Taxa whose conservation status is of concern to the Service (many previously known as Category 2 candidates), but for which further information is still needed.

(CF) - Candidate: National Marine Fisheries Service designation for any species being considered by the Secretary for listing for endangered or threatened species, but not yet the subject of a proposed rule.

** *Consultation with National Marine Fisheries Service may be required.*

[1] *U. S. Department of Interior, Fish and Wildlife Service, October 31, 2000, Endangered and Threatened Wildlife and Plants, 50 CFR 17.11 and 17.12*

[2] *Federal Register Vol. 60, No. 133, July 12, 1995 - Final Rule - Bald Eagle*

[3] *Federal Register Vol. 57, No. 10, January 15, 1992, Final Rule-Critical Habitat for the Northern Spotted Owl*

[4] *Federal Register Vol. 63, No. 153, August 10, 1998, Final Rule-Oregon Coast Coho Salmon*

[5] *Federal Register Vol. 62, No. 87, May 6, 1997, Final Rule-Coho Salmon*

[6] *Federal Register Vol. 63, No. 53, March 19, 1998, Final Rule-West Coast Steelhead*

ATTACHMENT B

FEDERAL AGENCIES RESPONSIBILITIES UNDER SECTION 7(a) and (c) OF THE ENDANGERED SPECIES ACT

SECTION 7(a)-Consultation/Conference

Requires:

1) Federal agencies to utilize their authorities to carry out programs to conserve endangered and threatened species;

2) Consultation with FWS when a Federal action may affect a listed endangered or threatened species to insure that any action authorized, funded or carried out by a Federal agency is not likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of Critical Habitat. The process is initiated by the Federal agency after they have determined if their action may affect (adversely or beneficially) a listed species; and

3) Conference with FWS when a Federal action is likely to jeopardize the continued existence of a proposed species or result in destruction or adverse modification of proposed Critical Habitat.

SECTION 7(c)-Biological Assessment for Major Construction Projects[1]

Requires Federal agencies or their designees to prepare a Biological Assessment (BA) for construction projects only. The purpose of the BA is to identify proposed and/or listed species which are/is likely to be affected by a construction project. The process is initiated by a Federal agency in requesting a list of proposed and listed threatened and endangered species (list attached). The BA should be completed within 180 days after its initiation (or within such a time period as is mutually agreeable). If the BA is not initiated within 90 days of receipt of the species list, the accuracy of the species list should be informally verified with our Service. No irreversible commitment of resources is to be made during the BA process which would foreclose reasonable and prudent alternatives to protect endangered species. Planning, design, and administrative actions may be taken; however, no construction may begin.

To complete the BA, your agency or its designee should: (1) conduct an on-site inspection of the area to be affected by the proposal which may include a detailed survey of the area to determine if the species is present and whether suitable habitat exists for either expanding the existing population or for potential reintroduction of the species; (2) review literature and scientific data to determine species distribution, habitat needs, and other biological requirements; (3) interview experts including those within FWS, National Marine Fisheries Service, State conservation departments, universities, and others who may have data not yet published in scientific literature; (4) review and analyze the effects of the proposal on the species in terms of individuals and populations, including consideration of cumulative effects of the proposal on the species and its habitat; (5) analyze alternative actions that may provide conservation measures and (6) prepare a report documenting the results, including a discussion of study methods used, any problems encountered, and other relevant information. The BA should conclude whether or not a listed species will be affected. Upon completion, the report should be forwarded to our Portland Office.

---

[1]A construction project (or other undertaking having similar physical impacts) which is a major Federal action significantly affecting the quality of the human environment as referred to in NEPA (42 U.S.C. 4332. (2)c). On projects other that construction, it is suggested that a biological evaluation similar to the biological assessment be undertaken to conserve species influenced by the Endangered Species Act.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
525 NE Oregon Street
PORTLAND, OREGON 97232-2737

Refer to:
OHB2003-0125-SL

June 17, 2003

Mr. Ilon E. Logan
URS Corporation
1501 4th Avenue, Suite 1400
Seattle, WA 98101

Re: Species List Request for Northwest Natural - Interstate Storage Expansion Project, Nehalem River Basin, Columbia County, Mist, Oregon

Dear Mr. Logan:

On May 28, 2003, the NOAA's National Marine Fisheries Service (NOAA Fisheries) received your letter requesting a list of threatened and endangered species for the proposed action in Columbia County, Oregon. A list of all anadromous salmonid fishes within Oregon under NOAA Fisheries' jurisdiction that are listed as endangered, threatened, or as a candidate species for listing under the Endangered Species Act (ESA) is enclosed (Enclosure 1). Please contact the U.S. Fish and Wildlife Service regarding the presence of species falling under its jurisdiction.

Available information indicates that one listed anadromous fish species, Oregon Coast coho salmon (*Oncorhynchus kisutch*), may be present in the proposed action area.

This letter constitutes the required notification of the presence of a Federally-listed threatened or endangered species or critical habitat under NOAA Fisheries' jurisdiction in the area that may be affected by the proposed project (Appendix A to Part 330, section C.13(5)(I)).

In addition, the Pacific Fisheries Management Council, which was established under the Magnuson-Stevens Fishery Conservation and Management Act, has described and identified essential fish habitat (EFH) in each of its fisheries management plans. EFH includes "those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity." All habitat in the Nehalem River basin that was historically accessible to coho and chinook salmon is designated as EFH.

Please refer to section 7 of the ESA and its implementing regulations (50 CFR Part 402) for information on the consultation process. Additional information on listed species' distribution, copies of Federal Register documents designating listed species status, and links to various ESA consultation policies and tools may be found on our web site at: *www.nwr.noaa.gov*.

Please direct any questions regarding this letter to Robert Anderson of my staff in the Oregon Habitat Branch at 503.231.2226.

Sincerely,

Jeffrey C Lockwood

for Michael P. Tehan
Oregon State Director
Habitat Conservation Division

Enclosure (1)
Endangered, Threatened and Candidate Pacific Salmon Under NOAA Fisheries' Jurisdiction in Oregon

Enclosure 1. Endangered, Threatened, and Candidate Pacific Salmon Under NOAA Fisheries' Jurisdiction in Oregon

Evolutionarily Significant Unit	Final Rule E = Endangered T = Threatened C = Candidate	Critical habitat (Final Rule)	Protective Regulations (Final Rule)
Upper Columbia River Spring Chinook Salmon	E: March 24, 1999; 64 FR 14308	N/A	ESA section 9 applies
Snake River Fall Chinook Salmon	T: April 22, 1992; 57 FR 14653	December 28, 1993; 58 FR 68543	April 22, 1992; 57 FR 14653
Snake River Spring/Summer Chinook Salmon	T: April 22, 1992; 57 FR 146531	October 25, 1999; 64 FR 57399[1]	April 22, 1992; 57 FR 14653
Upper Willamette River Chinook Salmon	T: March 24, 1999; 64 FR 14308	N/A	July 10, 2000; 65 FR 42422
Lower Columbia River Chinook Salmon	T: March 24, 1999; 64 FR 14308	N/A	July 10, 2000; 65 FR 42422
Snake River Basin Steelhead	T: August 18, 1997; 62 FR 43937	N/A	July 10, 2000; 65 FR 42422
Middle Columbia River Steelhead	T: March 25, 1999; 64 FR 14517	N/A	July 10, 2000; 65 FR 42422
Upper Willamette River Steelhead	T: March 25, 1999; 64 FR 14517	N/A	July 10, 2000; 65 FR 42422
Lower Columbia River Steelhead	T: March 19, 1998; 63 FR 13347	N/A	July 10, 2000; 65 FR 42422
Oregon Coast Steelhead	C: March 19, 1998; 63 FR 13347	N/A	N/A
Upper Columbia River Steelhead	E: August 18, 1997; 62 FR 43937	N/A	ESA section 9 applies
Oregon Coast Coho Salmon	T: August 10, 1998; 63 FR 42587	N/A	July 10, 2000; 65 FR 42422
S. Oregon/Northern California Coasts Coho Salmon	T: May 6, 1997; 62 FR 24588	May 5, 1999; 64 FR 24049	July 18, 1997; 62 FR 38479
Lower Columbia River/SW Washington Coho Salmon	C: July 25, 1995; 60 FR 38011	N/A	N/A
Columbia River Chum Salmon	T: March 25, 1999; 64 FR 14508	N/A	July 10, 2000; 65 FR 42422
Snake River Sockeye Salmon	E: November 20, 1991; 56 FR 58619	December 28, 1993; 58 FR 68543	ESA section 9 applies

OREGON NATURAL HERITAGE INFORMATION CENTER

Institute for Natural Resources

OREGON STATE UNIVERSITY
1322 SE Morrison Street
Portland, Oregon 97214-2423

April 17, 2003

Michael Hayward
NW Natural
220 NW 2nd Avenue
Portland, OR 97209

Dear Mr. Hayward:

Thank you for requesting information from the Oregon Natural Heritage Information Center (ORNHIC). We have conducted a data system search for rare, threatened and endangered plant and animal records for your Underground Storage Expansion Project in Township 6 North, Range 5 West, Sections 3, 4, 10, 11, and 22; and Township 7 North, Range 5 West, Sections 27, 28, and 32-35, W.M.

Eleven (11) records were noted within a two-mile radius of your project and are included on the enclosed computer printout. A key to the fields is also included.

Please remember that the lack of rare element information from a given area does not mean that there are no significant elements there, only that there is no information known to us from the site. To assure that there are no important elements present, you should inventory the site, at the appropriate season.

Please note that at this time ORNHIC does not have comprehensive computerized records available for all anadromous fish in Oregon. I have listed below the species that may be present within the waterways contained in the project area. I have also included their listing by the National Marine Fisheries Service (NMFS). For more information on anadromous fish you may wish to contact NMFS at: 525 NE Oregon Street; Portland, Oregon 97232-2737. Please also note that the U.S. Fish and Wildlife Service now has jurisdiction over coastal cutthroat trout.

Coho salmon (Oregon Coastal Runs)	*Oncorhynchus kisutch*	Threatened
Steelhead (Oregon Coast)	*Oncorhynchus mykiss*	Candidate

This data is confidential and for the specific purposes of your project and is **not to be distributed.**

If you need additional information or have any questions, please do not hesitate to contact me.

Sincerely,

Cliff Alton
Conservation Information Assistant

encl.: invoice (H-041703-CWA2)
computer printout and data key

SUMMARY LIST OF RECORDS

ONHIC April 17, 2003

Rana aurora aurora [1 RECORD]
Northern red-legged frog
State Status: Sensitive Undetermined/Sensitive Vulnerable

Oncorhynchus kisutch [7 RECORDS]
Coho salmon (Oregon coastal runs)
Federal Status: Listed Threatened
State Status: Sensitive Critical

Oncorhynchus mykiss [3 RECORDS]
Steelhead (Oregon coastal winter run)
Federal Status: Candidate for listing with enough data available for listing
State Status: Sensitive Vulnerable

EXHIBIT 9
(See binder pocket)

Surety: SAFECO Insurance Company of America
10915 Willows Rd.
Redmond, WA 98052

Site Certificate #:

Miller Station Underground Natural Gas Storage Facility

Decommissioning/Retirement Cost Estimate: $400,000

PAYMENT BOND
BOND NO: 6053326

KNOW ALL PERSONS by these presents, That we NORTHWEST NATURAL GAS COMPANY, as principal, and SAFECO INSURANCE COMPANY OF AMERICA, as surety, are hereto firmly bound unto the STATE Of OREGON, acting by and through the ENERGY FACILITY SITING COUNCIL, (hereinafter called EFSC), in the penal sum of FOUR HUNDRED THOUSAND DOLLARS, ($400,000) for the payment of which we bind ourselves, our heirs, executors, administrators, successors, and assigns jointly and severally; provided that, where the Surety(ies) are corporations acting as co-sureties, we, the Sureties, bind ourselves in such sum "jointly and severally" only for the purpose of allowing a joint action or actions against any or all of us, and for all other purposes each Surety binds itself, jointly and severally with the principal, for the payment of such sum only as is set forth opposite the name of such surety, but if no limit of liability is indicated, the limit of liability shall be the full amount of the penal sum.

WHEREAS said principal has a site certificate dated_____for the existing Mist Underground Storage Facility that has been fully operational since 1988; and

WHEREAS said principal has submitted an application for Amendment No. 8 to the Mist Underground Natural Gas Storage Site Certificate dated _____for construction of an additional compressor; and

WHEREAS above financial security requirement was not in effect when EFSC granted the original Site Certificate dated _____; and

WHEREAS said principal is required to provide financial security to the EFSC in an amount specified by the EFSC to be an adequate amount to restore the site to a useful, non-hazardous condition according to OAR 345-027-0020 (8), and as a condition of Amendment 8 of the Site Certificate.

NOW, THEREFORE, the condition of this obligation is such that if the principal shall faithfully complete construction of the facility and permanently retire those portions of the facility and restore the site to a useful, non-hazardous condition, as provided in condition (4) of Amendment 8 to the Site Certificate, then this obligation shall remain null and void, otherwise to remain in full force and effect.

OR, if the principal shall obtain and provide alternate financial assurance as approved by the Council as specified by OAR 345-027-0020 (8) and (9) and Amendment 8 of the Site Certificate, within 90 days after the date of notice of cancellation is received by both the principal and the EFSC from the Surety.

The Surety(ies) shall become liable on this bond obligation only when the principal has failed to fulfill the conditions described above. Upon notification by the EFSC that the principal has failed to perform as guaranteed by this bond, the Surety(ies) are obligated to pay monies to the obligee limited to the penal sum of this bond to fund any work required

PROVIDED HOWEVER:

The Surety(ies) has no obligation to perform any remediation work and no responsibility to contract with any other party for remediation work at the site. The Surety (ies) obligation under this bond consists of the payment of sums found to be due the EFSC only and no other obligation.

The liability of the Surety shall not be discharged by any payment or succession of payments hereunder, unless and until such payment or payments shall amount in the aggregate to the penal sum of the bond, but in no event shall the obligation of the Surety(ies) hereunder exceed the amount of said penal sum.

The Surety may cancel the bond by sending notice of cancellation by certified mail to the Principal and to the EFSC, provided, however, that cancellation shall not occur during the 120 days beginning on the date of receipt of the notice of cancellation by both the Principal and the EFSC, as evidenced by the return receipts.

The Principal may terminate this bond by sending written notice to the Surety(ies), provided, however, that no such notice shall become effective until the Surety(ies) receive(s) written authorization for termination of the bond by the EFSC.

The Surety(ies) agrees that no change, extension of time, alteration or addition to the site certificate and conditions therein affects its obligation under this bond.

The Surety(ies) will issue a rider or riders as needed to adjust the penal sum of the bond for inflation as consistent with section (4) of Amendment 8 of the Site Certificate based on, the annual U.S. Gross Domestic Product Implicit Price Deflator, as published by the U.S. Department of Commerce, Bureau of Economic Analysis, or any successor agency (the "Index"), or the Surety(ies) will send notice terminating the bond coverage as provided above.

The Surety(ies) agrees that it is liable for additional costs and expenses including reasonable attorneys fees, awarded by a court to EFSC in successfully enforcing the obligation against the Surety(ies) in the event Surety(ies) wrongfully fails to pay sums owed as required under the bond.

In witness whereof, the Principal and Surety has executed this Payment Bond on the 9th day of November, 2001.

The persons whose signatures appear below hereby certify that they are authorized to execute this surety bond on behalf of the Principal and Surety.

NORTHWEST NATURAL GAS COMPANY

By:

SAFECO INSURANCE COMPANY OF AMERICA

By: Muriel M. van Veen, Attorney-In-Fact

STATE OF OREGON, ENERGY FACILITY SITING COUNCIL

Accepted By:

SAFECO

POWER OF ATTORNEY

SAFECO INSURANCE COMPANY OF AMERICA
GENERAL INSURANCE COMPANY OF AMERICA
HOME OFFICE: SAFECO PLAZA
SEATTLE, WASHINGTON 98185

No. 10151

KNOW ALL BY THESE PRESENTS:

That **SAFECO INSURANCE COMPANY OF AMERICA** and **GENERAL INSURANCE COMPANY OF AMERICA**, each a Washington corporation, does each hereby appoint

**********EDWARD M. THOMPSON; GARY MCCANN; JENNIFER KEENE; GAIL A. FLYNN; CHARLENE EASON; DANIEL J. SLOAN; MURIEL M. VAN VEEN; Portland, Oregon**********

its true and lawful attorney(s)-in-fact, with full authority to execute on its behalf fidelity and surety bonds or undertakings and other documents of a similar character issued in the course of its business, and to bind the respective company thereby.

IN WITNESS WHEREOF, SAFECO INSURANCE COMPANY OF AMERICA and GENERAL INSURANCE COMPANY OF AMERICA have each executed and attested these presents

this 27th day of February, 2001.

R A Pierson
R.A. PIERSON, SECRETARY

Mike McGavick
MIKE MCGAVICK, PRESIDENT

CERTIFICATE

Extract from the By-Laws of **SAFECO INSURANCE COMPANY OF AMERICA**
and of **GENERAL INSURANCE COMPANY OF AMERICA:**

"Article V, Section 13. - FIDELITY AND SURETY BONDS ... the President, any Vice President, the Secretary, and any Assistant Vice President appointed for that purpose by the officer in charge of surety operations, shall each have authority to appoint individuals as attorneys-in-fact or under other appropriate titles with authority to execute on behalf of the company fidelity and surety bonds and other documents of similar character issued by the company in the course of its business... On any instrument making or evidencing such appointment, the signatures may be affixed by facsimile. On any instrument conferring such authority or on any bond or undertaking of the company, the seal, or a facsimile thereof, may be impressed or affixed or in any other manner reproduced; provided, however, that the seal shall not be necessary to the validity of any such instrument or undertaking."

Extract from a Resolution of the Board of Directors of **SAFECO INSURANCE COMPANY OF AMERICA**
and of **GENERAL INSURANCE COMPANY OF AMERICA** adopted July 28, 1970.

"On any certificate executed by the Secretary or an assistant secretary of the Company setting out,

(i) The provisions of Article V, Section 13 of the By-Laws, and
(ii) A copy of the power-of-attorney appointment, executed pursuant thereto, and
(iii) Certifying that said power-of-attorney appointment is in full force and effect,

the signature of the certifying officer may be by facsimile, and the seal of the Company may be a facsimile thereof."

I, R.A. Pierson, Secretary of **SAFECO INSURANCE COMPANY OF AMERICA** and of **GENERAL INSURANCE COMPANY OF AMERICA**, do hereby certify that the foregoing extracts of the By-Laws and of a Resolution of the Board of Directors of these corporations, and of a Power of Attorney issued pursuant thereto, are true and correct, and that both the By-Laws, the Resolution and the Power of Attorney are still in full force and effect.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the facsimile seal of said corporation

this 9TH day of NOVEMBER, 2001.

SAFECO INSURANCE COMPANY OF AMERICA CORPORATE SEAL 1953 STATE OF WASHINGTON

GENERAL INSURANCE COMPANY OF AMERICA CORPORATE SEAL 1923 State of Washington

R A Pierson
R.A. PIERSON, SECRETARY

EXHIBIT 11

COLUMBIA COUNTY
SHERIFF

PHILIP W. DERBY

July 30, 2001

Todd Thomas
Northwest Natural Gas Co.
221 NW 2nd Avenue
Portland, Oregon 97209

Dear Mr. Thomas,

This short letter is to inform that I can see no reason why your construction project scheduled for August 2001 through December 2001 will negatively impact Columbia County. I believe that this project will positively impact our County as approximately 50 to 60 employees will work on the project.

I can see no reason why this project will create any adverse problems for local law enforcement in Columbia County.

Sincerely,

Phillip W. Derby
Columbia County Sheriff
901 Port Avenue
St Helens, Oregon 97051

901 PORT AVENUE • ST. HELENS, OREGON 97051
PHONES: (503) 366-4611 • (503) 366-4600 • FAX: (503) 366-4644

JAMES L. WALTERS
CHIEF OF POLICE

VERNONIA POLICE DEPARTMENT
1001 BRIDGE STREET
VERNONIA, OREGON 97064

503-429-7335 OFFICE
1-800-696-7795 DISPATCH
503-429-5141 FAX

EMG 911

In Service To Our Community

07/26/01

Todd Thomas
Construction Manager
NW Natural

Dear Mr. Thomas,

During our conversation on July 25,2001, you informed me of a upcoming construction project in the Mist area with in the next couple of months involving NW Natural. Your concern with the influx of NW Natural personnel and outside contractors in our area and the impact it may have on our community and Law Enforcement is very much appreciated.

We feel this will not create any problems for our department. If any problems do arise we would appreciate NW Natural's cooperation with the resolution of those issues.

We look forward to serving you and your employee's.

Sincerely,

James L. Walters
Chief of Police
Vernonia Police Dept.

EXHIBIT 12

CITY OF VERNONIA

1001 BRIDGE STREET • VERNONIA, OR 97064
(503) 429-5291 • FAX (503) 429-4232

September 8, 2003

Todd Thomas, Project Manager
Northwest Natural Gas
220 SW 2nd AVE
Portland, OR 97209

Re: Mist construction project 2004

Dear Mr. Thomas:

I certainly appreciated the heads-up on the work project your company is planning. I have enclosed a few Vernonia visitor brochures to be provided to your contractors and any other interested persons.

From reviewing the provided summary of work to be performed, it appears that you will have personnel working in the Vernonia area for about 6 months. I have spoken with the public works director and she advises me that we have Airport Park which has 21 unimproved sites and Anderson Park which has 20 improved sites which could be doubled up. Another alternative is Big Eddy Park seven (7) miles to the north on the way to Mist. Big Eddy is a county park.

You or your contractors may contact Robyn Bassett, Public Works Director, to reserve the sites ahead of time. You should probably bave them reserved no later than April of 2004. Her number is 503-429-5291, or 6921. There is also the Vernonia Inn, Bed and Breakfast that has accomodations of 10 rooms, they can be reached at 503-429-4006.

Certainly the impact of nearly 50 workers will have both positive and possibly some negative impacts upon the community. The police department is prepared to deal with most incidents that frequently occur and we have available assets to deal with those we are not equipped to handle.

As your company gets closer to the work date, would it be possible for you or a designee to meet with our city leaders at a council meeting to give them a briefing on your project. To set this up you would want to contact Michael Sykes, City Administrator. Mr. Sykes may also have some other information that will be helpful to your project and company. His number is 503-429-5291.

Sincerely,

Michael J. Cahill
Chief of Police

cc: Mike Sykes
Robyn Bassett

MIST-BIRKENFELD RURAL FIRE PROTECTION DISTRICT
12525 HWY 202 Mist, OR 97016

(503) 755-2710 Fax (503) 755-2556

Todd Thomas, Project & Resource Services
Northwest Natural Gas Company
220 NW 2nd Avenue Portland, Oregon 97209

Regarding: The Sapphire Project

Dear Mr. Thomas,

This letter addresses the Sapphire Project, the latest in a series of natural gas storage and transmission projects at NNG's Miller Station and surrounding areas. According to the material provided regarding the project, it is made up of the following components:

- Within Miller Station, additional gas dehydration equipment and associated piping is to installed;
- Near the Busch well, south of the Nehalem River, one new injection/withdrawal well is to be drilled into Busch reservoir, complete with gathering lines to the existing gathering manifold;
- Near the existing 16" tie-in manifold, one new injection/withdrawal well is to be drilled into the Schlicker reservoir, with gathering lines installed into existing manifold system and to include flow control and metering devices;
- Provide required computer control program upgrading for wellhead near Miller Station;
- Possible additional tie in modifications to manifold are being considered.

Discussions with NNG personnel have indicated that these operations are similar in nature with several previous upgrades, and as such will likely produce little immediate impact on fire district operations. The addition of the Schlicker reservoir and the expansion of both storage and pumping capacity do, however, represent a major improvement to the system in the Mist area. As has been the practice in the past, a cooperative review of planned on-site safety precautions, emergency notification procedures, and pre-arranged security clearances for site emergency response should occur prior to project kick-off.

Information regarding the current construction activities in the fire district is critical to our ability to provide fast, effective service. NNG has done a great job of keeping us informed of work locations and of special hazards we may encounter during response to or mitigation of an emergency incident. As in the past, we request this information be updated weekly or as work on each major component commences. Generally, a phone message will suffice for notification after the initial project briefing.

The Mist Birkenfeld RFPD has no objections to the project going ahead as scheduled under those conditions. Our staff and volunteers look forward to working with you during the next few months during the construction period. As always, the cooperation NNG has demonstrated with the fire district and the community spirit we share as neighbors has been exemplary. If there is anything else we might do to enhance the safe completion of the Sapphire Project, please don't hesitate to call me.

Sincerely

Chief Dave Crawford
Mist-Birkenfeld RFPD

Days of Operation for Each Piece of Equipment

Withdrawl Load (%)	IC 3	IC 4	KC5	KC7	
90 to 100	26	12	1	14	
80 to 89	2	0	1	13	
70 to 79	4	0	8	11	
60 to 69	4	0	28	2	
50 to 59	0	0	12	0	
< 49	1	0	5	0	
TOTAL	37	12	55	40	144

Injection Load (%)					
90 to 100	0	0	0	0	
80 to 89	0	0	0	16	
70 to 79	0	0	63	13	
60 to 69	0	0	22	10	
50 to 59	0	0	19	13	
< 49	0	0	0	13	
	0	0	104	65	169

KC7 data used for CO2 calculations are shown highlighted

SURFACE OWNERS 500' FROM STORAGE AREA BOUNDARIES
BRUER FLORA, BUSCH AND CALVIN CREEK

Name Address	Section	Tax Lot #	Zoning if Known
Longview Fibre Company	3 & 4	700	PF 76
PO Box 3000	9	100	
Longview, WA 98632	10	100	PF76
		200	
	11	2600	
	15	100	
	3	400	PF76
		500	PF76
	22	4800	
	23	400	PF76
	24 & 26	5000	
	26 & 27	4900	PF76
	28	4400	
Agnes J. Vewter	15	400	
6835 SW Capital Hwy #34			
Portland, Oregon 97219			
Shalmon Libel	15	500	PF76
13854 Hwy 202			
Mist, Oregon 97016			
Fred & Phylis Busch	11	2800	PF76
'3163 Busch Lane		2900	PF76
Mist, OR 97016		3000	PF76
	15	800	PF76
	22	4700	
	23	500	PF76
	22	4700	
	23	500	PF76
Bascom Pacific LLC	11	2500	PF76
C/O Forest Systems Inc.	2	200	PF76
51 Main Street	3	600	PF76
North Easton, MA 02356			
Randal Hansen	15	200	
13390 Hwy 202			
Mist, OR 97016			
Olympic Forest Products	15	700	
985 NW 2nd Avenue	15	300	
Kalama, WA 98625	15	400	
	25	5100	
Joseph Banzer	21	4200	
69780 Banzer Rd.	16	100	
Mist, OR 97016			
Bolyard, Dale and Ida	21	4300	
1531 Stoney Creek Rd.			
Rochester, MI 48307			

EXHIBIT 15

VIBRATION MONITORING PROGRAM
FOR THE MIST UNDERGROUND STORAGE FACILITY

Approved by the Energy Facility Siting Council
Friday December 18, 1987

Purpose

Pursuant to the terms of the Mist Underground Storage Site Certificate Agreement, Oregon Natural Gas Development Corporation is implementing a vibration monitoring program as an initial step to determine whether any relationship exists between the Mist underground storage operations and earthquake-like events that may occur in the vicinity of the Mist facilities.

Procedures

Vibration Event Survey forms will be provided to residents of Mist, Birkenfeld and Natal for the purposes of recording any earthquake like events in the vicinity of the Mist facilities. The survey forms, a copy of which is attached, are designed to provide a convenient means for residents to provide specific details of events at the time they occur. In addition, the residents will be provided an instruction sheet to aid in filling out the survey forms. A copy of the instruction sheet is also attached.

Once an event has occurred, the residents can either mail the survey forms to Oregon Natural's office or deposit it at Oregon Natural's courier station at Nehalem Automotive in Mist. Upon receipt of event reports Oregon Natural will mail copies of the reports to the Oregon Department of Energy (ODOE) and the Columbia County Planning Department (County).

Concurrently with the circulation of the surveys and through the end of the monitoring program, Oregon Natural will record on a daily basis all gas injection and withdrawal activity. This data will be made available to ODOE and the County on request.

Analysis

On a quarterly basis or on Council request, all vibration event reports received during the previous quarter will be reviewed to determine if the reports indicate ground movement as a possible cause. The reports will also be compared with the gas injection/withdrawal records during the corresponding time frame.

If the reviews show any correlation between reported local observations and gas injection/withdrawal activity, Oregon Natural will institute a review of the records of all seismic recording stations in northwest Oregon and southwest Washington for the purpose of determining whether there was any seismic events centered in the vicinity of Mist. These stations will include at least the University of Washington network, the Trojan nuclear power plant, and Portland State University.

The results of this review will be provided to the Energy Facility Siting Council within twenty (20) days of request or the end of each quarter and will be made available to local residents, local news media and the County at the same time.

Seismic Monitoring Program

Within 60 days of the completed review, Oregon Natural will institute the development of a seismic monitoring program, for Council approval, if: 1) the analysis outlined above shows any correlation between local observation, data from seismic recording stations and gas injection/withdrawal activity; or 2) Oregon Natural or the Council has reason to believe the reported events could be localized shallow earth movements that may not be detected at existing seismic stations. The scope of such a program will be developed in coordination with the Oregon Department of Energy and the Oregon Department of Geology and Mineral Industries.

Program Duration

The vibration monitoring program may be terminated at the end of the first full year of commercial operation upon Council approval.