CASCADE NATURAL GAS CORPORATION®
A Subsidiary of MDU Resources Group, Inc.

8113 W. GRANDRIDGE BLVD., KENNEWICK, WASHINGTON 99336-7166
TELEPHONE 509-734-4500 FACSIMILE 509-737-9803
www.cngc.com

December 23, 2014

Oregon Public Utility Commission
P.O. Box 1088
Salem, OR 97308-1088

Re: Supplemental Cover letter – UM 1636 (3)

Attention: Filing Center

Cascade Natural Gas (Cascade or Company) is providing the following information, per discussions with staff, supplementing its request for an accounting order for reauthorization to record and defer environmental remediation work at the Manufactured Gas Plant (MGP) in Eugene, Oregon.

In regards to the status of the project, the parties identified as responsible for the remediation efforts (of which Cascade is the major party) have not received a final report (Record of Decision (ROD)) from the Oregon Department of Environmental Quality (DEQ) which would include actual remediation requirements. DEQ Staff has produced its report and was seeking public comments. Comments on the DEQ Staff report were due September 30, 2014. No comments were filed. Cascade expects the DEQ to issue its ROD sometime in 2015 based on the Staff report. Until the ROD is received Cascade cannot determine the extent or cost of required cleanup efforts. Attached are copies of the DEQ Staff report with recommendations as well as a copy of the notification of the public comment period.

To date the Company has been working to identify potential insurance providers and policy coverage during relevant time periods. Costs deferred to date have been associated with this effort. Including costs identified in the application for deferral, Cascade will also defer all insurance proceeds associated with costs deferred since the inception of the initial deferral order. To date the Company has received no insurance proceeds associated with deferred costs.

Also, included in this supplemental filing is a revised application. The total costs deferred to date was incorrect in the initial application. The initial application contained an amount booked as a reserve. The reserve should not be included in the deferred balance the revised total deferred costs as of November 30, 2014, are $186,696.07.

Please contact me at (509) 734-4593 if you have any further questions.

Sincerely,

Michael Parvinen
Director, Regulatory Affairs

BEFORE THE PUBLIC UTILITY COMMISSION OF OREGON

DOCKET NO. UM 1636(3)

In the Matter of the Application by CASCADE NATURAL GAS CORPORATION for an Order Reauthorizing Deferral of Certain Costs	APPLICATION FOR REAUTORIZATION OF DEFERRAL ACCOUNTING (OAR 860-027-0300)

In accordance with ORS 757.259 and OAR 860-027-0300, Cascade Natural Gas Corporation ("Cascade" or the "Company") applies to the Public Utility Commission of Oregon ("Commission") for an accounting order re-authorizing the Company to record and defer, on an ongoing basis, the cost of expenses for environmental remediation work at the Manufactured Gas Plant (MGP) in Eugene, Oregon. The Company respectfully requests that the deferral commence December 1, 2014, for a 12-month period. The Company's last authorization was approved in the Commission's Order No. 13-484.

In support of this Application, Casacade states:

1. CASCADE NATURAL GAS CORPORATION

Cascade Natural Gas Corporation is a public utility engaged in the distribution of natural gas in the states of Oregon and Washington and is subject to the jurisdiction of the Commission with regard to its rates, service, and accounting practices.

2. STATUTORY AUTHORITY

This Application is filed pursuant to ORS 757.259, authorization to defer environmental costs and amounts from insurance recoveries because they are "identifiable utility expenses or revenues, the recovery or refund of which the

commission finds should be deferred in order to minimize the frequency of rate changes… or to match appropriately the costs borne by and benefits received by ratepayers." *ORS 757.259(2)(e)*

3. COMMUNICATIONS

Communications regarding this Application should be addressed to:

Michael Parvinen
Director, Regulatory Affairs
Cascade Natural Gas Corporation
8113 West Grandridge Boulevard
Kennewick, WA 99336-7166
Telephone: (509) 734-4593
E-mail: michael.parvinen@cngc.com

4. BASIS FOR APPLICATION

Due to the variable and unpredictable nature of environmental remediation costs, Cascade seeks authorization to record all environmental costs, which shall include, but are not necessarily limited to, all costs related to investigation, monitoring, legal, study, oversight, and remediation costs, and all costs associated with pursuing insurance recoveries (hereafter "Environmental Costs") that are associated with MGP projects.

Cascade will pay its share (to be determined at a later date) of the remediation costs in the future and the other parties will pay the remainder of the costs. Through September 30, Cascade has deferred $186,696.07.

5. AMOUNTS SUBJECT TO DEFERRAL

Sufficient information is currently not available to determine the total cost of remediation of the MGP site or the liability involved. Management cannot predict the ultimate outcome of this matter.

For the 12-month period, Cascade proposes to transfer expenses incurred from operation and maintenance/administrative and general accounts to a deferred asset account. The proposed deferred asset account to be used is FERC Account 186.

6. ACCOUNTING

Cascade's proposed deferrals would be recorded in a sub-account of FERC Account 186 (Miscellaneous Deferred Debits). In the absence of deferral approval, Cascade would record the Environmental Costs of labor to FERC Account 920, Administrative and General Salaries, and the costs of outside services (e.g. consulting) to FERC Account 923, Outside Services Employed.

WHEREFORE, Cascade respectfully requests that in accordance with ORS 757.259 and OAR 860-027-0300, the Commission issue an order authorizing the Company to record and defer, commencing as of December 1, 2014 date of this filing, expenses for environmental remediation work at the Manufactured Gas Plant (MGP) in Eugene, as described in this Application.

DATED: December 23, 2014.

Respectfully submitted,

CASCADE NATURAL GAS CORPORATION

Michael Parvinen
Director, Regulatory Affairs
Cascade Natural Gas Corporation
8113 West Grandridge Boulevard
Kennewick, WA 99336-7166
Telephone: (509) 734-4593
E-mail: michael.parvinen@cngc.com

Oregon Bulletin

September 1, 2014

OTHER NOTICES

A CHANCE TO COMMENT ON
PROPOSED CONSENT JUDGMENT FOR A PROSPECTIVE PURCHASER AGREEMENT
AT 700 NW CORNELL AVENUE PROPERTY, CORVALLIS, OREGON

COMMENTS DUE: Oct. 1, 2014

PROJECT LOCATION: 700 NW Cornell Ave., Corvallis, Oregon.

PROPOSAL: Oregon DEQ proposes to enter into a consent judgment for a prospective purchaser agreement with Charles Grato for the property located at 700 NW Cornell Ave., Corvallis, Ore.

HIGHLIGHTS: Grato is acquiring the property to allow him to continue to operate Waucomah Auto Repair when the existing owner retires. The business will operate under new management and continue to provide automotive repair services to the community, as well as increase the property's productive use. The property was used historically from 1926 through the early 1980s as a bulk fuel distributor and contained a building and four 20,000 gallon aboveground storage tanks. The tanks stored gasoline, diesel and stove oil. In the early 1980s, the building was expanded and converted to an automotive and radiator repair business.

In May 2013, soil and groundwater samples were collected to determine if the historic bulk fuel operations had adversely impacted the property. Soil and groundwater contamination was detected. In July 2014, Grato's consultant collected additional soil samples. The recent sampling established that the historic bulk fuel operations are the source of total petroleum hydrocarbon contamination remaining in the soil and shallow groundwater at the property.

The consent judgment will require Grato to place institutional controls on the property precluding usage for residential purposes, the installation of water well(s) or use of the shallow groundwater. Grato has agreed to fund up to $50,000 of active bioremediation work to help reduce the residual petroleum hydrocarbon contamination levels to below DEQ risk-based cleanup concentrations. The bioremediation work will include injecting the contaminated soil with bacteria that will ingest and break down the residual contamination, as well as injecting nutrients that will enhance the ability of the microbes to degrade the contamination. The consent judgment will contain the institutional controls deemed necessary to help prevent the public from being exposed to potentially harmful residual chemicals.

DEQ's Prospective Purchaser Program was created in 1995 through amendments to the state's environmental cleanup law. The prospective purchaser agreement is a tool that facilitates the cleanup of contaminated property and encourages property transactions that would otherwise not likely occur because of the liabilities associated with purchasing a property with existing contamination. DEQ has approved more than 100 prospective purchaser agreements throughout the state since the program began.

The proposed consent judgment will provide Grato with a release from liability for claims by the State of Oregon under ORS §465.255 relating to any historical releases of hazardous substances or petroleum hydrocarbons at or from the property. The judgment will also provide Grato with protection from potential contribution actions by third parties for recovery of remedial action costs associated with any historical releases at or from the property. DEQ retains all existing rights it may have as to all other parties potentially liable for any releases.

HOW TO COMMENT: Written comments concerning the proposed consent judgment should be sent to Bill Mason at DEQ's Western Region Office, 165 East 7th Ave., Ste 100, Eugene, OR 97401-3049. Comments must be received by DEQ by 5p.m. on Oct. 1, 2014. If you have questions or would like to review the consent judgment and DEQ's files on the property call Bill Mason at 541-687-7427 or email at: mason.bill@deq.state.or.us.

Upon written request by ten or more persons, or by a group having ten or more members, a public meeting will be held to receive verbal comments on the proposed Consent Judgment.

THE NEXT STEP: DEQ will consider all public comments. A final decision concerning the proposed consent judgment will be made after consideration of public comments.

Request for Comments
Proposed cleanup for NW Cast

Comments due: 5 p.m., Tuesday, Sept 30, 2014

Project location: 9209 N Calvert Ave., Portland, Oregon

Proposal: The Oregon Department of Environmental Quality seeks comments on the proposed cleanup for NW Cast. The proposed remedial action includes excavation and off-site disposal of contaminated soil and backfill of the excavation area with gravel.

Highlights: Northwest Cast Metal Products and Universal Silver operated on site from approximately 1935 to the late 1970s. Activities included metals recovery and smelting operations and decommissioning of transformers containing polychlorinated biphenyl commonly known as PCBs. Currently, the site is used for truck and trailer parking.

Several site investigations between 1998 and 2014 found elevated concentrations of metals and PCBs in surface soils. Surface soil in some areas contain PCBs and metals at concentrations that exceed levels protective of on-site workers. Soil across the site could potentially be carried by stormwater discharges to the Columbia Slough. Site soil contains contaminants at concentrations that exceed protective levels established for Columbia Slough. Shallow groundwater samples collected in the vicinity of a former underground storage tank had detections of metals and petroleum. However, shallow groundwater is not used and contaminants are not expected to reach the Columbia Slough at concentrations of concern.

The proposed cleanup action is to remove one to three feet of soil such that residual concentrations are below levels protective of occupational workers and, to the extent practical, below Columbia Slough sediment screening levels. The excavation area would then be backfilled with clean gravel reducing the potential for remaining site soils to be carried in stormwater to the Columbia Slough.

How to comment: Send comments to DEQ Project Manager Sarah Miller at 2020 SW 4th Ave, Portland, Oregon 97201 or miller.sarah@deq.state.or.us by 5 p.m. Tuesday, Sept. 30. For more information contact Sarah Miller at 503-229-5040.

Find information about requesting a review of DEQ project files at: http://www.deq.state.or.us/records/recordsRequestFAQ.htm

Find the File Review Application form at: http://www.deq.state.or.us/records/RecordsRequestForm.pdf

To access site summary information and other documents in the DEQ Environmental Cleanup Site Information database, go to http://www.deq.state.or.us/lq/ECSI/ecsi.htm, select “Search complete ECSI database”, then enter ECSI#999 in the Site ID box and click “Submit” at the bottom of the page. Next, click the link labeled ECSI #999 in the Site ID/Info column. Alternatively, you may go directly to the database website for this page at: http://www.deq.state.or.us/Webdocs/Forms/Output/FPController.ashx?SourceIdType=11&SourceId=4157&Screen=Load

If you do not have web access and want to review the project file contact the DEQ project manager.

The next step: DEQ will issue a Record of Decision (ROD). A work plan will be developed to implement the remedial action.

Accessibility information: DEQ is committed to accommodating people with disabilities. Please notify DEQ of any special physical or language accommodations or if you need information in large print, Braille or another format. To make these arrangements, call DEQ at 503-229-5696 or toll free in Oregon at 800-452-4011; fax to 503-229-6762; or email to deqinfo@deq.state.or.us. People with hearing impairments may call 711.

Request for Comments
Proposed Shoreline Source Control for Evraz Oregon Steel

Comments due: 5 p.m., Tuesday, Sept. 30, 2014

Project location: 14400 Rivergate Ave., Portland, OR

Proposal: The Department of Environmental Quality proposes that Evraz Oregon Steel Mills implement shoreline source control measures to significantly reduce potential sources of contamination to the Willamette River. These measures include removing beach soils and removing, capping, and stabilizing bank soils contaminated with metals and PCBs. DEQ has concluded that this combination of actions will remove, or prevent contact with, and erosion of, contaminant sources along the site’s shoreline on the Willamette River.

Highlights: The Evraz facility is located on approximately145 acres at River Mile 2 on the east shore of the Willamette River. The property is part of the Portland Harbor Superfund Site study area. Oregon Steel Mills (formerly Gilmore Steel Mills) purchased the property in 1967 and built a steel mill on the site. Evraz purchased the facility from Oregon Steel Mills in 2006. Portions of the original steel mill continue to operate today, however the steelmaking operations have been idle since 2003.

Environmental investigations of the site conducted since 2001 revealed metals and PCBs present in fill material exposed along the facility's bank on the Willamette River. Concentrations exceed screening levels based on toxicity to aquatic organisms and bioaccumulation in fish tissue. Contaminated soil is currently subject to erosion into the river.

DEQ is proposing that contaminated soil along the beach be removed to depths of one to five feet below the surface with residual contamination capped with river rock, and that steeper portions of the bank, susceptible to erosion, be remediated via soil removal, followed by capping and stabilization of the bank and residual contamination.

How to comment: Send comments to DEQ Project Manager Jennifer Sutter DEQ Northwest Region, 2020 SW 4th Ave., Portland, OR 97201 or sutter.jennifer@deq.state.or.usby 5 p.m. Tuesday, Sept. 30, 2014. Contact Sutter at 503-229-6148.

Find information about requesting a review of DEQ project files at: http://www.deq.state.or.us/records/recordsRequestFAQ.htm

Find the File Review Application form at: http://www.deq.state.or.us/records/RecordsRequestForm.pdf

To access site summary information and other documents in the DEQ Environmental Cleanup Site Information database, go to http://www.deq.state.or.us/lq/ECSI/ecsi.htm, select "Search complete ECSI database", then enter [ECSI#] in the Site ID box and click "Submit" at the bottom of the page. Next, click the link labeled [ECSI #] in the Site ID/Info column. Alternatively, you may go directly to the database website for this page at http://www.deq.state.or.us/Webdocs/Forms/Output/FPController.ashx?SourceId=141&SourceIdType=11.

If you do not have web access and want to review the project file contact the DEQ project manager.

The next step: DEQ will consider all public comments, and the regional administrator will make and publish the final decision after consideration of these comments

Accessibility information: DEQ is committed to accommodating people with disabilities. Please notify DEQ of any special physical or language accommodations or if you need information in large print, Braille or another format. To make these arrangements, call DEQ at 503-229-5696 or toll free in Oregon at 800-452-4011; fax to 503-229-6762; or email to deqinfo@deq.state.or.us. People with hearing impairments may call 711.

Request for Comments
Proposed Source Control Decision for RB Recycling

Comments due: 5 p.m., Tuesday Sept.30, 2014

Project location: 8501 N Borthwick Ave., Portland, Oregon

Proposal: DEQ proposes to issue a determination that the stormwater pathway for contaminants to discharge to the Columbia Slough from the former RB Recycling facility site has been controlled.

Highlights: RB Recycling, a tire recycling facility, operated on the site from 1975 until 2013 when operations shut down and began vacating the property. Currently the site is vacant. Stormwater samples collected while the facility was operating repeatedly exceeded benchmarks for total suspended solids, copper, and zinc. Columbia Slough sediments adjacent to the RB Recycling stormwater discharge outfall contain elevated concentrations of metals, PCBs and PAHs. RB Recycling signed a voluntary agreement with DEQ in 2012 to investigate the stormwater pathway at the site.

As part of vacating the property, RB Recycling removed one to three feet of surface soils across the site and in adjacent roadways until samples of remaining soil were found to meet levels protective of the stormwater pathway. Following soil removal RB Recycling placed a minimum of six inches of clean gravel on the site and adjacent N. Hunt Ave. and N. Kirby St. A private outfall draining a portion of the site, known as the N. Hunt St. drain, was sealed by the northern property owner, Wastech (ECSI#1271) preventing storm?water discharge via this pathway.

How to comment: Send comments to DEQ Project Manager Sarah Miller at 2020 SW 4th Ave, Portland, Oregon 97201 or miller.sarah@deq.state.or.us by 5 p.m., Tuesday, Sept. 30. Contact Sarah Miller at 503-229-5040.

Find information about requesting a review of DEQ project files at: http://www.deq.state.or.us/records/recordsRequestFAQ.htm

Find the File Review Application form at: http://www.deq.state.or.us/records/RecordsRequestForm.pdf

To access site summary information and other documents in the DEQ Environmental Cleanup Site Information database, go to http://www.deq.state.or.us/lq/ECSI/ecsi.htm, select "Search complete ECSI database", then enter ECSI#4157 in the Site ID box and click "Submit" at the bottom of the page. Next, click the link labeled ECSI #4157 in the Site ID/Info column. Alternatively, you may go directly to the database website for this page at: http://www.deq.state.or.us/Webdocs/Forms/Output/FPController.ashx?SourceIdType=11&SourceId=4157&Screen=Load

If you do not have web access and want to review the project file contact the DEQ project manager.

The next step: DEQ will issue a stormwater source control decision.

Accessibility information: DEQ is committed to accommodating people with disabilities. Please notify DEQ of any special physical or language accommodations or if you need information in large print, Braille or another format. To make these arrangements, call DEQ at 503-229-5696 or toll free in Oregon at 800-452-4011; fax to 503-229-6762; or email to deqinfo@deq.state.or.us. People with hearing impairments may call 711.

Request for Comments
Proposed remedy approval and closure for Block 15, former Portland Gas Manufacturing. site

Comments due: 5 p.m., Tuesday, Sept. 30, 2014

Project location: 121 NW Everett St., Portland, OR

Proposal: The Department of Environmental Quality is proposing to approve a remedy to address soil and groundwater contamination at the Block 15 property, part of the former Portland Gas Manufacturing property undergoing investigation. DEQ has determined that an office building and other development eliminate potential contaminated media, and that no further action is necessary provided these capping elements are maintained.

Highlights: Block 15 is located on the eastern perimeter of the former Portland Gas Manufacturing site in downtown Portland. Portland Gas Manufacturing is undergoing investigation and cleanup under DEQ. A separate closure decision was requested for Block 15, which had limited impacts from gas manufacturing. Data indicate that soil and groundwater are contaminated at Block 15. However redevelopment of the property in 1999, including construction of an office building and paved parking, has effectively capped contamination. DEQ is proposing site closure given an absence of risk; ongoing inspection and maintenance of the site cap will be necessary, and a deed restriction will be recorded prohibiting groundwater use.

How to comment: Send comments to DEQ Project Manager Daniel Hafley at 2020 SW Fourth Ave., Suite 400, Portland, OR or hafley.dan@deq.state.or.us. For more information contact the project manager at 503-229-5417.

Find information about requesting a review of DEQ project files at: http://www.deq.state.or.us/records/recordsRequestFAQ.htm

Find the File Review Application form at: http://www.deq.state.or.us/records/RecordsRequestForm.pdf

To access site summary information and other documents in the DEQ Environmental Cleanup Site Information database, go to http://www.deq.state.or.us/lq/ECSI/ecsi.htm, select "Search complete ECSI database", then enter 5755 in the Site ID box and click "Submit" at the bottom of the page. Next, click the link labeled 5755 in the Site ID/Info column. Alternatively, you may go directly to the database website for this page at http://www.deq.state.or.us/lq/ecsi/ecsilist.asp?SiteID=5755.

If you do not have web access and want to review the project file contact the DEQ project manager.

The next step: After all comments have been considered, DEQ will proceed with site closure.

Accessibility information: DEQ is committed to accommodating people with disabilities. If you need information in another format, please contact DEQ toll free in Oregon at 800-452-4011, email at deqinfo@deq.state.or.us, or 711 for people with hearing impairments.

Request for Comments
Proposed approval of cleanup at Oregon Fir Supply Company site

Comments due: 5 p.m., Tuesday, Sept. 30

Project location: 6225 NE 112th Avenue, Portland, Oregon

Proposal: DEQ seeks comments on its proposal to issue a conditional no further action determination for an environmental cleanup at the former Oregon Fir Supply Company site located in Northeast Portland. DEQ is also proposing to issue LeJar Enterprises, LLC, a Certificate of Completion for remedial action obligations described in their Unilateral Order with DEQ.

Highlights: The property was subject to releases of hazardous wastes by Drum Recovery Incorporated in 1980 to 1981, which resulted in soil and groundwater contamination from pentachlorophenol and volatile organic compounds, commonly known as VOCs. The site is located within the City of Portland back up municipal supply well field and is designated General Industrial 2 land use.

Several phases of investigation and cleanup have been completed since 1994. DEQ issued a Record of Decision for cleanup in 2009 which directed treatment to address elevated VOCs concentrations in groundwater at source areas, environmental monitoring to assess soil-gas and groundwater, and institutional controls. In-situ bioremediation of groundwater was implemented in 2007 and 2011. Remedial action monitoring has been performed and post-treatment monitoring has not detected contaminants above applicable risk-based concentrations. DEQ has concluded remaining contamination does not pose unacceptable risk, including the beneficial use of Troutdale Gravel Aquifer groundwater as a drinking water source to nearby properties and the City of Portland municipal supply. Cleanup has restored the site to conditions protective for human health and the environment for current and reasonably likely future land use.

How to comment: Send written comments to the DEQ Project Manager Erin McDonnell at DEQ Northwest Region, 2020 SW 4th Avenue, Suite 400, Portland, Oregon 97201, or mcdonnell.erin@deq.state.or.us. For more information contact the project manager at 503-229-6900.

Find information about requesting a review of DEQ project files at: http://www.deq.state.or.us/records/recordsRequestFAQ.htm

Find the File Review Application form at: http://www.deq.state.or.us/records/RecordsRequestForm.pdf

To access site summary information and other documents in the DEQ Environmental Cleanup Site Information database, go to http://www.deq.state.or.us/lq/ECSI/ecsi.htm, select “Search complete ECSI database”, then enter 167 in the Site ID box and click “Submit” at the bottom of the page. Next, click the link labeled 167 in the Site ID/Info column. Alternatively, you may go directly to the database website for this page at: http://www.deq.state.or.us/Webdocs/Forms/Output/FPController.ashx?SourceId=167&SourceIdType=11.

If you do not have web access and want to review the project file contact the DEQ project manager.

The next step: DEQ will consider all public comments received within the public comment period and prior issuance of a conditional no further action determination.

Accessibility information: DEQ is committed to accommodating people with disabilities. If you need information in another format, please contact DEQ toll free in Oregon at 800-452-4011, email at deqinfo@deq.state.or.us, or 711 for people with hearing impairments.

Request for Comments
Revised cleanup plan for Block 8L in Portland’s Old Town District

Comments due: 5 p.m., Tuesday, Sept. 30, 2014

Project location: 60 NW Davis St., Portland, OR

Proposal: The Department of Environmental Quality is proposing a fundamental revision to the 2013 cleanup plan to address soil and groundwater contamination at the Block 8L property located in Portland’s Old Town district. Under the revised plan, site contamination will be capped with a combination of clean fill and hardscape. A soil vapor treatment system also will be installed.

Highlights: Investigation at the Block 8L property has identified elevated concentrations of petroleum hydrocarbons and metals in soil. Petroleum has also been detected in shallow groundwater in the northeast site corner exceeding DEQ risk-based concentrations. Soil contamination is principally from contaminated fill from past operations at the site. Groundwater contamination has migrated onto the site from a separate property to the northeast.

DEQ’s 2013 selected remedy consisted of excavation and landfill disposal of approximately 3,400 tons of contaminated soil, and installing of a soil vapor collection system, with excavation being performed during construction of subgrade parking. Revised developments plans call for minimal subgrade work. DEQ has determined site risk can be addressed through installation of a site cap consisting of clean fill and hardscape, as requested by the Portland Development Commission. Capping will require ongoing inspection and maintenance and a deed restriction

to be filed with the property deed. Specific information on the new cleanup remedy is presented in a DEQ Record of Decision Amendment dated August 2014.

How to comment: Send comments to DEQ Project Manager Daniel Hafley at 2020 SW Fourth Ave., Suite 400, Portland, OR or hafley.dan@deq.state.or.us. For more information contact the project manager at 503-229-5417.

Find information about requesting a review of DEQ project files at: http://www.deq.state.or.us/records/recordsRequestFAQ.htm

Find the File Review Application form at: http://www.deq.state.or.us/records/RecordsRequestForm.pdf

To access site summary information and other documents in the DEQ Environmental Cleanup Site Information database, go to http://www.deq.state.or.us/lq/ECSI/ecsi.htm, select "Search complete ECSI database", then enter 5768 in the Site ID box and click "Submit" at the bottom of the page. Next, click the link labeled 5768 in the Site ID/Info column. Alternatively, you may go directly to the database website for this page at http://www.deq.state.or.us/lq/ecsi/ecsilist.asp?SiteID=5768.

If you do not have web access and want to review the project file contact the DEQ project manager.

The next step: After all comments have been considered, DEQ will proceed with site closure.

Accessibility information: DEQ is committed to accommodating people with disabilities. If you need information in another format, please contact DEQ toll free in Oregon at 800-452-4011, email at deqinfo@deq.state.or.us, or 711 for people with hearing impairments.

Request for Comments
Proposed conditional approval of cleanup at Powell LLC Property

Comments due: 5 p.m., Tuesday, Sept. 30, 2014

Project Location: 3610 SE 29th Ave., Portland

Proposal: The Department of Environmental Quality is proposing to issue a No Further Action determination with conditions based on the results of a Phase II Environmental Site Assessment completed on May 28, 2013 for the Powell LLC Property in Portland. DEQ is proposing that no further investigation or cleanup be required unless new buildings are planned for the property or the existing warehouses are enclosed.

Highlights: The property extends over a former ravine that was filled with construction debris, including brick, concrete, glass, metal and vegetation, in the 1950s and 1960s. An office and vehicle maintenance shop was constructed at the north end of the property in 1951, and two three-sided aluminum storage warehouses were constructed in 1987. The property was occupied by construction companies through the mid-1980s and since then has been used for warehouse storage. Petroleum-contaminated soils are present in portions of the property at concentrations exceeding DEQ's risk-based standards for direct contact by construction workers. Methane generated from decomposing vegetation in the ravine fill soils also is a concern. The property does not pose an unacceptable risk to public health or the environment in its current state, but further investigations will be needed if new buildings are planned or if the current warehouses are enclosed.

How to comment: Send comments to DEQ Project Manager Kevin Dana at 2020 SW 4th Avenue, Suite 400, Portland, Oregon, 97201 or dana.kevin@deq.state.or.us. For more information contact the project manager at 503-229-5369.

Find information about requesting a review of DEQ project files at:http://www.deq.state.or.us/records/RecordsRequestFAQ.htm

Find the File Review Application form at: http://www.deq.state.or.us/records/RecordsRequestForm.pdf

To access site summary information and other documents in the DEQ Environmental Cleanup Site Information database, go to http://www.deq.state.or.us/lq/ECSI/ecsi.htm, select "Search complete ECSI database", then enter 5829 in the Site ID box and click "Submit" at the bottom of the page. Next, click the link labeled 5829 in the Site ID/Info column. Alternatively, you may go directly to the database website for this page athttp://www.deq.state.or.us/lq/ECSI/ecsidetail.asp?seqnbr=5829.

If you do not have web access and want to review the project file contact the DEQ project manager.

The next step: DEQ will consider all public comments received by the close of the comment period before making a final decision regarding the No Further Action determination. A public notice announcing the final decision will be published in this publication.

Accessibility information: DEQ is committed to accommodating people with disabilities. If you need information in another format, please contact DEQ toll free in Oregon at 800-452-4011, email at deqinfo@deq.state.or.us, or 711 for people with hearing impairments.

Request for Comments
Proposed Cleanup Plan for the former Eugene Manufactured Gas Plant

Comments due: 5 p.m., Tuesday, Sept. 30

Project location: 700 Block of E. 8th Ave., Eugene, Ore.

Proposal: DEQ is recommending a cleanup plan for a portion of the former Eugene Manufactured Gas Plant located on property owned by the Eugene Water & Electric Board (EWEB) at the 700 block of E. 8th Ave. along the Willamette River, in Eugene, and the adjacent cul-de-sac located at the intersection of Hilyard Street and E. 8th Ave. owned by the City of Eugene. DEQ proposes that *Engineering and Institutional Controls with Targeted Soil/Waste Removal* be adopted as the remedy to address unacceptable risks to human health and the environment at the site. This remedy includes removal of the highest concentration wastes from in and around some buried structures at the site, maintaining an asphalt or equivalent cap over the site, and shoreline and riverbank stabilization measures to prevent erosion. In addition, the proposal requires a deed restriction requiring regular cap maintenance and inspection as well as maintenance of shoreline stabilization measures and restricting residential use of the site. Information regarding DEQ's recommendations is in the Staff Report, Recommended Remedial Action for Eugene Manufactured Gas Plant (Former) EWEB-Owned Portion, and the Staff Report, Recommended Remedial Action for Eugene Manufactured Gas Plant (Former) Cul-de-Sac Portion, ESCI 1723.

Highlights: The gas plant operated from 1907 to 1950. Operations at the facility produced a thick tar-like residue containing several contaminants which contaminated soil and groundwater. A DEQ initiated site investigation and risk assessment demonstrated the need for a remedy to prevent direct exposure to contaminated soils, prevent indoor exposure to contaminated vapors and ensure continued shoreline stability.

How to comment: Send comments to DEQ Project Manager Seth Sadofsky at 165 E. 7th Ave., Suite 100, Eugene, OR 97401 or email to: sadofsky.seth@deq.state.or.us. For more information contact the project manager at 541-687-7329.

Find information about requesting a review of DEQ project files at: www.deq.state.or.us/records/recordsRequestFAQ.htm

Find the File Review Application form at: www.deq.state.or.us/records/RecordsRequestForm.pdf

To access site summary information and other documents in the DEQ Environmental Cleanup Site Information database, go to www.deq.state.or.us/lq/ECSI/ecsi.htm, select "Search complete ECSI database", then enter 1723 in the Site ID box and click "Submit" at the bottom of the page. Next, click the link labeled 1723 in the Site ID/Info column. Alternatively, you may go directly to the database website for this page at http://www.deq.state.or.us/Webdocs/Forms/Output/FPController.ashx?SourceId=1723&SourceIdType=11

If you do not have web access and want to review the project file contact DEQ Project Manager Seth Sadofsky.

The next step: At the conclusion of the public comment period a Record of Decision will be issued for the site and EWEB will begin working on the cleanup under the supervision of DEQ.

Accessibility information: DEQ is committed to accommodating people with disabilities. Please notify DEQ of any special physical or language accommodations or if you need information in large print, Braille or another format. To make these arrangements, call DEQ at 503-229-5696 or toll free in Oregon at 800-452-4011; fax to 503-229-6762; or email to deqinfo@deq.state.or.us. People with hearing impairments may call 711.

Request for Comments
DEQ Proposes No Further Action for Jimmy Creek Ranch

Comments due: 5 p.m., September 30, 2014

Project location: 53365 Jimmy Creek Road, North Powder

Proposal: The Department of Environmental Quality proposes to issue a no further action determination for the Jimmy Creek Ranch site located near North Powder. DEQ issues a no further action determination when a cleanup has met regulatory standards. DEQ also proposes to delist the site from the Confirmed Release List and Inventory of Hazardous Substances.

Highlights: A fence post treating area, two underground storage tanks (USTs), two above ground tanks, and associated dispensers were located approximately 200 feet south of the ranch residence. Between November 2011 and March 2012, approximately 400 tons of primarily pentachlorophenol contaminated soil was excavated and transported off-site for

disposal. Soil was also excavated from two burn pile areas. The two USTs were decommissioned by excavation and removal.

How to comment: Send comments by 5 p.m., September 30, 2014, to DEQ Project Manager Katie Robertson by phone at 541-278-4620, by mail at 800 SE Emigrant Ave., Suite 330, Pendleton, OR 97801, by e-mail at Robertson.Katie@deq.state.or.us or by fax at 541-278-0168.

To access site summary information, the consent order, and other documents visit DEQ's Environmental Cleanup Site Information (ECSI) database at http://www.deq.state.or.us/lq/ecsi/ecsi.htm under Site ID 4849. To review the project file, contact the project manager above for a file review appointment.

The next step: DEQ will consider all public comments received before making a final decision on the proposed no further action determination and proposed delisting. DEQ will provide written responses to all public comments received.

Accessibility information: DEQ is committed to accommodating people with disabilities. If you need information in another format, please contact DEQ toll free in Oregon at 800-452-4011, email at deqinfo@deq.state.or.us, or 711 for people with hearing impairments.

DEQ RECOMMENDS NO FURTHER ACTION FOR ASSESSMENT OR CLEANUP OF FORMER TRUCK MAINTENANCE FACILITY, GOLDFISH FARM ROAD ALBANY, OREGON

PROJECT LOCATION: 1248 Goldfish Farm Road, SE

Albany, Linn County, Oregon

SUMMARY: The Oregon Department of Environmental Quality is recommending No Further Action (NFA) for assessment or cleanup of historical contaminants at the former Truck Maintenace Facility (Goldfish Farm Road) in Albany. DEQ is soliciting public comment on the recommendation. The following provides a short project summary and information on how to comment.

Historical operations at the property included several generations of truck and equipment repair and storage facilities. The former truck repair facility, which operated from the 1950s to 1970s, included a truck shop building containing a grease pit and a truck fueling area with two above-ground fuel storage tanks (ASTs) located in a separate shed structure. A truck wash company operated at the property from approximately 1989 until 1995.

Historic releases of petroleum (diesel, gasoline, and waste oil) resulted in shallow soil and groundwater contamination. The contamination was assessed during several subsurface investigations between 2006 and 2012. The current property owner's consultant completed a summary of the assessment work and prepared a Remedial Investigation Summary Report which recommended site closure under Oregon Cleanup Rules. DEQ agreed with the conclusions and prepared a staff memo recommending No Further Action for assessment and cleanup. The report also supports DEQ's conclusions as to why residual contaminants are below acceptable risk levels and that the site is protective of human health and the environment.

DEQ's recommendation is conditional based on the presumed future use of the property remaining commercial. DEQ's recommendation includes a deed restriction on the property that presents where residual contamination might be found and how to manage contaminated soil and groundwater, if encountered. As long as the deed restriction is adhered to, the site will be protective of human health and the environment.

HOW TO COMMENT: The Remedial Investigation Report and the Staff Memo are available on line at http://www.deq.state.or.us/lq/cu/index.htm by entering the Site ID number 5043 in the Environmental Cleanup Site Inventory (ECSI) database. A file containing detailed information for the site is available for review in DEQ's office located in Suite 100 at 165 East 7th Avenue in Eugene. Comments need to be received by September 30th at 5 pm by email or letter. Comments or questions should be directed to Bryn Thoms at DEQ's Eugene office at 541-687-7424 or toll-free in Oregon at 1-800-844-8467, extension 7424, or by email at thoms.bryn@deq.state.or.us.

State of Oregon
Department of Environmental Quality

Recommended Remedial Action

Eugene Former Manufactured Gas Plant
ECSI #1723

August 29, 2014

Prepared by

Seth Sadofsky, Ph.D., R.G.
Remedial Action Specialist
Western Region Environmental Cleanup Program

Approved By

Don Hanson, R.G
Lead Worker
Western Region Cleanup Program

Introduction
DEQ has recommended a remedial plan for a part of the former Eugene Manufactured Gas Plant (MGP) located on property owned by the Eugene Water & Electric Board (EWEB) at the 700 block of East 8th Avenue along the Willamette River and the adjacent cul-de-sac property at 8th avenue and Hilyard Street, in Eugene, Oregon (Figures 1 and 2). At the time the MGP was in operation, the Cul-de-Sac Property and the EWEB Property were part of the same parcel of land and the MGP operations were conducted on both properties. Separate staff reports were prepared for the main site of MGP operations and for the Cul-de-Sac area. However, after comparing possible remedies, both properties will best be addressed by a similar combination of remedies as described below.

In the 19th and early 20th centuries, MGPs produced gasses (similar to natural gas) by heating coal, oil, or other fuels in the absence of oxygen, producing flammable gasses that were used for lighting, cooking, heating, fueling industrial processes, etc. These MGP processes and operations often resulted in environmental contamination sometimes referred to as MGP residue, a thick tar-like substance. The Eugene Former MGP operated from 1907 to 1950. During operation of the facility, MGP residue contaminated the soil and groundwater. In 1976 EWEB purchased the property where the main portion of the MGP operated and later investigated the contamination under an Intergovernmental Agreement with the DEQ.

Soil
Contaminated soil is common beneath the core area of the site, and occurs to the south beneath the City of Eugene cul-de-sac and to the north beneath the bike path and to the edge of the river (see Figure 3). In the core area of the site the contamination extends from near ground level to bedrock, which is at a depth of about 27 feet below ground surface. Soil contamination in the core area extends beneath the water table where groundwater transported site contaminants toward the river (Figure 4). Soil contamination also occurs on the University of Oregon Riverfront Research Park property a short distance to the east and south east of the site. Soil contamination mostly consists of polynuclear aromatic hydrocarbons (PAH)s, which are semi-volatile organic compounds, and benzene, toluene, ethylbenzene, and xylenes (BTEX), which are volatile organic compounds, some of which can vaporize and migrate to the surface.

Groundwater
Groundwater contamination is present below much of the site and extends to the river. Groundwater contamination consists of PAHs and BTEX and occurs within a thin (5-9 feet thick) layer above the bedrock. There is no current or likely future use of groundwater at the site except for discharge to surface water (Willamette River). While the site investigation indicates that contaminated groundwater discharges into the Willamette River, it also indicated that the site-related compounds have no adverse effects on aquatic receptors or future uses of the Willamette River.

Pure Phase Wastes
MGP residue is present beneath the surface of much of the site (see Figure 5). In places, the residue is a Non-Aqueous Phase Liquid (NAPL), which means that it is a separate-phase liquid, which, like oil, does not dissolve in water. NAPL is principally found beneath the core area of the site in the pore spaces in the soil (as residual NAPL), both above the water table and below it. The NAPL is a combination of compounds including BTEX, PAHs, and other chemicals.

Overall, the NAPL is slightly heavier than water. However, some of the chemicals separate from the NAPL in the presence of water and float on the surface of the groundwater table to form a sheen or film. The NAPL extends from the core area of the site to the Willamette River in saturated soils beneath the water table.

The NAPL can share soil pore spaces with water in discontinuous blebs. It is viscous and does not flow easily. Many years ago, when the NAPL was released, the NAPL spread in different ways including flowing down to the groundwater from its point of release and then flowing with groundwater to the Willamette River. However over the years, the more soluble compounds in the NAPL dissolved in groundwater; and in its current form the NAPL is non-mobile. It occurs as a residue coating pore spaces, but not flowing toward the river, although it does act as a source for groundwater contamination beneath the site.

Some NAPL is present in limited areas near or in buried foundations or former MGP structures at the site. EWEB removed about 1,500 gallons of NAPL and water from the former underground tar tank in 1999.

Surface Water

Water samples from the Willamette River show that some chemicals from the site are present in the river at low concentrations that do not present a risk concern for fish or other aquatic species. In addition a worst-case-scenario model for groundwater discharging to the Willamette River predicted no significant effect on aquatic receptors in the river.

Sediments

The site has slightly less than 300 feet of river frontage. The river bed is dominated by cobble gravel. Fine-grained sediments in two small areas along the site contained contaminants in excess of ecological screening levels. An investigation was completed to further evaluate the risk associated with these contaminants. The analysis showed that the risk from contaminants in the sediment was not significant.

Risk Assessment

Oregon cleanup rules are based on risk. If contaminants pose unacceptable risk to people or the environment, a cleanup action is required. The majority of the site is expected to remain under the control of EWEB for the foreseeable future and to be used for a combination of park space and access to the adjacent substation. Applicable risk pathways for future use of the site are summarized in Table 1. DEQ identified the following unacceptable risks at the site, based on current Site conditions, chemical concentrations in soil and high-concentration MGP residues:

- Vapor intrusion from soil or high-concentration MGP residue into indoor air in an occupational setting.
- Exposure to contaminated soil by site workers or excavation workers.

The Human Health Risk Assessment is Summarized in Tables 2 and 3. No unacceptable ecological risk was identified at the site. Nor was any unacceptable risk to site visitors or recreational users identified.

Remedial Action Objectives

Based on the unacceptable risks identified above Oregon's cleanup rules require a cleanup or remedial action to reduce the risk. The objectives of the remedial action include the following:

- Prevent industrial and excavation worker exposure to contaminated soils.
- Prevent exposure to future site users from vapor intrusion of benzene into indoor spaces.
- Ensure continued shoreline stability to prevent erosion of contaminated subsurface soil, the unintentional dispersal of soil contaminants to the Willamette River, and public and worker exposure to soil contaminants.
- Control infiltration of rainwater through contaminated soil in upland Site area to minimize the potential for mobilization of contaminants to the Willamette River.
- Treat or remove high-concentration waste to the extent feasible.

Note that several of these remedial action objectives are related to limiting the potential for migration of contaminants rather than risks identified in the Human Health or Ecological Risk Assessments.

Remedial Alternatives

The following remedial action alternatives were evaluated to meet the remedial action objectives:

No Action

No action is not protective and was eliminated from consideration as a remedial alternative for the site.

Engineering and Institutional controls

Engineering and institutional controls include maintaining an asphalt or equivalent cap over the site, shoreline and riverbank stabilization measures to prevent erosion, and applying a deed restriction requiring regular cap maintenance and inspection as well as maintenance of shoreline stabilization measures, restricting residential use of the site, and restricting construction of buildings for continuous human occupancy. Institutional controls would also include preparing a site management plan to ensure safe work practices in the contaminated zone, proper management of contaminated soil and groundwater, and documenting shoreline stabilization and inspection requirements.

Engineering and Institutional Controls with Targeted Soil/Waste Removal

This remedial alternative includes the engineering and institutional controls outlined above and removal of the highest concentration wastes from in and around some buried structures at the site (see Figure 6).

Engineering and Institutional Controls with Deep Soil Removal and Shoreline Bulkhead Construction

This remedy includes the engineering and institutional controls outlined above and removal of soil in the core area to a depth of about 15 feet below ground surface. In

addition a massive shoreline bulkhead would be constructed to protect against erosion and potential exposure of contaminated subsurface soil beneath the shoreline area.

After evaluating each alternative for effectiveness, long term reliability, implementability, implementation risk, and cost, DEQ proposes ***Engineering and Institutional Controls with Targeted Soil/Waste Removal*** as the remedy for the site.

DEQ will announce the proposed remedy in the local Eugene Register Guard, on its Public Notices website, and in the Oregon Secretary of State's Bulletin, and will hold a 30-day public comment period. After considering all public comments, DEQ may finalize the proposed remedy in a record of decision for the site.

Table 1 **Human Health Conceptual Site Model for MGP Site Prepared by DEQ**

Media	Pathway	Depth (ft)	Industrial or Occupational	Excavation Worker	Recreational User	Rational
Soil	Direct Contact	1.5-3	X	X	O	Occupational contact with shallow soils is unlikely, given the current Site paving and EWEB plans/commitment to Site management approach, including upland soil cap/cover and shoreline area controls. Construction/excavation worker direct contact with shallow soils is possible. Visitor contact is unlikely since the site is paved and fenced.
		3-15	O	X	O	Construction/excavation worker exposure to deeper soils is possible. Exposure to soils below 3 ft is unlikely for visitors.
		Shore-line (0-0.5)	O	O	X	Occupational or excavation worker contact with shoreline surface soils is unlikely. EWEB maintenance worker and visitor/trespasser contact with surface soils in the shoreline area is possible.
	Vapor Intrusion to Indoor Air	1.5-3	X	O	O	No structures for human occupation are currently located on the site. Benzene in one soil sample and in MGP waste material in/at two former MGP structures exceed DEQ generic RBCs; thus, in the absence of further analysis or remedial action, Site controls will be needed preventing future buildings on the site.
		3-15	X	O	O	As above.
		Shore-line (0-0.5)	O	O	O	No buildings are present or likely on the bank of the river.
	Volatilization to Outdoor Air	All	X	O	X	Benzene levels in one soil sample exceed generic RBCs for volatilization to outdoor air. Site-specific calculations presented in the final FFS demonstrate that volatilization to outdoor air does not pose an unacceptable risk to occupational users, maintenance workers or site visitors, even if the soil cap/cover were permanently removed.
	Leaching to Groundwater	All	O	O	O	Groundwater is not used as a drinking water source at or downgradient of the subject property. Since groundwater ingestion is not considered to be a complete pathway for the site, neither is leaching to groundwater.
Groundwater	Groundwater Ingestion		O	O	O	No drinking water use of the perched shallow groundwater.
	Direct Exposure to Groundwater		O	O	O	Since groundwater occurs at depths greater than ten feet (~17 feet), construction/excavation worker contact with contaminated groundwater is unlikely.
	Vapor Intrusion to Indoor Air		X	O	O	No buildings are currently located on site. While volatile constituents are present in the groundwater, none is present at concentrations in excess of volatilization RBCs. Benzene concentrations in groundwater do not exceed the acceptable risk level of 1E-06.
	Volatilization to Outdoor Air		X	X	X	While volatile constituents are present in the groundwater, none are present at concentrations in excess of volatilization RBCs.

X indicates a pathway is complete; O indicates a pathway is incomplete

Recreational user is equivalent to the visitor or trespasser potential exposure scenario.

Table 2

DEQ Derived Risk Characterization Summary – Cancer Risk Estimates

Scenario	COC	Soil Cancer Risk [1]	Waste Materials Cancer Risk [2]	Groundwater Cancer Risk	Cumulative Cancer Risk
Industrial (Direct Contact)	**Benz(a)anthracene**	2.7E-04	1.0E-04		3.7E-04
	Benzo(a)pyrene	1.7E-03	8.9E-04		2.6E-03
	Benzo(b)fluoranthene	1.6E-04			1.6E-04
	Benzo(k)fluoranthene	1.3E-05	7.8E-06		2.1E-05
	Chrysene	3.7E-06	1.1E-06		4.8E-06
	Indeno(1,2,3-cd)pyrene	3.5E-06			3.5E-06
	Benzene	6.4E-07	5.3E-06		5.9E-06
	TOTAL CANCER RISK	2.2E-03	1.0E-03		3.2E-03
Industrial Indoor Air	**Benzene** [6]	4.9E-05	1.5E-04	1.3E-06	2.0E-04
Industrial Outdoor Air	**Benzene** [7]	6.9E-08	2.1E-07	2.8E-07	5.6E-07
Excavation					
	Benz(a)anthracene	2.2E-06	4.7E-07		2.7E-06
	Benzo(a)pyrene	2.3E-05	4.1E-06		2.7E-05
	Benzo(b)fluoranthene	1.7E-06			1.7E-06
	Benzo(k)fluoranthene	1.8E-07	3.6E-08		2.2E-07
	Chrysene	3.1E-08	5.1E-09		3.6E-08
	Indeno(1,2,3-cd)pyrene	5.2E-07			5.2E-07
	Benzene [3]	3.9E-07	1.9E-08	2.8E-07	6.9E-07
	TOTAL CANCER RISK	2.8E-05	4.6E-06	2.8E-07	3.3E-05
Recreational User [4]					
	Benz(a)anthracene	5.7E-08			5.7E-08
	Benzo(a)pyrene	3.4E-07			3.4E-07
	Benzo(b)fluoranthene	2.9E-08			2.9E-08
	Benzo(k)fluoranthene	3.4E-09			3.4E-09
	Chrysene	5.7E-10			5.7E-10
	Dibenz(a,h)anthracene	6.2E-08			6.2E-08
	Indeno(1,2,3-cd)pyrene	1.8E-08			1.8E-08
	Benzene[5]	9.7E-08	3.0E-07		4.0E-07
	TOTAL CANCER RISK	6.1E-07			9.1E-07

Footnotes:

1 Cancer risk for soil was calculated for both shallow soil (1.5-3ft) and deeper subsurface soil (3-15 ft) in the final Focused Feasibility Study (SH+G 2006). The maximum cancer risk for either shallow soil or deeper subsurface soil is presented for the Excavation scenario.

2 Cancer risks for waste material were calculated using maximum concentrations provided in Table A-5 of the Human Health Risk Evaluation (Exponent 2002) and comparing them to RBCs in DEQ's 2003 RBDM Guidance.

3 Cancer risk for the excavation worker exposed to benzene in groundwater via outdoor air volatilization was conservatively assumed to be equal to the industrial worker because no default scenario is available for this pathway for excavation workers.

4 As described in the Human Health Risk Evaluation (Exponent 2002), the Recreational user (i.e., river bank trespasser or visitor) was evaluated by comparing against a risk-based concentration for an industrial worker as a conservative measure. This comparison is over-protective because the assumed duration of contact is much less for a Recreational user. Therefore, the risk values presented overestimate actual risk to Recreational users. All detected chemicals are presented for the Recreational user since this scenario was not presented in the residual risk assessment of the Focused Feasibility Study (SH+G 2006) because all concentrations in surface soil at the shoreline area were below conservative risk-based screening levels. Screening tables for the Recreational user can be found in Tables A-1 to A-3 of the Human Health Risk Evaluation (Exponent 2002).

5 Benzene in soil was evaluated for volatilization to outdoor air for the recreational user by applying the site-specific screening levels in the final FFS. Site soil maximum concentration of benzene was 59,000 ug/kg and the waste material maximum was 180,000 ug/kg. The site-specific screening level for a visitor to the site was 607,639 ug/kg. This evaluation confirms acceptable risk level for the visitor exposure scenario.

6 Volatilization to indoor air was evaluated for benzene (the only highly volatile chemical detected). Maximum soil, waste, and groundwater concentrations were used to calculate risk estimates. Benzene site soil maximum concentration was 59,000 ug/kg, the waste material maximum concentration was 180,000 ug/kg, and the groundwater maximum concentration was 3,590 ug/L. The RBCs for soil/waste and groundwater were 1,200 ug/kg and 2,800 ug/L, respectively (RBCs from DEQ's 2003 RBDM Guidance, as updated 2009).

7 Benzene in soil was evaluated for volatilization to outdoor air for the industrial user by applying the site-specific screening levels in the final FFS. Site soil maximum concentration of benzene was 59,000 ug/kg and the waste material maximum was 180,000 ug/kg. The site-specific screening level for EWEB industrial workers to the site was 857,143 ug/kg which exceeds the soil saturation level of (701,000 ug/kg). This evaluation confirms acceptable risk level for the visitor exposure scenario. Benzene in groundwater was evaluated for volatilization to outdoor air for the industrial worker by applying the 2003 RBDM (as updated 2009) outdoor RBC of 14,000 ug/L and comparing it to the maximum concentration of benzene detected in groundwater (3,590 ug/L).

Table 3 **DEQ Derived Risk Characterization Summary – Noncancer Hazards**

Scenario	COC	Soil Noncancer HQ [1]	Waste Materials Noncancer HQ [2]	Groundwater Noncancer HQ	Cumulative Noncancer HI
Industrial					
	2-methylnaphthalene	5.8	6.3		12.1
	Acenaphthylene	NA	NA		NA
	Benzo(g,h,i)perylene	0.43	ND		0.43
	Naphthalene	2.8	18		20.8
	Phenanthrene	14	7		21
	TOTAL HAZARD INDEX	23.0	31.3		54.3
Excavation					
	2-methylnaphthalene	3.0	NC		3.0
	Acenaphthylene	0.80	<0.001		0.80
	Benzo(g,h,i)perylene	0.48	NC		0.48
	Naphthalene	5.0	0.18		5.18
	Phenanthrene	3.0	NC		3.0
	TOTAL HAZARD INDEX	12.3	0.2		12.5
Recreational User [3]					
	2-methylnaphthalene	NC			NC
	Acenaphthylene	<0.001			<0.001
	Benzo(g,h,i)perylene	0.003			0.003
	Naphthalene	ND			ND
	Phenanthrene	0.02			0.02
	TOTAL HAZARD INDEX	0.2			0.2

Footnotes:

NA – not applicable because Acenaphylene not identified as a COPC for shallow soil in HHRE
NC – not calculated because EPA-verified toxicity data not available
ND – not detected

1. Noncancer hazards for soil were calculated for both shallow soil (1.5-3 ft) and deeper subsurface soil (3-15 ft) in the final Focused Feasibility Study (SH+G 2006). The maximum noncancer hazard quotient for either shallow soil or deeper subsurface soil is presented for the Excavation scenario.

2. Noncancer hazards for waste material were calculated using maximum concentrations provided in Table A-5 of the Human Health Risk Evaluation (Exponent 2002) and comparing them to RBCs in DEQ's 2003 RBDM Guidance.

3. As described in the Human Health Risk Evaluation (Exponent 2002), the Recreational user (i.e., river bank trespasser or visitor) was evaluated by comparing against a risk-based concentration for an industrial worker as a conservative measure. This comparison is over-protective because the assumed duration of contact is much less for a Recreational user. Therefore, the risk values presented overestimate actual risk to Recreational users. All detected chemicals are presented for the Recreational user since this scenario was not presented in the residual risk assessment of the Focused Feasibility Study (SH+G 2006) because all concentrations in surface soil at the shoreline area were below conservative risk-based screening levels. Screening tables for the Recreational user can be found in Tables A-1 to A-3 of the Human Health Risk Evaluation (Exponent 2002).

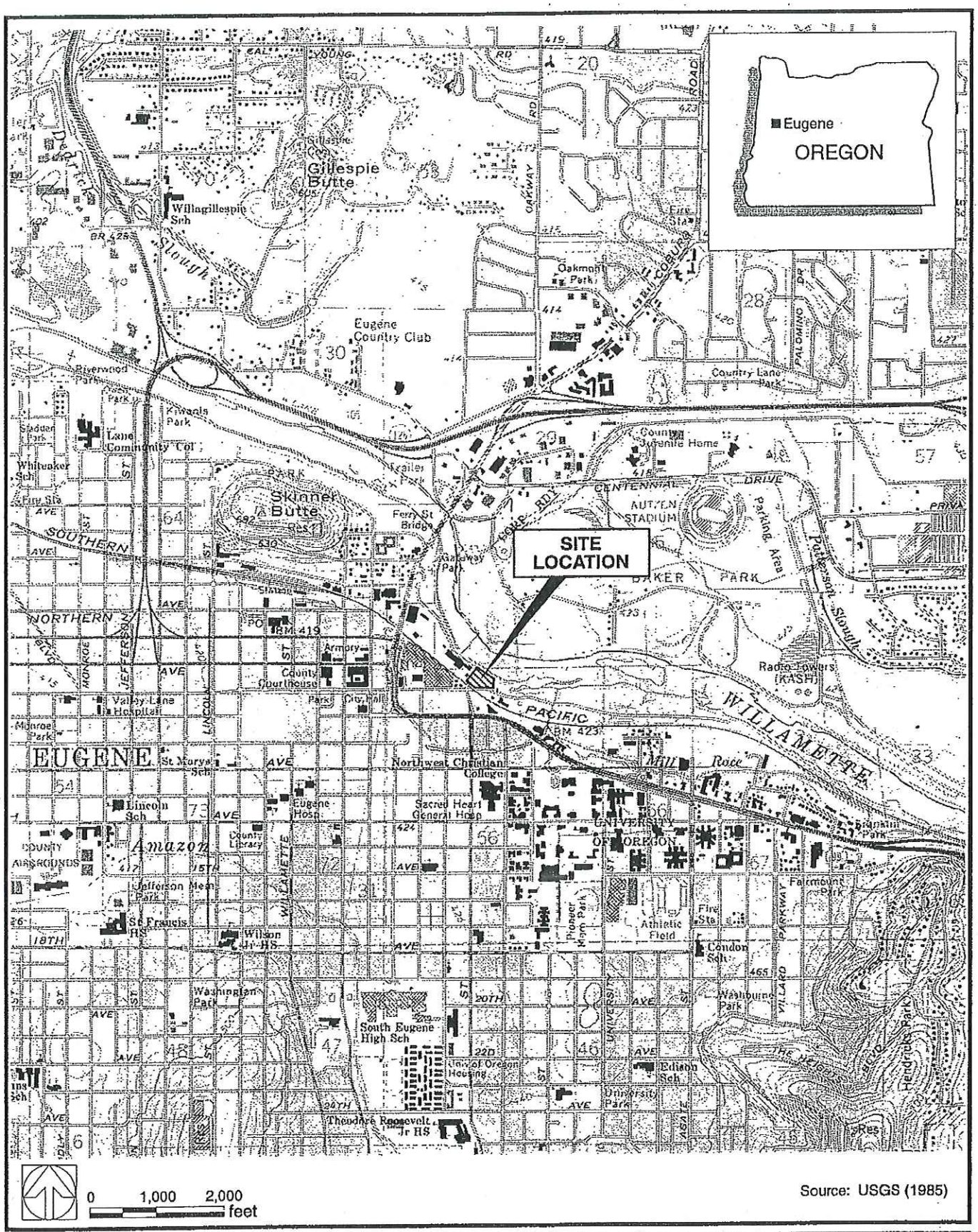
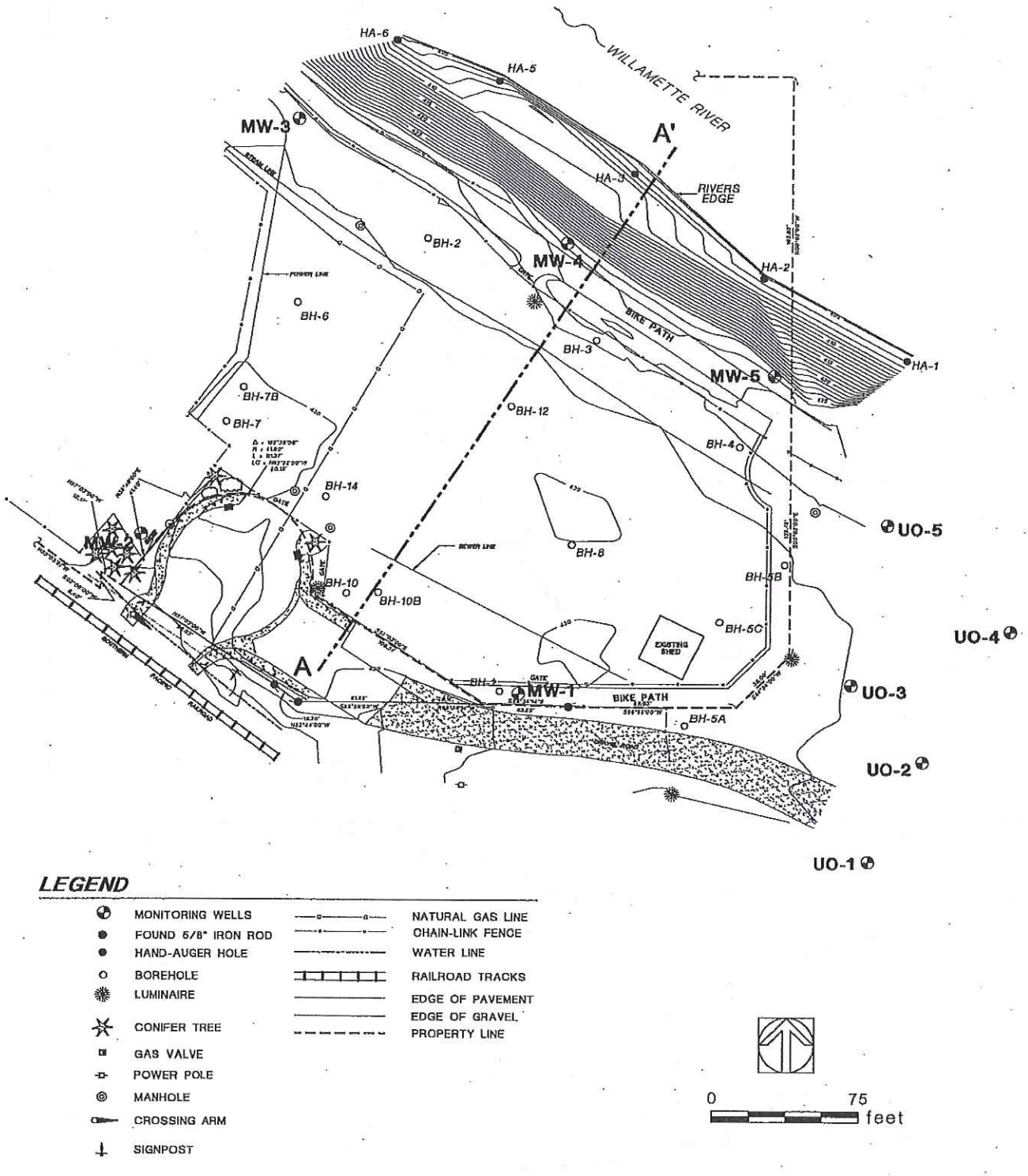


Figure 1. Site Location Map

8600580.002.0107 LOCATION.fh7 12/20/99 OR



Source: W&H Pacific

Exponent

Figure 2. Site Plan

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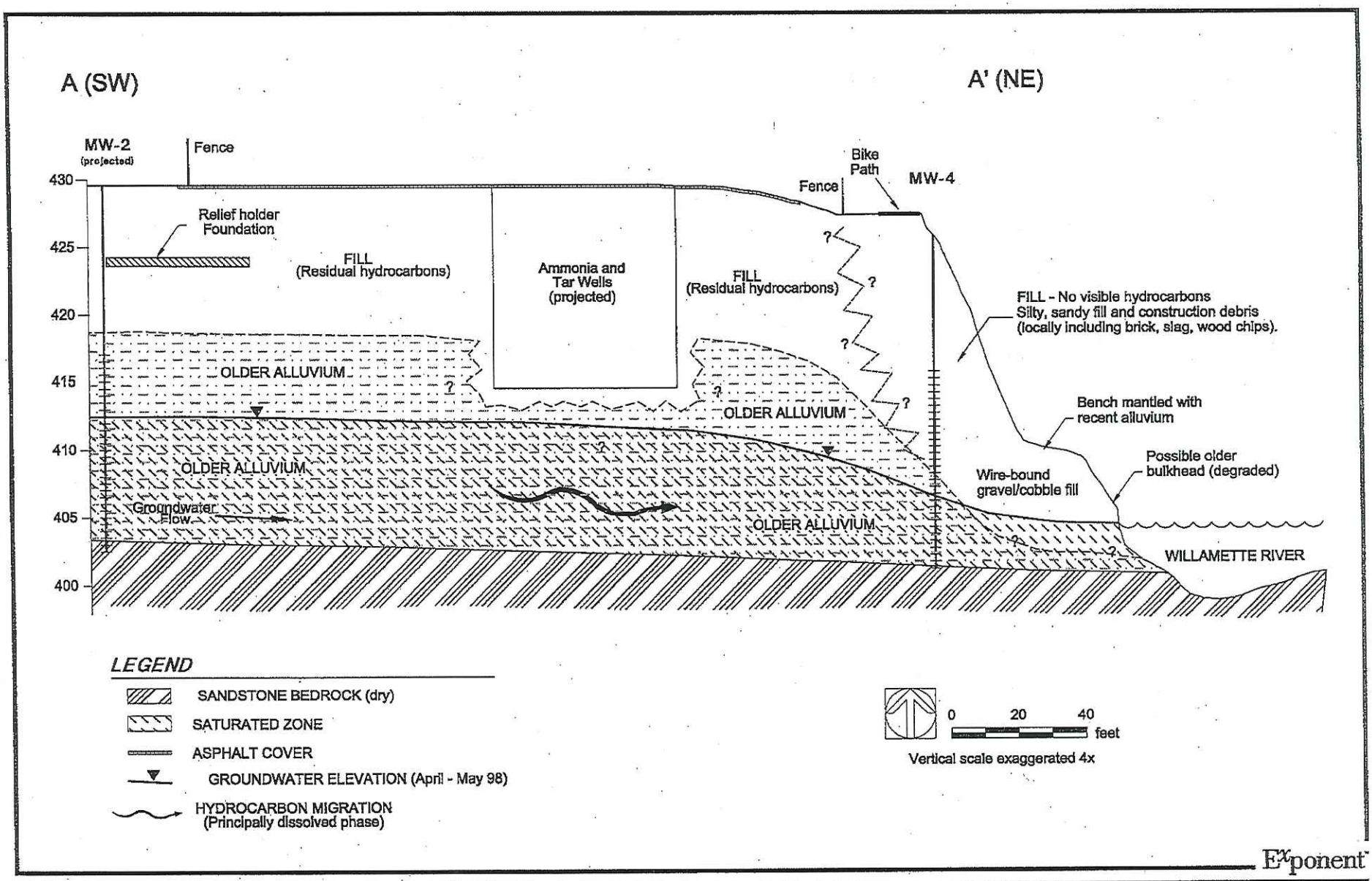

Figure 3. Generalized Cross-Section

86005800103/CSECTBASELOC.dwg 03/02/00 OR

Notes:
1. Property boundary between City of Eugene and University of Oregon approximately located.

Sources:
1. Base Map Survey by: W&H Pacific (9/17/96)
2. Base Map Provided by: Swanson Hydrology + GeoMorphology and Windward Enviromental, LLC. (Final Feasibility Study, April 2006)

Prepared by Integral Consulting Inc.

W:\Projects\Axelrod LLC EWEB MGP Site\Data\CAD_etc_from_Russ\Locality\From Integral\Figure_4_MGP_site_WW.dwg 1/27/2014 2:19:03 PM

Windward environmental LLC

Axelrod ENVIRONMENTAL CONSULTING

Figure 4.
DEQ Revised Locality of Facility for Contamination
Eugene Manufactured Gas Plant (Former) Site

State of Oregon
Department of
Environmental
Quality

MANAGEMENT APPROVAL FORM **REPORT/DOCUMENT TYPE:**
(Preliminary Approval)
STAFF REPORT
RECOMMENDED REMEDIAL ACTION
EUGENE MANUFACTURED GAS PLANT (FORMER) CUL-de-SAC PORTION

Project Name: 1723
Eugene Former Manufactured Gas Plant

Date: _08/29/2014_

Proposed Remedial Action: __X____
Certification of Completion _____
Other: [Describe]_____

Please review the attached staff recommendation regarding an environmental cleanup activity. ORS 465.320 requires public notification of, and a 30 day comment period for, this recommendation. It is important to receive your concurrence/comments as soon as possible to meet publication deadlines. Please sign below as approval.

PRELIMINARY APPROVAL: (INDICATES CLEARANCE FOR PUBLIC NOTICE AND COMMENT.)

Michael E. Kucinski,
Western Region Cleanup Manager

9/3/14
Date

Return completed form to Seth Sadofsky, Project Manager
Western Region Environmental Cleanup

Copy: Project Administrative Record File

State of Oregon
Department of
Environmental
Quality

PEER REVIEW COMMENTS & APPROVAL FORM

STAFF REPORT
RECOMMENDED REMEDIAL ACTION
For
EUGENE MANUFACTURED GAS PLANT (FORMER)
CUL-DE-SAC PORTION
ECSI 1723
(Attached)

Date: 08/28/14 Action: Staff Report

Please review and comment on the attached document. It is the Staff Report,. Please provide comments as soon as possible or sign below as approval.

Route to the following technical team members:

Geoff Brown	Seth Sadofsky for Geoff Brown Signature	9/3/14 Date
Susan Turnblom	Susan M Turnblom Signature	8/28/2014 Date
Don Hanson, R.G.	Don Hanson Signature	8/29/14 Date
Seth Sadofsky	Seth Sadofsky Signature	8/28/2014 Date

Return completed form to: Seth Sadofsky, Project Manager
Western Region Cleanup Program

Copy: Administrative Record file 1723

STAFF REPORT

RECOMMENDED REMEDIAL ACTION

For

EUGENE MANUFACTURED GAS PLANT (FORMER)
CUL-de-SAC PORTION

EUGENE, OREGON

ECSI 1723

Approved By

OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY
Western Region Office

August, 2014

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1. INTRODUCTION

This document presents the recommended remedial action for the portion of the Eugene Former Manufactured Gas Plant (MGP) Site located on the cul-de-sac property (the "Cul-de-Sac Property") at the intersection of Hilyard Street and East 8th Avenue, Eugene, Oregon, which is part of ECSI Site No. 1723. It was developed in accordance with Oregon Revised Statutes (ORS) 465.200 et. seq. and Oregon Administrative Rules (OAR) Chapter 340, Division 122, Sections 010 through 115. The Cul-de-Sac Property is adjacent to the property owned by the Eugene Water & Electric Board (EWEB) at the 700 block of East 8th Avenue (the "EWEB Property"). At the time the MGP was in operation, the Cul-de-Sac Property and the EWEB Property were part of the same parcel of land and the MGP operations were conducted on both properties.

The recommended remedial action for the Cul-de-Sac Property is based on the administrative record for ECSI Site No. 1723, and the letter from PERCo (October 2011)[1]. A copy of the Administrative Record Index is attached as Appendix A. This report accompanies the staff report for the EWEB Property (EWEB Property Staff Report), which is based on Remedial Investigation, Risk Assessment, Ecological Risk Assessment and Feasibility Study (RI/FS) reports completed under Oregon Department of Environmental Quality (DEQ) intergovernmental agreement WMCVC-WR-98-13, dated November 25, 1998. This staff report summarizes the more detailed information contained in the RI/FS reports and is supplemented by the technical memorandum (September 30, 2011) prepared by AECOM describing subsurface conditions at the Cul-de-Sac Property. The AECOM technical memorandum was prepared on behalf of PacifiCorp and Cascade Natural Gas Corporation. EWEB did not participate in preparation of the memorandum.

The RI/FS reports were prepared primarily for the EWEB Property and the remedy proposed in the EWEB Property Staff Report applies to the EWEB Property, although it also covers remedial action for the small relief holder that extends from the EWEB Property into the Cul-de-Sac Property. DEQ has determined the property history, land use, physical setting, hydrogeology and nature and

[1] See Letter to Geoffrey Brown from PERCo regarding Cul-de-Sac Property dated October 27, 2011, and AECOM memorandum on subsurface conditions at Cul-de-Sac Property dated September 30, 2011.

extent of the contamination on the Cul-de-Sac Property is so similar to the EWEB Property that the risk assessment and feasibility study for the EWEB Property can also be applied generally to the Cul-de-Sac Property. This staff report, therefore, relies heavily on the EWEB Property Staff Report and recommends extension of the proposed remedy for the EWEB Property to the Cul-de-Sac Property.

The Cul-de-Sac property is part of the former Eugene MGP and is contiguous with the portion currently owned by EWEB. The evaluation and remedy selection for the Cul-de-Sac Property is occurring concurrently with the administrative process for the EWEB Property. However, EWEB is not participating in the evaluation or remedy selection for the Cul-de-Sac Property.

This report was based on a draft prepared, in large part, by PacifiCorp and Cascade Natural Gas Corporation. However, DEQ has carefully reviewed and revised the document the conclusions of which represent the opinion of DEQ.

1.1 SCOPE AND ROLE OF THE RECOMMENDED REMEDIAL ACTION

The recommended remedial action addresses the presence of polynuclear aromatic hydrocarbons (PAHs), benzene, cyanide, and total mercury in contaminated soil and groundwater at the Cul-de-Sac Property. The recommended remedial action consists of the following elements:

- Excavation and off-site disposal of high-concentration residuals/waste at that portion of the small relief holder located within the Cul-de-Sac Property.
- Engineering controls consisting of a surface cap.
- Institutional controls consisting of an Easement & Equitable Servitude restricting property use, and development of a site management plan.
- Monitoring and maintenance of the surface cap according to the site management plan for the Cul-de-Sac Property.

2. SITE HISTORY AND DESCRIPTION

2.1 SITE LOCATION AND LAND USE

The Cul-de-Sac Property is a right-of-way that consists of approximately 0.2 acres located at the intersection of East Hilyard Street and 8th Avenue in Eugene, Oregon, T17S, R3W, Section 32, Lane County (Figure 1). Because it is public right-of-way, the Cul-de-Sac Property does not have a separate tax lot number. The legal description of the Cul-de-Sac Property, which defines its boundaries, is included in Attachment A. The Cul-de-Sac Property is shown in green on Figure 2. The City of Eugene owns and controls the right of way to the Cul-de-Sac. The Cul-de-Sac Property location is latitude 44°3' 4.5"N and longitude 123 4' 55.94"W. The Cul-de-Sac Property is located in a mixed use area neighborhood encompassing commercial, industrial, office, residential, and park land uses. Land immediately west of the Cul-de-Sac Property is used for EWEB operations and offices. Land to the south consists of mixed commercial, residential, and industrial uses, as well as the federal courthouse. The University of Oregon owns the adjacent land to the east of the Cul-de-Sac property known as Riverfront Research Park. This property is zoned for Special Development as part of Riverfront Research Park. Although the immediately adjacent portion of Riverfront Research Park is undeveloped, future development as office space is possible. The nearest residential development is approximately ¼ mile west of the Cul-de-Sac Property. The Cul-de-Sac Property is bounded on the north and west by the EWEB Property. The Cul-de-Sac Property and the EWEB Property are zoned as Public Land.

The approximate ground elevation of the Cul-de-Sac Property is 430 feet above mean sea level. The Cul-de-Sac Property is paved with asphalt and concrete sidewalks, except for a small triangle in the eastern corner that is covered by gravel. There are no permanent structures on the Cul-de-Sac Property. Currently, the Cul-de-Sac Property is used as a public road. Future uses of the Cul-de-Sac Property are expected to remain the same.

2.2 PHYSICAL SETTING

For details on the physical setting, geology and hydrogeology, see the EWEB Property Staff Report.

2.2.1 Surface Water and Stormwater Features

There are no surface water features on the Cul-de-Sac Property. The Cul-de-Sac Property is largely paved. Stormwater from the Cul-de-Sac Property drains to two catch basins in the Cul-de-Sac Property, which flow to a manhole to the north of the Cul-de-Sac Property on the EWEB Property and then discharge to the Willamette River through a storm drain pipe passing through the EWEB Property.

2.2.2 Groundwater and Surface Water Beneficial Use Determination

Beneficial uses were evaluated for the water-bearing zone beneath the Cul-de-Sac Property and the nearby Willamette River considering current use and the following factors listed in OAR 340-122-080(3)(f)(F):

- Historical land and water uses
- Anticipated future land and water uses
- Concerns of community and nearby property owners
- Regional and local development patterns
- Regional and local population projections
- Availability of alternate water sources

Based on information in the beneficial use determination, DEQ concludes that:

- No drinking water wells are located at the Cul-de-Sac Property or within ¼ mile of the Cul-de-Sac Property, nor are any future nearby wells reasonably likely. All domestic use water within that distance is provided by EWEB. No future domestic use of the underlying aquifer is reasonably likely.

- The Cul-de-Sac Property is located approximately 225 feet upgradient of the Willamette River. Groundwater discharging to surface water (Willamette River) is the only known beneficial use of the shallow groundwater at the Cul-de-Sac Property, although potential human exposure to site-related contaminants could occur if dewatering were to be required in connection with possible future construction of subsurface road features (such as an underpass) or building features.

- One historical water intake was located on the Willamette River about ¼ mile downstream of the Cul-de-Sac Property. The water intake was used to provide non-contact cooling water to the EWEB steam plant. EWEB no longer uses the steam plant to generate electricity, has no plans to reuse the steam plant, and has let the NPDES discharge permit associated with discharge of the cooling water expire and this water right is inactive. Two irrigation water

intakes are located approximately one mile downstream of the Cul-de-Sac Property. There is no known nearby domestic use of water from the Willamette River.

- Beneficial uses of the Willamette River in the area of the Cul-de-Sac Property include habitat, recreation, irrigation, and aesthetic value.

- The current and reasonably likely future use of the Cul-de-Sac Property is as a public road. Other properties in the area are expected to remain public lands, multi-family residential, industrial, or commercial use. Conditions at the Cul-de-Sac Property are unlikely to preclude any of these uses for nearby properties.

2.2.3 Subgrade Utilities

The Cul-de-Sac Property is crossed by three known utility lines:

- A natural gas line running north-south through the central portion of the Cul-de-Sac Property (see Figure 2; trenching for the gas line extended up to 3 feet below ground surface);

- An electrical transmission line running generally east-west through the central portion of the Cul-de-Sac Property (see Figure 2; trenching for the transmission line extended up to 6 feet below ground surface); and

- Stormwater lines which drain from two catch basins on the north side of the Cul-de-Sac Property to a 12-inch storm drain line which passes beneath the EWEB Property and discharges to the Willamette River.

Historic maps suggest an additional stormwater drain line was formerly present beneath the Cul-de-Sac Property, running northeast-southwest and is presumed to be abandoned or removed. The current stormwater drainage for the Cul-de-Sac Property does not drain to this historic line and the historic line was not observed in the transmission line or natural gas line installation.

2.3 HISTORICAL OPERATIONS

A MGP formerly operated in the area, including on the Cul-de-Sac Property. Although the core of the MGP operations were conducted on the EWEB Property, portions of the operations extended into the Cul-de-Sac Property. At the time the MGP was in operation, the Cul-de-Sac Property and the EWEB Property were one parcel of land. For details on the MGP history, see the EWEB Property Staff Report. Demolition, utility trenching, road construction, and other activities which occurred over the years following MGP operations may have exacerbated

contaminant conditions at the Cul-de-Sac Property.

The contaminants encountered at the EWEB Property or the Cul-de-Sac Property as a result of historical operation of the MGP consist of hydrocarbons containing volatile and semivolatile organic compounds, and metals, including:

- Arsenic
- Cyanide
- Total Mercury
- 2-Methylnaphthalene
- Acenaphthylene
- Benz[a]anthracene
- Benzo[a]pyrene
- Benzo[b]fluoranthene
- Benzo[g,h,i]perylene
- Benzo[k]fluoranthene
- Chrysene
- Indeno[1,2,3-cd]pyrene
- Naphthalene
- Phenanthrene
- Benzene

3. RESULTS OF INVESTIGATION(S)

3.1 NATURE AND EXTENT OF CONTAMINATION

Investigations of soil, groundwater, and surface water potentially affected by the MGP began around 1995. The nature and extent of soil and groundwater impacts are reported in the following documents:

PTI Environmental Services. Initial Site Investigation Report, Former Manufactured Gas Plant Site, Eugene, Oregon. February 1996.

Exponent. Results from Focused Groundwater Investigation, Eugene Former MGP Site. August 12, 1998.

Exponent. Phase I Remedial Investigation Report, Former Manufactured Gas Plant Site. December 2000.

Axelrod LLC 2011. Technical Memorandum, Field Activity Summary – Focused Soil/Fill Management Plan, Eugene Former MGP Site. Axelrod, April 3, 2011.

AECOM. Memorandum on Subsurface Conditions at Intersection of Hilyard Street and East 8th Avenue. September 30, 2011.

PERCo. Letter to Geoffrey Brown, Department of Environmental Quality. Cul-de-Sac Property at Hilyard Street and 8th Avenue. October 27, 2011.

The investigations detailed in these reports reveal that soil and groundwater beneath the Cul-de-Sac Property are contaminated by MGP residue and MGP-related chemicals. The estimated area of soil and/or groundwater contamination at both the EWEB Property and Cul-de-Sac Property is shown by red dashed line on Figure 3 as the DEQ Revised Locality of Facility for Contamination in accordance with OAR 340-122-0115(35). The entire Cul-de-Sac Property is within the DEQ Revised Locality of Facility for Contamination.

3.1.1 Groundwater

Shallow groundwater occurs within the alluvium and above the bedrock and is 5 to 9 feet thick. Groundwater is encountered approximately 20 to 25 feet bgs, increasing in depth towards the Willamette River. Investigations conducted on the EWEB Property indicate that the bedrock retards vertical groundwater movement. Groundwater flow direction is to the north-northeast from the Cul-de-Sac Property to the Willamette River. The beneficial use of groundwater is recharge to the Willamette River. No current or future potable use of the shallow aquifer is likely.

Groundwater quality adjacent to the Cul-de-Sac Property provides additional information on conditions in the Cul-de-Sac Property. The Cul-de-Sac Property is located hydraulically upgradient to cross-gradient of the monitoring wells at the EWEB Property. Monitoring well MW-1 is immediately downgradient of the southeastern corner of the Cul-de-Sac Property and immediately upgradient of most former MGP structures. MW-2 is immediately west of, and cross-gradient to the Cul-de-Sac Property and upgradient of most former MGP structures. Monitoring wells MW-3, MW-4 and MW-5 are not located in the immediate vicinity of the Cul-de-Sac Property, but are on the northern portion of the EWEB Property, closer to the Willamette River and downgradient from the central area of the EWEB Property where the majority of the former MGP operations were conducted. These monitoring wells were sampled three times in 1998, twice in 1999 and once in 2000 (Exponent 1998a, b).

Groundwater samples have been analyzed for PAHs (EPA method 8270M with SIM), BTEX (EPA Method 8020A) and for total and dissolved metals (EPA Methods 6010/6020/7000). In monitoring wells MW-1 and MW-2, BTEX constituents were not detected during the monitoring period (1998-2000). Low concentrations of PAHs were intermittently detected in MW-1 and MW-2. Concentrations of constituents found in upgradient wells MW-1 and MW-2 are significantly lower than the concentrations found in wells downgradient of the former MGP operational area (MW-4 and MW-5). The substantially lower concentrations in MW-1 and MW-2 suggest that any contaminant source upgradient of MW-1 and MW-2 is much less significant than source material present downgradient of MW-1 and MW-2 and upgradient of MW-4 and MW-5.

Additional information on groundwater flow and potential impacts is located in the EWEB Property Staff Report and the investigation documents listed above.

3.1.2 Surface Water

There are no surface water features on the Cul-de-Sac Property. Groundwater at the Cul-de-Sac Property flows north through the EWEB Property and eventually discharges to the Willamette River. See the EWEB Property Staff Report for a discussion of potential impacts of

contamination in groundwater to the Willamette River.

3.1.3 Soil

EWEB has periodically collected information regarding subsurface conditions at and near the Cul-de-Sac Property since 1994. Direct data and observations are available regarding the condition of near surface soils in the Cul-de-Sac Property. The condition of shallow and deep subsurface soil and groundwater on the Cul-de-Sac Property can also be inferred based on observations and analytical data collected adjacent to the Cul-de-Sac Property, on the EWEB Property and the railroad property to the south. Additional information regarding soil conditions at the Cul-de-Sac Property can be found in the letter PERCo sent to DEQ dated October 27, 2011, and the AECOM memorandum dated September 30, 2011.

November 1994 Trenching Event: EWEB observed soil conditions at the Cul-de-Sac Property in a trench excavated for a natural gas line extending to the EWEB steam plant. The location of the trench is shown on Figure 4. The field observations were documented in a facsimile (AECOM 2011). Based on the notes, the trench extended to approximately 5 to 6 feet bgs in the Cul-de-Sac Property, penetrating the surface asphalt. In the northern portion of the Cul-de-Sac Property, visibly clean fill was observed in the upper foot of the trench and stained fill was observed below the clean fill to the total depth of the trench. In the southern portion of the Cul-de-Sac Property, no staining was observed in any of the fill. The approximate location of soil without observed staining is shown on Figure 4.

Fall 2010 Trenching Event: Axelrod LLC, on behalf of EWEB, observed soil conditions in a transmission line trench that extended across the southern portion of the Cul-de-Sac Property to a depth of 5 to 6 feet bgs (Figure 4). The field observations were documented in a Technical Memorandum (Axelrod 2011) and through EWEB internal communications. The trench work exposed soil/fill containing debris (e.g., brick, glass, metal fragments) and exhibiting varying degrees of discoloration/staining and light to strong odors. Sheen testing of the soil/fill was observed to range from no sheen to a light or moderate sheen. The following observations were also reported by Axelrod:

- The field evidence was generally consistent with staining observations gathered during the natural gas trench work performed in 1994.
- The trench was excavated approximately 15 feet south of the small relief holder foundation. The soil type around the small relief holder is similar to that encountered around the large gas holder on the EWEB Property (e.g., loose gravels with minimal to no fines).
- Strong odors were noted at a pothole location in the southeast corner of the Cul-de-Sac Property.

- Soil impacts (odor, staining, sheen) were less in the Cul-de-Sac Property than in the portion of the EWEB Property north of the Cul-de-Sac Property. Soil impacts were also less significant on the portion of the EWEB property immediately west of the Cul-de-Sac Property than observed in the Cul-de-Sac Property or the portion of the EWEB property north of the Cul-de-Sac Property.

All contaminants detected in soil and shallow groundwater during the fall 2010 trenching event are consistent with former MGP operations, with organic compounds (i.e., PAHs) being the key contaminants of interest. Metals concentrations in soil are generally low.

The soil samples collected during the fall 2010 trenching event are presented in Table 1. The estimated area of soil and/or groundwater contamination at both the EWEB Property and Cul-de-Sac Property is shown by red dashed line on Figure 3 as the DEQ Revised Locality of Facility for Contamination in accordance with OAR 340-122-0115(35). The entire Cul-de-Sac Property is within the DEQ Revised Locality of Facility for Contamination.

Southern Extent of MGP Contamination: The southern extent of MGP contamination at the Cul-de-Sac Property is estimated based on observations in shallow utility trenches, nearby soil borings on the EWEB Property, downgradient groundwater quality, and historic MGP operational locations. The contaminated area likely includes the small relief holder where MGP residuals are expected to be present (these residuals will be removed as part of the planned remedial action for the EWEB Property), the projected area of heavy staining depicted on Figure 4, and a small portion of the Cul-de-Sac Property to the south of the projected area of heavy staining where a lesser degree of contamination may exist based on the presence of odor and debris. The southern extent of contamination has not been defined by detailed sampling but decreases to the south. While some uncertainty exists regarding the extent of contamination, the existing information is sufficient to allow selection and implementation of a protective remedial action for the Cul-de-Sac Property as discussed in Sections 5 through 7.

3.1.4 Other Media

A small relief holder associated with former MGP operations was located along the northeast border of the Cul-de-Sac Property. The foundation of the small relief holder still exists below the surface on both the EWEB Property and Cul-de-Sac Property as shown on Figure 2.

The remnants of the small relief holder structure consist, for the most part, of contaminated fill and concrete foundations in the subsurface. The small relief holder has a thin (approximately 0.5- to 1-ft thick) layer of high-concentration MGP residuals in fill deposits present within a concrete ring-wall foundation. The residuals/wastes contain high levels of benzene (100,000-180,000 ppb) and several PAHs. While this structure may be currently stable, the failure (as a result of a future catastrophic event such as an earthquake or general degradation over time) of

any structures containing mobile residuals/waste or liquid could result in the introduction of concentrated waste into the subsurface at the Cul-de-Sac Property.

3.2 RISK ASSESSMENT

A risk assessment was performed as part of the RI for the EWEB Property to evaluate the potential risks to human health and the environment, and the need for remedial action on the EWEB Property. The portions of that risk assessment associated with soil and groundwater contamination apply to the Cul-de-Sac Property. The risk assessment included a human health risk screening, an exposure assessment, a toxicity assessment, a human health risk characterization, and an ecological assessment. The results of the risk assessment for human health and potential ecological receptors are discussed in the EWEB Property Staff Report and are summarized below. More details are available in:

Exponent. Level I (Scoping) Ecological Risk Assessment. November 1999.

Exponent. Human Health Risk Evaluation, Former Manufactured Gas Plant. August 2002.

Exponent. Technical Memorandum – Supplemental Discussion of Cumulative and Inhalation Risks, Former MGP Site February 10, 2003.

Exponent. Letter to Geoffrey Brown, Department of Environmental Quality. Response to DEQ Comments on August 2003 Draft Focused Feasibility Study. March 18, 2004.

Swanson and Windward. Focused Feasibility Study, Former Manufactured Gas Plant Site. April 2006.

Windward and Axelrod. Level II (Screening) Ecological Risk Assessment. October 2009.

3.2.1 Human Health Risk

Figure 5 is the conceptual site model for contaminant transport and exposures at the Cul-de-Sac Property. The current and planned use for the Cul-de-Sac Property is a transportation and pedestrian corridor. The primary current uses for the Cul-de-Sac Property include construction worker access to the EWEB Property and bicyclist/pedestrian (Site Visitor) access to a paved path along the river. Future use is expected to be consistent with current use. Future excavation workers could remove the cover of pavement and gravel to perform subsurface work (e.g., utility installation or repair).

The cover on the Cul-de-Sac Property (mostly asphalt and a small section of gravel) prevents exposure to contaminated soils. If the cover were removed or sufficiently degraded, contact with

contaminants in surface and subsurface soil could occur, resulting in incidental ingestion and dermal absorption.

High-Concentration Residuals/Waste Materials

Contaminants in residuals/waste at the small relief holder foundation exceed DEQ's acceptable risk levels for the direct contact and volatilization to indoor air pathway for industrial workers. They also exceed DEQ's acceptable risk levels for the direct contact exposure pathway for excavation and construction workers. The contaminants of concern in the residuals/waste materials are PAHs and benzene.

Soil

Contaminants in soil exceed DEQ's acceptable risk levels for the direct contact and volatilization to indoor air pathway for industrial workers. They also exceed DEQ's acceptable risk levels for the direct contact exposure pathway for excavation and construction workers. The contaminants of concern in soil are PAHs and benzene.

Excess lifetime cancer risks (ELCR)s associated with direct contact with soil containing benzene and carcinogenic PAHs were estimated for sample SL6, located in the southern portion of the Cul-de-Sac Property, and BH-14, the closest sample on the EWEB Property northeast of the Cul-de-Sac Property. The total ELCR for a future excavation worker scenario are estimated to be $2x10^{-7}$ and less than $2x10^{-5}$ for SL6 and BH-14, respectively. The total estimated ELCRs for a construction worker scenario are $6x10^{-6}$ and less than $5x10^{-4}$, respectively. The estimated risks for BH-14 are reported as "less than" because the results for several PAH analytes are reported as less than, presumably due to analytical interference. The total ELCRs for SL6 are less than those on EWEB Property and less than DEQ's (2010) upper limit of $1x10^{-5}$. These risk estimates are based on scenarios using DEQ's default assumptions for exposure frequency and duration and assume that excavation and construction workers take no precautions to reduce exposure, including personal hygiene and safety protocols such as hand washing and protective clothing typical of such work environments.

Groundwater

Based on evaluations and conclusions of the beneficial use survey, remedial investigation, and exposure pathway analysis, contaminants dissolved in groundwater do not present an unacceptable risk for industrial workers, excavation workers, or recreational users.

3.2.2 Ecological Risk Assessment

There is no ecological habitat on the Cul-de-Sac property, and therefore no ecological risk.

3.2.3 Uncertainty

Although there is limited data for soil and no data for groundwater in the Cul-de-Sac Property, reasonable inferences can be made regarding the extent of contamination at the Cul-de-Sac Property based on surface and subsurface conditions in adjacent areas. The Locality of the Facility is assumed to include the whole Cul-de-Sac Property as shown on Figure 3. Data gaps for the Cul-de-Sac Property have no impact on the choice of remedy, which will prevent exposure to workers and site visitors.

3.3 HOT SPOT DETERMINATION

Oregon cleanup rules require the identification of "hot spots" of contamination. The rules also require that the remedial action treat or remove hot spots to the extent feasible. For soil, hot spots are defined as areas with contaminants that pose a human health risk greater than 1×10^{-4}, or a non-cancer hazard quotient greater than 10. For water, hot spots are defined by having contaminants that would have a significant adverse effect on the beneficial use of the water (e.g., exceed safe drinking water standards in a domestic water well), and for which treatment would be likely to restore the beneficial use within a reasonable time.

3.3.1 Groundwater

Since contaminants at the Cul-de-Sac Property do not pose a significant adverse effect on beneficial uses of the groundwater or surface water, the contaminant plume in shallow groundwater at the Cul-de-Sac Property does not meet the definition of a hot spot.

3.3.2 Contaminated Soil

Selected PAHs in the one soil sample collected from within the Cul-de-Sac Property exceeded DEQ generic hot spot values (benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[k]fluoranthene, and dibenzo[a,h]anthracene; DEQ 1998, updated May 31, 2005). Arsenic also exceeded DEQ generic hot spot values. Concentrations for most compounds were within the same order of magnitude as the generic hot spot values.

Current exposure to these soils is limited by the existing asphalt cap and gravel base-course covering the Cul-de-Sac Property. These subsurface soils do not currently meet the definition of a hot spot as they are not mobile and currently pose no risk to site users or ecological receptors. The contaminants contained in these soils could be of concern if they were highly disturbed and exposed in an uncontrolled manner at the surface. Soils with concentrations that have the potential to be classified as hot spot soil also exist on the adjacent EWEB Property and are also not considered a hot spot under current conditions.

3.3.3 Small Relief Holder

The residuals within the small relief holder foundation contain generic hot spot levels of benzene by the volatilization to indoor air pathway and PAHs by the direct contact pathway.

The residuals in the small relief holder appear stable currently due to the form of the waste, and the containment provided by the remaining foundation structure. However, if any structures containing mobile waste were to fail in the future, the resulting subsurface release of high concentration MGP wastes could change subsurface conditions at the Cul-de-Sac Property. The material contained in the small relief holder meets Oregon's definition of a hot spot.

4. DESCRIPTION OF REMEDIAL ACTION OPTIONS

4.1 REMEDIAL ACTION OBJECTIVES

Acceptable risk levels, as defined in OAR 340-122-115(1) through (6), and remedial action objectives were developed for the EWEB Property based on the identified land and water uses, exposure pathways and the risk assessment. These same acceptable risk levels apply to the similar conditions at the Cul-de-Sac Property.

4.1.1 Numerical Remedial Action Objectives

The remedial actions for soil will be guided by generic numerical remedial action objectives (NRAOs) based on risk-based screening levels rather than site-specific cleanup levels. Remedial actions based on these NRAOs are protective for the potential exposure pathways listed. Should alternative or contingent remedial actions be considered in the future, site-specific cleanup levels may be developed in cooperation with DEQ and applied in lieu of the NRAOs.

The following numerical remedial action objectives were developed to protect industrial site workers and excavation workers. Remedial action objectives for carcinogenic chemicals are based on a $1x10^{-6}$ cancer risk, while non-carcinogenic chemicals are based on a Hazard Index (HI) of 1. Soils that contain chemicals in excess of remedial action objectives will require action to prevent unacceptable human exposure.

NUMERICAL SOIL REMEDIAL ACTION OBJECTIVES
Eugene Former Manufactured Gas Plant Site

HAZARDOUS SUBSTANCE	INDUSTRIAL CONCENTRATION	DEQ EXCAVATION WORKER CONCENTRATION	BASIS AND PRIMARY EXPOSURE PATHWAY
Cyanide	610	5,100	HI=1 Direct contact
Total Mercury	310	2,600	HI=1 Direct contact
2-Methylnaphthalene	23*	16,000*>Csat	HI=1 Direct contact

NUMERICAL SOIL REMEDIAL ACTION OBJECTIVES
Eugene Former Manufactured Gas Plant Site

HAZARDOUS SUBSTANCE	INDUSTRIAL CONCENTRATION	DEQ EXCAVATION WORKER CONCENTRATION	BASIS AND PRIMARY EXPOSURE PATHWAY
Acenaphthylene	23*	16,000*>Csat	HI=1 Direct contact
Benz[a]anthracene	2.7	590>Csat	$1x10^{-6}$ Risk, Direct Contact
Benzo[a]pyrene	0.27	59>Csat	$1x10^{-6}$ Risk, Direct Contact
Benzo[b]fluoranthene	2.7	590>Csat	$1x10^{-6}$ Risk, Direct Contact
Benzo[g,h,i]perylene	23*	16,000*>Csat	HI=1 Direct contact
Benzo[k]fluoranthene	27	5,900>Csat	$1x10^{-6}$ Risk, Direct Contact
Chrysene	270	59,000>Csat	$1x10^{-6}$ Risk, Direct Contact
Indeno[1,2,3-cd]pyrene	2.7	590>Csat	$1x10^{-6}$ Risk, Direct Contact
Naphthalene	23	16,000>Csat	HI=1 Direct contact
Phenanthrene	23*	16,000*>Csat	HI=1 Direct contact
Benzene	34	9,500>Csat	$1x10^{-6}$ Risk, Direct Contact

NOTES:
The numerical remedial action objective values for soil are risk-based concentrations (RBCs) from DEQ's 2003 RBDM, as updated 2009. Cyanide numerical remedial action objective is from USEPA's Region Screening Level (RSL) Summary Table, May 2011. Direct contact includes soil ingestion, dermal contact, and inhalation.

1) Soil units shown are in mg/kg, or ppm.
2) Cumulative excess cancer risk for all carcinogens shall not exceed $1x10^{-5}$
3) The soil numerical remedial action objective for benzene in indoor air (vapor intrusion into buildings) is 1.2 mg/kg (DEQ 2003 RBDM, as updated 2009).

* Surrogate value based on toxicity data for naphthalene.

4.1.2 Remedial Action Objectives

The following site-specific remedial action objectives (RAOs) stated in the EWEB Property Staff Report apply to the Cul-de-Sac Property:

- Prevent industrial construction and excavation worker exposure to direct contact with soils containing contaminants of concern (COCs) above the numerical soil remedial action objectives (NRAOs).
- Prevent exposure to future site visitors/workers from vapor intrusion of benzene into indoor spaces above the numerical NRAOs.
- Minimize or control infiltration of rainwater through contaminated soil to prevent possible mobilization of contaminants to the Willamette River.
- Treat (or excavate and dispose off-site) residual material hot spots (i.e., small relief holder) identified in Section 3.3 above, to the extent feasible considering the criterion in OAR 340-122-0085(7) and the balancing factors in OAR 340-122-0090(3).

4.2 REMEDIAL ACTION OPTIONS

Remedial action technologies were developed and screened in the FFS for the EWEB Property. The general response actions included no action, institutional controls, engineering controls, and soil and high-concentration residuals/waste material excavation with off-site disposal or recycling. Viable response actions and technologies that can meet the RAOs were assembled into remedial action options or alternatives. These options are discussed in the EWEB Property Staff Report and not repeated here. Each of the options apply to the conditions on the Cul-de-Sac Property, except to the extent they involve remedial action for the shoreline, which is not present on the Cul-de-Sac Property.

5. EVALUATION OF REMEDIAL ACTION OPTIONS

The criteria used to evaluate the remedial action alternatives are defined in OAR 340-122-090, and establish a two-step approach to evaluate and select a remedial action. The first step evaluates whether a remedial action is protective; if not, the alternative is unacceptable and the second step evaluation is not required. The remedial alternatives considered protective are evaluated and compared with each other using five balancing factors. The five balancing factors are 1) effectiveness in achieving protection, 2) long-term reliability, 3) implementability, 4) implementation risk, and 5) reasonableness of cost, as well as treatment (or excavation and off-site disposal) of hot spots to the extent feasible.

The EWEB Property Staff Report includes a full discussion evaluating the remedial action options.

Four of the alternatives considered for the EWEB Property are carried forward in the feasibility evaluation for the Cul-de-Sac Property. Each alternative is evaluated with respect to the five balancing factors on Table 2. The alternatives are as follows:

- Alternative 1 - No Action: No action is taken, no monitoring is performed, no engineering or institutional controls are implemented, no costs are incurred.

- Alternative 2 - Engineering and Institutional Controls: Existing pavement cap (with small gravel-capped area) is maintained; site management plan addresses maintenance and protocols to prevent worker exposure during excavation or cap repair.

- Alternative 3 – High-concentration Residuals Removal from small relief holder,[2] Engineering and Institutional Controls: Similar to Alternative 2 with removal of high-concentration residuals.

[2] Removal of high concentration residual from the small relief holder is part of the remedy for the adjacent EWEB property. It is included here because it is relevant to risk reduction at the Cul-de-Sac Property, but it would be implemented as part of the remedy for the EWEB Property.

- Alternative 4 – Deep soil removal and Institutional Controls: Contaminated soil is removed to a depth of 15 feet and institutional controls are implemented to prevent contamination from the EWEB Property from being drawn onto the Cul-de-Sac Property (e.g., groundwater extraction).

6. COMPARATIVE ANALYSIS OF REMEDIAL ACTION ALTERNATIVES

The EWEB Property Staff Report includes a comparative analysis of the remedial action alternatives using the remedy selection criteria identified in Section 5.1 of the EWEB Property Staff Report.

That analysis applies to the Cul-de-Sac Property and a simplified comparison is provided on Table 2. Alternative 1 (No Action) does not meet the protectiveness criteria. The remainder of the alternatives meet the protectiveness criteria through containment and/or removal. Alternative 3 is similar to and slightly more protective than Alternative 2 as it includes removal of high-concentration residuals present in a limited area of the Cul-de-Sac Property. The costs for the residuals removal from the small relief holder, which is located partially on the Cul-de-Sac Property and partially on the EWEB Property is included in the alternatives for the adjacent EWEB Property. Therefore, Alternative 3 provides additional protectiveness at no additional cost. Alternatives 2 and 3 have substantially less short-term risk and somewhat higher long-term risk than Alternative 4 (Removal) as the removal volume and complexity of the removal action are much greater in Alternative 4. The cost of Alternative 4 is high relative to Alternative 3 with a very limited incremental benefit.

7. RECOMMENDED REMEDIAL ACTION ALTERNATIVE

On the basis of the detailed evaluation of the alternatives in the EWEB Property Staff Report, Alternative 3 as modified is recommended for implementation at the Cul-de-Sac Property. Alternative 3 provides a balance of protectiveness, effectiveness, and reasonableness of cost, while still addressing DEQ's preference for the treatment of hot spots.

7.1 DESCRIPTION OF THE RECOMMENDED ALTERNATIVE

7.1.1 Removal of High-Concentration Residuals/Wastes

High-concentration residuals/waste will be removed at the small relief holder foundation by excavation. This material will be disposed of properly after characterization.

Removal of the material from within the small relief holder foundation may occur at the same time as implementation of other remedial action on the EWEB Property, unless coordination with the City on development of the adjoining roadway requires removing the material on a different schedule.

7.1.2 Engineering Controls

Engineering controls will consist of capping the small area of the Cul-de-Sac Property that is not already paved with a minimum of three inches of asphalt. Cap inspection and maintenance will be included in a site management plan. The City may elect to conduct additional analyses in the future to consider other cap/cover types as long as RAOs are met and any modifications to the cap/cover design are coordinated with DEQ.

7.1.3 Institutional Controls – Site Management Plan

A DEQ-approved site management plan (SMP) will be prepared for the Cul-de-Sac Property, which will cover the following general topics:

1. Excavation and construction worker health and safety. The site management plan will describe how work will be conducted at the Cul-de-Sac Property, who can complete the work, what notifications will need to occur prior to work commencing, measures for personal protective equipment and training required to work on the

Cul-de-Sac Property, and general protocols for excavating, storing, characterizing, and disposing of any excavation spoils from the Cul-de-Sac Property.

2. Cap Maintenance. The SMP will detail how and at what interval the cap will be inspected and outline any regularly scheduled cap maintenance that may be required.

3. DEQ Reporting. The SMP will include a simple annual report form to be submitted to DEQ containing records of excavation work at the Cul-de-Sac Property and cap inspection and (if necessary) maintenance.

7.1.4 Institutional Controls – Easement and Equitable Servitude

A DEQ-approved Easement and Equitable Servitude (E&ES) will be recorded in the county property records with the following general requirements:

1. The City shall notify DEQ of significant developments at the Cul-de-Sac Property such as zoning changes, intent to convey the Cul-de-Sac Property to a third party, or land use changes.

2. The City shall notify DEQ prior to any significant disturbance of the asphalt cap. This would exclude cap maintenance or minor utility work involving subsurface exploration where limited worker exposure to contaminated soil is anticipated, and less than five cubic yards of soil is disturbed.

3. No wells for beneficial water use shall be installed on the Cul-de-Sac Property, except that a dewatering well(s) may be installed with prior authorization from DEQ.

4. No buildings for human occupancy shall be constructed at the Cul-de-Sac Property (e.g., offices, shops, retail development, or residential development) unless additional site-specific analyses are conducted in the future to demonstrate that RAOs would be met and the analyses are coordinated with DEQ, and aspects of the building construction to meet RAOs are approved by DEQ.

5. The City shall implement the site management plan approved by DEQ.

7.2 RESIDUAL RISK ASSESSMENT

OAR 340-122-084(4)(c) requires a residual risk evaluation of the recommended alternative that demonstrates that the standards specified in OAR 340-122-040 will be met, namely:

- Assure protection of present and future public health, safety, and welfare, and the environment.

- Achieve acceptable risk levels.
- Prevent or minimize future releases and migration of hazardous substances in the environment.

Under the recommended remedial action alternative, site risks as presented in Section 3.2 above will meet the protectiveness as required by OAR 340-122-0040 for unacceptable site risks by applying the following measures:

- **Excavation and Construction Worker Scenario.** Risk from this scenario is mitigated through a site management plan that will be prepared to direct all future excavation activities. Implementation of the safe work practices and use of the personal protective equipment required by the site management plan will control residual risk posed by remaining contaminated soils.
- **Industrial Worker Scenario.** To address this risk, an asphalt or concrete cap will cover the entire Cul-de-Sac Property, and cap inspections and maintenance will be included in the site management plan. As part of the institutional controls on the Cul-de-Sac Property, the E&ES will contain a requirement that the City notify DEQ prior to any disturbance of the asphalt cap where worker exposure to contaminated subsurface soil is anticipated. The City may elect to conduct additional analyses in the future to consider other cap/cover types as long as RAOs are met and any modifications to the cap/cover design are coordinated with DEQ.
- **Potential Future Exposure to Vapor Intrusion to Buildings**. This scenario was assumed to be above acceptable risk levels assuming the buildings were for year-round occupancy based on limited exceedance of DEQ RBCs in deep soil. To address this risk, an institutional control will be included in the E&ES. Specifically, no buildings for continuous human occupancy will be allowed on the Cul-de-Sac Property (no offices, shops, retail development, or residential development) unless additional site-specific analyses are conducted in the future to demonstrate that RAOs would be met and the analyses are coordinated with DEQ, and aspects of the building construction to meet RAOs are approved by DEQ. No residual risk by vapor intrusion remains after implementation of the proposed remedy.

8.
PEER REVIEW SUMMARY

Technical documents produced during the investigation of the Eugene Manufactured Gas Plant (Former) Site have been reviewed by a technical team at DEQ. The team consists of the project manager/geologist and a toxicologist. The team unanimously supports the recommended remedial action.

Geoff Brown, 8/28/2014

Project Manager

Susan Turnblom

Toxicologist

Don Hanson, R.G.

Western Region Cleanup Lead Worker

9. APPENDIX A

ADMINISTRATIVE RECORD INDEX

The Administrative Record consists of the documents on which the recommended remedial action for the Cul-de-Sac Property is based. The primary documents used in evaluating remedial action alternatives for the Eugene Manufactured Gas Plant (Former) Site is below. Additional background and supporting information can be found in the project file located at DEQ Western Region Offices in Eugene, Oregon.

ADMINISTRATIVE RECORD FOR RI/FS
Cul-de-Sac Portion of
Eugene Manufactured Gas Plant (Former) Site
November 2011 (Draft)

Administrative Record

AECOM. Memorandum on Subsurface Conditions at Intersection of Hilyard Street and East 8th Avenue. September 30, 2011.

Axelrod and Windward. 2010a. Focused Soil/Fill Management Plan, Electric Transmission Line Construction Project – Eugene Former MGP Site, prepared for Eugene Water & Electric Board, August 31, 2010 (Draft).

Axelrod and Windward. 2010b. Removal Action at Gas Holder Foundation, Eugene Former MGP Site, Technical Memorandum, DEQ Review Draft, December 8, 2010.

Axelrod and Windward. 2011. Field Activity Summary - Focused Soil/Fill Management Plan, Eugene Former MGP Site, prepared for Eugene Water & Electric Board, April 2011.

Axelrod, Otak, and Windward. 2011. Focused feasibility study addendum – Eugene Former MGP Site, prepared for Eugene Water & Electric Board, by Axelrod LLC with support from Otak Inc. and Windward Environmental LLC, July 2011.

DEQ. 1996a. File Review Summary, Eugene Former Manufactured Gas Plant Site. DEQ, Western Region Cleanup Program, Eugene, OR.

DEQ. 1998a. Memorandum dated March 31, 1998, from B. Mason, DEQ, to D. Unfried, EWEB, approving field sampling plan for focused groundwater investigation with limited comments, Eugene former manufactured gas plant site. DEQ, Western Region Cleanup Program, Eugene, OR.

DEQ. 1999b. Letter dated January 27, 1999, from M. McCann, DEQ, to D. Unfried, EWEB, regarding approval of project documents (ISI Work Plan [PTI 1995], ISI Report [PTI 1996], FGI FSP [Exponent 1998], FGI Results [Exponent 1998]), Eugene manufactured gas plant site. DEQ, Western Region Cleanup Program, Eugene, OR.

DEQ. 1999c. Letter dated January 27, 1999, from M. McCann, DEQ, to D. Unfried, EWEB, regarding approval of Phase I remedial investigation work plan with direction to address limited DEQ comments in later report or in future project meeting, Former Eugene manufactured gas plant site. DEQ, Western Region Cleanup Program, Eugene, OR.

DEQ. 1999f. Letter dated December 3, 1999, from M. McCann, DEQ, to D. Lawder, EWEB, regarding approval of Level 1 ecological risk assessment, former Eugene manufactured gas plant site. DEQ, Western Region Cleanup Program, Eugene, OR.

DEQ. 2001a. Letter dated January 4, 2001, from M. McCann, DEQ, to D. Lawder, EWEB, regarding approval of final Phase I Remedial Investigation completed at former Eugene manufactured gas plant site. DEQ, Western Region Cleanup Program, Eugene, OR.

DEQ. 2001b. Letter dated January 4, 2001, from M. McCann, DEQ, to D. Lawder, EWEB, regarding approval of final Land and Beneficial Water Use Survey completed at former Eugene manufactured gas plant site. DEQ, Western Region Cleanup Program, Eugene, OR.

DEQ. 2002. Letter dated December 20, 2002 from G. Brown, DEQ, to D. Lawder, EWEB, regarding approval of Human Health Risk Evaluation and Focused Feasibility Study – Annotated Outline, Eugene former manufactured gas plant site, Eugene, Oregon. DEQ, Western Region Cleanup Program, Eugene, OR.

DEQ. 2003. Letter dated November 26, 2003 from G. Brown, DEQ, to D. Lawder, EWEB, regarding focused feasibility study, Eugene former manufactured gas plant site, Eugene, Oregon. DEQ, Western Region Cleanup Program, Eugene, OR.

DEQ. 2006. Email dated April 5, 2006, from G. Brown, DEQ, to R. Axelrod, Swanson Hydrology

& Geomorphology, regarding approval of final revisions to revised draft focused feasibility study, Eugene manufactured gas plant site. DEQ, Western Region Cleanup Program, Eugene, OR.

DEQ. 2010a. DEQ letter from Geoff Brown/DEQ to Debbie Spresser/EWEB approving the *August 9, 2010 (Draft) Focused Soil/Fill Management Plan, Electric Transmission Line Construction Project, Eugene Former MGP Site,* letter dated August 11, 2010.

DEQ. 2010b. DEQ letter from Geoff Brown/DEQ to Debbie Spresser/EWEB regarding *MGP Waste discovered during the Electric Transmission Line Construction Project – Eugene, October 1, 2010, Eugene Former MGP Site, ECSI 1723,* letter dated October 1, 2010.

DEQ. 2011. DEQ letter from Geoff Brown/DEQ to Jared Rubin/EWEB regarding approval of *Focused Feasibility Study Addendum, May 2010, Eugene Former MGP Site, ECSI 1723,* letter dated June 20, 2011.

Exponent. 1998a. Focused Groundwater Investigation Field Sampling Plan. Prepared for Eugene Water & Electric Board, Eugene, Oregon, March 18, 1998. Exponent, Lake Oswego, OR.

Exponent. 1998b. Results from focused groundwater investigation, Eugene former MGP site, August 12, 1998. Prepared for Eugene Water & Electric Board, Eugene, Oregon. Exponent, Lake Oswego, OR.

Exponent. 1998c. Phase I remedial investigation work plan, Eugene former MGP site. Prepared for Eugene Water & Electric Board, Eugene, Oregon. Exponent, Lake Oswego, OR.

Exponent. 1999a. Letter dated July 29, 1999 from R. Axelrod, Exponent to M. McCann, DEQ, regarding continued groundwater monitoring schedule – change to semiannual basis, Eugene former manufactured gas plant site, Eugene, Oregon.

Exponent. 1999b. Level I (scoping) ecological risk assessment, technical memorandum, November 1999. Prepared for Eugene Water & Electric Board, Eugene, Oregon. Exponent, Lake Oswego, OR.

Exponent. 1999c. Level I (Scoping) Ecological Risk Assessment report, prepared for Eugene Water & Electric Board by Exponent Inc., Lake Oswego, Oregon, January 1999.

Exponent. 2000a. Land and beneficial water use survey, former Eugene MGP site, December 2000. Prepared for Eugene Water & Electric Board, Eugene, Oregon. Exponent, Lake Oswego, OR.

Exponent. 2000b. Phase I remedial investigation report, former manufactured gas plant site, Eugene, Oregon, December 2000. Prepared for Eugene Water & Electric Board, Eugene, Oregon. Exponent, Lake Oswego, OR.

Exponent, 2001a. Email dated July 3, 2001, from R. Axelrod, Exponent, to M. McCann, DEQ, confirming agreement to modify field monitoring for July 2001.

Exponent. 2002a. Human health risk evaluation, former manufactured gas plant site, Eugene, OR, August 2002. Exponent, Lake Oswego, OR.

Exponent. 2002b. Letter dated October 22, 2002 from R. Axelrod, Exponent, to A. Spencer, DEQ, regarding discontinuation of site monitoring, former manufactured gas plant site, Eugene, Oregon. Exponent, Lake Oswego, OR.

Exponent. 2002c. Focused feasibility study outline, Eugene former manufactured gas plant site, Eugene, Oregon, November 6, 2002. Prepared for Eugene Water & Electric Board, Eugene, OR. Exponent, Lake Oswego, OR

Exponent. 2003. Technical memorandum: supplemental discussion of cumulative and inhalation risks, former manufactured gas plant site, February 10, 2003. Prepared for Eugene Water & Electric Board, Eugene, OR. Exponent, Lake Oswego, OR.

PERCo. Letter to Geoffrey Brown, Department of Environmental Quality. Cul-de-Sac Property at Hilyard Street and 8th Avenue. October 27, 2011
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PTI. 1995. Initial site investigation work plan, former manufactured gas plant site, Eugene, Oregon. Prepared for Eugene Water & Electric Board, Eugene, Oregon. PTI Environmental Services, Lake Oswego, OR.

PTI. 1996. Initial site investigation report, former manufactured gas plant site, Eugene, Oregon. Prepared for Eugene Water & Electric Board, Eugene, Oregon. PTI Environmental Services, Lake Oswego, OR.

Swanson and Windward. 2006. Final Focused Feasibility Study, Former Manufactured Gas Plant Site, Eugene, Oregon, April 2006. Prepared for Eugene Water & Electric Board, Eugene, OR. Swanson Hydrology & Geomorphology, Santa Cruz, CA.

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DEQ. 1998b. Guidance for ecological risk assessment. Oregon Department of Environmental Quality, Portland, OR, Final, April 1998.

DEQ. 1998c. Guidance for identification of hot spots. Oregon Department of Environmental Quality, Portland, OR, April 1998.

DEQ. 1998d. Guidance for conducting feasibility studies. Oregon Department of Environmental Quality, Portland, OR, July 1, 1998.

DEQ. 2003. Risk-based decision making for the remediation of petroleum-contaminated sites. Oregon Department of Environmental Quality, Portland, OR, September 22, 2003 (as amended through 2009).

DEQ. 2007. Guidance for assessing bioaccumulative chemicals of concern in sediment. 07-LQ-023A. Environmental Cleanup Program, Oregon Department of Environmental Quality, Portland, OR.

DEQ. 2009. Staff Report, Conditional No Further Action for Action Recommendation for Area P-A Upland Portion of the Western Parcel - University of Oregon Riverfront Research Park, University of Oregon, Eugene, OR, September 2009. Oregon Department of Environmental Quality, Western Region Office.

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Table 1. Soil Sample Analytical Results for Cul-de-Sac Former MGP Facility Samples

Sample ID (Location)	SL6 (EWEB Trans Line 14+00 City Cul-de-Sac)	SL5/SL100 (EWEB Trans Line 13+00- Avg[a])
Sample Depth (bgs)	**1-2 ft**	**2.5-4.5 ft**
Sample Media	**Soil**	**Soil**
Location	**Cul-de-Sac**	**EWEB Property**
Volatile Organic Compounds (mg/kg)		
Benzene	0.056	NA
Ethylbenzene	< 0.052	NA
Toluene	0.11	NA
Xylenes (total)	0.208	NA
Total Petroleum Hydrocarbons (mg/kg)	—	—
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)		
2-Methylnaphthalene	0.87	0.0067
Acenaphthene	0.097	< 0.00285
Acenaphthylene	1.9	0.023
Anthracene	1.4	0.003
Benz(a)anthracene	1.7	0.101
Benzo(a)pyrene	2.4	0.19
Benzo(b)fluoranthene	30	0.17
Benzo(g,h,i)perylene	30	0.1095
Benzo(k)fluoranthene	8.6	0.07
Chrysene	2.4	0.1025
Dibenz(a,h)anthracene	3.5	0.0195
Dibenzofuran	0.21	< 0.00285
Fluoranthene	37	0.12
Fluorene	0.37	< 0.00285
Indeno(1,2,3-cd)pyrene	25	0.12
Naphthalene	1.6	0.0215
Phenanthrene	8.3	0.012
Pyrene	58	0.27
Metals and Cyanide (mg/kg)		
Antimony	0.615	0.173
Arsenic	5.65	3.855
Beryllium	0.435	0.5505
Cadmium	0.28	0.082
Chromium	15.10	20.1
Copper	110	24
Lead	51.1 J	12.25 J
Mercury, Total	0.110	0.0505
Nickel	29.1	26
Selenium	0.7 J	0.7 J
Silver	0.093	0.0545
Thallium	0.068	0.0635
Zinc	100	50.6
Cyanide, Total	6.35	0.295

Notes

[a] avg = average of duplicates; where applicable the average was calculated using the full detection limit.
ft bgs = feet below ground surface; J = estimated; NA= not available; Trans = Transmission

Table 2. Evaluation of Remedial Alternatives for the Cul-de-Sac Property[1]

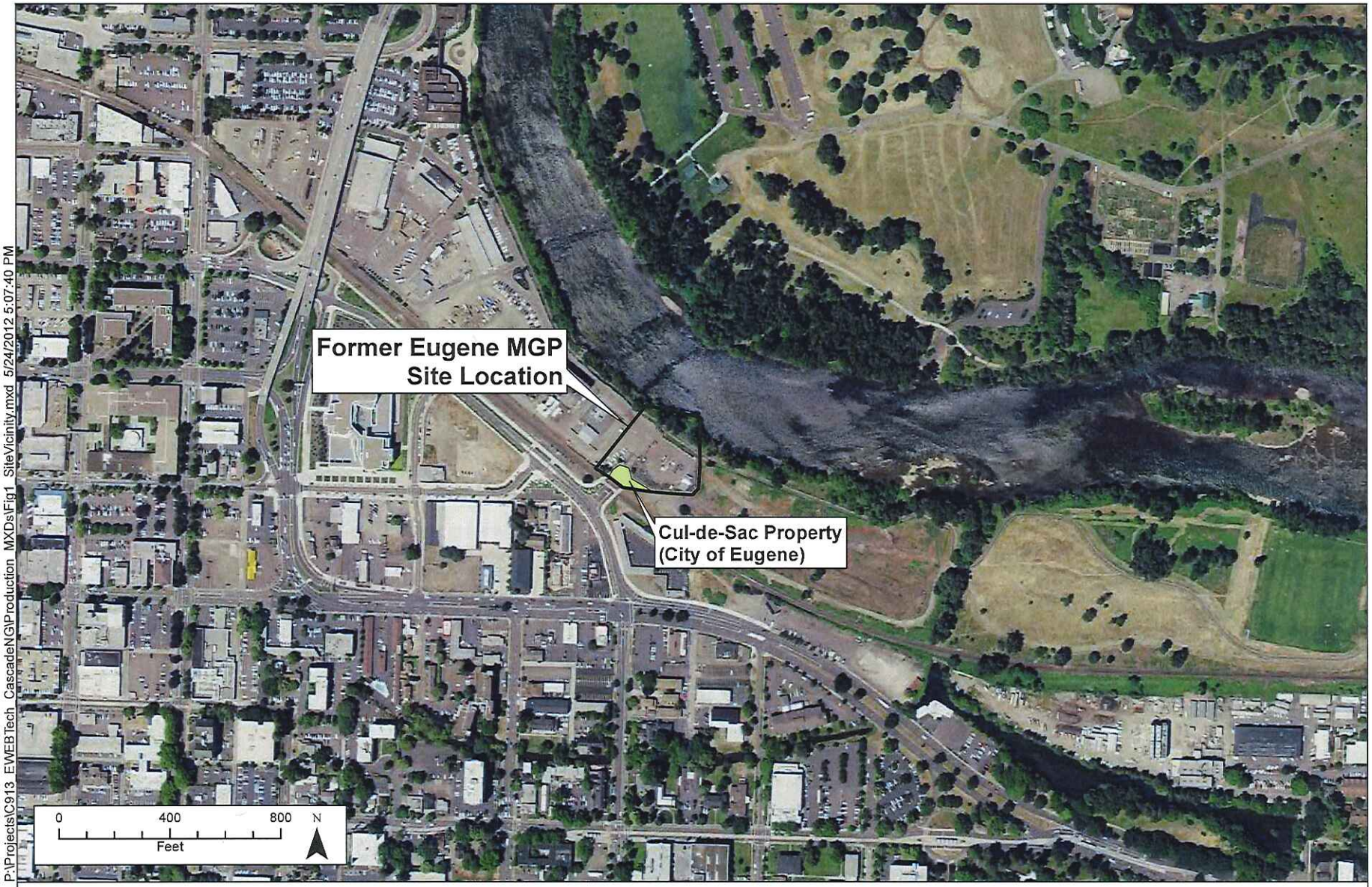
Alternative	Effectiveness in Achieving Protection	Long-Term Reliability	Implementability	Implementation Risk	Reasonableness of Cost
Alternative 1, No Action	Not effective; does not address future potential exposure pathways, remove contamination or monitor site conditions.	Not reliable; does not address future risk to excavation workers or site visitors if existing cap degrades.	Readily implemented.	None.	No associated remedial costs.
Alternative 2, Engineering and Institutional Controls	Effective; reduces risk by preventing future direct contact exposure, erosion of contaminated soil and generation of windblown dust; site management plan will address potential future exposure to workers related to utility/excavation activities.	Reliable; capping is an effective means of isolating and controlling contaminated soils; requires routine inspection and maintenance. Risks to utility/excavation worker addressed through Site Management Plan.	Implementable; technically and administratively feasible; City committed to maintaining right-of-way.	Limited Risk; Cul-de-Sac Property is currently capped. Risks include direct contact and minor dust generation during cap maintenance. These risks will be addressed through the Site Management plan.	Current and future capital and O&M costs for a 30-year project life are estimated to be $36,000.[2]
Alternative 3, Removal of High-concentration Residuals from Small Relief Holder and Engineering and Institutional Controls	Effective; reduces risk by removing high-concentration residuals,[3] preventing future direct contact exposure, erosion of contaminated soil and generation of windblown dust; site management plan will address potential future exposure to workers related to utility/excavation activities.	Reliable; similar to Alternative 2, with a slightly higher degree of reliability as high-concentration residuals in small relief holder are removed.	Implementable; similar to Alternative 2 with slightly more implementation challenges due to removal activities. However, excavation is limited in aerial extent and depth minimizing the technical challenges associated with excavation and soil handling.	Limited Risk; similar to Alternative 2 with slightly more risk associated with removal activities. Risks include potential vapor emissions, dust generation, potential spilling of contaminated materials during handling and transport and worker exposure. As the removal volume is limited to the small relief holder, the risk is considered limited.	Similar to Alternative 2, current and future capital and O&M costs for a 30-year project life are estimated to be $36,000. The costs associated with the high-concentration residuals removal are included in the remedial action for the EWEB Property.
Alternative 4, Deep Soil Removal and Institutional Controls	Very effective; this option permanently removes contaminated soils, and therefore eliminates sources that pose an unacceptable risk to future on-site workers. Institutional controls on groundwater production would prevent recontamination from adjacent property.	Very reliable; all contaminated soil is removed.	Difficult to implement; subsurface excavation needs to take into account existing utilities (main transmission line, natural gas line), stabilization of adjacent facilities (railroad right-of-way, substation), prevention of recontamination of clean backfill from contaminated media on neighboring properties, prevention of migration of vapors from contaminated media on neighboring properties, and limited space for soil/debris staging.	Moderate Risk; risks of implementation include potential vapor emissions, dust generation during excavation and potential spilling of contaminated materials during handling and transport. Direct loading of excavated materials would be required. Cleanup worker exposure to impacted soils would need to be controlled using personal protective equipment and properly trained personnel.	Current and future costs for the removal (excluding future relief holder) is estimated to be $1,400,000.[4]

[1] Remedial action technologies were developed in the FFS for the EWEB Property and are discussed in the EWEB Property Staff Report. Each of the options for the EWEB Property applies to the conditions on the Cul-de-Sac Property, except to the extent they involve remedial action for the shoreline, which is not present on the Cul-de-Sac Property.

[2] Cul-de-Sac Property area is 8% of adjacent EWEB property area. Current and future capital O&M costs for the Cul-de-Sac Property are estimated at 8% of the upland capping costs for the EWEB Property (excluding the bank stabilization action).

[3] Removal of high concentration residual from the small relief holder is part of the remedy for the adjacent EWEB property. It is included here because it is relevant to risk reduction at the Cul-de-Sac Property, but it would be implemented as part of the remedy for the EWEB Property.

[4] Current and future capital O&M costs for the Cul-de-Sac Property plus additional cost ($400,000) for stabilization/sheet pile of sidewalls (railroad right-of-way and adjacent contaminated EWEB property).



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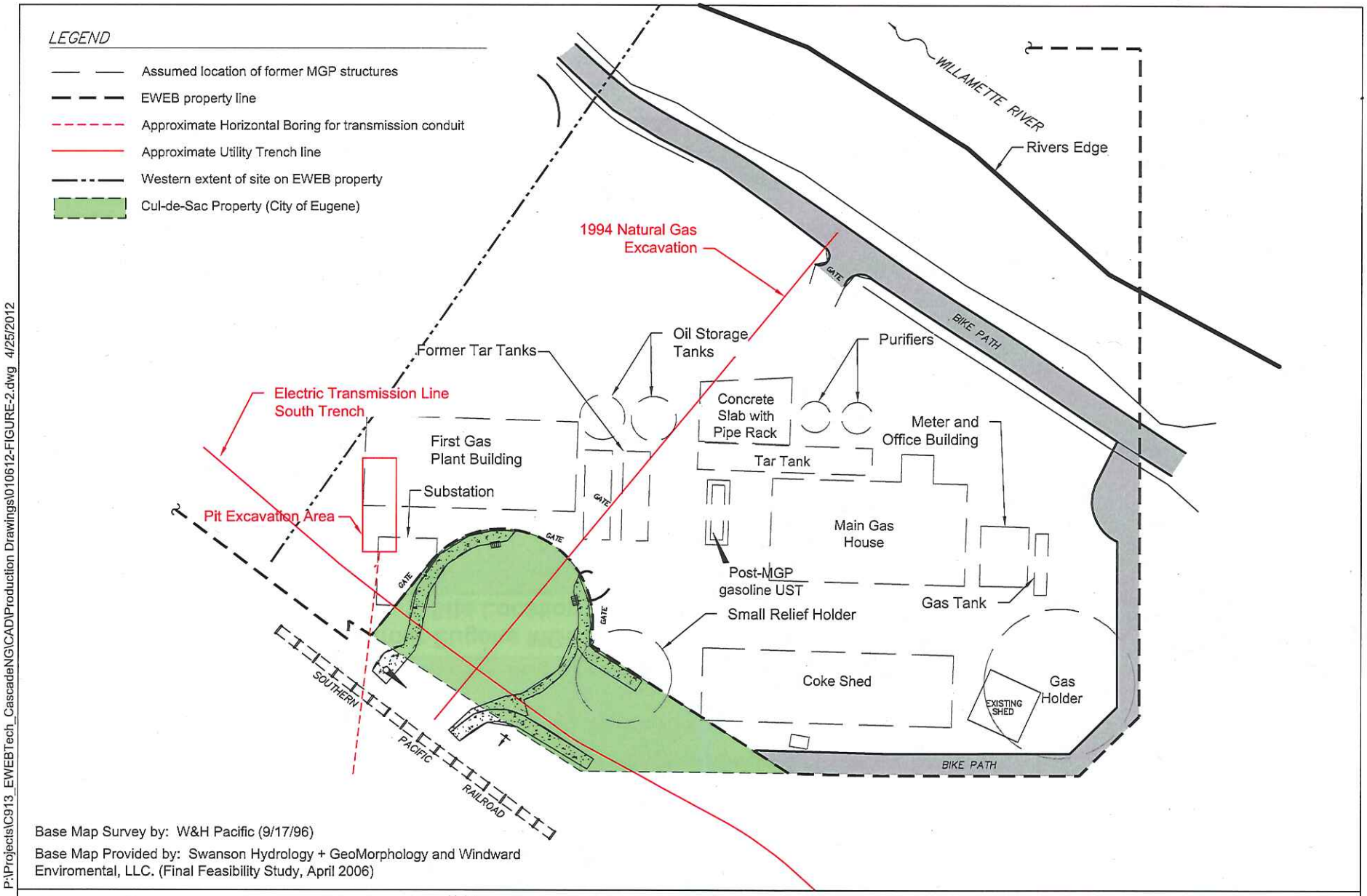
integral consulting inc.

Aerial Source: ESRI, AEX (2009)

Figure 1.
Site Location Map
Eugene Manufactured Gas Plant (Former) Site



Base Map Survey by: W&H Pacific (9/17/96)

Base Map Provided by: Swanson Hydrology + GeoMorphology and Windward Enviromental, LLC. (Final Feasibility Study, April 2006)

integral consulting inc.

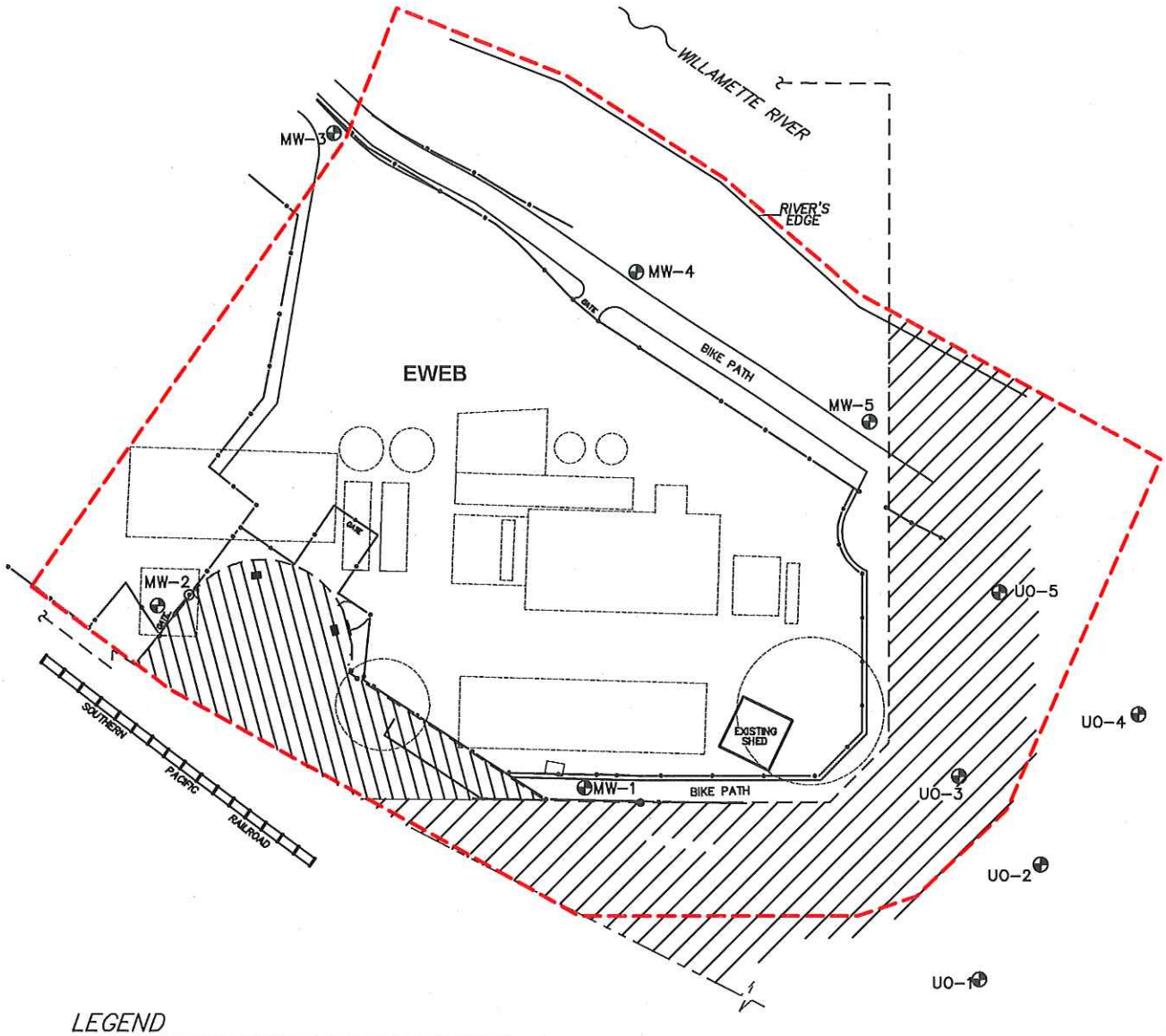
0 30 60 Feet

N

Note:
-Electric transmission line south trench, horizontal boring, and pit excavation locations estimated based on planned location and field measurements reported by Axelrod LLC
-Figure adapted from AECOMM, October 2011

Figure 2
Former MGP Layout
Eugene Manufactured Gas Plant (Former) Site

P:\Projects\C913_EWEBTech_CascadeNG\CAD\Production Drawings\010612-FIGURE-2.dwg 4/25/2012



LEGEND

- Monitoring well
- EWEB property line
- Approximate location of revised locality of facility (LOF)
- Fence line
- Railroad
- University of Oregon Property
- Cul-de-Sac Property

0 75 feet

NOTE: Property boundary between City of Eugene and University of Oregon approximately located.

Source: W&H Pacific. Figure base by Exponent, Inc.

integral consulting inc.

Figure 3.
DEQ Revised Locality of Facility for Contamination
(Base Drawing is Figure 6 from the FFS)

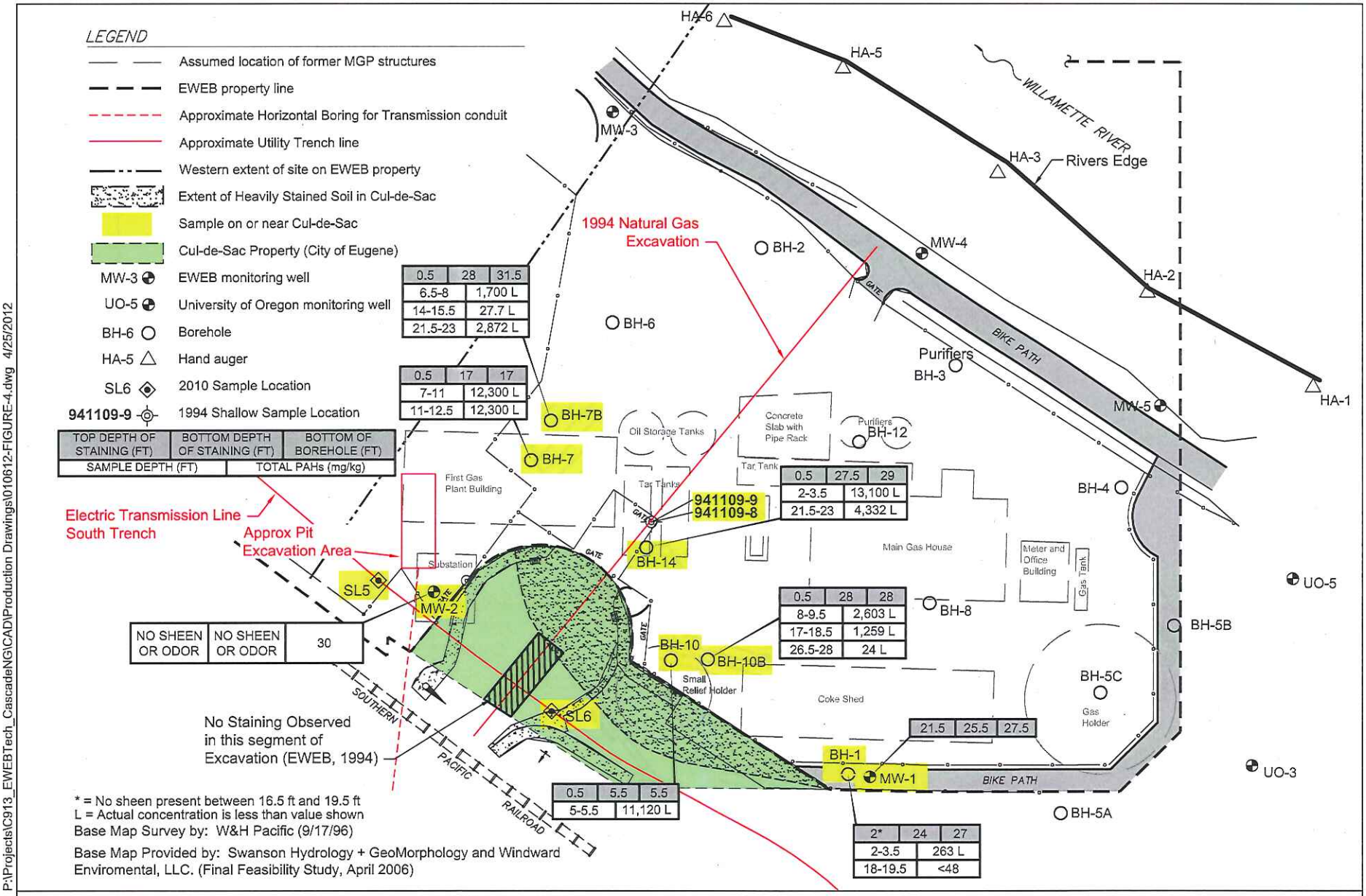


Figure 4
Sample Location Map
Eugene Manufactured Gas Plant (Former) Site

P:\Projects\C913_EWEBTech_CascadeNG\CAD\Production Drawings\010612-FIGURE-4.dwg 4/25/2012

LEGAL DESCRIPTION FOR CUL-DE-SAC PROPERTY

Beginning at the iron rod set in concrete monument at the intersection of the centerlines of Hilyard Street and 9th Avenue East, Eugene, Oregon; thence East 148.53 feet to a point; thence North 367.33 feet to a point marked by a railroad spike; thence North 0° 02' West, 59.54 feet to a point marked by an iron pin and the True Point of Beginning; thence North 89° 58' East, 86.03 feet to an iron pin; thence North 44° 58' East, 38.0 feet to a point marked by an iron pin; thence North 0° 02' West, 135.76 feet to a point marked by an iron pin on the left bank of the Willamette River; thence along the left bank of the Willamette River North 65° 52' 45" West, 52.09 feet to a point on said left bank marked by an iron pin; thence South 85° 33' West 54.91 feet; thence North 41° 50' West, 115.74 feet; thence South 38° 49' West, 261.02 feet to a point; thence South 57° 03' East, 95.03 feet to an iron pin; thence South 53° 34' East, 15.20 feet to an iron pin; thence North 89° 58' East, 61.88 feet to an iron pin; thence South 88° 34' 14" East, 76.47 feet to the True Point of Beginning, in Lane County, Oregon.

State of Oregon
Department of
Environmental
Quality

MANAGEMENT APPROVAL FORM REPORT/DOCUMENT TYPE:

(Preliminary Approval)
STAFF REPORT
RECOMMENDED REMEDIAL ACTION
EUGENE MANUFACTURED GAS PLANT (FORMER)
EWEB-OWNED PORTION

Project Name: 1723
Eugene Former Manufactured Gas Plant

Date: _08/29/2014_

Proposed Remedial Action: __X____
Certification of Completion _____
Other: [Describe]_____

Please review the attached staff recommendation regarding an environmental cleanup activity. ORS 465.320 requires public notification of, and a 30 day comment period for, this recommendation. It is important to receive your concurrence/comments as soon as possible to meet publication deadlines. Please sign below as approval.

PRELIMINARY APPROVAL: (INDICATES CLEARANCE FOR PUBLIC NOTICE AND COMMENT.)

Michael E. Kucinski,
Western Region Cleanup Manager

9/3/14
Date

Return completed form to Seth Sadofsky, Project Manager
Western Region Environmental Cleanup

Copy: Project Administrative Record File

State of Oregon
Department of
Environmental
Quality

PEER REVIEW COMMENTS & APPROVAL FORM

STAFF REPORT
RECOMMENDED REMEDIAL ACTION
For
EUGENE MANUFACTURED GAS PLANT (FORMER)
EWEB-OWNED PORTION
ECSI 1723

(Attached)

Date: 08/28/14 Action: Staff Report

Please review and comment on the attached document. It is the Staff Report,. Please provide comments as soon as possible or sign below as approval.

Route to the following technical team members:

Geoff Brown	Signature for Geoff Brown	9/3/14 Date
Susan Turnblom	Signature	8/28/2014 Date
Don Hanson, R.G.	Signature	8/29/14 Date
Seth Sadofsky	Signature	8/28/2014 Date

Return completed form to: Seth Sadofsky, Project Manager
Western Region Cleanup Program

Copy: Administrative Record file 1723

STAFF REPORT

RECOMMENDED REMEDIAL ACTION

For

EUGENE MANUFACTURED GAS PLANT (FORMER)
EWEB-OWNED PORTION

EUGENE, OREGON

ECSI 1723

Approved By

OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY
Western Region Office

August 2014

TABLE OF CONTENTS

EXECUTIVE SUMMARY

This document presents the recommended remedial plan for a part of the former Eugene Manufactured Gas Plant (MGP) located on property owned by the Eugene Water & Electric Board (EWEB) at the 700 block of East 8th Avenue along the Willamette River, in Eugene, Oregon.

In the 19th and early 20th centuries, MGPs produced gasses (similar to natural gas) by heating coal, oil, or other fuels in the absence of oxygen, producing flammable gasses that were used for lighting, cooking, heating, fueling industrial processes, etc. These MGP processes and operations often resulted in environmental contamination sometimes referred to as MGP residue, a thick tar-like substance. The Eugene Former MGP operated from 1907 to 1950. During operation of the facility, MGP residue contaminated the soil and groundwater. In 1976 EWEB purchased the property where the main portion of the MGP operated and later investigated the contamination under an Intergovernmental Agreement with the DEQ.

Soil

Contaminated soil is common beneath the core area of the site, and occurs offsite to the south beneath the City of Eugene cul-de-sac and to the north beneath the bike path and to the edge of the river. In the core area of the site the contamination extends from near ground level to bedrock, which is at a depth of about 27 feet below ground surface. Soil contamination in the core area extends beneath the water table where groundwater transported site contaminants toward the river. Soil contamination occurs also on the University of Oregon Riverfront Research Park property a short distance to the east and south east of the site. Soil contamination mostly consists of chemicals called Polynuclear Aromatic Hydrocarbons (PAH)s, which are semi-volatile organic compounds, and Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX), which are volatile organic compounds, some of which can vaporize and migrate to the surface.

Groundwater

Groundwater contamination is present below much of the site and extends to the river. Groundwater contamination consists of PAHs and BTEX and occurs within a thin (5-9 feet thick) layer above the bedrock. There is no current or likely future use of groundwater at the site except for discharge to surface water (Willamette River). While the site investigation indicates that contaminated groundwater discharges into the Willamette River, it also indicated that the site-related compounds have no adverse effects on aquatic receptors or future uses of the Willamette River.

NAPL

MGP residue is present beneath the surface of much of the site. In places, the residue is a Non-Aqueous Phase Liquid (NAPL), which means that it is a separate-phase liquid, which, like oil, does not dissolve in water. NAPL is principally found beneath the core area of the site in the pore spaces in the soil (as residual NAPL), both above the water table and below it. The NAPL is a combination of compounds including BTEX, PAHs, and other chemicals. Overall, the NAPL is slightly heavier than water. However, some of the chemicals separate from the NAPL in the presence of water and float on the surface of the groundwater table to form a sheen or film. The NAPL extends from the core area of the site to the Willamette River in saturated soils beneath the water table.

The NAPL can share soil pore spaces with water in discontinuous blebs. It is viscous and does not flow easily. Many years ago, when the NAPL was released, the NAPL spread in different ways including flowing down to the groundwater from its point of release and then flowing with groundwater to the Willamette River. However over the years, the more soluble compounds in the NAPL dissolved in groundwater; and in its current form the NAPL is non-mobile. It occurs as a residue coating pore spaces, but not flowing toward the river, although it does act as a source for groundwater contamination beneath the site.

Some NAPL is present in limited areas near or in buried foundations or former MGP structures at the site. EWEB removed about 1,500 gallons of NAPL and water from the former underground tar tank in 1999.

Surface Water

Water samples from the Willamette River show that some chemicals from the site are present in the river at low concentrations that do not present a risk concern for fish or other aquatic species. In addition a worst-case-scenario model for groundwater discharging to the Willamette River predicted no significant effect on aquatic receptors in the river.

Sediments

The site has slightly less than 300 feet of river frontage. The river bed is dominated by cobble gravel. Fine-grained sediments in two small areas along the site contained contaminants in excess of ecological screening levels. An investigation (Level II Ecological Risk Assessment) was completed to further evaluate the risk associated with these contaminants. The analysis showed that the risk from contaminants in the sediment was not significant.

Risk

Oregon cleanup rules are based on risk. If contaminants pose unacceptable risk to people or the environment, a cleanup action is required. DEQ identified the following unacceptable risks at

the site, based on current Site conditions, chemical concentrations in soil and high-concentration MGP residues:

- Vapor intrusion from soil or high-concentration MGP residue into indoor air in an occupational setting.
- Exposure to contaminated soil by site workers or excavation workers.

No unacceptable ecological risk was identified at the site. Nor was any unacceptable risk to site visitors or recreational users identified.

Remedial Action Objectives

Based on the unacceptable risks identified above, Oregon's cleanup rules require a cleanup or remedial action to reduce the risk. The objectives of the remedial action include the following:

- Prevent industrial and excavation worker exposure to contaminated soils.
- Prevent exposure to future site occupants/workers from vapor intrusion of benzene into indoor spaces.
- Ensure continued shoreline stability to prevent erosion of contaminated subsurface soil, the unintentional dispersal of soil contaminants to the Willamette River, and public and worker exposure to soil contaminants.
- Control infiltration of rainwater through contaminated soil in upland Site area to minimize the potential for mobilization of contaminants to the Willamette River.
- Treat or remove high-concentration waste to the extent feasible.

Remedial Alternatives

The following remedial action alternatives were evaluated to meet the remedial action objectives:

No Action

No action is not protective and was eliminated from consideration as a remedial alternative for the site.

Engineering and Institutional controls

Engineering and institutional controls include maintaining an asphalt or equivalent cap over the site, shoreline and riverbank stabilization measures to prevent erosion, and applying a deed restriction requiring regular cap maintenance and inspection as well as maintenance of shoreline stabilization measures, restricting residential use of the site, and restricting construction of buildings for continuous human occupancy. Institutional controls would also include preparing a site management plan to ensure safe work practices in the contaminated zone, proper management of contaminated

soil and groundwater, and documenting shoreline stabilization and inspection requirements.

Engineering and Institutional Controls with Targeted Soil/Waste Removal
This remedial alternative includes the engineering and institutional controls outlined above and removal of the highest concentration wastes from in and around some buried structures at the site.

Engineering and Institutional Controls with Deep Soil Removal and Shoreline Bulkhead Construction
This remedy includes the engineering and institutional controls outlined above and removal of soil in the core area to a depth of about 15 feet below ground surface. In addition a massive shoreline bulkhead would be constructed to protect against erosion and potential exposure of contaminated subsurface soil beneath the shoreline area.

After evaluating each alternative for effectiveness, long term reliability, implementability, implementation risk, and cost, DEQ proposes ***Engineering and Institutional Controls with Targeted Soil/Waste Removal*** as the remedy for the site.

DEQ will announce the proposed remedy in the local Eugene Register Guard, on its Public Notices website, and in the Oregon Secretary of State's Bulletin, and will hold a 30-day public comment period. After considering all public comments, DEQ may finalize the proposed remedy in a record of decision for the site.

1. INTRODUCTION

This document presents the recommended remedial action for the portion of the Eugene Former Manufactured Gas Plant (MGP) located on property owned by the Eugene Water & Electric Board (EWEB) at the 700 block of East 8th Avenue, in Eugene, Oregon. It was developed in accordance with Oregon Revised Statutes (ORS) 465.200 et. seq. and Oregon Administrative Rules (OAR) Chapter 340, Division 122, Sections 010 through 115.

The recommended remedial action is based on the administrative record for this site. A copy of the Administrative Record Index is attached as Appendix A. This report summarizes the more detailed information contained in the Remedial Investigation, Risk Assessment, Ecological Risk Assessment and Feasibility Study (RI/FS) reports completed under Oregon Department of Environmental Quality (DEQ) intergovernmental agreement WMCVC-WR-98-13, dated November 25, 1998. EWEB also stated that it prepared these reports in accordance with the regulations of the U.S. Environmental Protection Agency in the National Contingency Plan.

1.1 SCOPE AND ROLE OF THE RECOMMENDED REMEDIAL ACTION

The recommended remedial action addresses the presence of polynuclear aromatic hydrocarbons (PAHs), benzene, cyanide, and total mercury in contaminated soil and groundwater at the site. The recommended remedial action consists of the following elements:

- Excavation and off-site disposal of high-concentration residuals/waste at two former MGP structures and an assessment and removal for similar residuals/waste at another MGP structure.
- Engineering controls consisting of a (1) cap and (2) bank stabilization action
- Institutional controls consisting of an Easement & Equitable Servitude restricting property use, and development of a site management plan
- Monitoring and maintenance of the Site conditions and features according to the site management plan.

2. SITE HISTORY AND DESCRIPTION

2.1 SITE LOCATION AND LAND USE

The portion of the MGP site owned by EWEB consists of approximately 1.5-acres and is dominated by a flat paved lot located at the 700 block of E 8th Avenue, in Eugene, Oregon, T17S, R3W, Section 32, Tax Lot 1500, Lane County [Figure 1]. The site latitude is 44°3'3"N, longitude is 123°4'37"W. The site is located in a mixed use area neighborhood encompassing commercial, industrial, office, residential, and park land uses. Land immediately west of the Site is used for EWEB operations and offices. Land to the south consists of mixed commercial, residential, and industrial uses, as well as the federal courthouse. The University of Oregon owns the adjacent land to the east of the site known as Riverfront Research Park. Although the immediately adjacent portion of the Riverfront Research Park is undeveloped, future development as office space is possible. The nearest residential development is approximately ¼ mile south of the site. The site is bound on the north by the Willamette River. The Site and EWEB property immediately west of the Site are recognized as the Eugene Downtown Riverfront Special Area Zone (S-DR) with the Site portion designated as Cultural Landscape and Open Space (CL/POS) and land west of the Site designated as CL/POS and Mixed-Use (MU). The UO property south and east of EWEB property is zoned for Special Development as part of the Riverfront Research Park.

Soil and/or groundwater contamination associated with operation of the former MGP is present on property owned by EWEB (the subject of this Staff Report), property owned by the University of Oregon, and the City of Eugene cul-de-sac located southwest of the EWEB property. The core area of the site is the main upland area of historical MGP operations where the greatest mass of contamination is located [Figure 2]. The Core Area consists of the central upland portion of the site, within the EWEB fence line. Unless otherwise noted, the terms "MGP Site," "Site," and "site" when used in this document refer only to that portion of the contamination located on property owned by EWEB.

The approximate ground elevation of the site is 430 feet above mean sea level. The upland portion of the site is paved with asphalt and fenced [Figure 2]. A bike path separates the site from the University of Oregon Riverfront Research Park to the east. Another bike path, running

northwest/southeast separates the upland portion of the site from the shoreline area portion of the site, which consists of a steep bank with a narrow bench at its base at the shoreline of the Willamette River. The A power substation (Willamette Substation) is located adjacent to the west boundary of the Site on EWEB property.

Currently, the Site is used by EWEB for equipment or material storage. The upland portion of the Site is paved and is used for ingress and egress from the EWEB property and facilities. Also, bike paths on the Site are used for recreational purposes. Planning is in progress for future uses of the site but it is expected to be maintained as green space in future area redevelopment.

2.2 PHYSICAL SETTING

2.2.1 Climate

Eugene receives approximately 50 inches of precipitation annually. The majority of the precipitation falls between November and March, with monthly totals ranging from 0.6 to 8.5 inches with the highest in November. Precipitation totals for the remainder of the year are generally less than 3 inches per month. The average annual temperature is approximately 52°F.

2.2.2 Geology

Based on boring logs from investigations at and near the Site, three general geologic units underlie the Site; fill, alluvium, and bedrock. A generalized cross section of the site is presented in Figure 3.

Fill

Fill materials underlie the Site and are exposed in a narrow strip along a portion of the main bike path and in the shoreline area below (north of) the main bike path; the fill is covered by asphalt in all other areas. Fill thickness is estimated to vary from approximately 10 ft to the south to 17 ft along the main bike path. A maximum fill thickness of approximately 19 ft was documented toward the northwest corner of the site. An EWEB review of available aerial photographs suggests that this area may coincide with a topographic low associated with a former drainage swale.

Fill materials typically consist of variable mixtures of silt, sand, and gravel, and are sometimes difficult to distinguish from the underlying alluvium, especially for the central portion of the Site extending to the south property line. In other areas, the fill may contain construction debris (e.g., brick, concrete, wire, wood), wood chips, and/or dark slag materials, and is therefore easily distinguished. Along the north side of the main bike path, the fill was observed to consist largely of finer-grained silty sand, gravelly clay, and clayey gravel. North of this area toward the river, the lower topographic bench is underlain by wire-reinforced cobble fill (gabion structures), debris similar to upland areas, and sand to cobble/alluvium deposits. Recent fine-grained (silt to sand) flood-stage deposits typically occur as a thin cover over much of the bench. Portions of

the immediate shoreline area contain large concrete riprap blocks in chaotic configurations. For the lower bench area, it is not known whether the wire-reinforced fill or a thin layer of alluvium rests upon the sandstone bedrock.

Alluvium
Coarse-grained alluvial deposits underlie the fill and range in thickness from a few feet or less near the Willamette River (i.e., north of MW-4 and -5) to approximately 15 ft along the southern margin of the Site. The alluvium is dominated by a basal, coarse-grained, silty sandy gravel unit observed in all boreholes drilled to depth. The gravel unit ranges in thickness from approximately 7–10 ft immediately south of the main bike path, and may comprise the entire alluvium section in other areas. The lower portion of this unit is saturated with shallow groundwater. Variable lithologies, including fill, may directly overlie the basal gravel unit. These other alluvial deposits include sandy silt, silty sand, sand, and gravel or combinations of these finer-grained deposits with gravel. The upper contact of the alluvium with the fill may be difficult to distinguish except in areas containing actual construction debris or other obvious fill materials such as wood chips.

Sandstone Bedrock
A fine-grained, tan to greenish-brown sandstone (herein referred to as bedrock) underlies the entire Site at depths ranging from approximately 25–28 ft below ground surface (bgs). The bedrock was encountered in all areas drilled to this depth range, and samples were collected from the upper surface of the bedrock (up to 1.5 ft maximum) at many locations across the Site for field screening and physical description purposes. The bedrock is locally weathered and is dry to moist beneath the Site. The topography of the upper bedrock surface generally slopes from the UO property toward the Site and at the Site slopes northward toward the Willamette River with approximately 3 ft or more of relief beneath the Site. The bedrock extends in all areas away from the Site and is visible to the northeast where it crops out to form the bed of the Willamette River. The bedrock represents the Eugene Formation of Oligocene age, recognized regionally in the literature (USGS 1973). Borehole logs reviewed in the land and beneficial water use survey (Survey) (Exponent 2000b) indicate that the bedrock is at least 420 ft thick in the study area; USGS (1973) indicates that the Eugene Formation may be up to 15,000 ft in total thickness.

2.2.3 Hydrogeology

Shallow groundwater occurs at the Site within the coarse-grained and unconsolidated alluvial deposits and fill present above the older consolidated sandstone bedrock. The thickness of the shallow groundwater zone ranges from approximately 5–9 ft. The shallow groundwater flows north-northeast beneath the Site and discharges to the Willamette River along the northern boundary of the Site. Based on regional information and observations during drilling at the Site,

the underlying sandstone bedrock is expected to retard vertical groundwater movement. Field observations and the contrast in lithology between the alluvium and the bedrock indicate that the shallow groundwater in this area may be considered perched and generally isolated from any deeper groundwater systems.

The bedrock at the Site is observed to be dry or only moist beneath the overlying saturated alluvium. These bedrock characteristics contrast significantly with the loose and highly permeable nature of the overlying alluvium. Regional descriptions of the bedrock indicate that the formation generally yields little water to wells and the available water is typically of poor quality and often saline (USGS 1973). Deeper sections of the bedrock may contain hydraulically productive zones. However, most groundwater production in the region occurs from alluvial systems in central portions of the Willamette Valley, and these areas are hydraulically isolated and separate from the limited shallow groundwater zone beneath the Site.

Groundwater Flow

The shallow groundwater flow direction at the Site is to the north-northeast toward the Willamette River. Groundwater elevation data collected from the Site indicate that the shallow groundwater flow directions and gradients are generally consistent through all seasons, but elevations vary somewhat. Depth to water at the site ranges from approximately 16 to 20 feet below ground surface. The highest groundwater levels are observed in the winter and early spring, and the lowest levels in the late summer and fall. The horizontal hydraulic gradient is typically flatter (approximately 0.01 ft/ft) across the southwestern half of the Site, and steepens significantly (ranging from approximately 0.04 to 0.06 ft/ft) beneath the bike path toward the Willamette River. The groundwater levels in the shallow alluvial system fluctuate generally with changing stages of the Willamette River; the river levels are controlled in large part by upstream dam discharges. Groundwater levels in wells completed nearest to the shoreline area (i.e., MW-4, MW-5) fluctuate more directly in response to changes in river level than other onsite wells to the south. These changes may result in periodic variable flow direction or stagnant flow conditions (i.e., flattened gradient) locally along the immediate shoreline between the river and MW-4 and MW-5; however, groundwater flow direction beneath the Site remains toward the river for all observations.

2.2.4 Surface Water and Stormwater Features

The site is bound to the north by the Willamette River, which flows in a northwesterly direction. There is no other surface water at the site.

Storm water runoff from the western upland portion of the Site drains to a gutter that runs between the fenced portion of the site and the bike path and flows west to a storm drain, which

drains to the Willamette River. Stormwater runoff from the pavement cover on the eastern side of the upland portion of the site drains to an unpaved planting strip along the bike path.

2.2.5 Groundwater and Surface Water Beneficial Use Determination

Beneficial uses were evaluated for the water-bearing zone beneath the site and the nearby Willamette River considering current use and the following factors listed in OAR 340-122-080(3)(f)(F):

- Historical land and water uses
- Anticipated future land and water uses
- Concerns of community and nearby property owners
- Regional and local development patterns
- Regional and local population projections
- Availability of alternate water sources

The beneficial use determination concluded:

- No drinking water wells are located at the site or within ¼ mile of the site, nor are any future nearby wells reasonably likely. All domestic use water within that distance is provided by EWEB. No future domestic use of the underlying aquifer is reasonably likely.

- One historical non-contact cooling water intake on the Willamette River is located near the site; two irrigation water intakes are located approximately one mile downstream of the site. There is no known nearby domestic use of water from the Willamette River.

- Groundwater discharging to surface water (Willamette River) is the only known beneficial use of the shallow groundwater at the site.

- Beneficial uses of the Willamette River in the area of the site include habitat, recreation, irrigation, and aesthetic value.

- The Site is not currently active. Reasonably likely future use of the site is public use with industrial (utilities) infrastructure on the site and support of the adjacent Willamette Substation. The site is in a area of active planning and development and conditions at the site are unlikely to preclude any uses for nearby properties.

2.3 HISTORICAL OPERATIONS

The Willamette Substation is currently located adjacent to the western side of the upland portion

of the Site. The balance of the upland portion of the site is paved and is used for ingress and egress from the EWEB maintenance facilities.

An MGP was formerly operated on the approximately 1.5-acre Site now owned by EWEB. While most of the former MGP operational area is located on property now owned by EWEB, MGP operations also occurred to the east and south on properties owned by University of Oregon and the City of Eugene, respectively.

The MGP was constructed in 1906 as a coal carbonization process facility and operated in that mode from 1907 until approximately 1910, when it was converted to a carbureted water-gas plant. The early plant, including the first gas plant building, was constructed in 1906 and consisted of coal gas benches positioned inside a rectangular structure near the west side of the Site according to a Byllesby & Company (1918) report. The first gas plant building was later converted to a warehouse. Other early plant structures included a 20,000 cubic feet gas holder located near the southwest corner of the Site, which was later converted to a relief holder (herein small relief holder).

The plant was expanded and converted to the water-gas operation in 1910–11. A two-story brick and steel building (referred to as the main brick building or main gas house) housing the water-gas units was constructed in the central portion of the Site. Other structures reportedly erected in 1910–11 include a 150,000 cubic feet gas holder (herein large gas holder), coke shed, meter and office buildings, two 35,000-gallon aboveground oil storage tanks, two 25,000-gallon tar storage tanks, underground ammonia well/tar well structure and oxide platform (herein tar tank), and aboveground purifiers (Byllesby & Company 1918). The plant was used to manufacture gas until approximately 1950, when it was converted to a propane-air gas operation. Later the plant was converted to the storage and distribution of propane.

A proposed plant drawing from 1950 shows four 18,000-gallon propane aboveground tanks located in the area of the former coke shed. Aerial photographs from the 1950s and early 1960s show three aboveground tanks located in that area. Purchase and sale documents from a 1958 sale of the property, including the Site, list three 18,000-gallon propane storage tanks. A 1958 survey drawing prepared approximately three months later for the purchaser shows a "concrete slab for 4 tanks" in the same area of the former coke shed. Also, the survey drawing shows a "Gas Tank" at the west end of the main brick building, a "Gas Tank" at the east end of the main brick building and the large gas holder labeled as a "Gas Tank." Photographs from ca. 1960 and June 1961 show the three propane tanks, show part of the "Gas Tank" at the east end of the brick building, and show the "Gas Tank" at the west end of the main brick building. A drawing entitled "Proposed 1st Floor Arrangement – Eugene" dated December 3, 1962 shows a 10,000-gallon "gasoline storage tank" on the west end of the main brick building and a "gasoline pump" at the southwest corner of the same building with installation notes. A drawing entitled "Layout of Eugene Plant" dated June 27, 1963 shows a "concrete slab – 10,000 gal. gasoline storage tank under" on the west end of the main brick building and a "GASOLINE PUMP ISLAND" at the

southwest corner of the same building.

By approximately 1972, all remaining aboveground structures (except the main brick building) had been removed from the Site. EWEB purchased the Site in 1976. At the time of EWEB's acquisition, the Site was largely paved and fenced with a locked gate, and the only aboveground structure remaining at the Site was the main brick building; EWEB removed the brick building in 1978. The only subsurface structures known to remain at the Site include: a portion of the concrete foundation for the large gas holder; a portion of the concrete foundation for the small relief holder; and a portion of the concrete tar tank. The presence of any concrete foundation at the first gas plant location is uncertain.

In 1999, EWEB conducted an investigation to determine if the gasoline underground storage tank (gasoline UST) shown in the 1962 and 1963 drawings was present because there was no record of it having been decommissioned. EWEB dug trenches in the area where the gasoline UST was reportedly located. No concrete slab or gasoline UST was identified and subsurface observations indicated that the assumed area of the gasoline UST was backfilled with clean pea-gravel. A magnetometer survey also was conducted to confirm that a gasoline UST was not present in the subsurface.

2.3.1 Chemical Use and Waste Generation and Management

Storage of Electrical Transformers
Prior to November 2010, the site was used to store non-PCB transformers (equipment containing <50 ppm PCBs) and other miscellaneous equipment and supplies used in EWEB operations. The site was paved and was inspected daily to ensure that no leaking transformers were present.

Storage of Propane and Potentially Gasoline
Following MGP operations, the Site was first used for propane-air gas operations starting in the early 1950s and then used for propane storage and distribution. Propane was stored in aboveground tanks of various sizes and at different locations at the Site during this period. As described above in the previous section, a 10,000-gal gasoline UST is shown on two Site drawings dated 1962 and 1963; however, no records confirming the tank use or its period of operation were identified during the RI/FS. All aboveground tanks were removed before EWEB acquired the Site in 1976, and there is no evidence that the gasoline UST remains at the Site.

MGP Operations
Historically, two MGP processes occurred at the site. General literature describes the two processes

as follows:

Coal Carbonization
Coal carbonization consisted of heating bituminous coal in a sealed chamber, which released a combustible gas and produced coke. The coke was sold or used on-site, while the gasses were processed and distributed. Coal carbonization by-product tars contained phenols, organics, mercury and cyanide. Ammonia was also produced (and often recovered) as part of the coal carbonization process. Coal carbonization tars were often recovered and distributed as fuel or used on-site.

Carbureted Water Gas
Carbureted water gas production involved injecting steam into incandescent coal, which produced hydrogen and carbon monoxide. This gas was then combined with oil to produce a combustible gas and tar. This process frequently produced condensates containing emulsions of tar and water, which were difficult to separate. Often tar from the carbureted water gas process was disposed of, as commercially recovering the tar was difficult.

The contaminants encountered at the site consist of hydrocarbons containing volatile and semivolatile organic compounds, and metals, including:

- Arsenic
- Cyanide
- Total Mercury
- 2-Methylnaphthalene
- Acenaphthylene
- Benz[a]anthracene
- Benzo[a]pyrene
- Benzo[b]fluoranthene
- Benzo[g,h,i]perylene
- Benzo[k]fluoranthene
- Chrysene
- Indeno[1,2,3-cd]pyrene
- Naphthalene
- Phenanthrene
- Benzene

3. RESULTS OF INVESTIGATION(S)

3.1 NATURE AND EXTENT OF CONTAMINATION

Investigations of soil, groundwater, and surface water began around 1995, following the discovery of contaminants during sampling by University of Oregon on its property and other historical documentation. The nature and extent of soil and groundwater impact are reported in the following documents:

PTI Environmental Services. Initial Site Investigation Report, Former Manufactured Gas Plant Site, Eugene, Oregon. February 1996

Exponent. Results from Focused Groundwater Investigation, Eugene Former MGP Site. August 12, 1998

Exponent. Phase I Remedial Investigation Report, Former Manufactured Gas Plant Site. December 2000

Windward and Axelrod. Level II (Screening) Ecological Risk Assessment – Eugene Former MGP Site. October 2009.

The investigations detailed in these reports revealed that soil and groundwater beneath the site are extensively contaminated by MGP residue and MGP-related chemicals. The estimated area of soil and/or groundwater contamination is shown by red dashed line on Figure 4 as the DEQ Revised Locality of Facility for Contamination in accordance with OAR 340-122-0115(35). The nature and extent of contamination were evaluated on EWEB property within the boundary of the LOF depicted on Figure 4. This portion of EWEB property is shown in green on Figure 4 and is the area where the engineering and institutional controls will apply under DEQ's recommended remedial action discussed later in this report (Section 7). As indicated on Figure 4, the contamination is also present on University of Oregon and City of Eugene properties adjacent to the EWEB property.

3.1.1 Groundwater

Groundwater at the site is contaminated with Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX) as well as Polynuclear Aromatic Hydrocarbons (PAHs), principally naphthalene. In addition, tar-like Non-Aqueous Phase Liquid (NAPL) residuals occur within the soil matrix beneath the Core Area, and at locations between the Core Area and the Willamette River. All groundwater data from the site comes from five monitoring wells, two of which are located along the south/southwest or upgradient side of the Site and three of which are located downgradient of the Core Area along the northeast fence line (See Figure 2).

Groundwater at the site was monitored between April of 1998 and January of 2000. Quarterly groundwater monitoring data is presented in Table 1.

In upgradient monitoring wells MW-1 and MW-2, and in downgradient well MW-3, which is located in the northwest corner of the site, no BTEX constituents were detected during the monitoring period. Low concentrations of PAHs were intermittently detected in MW-1 and MW-2, and naphthalene and acenaphthylene only were detected at low concentrations once at MW-3.

Elevated BTEX levels were regularly detected during the monitoring period in downgradient monitoring wells MW-4 and MW-5, with the highest concentrations observed in MW-4. No trend is evident in BTEX data from either well. Benzene levels in MW-4, located immediately downgradient of the Core Area, ranged between 1,330 parts per billion (ppb) and 3,590 ppb. Benzene levels in MW-5, which is located in the northeast corner of the site ranged between 44 ppb and 702 ppb.

During the monitoring period PAH concentrations in MW-4 and MW-5 were elevated, particularly the relatively mobile compound naphthalene. Naphthalene concentrations in the wells ranged from 4,430 ppb and 61,300 ppb. PAH concentrations in these wells showed a marked increase during the two sampling events conducted in 1999. For example, before 1999, levels of naphthalene in MW-5 ranged from 7,980 ppb to 10,900 ppb and in January and July of 1999, naphthalene levels in the well rose to 25,200 ppb and 61,300 ppb, respectively. It is possible that the July 1999 sampling results were biased high due to unusual field conditions or methods used during sample collection. The sampling methods were subsequently modified which resulted in more representative water samples being collected. In January of 2000, naphthalene levels in MW-5 dropped to 4,430 ppb. No other trend is evident in MW-4 or 5.

During the monitoring period, University of Oregon Riverfront Research Park (UO) monitoring wells UO-3 and UO-5 were regularly sampled for BTEX and PAHs. These wells are located approximately 50 feet east of the property line shared by EWEB and UO. Low levels of Benzene were regularly detected in both monitoring wells at relatively equivalent levels, ranging

from 0.84 ppb to 141 ppb. PAHs, most significantly naphthalene were also detected in the UO monitoring wells. Levels of naphthalene in UO-5 prior to 1999 ranged between 1,400 ppb and 2,050 ppb. In January of 1999, naphthalene levels in the well rose to 8,500 ppb, before dropping back off to 1.15 ppb in July of the same year. In the final monitoring event for the well, naphthalene levels rose to 577 ppb.

The risks posed by the contaminants described above are discussed in the Risk Assessment Section, below.

The approximate extent of groundwater contamination on EWEB, UO, and City of Eugene property was estimated by DEQ and is shown on Figure 4 as the DEQ Revised Locality of Facility for Contamination.

3.1.2 NAPL

During the Initial Site Investigation (ISI) conducted in 1995, fifteen soil borings were completed at the MGP site. EWEB noted Non-Aqueous Phase Liquid (NAPL) blebs in groundwater in eight of the borings; BH-3, BH-4, BH-5B, BH-7B, BH-8, BH10B, BH-12, and BH-14, See Figure 2. While drilling disturbed the soil matrix temporarily mobilizing residuals, the presence of NAPL in these borings indicates that residual oil is present in the soil matrix beneath much of the Core Area of the site. Where encountered, NAPL in the soil matrix was observed within the saturated gravel interval between the surface of the water table and the underlying Eugene Formation bedrock.

Quarterly NAPL assessments were conducted at wells MW-4, MW-5, and UO-5 between May of 1998 and October of 2001. NAPL was initially encountered in all three wells; however between September of 1998 and January of 2000, no NAPL was encountered in UO-5, after which time, NAPL assessment for this well was discontinued. NAPL was encountered in each assessment event for MW-4 at thicknesses ranging from 0.14 feet to 1.25 feet, and at lesser thicknesses in MW-5. When the NAPL was pumped from MW-4, and the well was reassessed after 24 hours, no NAPL had reentered the well. However, at the next sampling event three months later, NAPL was again seen in the well.

NAPL has also been encountered in subsurface soils adjacent to the Willamette River downgradient from the former MGP. Based on the presence of NAPL in upland monitoring wells and in widely spaced borings across the site, it is likely that NAPL in the deeper soil matrix extends to the shoreline area along the Willamette River downgradient from the Site. No sheen or NAPL blebs are present in undisturbed riverside soils or sediments, however, when disturbed, soil and sediment at the river edge at low water conditions can produce a sheen.

NAPL occurs as Dense Non-Aqueous Phase Liquids (DNAPL), with density greater than water, and Light Non-Aqueous Phase Liquids (LNAPL), with a density less than water. LNAPL has been observed infrequently in monitoring well UO-5 while DNAPL has been found in MW-4 and MW-5 on the Site.

As part of the Remedial Investigation for the site, EWEB conducted an evaluation of DNAPL in which analysis of the physical properties of the material determined it was only slightly heavier than water with a high viscosity very similar to coal tar.

The presence of NAPL beneath much of the site and at the river edge suggests that historically, the NAPL was much more mobile than it is today and likely moved with groundwater from the upland portion of the site to the river. Its reoccurrence in on-site monitoring well MW-4 suggests that the residual NAPL still has some degree of mobility locally. EWEB's remedial investigation report describes mechanisms for some NAPL translocation (as blebs or globules) and accumulation (entrapment) in the well, including soil disturbance during drilling and hydrostatic forces due to dynamic gradient fluctuations in shallow groundwater near the river.

While retaining some mobility, the weight of evidence suggests that the overall NAPL mobility is low for the following reasons:

- Historic Nature of the Release – The former MGP operations are a likely source of the NAPL. The MGP operations ceased around 1950. Additional releases of NAPL may have occurred following MGP operations during demolition of the former gas plant structures after 1950. This suggests that much of the widespread migration of NAPL occurred historically, and that subsequent flushing by groundwater selectively removed the more mobile constituents of the NAPL. This is supported by the observation that soils from below the water table are generally not saturated with NAPL, but typically contain discrete immiscible blebs.

- High Viscosity of NAPL – the viscosity of the NAPL is approximately 225 centipoise, equivalent to coal tar, making it highly viscous. The high viscosity of the product retards its migration in the subsurface, and may limit the potential for discharge to the Willamette River.

- Lack of NAPL Discharge to the Willamette River - no oil sheen or blebs have been observed in the Willamette River.

Although all evidence suggests that that the mobility of NAPL beneath the site is low, it is possible that disturbances along the banks of the Willamette river, such as erosion or bank maintenance could result in mobilization of small amounts of residual NAPL in soil to the Willamette River. In addition, if the existing cap over the site was removed, this could result in

the mobilization of some of the more mobile Site contaminants in vadose zone soil (i.e., naphthalene), and possibly some residual NAPL in the soil matrix due to enhanced infiltration of rainwater.

3.1.3 Surface Water

Initially, no surface water sampling was conducted or required at the Site. Calculations evaluating the effect on surface water by groundwater discharging from the Site were presented in the September 2000 Phase I Remedial Investigation Report (Exponent 2000). The maximum and average potential concentrations of several VOCs and PAHs in the Willamette River were calculated based on the concentration of contaminants observed in downgradient monitoring wells. The following conservative assumptions were used in the calculations:

- The maximum documented hydraulic gradient (the slope of the groundwater table) observed at the Site, which was 0.05 ft/ft, recorded in January of 1999 was used for the calculations.

- No site-specific hydraulic conductivity was available for the Site, therefore a value of 50 ft/day was assumed, based on textbook values for a sandy silty gravel.

- The discharge of water from the Site was calculated across the area defined as the average distance between the surface of the water table and bedrock (6 feet measured at wells MW-4 and MW-5), multiplied by the river frontage of the Site; because the saturated thickness at discharge to the river is 3 ft or less, the discharge (volume) estimates using this approach likely exceed actual discharge by 100 percent or more.

Based on these assumptions, approximately 150,000 liters of water per day discharges from the Site to the river. The contaminant load to the river was calculated by multiplying the discharge to the river by a range of contaminants recorded in the worst case well.

By dividing the contaminant load to the river by one tenth of the flow of the Willamette River (one tenth of the flow was used to produce a conservative in-stream value), theoretical concentrations of several constituents of concern were calculated. Theoretical in-stream values for benzene, ethylbenzene, toluene, xylenes, and naphthalene were orders of magnitude below NOAA water screening concentrations (Buchman 1999) equivalent to current DEQ Level II Ecological Screening Level Values (SLVs).

The surface water calculations were based on groundwater discharging from beneath a capped site. If the existing asphalt cap were removed, it is possible that contaminant concentrations in shallow groundwater could increase (due to enhanced infiltration of rainwater); however, maintaining a protective cap or cover is a required element of the remedy.

The mixing zone calculations are presented in Appendix A.

In 2008, surface water samples were collected from the Willamette River along and in the vicinity of the Site to support the Level II Ecological Risk Assessment (See Section 3.2.3 and Attachment 1). The sampling results confirmed the findings predicted from the dispersion modeling presented in the Phase I Remedial Investigation Report. The sampling results indicate that contaminant concentrations in surface water adjacent to the Site are below detection limits or below DEQ SLVs.

3.1.4 Soil

Contaminated soil is common beneath many areas of the site. The contamination is most significant beneath the paved Core Area of the Site, and consists of BTEX, selected PAHs, and Metals. Metals concentrations are low and not of concern. Soil sampling results from borehole drilling during the ISI is presented in Table 2. Figure 4 shows the approximate area of soil and/or groundwater contamination as the DEQ Revised Locality of Facility for Contamination.

Shallower soils and fill (above the water table) outside the Core Area are typically less affected and do not contain oily residues. Shallow groundwater is affected by these soils across the thin (approximately 4–9 ft thick) saturated zone in the coarse-grained alluvium. Most significant impacts on soil and groundwater at the Site are limited in vertical extent to the fill and alluvial materials above the sandstone bedrock present at approximately 27 ft bgs.

All contaminants detected in soil and shallow groundwater are consistent with former MGP operations and aboveground and underground petroleum product storage, with organic compounds (i.e., PAHs and BTEX) being the key contaminants of interest. Demolition activities which occurred over the years following MGP operations may have exacerbated contaminant conditions at the Site. Metals concentrations in soil are generally low.

Toward the shoreline area, an older MGP-era surface underlies structural fill, at least some of which was placed in connection with the bike path construction. Based on current information, hydrocarbon contamination in this region generally appears to be associated with the thin zone of shallow groundwater migration from the central upland portion of the Site to the river, and current contaminant migration is believed to be principally in the dissolved phase. While residual NAPL has been observed in the subsurface soils in the central upland portion of the Site, and dense nonaqueous-phase liquid (DNAPL) has been observed in well MW-4, it appears that most NAPL migration occurred during historical periods at the Site. EWEB has inspected the shoreline area periodically since 1995, and NAPL seeps have not been observed in undisturbed conditions.

3.1.5 Other Media

Several subsurface structures associated with the former MGP operations were evaluated during different phases of the Site investigation. This included the large gas holder, tar tank, potential gasoline UST, small relief holder, and first gas plant building location (Figure 4).

The investigation of the tar tank included the removal of hydrocarbon liquids found within the structure. Based on the Byllesby & Company (1918) report, the concrete tar tank is divided into four approximately equal-sized chambers with overall tank dimensions of approximately 80 ft long, 14 ft wide, and 14 ft deep. After the tank was located in the field by trenching, four boreholes were carefully advanced (one in each chamber) to the bottom of the tank (approximately 13.5 ft) where concrete was encountered beneath each chamber. Sandy gravel fill was encountered in each borehole along with concrete rubble and voids within some of the concrete rubble. Contaminated (hydrocarbon) fill was evident starting at depths ranging from 2.5 to 4 ft bgs, and liquids (principally hydrocarbon liquids) were encountered in the three easternmost chambers; no measurable liquid was present in the fourth (westernmost) chamber. A temporary, slotted standpipe was placed in each borehole/chamber, and the liquids were sampled to confirm that the material was not hazardous waste and was suitable for energy recovery/recycling as petroleum material.

DEQ determined that removal of the liquids from the tar tank was required, and a removal site evaluation was completed by EWEB in accordance with Oregon statutes (Exponent 1999b). Between May and November 1999, approximately 1,500 gallons of hydrocarbon liquids were removed from the tank and recycled offsite in accordance with applicable regulations. The liquids were pumped until recovery of liquids was no longer effective or possible, and the standpipes were abandoned and the asphalt cover sealed under DEQ oversight. Approximately 275 cubic yards of contaminated sandy gravel and concrete are estimated to remain in the concrete structure. Because hydrocarbon liquids have been removed and the remaining solid waste is contained in the concrete tar tank and covered by the existing asphalt cap, these materials are considered stable under current Site conditions.

At the large gas holder, a basal concrete foundation (approximately 8 ft thick and 69 ft in diameter) remains below approximately 1-2 ft of gravel cover and asphaltic-concrete cap. During soil trenching to install an electric transmission line in 2010, a sump or vault structure in the southeast margin of the foundation was discovered. Gravels overlying this area of the foundation were contaminated based on field indicators. Fill within the lower portion of the vault contained high-concentration residuals/waste and a significant portion of this material and approximately 110 gallons of oily liquid were removed in [2011], as directed by DEQ. Further evaluation of historic photographs (circa 1910) indicates that two additional vault-like structures should be present in the gas holder foundation on the north side. These two additional vaults will be

assessed during implementation of the remedial actions recommended in this Staff Report and any high-concentration residuals/waste and oily liquid will be removed from these structures.

Trench excavations were also extended to the south of the tar tank to determine whether a concrete slab and gasoline UST remained from former operations. No concrete slab or UST was identified, and subsurface observations indicated that the assumed area of the former UST was backfilled with clean pea-gravel. A magnetometer survey also was conducted to confirm that a UST was not present in the subsurface.

The remnants of the first gas plant and small relief holder structures consist, for the most part, of contaminated fill and concrete foundations in the subsurface. At the first gas plant building location, high-concentration MGP residuals are present and include a zone (approximately 7 ft thick) of highly viscous tar-like material mixed with fill. Drilling was terminated after encountering concrete at the base of the contaminated fill. The concrete may be rubble within the fill and possibly part of foundation pilings reportedly used in construction associated with the first gas plant building. The small relief holder has a thin (approximately 0.5- to 1-ft thick) layer of high-concentration MGP residuals in fill deposits present within a concrete ring-wall foundation. The residuals/wastes at these structures contain high levels of benzene (100,000-180,000 ppb) and several PAHs. These structures, particularly the first gas house location, contain high concentration MGP waste and the two additional vaults at the large gas holder foundation may also contain high-concentration MGP waste and oily liquid. While these structures may be currently stable, the failure (as a result of a future catastrophic event such as an earthquake or general degradation over time) of any structures containing mobile residuals/waste or liquid could result in the introduction of concentrated waste into the subsurface at the site.

3.1.6 Sediment

The river off-shore of the Site consists primarily of an erosional rather than depositional environment. The bank along the Site is stabilized by the presence of buried gabions, vegetation including root mats, and rip-rap. Some shallow soils near the rivers edge are contaminated with hydrocarbons. At a few locations near the central area, a sheen has occasionally been observed when the shoreline deposits were intentionally disturbed. While the shoreline along the site has been relatively stable over the years, erosion of some bank materials has been documented more recently. This bank erosion resulted in the presence of "sediment" along portions of the shoreline which contained some hazardous constituents. These deposits appear to be ephemeral and were removed from most locations of the river bed during periods of higher river flow (e.g., seasonal flow events). The high-flow scouring typically exposes the underlying predominant cobble substrate that is characteristic of the shoreline reach in this area. The sediment deposits appeared generally stable at only one location, a small cove located in the bank downstream of the Site.

In 2008, sampling of sediment adjacent to the shoreline was conducted as part of the Level II Ecological Risk Assessment (see Section 3.2.3 and Attachment 1). Several PAHs were detected at two locations and residual NAPL blebs were observed at one location in sediments believed to be derived from the adjacent bank. The Level II Ecological Risk Assessment concluded that the sediment did not present an unacceptable risk to ecological receptors at the shoreline area.

3.2 RISK ASSESSMENT

A risk assessment was performed as part of the RI to evaluate the potential risks to human health and the environment, and the need for remedial action at the site. The risk assessment included a human health risk screening, an exposure assessment, a toxicity assessment, a human health risk characterization, and an ecological assessment. The results of the risk assessment for human health and potential ecological receptors at the Site are summarized below. More details are available in:

Exponent. Human Health Risk Evaluation, Former Manufactured Gas Plant. August 2002.

Exponent. Level I (Scoping) Ecological Risk Assessment. November 1999.

Exponent. Technical Memorandum – Supplemental Discussion of Cumulative and Inhalation Risks, Former MGP Site February 10, 2003.

Exponent. Letter to Geoffrey Brown, Department of Environmental Quality. Response to DEQ Comments on August 2003 Draft Focused Feasibility Study. March 18, 2004.

Swanson and Windward. Focused Feasibility Study, Former Manufactured Gas Plant Site. April 2006.

Windward and Axelrod. Level II (Screening) Ecological Risk Assessment. October 2009.

3.2.1 Human Health Risk Screening

Contaminant concentrations for each environmental medium were compared with USEPA (2001, then 2004) Region 9 Industrial Preliminary Remedial Goal screening values (PRGs) to determine which media and contaminants posed potential risk to human health. Industrial PRGs were chosen as screening values based on the anticipated future land use (including recreational users). Other potential exposure routes identified within the locality of the facility included recreational users and excavation workers who spend less time at the site than the industrial PRGs assume. If detected concentrations of chemicals in a particular medium did not exceed the screening levels, then that medium was eliminated as a medium of potential concern and was not evaluated further. Chemicals found in each medium that exceeded the screening levels were carried through for detailed evaluation in the baseline human health risk assessment.

A brief summary of the results for each environmental medium is provided below:

- **Soil and Wastes** – Concentrations of BTEX and PAH constituents, as well as total mercury and cyanide in soil and high-concentration residuals/waste at two former MGP structures exceed screening levels and are evaluated further in the Human Health Risk Evaluation.

- **Surface Water** – Surface water is not a complete exposure pathway of concern for the human health risk assessment. Therefore, exposure to surface water was not required for further evaluation in the human health risk assessment. Surface water was evaluated further in the Ecological Risk Assessment (Section 3.2.3).

- **Groundwater** - Concentrations of Benzene, Ethylbenzene, Total Xylenes, and selected PAH constituents in shallow groundwater exceeded PRGs for tap water. Based on the findings of the Beneficial Use Survey, described in Section 2.2.5 (Exponent 2000), there is no current or reasonably likely future use of the groundwater for drinking water in the area of the site. Therefore, only the exposure to groundwater by volatilization (i.e., Benzene) pathway (to outdoor air and potentially to indoor air) was required for evaluation in the human health risk assessment.

To summarize, the chemicals and media that were carried forward and evaluated in detail in the human health risk assessment were:

Media	Soil and Residuals/Wastes at Structures	Groundwater
Chemicals	Arsenic Cyanide Total Mercury 2-Methylnaphthalene Acenaphthylene Benz[a]anthracene Benzo[a]pyrene Benzo[b]fluoranthene Benzo[g,h,i]perylene Benzo[k]fluoranthene Chrysene Indeno[1,2,3-cd]pyrene Naphthalene Phenanthrene Benzene	BTEX

Organic and inorganic compounds in other media did not exceed human health screening levels and were not evaluated further in the human health risk assessment.

3.2.2 Human Health Risk Assessment

The Human Health Risk Evaluation report describes in detail the procedures used to evaluate the potential risks associated with the chemicals and media retained for evaluation following the screening step. The methodology used in the human health risk assessment consisted of following DEQ's *Guidance for the Conduct of Deterministic Human Health Risk Assessment (DEQ 2001)*. Cancer risks and noncancer hazard indices were calculated using risk ratios of concentrations to risk-based screening levels (USEPA 2004).

EXPOSURE ASSESSMENT

People can be exposed to chemicals at contaminated sites through a number of potential "exposure pathways." Typically, these include direct contact with contaminated soil (e.g., skin contact during gardening or construction work), ingestion of contaminated soil or soil dust, ingestion of contaminated groundwater, and inhalation of vapors from the volatilization of contaminants present in soil or groundwater.

This exposure assessment evaluated current and reasonably likely future site use scenarios where humans might be exposed to contaminants in soil, high-concentration residuals/wastes at two former MGP structures, and groundwater. The exposure scenarios evaluated include industrial workers, excavation workers, and recreational users. Recreational users may include cyclists and pedestrians on the bike paths, or people walking along the shoreline area. As detailed in risk assessment documentation and the final FFS, EWEB used the standard industrial worker or occupational exposure pathway to evaluate risks to possible receptors, based on current and reasonably likely future Site use and EWEB's commitment to maintain a protective cover and other institutional controls preventing direct contact/exposure to Site contaminants.

The following paragraphs summarize how each of these user groups potentially could be exposed to contaminants at the Site.

Industrial Workers:
People working on the site could be exposed to contaminants in soil and residuals by direct contact (if pavement cover removed and soils disturbed), vapor intrusion from soil and high-concentration residuals/waste at two structures into indoor air (should buildings be constructed in the future), and volatilization to outdoor air. Site workers could also be exposed to contaminants volatilizing from groundwater into indoor and outdoor air. Risk calculations presented below for

the industrial worker are based on the assumption that the Site cap is permanently removed (hypothetical exposure scenario) and workers would be exposed to site contaminants for eight hours per day, 250 days per year, for 25 years. EWEB maintenance workers were assumed to visit the Site 14 days per year.

Excavation Workers:

Excavation workers could be exposed to contaminants in soil and high-concentration residuals/waste at structures by direct contact and volatilization to outdoor air. Excavation workers could also be exposed to contaminants volatilizing from groundwater into outdoor air. The excavation worker scenario is based on the assumption that workers would be exposed to site contaminants for 8 hours per day, 9 days per year, for one year.

Recreational Users:

Recreational users could be exposed to contaminants in surface soil in the shoreline area by direct contact. They could also be exposed to contaminants volatilizing from shallow soil and subsurface soil from all areas and from groundwater into outdoor air. Risk calculations for recreational users used the extremely conservative assumption that recreational users would be exposed for 8 hours per day, 250 days per year, for 25 years. Risk calculations for the volatilization pathway included adults and small children visiting for 3 hours, 24 days per year, for 30 years (adults) or 6 years (children), and assumed that the existing soil cover (upland area) was not present.

Table 3 summarizes DEQ's human health conceptual site model (exposure assessment). It shows potentially complete exposure pathways and receptor categories considered for the site. Those use scenarios and exposure pathways considered to be complete are indicated with an "X" and those considered to be incomplete (i.e., exposure not possible or likely) are indicated with an "O". Only use scenarios and exposure pathways considered to be complete are carried forward into the risk characterization.

TOXICITY ASSESSMENT

The toxicity assessment evaluates the potential adverse health effects associated with the chemicals of concern. The potential health impacts from the major contaminants found at the Site are described below.

Benzene: The United States Department of Health and Human Services (DHHS) has determined that benzene is a known human carcinogen. Long-term exposure to high levels of benzene can

cause harmful effects on the bone marrow and can cause a decrease in red blood cells leading to anemia.

Carcinogenic PAHs: A number of PAHs are suspected of having carcinogenic properties. These compounds include benzo(a)pyrene, benzo(a) anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, indeno(1,2,3-cd) pyrene, and dibenzo(a,h)anthracene. The general class of carcinogenic PAHs is represented by benzo(a)pyrene, which is considered by EPA to be a probable human carcinogen. Some people who have breathed or touched mixtures of PAHs and other chemicals for long periods of time have developed cancer. Some PAHs have caused cancer in laboratory animals when they breathed air containing them (lung cancer), ingested them in food (stomach cancer), or had them applied to their skin (skin cancer).

Non-Carcinogenic PAH: The remaining PAHs are considered to not have carcinogenic properties and are evaluated for non-cancer types of effects. These compounds include: acenapthylene, benzo(g,h,i)perylene, naphthalene, and phenanthrene. Mice that were fed high levels of one PAH during pregnancy had difficulty reproducing and so did their offspring. These offspring also had higher rates of birth defects and lower body weights. It is not known whether these effects occur in people. Animal studies have also shown that PAHs can cause harmful effects on the skin, body fluids, and ability to fight disease after both short- and long-term exposure, but these effects have not been seen in people.

Toxicity properties for other chemicals found at the MGP site can be found at http://www.epa.gov/iris/.

RISK CHARACTERIZATION

For carcinogenic chemicals, risks are estimated as the probability of an individual developing cancer over a lifetime as a result of exposure to the carcinogen. These risks are probabilities generally expressed in scientific notation (e.g., 1×10^{-4}). An excess lifetime cancer risk of 1×10^{-4} means that an individual has a 1 in 10,000 chance of developing cancer as a result of exposure to the carcinogen under the assumed exposure conditions. The potential for non-carcinogenic effects is evaluated by comparing an exposure level over a specified period of time with a reference dose derived for a similar exposure period. Hazard quotients are calculated by dividing the chronic daily intake by the specific reference dose. The hazard index (HI) is generated by adding the hazard quotients for all chemicals.

When the excess lifetime cancer risk estimate for exposure to an individual carcinogen is equal to or below 1×10^{-6} (1 in 1,000,000), and when the cumulative excess lifetime cancer risk for exposure to multiple carcinogens and multiple exposure pathways is less than or equal to 1×10^{-5} (1 in

100,000), DEQ considers the potential health risks to be below levels of concern. The acceptable HI level is less than or equal to one. DEQ considers that remedial action is necessary when excess cancer risks and/or HI exceed these protective levels.

The human health cancer risk estimates for chemicals of concern are presented in Table 4. For the industrial worker scenario, all chemicals in soil and high-concentration residuals/waste at two former MGP structures exceed DEQ's acceptable risk level for individual chemicals of 1×10^{-6} (also expressed as 1E-06) excess cancer risk. Three chemicals in soil (benz(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene) and benzo(a)pyrene in the residuals/waste exceed DEQ's acceptable risk level for individual chemicals for the excavation worker. Although levels of arsenic also exceeded acceptable risk levels based on assumptions for an industrial worker, arsenic levels were within the range of regional naturally occurring background levels, and arsenic was dropped from further risk evaluation. Theoretical levels of benzene in outdoor air estimated from measured concentrations in groundwater, soil, and residuals/waste are acceptable for the industrial and excavation worker. Benzene concentrations found in soil and high-concentration residuals/waste resulted in theoretical levels of benzene in indoor air that present unacceptable risk levels for volatilization to indoor air. The industrial worker and the excavation worker cumulative risk are 3.2×10^{-3} and 3.3×10^{-5}, respectively, which exceeds DEQ's acceptable level of 1×10^{-5} for cumulative risk; the industrial risk estimate assumes that the soil cap/cover is permanently removed in the hypothetical exposure scenario evaluated by EWEB. Individual chemical and cumulative risks for the recreational user were less than the acceptable risk levels of 1×10^{-6} and 1×10^{-5}, respectively.

The human health noncarcinogenic risk estimates for chemicals of concern are presented in Table 5. For the industrial and excavation worker soil exposure scenarios, the hazard indices exceed the acceptable level of 1.0. The recreational user soil exposure scenario resulted in a hazard index of 0.2 which is less than the acceptable level of 1.0. The hazard indices for high-concentration residuals/waste at the two former MGP structures were unacceptable for the industrial worker (HI = 31.3) and were acceptable for the excavation worker (0.2). Hazard indices for the high-concentration residuals/waste were not calculated for the recreational user because this material only occurs on-site at deep depths (>5ft).

CHEMICALS OF CONCERN

The final chemicals of concern (COC) for the site were developed based on the results of the human health risk assessment risk characterization. Those chemicals that exhibited cancer risks greater than 1×10^{-6} and/or non-cancer hazard quotients greater than 1 were identified as COCs. Benzene is a COC based on the (hypothetical) industrial worker scenario and for potential volatilization from soil and high-concentration residuals/waste at two former MGP structures

into indoor air. Cyanide and mercury were eliminated as COCs because their respective hazard quotients were less than 1.

Therefore, the COCs for soil and high-concentration residuals/waste at the two structures are 2-methylnaphthalene, acenaphthylene, benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, chrysene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, and benzene; these COCs also are consistent with characterization information for the high-concentration residuals/waste and oily liquid removed from one vault at the large gas holder and, as a result, are likely COCs to be encountered at the two additional vaults at the large gas holder foundation. There are no COCs for groundwater.

HUMAN HEALTH RISK SUMMARY

High-Concentration Residuals/Waste Materials

Contaminants in residuals/waste at two former MGP structures (small relief holder foundation and first gas plant building location) in the upland portion of the Site exceed DEQ's acceptable risk levels for the direct contact and volatilization to indoor air pathway for industrial workers. They also exceed DEQ's acceptable risk levels for the direct contact exposure pathway for excavation workers. The contaminants of concern in the residuals/waste materials are PAHs and Benzene.

Soil

Contaminants in soil in the upland portion of the Site exceed DEQ's acceptable risk levels for the direct contact and volatilization to indoor air pathway for industrial workers. They also exceed DEQ's acceptable risk levels for the direct contact exposure pathway for excavation workers. Contaminants in soil, including shoreline soil, do not exceed DEQ's acceptable risk levels for recreational users. The contaminants of concern in soil are PAHs and Benzene.

Groundwater

Based on evaluations and conclusions of the beneficial use survey, remedial investigation, and exposure pathway analysis, contaminants dissolved in groundwater do not present an unacceptable risk for industrial workers, excavation workers, or recreational users.

3.2.3 Ecological Risk Assessment

The ecological risk assessment (ERA) included a Level I (Scoping) ERA (Level I ERA) (Exponent 1999) and a Level II (Screening) ERA (Level II ERA) (Windward and Axelrod 2009). Additional information is available in the Level I and II ERA documents in the project file. All

work was performed in accordance with DEQ's *Guidance for Ecological Risk Assessment*, April 1998, Final (as amended) (DEQ 1998).

Level I (Scoping) Ecological Risk Assessment

A Level I (Scoping Ecological) Risk Assessment is a conservative qualitative determination of whether there is any reason to believe that ecological receptors and/or exposure pathways are present or potentially present at or in the locality of the facility. Scoping is intended to identify sites that are obviously devoid of ecologically important species or habitats and/or where exposure pathways are obviously incomplete. If no significant species or habitats are identified in the Scoping Level risk assessment, Oregon's ecological risk assessment guidance stipulates that no additional ecological evaluation is required.

The Level I ERA identified the shoreline area and adjacent Willamette River as the only potentially ecologically important habitat associated with the Site. Paving and other hardscape features limit terrestrial habitat for most of the upland portion of the Site. The Level I ERA also applied to the west portion of property owned by the University of Oregon (UO) located immediately east of EWEB's property, and concluded that the habitat characteristics of that property were similar to the EWEB property. The Level I Ecological Scoping concluded the following:

- Moles were identified as the ecological receptor with the greatest potential for exposure to impacted soils. Moles are not considered an ecologically important species in this setting.
- Other receptors such as birds may visit the Site.
- Paving on the upland portion of the Site limits terrestrial habitat at the Site.
- A narrow vegetated area paralleling the bike path is considered the only significant habitat for ecological receptors. This corridor was assumed to be clean fill soils associated with bike path construction. Thus, no exposure pathway to contaminated media exists for the receptors in this area.
- Water in the river is unlikely to be significantly impacted by discharge of contaminated groundwater. The impact from dissolved contaminants discharging to the river is limited by the comparative volume of what is discharging from the Site and the flow of the Willamette River. In addition, the area immediately off-shore of the Site is not a depositional environment, limiting the potential for long-term sediment accumulation.
- The Site is situated on the outside of a bend in the river, in a fast water environment. A narrow shelf is present at the river edge along the Site. The shelf is underlain by rock-filled gabions and other fill (e.g., rip-rap and debris) and/or cobble alluvium deposits covered by soil and a locally thin veneer of flood sediment (silt or sand deposits). Immediately off-shore of the bench, the river bottom contains a veneer of cobble deposits extending to a channel edge that is scoured to bare bedrock. Downstream of the Site the

bank of the river continues in a fast water environment over bedrock or rip-rap for several hundred feet. This high-energy fluvial environment precludes any accumulation of Site contaminants currently or historically.

Because aquatic receptors were assumed to be only temporary inhabitants along the Site and because this portion of the Willamette River was identified as having little sediment accumulation, the Level I ERA concluded that hazardous substances via groundwater discharge do not reach aquatic receptors at concentrations that would result in adverse impact to these receptors. These findings of the Level I assessment were confirmed through a conservative dispersion (mixing zone) analysis in the Phase 1 RI report.

Although DEQ approved the Level I assessment, DEQ subsequently re-examined ecological issues and the shoreline area along the Site. As a result, DEQ directed EWEB to perform a Level II ERA for the shoreline area.

Level II (Screening) Ecological Risk Assessment

A Level II (Screening) ERA is a conservative, quantitative determination of whether ecological receptors and potential exposure pathways associated with a site could result in adverse ecological effects. Screening is intended to identify sites for which risks associated with exposure of ecological receptors to contaminants of potential ecological concern (CPECs) can be ruled out based on conservative assumptions. If no significant exposure pathways to CPECs are identified in the screening level assessment, Oregon's ecological risk assessment guidance stipulates that no additional ecological evaluation is required.

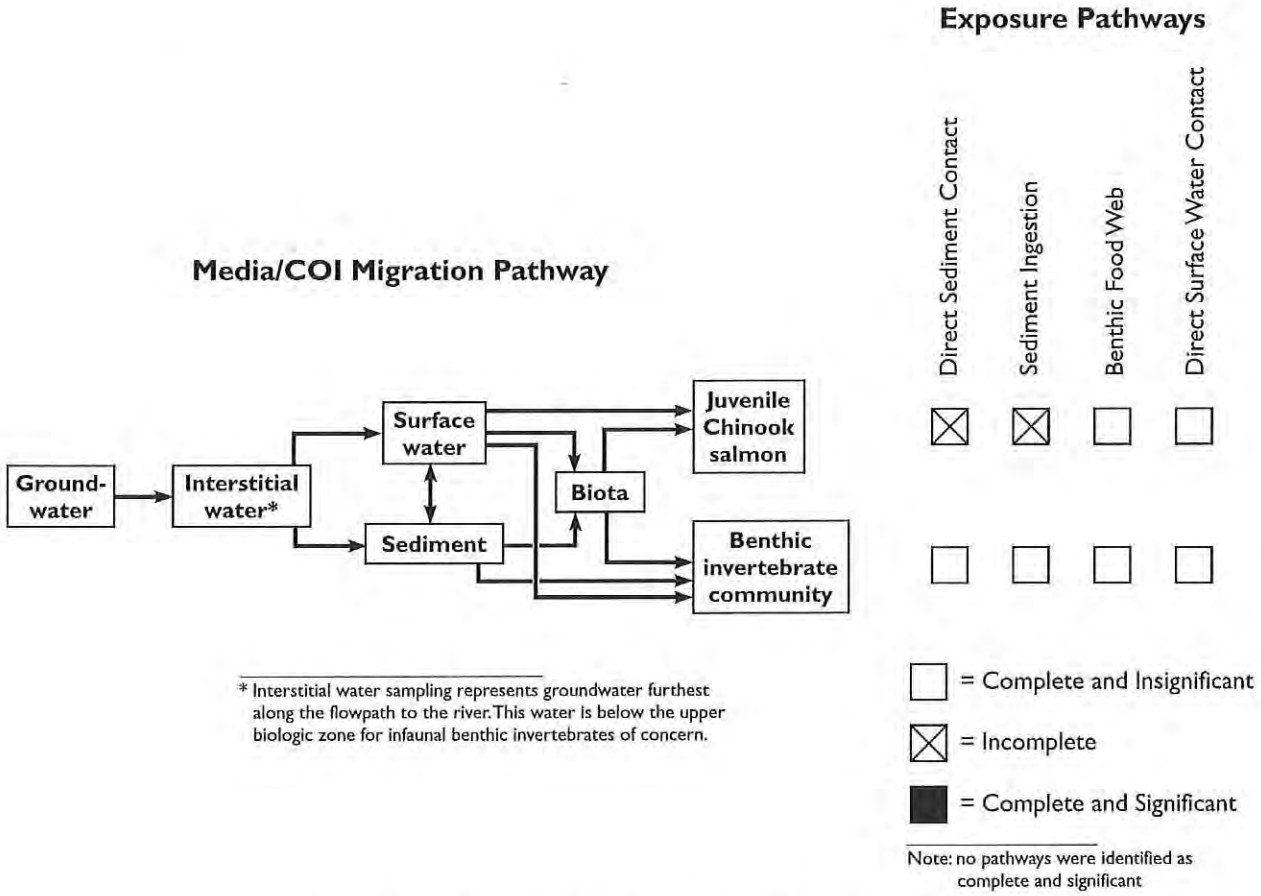
A Level II ERA was conducted to assess the potential for juvenile salmonids and resident benthic invertebrates in the Willamette River to be adversely affected by the discharge of contaminated groundwater along the shoreline portion of the Site. Scoping components of the Level II ERA included: a field survey of the Willamette River aquatic habitat bordering the Site to evaluate the presence of fish and benthic invertebrates and for fish and benthic invertebrate habitat quality; an evaluation of the feeding and respiration methods of benthic invertebrates for the river environmental conditions along the Site; and, development of a focused work plan and sampling and analysis plan (WP/SAP) (Axelrod and Windward 2008).

The Level II aquatic assessment was focused on the Willamette River shoreline area along the Site that coincides with shallow groundwater contamination in the upland area. This portion of the shoreline area is referred to as the focus reach (FR). The FR and other investigation elements of the Level II ERA are shown on Figure 2-1 attached from the final report. The target ecological receptors for the aquatic assessment were juvenile salmonids and the benthic invertebrate community along the FR. As a conservative assumption, the assessment assumed that juvenile

upper Willamette River Chinook salmon listed as threatened under the Endangered Species Act of 1973, as amended (ESA) are present at the Level II ERA study area (although juvenile Chinook salmon have not been observed there and spawning for Chinook salmon generally occurs a significant distance upstream). The benthic community includes both infaunal and epibenthic invertebrates; however, because they constitute the vast majority of the benthic community, the principal invertebrates of interest are the high-flow-adapted epibenthic community living on the rocky substrate of the shoreline area along the Site.

Additional environmental sampling was performed to obtain Site characterization data, as directed by DEQ, and to support the exposure assessment for the Level II ERA. Sampling of Willamette River surface water was the primary objective of the environmental sampling based on potentially complete exposure pathway assumptions. Supplemental sampling of sediment and interstitial water was performed to support the Level II ERA and provide a better understanding of the nature and extent of contamination. The results from sampling of surface water, sediment, and interstitial water are presented in data screening tables attached from the final report (see Attachment 1).

A refined conceptual site model (CSM) integrating environmental media and contaminant migration and exposure pathways for the Level II ERA was presented in the final report (Windward and Axelrod 2009). A copy of the CSM is provided below.



Conceptual Site Model for Level II (Screening) ERA

The Level II ERA report presented conclusions and recommendations based on analysis of the ecology of the shoreline environment, chemical data collected, and potential for exposure of ecological receptors to COIs under the site-specific conditions. The primary findings of the Level II ERA are provided below:

- The Willamette River adjacent to the Site provides habitat for juvenile fish, including potential rearing habitat for juvenile Chinook salmon; Chinook salmon spawning occurs a significant distance upstream on the river system.
- The Willamette River adjacent to the Site supports a benthic invertebrate community composed primarily of epibenthic invertebrates on the primarily rocky/cobble substrate.

- Because of the hydraulic and substrate characteristics of the river along the FR, there is limited fine-grained sediment present to support an infaunal benthic invertebrate community.
- Surface water represents the primary potential pathway for contaminated groundwater to expose aquatic ecological receptors to COIs. All COI concentrations in surface water collected from throughout the FR at 1-inch above the river bed were below detection limits or below biologically significant concentrations (DEQ Screening Level Values), and no surface water CPECs were identified; therefore, surface water was determined to be a complete and insignificant exposure pathway for fish and the benthic invertebrate community, and risk from this pathway is acceptable.
- Some sediment COI concentrations from the two fine-grained sediment locations sampled within the FR exceeded conservative risk-based SLVs. However, sediment represents an insignificant pathway for the benthic invertebrate community to be exposed to COIs in contaminated groundwater because there is a very small amount of fine-grained sediment in the FR and fine-grained sediments constitute a small fraction of the available habitat. The sediment has also been demonstrated to be ephemeral for a majority of the FR.
- Interstitial water data from the Site represents COI concentrations in groundwater furthest along the flow path to the Willamette River. Water samples collected from below and above the bed of the river demonstrate that COIs are attenuated in the shoreline zone below levels of concern. These sampling results confirm the findings from earlier dispersion modeling analyses presented in the Phase I RI report. Invertebrates are not likely exposed to interstitial water at the depths sampled, and surface water data better represent concentrations to which epibenthic invertebrates, the predominant invertebrates at the shoreline zone, are exposed.
- The ecological survey determined that the aquatic habitats along the FR support a diverse benthic community, including several long-lived species (e.g., Corbicula and freshwater mussel), as well as species indicative of good water quality, such as stonefly larvae. Therefore, COIs in groundwater do not appear to be adversely affecting the condition of the benthic community. In addition, the FR provides good-quality instream and supporting upland habitat (vegetation shade and cover) for rearing fish, including juvenile salmonids.
- Assessing the ecological risk conditions for aquatic receptors at the shoreline area along the Site addresses the ecological risk concerns from groundwater discharge along the shoreline area on the UO property. This is based on similarity of the habitat conditions and COIs for both properties, and because the former MGP operated during the same period of time and generally in the same manner on both properties.

In conclusion, the Level II ERA found two localized areas of screening level exceedances, but the location of these exceedances represents an insignificant portion of the shoreline area. Therefore, there is no unacceptable risk to the aquatic ecological receptors present in the Site shoreline area. Based on these findings, and in accordance with TMDP 3 of the DEQ Level II screening guidance (DEQ 1998), no further ecological investigation is necessary.

3.3 HOT SPOT DETERMINATION AND VOLUME OF CONTAMINATED MEDIA

Oregon cleanup rules require the identification of "hot spots" of contamination. The rules also require that the remedial action selected for a site treat hot spots to the extent feasible. For soil, hot spots are defined as areas with contaminants that pose a human health risk greater than 1 x 10^{-4}, or a non-cancer hazard quotient greater than 10. For water, hot spots are defined by having contaminants that would have a significant adverse effect on the beneficial use of the water (e.g., exceed safe drinking water standards in a domestic water well), and for which treatment would be likely to restore the beneficial use within a reasonable time.

In the approved FFS, EWEB made the following comments concerning hot spots:

> "For the Site, default hot spots (based on concentration) were identified for selected contaminants in soil and MGP waste/residual material. Maximum Site concentrations were compared with RBCs for full-time workers modified to represent hot spot risk levels identified in DEQ risk assessment guidance. Hot spots were assessed using this default approach for the following reasons: Site conditions make it impractical to treat or excavate all MGP-affected Site soils; EWEB will continue Site ownership; the anticipated remedial approach incorporates engineering and institutional controls and a Site management plan that prevent exposure to Site contaminants. Based on these discussions with DEQ and Site management considerations, Site-specific hot spot levels were never calculated or required to be calculated in the HHRE. In addition, if Site-specific hot spot calculations were performed, it is possible that hot spot soils would not be identified or would be further localized and perhaps limited to the two remnant structures containing high-concentration MGP residuals at depth—the first gas plant building and the small relief holder locations. (Under the recommended remedial alternative discussed later in this FFS, these high-concentration residuals will be removed.)"

3.3.1 Groundwater

Since contaminants at the site do not pose a significant adverse effect on beneficial uses of the groundwater or surface water, the contaminant plume in shallow groundwater at the site does not meet the definition of a hot spot.

3.3.2 Contaminated Soil

Approximately 22,000 cubic yards of upland soil contain one or more contaminants in excess of numerical remedial action objectives, much of it present at levels in excess of DEQ generic hot spot values (DEQ 1998, updated May 31, 2005).

Shoreline soils comprise an additional 2,800 cubic yards of contaminated material, very little of which exceeds DEQ generic hot spot values.

In the upland Core Area of the Site, concentrations of selected PAHs in shallow and subsurface soil at some locations and depths, and benzene in deep (approx. 10-18 ft bgs) subsurface soil at BH-12, exceed DEQ generic hot spot concentrations (DEQ 1998, updated May 31, 2005). For the PAHs, the principal compound exceeding DEQ generic hot spot levels is benzo[a]pyrene (BaP). These Core Area soils meet the concentration based hot-spot criteria under DEQ environmental cleanup rules. Current exposure to these soils is limited by the existing cap (and gravel base-course) covering the site.

Using existing data, DEQ has estimated a volume soils exceeding hot-spot concentration. This estimate was made for the upland Core Area of the Site. Up to 50 to 75 percent of the subsurface soil in the Core Area potentially could exceed the DEQ generic hot spot levels (principally for BaP) based on existing information. This estimate suggests that the volume of hot spot soil for this area could be in the range of 10,000 to 15,000 yd^3 (15,000 to 22,500 tons) if excavated. DEQ recognizes that the existing data collected for the remedial investigation was focused on anticipated contaminated areas and perimeter areas in order to delineate the limits of affected soil at the Site. As a result, this volume is only an estimate and it is based on the hypothetical assumption that subsurface soils would be excavated and exposed to receptors in the absence of any Site controls. This volume estimate includes high-concentration residuals/waste beneath the First Gas Plant building location and within the Small Relief Holder foundation.

This hot-spot volume estimate excludes potential hot-spot soils beneath the bike path and the shoreline portion of the site. This area contains a large quantity of variable-thickness clean fill overlying a relatively thin zone of contaminated soil, complicating accurate estimation. Subsurface soil at one location (HA-3), adjacent to the river, contains BAP at concentrations in excess of DEQ generic hot-spot levels. This material does not currently meet the definition of a hot spot as it is not mobile and currently poses no risk to site users or ecological receptors. The contaminants contained in these subsurface soils could be of concern if they were highly disturbed and exposed in an uncontrolled manner at the surface.

3.3.3 Waste Materials

The material beneath the first gas house location and within the small relief holder foundation contains generic hot spot levels of benzene by the volatilization to indoor air pathway and PAHs by the direct contact pathway. The high-concentration residuals/waste and oily liquid removed from one vault at the large gas holder foundation also exhibited high concentrations of benzene and PAHs.

Included in the 22,000 cubic yards of contaminated upland soil and waste are MGP residues consisting of:

- An estimated 1,085 cubic yards of MGP residue beneath the first gas house location,
- 65 cubic yards (likely maximum) of residuals/waste contained in the small relief holder foundation, and
- 250 cubic yards (likely maximum) of contaminated fill within the former tar tank (1,500-gallon of hydrocarbon liquids were removed in an interim action in 1999).

The waste material remaining at these subsurface structures appears stable currently due to the form of the waste, the containment provided by remaining foundation structures, or the removal of mobile liquids already performed (i.e., the tar tank and first vault discovered at the large gas holder foundation). However, if any structures containing mobile waste were to fail in the future, the resulting subsurface release of high concentration MGP wastes could change subsurface conditions at the site.

3.4 PILOT TESTS AND INTERIM REMEDIAL ACTIONS

An interim remedial action occurred at the Site in 1999 involving the tar tank described in Section 3.1.5. This was a removal site evaluation conducted in accordance with Oregon statutes. Approximately 1,500 gallons of hydrocarbon liquids were removed from the tar tank structure and recycled offsite in accordance with applicable regulations.

4. DESCRIPTION OF REMEDIAL ACTION OBJECTIVES AND OPTIONS

4.1 REMEDIAL ACTION OBJECTIVES

Acceptable risk levels, as defined in OAR 340-122-115(1) through (6), and remedial action objectives were developed based on the identified land and water uses, exposure pathways and the risk assessment. Acceptable risk levels and remedial action objectives can be developed based on removal of Site contaminants and/or implementation of engineering and institutional controls to prevent any contaminants that might remain at the Site from causing an unacceptable risk to human and ecological receptors.

4.1.1 Numerical Remedial Action Objectives

The remedial actions for soil will be guided by numerical remedial action objectives (NRAOs) based on risk-based screening levels rather than Site-specific cleanup levels. Remedial actions based on these NRAOs are protective for the potential exposure pathways listed. Should alternative or contingent remedial actions be considered in the future, Site-specific cleanup levels may be developed in cooperation with DEQ and applied in lieu of the NRAOs.

The following numerical remedial action objectives were developed to protect industrial site workers and excavation workers. Remedial action objectives for carcinogenic chemicals are based on a $1X10^{-6}$ cancer risk, while non-carcinogenic chemicals are based on a Hazard Index (HI) of 1. Soils that contain chemicals in excess of remedial action objectives will require action to prevent unacceptable human exposure.

NUMERICAL SOIL REMEDIAL ACTION OBJECTIVES
Eugene Former Manufactured Gas Plant Site

HAZARDOUS SUBSTANCE	INDUSTRIAL CONCENTRATION	DEQ EXCAVATION WORKER CONCENTRATION	BASIS AND PRIMARY EXPOSURE PATHWAY
Cyanide	610	5,100	HI=1 Direct contact

NUMERICAL SOIL REMEDIAL ACTION OBJECTIVES Eugene Former Manufactured Gas Plant Site			
HAZARDOUS SUBSTANCE	INDUSTRIAL CONCENTRATION	DEQ EXCAVATION WORKER CONCENTRATION	BASIS AND PRIMARY EXPOSURE PATHWAY
Total Mercury	310	2,600	HI=1 Direct contact
2-Methylnaphthalene	23*	16,000*>Csat	HI=1 Direct contact
Acenaphthylene	23*	16,000*>Csat	HI=1 Direct contact
Benz[a]anthracene	2.7	590>Csat	$1x10^{-6}$ Risk, Direct Contact
Benzo[a]pyrene	0.27	59>Csat	$1x10^{-6}$ Risk, Direct Contact
Benzo[b]fluoranthene	2.7	590>Csat	$1x10^{-6}$ Risk, Direct Contact
Benzo[g,h,i]perylene	23*	16,000*>Csat	HI=1 Direct contact
Benzo[k]fluoranthene	27	5,900>Csat	$1x10^{-6}$ Risk, Direct Contact
Chrysene	270	59,000>Csat	$1x10^{-6}$ Risk, Direct Contact
Indeno[1,2,3-cd]pyrene	2.7	590>Csat	$1x10^{-6}$ Risk, Direct Contact
Naphthalene	23	16,000>Csat	HI=1 Direct contact
Phenanthrene	23*	16,000*>Csat	HI=1 Direct contact
Benzene	34	9,500>Csat	$1x10^{-6}$ Risk, Direct Contact

NOTES:
The numerical remedial action objective values for soil are risk-based concentrations (RBCs) from DEQ's 2003 RBDM, as updated 2012. Cyanide numerical remedial action objective is from USEPA's Region Screening Level (RSL) Summary Table, May 2011. Direct contact includes soil ingestion, dermal contact, and inhalation.

1) Soil units shown are in mg/kg, or ppm.
2) Cumulative excess cancer risk for all carcinogens shall not exceed $1x10^{-5}$

NUMERICAL SOIL REMEDIAL ACTION OBJECTIVES Eugene Former Manufactured Gas Plant Site			
HAZARDOUS SUBSTANCE	INDUSTRIAL CONCENTRATION	DEQ EXCAVATION WORKER CONCENTRATION	BASIS AND PRIMARY EXPOSURE PATHWAY
3) The soil numerical remedial action objective for benzene in indoor air (vapor intrusion into buildings) is 1.2 mg/kg (DEQ 2003 RBDM, as updated 2012). * Surrogate value based on toxicity data for naphthalene.			

4.1.2 Media Specific Remedial Action Objectives

Site-specific remedial action objectives (RAOs) were developed for surface and subsurface soil in the upland and shoreline areas including soil and high-concentration residuals/waste materials at two former MGP structures for the purpose of achieving protection of human health and the environment, as required by OAR 340-122-040. The RAOs for these site areas are as follows:

- Prevent industrial and excavation worker exposure to upland soils containing contaminants of concern (COCs) above the numerical soil remedial action objectives (NRAO)s, and limit future public and worker exposure to contaminated subsurface soil in the shoreline area to acceptable levels.
- Prevent exposure to future site occupants/workers from vapor intrusion of benzene into indoor spaces above the numerical NRAOs.
- Ensure continued shoreline stability to prevent erosion of upland or shoreline subsurface soil, to prevent the unintentional dispersal of soil contaminants to the Willamette River, and to prevent public and worker exposure to subsurface soil.
- Minimize or control infiltration of rainwater through contaminated soil in upland Site area to prevent possible mobilization of contaminants to the Willamette River.

- Treat (or excavate and dispose offsite) soil/waste material hot spots identified in Section 3.3 above, to the extent feasible considering the criterion in OAR 340-122-0085(7) and the balancing factors in OAR 340-122-0090(3).

4.2 REMEDIAL ACTION ALTERNATIVES

General response actions and remedial technologies were screened in the FFS. The general response actions included no action, institutional controls, engineering controls, and soil and high-concentration residuals/waste material excavation with off-site disposal or recycling. Viable response actions and technologies that can meet the RAOs were assembled into remedial action options or alternatives.

All alternatives in the FFS, except the no action alternative, included measures to inspect and to maintain the riverbank at the shoreline area, including stabilization enhancements as necessary. Because of limited erosion observed along a part of the shoreline since the FFS was completed, an FFS Addendum was prepared to describe a general approach to bank stabilization using engineering controls focused on natural elements to the extent possible. This approach is incorporated as a shoreline bank stabilization action (BSA) under Alternative 2, and under Alternative 3A, which incorporates Alternative 2.

4.2.1 Alternative 1: No Action

OAR 340-122-0085(2) requires that a no action alternative be evaluated as a remedial action alternative. The no action alternative assumes that no action is taken, no monitoring is performed, no engineering and institutional controls are implemented, and no remedial costs are incurred.

4.2.2 Alternative 2: Engineering and Institutional Controls

Alternative 2 includes engineering controls (primarily capping and shoreline bank stabilization) combined with institutional controls.

Asphalt pavement in the upland area at the northeast fence line would be completed to provide a continuous cap structure throughout the upland portion of the Site. This area would be expanded slightly along the northeast fence line to cover the existing strip not covered by asphalt pavement, so that all soil at the upland portion of the Site would be covered with a minimum 3-in.-thick asphalt pavement. The gravel ballast in the existing substation is suitable for preventing any contact or erosion of contaminated soil in this area under current use and would be maintained.

The BSA would involve stabilizing the riverbank at the shoreline area using a combination of native vegetation, natural rock and bioengineering treatments. The BSA would focus on the lower bench area, and areas immediately upstream and downstream of the bench (up to 350 ft of riverbank area), which occur generally below ordinary high water level (approximately 410 ft elevation). The BSA would address potential bank instability and be designed to contain and prevent exposure of contaminants in subsurface soil/fill within the lower bench area and be designed to protect Willamette River surface water and sediment. A design for the BSA would be prepared following completion of additional topographic mapping, field inspection, geomorphic assessment and analysis of hydrologic data, including hydraulic modeling. The BSA final design would be subject to review and approval by DEQ and, potentially, other state and federal governmental agencies.

Institutional controls would include a DEQ-approved Easement and Equitable Servitude (E&ES) recorded in the county property records. The E&ES would require:

1) The Site may be used for industrial, commercial, and recreational purposes which satisfy RAOs;
2) Regular periodic inspection and maintenance of the cap and surface water drainage;
3) Regular periodic shoreline inspection to evaluate the continued stability of the shoreline area;
4) Prevent construction of structures for human occupancy, unless vapor-mitigation construction technologies are employed in building construction or other analyses are conducted to demonstrate that RAOs will be met;
5) Preparation and implementation of a site management plan (SMP) to address items 1 through 4 above. The SMP will address protocols for preventing worker exposure during maintenance of buried utilities or other activities that might result in worker exposure to contaminated soils, and for inspection and maintenance of the shoreline area including any implemented bank stabilization measures.

The E&ES will "run with the land" to ensure that future owners or lessees of the Site, if any, have knowledge of site conditions and the requirements of the E&ES. Future Site-specific analyses could be conducted to support other uses such as public open space or certain commercial development, including building structures, as long as RAOs are met and the analyses and findings are coordinated with DEQ.

Excluding BSA costs, Alternative 2 was estimated in the FFS to have combined current and future capital costs of $177,127 with an annual O&M cost of $13,900, which over a 30 year period, adjusted for inflation and interest, would produce a total O&M cost of $272,450, for a total project cost of $449,577[1]. Preliminary BSA costs were estimated in the FFS Addendum to

[1] The remedial alternative costs represent 2005 estimates presented in

range from $250,000 to $650,000, based on conceptual-level design information. For FS comparison purposes, the summed estimate for Alternative 2 is $700,000 to $1,100,000.

4.2.3 Alternative 3: Focused Soil and Residuals/Waste Removal at Former MGP Structures and Engineering and Institutional Controls

Alternative 3 incorporates all of the engineering and institutional controls in Alternative 2. In the FFS, Alternative 3 included two future remedial alternatives (3A and 3B). Alternative 3A reflected actions consistent with EWEB's plan to relocate the Willamette Substation entirely off of the Site on adjacent EWEB property. Alternative 3B was similar to 3A, but included additional removal actions that would be implemented only if the substation were to be relocated on the Site. Because the Willamette Substation was relocated on adjacent property in 2008-09 (consistent with Alternative 3A), Alternative 3B is no longer being considered and is not retained. Alternative 3A is described below and the likely removal footprint is shown on Figure 6.

Alternative 3A

Under Alternative 3A, hot spot residuals/waste will be removed from beneath the first gas plant building location and from within the small relief holder foundation. This removal will occur at the first gas plant building after the DEQ issues the Record of Decision for the Site, and will occur at the small relief holder at the same time if an access agreement is reached with the City of Eugene for that portion of the holder on City property. Should the City or UO plan redevelopment work in the cul-de-sac or adjacent roadway prior to the issuance of the Record of Decision or implementation of the removal at the small relief holder foundation, the removal may be accelerated or modified as necessary with DEQ approval, and coordinated with the City and/or UO, and the DEQ to the extent needed. The two additional vaults at the large gas holder foundation will be assessed, and removals of any high-concentration residuals/waste and oily liquid will be performed during implementation of the removal actions at the other structures.

The completion of the substation reconstruction allows access to the first gas plant building location for removal of high-concentration residuals/waste. High-concentration residuals/waste removal from within the small relief holder foundation and two additional vaults within the large relief holder foundation would occur at the same time as the first gas plant removal if feasible. The removal at the relief holder foundation will occur after an access agreement is reached with the City because approximately half of the MGP structure is located beneath the City of Eugene cul-de-sac.

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the final FFS report. The BSA costs were estimated in the FFS Addendum in 2010. The relative comparison of costs is not likely to have changed significantly since they were estimated.

High-concentration residuals/waste at the first gas plant building location will be removed and disposed of offsite, and a portion of any concrete foundation walls (if present) will be dismantled, as necessary, to accommodate future redevelopment plans. The dismantled concrete will be used as backfill in the lower portion of the empty structure. It is estimated that the upper 5 to 10 ft of any subsurface concrete foundation may be dismantled and placed within the structure. Following removal of the high-concentration residuals/waste, backfilling will be completed to grade using suitable materials, and the area will be capped to match the surrounding cap.

MGP residues will be removed from the vaults within the large relief holder concurrent with the removal beneath first gas plant building location. The vaults will be backfilled to grade using suitable materials and capped to match the surrounding cap.

Prior to any further development of the existing roadway along the southern portion of the Site by UO, City of Eugene, or other entity, high-concentration residuals/waste present within the small relief holder will be removed and disposed of offsite. These residuals/waste occur within a vertical concrete ring-wall structure (approximately 4 ft tall assumed remaining) that rests upon a substantial concrete holder foundation. The holder foundation is estimated to be 4 ft thick with the top present at approximately 6 ft below current grade. The base foundation is not proposed for removal, however, the ring-wall concrete structure would be removed and placed as fill on the Site or disposed of offsite. Following removal of the concrete ring-wall and high-concentration residuals/waste within the relief holder structure, backfill will be added to grade using suitable materials, and the areas will be paved or capped with concrete to match the surrounding cover. Ideally, the high-concentration residuals/waste within the entire relief holder would be removed around the same time that the high-concentration residuals/waste are removed from the first gas plant building location.

It is assumed that the upper approximately 1 ft of asphalt and underlying base material would be managed as construction debris. Measures to control vapors and airborne dust during excavation would be implemented during removal actions. Shoring would be required where necessary to protect adjacent aboveground structures. For costing purposes, it is assumed that half of any excavated soil/fill/residuals/waste materials removed would be disposed of at a local landfill and half would be hazardous waste and disposed of at a RCRA landfill (i.e., Arlington, Oregon). Sampling during remedy implementation will determine the appropriate recycling or disposal approach for the excavated materials.

The eastern portion of the former substation footprint which overlapped with the footprint of the former MGP would be paved with asphalt (capped) after the removal action at the first gas plant location is completed. In the FFS, this unpaved area was estimated to be approximately 9,125 ft^2. The asphalt cap would be contiguous with the other paved areas and would cover all remaining upland contaminated soils above the numerical soil remedial goals.

Excluding BSA costs (preliminarily estimated in the FFS Addendum at $250,000 to $650,000) and future vault assessment/removal costs (preliminarily estimated by EWEB at $60,000), Alternative 3A was estimated in the FFS to have the same capital and O&M costs as Alternative 2, with an added $1,408,648 in capital costs for removal and disposal of high-concentration residuals/wastes, for a combined project cost of $1,766,979. The cost estimate for 3A in the FFS is likely conservative based on assumptions that contain significant uncertainty, including, for example, that half of the excavated material would require disposal at a hazardous waste landfill. For purpose of comparison in the FFS, the summed estimate for Alternative 3A is $2,080,000 to $2,480,000.

4.2.4 Alternative 4: Deep Soil Removal in Core Area, Residuals/Waste Removal at Former MGP Structures, Shoreline Bulkhead Construction, and Engineering and Institutional Controls

Alternative 4 incorporates Alternative 3A and includes additional (deeper) soil removal from the Core Area (see Figure 7). Alternative 4 also includes substantial stabilization measures for the shoreline area (i.e., bulkhead construction) rather than the less intrusive BSA measures included in Alternative 2 and 3A. In addition to the cap placement and soil and high-concentration residuals/waste removal actions described in Alternative 3A, an additional 18,400 yd^3 of contaminated soil, of which up to 15,000 cubic yards could exceed DEQ generic hot spot levels, would be removed to a depth of 15 ft in the upland Core Area. Additional shoring and dust/vapor control measures would be needed similar to those described for Alternative 3A. Various methods could be considered for recycling or offsite disposal of the removed soil depending on its chemical characteristics. Removed soil would be replaced with clean fill. For costing purposes for the additional soil removed in this alternative, it is assumed that half of the excavated soil would be disposed of at a local landfill and half of the soil would be hazardous waste and disposed of at a RCRA landfill (i.e., Arlington, Oregon). Sampling during remedy implementation would be used to determine the appropriate recycling or disposal options for the excavated materials.

This alternative also includes construction of a massive shoreline bulkhead structure along the Site to enhance shoreline stability. Riprap or bioengineered bank stabilization type structures could be used behind the bulkhead on the flat shoreline area (bench) to complete the armoring and stabilization of the riverbank.

Excluding future vault assessment/removal costs (preliminarily estimated by EWEB at $60,000), Alternative 4 was estimated in the FFS to have combined current and future capital costs of $9,436,937 with an annual O&M cost of $102,896, which over a 30 year period, adjusted for inflation and interest, would produce a total O&M cost of $2,016,896, for a total project cost of

$11,453,739. This cost estimate is conservative and based on assumptions that contain significant uncertainty, including, for example, that half of the excavated material would require disposal at a hazardous waste landfill. For purpose of comparison in the FFS, the summed estimate for Alternative 4 is $11,515,000.

5. EVALUATION OF REMEDIAL ACTION OPTIONS

5.1 EVALUATION CRITERIA

The criteria used to evaluate the remedial action alternatives described in Section 5 are defined in OAR 340-122-090, and establish a two-step approach to evaluate and select a remedial action. The first step evaluates whether a remedial action is protective; if not, the alternative is unacceptable and the second step evaluation is not required. The remedial alternatives considered protective are evaluated and compared with each other using five balancing factors. The five balancing factors are 1) effectiveness in achieving protection, 2) long-term reliability, 3) implementability, 4) implementation risk, and 5) reasonableness of cost, as well as treatment (or excavation and offsite disposal) of hot spots to the extent feasible.

5.2 PROTECTIVENESS

The protectiveness of a given remedial action is evaluated by comparing actual or estimated future COC concentrations to the DEQ acceptable risk levels. The site uses and exposure pathways for which the concentrations of COCs exceeds the acceptable risk level are:

- Direct contact with contaminated soil for site workers
- Direct contact with contaminated soil for excavation workers
- Vapor intrusion to indoor air

The protectiveness of each remedial action alternative is also evaluated for its ability to ensure: 1) continued shoreline stability to prevent direct exposure to contaminants and to prevent erosion of upland or shoreline area soil and the potential for unintentional dispersal of contaminants to the Willamette River; and, 2) Site contaminants will not cause an exceedance of an acceptable risk level in the Willamette River surface water and sediment.

OAR 340-122-090 states that protectiveness may be achieved by any of the following methods:

- Treatment

- Excavation and off-site disposal
- Engineering controls
- Institutional controls
- Any other method of protection
- A combination of the above

With the exception of hot spots, there is no preference for any one of the above methods for achieving protectiveness. Where a hot spot has been identified, OAR 340-122-090(4) establishes a preference for treatment (or excavation and offsite disposal) to the extent feasible, including a higher threshold for evaluating the reasonableness of costs for treatment and consideration of the five balancing factors.

5.2.1 Alternative 1 - No Action

Alternative 1 would not take any action to minimize potential human or environmental exposure. The potential for future exposure of occupational or excavation workers exposed to soil that exceed the acceptable risk levels would still exist. Therefore, Alternative 1 is not protective and will not be evaluated further.

5.2.2 Alternative 2 – Engineering and Institutional Controls

Alternative 2 prevents industrial worker contact with contaminated soils by maintaining an asphalt cap over the upland portion of the site. BSA engineering controls at the shoreline area prevent or minimize potential worker or visitor exposure to subsurface contaminated soil/fill and the potential for unintentional dispersal of soil/fill contaminants to the Willamette River. The BSA controls are designed to prevent an exceedance of an acceptable risk level in the Willamette River surface water and sediment. Construction and excavation worker exposure to contaminated soils is controlled through a site management plan requiring proper training and personal protective equipment when working around contaminated soils. The potential for vapor intrusion to indoor air is managed by a deed restriction limiting construction of buildings or requiring vapor mitigation construction techniques.

Alternative 2 meets the protectiveness criteria and will be carried forward for further evaluation.

5.2.3 Alternative 3A – Focused Soil and Residuals/Waste Removal at Former MGP Structures, and Engineering and Institutional Controls

Alternative 3A incorporates all elements of Alternative 2, and so is protective and will be evaluated further.

5.2.4 Alternative 4 - Deep Soil Removal in Core Area, Residuals/Waste Removal at Former MGP Structures, Shoreline Bulkhead Construction, and Engineering and Institutional Controls

Alternative 4 limits exposure to contaminated soils by removing them. It is protective and will be evaluated further.

5.3 BALANCING FACTORS AND TREATMENT OF HOT SPOTS

The remedial action alternatives determined to be protective are evaluated against the following balancing factors defined in OAR 340-122-090(3):

- **Effectiveness in achieving protection.** The evaluation of this factor includes the following components, as appropriate:
  - Magnitude of the residual risk from untreated waste or treatment residuals, without considering risk reduction achieved through on-site management of exposure pathways (e.g., engineering and institutional controls). The characteristics of the residuals are considered to the degree that they remain hazardous, taking into account their volume, toxicity, mobility, propensity to bio-accumulate, and propensity to degrade.
  - Adequacy of any engineering and institutional controls necessary to manage residual risks.
  - The extent to which the remedial action restores or protects existing or reasonably likely future beneficial uses of water.
  - Adequacy of treatment technologies in meeting treatment objectives.
  - The time until remedial action objectives are achieved.
- **Long-term reliability.** The following components are considered when evaluating this factor, as appropriate:
  - The reliability of treatment technologies in meeting treatment objectives.
  - The reliability of engineering and institutional controls needed to manage residual risks, taking into consideration the characteristics of the hazardous substances being

managed, the ability to prevent migration and manage risk, and the effectiveness and enforceability over time of the controls.

- The nature and degree of uncertainties associated with any necessary long-term management (e.g., operations, maintenance, monitoring).

- **Implementability.** This factor includes the following components:

  - Practical, technical, legal difficulties and unknowns associated with the construction and implementation of the technologies, engineering controls, and/or institutional controls, including the potential for scheduling delays.

  - The ability to monitor the effectiveness of the remedy.

  - Consistency with regulatory requirements, activities needed to coordinate with and obtain necessary approvals and permits from other governmental bodies.

  - Availability of necessary services, materials, equipment, and specialists, including the availability of adequate treatment and disposal services.

- **Implementation Risk.** This factor includes evaluation of the potential risks and the effectiveness and reliability of protective measures related to implementation of the remedial action, including the following receptors: the community, workers involved in implementing the remedial action, and the environment; and the time until the remedial action is complete.

- **Reasonableness of Cost.** This factor assesses the reasonableness of the capital, O&M, and periodic review costs for each remedial alternative; the net present value of the preceding; and if a hot spot has been identified at this site, the degree to which the cost is proportionate to the benefits to human health and the environment created through treatment of the hot spot. The costs presented below include 2005 estimates from the FFS which have not been adjusted to reflect current costs, but are reasonable estimates to evaluate and compare the remedial alternatives.

  In general, the least expensive remedial action is preferred unless the additional cost of a more expensive corrective action is justified by proportionately greater benefits to one or more of the other balancing factors. For sites with hot spots, the costs of remedial actions must be evaluated to determine the degree to which they are proportionate to the benefits created through restoration or protection of beneficial uses of water. A higher threshold is used for evaluating the reasonableness of costs for treatment or excavation

and offsite disposal of hot spots than for remediation of areas other than hot spots. The sensitivity and uncertainty of the costs are also considered.

- **Treatment or Excavation and Disposal of Hot Spots.** Where a hot spot has been identified, OAR 340-122-090(4) establishes a preference for treatment (or excavation and off-site disposal) to the extent feasible considering the five balancing factors listed above and including a higher threshold for evaluating the reasonableness of costs for treatment.

5.4 EVALUATION OF BALANCING FACTORS

This section evaluates each of the remedial action alternatives that met the protectiveness criteria against the balancing factors described in Section 5.3. The sections below summarize the major conclusions of this comparison and provide additional discussion for differentiating issues at this site.

5.4.1 Alternative 2 - Engineering and Institutional Controls

Effectiveness: Engineering controls (primarily asphalt cap and shoreline BSA) combined with institutional controls would be an effective means of preventing uncontrolled access and exposure of Site workers to soil in the upland portion of the Site (including potential exposure to contaminated indoor air), and exposure of Site workers and visitors to contamination in subsurface soil/fill at the shoreline area. However, the concentrations of CoCs would not be reduced (e.g., as in a removal action), and shallow contaminated soils, including soils exceeding DEQ generic hot spot levels contained therein, would remain at the Site under this alternative. Where the contaminated soils are covered, there is no unacceptable risk except potentially during excavation for utility work or other intrusive construction activity. Site access would be controlled in the upland area, and an SMP (and associated health and safety protocols) would guide any excavation or other intrusive subsurface work for utility maintenance or construction across the Site. Both the upland and shoreline areas would be periodically inspected. The BSA measures are considered effective at controlling or managing shoreline instability. The continued stability of the shoreline would be managed through institutional controls, including periodic inspections and assessment of activities and conditions in the area that might affect shoreline stability and conducting any needed maintenance.

Long-Term Reliability: Engineering controls (asphalt capping and shoreline BSA) and institutional controls are reliable in the long term if they continue to be implemented, monitored, and maintained. A DEQ-approved Easement and Equitable Servitude will require the cap and shoreline BSA controls to be monitored, maintained, and that the institutional controls remain in

place. The long-term reliability of the cap would be ensured through restrictions on cap disturbance and annual inspection and maintenance measures. Capping is an established and effective means of stabilizing and isolating soil contaminants, and the technology has been demonstrated as an effective means of controlling contact and movement (erosion) of contaminated soil. Overall, BSA engineering controls are reasonably reliable long-term when inspections and maintenance are integrated in an SMP. Subsurface soils and high-concentration residuals/waste at former MGP structures which are above DEQ generic hot spot levels would remain at the Site under this alternative.

Implementability: Capping is technically and administratively feasible. Equipment and procedures for installing and maintaining asphalt pavement are readily available. Most of the outdoor areas are already paved, so the additional paving required under this option would be minimal. Some short-term disruption to the bike path area would occur during paving. Existing pavement would need to be evaluated to make sure it is in acceptable condition. Future replacement pavement would need to meet minimum design specifications equivalent to the existing cap. All paved areas would require periodic inspections and long-term maintenance. The BSA measures would require a comprehensive permitting/authorization process and various Site controls for implementation (e.g., temporary rerouting of the main bike path and other environmental controls at the shoreline to meet regulatory requirements). Inspections and monitoring of the shoreline area would be needed, and especially short-term, to confirm that vegetation controls are established, and RAOs are met. The permitting/authorization process for the BSA could affect the approach and final design of bank stabilization measures used.

The institutional controls could be readily implemented. Access restrictions and Site security are already in force and would need to be reviewed for appropriateness in the context of Site remediation. Other key institutional controls (e.g., SMP and land use restrictions) could be easily prepared and implemented.

Implementation Risk: The risk to remediation workers, EWEB employees, and the general public during implementation of capping and institutional controls would be extremely low. Although theoretically some contaminated soil might be temporarily exposed during preparation for additional paving, this exposure can be readily addressed through construction safety plans. No other potential short-term exposures are anticipated during capping and institutional controls. The shoreline work would require the use of heavy machinery and construction activity over irregular terrain and in a sensitive environment. The potential impacts to human health and the environment from these activities would be generally controllable by adhering to appropriate safety, construction and environmental protocols. . Measures would be implemented to prevent and to control the disturbance of subsurface materials and the potential release of Site contaminants to the river environment.

Reasonableness of Cost: Over a 30-year project life, Alternative 2 costs were estimated in the FFS to represent an equivalent present value of approximately $450,000 excluding BSA costs. Preliminary costs for the BSA were estimated in the FFS Addendum to range from $250,000 to $650,000, based on conceptual-level design information. Using this information, the combined cost for Alternative 2 is estimated at $700,000 to 1,100,000.

Hot Spots

Alternative 2 does not treat (excavate or remove) any soil hot spots at the site.

5.4.2 Alternative 3A– Focused Soil and Residuals/Waste Removal at Former MGP Structures, and Engineering and Institutional Controls

Effectiveness: In addition to the measures of Alternative 2 (Engineering and Institutional Controls), Alternative 3A includes the removal of high-concentration residuals/waste from beneath the first gas plant building location and from within the small relief holder foundation. Removal of high-concentration residuals/waste from beneath the first gas plant building location and small relief holder foundation addresses Oregon's preference for excavation and offsite disposal of hot spots by removing the highest concentration materials. Excavation is an effective remedial action because it completely eliminates the contaminants in those areas. The continued stability of the shoreline area would be managed through institutional controls, including periodic inspections and assessment of activities in the area that might affect future shoreline stability, and conducting any needed maintenance.

The existing pavement cover provides Site control for potential exposure to underlying soil. Placement of an additional engineered cap in the upland area following any subsurface removal action under Alternative 3A would be an effective means of reducing risk of direct contact and infiltration in the future. An effective cap design could incorporate a design engineered for other Site uses as part of potential future redevelopment. The designed cap would also serve to further increase the long-term stability of soil by preventing erosion and infiltration of rainwater to deeper soil units.

Long-Term Reliability: The long-term reliability of soil and/or high-concentration residuals/waste removal from the structures is high because some contaminated materials are physically removed from the Site. The cap in the Core Area would stabilize the soil and restrict direct contact with underlying soil. Institutional controls in the shoreline area, including inspection and maintenance of the BSA, are reliable in the long term when performed in accordance with a site management plan.

Implementability: Under certain redevelopment options, any subsurface excavation at the Site would need to take into account the presence of remnant concrete structures (e.g., gas plant building substructure, small relief holder, large gas holder, tar tank, and other foundations), existing utilities, the need to stabilize surrounding property and structures, and the need to implement measures to minimize and control vapors and fugitive dust that would be generated during excavation. Portions of the subsurface concrete structures would need to be removed where necessary to accommodate redevelopment, representing additional waste handling and disposal issues. Areas at the Site available for soil staging are somewhat limited.

Implementation Risk: This alternative has a moderate implementation risk due to:

- Limited space for soil/debris staging and reloading adjacent to the excavation area
- Potential for emissions of potentially toxic or nuisance vapors and contaminated dust during excavation and transportation
- Potential for spilling during transportation of contaminated soil.

Although some limited areas are available at the site for soil staging, they would not be adequate for the anticipated soil volume. Direct loading of some excavated materials would be necessary to avoid interfering with adjacent EWEB operations and public areas. Vapors and dust could be managed by placing an enclosure (tent structure) over the work area with controlled ventilation.

Reasonableness of Cost: Attachment B includes an evaluation of the initial and recurring capital and annual (operation and maintenance) costs for Alternative 3A from the FFS, excluding BSA costs and costs to assess and remove high-concentration residuals/waste potentially present at the two additional vaults at the large gas holder foundation. Over a 30-year project life, these costs for Alternative 3A in the FFS represent an estimated present value of $1,767,000, based on likely conservative cost assumptions for the removal of high-concentration residuals/waste from structures. Preliminary costs for BSA were later estimated in the FFS Addendum to range from $250,000 to $650,000, based on conceptual-level design information. Future vault assessment and potential removal costs are preliminarily estimated by EWEB at $60,000. Using this information, the combined cost for Alternative 3A is estimated at $2,080,000 to $2,480,000.

Hot Spots

Alternative 3A addresses the preference for treatment (or excavation and offsite disposal) of soil hot spots by targeting high-concentration residuals/waste removal from beneath the first gas plant building, from the small relief holder, and the two additional vaults in the large relief holder foundation.

5.4.3 Alternative 4 - Deep Soil Removal in Core Area, Residuals/Waste Removal at Former MGP Structures, Shoreline Bulkhead Construction, and Engineering and Institutional Controls

Effectiveness: Similar to Alternative 3A, this alternative would permanently remove upland vadose zone soils and high-concentration residuals/waste exceeding remedial goals. The additional excavation of soil to the 15-ft depth would address portions of the deeper contamination that exceed numerical soil remedial goals and would protect utility or construction workers in the event deeper excavations are needed. Soil excavation is an effective remedial action for soils and any high-concentration residuals/waste in structures that can be feasibly removed, because it completely eliminates the contaminants in those areas. As noted under Alternative 3A, excavation is not an effective measure for subsurface soils in the shoreline area. Although not required to eliminate contact with contaminated soil, replacement of asphalt pavement would be part of the site redevelopment and would further increase the long-term stability of soil units by preventing erosion and infiltration of rainwater to deeper soil units.

Bulkhead construction at the shoreline would ensure long-term isolation of subsurface soil contaminants beneath the shoreline area and would reduce or eliminate the potential for future exposure and increased risk from erosion and subsequent dispersal of hydrocarbons to the river.

Long-Term Reliability: The long-term reliability of soil removal in the vadose zone is extremely high, because contaminated soil is physically removed from the Site. The long-term reliability of bulkhead construction can be ensured through restrictions on disturbance and annual inspection and maintenance measures. Use of a bulkhead structure is an historic, established means of enhancing the stability of urban/developed river shoreline areas and protecting them from long-term effects of erosion.

Implementability: Any subsurface excavation at the Site would need to take into account the presence of remnant concrete structures (e.g., gas plant building substructure, small relief holder, large gas holder, tar tank, and other foundations), existing utilities, the need to stabilize surrounding property and structures, and the need to implement measures to minimize and control vapors and fugitive dust that would be generated during excavation. Depending on the final Site use, portions of the subsurface structures would likely need to be removed, representing additional waste handling and disposal issues. Areas at the Site available for staging of excavated materials are limited considering the additional volume included in this alternative.

Bulkhead construction would require a comprehensive permitting process and various Site controls for its implementation (e.g., temporary rerouting of the main bike path and other environmental controls at the shoreline to meet regulatory requirements). Disruption to the bike path area would likely occur during shoreline area work because bulkhead structures would

likely need to be placed using heavy equipment located above the shoreline slope and possibly from a barge or platform in the river. Permitting for in-water and shoreline construction necessary to erect a bulkhead would be difficult and potentially infeasible because bulkhead structures are disfavored by permitting/authorizing governmental agencies.

Implementation Risk: Because of the large volume and depth of soils that would be excavated, Alternative 4 has a high implementation risk due to the concerns relative to soil management, including excavation procedures, soil staging, fugitive emissions, and soil transportation and disposal. Alternative 4 also has additional high implementation risks associated with construction of a bulkhead in the shoreline area. Working on the river bank would likely disturb contamination in soil/fill, which could result in the release of contaminants to the river.

Reasonableness of Cost: Over a 30-year project life, Alternative 4 costs from the FFS represent an equivalent present value of approximately $11,454,000. When factoring the additional remedial elements of Alternative 3A (i.e., vault assessment/potential removal at large gas holder), the combined cost for Alternative 4 is estimated at $11,515,000.

Hot Spots

Alternative 4 addresses Oregon's preference for the treatment (or excavation and offsite disposal) of hot spots by removing an increased volume of soil and high-concentration residuals/waste above DEQ generic hot spot levels.

6. COMPARATIVE ANALYSIS OF REMEDIAL ACTION ALTERNATIVES

In this section, the 3 protective remedial action alternatives are compared using the remedy selection criteria identified in Section 5.1.

6.1 Protectiveness:

Alternatives involving soil excavation in addition to engineering and institutional controls are considered more protective than Alternative 2. Alternative 4 is considered the most protective because it removes a large quantity of contaminated soil. Alternative 3A also is very protective.

6.2 Effectiveness:

Alternatives involving focused excavation and removal of contaminated soil, and any high-concentration residuals/waste removal from structures (Alternatives 3A and 4), are the most effective because they reduce the presence of contaminants in excess of numerical RAOs. Alternative 2 (i.e., engineered cap, BSA, and institutional controls) is considered less effective, because greater amounts of contamination would remain at the site. Therefore, Alternative 2 is considered the least effective and Alternative 4 is considered the most effective.

6.3 Long Term Reliability:

Similar to effectiveness, the relative long-term reliability of alternatives involving focused excavation and removal of soil and any high-concentration residuals/waste from structures is highest because it results in permanent reduction of soil contamination and removal of hot spot soils present within the projected excavation zones in the upland area. Alternatives 3A and 4 rated high, although maintenance of the pavement and (for Alternative 4) the more intrusive shoreline bulkhead are necessary to ensure long-term reliability. The use of engineering and institutional controls alone is less reliable in the long term compared to the other alternatives because the engineering controls depend on regular maintenance. Inspection and institutional controls can be made effective by use of an E&ES. Therefore, Alternative 2 alone is considered less reliable because it relies exclusively on engineering and institutional controls, and Alternative 4 is more reliable, although it relies on additional maintenance of a highly intrusive shoreline bulkhead.

6.4 Implementability:

In contrast to effectiveness and long-term reliability, the relative implementability of each alternative decreases as the complexity of the action increases. Although all technologies represent demonstrated remedial methods, intrusive soil excavation at the Site such as the deeper excavations under Alternative 4 presents moderate to high implementation concerns, including the management of buried concrete structures, need for extensive shoring, protection of existing underground utilities, inadequate areas for excavation, staging and loading, and significant control measures for vapors and fugitive dust. The construction of the more intrusive shoreline bulkhead in Alternative 4 would present high implementability issues. In-water and shoreline construction of the bulkhead structure would be more difficult, requiring a prolonged and potentially infeasible permitting process and mitigation of environmental impacts. In contrast, upland paving, less intrusive BSA measures, and institutional controls associated with Alternative 2 should be implemented more readily. Much of the upland Site area is already paved.

6.5 Implementation Risk:

Similar to implementability, the implementation risk of focused excavation and removal of soil, and any high-concentration residuals/waste from structures, is deemed moderate to high due to Site-specific issues, and therefore receives a lower score. Alternative 4 has a very low rating because there are potentially very high implementation risks associated with the deeper soil excavation and the more intrusive shoreline bulkhead construction. Additional implementation concerns associated with excavation (in particular the deeper excavation in Alternative 4) include limited space for soil/debris staging and reloading, the potential for onsite and offsite emissions of toxic or nuisance vapors and contaminated dust, shoring measures, potential damage to existing utilities, and transportation of contaminated soil. There are also added difficulties if implementing soil excavation and staging activities would occur in a public right-of-way. Alternative 4, which includes more intrusive shoreline bulkhead construction, is rated relatively low because in-water and shoreline construction of the bulkhead could potentially destabilize soils in the short term and result in the dispersal of Site contaminants to the river. In contrast, upland paving, less intrusive BSA measures and institutional controls (i.e., Alternative 2) would have lower associated risks. Therefore, Alternative 2 has the lowest implementation risk and Alternative 4 the highest.

6.6 Reasonableness of Cost:

Alternative 2 is the most cost reasonable in terms of current risk reduction. It is less than the cost of Alternative 3A while leaving little quantifiable residual risk with the implementation of engineering and institutional controls. However, Alternative 2 removes no hot spot materials, and Oregon Cleanup Rules provide a higher threshold of cost reasonableness for the treatment of

hotspots. Alternative 3A has the benefit of targeting the high-concentration residuals/waste at former subsurface structures, and removing it from the Site permanently. Alternative 3A would reduce risk by removing these residuals/wastes. The incremental effectiveness and long-term reliability represented by more extensive soil excavation and removal to the 15-ft depth and construction of the more intrusive shoreline bulkhead under Alternative 4 are not justified relative to the large additional cost represented by this more difficult alternative.

Based on current Site conditions and the comparative evaluation of Site-specific factors considered in the FFS, Alternative 3A (Focused Soil and Residuals/Waste Removal at Former MGP Structures, and Engineering and Institutional Controls) achieves RAOs that are protective of Site workers and the public and ranks superior to the other alternatives based on balancing of the remedy selection factors.

6.7 HOT SPOT

Alternative 2 does not address Oregon's preference for the treatment (or excavation and offsite disposal) of hot spots while Alternative 4 would remove the greater volume of DEQ generic hot spot materials. Alternative 3 proposes to remove an intermediate volume of DEQ generic hot spot materials from the site.

7. RECOMMENDED REMEDIAL ACTION ALTERNATIVE

On the basis of the detailed evaluation of the alternatives in Section 5 and 6, Alternative 3A, modified with contingencies described below, is recommended for implementation at the Site. Alternative 3A provides a balance of protectiveness, effectiveness, and reasonableness of cost, while still in part addressing DEQ's preference for the treatment of hot spots. This recommended remedial action applies to that portion of the EWEB property shown in green on Figure 4, and is referred to as the Management Area.

7.1 DESCRIPTION OF THE RECOMMENDED ALTERNATIVE

7.1.1 Removal of High-Concentration Residuals/Wastes

High-concentration residuals/waste will be removed at the two structures previously evaluated (i.e., first gas plant building location and small relief holder foundation) by excavation. This material will be disposed of properly after characterization. The removal of the material at the first gas plant location will follow DEQ issuance of the ROD.

Removal of the material from within the small relief holder foundation may occur at the same time unless coordination with the City on development of the adjoining roadway requires removing the material on a different schedule.

The two additional vaults at the large gas holder foundation will be assessed during implementation of the recommended removal actions at the other MGP structures. High-concentration residuals/waste and oily liquid will be removed from these additional structures. Any removed material will be disposed of properly after characterization.

7.1.2 Engineering Controls

Engineering controls will consist of completing an asphalt cap over the entire upland portion of the Management Area and implementing BSA measures at the shoreline area. Approximately 90% of the upland area is already capped with asphalt and under the recommended alternative, the remaining portions of the site will be capped with a minimum of three inches of asphalt. Cap inspection and maintenance will be included in the site management plan. EWEB may elect to

conduct additional analyses in the future to consider other cap/cover types as long as RAOs are met and any modifications to the cap/cover design are coordinated with DEQ.

The BSA measures will incorporate native vegetation, natural rock and bioengineering treatments at the shoreline area and will be designed to contain and prevent exposure of Site contaminants, and the potential unintentional dispersal of contaminants in subsurface soil/fill to the Willamette River. The BSA is intended to prevent habitat/ecological adverse impacts, including preventing Site contaminants from causing an exceedance of an acceptable risk level in the Willamette River surface water and sediment. The BSA design will consider factors such as flood events and Site and nearby shoreline configuration to ensure protectiveness. The BSA final design will be subject to review and approval by DEQ and, potentially, other state and federal governmental agencies.

7.1.3 Institutional Controls – Site Management Plan

A DEQ-approved site management plan (SMP) will be prepared for the Management Area, which will cover the following general topics:

1. Excavation worker health and safety. The site management plan will describe how work shall be conducted at the site, who can complete the work, what notifications will need to occur prior to work commencing, measures for personal protective equipment and training required to work on the site, and general protocols for excavating, storing, characterizing, and disposing of any excavation spoils from the site.

2. Cap Maintenance. The SMP will detail how and at what interval the cap will be inspected and outline any regularly scheduled cap maintenance that may be required.

3. Shoreline Inspection and Maintenance. The SMP will detail a shoreline inspection and maintenance plan designed to ensure that conditions in the shoreline area remain stable (i.e., no exposure or release of impacted soils or soil contaminants).

4. Shoreline Area and Bank Stabilization Measures. The SMP will include measures for monitoring and maintenance of the shoreline area, including any implemented bank stabilization measures and coordination with the DEQ as required.

5. DEQ Reporting. The SMP will detail a simple annual report form to be submitted to the DEQ containing records of excavation work at the site, cap maintenance/inspection, and shoreline inspection.

7.1.4 Institutional Controls – Easement and Equitable Servitude

A DEQ-approved Easement and Equitable Servitude (E&ES) will be recorded in the county property records with the following general requirements for the Management Area:

1. EWEB shall notify DEQ of significant developments at the site such as zoning changes, intent to convey the Site to a third party, or land use changes.

2. EWEB shall notify DEQ prior to any significant disturbance of the asphalt cap or shoreline area of the site. This would exclude cap maintenance or minor utility work involving subsurface exploration where limited worker exposure to contaminated soil is anticipated.

3. No wells for beneficial water use shall be installed on the Site, except that a dewatering well(s) may be installed with prior authorization from DEQ.

4. No buildings for human occupancy shall be constructed at the site (e.g., offices, shops, retail development, or residential development) unless additional Site-specific analyses are conducted in the future to demonstrate that RAOs would be met and the analyses are coordinated with and approved by DEQ, and aspects of the building construction to meet RAOs are approved by DEQ.

5. EWEB shall implement the site management plan as an attachment to the E&ES.

7.2 RESIDUAL RISK ASSESSMENT

OAR 340-122-084(4)(c) requires a residual risk evaluation of the recommended alternative that demonstrates that the standards specified in OAR 340-122-040 will be met, namely:

- Assure protection of present and future public health, safety, and welfare, and the environment

- Achieve acceptable risk levels

- Prevent or minimize future releases and migration of hazardous substances in the environment.

Under the recommended remedial action alternative, Site risks as presented in Section 3 will meet the protectiveness as required by OAR 340-122-0040 for unacceptable Site risks by applying the following measures.

- **Excavation Worker Scenario.** Risk from this scenario is reduced to acceptable levels through a site management plan that will be prepared to direct all future excavation activities.

- **Industrial Worker Scenario.** To address this risk, an asphalt cap will be placed over the upland portion of the Site, and cap inspections and maintenance will be included in the site management plan. As part of the institutional controls on the site, the property Easement and Equitable Servitude will contain a requirement that EWEB shall notify DEQ prior to any disturbance of the asphalt cap where worker exposure to contaminated subsurface soil is anticipated. EWEB may elect to conduct additional analyses in the future to consider other cap/cover types as long as RAOs are met and any modifications to the cap/cover design are coordinated with DEQ.

- **Potential Future Exposure to Vapor Intrusion to Buildings.** This scenario was assumed to be above acceptable risk levels assuming the buildings were for year-round occupancy based on limited exceedance of DEQ RBCs in deep soil. To address this risk, an institutional control will be included in the property Easement and Equitable Servitude. Specifically, no buildings for continuous human occupancy will be allowed on the site (no offices, shops, retail development, or residential development) unless additional site-specific analyses are conducted in the future to demonstrate that RAOs would be met and the analyses are coordinated with DEQ, and aspects of the building construction to meet RAOs are approved by DEQ.

- **Potential Exposure at Shoreline Area.** The recommended remedial action alternative, including the bank stabilization measures, will be designed to prevent or minimize potential exposure of Site workers and visitors to subsurface soil/fill contaminants in the shoreline area and the potential for unintentional dispersal of soil/fill contaminants to the Willamette River surface water and sediment.

8. APPENDIX

ADMINISTRATIVE RECORD INDEX

The Administrative Record consists of the documents on which the recommended remedial action for the site is based. The primary documents used in evaluating remedial action alternatives for the MGP site are listed below. Additional background and supporting information can be found in the project file located at DEQ Western Region Offices in Eugene, Oregon.

Appendix A

ADMINISTRATIVE RECORD AND SUPPORT DOCUMENTATION FOR RI/FS

Eugene Former Manufactured Gas Plant Site

Through December 2013

Administrative Record

Axelrod and Windward. 2007. Scoping approach for Level II (Screening) ecological risk assessment, Eugene Former MGP Site, prepared for Eugene Water & Electric Board by Axelrod LLC and Windward Environmental LLC, September 11, 2007.

Axelrod. 2008. Opportunistic shoreline probing during September 19 ecological habitat survey, Memorandum, Eugene Former MGP Site, prepared for Eugene Water & Electric Board by Axelrod LLC, February 13, 2008.

Axelrod and Windward. 2008. Focused work plan/sampling and analysis plan, Willamette River surface water sampling event, Eugene Former MGP Site, prepared for Eugene Water & Electric Board by Axelrod LLC and Windward Environmental LLC, December 3, 2008.

Axelrod and Windward. 2010a. Focused Soil/Fill Management Plan, Electric Transmission Line Construction Project – Eugene Former MGP Site, prepared for Eugene Water & Electric Board, August 31, 2010 (Draft).

Axelrod and Windward. 2010b. Removal Action at Gas Holder Foundation, Eugene Former MGP Site, Technical Memorandum, DEQ Review Draft, December 8, 2010.

Axelrod and Windward. 2011. Field Activity Summary - Focused Soil/Fill Management Plan, Eugene Former MGP Site, prepared for Eugene Water & Electric Board, April 2011.

Axelrod, Otak, and Windward. 2011. Focused feasibility study addendum – Eugene Former MGP Site, prepared for Eugene Water & Electric Board, by Axelrod LLC with support from Otak Inc. and Windward Environmental LLC, July 2011.

Axelrod. 2011. Letter from Russ Axelrod/Axelrod LLC to Geoff Brown/DEQ regarding EWEB Second Source Water Supply Evaluation – Supplemental Information for Administrative Record for MGP Site, June 11, 2012.

DEQ. 1995. Letter dated July 27, 1995, from Keith Andersen, DEQ to D. Unfried, EWEB, regarding addition of MGP site to the Environmental Cleanup Site Information System (#1723) and recommendation for inclusion on the Confirmed Release List. DEQ, Western Region Cleanup Program, Eugene, OR.

DEQ. 1996a. File Review Summary, Eugene Former Manufactured Gas Plant Site. DEQ, Western Region Cleanup Program, Eugene, OR.

DEQ. 1996b. Letter dated November 20, 1996, from M. Wahl, DEQ, to D. Unfried, EWEB, regarding notice to owners and operators of decision to list contaminated property, Eugene former MGP. DEQ, Western Region Cleanup Program, Eugene, OR.

DEQ. 1998a. Memorandum dated March 31, 1998, from B. Mason, DEQ, to D. Unfried, EWEB, approving field sampling plan for focused groundwater investigation with limited comments, Eugene former manufactured gas plant site. DEQ, Western Region Cleanup Program, Eugene, OR.

DEQ. 1998b. Intergovernmental Agreement for Remedial Investigation/Feasibility Study (DEQ No. WMCVC-WR-98-13) between EWEB and DEQ, November 25, 1998, including Attachment B (Voluntary Cleanup Program Remedial Investigation/Feasibility Study Scope of Work, September 23, 1998).

DEQ. 1999a. News Release dated January 7, 1999, DEQ and EWEB Sign Agreement for Cleanup, regarding intergovernmental agreement signed by DEQ and EWEB for Eugene former manufactured gas plant site. DEQ, Western Region Cleanup Program, Eugene, Oregon.

DEQ. 1999b. Letter dated January 27, 1999, from M. McCann, DEQ, to D. Unfried, EWEB, regarding approval of project documents (ISI Work Plan [PTI 1995], ISI Report [PTI 1996], FGI FSP [Exponent 1998], FGI Results [Exponent 1998]), Eugene manufactured gas plant site. DEQ, Western Region Cleanup Program, Eugene, OR.

DEQ. 1999c. Letter dated January 27, 1999, from M. McCann, DEQ, to D. Unfried, EWEB, regarding approval of Phase I remedial investigation work plan with direction to address limited DEQ comments in later report or in future project meeting, Former Eugene manufactured gas plant site. DEQ, Western Region Cleanup Program, Eugene, OR.

DEQ. 1999d. News Release dated October 22, 1999, Emergency Waste Removal Planned at Eugene Site, regarding planned removal of liquid waste from former tar containment tank. DEQ, Western Region Cleanup Program, Eugene, OR.

DEQ. 1999e. Letter dated October 28, 1999, from M. McCann, DEQ, to D. Unfried, EWEB, regarding approval of plan for liquids removal from tar tank structure at former Eugene manufactured gas plant site. DEQ, Western Region Cleanup Program, Eugene, OR.

DEQ. 1999f. Letter dated December 3, 1999, from M. McCann, DEQ, to D. Lawder, EWEB, regarding approval of Level 1 ecological risk assessment, former Eugene manufactured gas plant site. DEQ, Western Region Cleanup Program, Eugene, OR.

DEQ. 2001a. Letter dated January 4, 2001, from M. McCann, DEQ, to D. Lawder, EWEB, regarding approval of final Phase I Remedial Investigation completed at former Eugene manufactured gas plant site. DEQ, Western Region Cleanup Program, Eugene, OR.

DEQ. 2001b. Letter dated January 4, 2001, from M. McCann, DEQ, to D. Lawder, EWEB, regarding approval of final Land and Beneficial Water Use Survey completed

at former Eugene manufactured gas plant site. DEQ, Western Region Cleanup Program, Eugene, OR.

DEQ. 2002. Letter dated December 20, 2002 from G. Brown, DEQ, to D. Lawder, EWEB, regarding approval of Human Health Risk Evaluation and Focused Feasibility Study – Annotated Outline, Eugene former manufactured gas plant site, Eugene, Oregon. DEQ, Western Region Cleanup Program, Eugene, OR.

DEQ. 2003. Letter dated November 26, 2003 from G. Brown, DEQ, to D. Lawder, EWEB, regarding focused feasibility study, Eugene former manufactured gas plant site, Eugene, Oregon. DEQ, Western Region Cleanup Program, Eugene, OR.

DEQ. 2006. Email dated April 5, 2006, from G. Brown, DEQ, to R. Axelrod, Swanson Hydrology & Geomorphology, regarding approval of final revisions to revised draft focused feasibility study, Eugene manufactured gas plant site. DEQ, Western Region Cleanup Program, Eugene, OR.

DEQ. 2007. Letter dated October 22, 2007, from G. Brown, DEQ, to D. Spresser, EWEB, regarding Ecological Risk Assessment, Former Manufactured Gas Plant, ECSI #1723. Oregon Department of Environmental Quality, Western Region Cleanup Program, Eugene, OR.

DEQ. 2010a. DEQ letter from Geoff Brown/DEQ to Debbie Spresser/EWEB approving the *August 9, 2010 (Draft) Focused Soil/Fill Management Plan, Electric Transmission Line Construction Project, Eugene Former MGP Site,* letter dated August 11, 2010.

DEQ. 2010b. DEQ letter from Geoff Brown/DEQ to Debbie Spresser/EWEB regarding *MGP Waste discovered during the Electric Transmission Line Construction Project – Eugene, October 1, 2010, Eugene Former MGP Site, ECSI 1723,* letter dated October 1, 2010.

DEQ. 2011. DEQ letter from Geoff Brown/DEQ to Jared Rubin/EWEB regarding approval of *Focused Feasibility Study Addendum, May 2010, Eugene Former MGP Site, ECSI 1723,* letter dated June 20, 2011.

EWEB. 2013a. Letter from Jared Rubin/EWEB to Geoff Brown/DEQ regarding Supplemental Information for Administrative Record for Eugene Former MGP Site Willamette Riverfront Land Use Action, May 10, 2013, with attachment: Eugene Downtown Riverfront Special Area Zone (S-DR), December 2012 - for City Review.

EWEB. 2013b. E-mail from Jared Rubin/EWEB to Geoff Brown/DEQ informing DEQ of the City of Eugene approval of new land use regulations for EWEB's riverfront property addressed in EWEB's May 10, 2013 letter (May correspondence attached), July 10, 2013.

Exponent. 1998a. Focused Groundwater Investigation Field Sampling Plan. Prepared for Eugene Water & Electric Board, Eugene, Oregon, March 18, 1998. Exponent, Lake Oswego, OR.

Exponent. 1998b. Results from focused groundwater investigation, Eugene former MGP site, August 12, 1998. Prepared for Eugene Water & Electric Board, Eugene, Oregon. Exponent, Lake Oswego, OR.

Exponent. 1998c. Phase I remedial investigation work plan, Eugene former MGP site. Prepared for Eugene Water & Electric Board, Eugene, Oregon. Exponent, Lake Oswego, OR.

Exponent. 1999a. Letter dated July 29, 1999 from R. Axelrod, Exponent to M. McCann, DEQ, regarding continued groundwater monitoring schedule – change to semiannual basis, Eugene former manufactured gas plant site, Eugene, Oregon.

Exponent. 1999b. Level I (scoping) ecological risk assessment, technical memorandum, November 1999. Prepared for Eugene Water & Electric Board, Eugene, Oregon. Exponent, Lake Oswego, OR.

Exponent. 1999c. Level I (Scoping) Ecological Risk Assessment report, prepared for Eugene Water & Electric Board by Exponent Inc., Lake Oswego, Oregon, January 1999.

Exponent. 1999d. Plan for liquids removal from tar tank structure—Eugene former MGP site, technical memorandum, October 18, 1999. Prepared for Eugene Water & Electric Board, Eugene, Oregon. Exponent, Lake Oswego, OR.

Exponent. 2000a. Land and beneficial water use survey, former Eugene MGP site, December 2000. Prepared for Eugene Water & Electric Board, Eugene, Oregon. Exponent, Lake Oswego, OR.

Exponent. 2000b. Phase I remedial investigation report, former manufactured gas plant site, Eugene, Oregon, December 2000. Prepared for Eugene Water & Electric Board, Eugene, Oregon. Exponent, Lake Oswego, OR.

Exponent, 2001a. Email dated July 3, 2001, from R. Axelrod, Exponent, to M. McCann, DEQ, confirming agreement to modify field monitoring for July 2001.

Exponent. 2001b. Clarification of project information for DEQ, Eugene former MGP site. External memorandum, August 16, 2001. Exponent, Lake Oswego, OR.

Exponent. 2002a. Human health risk evaluation, former manufactured gas plant site, Eugene, OR, August 2002. Exponent, Lake Oswego, OR.

Exponent. 2002b. Letter dated October 22, 2002 from R. Axelrod, Exponent, to A. Spencer, DEQ, regarding discontinuation of site monitoring, former manufactured gas plant site, Eugene, Oregon. Exponent, Lake Oswego, OR.

Exponent. 2002c. Focused feasibility study outline, Eugene former manufactured gas plant site, Eugene, Oregon, November 6, 2002. Prepared for Eugene Water & Electric Board, Eugene, OR. Exponent, Lake Oswego, OR.

Exponent. 2003. Technical memorandum: supplemental discussion of cumulative and inhalation risks, former manufactured gas plant site, February 10, 2003. Prepared for Eugene Water & Electric Board, Eugene, OR. Exponent, Lake Oswego, OR.

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Meeting Notes. 2002b. Meeting Notes for November 19, 2002 project meeting between DEQ and EWEB. Notes transmitted to DEQ on November 26, 2002.

Meeting Notes. 2004. Meeting Notes for April 20, 2004 project meeting between DEQ and EWEB. Notes transmitted to DEQ on May 12, 2004.

Meeting Notes. 2005a. Meeting Notes for January 25, 2005 project meeting between DEQ and EWEB. Notes transmitted to DEQ on February 7, 2005.

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PTI. 1996. Initial site investigation report, former manufactured gas plant site, Eugene, Oregon. Prepared for Eugene Water & Electric Board, Eugene, Oregon. PTI Environmental Services, Lake Oswego, OR.

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Windward and Axelrod. 2009. Level II (Screening) ecological risk assessment - Eugene former manufactured gas plant, prepared for Eugene Water & Electric Board, by Windward Environmental LLC and Axelrod LLC, October 2009.

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Table 1. Quarterly GW Monitoring Data

Summary of groundwater BTEX results

Station	Date	Field Rep.	Benzene	Toluene	Ethylbenzene	Total Xylenes
EWEB Monitoring Wells						
MW-1	4/98		0.5 *U*	0.5 *U*	0.5 *U*	1.0 *U*
	7/98		0.5 *U*	0.5 *U*	0.5 *U*	1.0 *U*
	10/98		0.5 *U*	0.5 *UJ*	0.5 *U*	1.0 *U*
	1/99		0.5 *U*	0.5 *U*	0.5 *U*	1.0 *U*
	7/99		0.5 *U*	0.5 *UJ*	0.5 *U*	1.0 *U*
	1/00		0.5 *U*	0.539 *U*	0.5 *U*	1.0 *U*
MW-2	4/98		0.5 *U*	0.5 *U*	0.5 *U*	1.0 *U*
	4/98	DUP	0.5 *U*	0.5 *U*	0.5 *U*	1.0 *U*
	7/98		0.5 *U*	0.5 *U*	0.5 *U*	1.0 *U*
	10/98		0.5 *U*	0.5 *UJ*	0.5 *U*	1.0 *U*
	1/99		0.5 *U*	0.5 *U*	0.5 *U*	1.0 *U*
	7/99		0.5 *U*	0.5 *UJ*	0.5 *U*	1.0 *U*
	1/00		0.5 *U*	0.5 *U*	0.5 *U*	1.0 *U*
	1/00	DUP	0.5 *U*	0.5 *U*	0.5 *U*	1.0 *U*
MW-3	4/98		0.5 *U*	0.5 *U*	0.5 *U*	1.0 *U*
	7/98		0.5 *U*	0.5 *U*	0.5 *U*	1.0 *U*
	10/98		0.5 *U*	0.5 *U*	0.5 *U*	1.0 *U*
	1/99		0.5 *U*	0.5 *U*	0.5 *U*	1.0 *U*
	7/99		0.5 *U*	0.5 *UJ*	0.5 *U*	1.0 *U*
	1/00		0.5 *U*	0.5 *U*	0.5 *U*	1.0 *U*
MW-4	4/98		1,980	25 *U*	1,210	747
	7/98		3,320	36.4	1,640	1,200
	10/98		2,690	85 *J*	1,620	1,340
	10/98	DUP	2,530	34.5 *J*	1,500	1,150
	1/99		1,370	10	996	670
	1/99	DUP	1,330	10 *U*	1,010	660
	7/99		3,590	100 *U*	1,880	536
	1/00		1,690	62.0	1,060	772
MW-5	4/98		495	12.5 *U*	2,110	1,470
	7/98		558	12.5 *U*	2,160	1,510
	7/98	DUP	588	20.3	2,320	1,620
	10/98		702	21.2 *J*	2,340	1,650
	1/99		44	5 *U*	550	500
	7/99		453	112 *J*	1,710	1,570
	7/99	DUP	295	28.0 *J*	1,420	1,200
	1/00		48.9	30.9	247	304
University of Oregon Monitoring Wells						
UO-3	4/98		12.5 *U*	12.5 *U*	107	398
	7/98		141	434	170	463
	10/98		5.35	60.8 *J*	116	187
	1/99		5.0 *U*	5.0 *U*	3.9	9.61
	7/99		1.74	4.44 *J*	41.1	37.8
	1/00		16.4	24.0	62.0	148
UO-5	4/98		5.0 *U*	5.0 *U*	564	38.6
	7/98		10.5	5.0 *U*	710	71.8
	10/98		18.2	5.08 *J*	654	69.6
	1/99		5.0 *UJ*	5.0 *UJ*	612 *J*	57.6 *J*
	7/99		9.78	5.0 *UJ*	734	53.1
	1/00		0.839	0.526 *U*	11.8	11.1

Note: Results reported in μg/L DUP - duplicate sample
BTEX - benzene, toluene, ethylbenzene, and xylene

Qualifier: *J* - result is an estimate *U* - undetected at detection limit shown

Table 1. Quarterly GW Monitoring Data (cont.)

Summary of groundwater PAH results

	EWEB Monitoring Well MW-1					
Constituent Date:	4/98	7/98	10/98	1/99	7/99	1/00
Acenaphthene	0.3	0.263	0.1 U	0.1 U	0.157 J	0.1 U
Acenaphthylene	0.1 U	0.1 U	0.1 U	0.1 U	0.27 J	0.1 U
Anthracene	0.1 U	0.255	0.1 U	0.1 U	0.1 UJ	0.1 U
Benz[a]anthracene*	0.1 U	0.101	0.1 U	0.1 U	0.131 J	0.1 U
Benzo[a]pyrene*	0.1 U	0.1 U	0.1 U	0.1 U	0.10 UJ	0.1 U
Benzo[b]fluoranthene*	0.1 U	0.1 U	0.1 U	0.1 U	0.1 UJ	0.1 U
Benzo[ghi]perylene	0.1 U	0.1 U	0.1 U	0.1 U	0.1 UJ	0.1 U
Benzo[k]fluoranthene*	0.1 U	0.1 U	0.1 U	0.1 U	0.1 UJ	0.1 U
Chrysene*	0.1 U	0.11	0.1 U	0.1 U	0.202	0.1 U
Dibenz[a,h]anthracene*	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Fluoranthene	0.533	0.743	0.345	0.1 U	2.31 J	0.1 U
Fluorene	0.458	0.498	0.1 U	0.1 U	0.1 UJ	0.1 U
Indeno[1,2,3-cd]pyrene*	0.1 U	0.1 U	0.1 U	0.1 U	0.1 UJ	0.1 U
Naphthalene	0.131	0.102	0.1 U	0.1 U	0.1 UJ	0.1 U
Phenanthrene	0.1 U	0.183 U	0.1 U	0.1 U	1.21 J	0.1 U
Pyrene	0.877	1.05	0.387	0.1 U	3.31 J	0.1 U

	EWEB Monitoring Well MW-2							
Constituent	4/98	4/98 (Dup)	7/98	10/98	1/99	7/99	1/00	1/00 (Dup)
Acenaphthene	0.808	0.841	0.222	0.296	0.266	0.1 UJ	1.57	1.19
Acenaphthylene	0.364	0.384	0.2 U	0.5 U	0.1 U	0.1 UJ	0.469	0.369
Anthracene	1.15	1.24	0.2 U	1.21	0.1 U	0.1 UJ	1.96	1.43
Benz[a]anthracene*	0.1 U	0.1 U	0.2 U	0.1 U	0.1 U	0.1 UJ	0.203	0.154
Benzo[a]pyrene*	0.1 U	0.1 U	0.2 U	0.1 U	0.1 U	0.1 UJ	0.1 U	0.1 U
Benzo[b]fluoranthene*	0.1 U	0.1 U	0.2 U	0.1 U	0.1 U	0.1 UJ	0.1 U	0.1 U
Benzo[ghi]perylene	0.1 U	0.1 U	0.2 U	0.1 U	0.1 U	0.1 UJ	0.1 U	0.1 U
Benzo[k]fluoranthene*	0.1 U	0.1 U	0.2 U	0.1 U	0.1 U	0.1 UJ	0.1 U	0.1 U
Chrysene*	0.1 U	0.1 U	0.2 U	0.1 U	0.1 U	0.1 UJ	0.226	0.163
Dibenz[a,h]anthracene*	0.2 U	0.2 U	0.4 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Fluoranthene	2.23	2.39	0.959	2.15	0.407	0.26 J	3.33	2.58
Fluorene	0.344	0.362	0.2 U	0.1 U	0.1 U	0.1 UJ	1.0 U	1.0 U
Indeno[1,2,3-cd]pyrene*	0.1 U	0.1 U	0.2 U	0.1 U	0.1 U	0.1 UJ	0.1 U	0.1 U
Naphthalene	1.46	1.72	0.2 U	0.1 U	0.1 U	0.1 UJ	0.5 U	0.5 U
Phenanthrene	0.15	0.175	0.2 U	0.1 U	0.1 U	0.1 UJ	0.103	0.1 U
Pyrene	1.94	1.95	1.27	2.88	0.31	0.4 J	4.15	3.15

Table 1. Quarterly GW Monitoring Data (cont.)

		EWEB Monitoring Well MW-3					
Constituent	Date:	4/98	7/98	10/98	1/99	7/99	1/00
Acenaphthene		0.1 U	0.1 U	0.1 U	0.173	0.1 UJ	0.1 U
Acenaphthylene		0.1 U	0.1 U	0.1 U	0.1 U	0.1 UJ	0.1 U
Anthracene		0.1 U	0.1 U	0.1 U	0.1 U	0.1 UJ	0.1 U
Benz[a]anthracene*		0.1 U	0.1 U	0.1 U	0.1 U	0.1 UJ	0.1 U
Benzo[a]pyrene*		0.1 U	0.1 U	0.1 U	0.1 U	0.1 UJ	0.1 U
Benzo[b]fluoranthene*		0.1 U	0.1 U	0.1 U	0.1 U	0.1 UJ	0.1 U
Benzo[ghi]perylene		0.1 U	0.1 U	0.1 U	0.1 U	0.1 UJ	0.1 U
Benzo[k]fluoranthene*		0.1 U	0.1 U	0.1 U	0.1 U	0.1 UJ	0.1 U
Chrysene*		0.1 U	0.1 U	0.1 U	0.1 U	0.1 UJ	0.1 U
Dibenz[a,h]anthracene*		0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Fluoranthene		0.1 U	0.1 U	0.1 U	0.1 U	0.1 UJ	0.1 U
Fluorene		0.1 U	0.1 U	0.1 U	0.1 U	0.1 UJ	0.1 U
Indeno[1,2,3-cd]pyrene*		0.1 U	0.1 U	0.1 U	0.1 U	0.1 UJ	0.1 U
Naphthalene		0.1 U	0.353	0.1 U	0.1 U	0.1 UJ	0.1 U
Phenanthrene		0.1 U	0.1 U	0.1 U	0.1 U	0.1 UJ	0.1 U
Pyrene		0.1 U	0.1 U	0.1 U	0.1 U	0.1 UJ	0.1 U

Table 1. Quarterly GW Monitoring Data (cont.)

	EWEB Monitoring Well MW-4							
Constituent	4/98	7/98	10/98	10/98 (Dup)	1/99	1/99 (Dup)	7/99	1/00[a]
Acenaphthene	100 U	110	122	129	68.5	461	2,940 J	65.3
Acenaphthylene	105	50 U	50 U	50 U	114	522	807 J	49.5
Anthracene	12.5	50 U	19.6	50 U	11.5	134	1,670 J	12
Benz[a]anthracene*	2 U	50 U	7.36	50 U	10 U	50 U	1,140 J	5.54
Benzo[a]pyrene*	2 U	50 U	7.02	50 U	10 U	50 U	1,230 J	5.46
Benzo[b]fluoranthene*	2 U	50 U	0.1 U	50 U	10 U	50 U	557 J	2.90
Benzo[ghi]perylene	2 U	50 U	0.1 U	50 U	10 U	50 U	708 J	3.18
Benzo[k]fluoranthene*	2 U	50 U	0.1 U	50 U	10 U	50 U	675 J	2.76
Chrysene*	2 U	50 U	8.13	50 U	10 U	50 U	1,720 J	6.02
Dibenz[a,h]anthracene*	4 U	100 U	0.2 U	100 U	20 U	100 U	1,000	2.0 U
Fluoranthene	7.8	50 U	21.3	50 U	11.3	136	2,950 J	14.7
Fluorene	100 U	50 U	76	80.3	50.6	286	1,510 J	41.8
Indeno[1,2,3-cd]pyrene*	2 U	50 U	0.1 U	50 U	10 U	50 U	571 J	2.29
Naphthalene	6,680	5,180	6,590	6,150	22,700	23,400	22,400 J	4,850
Phenanthrene	77	99	99	109	67.6	515	6,960 J	68.3
Pyrene	10.2	50 U	31.2	50 U	18.9	167	4,270 J	20.6

	EWEB Monitoring Well MW-5							
Constituent Date:	4/98	7/98	7/98 (Dup)	10/98	1/99	7/99	7/99 (Dup)	1/00[a]
Acenaphthene	100 U	69	93	102	250 U	509 J	99.1 J	15.3
Acenaphthylene	100 U	50 U	50 U	100 U	250 U	381 J	67.2 J	3.40
Anthracene	6.77	50 U	50 U	6.32	50 U	287 J	46.5 J	2.23
Benz[a]anthracene*	2 U	50 U	50 U	1 U	0.137	330 J	54.7 J	1.47
Benzo[a]pyrene*	2 U	50 U	50 U	1 U	0.1 U	452 J	73.1 J	1.88
Benzo[b]fluoranthene*	2 U	50 U	50 U	1 U	0.1 U	249 J	44.3 J	1.13
Benzo[ghi]perylene	2 U	50 U	50 U	1 U	0.1 U	381 J	62.3 J	1.59
Benzo[k]fluoranthene*	2 U	50 U	50 U	1 U	0.1 U	276 J	41.7 J	1.14
Chrysene*	2 U	50 U	50 U	1.04	0.164	523 J	88.2 J	1.80
Dibenz[a,h]anthracene*	4 U	100 U	100 U	2 U	0.2 U	100 U	50 U	2.0 U
Fluoranthene	4.62	50 U	50 U	4.13	50 U	694 J	116 J	3.72
Fluorene	100 U	50 U	50 U	100 U	250 U	514 J	95.5 J	7.63
Indeno[1,2,3-cd]pyrene*	2 U	50 U	50 U	1 U	0.1 U	291 J	46.9 J	1.09
Naphthalene	10,400	7,980	8,940	10,900	25,200	61,300 J	15,600 J	4,430
Phenanthrene	46.9	50 U	50 U	35.5	70.4	1,260 J	218 J	12.8
Pyrene	5.88	50 U	50 U	6.01	1.42	870 J	149 J	5.07

a

Table 1. Quarterly GW Monitoring Data (cont.)

	University of Oregon Monitoring Well UO-3					
Constituent	4/98	7/98	10/98	1/99	7/99	1/00
Acenaphthene	0.574	317 *J*	10 *U*	0.103	1.08 *J*	1.17
Acenaphthylene	2.8	2.5 *UJ*	10 *U*	0.1 *U*	0.623 *J*	0.724
Anthracene	0.23	2.5 *UJ*	0.227	0.1 *U*	0.164 *J*	0.249
Benz[a]anthracene*	0.1 *U*	2.5 *UJ*	0.1 *U*	0.1 *U*	0.1 *UJ*	0.1 *U*
Benzo[a]pyrene*	0.1 *U*	2.5 *UJ*	0.1 *U*	0.1 *U*	0.1 *UJ*	0.1 *U*
Benzo[b]fluoranthene*	0.1 *U*	2.5 *UJ*	0.1 *U*	0.1 *U*	0.1 *UJ*	0.1 *U*
Benzo[ghi]perylene	0.1 *U*	2.5 *UJ*	0.1 *U*	0.1 *U*	0.1 *UJ*	0.1 *U*
Benzo[k]fluoranthene*	0.1 *U*	2.5 *UJ*	0.1 *U*	0.1 *U*	0.1 *UJ*	0.1 *U*
Chrysene*	0.1 *U*	2.5 *UJ*	0.1 *U*	0.1 *U*	0.1 *UJ*	0.1 *U*
Dibenz[a,h]anthracene*	0.2 *U*	5.0 *UJ*	0.2 *U*	0.2 *U*	0.2 *U*	0.2 *U*
Fluoranthene	0.279	2.5 *UJ*	0.255	0.1 *U*	0.186 *J*	0.273
Fluorene	0.887	2.5 *UJ*	10 *U*	0.1 *U*	0.572 *J*	0.868
Indeno[1,2,3-cd]pyrene*	0.1 *U*	2.5 *UJ*	0.1 *U*	0.1 *U*	0.1 *UJ*	0.1 *U*
Naphthalene	1,350	151 *J*	256	0.1 *U*	38.4 *J*	66.8
Phenanthrene	0.62	2.5 *UJ*	0.705	0.1 *U*	0.358 *J*	0.446
Pyrene	0.385	2.5 *UJ*	0.353	0.1 *U*	0.294 *J*	0.329

	University of Oregon Monitoring Well UO-5					
Constituent	4/98	7/98	10/98	1/99	7/99	1/00
Acenaphthene	50 *U*	10 *U*	6.3	50 *U*	0.1 *UJ*	2.42
Acenaphthylene	50 *U*	10 *U*	5 *U*	50 *U*	0.1 *UJ*	0.369
Anthracene	1.17	10 *U*	5 *U*	50 *U*	0.169 *J*	0.278
Benz[a]anthracene*	0.1 *U*	10 *U*	5 *U*	0.1 *U*	0.1 *UJ*	0.1 *U*
Benzo[a]pyrene*	0.1 *U*	10 *U*	5 *U*	0.1 *U*	0.1 *UJ*	0.1 *U*
Benzo[b]fluoranthene*	0.1 *U*	10 *U*	5 *U*	0.1 *U*	0.1 *UJ*	0.1 *U*
Benzo[ghi]perylene	0.1 *U*	10 *U*	5 *U*	0.1 *U*	0.1 *UJ*	0.1 *U*
Benzo[k]fluoranthene*	0.1 *U*	10 *U*	5 *U*	0.1 *U*	0.1 *UJ*	0.1 *U*
Chrysene*	0.1 *U*	10 *U*	5 *U*	0.1 *U*	0.1 *UJ*	0.1 *U*
Dibenz[a,h]anthracene*	0.2 *U*	20 *U*	10 *U*	0.2 *U*	0.2 *UJ*	0.2 *U*
Fluoranthene	0.75	10 *U*	5 *U*	50 *U*	0.267 *J*	0.250
Fluorene	50 *U*	10 *U*	5 *U*	50 *U*	0.165 *J*	1.22
Indeno[1,2,3-cd]pyrene*	0.1 *U*	10 *U*	5 *U*	0.1 *U*	0.1 *UJ*	0.1 *U*
Naphthalene	2,050	1,400	1,440	8,500	1.15 *J*	577
Phenanthrene	7.5	10 *U*	0.1 *U*	50 *U*	0.85 *J*	1.59
Pyrene	1.06	10 *U*	0.1 *U*	0.749	0.496 *J*	0.306

Note: Results reported in μg/L

* - carcinogenic PAH (Based on: Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons, U.S. EPA, ECAO-CIN-842, final draft, March 1993)

Dup - duplicate sample

PAH - polycyclic aromatic hydrocarbon

Qualifier: *J* - result is an estimate

U - undetected at detection limit shown

[a] Improved sampling methodology implemented at MW-4 and MW-5 in January 2000 provides results more representative of PAH concentrations than sampling results in July 1999.

Table 2. Soil Data

SELECTED METALS AND CYANIDE RESULTS FOR BOREHOLE SAMPLES

Location	Depth Interval Represented (ft)	Copper	Cyanide	Lead	Mercury	Nickel	Zinc
BH1	2 - 3.5	47	0.32 J	40	0.1 U	31	410 J
BH1	18 - 19.5	15	0.14 J	10 U	0.09 U	16	36 J
BH2	17 - 18.5	170	0.53 J	35	0.09 U	17	81 J
BH2	23 - 24.5	56	4.6 J	10 U	0.09 U	17	43 J
BH3	4.5 - 6	170	22 J	260	0.95	100	140 J
BH3	13.5 - 15	56	2.3 J	24	0.1 U	25	53 J
BH4	17 - 18.5	19	0.55 J	16	0.1 U	22	56 J
BH4	20 - 21.5	25	0.1 UJ	20	0.1 U	17	47 J
BH5A	6.5 - 8	22	0.1 UJ	10 U	0.1 U	21	54 J
BH5A	18.5 - 20	17	0.1 UJ	10 U	0.1 U	15	44 J
BH5B	15.5 - 17	18	1.1 J	10 U	0.09 U	23	34 J
BH5B	21.5 - 23	15	4.6 J	10 U	0.1 U	14	42 J
BH6	23 - 24.5	15	0.23 J	10 U	0.1 U	17	30 J
BH7	11 - 12.5	14	6 J	10 U	0.39	7.7	37 J
BH7B	6.5 - 8	100	4.2 J	120	0.68	26	680
BH7B	14 - 15.5	27	0.43 J	10 U	0.18	16	160
BH7B	21.5 - 23	20	1.3 J	10 U	0.04	17	55
BH8	2 - 3.5	84	0.46 J	170	100	110	560
BH8	11 - 12.5	26	0.58 J	14	0.26	26	68
BH8	21.5 - 23	12	0.25 J	10 U	0.14	9.5	25
BH10	5 - 5.5	24	4.4 J	56	0.09 U	23	49 J
BH10B	8 - 9.5	26	5.9 J	16	0.1 U	25	94 J
BH10B	17 - 18.5	20	0.1 UJ	10 U	0.09 U	16	43 J
BH10B	26.5 - 28	15	0.34 J	10 U	0.09 U	14	49 J
BH12	3 - 4.5	130	5.4 J	440	0.26	46	170
BH12	8 - 9.5	30	0.24 J	19	0.15	25	67
BH12	11 - 12.5	38	1.2 J	10 U	0.11	20	58
BH12	18.5 - 20	16	0.12 J	10 U	0.12	20	39
BH14	2 - 3.5	220	8.7 J	340	1.7	41	360 J
BH14	21.5 - 23	17	0.1 UJ	10 U	0.09 U	16	45 J

Note: Results reported in mg/kg

Qualifier: *U* - Undetected at detection limit shown
J - Estimated value

Table 2. Soil Data (cont.)

TPH RESULTS FOR BOREHOLE SAMPLES

Location	Depth Interval Represented (ft)	Hydrocarbon Type[a]	TPH[b]
BH1	2 - 3.5	1	1,200
BH1	18 - 19.5	0	31
BH2	17 - 18.5	1	170
BH2	23 - 24.5	3	190
BH3	4.5 - 6	2	630
BH3	13.5 - 15	2	1,200
BH4	17 - 18.5	3	3,800
BH4	20 - 21.5	3	3,100
BH5A	6.5 - 8	0	20 *U*
BH5A	18.5 - 20	3	1,200
BH5B	15.5 - 17	4	180
BH5B	21.5 - 23	3	500
BH6	23 - 24.5	3	370
BH7	11 - 12.5	2	1,400
BH7B	6.5 - 8	1	100
BH7B	14.0 - 15.5	1	830
BH7B	21.5 - 23	2	38
BH8	2 - 3.5	1	370
BH8	11 - 12.5	2	NA
BH8	21.5 - 23	3	NA
BH10	5 - 5.5	4	7,200
BH10B	8 - 9.5	3	1,700
BH10B	17 - 18.5	3	2,200
BH10B	26.5 - 28	0	26
BH12	3 - 4.5	1	2,300
BH12	8 - 9.5	2	1,600
BH12	11 - 12.5	2	1,300
BH12	18.5 - 20	2	1,500
BH14	2 - 3.5	2	6,900
BH14	21.5 - 23	3	2,800

Note: Results reported in mg/kg
NA - not analyzed because no heavy-range hydrocarbons detected by TPH-HCID
TPH - total petroleum hydrocarbons

Qualifier: *U* - undetected at detection limit shown

[a] Based on TPH-HCID chromatograms. See text at page 24 for explanation of hydrocarbon types.

[b] TPH by 418.1

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Table 2. Soil Data (cont.)

BTEX RESULTS FOR BOREHOLE SAMPLES

Location	Depth Interval Represented (ft)	Benzene	Ethyl-benzene	Toluene	Total Xylenes	Total BTEX
BH1	2 - 3.5	13 *U*	13 *U*	42	41	109 *L*
BH1	18 - 19.5	13 *U*	13 *U*	13 *U*	13 *U*	52 *U*
BH2	17 - 18.5	13 *U*	13 *U*	20	44	90 *L*
BH2	23 - 24.5	25 *U*	340	30	210	605 *L*
BH3	4.5 - 6	510	140	800	760	2,210
BH3	13.5 - 15	7,600	47,000	7,200	65,000	126,800
BH4	17 - 18.5	25 *U*	150	25 *U*	250	450 *L*
BH4	20 - 21.5	630 *U*	63,000	630 *U*	72,000	136,260 *L*
BH5A	6.5 - 8	13 *U*	13 *U*	13 *U*	13 *U*	52 *L*
BH5A	18.5 - 20	130 *U*	16,000	160	17,000	33,290 *L*
BH5B	15.5 - 17	13 *U*	130	15	590	748 *L*
BH5B	21.5 - 23	300	4,900	700	6,500	12,400
BH6	23 - 24.5	13 *U*	18	13 *U*	28	72 *L*
BH7	11 - 12.5	180,000	48,000	360,000	500,000	1,088,000
BH7B	6.5 - 8	90	17	98	160	365
BH7B	14.0 - 15.5	13 *U*	35	13 *U*	110	171 *L*
BH7B	21.5 - 23	130 *U*	6,000	220	5,900	12,250 *L*
BH8	2 - 3.5	49	13 *U*	22	19	103 *L*
BH8	11 - 12.5	13 *U*	13 *U*	13 *U*	13 *U*	52 *U*
BH8	21.5 - 23	510	3,600	50 *U*	3,800	7,960
BH10	5 - 5.5	100,000	220,000	61,000	220,000	601,000
BH10B	8 - 9.5	130 *U*	34,000	4,700	57,000	95,830 *L*
BH10B	17 - 18.5	130 *U*	7,400	330	8,600	16,460 *L*
BH10B	26.5 - 28	13 *U*	19	13 *U*	13 *U*	58 *L*
BH12	3 - 4.5	12,000	10,000	39,000	130,000	191,000
BH12	8 - 9.5	13,000	15,000	7,400	82,000	117,400
BH12	11 - 12.5	59,000	52,000	46,000	310,000	467,000
BH12	18.5 - 20	23,000	56,000	2,200	140,000	221,200
BH14	2 - 3.5	360	2,700	3,600	30,000	36,660
BH14	21.5 - 23	430	20,000	420	16,000	36,850

Note: Results reported in µg/kg
BTEX - benzene, toluene, ethylbenzene, and total xylenes

Qualifier: *L* - actual concentration is less than value shown
U - undetected at quantification limit shown

Table 2. Soil Data (cont.)

SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN BOREHOLE SAMPLES[a]

Location	Depth Interval Represented (ft)	2-Methyl-naphthalene	Acenaph-thene	Acenaph-thylene	Anthra-cene	Benz[a]-anthracene	Benz[a]-pyrene	Benzo[b]-fluoranthene	Benzo[ghi]-perylene	Benzo[k]-fluoranthene	Chrysene
BH1	2 - 3.5	15 U	15 U	15 U	15 U	15 U	20	15 U	17	15 U	15 U
BH1	18 - 19.5	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U
BH2	17 - 18.5	15 U	15 U	15 U	15 U	23	54	31	32	36	29
BH2	23 - 24.5	15	13	6 U	9.3	7.7	7.4	4	6 U	4	9.2
BH3	4.5 - 6	290 J	600 UJ	600 UJ	600 UJ	480 J	580 J	420 J	420 J	440 J	640 J
BH3	13.5 - 15	2,600 J	85 J	700 J	490 J	330 J	330 J	160 J	60 J	220 J	380 J
BH4	17 - 18.5	150 UJ	150 UJ	150 UJ	150 UJ	53 J	70 J	53 J	75 J	54 J	73 J
BH4	20 - 21.5	890 J	370 J	300 UJ	170 J	110 J	120 J	300 UJ	300 UJ	300 UJ	120 J
BH5A	6.5 - 8	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U
BH5A	18.5 - 20	20	1.5 U	0.7	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U
BH5B	15.5 - 17	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U
BH5B	21.5 - 23	3.1	1.5 U	1.5 U	1.5 U	1.5 U	0.8	0.9	1.1	0.75	1.5 U
BH6	23 - 24.5	3 U	3 U	3 U	1.6	1.3	1.3	3 U	3 U	3 U	1.6
BH7	11 - 12.5	1,200 J	600 UJ	550 J	420 J	280 J	240 J	600 UJ	600 UJ	210 J	300 J
BH7B	6.5 - 8	100 UJ	100 UJ	100 UJ	100 UJ	110 J	101 J	68 J	39 J	85 J	120 J
BH7B	14 - 15.5	1 U	1 U	1 U	1 U	2.3	3.7	2	1.3	2	2.5
BH7B	21.5 - 23	200 UJ	200 UJ	72 J	84 J	200 UJ	200 UJ	200 UJ	200 UJ	200 UJ	200 UJ
BH8	2 - 3.5	10 UJ	10 UJ	10 UJ	10 UJ	9.9 J	15 J	10 J	9.5 J	12 J	12 J
BH8	11 - 12.5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
BH8	21.5 - 23	18 J	8.4 J	10 UJ	8.4 J	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	3.6 J
BH10	5 - 5.5	1,100 J	230 J	600 UJ	600 UJ	600 UJ	600 UJ	600 UJ	600 UJ	600 UJ	600 UJ
BH10B	8 - 9.5	220 J	150 UJ	150 UJ	150 UJ	150 UJ	150 UJ	150 UJ	150 UJ	150 UJ	150 UJ
BH10B	17 - 18.5	120 J	75 UJ	75 UJ	23 J	75 UJ	75 UJ	75 UJ	75 UJ	75 UJ	25 J
BH10B	26.5 - 28	0.6	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U
BH12	3 - 4.5	2,500 J	150 J	190 J	350 J	330 J	300 J	220 J	170 J	200 J	390 J
BH12	8 - 9.5	1,000 J	200 UJ	200 UJ	200 UJ	150 J	160 J	96 J	75 J	110 J	190 J
BH12	11 - 12.5	1,200 J	200 UJ	200 UJ	170 J	140 J	140 J	78 J	76 J	91 J	174 J
BH12	18.5 - 20	680 J	120 J	200 UJ	100 J	71 J	77 J	200 UJ	200 UJ	200 UJ	90 J
BH14	2 - 3.5	1,100 J	600 UJ	600 UJ	310 J	560 J	350 J	330 J	600 UJ	280 J	780 J
BH14	21.5 - 23	200 J	300 UJ	300 UJ	300 UJ	300 UJ	300 UJ	300 UJ	300 UJ	300 UJ	300 UJ

Table 2. Soil Data (cont.)

Location	Depth Interval Represented (ft)	Fluor-anthene	Fluorene	Indeno [1,2,3-cd]-pyrene	Naph-thalene	Phenan-threne	Pyrene	Total LPAH[a]	Total HPAH[b]	Total CPAH[c]	Total PAH
BH1	2 - 3.5	18	15 U	15 U	15 U	15 U	28	105 U	158 U	125 L	263 L
BH1	18 - 19.5	3 U	3 U	3 U	3 U	3 U	3 U	21 U	27 U	24 U	48 U
BH2	17 - 18.5	36	15 U	24	15 U	5.7	55	96 L	320	284	416 L
BH2	23 - 24.5	18	8.3	6 U	9.1	39	26	100 L	88 L	70 L	188 L
BH3	4.5 - 6	770 J	600 UJ	94 J	600 UJ	1,200 J	1,400 J	4,490 L	5,244	4,474	9,734 L
BH3	13.5 - 15	720 J	560 J	82 J	4,400 J	2,200 J	960 J	11,035	3,242	2,522	14,277
BH4	17 - 18.5	150 J	150 UJ	150 UJ	150 UJ	150 UJ	310 J	1,050 U	988	838	2,038 L
BH4	20 - 21.5	320 J	180 J	300 UJ	2,400 J	860 J	510 J	5,170 U	2,380 L	2,060 L	7,550 L
BH5A	6.5 - 8	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	10 L	13 U	12 U	24 U
BH5A	18.5 - 20	0.8	0.6	1.5 U	49	1.7	1.3	75 L	13 L	12 L	88 L
BH5B	15.5 - 17	1.5 U	1.5 U	0.69	1.1	1.5 U	0.74	10 L	9 L	8 L	20 L
BH5B	21.5 - 23	0.75	1.5 U	1.5 U	3	1.7	1	14 L	12 L	11 L	26 L
BH6	23 - 24.5	3.7	1.2	3 U	3 U	6.6	4.6	21 L	24 L	21 L	46 L
BH7	11 - 12.5	700 J	340 J	600 UJ	3,500 J	1,400 J	760 J	8,010 L	4,290 L	3,590 L	12,300 L
BH7B	6.5 - 8	200 J	100 UJ	37 J	100 UJ	120 J	220 J	720 L	980	780	1,700 L
BH7B	14 - 15.5	2.6	1 U	1	0.41	0.39	4.5	6 L	22	19	27.7 L
BH7B	21.5 - 23	140 J	76 J	200 UJ	260 J	280 J	160 J	1,172 L	1,700 L	1,560 L	2,872 L
BH8	11 - 12.5	15 J	10 UJ	7.3 J	10 UJ	5.6 J	23 J	66 L	113.7	99	179 L
BH8	2 - 3.5	0.5 U	0.5 U	0.5 U	0.5 U	0.18	0.19	3.2 L	4.2 L	3.7 U	7.37 L
BH8	21.5 - 23	7.4 J	5.1 J	10 UJ	38 J	20 J	12 J	108 L	83 L	76 L	191 L
BH10	5 - 5.5	600 UJ	600 UJ	600 UJ	2,400 J	490 J	300 J	6,020 L	5,100 L	4,500 L	11,120 L
BH10B	8 - 9.5	150 UJ	150 UJ	150 UJ	440 J	83 J	60 J	1,343 L	1,260 L	1,110 L	2,603 L
BH10B	17 - 18.5	43 J	75 UJ	75 UJ	210 J	92 J	71 J	670 L	589 L	546 L	1,259 L
BH10B	26.5 - 28	1.2	1.5 U	1.5 U	1.5 U	2.7	1.8	11 L	13 L	12 L	24 L
BH12	3 - 4.5	700 J	360 J	130 J	3,600 J	1,600 J	1100 J	8,750	3,540	2,840	12,290 L
BH12	8 - 9.5	300 J	150 J	200 UJ	2,000 J	640 J	580 J	4,390 L	1,861	1,561	6,251 L
BH12	11 - 12.5	300 J	160 J	200 UJ	2,400 J	690 J	510 J	5,020 L	1,709	1,409 L	6,729 L
BH12	18.5 - 20	160 J	110 J	200 UJ	1,200 J	440 J	280 J	2,850 L	1,478 L	1,318 L	4,328 L
BH14	2 - 3.5	1,300 J	510 J	600 UJ	380 J	2,600 J	2,200 J	6,100 L	7,000 L	5,700 L	13,100 L
BH14	21.5 - 23	300 UJ	300 UJ	300 UJ	300 J	138 J	93.8 J	1,838 L	249 L	2,194 L	4,332 L

Note: Results reported in mg/kg

PAH - polycyclic aromatic hydrocarbon

Qualifier: J - estimated value

L - actual concentration is less than value shown

[a] LPAHs (low-molecular-weight PAHs) include naphthalene, acenaphthalene, acenaphthene, fluorene, phenanthrene, anthracene, and 2 methylnaphthalene. In addition, di-*n*-butylphthalate was detected in source samples at low concentrations.

[b] HPAHs (high-molecular-weight PAHs) include fluoranthene, pyrene, benz[a]anthracene, chrysene, benzo[b,k]fluoranthene, benzo[a]pyrene, benzo[e]pyrene, indeno[1,2,3-cd]pyrene, dibenz[a,h]anthracene, benzo[ghi]perylene, and anthanthrene.

[c] CPAHs (carcinogenic PAHs) include benz[a]anthracene, benzo[b]fluoranthene, benzo[k]fluoranthene, benzo[a]pyrene, chrysene, dibenz[a,h]anthracene, 1,2,3-[cd]pyrene, benzo[ghi]perylene, and pyrene.

Table 2. Soil Data (cont.)

SELECTED FIELD AND LABORATORY RESULTS FOR SHORELINE-AREA SOIL SAMPLES

Parameter	Units	Location				
		HA1	HA2	HA3	HA5	HA6
Sheen		Slight	Heavy	Heavy	Moderate	Moderate
TPH	mg/kg	NA	150	1,200	20 *U*	65
Hydrocarbon type[a]		NA	2	2	NA	1
BTEX	µg/kg	156 *L*	11,960	8,580	55 *L*	56 *U*
LPAHs[b]	mg/kg	8 *U*	273 *L*	3,404 *L*	47 *L*	7.5 *L*
HPAHs[c]	mg/kg	10 *U*	213 *L*	2,672 *L*	51 *L*	11.7 *L*
CPAHs[d]	mg/kg	9 *U*	190 *L*	2,202 *L*	42 *L*	9.8 *L*
Total PAHs	mg/kg	18 *U*	486 *L*	6,076 *L*	98 *L*	19.2 *L*

Note: BTEX - benzene, toluene, ethylbenzene, and total xylenes
NA - not applicable
PAH - polycyclic aromatic hydrocarbon
TPH - total petroleum hydrocarbon

Qualifier: *L* - Actual concentration is less than value shown
U - Undetected at detection limit shown

[a] Based on TPH-HCID chromatogram.

[b] LPAHs (low-molecular-weight PAHs) include naphthalene, acenaphthalene, acenaphthene, fluorene, phenanthrene, anthracene, and 2 methyl-naphthalene. In addition, di-n-butylphthalate was detected in source samples at low concentrations.

[c] HPAHs (high-molecular-weight PAHs) include fluoranthene, pyrene, benz[a]anthracene, chrysene, benzo[b,k]fluoranthane, benzo[a]pyrene, benzo[e]pyrene, indeno[1,2,3-cd]pyrene, dibenz[a,h]-anthracene, benzo[ghi]perylene, and anthanthrene.

[d] CPAHs (carcinogenic PAHs) include benz[a]anthracene, benzo[b]fluoranthene, benzo[k]fluoranthene, benzo[a]pyrene, crysene, dibenz[a,h]anthracene, 1,2,3-[cd]pyrene, benzo[ghi]perylene, and pyrene.

Table 3. Human Health Conceptual Site Model for MGP Site Prepared by DEQ

Media	Pathway	Depth (ft)	Industrial or Occupational	Excavation Worker	Recreational User	Rational
Soil	Direct Contact	1.5-3	X	X	O	Occupational contact with shallow soils is unlikely, given the current Site paving and EWEB plans/commitment to Site management approach, including upland soil cap/cover and shoreline area controls. Construction/excavation worker direct contact with shallow soils is possible. Visitor contact is unlikely since the site is paved and fenced.
		3-15	O	X	O	Construction/excavation worker exposure to deeper soils is possible. Exposure to soils below 3 ft is unlikely for visitors.
		Shore-line (0-0.5)	O	O	X	Occupational or excavation worker contact with shoreline surface soils is unlikely. EWEB maintenance worker and visitor/trespasser contact with surface soils in the shoreline area is possible.
	Vapor Intrusion to Indoor Air	1.5-3	X	O	O	No structures for human occupation are currently located on the site. Benzene in one soil sample and in MGP waste material in/at two former MGP structures exceed DEQ generic RBCs; thus, in the absence of further analysis or remedial action, Site controls will be needed preventing future buildings on the site.
		3-15	X	O	O	As above.
		Shore-line (0-0.5)	O	O	O	No buildings are present or likely on the bank of the river.
	Volatilization to Outdoor Air	All	X	O	X	Benzene levels in one soil sample exceed generic RBCs for volatilization to outdoor air. Site-specific calculations presented in the final FFS demonstrate that volatilization to outdoor air does not pose an unacceptable risk to occupational users, maintenance workers or site visitors, even if the soil cap/cover were permanently removed.
	Leaching to Groundwater	All	O	O	O	Groundwater is not used as a drinking water source at or downgradient of the subject property. Since groundwater ingestion is not considered to be a complete pathway for the site, neither is leaching to groundwater.
Groundwater	Groundwater Ingestion		O	O	O	No drinking water use of the perched shallow groundwater.
	Direct Exposure to Groundwater		O	O	O	Since groundwater occurs at depths greater than ten feet (~17 feet), construction/excavation worker contact with contaminated groundwater is unlikely.
	Vapor Intrusion to Indoor Air		X	O	O	No buildings are currently located on site. While volatile constituents are present in the groundwater, none is present at concentrations in excess of volatilization RBCs. Benzene concentrations in groundwater do not exceed the acceptable risk level of 1E-06.
	Volatilization to Outdoor Air		X	X	X	While volatile constituents are present in the groundwater, none are present at concentrations in excess of volatilization RBCs.

X indicates a pathway is complete; O indicates a pathway is incomplete

Recreational user is equivalent to the visitor or trespasser potential exposure scenario.

Table 4. DEQ Derived Risk Characterization Summary – Cancer Risk Estimates

Scenario	COC	Soil Cancer Risk [1]	Waste Materials Cancer Risk [2]	Groundwater Cancer Risk	Cumulative Cancer Risk
Industrial (Direct Contact)	**Benz(a)anthracene**	2.7E-04	1.0E-04		3.7E-04
	Benzo(a)pyrene	1.7E-03	8.9E-04		2.6E-03
	Benzo(b)fluoranthene	1.6E-04			1.6E-04
	Benzo(k)fluoranthene	1.3E-05	7.8E-06		2.1E-05
	Chrysene	3.7E-06	1.1E-06		4.8E-06
	Indeno(1,2,3-cd)pyrene	3.5E-06			3.5E-06
	Benzene	6.4E-07	5.3E-06		5.9E-06
	TOTAL CANCER RISK	2.2E-03	1.0E-03		3.2E-03
Industrial Indoor Air	**Benzene [6]**	4.9E-05	1.5E-04	1.3E-06	2.0E-04
Industrial Outdoor Air	**Benzene [7]**	6.9E-08	2.1E-07	2.8E-07	5.6E-07
Excavation					
	Benz(a)anthracene	2.2E-06	4.7E-07		2.7E-06
	Benzo(a)pyrene	2.3E-05	4.1E-06		2.7E-05
	Benzo(b)fluoranthene	1.7E-06			1.7E-06
	Benzo(k)fluoranthene	1.8E-07	3.6E-08		2.2E-07
	Chrysene	3.1E-08	5.1E-09		3.6E-08
	Indeno(1,2,3-cd)pyrene	5.2E-07			5.2E-07
	Benzene [3]	3.9E-07	1.9E-08	2.8E-07	6.9E-07
	TOTAL CANCER RISK	2.8E-05	4.6E-06	2.8E-07	3.3E-05
Recreational User [4]					
	Benz(a)anthracene	5.7E-08			5.7E-08
	Benzo(a)pyrene	3.4E-07			3.4E-07
	Benzo(b)fluoranthene	2.9E-08			2.9E-08
	Benzo(k)fluoranthene	3.4E-09			3.4E-09
	Chrysene	5.7E-10			5.7E-10
	Dibenz(a,h)anthracene	6.2E-08			6.2E-08
	Indeno(1,2,3-cd)pyrene	1.8E-08			1.8E-08
	Benzene[5]	9.7E-08	3.0E-07		4.0E-07
	TOTAL CANCER RISK	6.1E-07			9.1E-07

Footnotes:

1 Cancer risk for soil was calculated for both shallow soil (1.5-3ft) and deeper subsurface soil (3-15 ft) in the final Focused Feasibility Study (SH+G 2006). The maximum cancer risk for either shallow soil or deeper subsurface soil is presented for the Excavation scenario.

2 Cancer risks for waste material were calculated using maximum concentrations provided in Table A-5 of the Human Health Risk Evaluation (Exponent 2002) and comparing them to RBCs in DEQ's 2003 RBDM Guidance.

3 Cancer risk for the excavation worker exposed to benzene in groundwater via outdoor air volatilization was conservatively assumed to be equal to the industrial worker because no default scenario is available for this pathway for excavation workers.

4 As described in the Human Health Risk Evaluation (Exponent 2002), the Recreational user (i.e., river bank trespasser or visitor) was evaluated by comparing against a risk-based concentration for an industrial worker as a conservative measure. This comparison is over-protective because the assumed duration of contact is much less for a Recreational user. Therefore, the risk values presented overestimate actual risk to Recreational users. All detected chemicals are presented for the Recreational user since this scenario was not presented in the residual risk assessment of the Focused Feasibility Study (SH+G 2006) because all concentrations in surface soil at the shoreline area were below conservative risk-based screening levels. Screening tables for the Recreational user can be found in Tables A-1 to A-3 of the Human Health Risk Evaluation (Exponent 2002).

5 Benzene in soil was evaluated for volatilization to outdoor air for the recreational user by applying the site-specific screening levels in the final FFS. Site soil maximum concentration of benzene was 59,000 ug/kg and the waste material maximum was 180,000 ug/kg. The site-specific screening level for a visitor to the site was 607,639 ug/kg. This evaluation confirms acceptable risk level for the visitor exposure scenario.

6 Volatilization to indoor air was evaluated for benzene (the only highly volatile chemical detected). Maximum soil, waste, and groundwater concentrations were used to calculate risk estimates. Benzene site soil maximum concentration was 59,000 ug/kg, the waste material maximum concentration was 180,000 ug/kg, and the groundwater maximum concentration was 3,590 ug/L. The RBCs for soil/waste and groundwater were 1,200 ug/kg and 2,800 ug/L, respectively (RBCs from DEQ's 2003 RBDM Guidance, as updated 2009).

7 Benzene in soil was evaluated for volatilization to outdoor air for the industrial user by applying the site-specific screening levels in the final FFS. Site soil maximum concentration of benzene was 59,000 ug/kg and the waste material maximum was 180,000 ug/kg. The site-specific screening level for EWEB industrial workers to the site was 857,143 ug/kg which exceeds the soil saturation level of (701,000 ug/kg). This evaluation confirms acceptable risk level for the visitor exposure scenario. Benzene in groundwater was evaluated for volatilization to outdoor air for the industrial worker by applying the 2003 RBDM (as updated 2009) outdoor RBC of 14,000 ug/L and comparing it to the maximum concentration of benzene detected in groundwater (3,590 ug/L).

Table 5. DEQ Derived Risk Characterization Summary – Noncancer Hazards

Scenario	COC	Soil Noncancer HQ [1]	Waste Materials Noncancer HQ [2]	Groundwater Noncancer HQ	Cumulative Noncancer HI
Industrial					
	2-methylnaphthalene	5.8	6.3		12.1
	Acenaphthylene	NA	NA		NA
	Benzo(g,h,i)perylene	0.43	ND		0.43
	Naphthalene	2.8	18		20.8
	Phenanthrene	14	7		21
	TOTAL HAZARD INDEX	23.0	31.3		54.3
Excavation					
	2-methylnaphthalene	3.0	NC		3.0
	Acenaphthylene	0.80	<0.001		0.80
	Benzo(g,h,i)perylene	0.48	NC		0.48
	Naphthalene	5.0	0.18		5.18
	Phenanthrene	3.0	NC		3.0
	TOTAL HAZARD INDEX	12.3	0.2		12.5
Recreational User [3]					
	2-methylnaphthalene	NC			NC
	Acenaphthylene	<0.001			<0.001
	Benzo(g,h,i)perylene	0.003			0.003
	Naphthalene	ND			ND
	Phenanthrene	0.02			0.02
	TOTAL HAZARD INDEX	0.2			0.2

Footnotes:

NA – not applicable because Acenaphylene not identified as a COPC for shallow soil in HHRE
NC – not calculated because EPA-verified toxicity data not available
ND – not detected

1. Noncancer hazards for soil were calculated for both shallow soil (1.5-3 ft) and deeper subsurface soil (3-15 ft) in the final Focused Feasibility Study (SH+G 2006). The maximum noncancer hazard quotient for either shallow soil or deeper subsurface soil is presented for the Excavation scenario.

2. Noncancer hazards for waste material were calculated using maximum concentrations provided in Table A-5 of the Human Health Risk Evaluation (Exponent 2002) and comparing them to RBCs in DEQ's 2003 RBDM Guidance.

3. As described in the Human Health Risk Evaluation (Exponent 2002), the Recreational user (i.e., river bank trespasser or visitor) was evaluated by comparing against a risk-based concentration for an industrial worker as a conservative measure. This comparison is over-protective because the assumed duration of contact is much less for a Recreational user. Therefore, the risk values presented overestimate actual risk to Recreational users. All detected chemicals are presented for the Recreational user since this scenario was not presented in the residual risk assessment of the Focused Feasibility Study (SH+G 2006) because all concentrations in surface soil at the shoreline area were below conservative risk-based screening levels. Screening tables for the Recreational user can be found in Tables A-1 to A-3 of the Human Health Risk Evaluation (Exponent 2002).

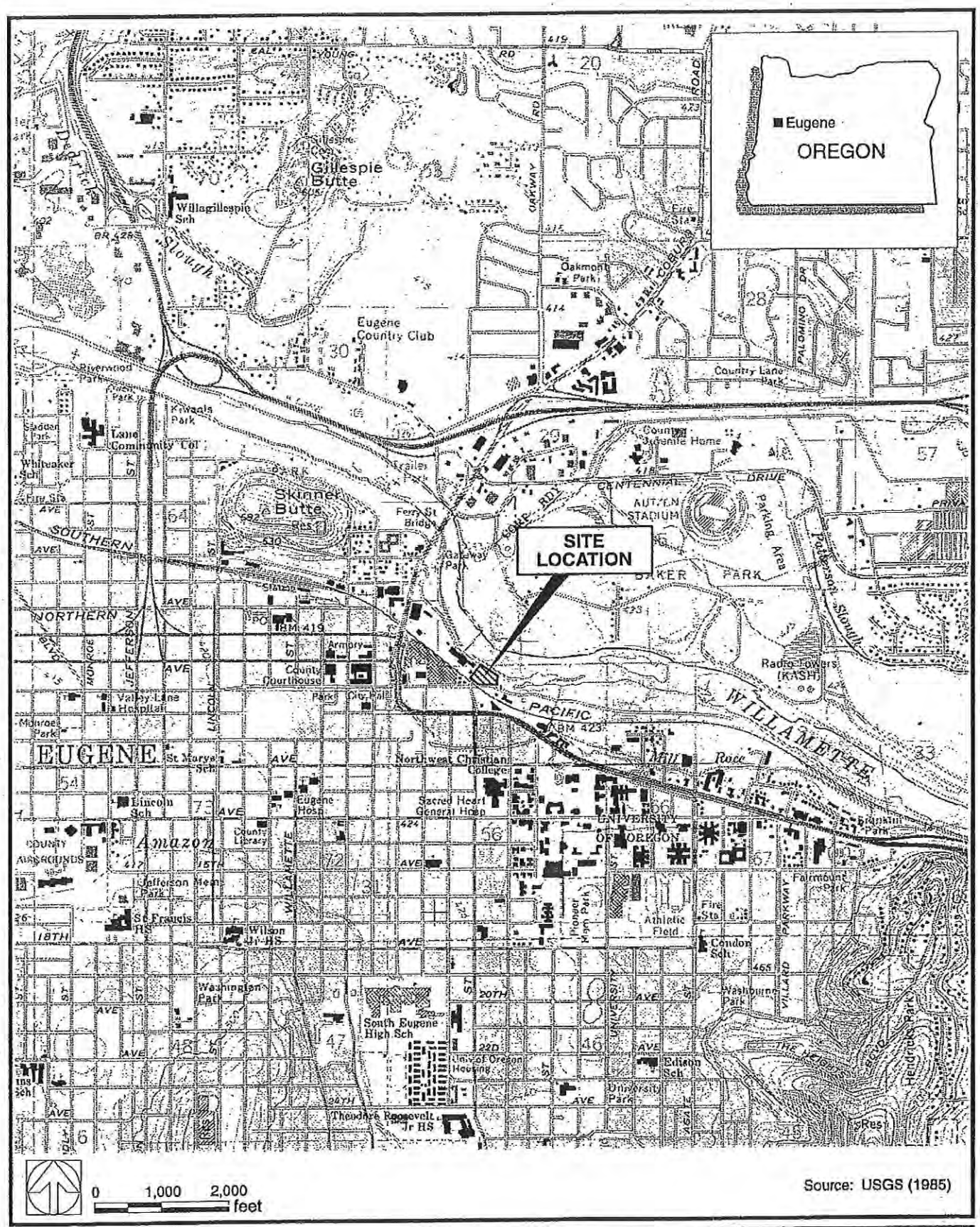
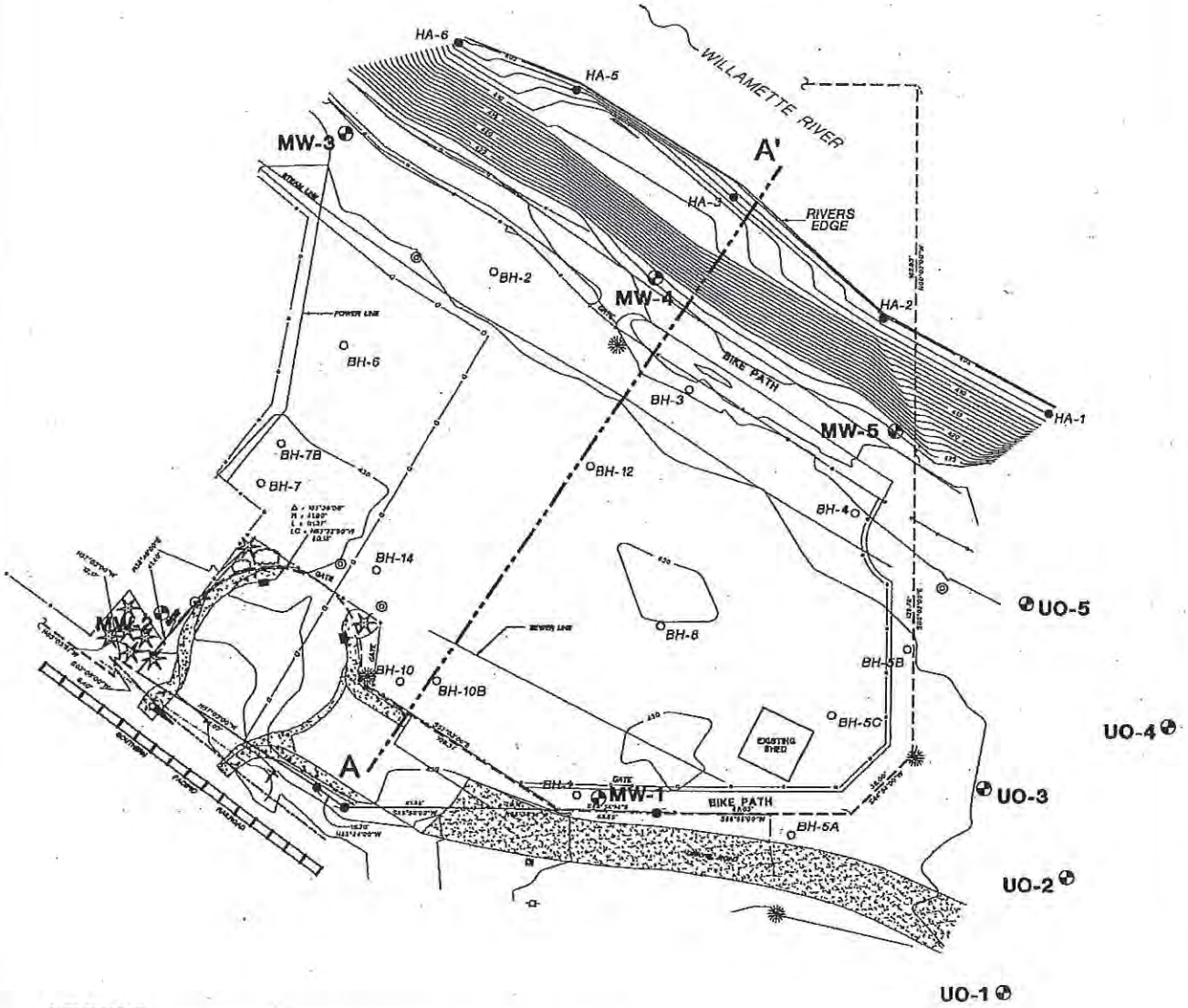


Figure 1. Site Location Map



LEGEND

- MONITORING WELLS
- FOUND 5/8" IRON ROD
- HAND-AUGER HOLE
- BOREHOLE
- LUMINAIRE
- CONIFER TREE
- GAS VALVE
- POWER POLE
- MANHOLE
- CROSSING ARM
- SIGNPOST
- NATURAL GAS LINE
- CHAIN-LINK FENCE
- WATER LINE
- RAILROAD TRACKS
- EDGE OF PAVEMENT
- EDGE OF GRAVEL
- PROPERTY LINE

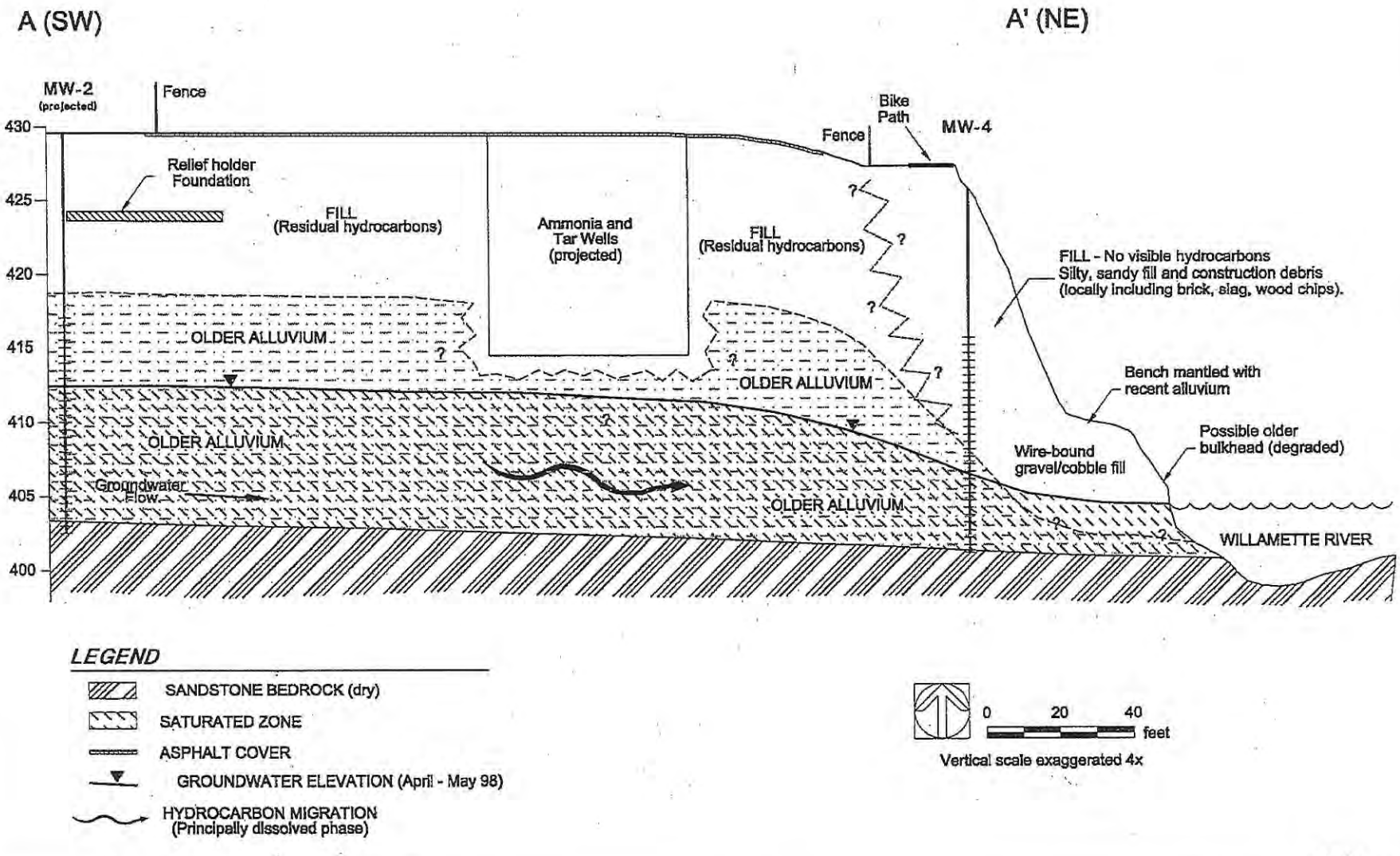
0 75 feet

Source: W&H Pacific

Exponent

Figure 2. Site Plan

86005800.001.0103\NEWBASE 2.dwg 04/20/00 OR



Exponent

Figure 3. Generalized Cross-Section

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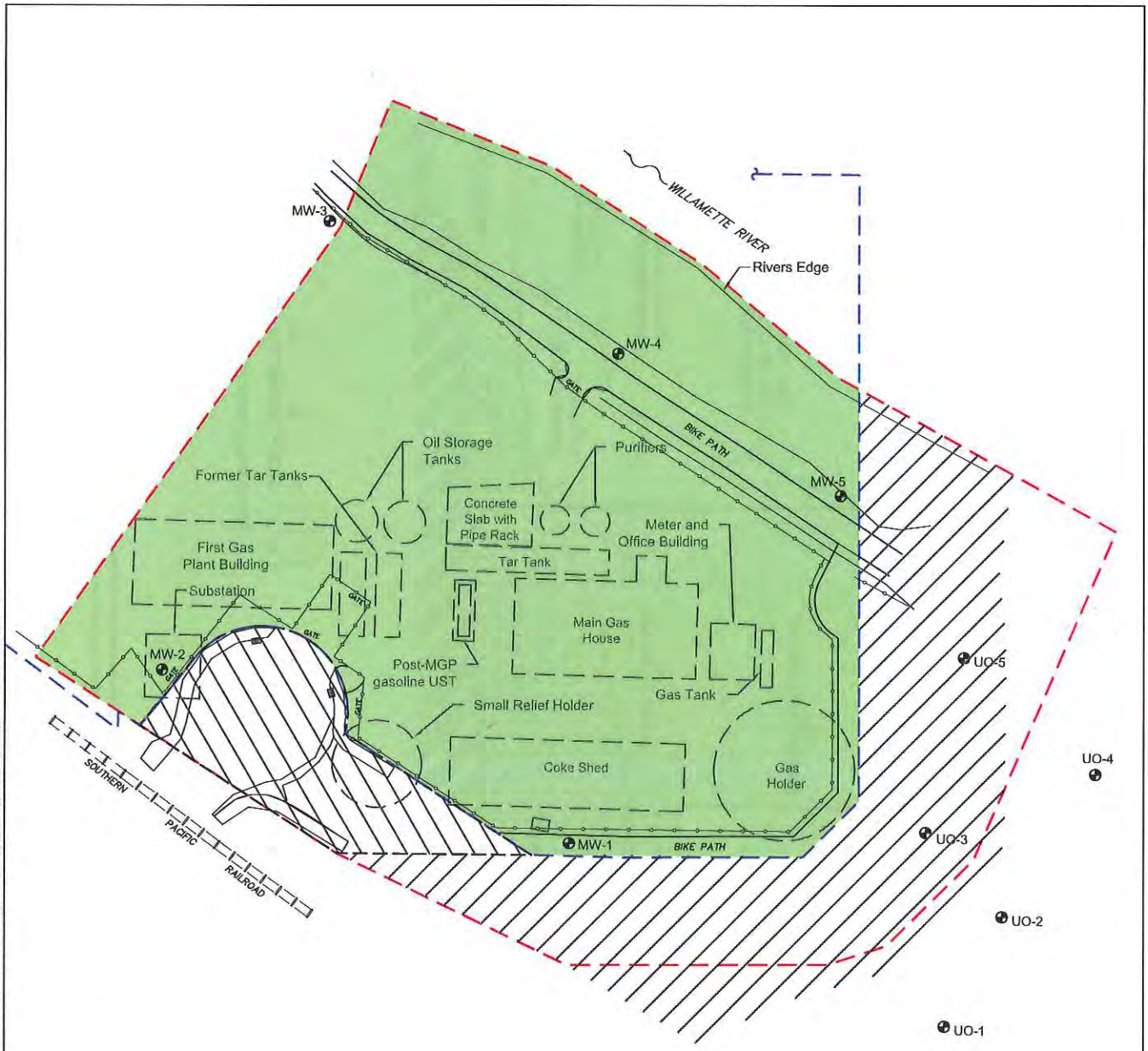

Monitoring well
EWEB property line
Approximate location of revised locality of facility (LOF)
Fence line
Railroad
Management Area (EWEB property subject to engineering and institutional controls)
University of Oregon Property
City of Eugene Property

0 75 Feet

N

Notes:
1. Property boundary between City of Eugene and University of Oregon approximately located.

Sources:
1. Base Map Survey by: W&H Pacific (9/17/96)
2. Base Map Provided by: Swanson Hydrology + GeoMorphology and Windward Environmental, LLC. (Final Feasibility Study, April 2006)

Prepared by Integral Consulting Inc.

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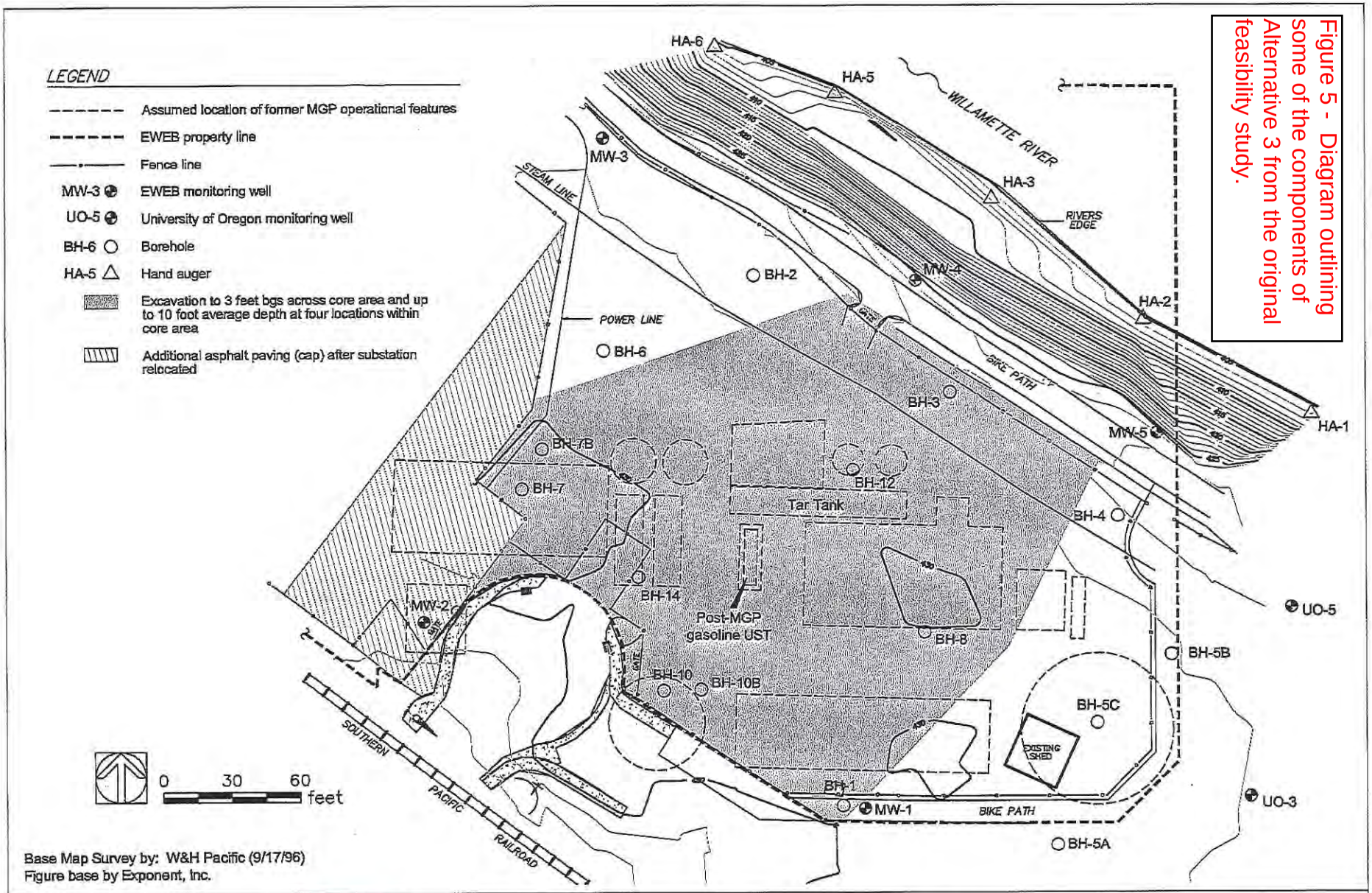
Windward environmental LLC

Axelrod LLC ENVIRONMENTAL CONSULTING

Figure 4.
DEQ Revised Locality of Facility for Contamination
Eugene Manufactured Gas Plant (Former) Site

Figure 5 - Diagram outlining some of the components of Alternative 3 from the original feasibility study.



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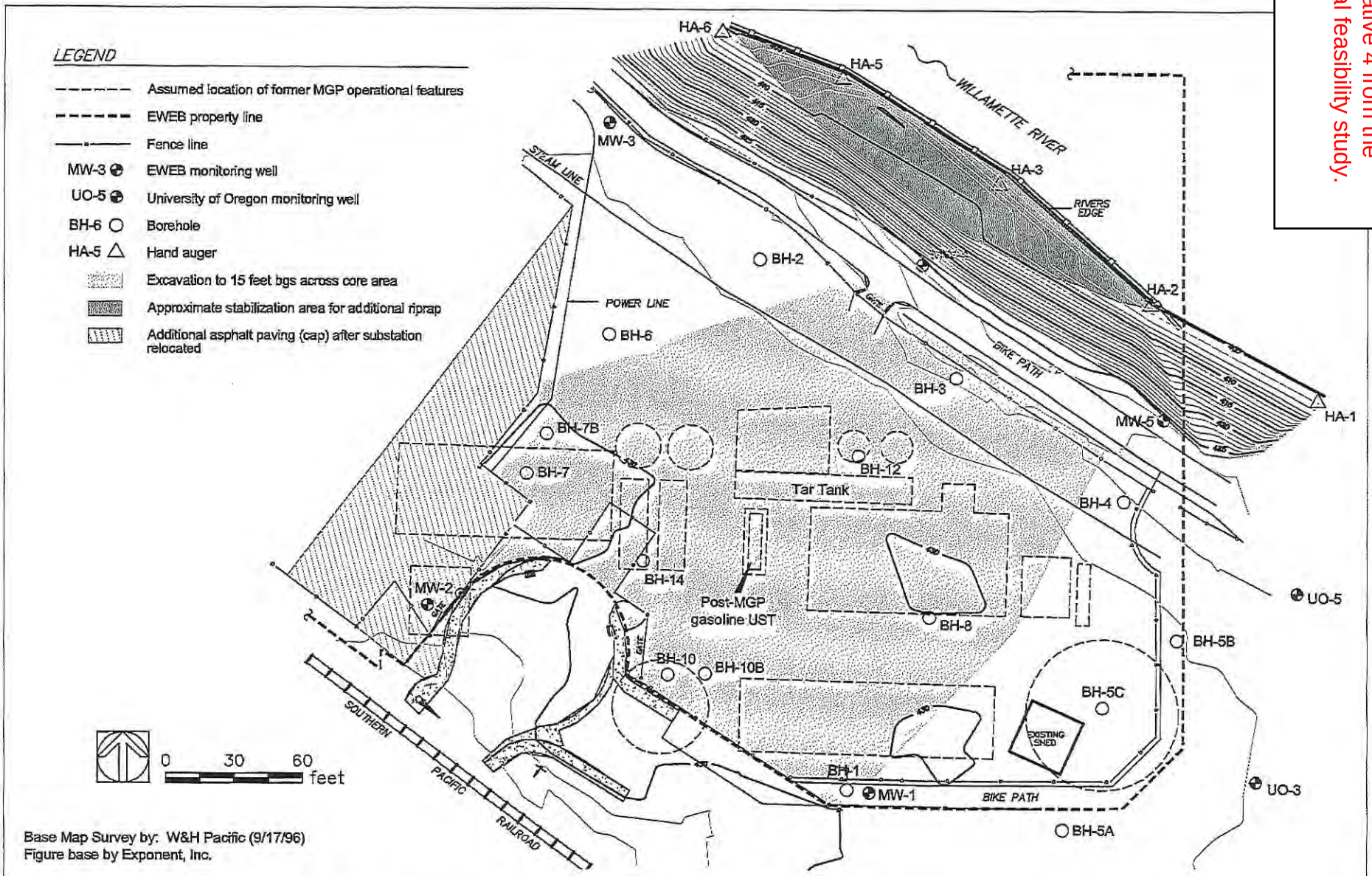
500 Seabright Ave, Suite 202 Santa Cruz, CA 95062
PH 831.427.0288 FX 831.427.0472

Upland shallow soil excavation area and supplemental paving for Alternative 3

Figure 6 - Diagram outlining some of the components of Alternative 4 from the original feasibility study.



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500 Seabright Ave, Suite 202 Santa Cruz, CA 95062
PH 831.427.0288 FX 831.427.0472