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Source Water – Wellhead Protection Program

Section 5 of 2012 Water System Plan Update (Draft)

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Prepared for

City of Longview
1525 Broadway
Longview, Washington 98632

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List of Acronyms

<u>Acronym</u>	<u>Description</u>
ADD	Average Day Demand
bgs	below ground surface
BHWSD	Beacon Hill Water and Sewer District
City	City of Longview
Cowlitz PUD	Cowlitz County Public Utility District #1
DOH	Washington State Department of Health
Ecology	Washington State Department of Ecology
GSI	GSI Water Solutions, Inc.
LMC	Longview Municipal Code
MCL	Maximum Contaminant Limit
MGD	million gallons per day
MFRWTP	Mint Farm Regional Water Treatment Plant
PCAs	potential contaminating activities
PDR	Preliminary Design Report
WAC	Washington Administrative Code
WHPP	Wellhead Protection Plan
WHPA	Wellhead Protection Area
WSP	City of Longview Water System Plan Update 2012

Section 5: Source Water – Wellhead Protection Program

This report discusses the City of Longview's (City's) new source of supply and summarizes the aquifer characteristics and the City's Wellhead Protection Program. The Mint Farm Wellfield and Mint Farm Regional Water Treatment Plant (MFRWTP) are scheduled to begin producing drinking water for the City and Beacon Hill Water and Sewer District (BHWSD) in late 2012. Various studies were conducted and reports generated to determine the feasibility of the site as the sole source of supply from hydrogeologic and water quality aspects. These reports are available in their entirety on the City's web site at <http://www.mylongview.com/publicworks/WaterProject.html>.

Information pertinent to protecting the groundwater source is contained in Part 2 of the *City of Longview Mint Farm Regional Water Treatment Plant Preliminary Design Report (PDR)*, dated March 2010. More specifically, Part 2A, Hydrogeologic Characterization, Part 2B, Water Quality and Environmental Risk Assessment, contain hydrogeology information on the aquifer and the results of the Environmental Site Assessment (Phase I and II) and Human Health Risk Assessment. This information is also available on the City's website. To protect the groundwater source, and in accordance with Washington Administrative Code (WAC) 246-290-135 (3), this chapter is the City's Wellhead Protection Program.

5.1 Source Information

5.1.1 Aquifer Characteristics

The wellfield is located in the southwestern part of the City in an area known as the Mint Farm Industrial Park (see Figure 5-1) and is situated on a relatively flat floodplain at an elevation of approximately 10 feet above mean sea level. A network of dikes and drainage ditches in the Longview-Kelso basin lowers the overall shallow groundwater elevations and protects the basin from flooding during high river levels and large storm events. The wellfield site was used for agricultural operations, including mint and grass farming, until about 1975. The wellfield is located near industrial and commercial businesses, a managed wetland, and undeveloped property.

Two distinct groundwater systems are present at the wellfield site: a shallow system, and a deep system with a confining layer of silt and clay about 200 feet thick between the two systems. In the area around the wellfield site, the confining layer ranges in thickness from approximately 100 to 200 feet near the wellfield, but becomes appreciably thinner to the north and east near residential areas. The wellfield consists of four wells drilled into the deep aquifer, with plans to add two more wells as needed to meet future water demands. Figure 5-2 shows the wellfield configuration. Groundwater modeling indicates the source for the deep aquifer is the Columbia River, with a travel time to the wellfield of between 2 and 35 years. Figure 5-3 illustrates the aquifer source area and anticipated travel times. The hydrogeologic characterization of the Mint Farm area, including the deep groundwater aquifer, is provided in Hydrogeologic Characterization (Kennedy/Jenks 2010) of PDR Part 2A, Hydrogeologic Characterization (Kennedy/Jenks 2010).

The groundwater model utilized a 50-year demand scenario (2059). Based on the groundwater modeling results, the wellfield is capable of meeting and exceeding the 2059 demands.

5.1.2 Constructed Wells

Four wells have been drilled on the wellfield site (PW-1 through PW-4), with plans to add two additional wells to meet future water demands. The wells are nearly identical and drilled to a depth of between 352 and 378 feet. All of the wells have sanitary seals to at least 150 feet below ground surface (bgs). Table 5-1 below summarizes the constructed wells. Copies of the well logs for each well are included in the Water System Plan (WSP) appendices.

Table 5-1: Mint Farm Wellfield – Constructed Wells

Well Name	Ecology Well Tag#	Depth (feet bgs)	Depth to First Open Interval (feet bgs)	Sustained Yield (gpm)	Length of Pump Test	Drawdown (feet)	Drawdown of Nearest Well (feet)
PW-1	BAM420	375	230 BGS	3,918	36 days	3.3 avg.	.33 avg.
PW-2	BHF855	378	228	3982	12 hours	2.2	0
PW-3	BHF856	352	235	3987	12 hours	1.9	0
PW-4	BHF857	352	237	3950	12 hours	1.7	0

Groundwater Contamination Susceptibility Assessments have been completed for each well and are included in the WSP Appendices. In addition, a Source Approval package will be submitted to the Washington State Department of Health (DOH) in February 2012 with a request to consider these four wells as part of a wellfield, rather than regulate them as unique separate wells.

Figure 5-1: Wellfield Location Overview



Figure 5-2: Wellfield Configuration

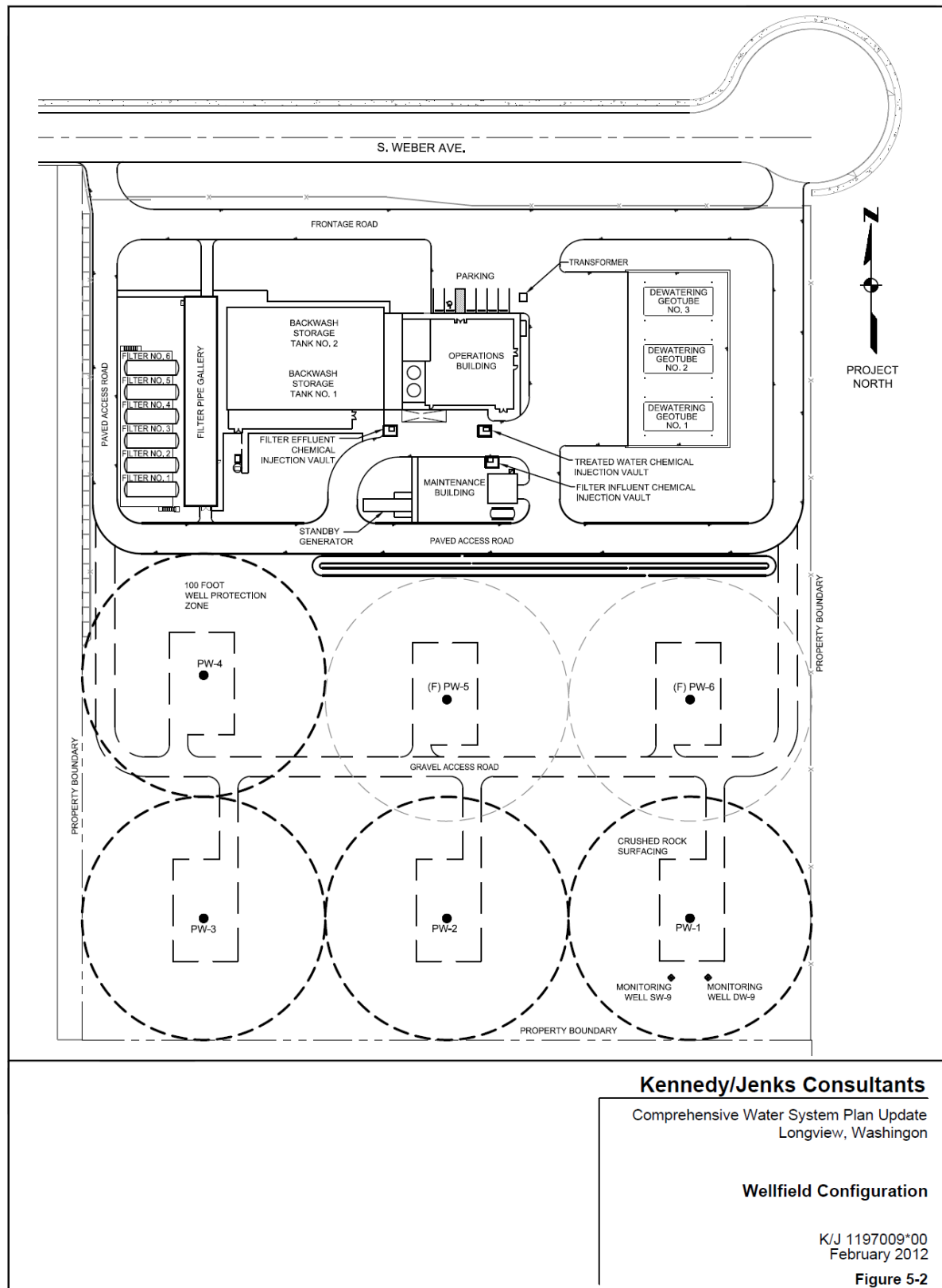
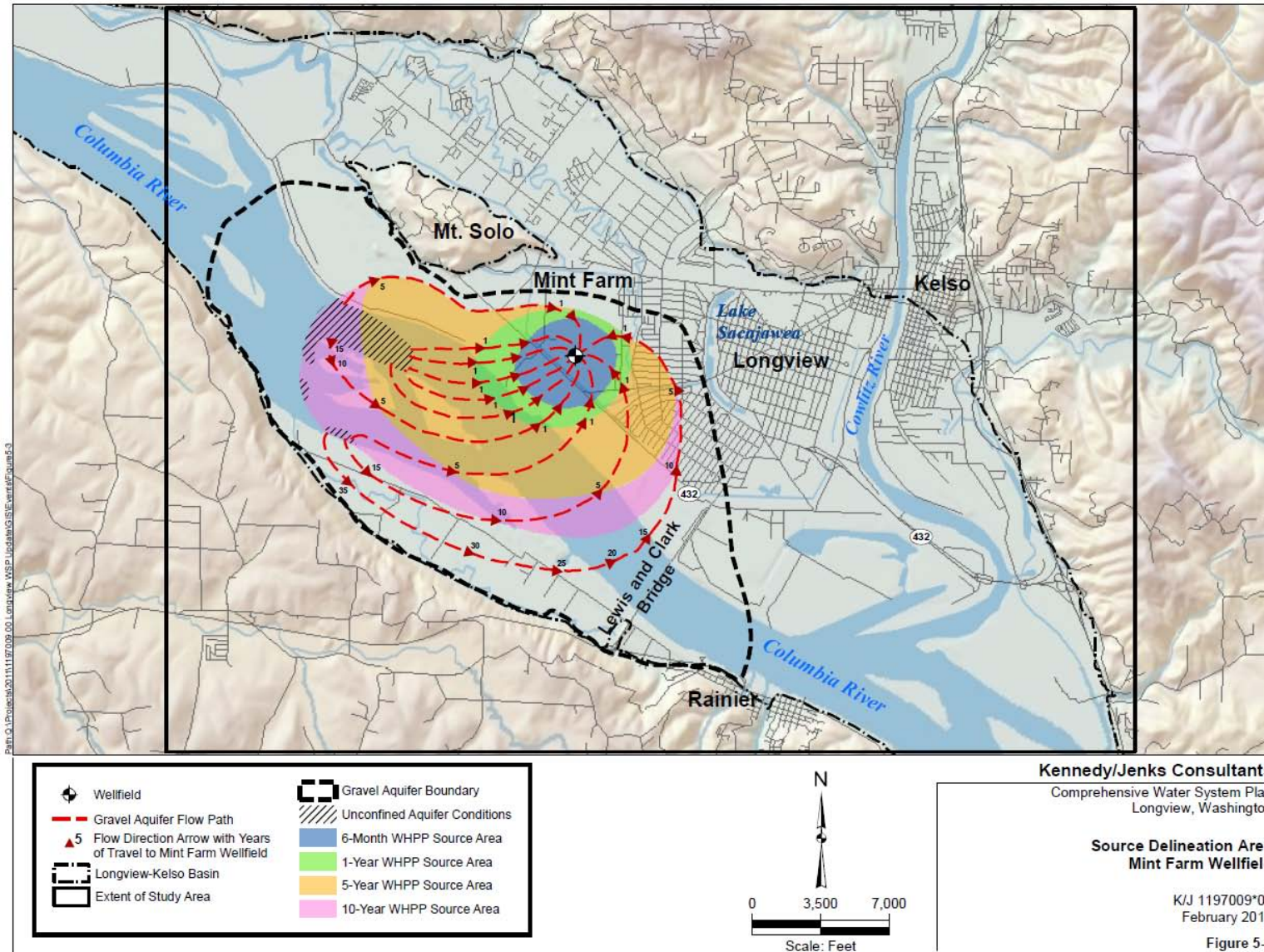


Figure 5-3: Source Delineation Area Mint Farm Wellfield



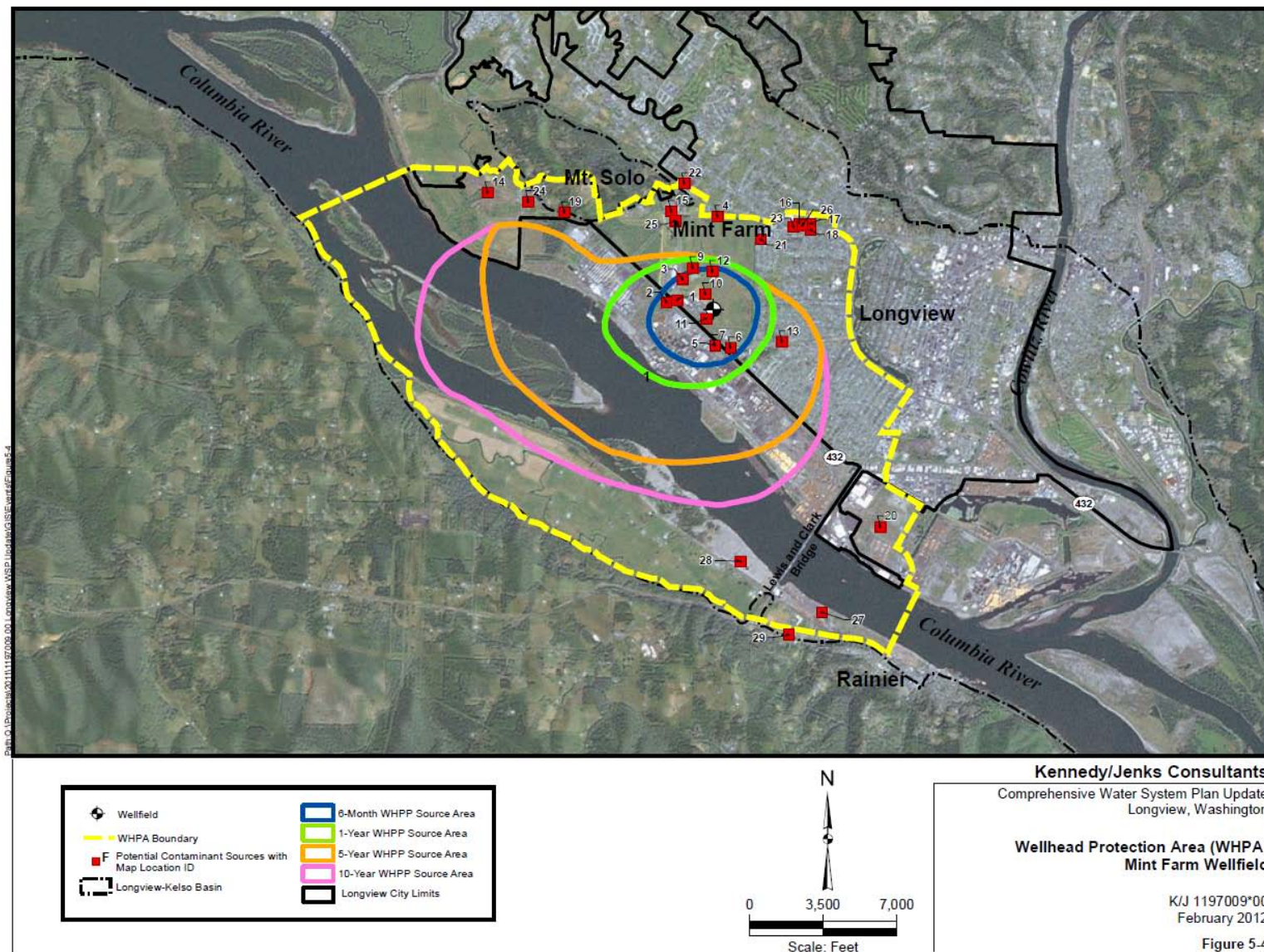
5.2 Wellhead Protection Area

The Wellhead Protection Area (WHPA) delineation was developed using the three-dimensional numerical groundwater model United States Geological Survey Code MODFLOW2000 and ADD projected at 12 million gallons per day (MGD) in 2059. Current water demand forecast suggest a 2059 ADD of about 8 MGD. As a result, the analysis is quite conservative allowing for unexpected industrial or commercial demand, or higher than forecasted growth. The groundwater flow patterns were calculated using MODPATH, a particle tracking program that uses the hydraulic gradient, hydraulic conductivity, and porosity. The model results indicate the times for water from the Columbia River to travel to the Mint Farm Wellfield varies from approximately 2 years to over 35 years along the paths shown on Figure 5-3. The City's comprehensive Wellhead Protection Plan (WHPP) comprises specific elements that include:

- A susceptibility assessment
- Delineation of wellhead protection areas
- Inventory of potential contaminant sources
- Distribution of findings
- Contingency Plans
- Appropriate spill/incident response measures.

The City intends to establish, by ordinance, a WHPA. The area is larger than the estimated 10-year time of travel in order to have boundaries that are readily recognizable in the field and on maps to facilitate implementation of various protective measures. The WHPA is shown on Figure 5-4.

Figure 5-4: Mint Farm Wellhead Protection Area



Potential threats to groundwater quality caused by 12 MGD ADD pumping at the Mint Farm wellfield were evaluated with three model scenarios:

- Forward particle tracking from potential contaminating activities (PCAs).
- Constant ground surface contaminant source at the Mint Farm.
- Constant ground source contaminant source along the Columbia River.

The results indicate that contamination from the above sources does not reach the Mint Farm production wells within a 30-year time frame (Kennedy/Jenks Consultants 2010). Figure 5-5 provides an additional illustration of the source of supply to the Mint Farm wells. Water from the Columbia River percolates through the deep water-bearing gravel to the Mint Farm and up into the wells. Therefore, the City's WHPP is focused as follows:

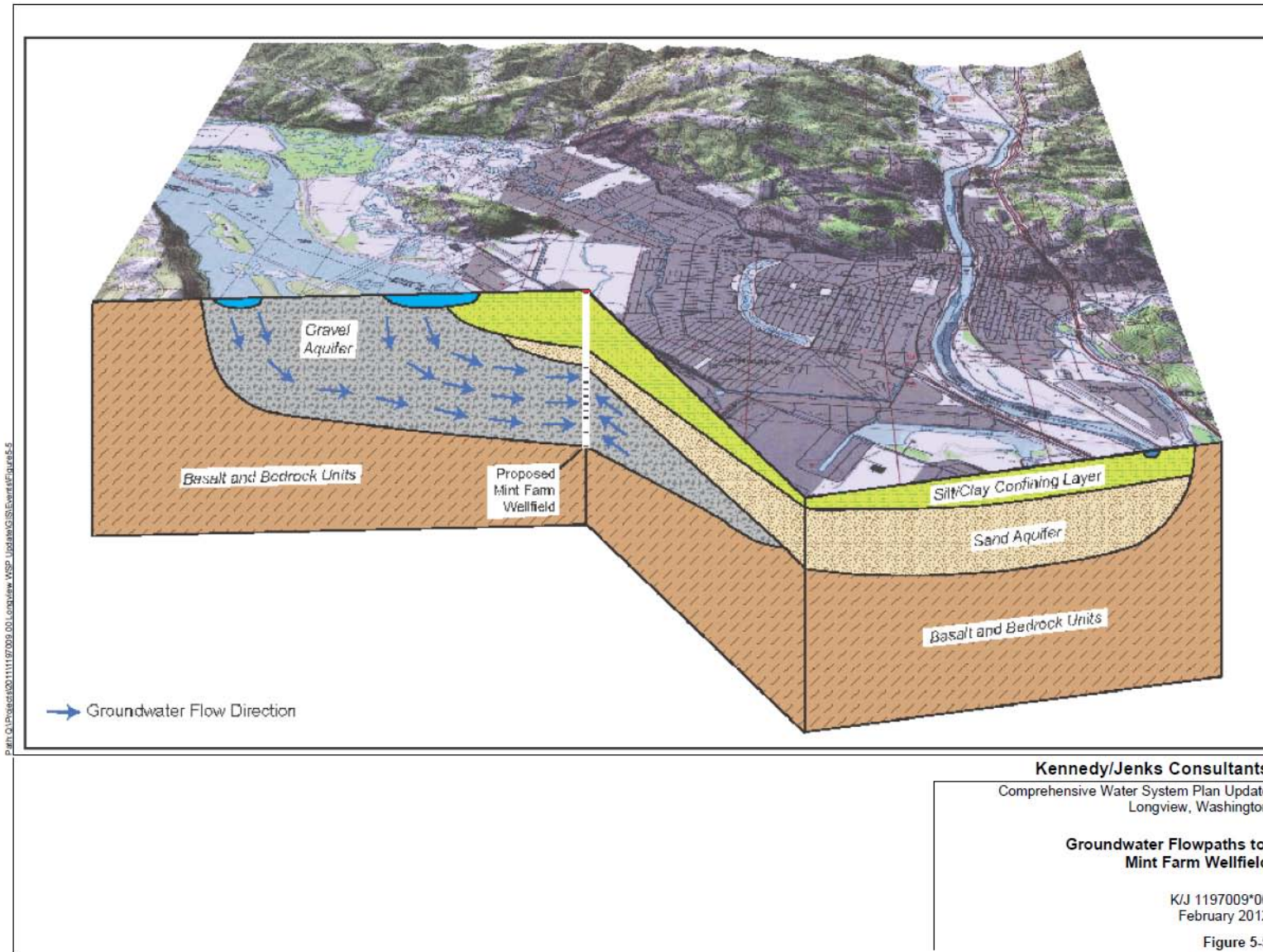
- Most spills of light non-aqueous phase liquid will float on the river surface and not impact the deep aquifer. Major spills consisting of dense non-aqueous phase liquid could sink to the river bottom and present some concern. In both cases, the compound will be flushed downstream rapidly. A method to quickly report spills in the Columbia River to the City will be developed as part of the program.
- Protective measures within the wellhead protection area will focus on preventing or mitigating the risks from construction or drilling methods that could penetrate to the deep aquifer, such as drilled pilings, piers, or other penetrations for new buildings and structures.
- The prevention of spills or surface contamination of any kind within the wellhead protection area is essential, even if the likelihood of penetration to the deep aquifer is remote.

5.2.1 Inventory of Potential Contaminants

An environmental review was completed in 2008 by GSI Water Solutions, Inc. (GSI) that identified and assessed the potential contaminants in the Mint Farm WHPA. A copy of GSI's 2008 report is available in their entirety on the City's website. This report identified 17 risks from industrial or commercial activities, three risks from contaminated shallow groundwater plumes, and risk from inadequate well seals.

Although numerous sites for potential contamination were identified, most were determined to be low risk surface contamination sites. To address the medium risk elements, the City has established a rigorous monitoring program. The shallow groundwater plumes appear to be migrating away from the wellfield towards the Columbia River. The Water Quality and Environmental Risk Assessment Part 2B of the PDR, presents a thorough discussion of water quality findings, as well as the data gathering and analyses conducted of the deep and shallow monitoring well network constructed in 2009. The City will continue to monitor the deep sentry wells for early detection purposes. As noted previously, the Longview MODFLOW Model did not identify any complete pathways between potential contamination activities in the Mint Farm or neighboring industrial areas and the deep groundwater aquifer.

Figure 5-5: Groundwater Flowpaths to Mint Farm Wellfield



Spills, leaks, or discharges of potential contaminants on or near the surface will not directly impact the deeper aquifer. However, these sources of contamination may enter the Columbia River through either the shallow aquifer or the drainage canals. The tremendous flow of the Columbia River, as well as the fact that the recharge area is at the bottom of the river, minimizes the potential threat presented by the shallow aquifer or drainage canals in this area.

A list of the potential sources of contamination within and near the 10-year time of travel is included in Table 5-2. Table 5-2 summarizes the information as reported in GSI's report and the Phase I and II Environmental Site Assessment. These sites are located on Figure 5-4. The City will notify all owners and operators of these sites of the wellfield and request their assistance in protecting the aquifer. Regulatory agencies and local governments (regulatory and first responders) involved with the areas within the WHPP will also be notified. A copy of these letters and their lists recipients are included in the WSP appendices.

The following is a list of governmental agencies that will be notified of the WHPA boundary and potential contaminant inventory:

- Washington State Department of Ecology
- Washington State Department of Health
- Oregon State Department of Environmental Quality
- Cowlitz County
- Columbia County (Oregon)
- US Environmental Protection Agency
- Washington State Department of Fish and Wildlife
- Oregon State Department of Fish & Wildlife
- US Army Corps of Engineers
- US Coast Guard
- Port of Longview
- Port of St. Helens
- National Oceanic and Atmospheric Administration Fisheries / National Marine Fisheries Service
- Washington Department of Emergency Management
- City of Rainier
- Columbia River Fire District.

Table 5-2: List of Potential Sources of Contamination

Company/Business	Site Name	Map Location	Latitude/Longitude	Time of Travel Zone
Moeller Land/Cattle Co.	Flex Foam Facility	1	46.1375/122.98583	6-Month
Bonneville Power Administration	Longview Substation	2	46.13716/-122.98786	6-Month
Mint Farm Energy Ctr, LLC	Energy Plant	3	48.14028/122.985	6-Month
Weyerhaeuser	Mint Farm	4	46 8 54.83/122 58 43.62	6-month
Weyerhaeuser	HG Chlor Alkali	5	46.13171/-122.9785	6-Month
Washington Way Market	Washington Way Market	6	46.1315/-122.97555	6-Month
Weyerhaeuser	Plywood Mill	7	46.13172/-122.9785	6-Month
Columbia/Cowlitz Railway	Rail Spur	8	N/A	6-Month
Woodinville Lumber, Inc.	Tri County Truss	9	46 8 30.38/122 58 59.29	6-Month
Solvay Interlox	Solvay Interlox Facility	10	46 8 18.39/122 58 50.35	6-Month
HASA (J Huber)	HASA (J Huber)	11	46 8 6.70/122 58 49.03	6-Month
Millennium Bulk Terminals	Millennium Bulk Terminals - Longview	12	46 8 29/122 59 46	5-Year
Millers Market	Millers Market	13	46.13252/-122.96597	5-Year
Unknown	Unknown Diesel Spill	14	46 9 2.63/123 1 19.23	Buffer area
Longview Auto Wrecking	Longview Auto Wrecking	15	46 8 56.501/122 59 15	Buffer area
Fred Meyer	Fred Meyer Fuel Stop	16	46 08 52.43/-122 57 48.31	Buffer area
Safeway	Safeway Fuel Station	17	46 8 52.71 / 122 57 40.93	Buffer area
Rio West Restaurant	Rio West Restaurant	18	46 8 49.898/122 57 40.702	Buffer area
McCall Trucking	McCall Trucking	19	46.14846/-123.00753	Buffer area
Port of Longview	Port of Longview	20	46 6 31.63/122 56 47.33	Buffer area
US EPA Dorothy Ave Mercury Spill	US EPA Dorothy Ave Mercury Spill	21	46 8 44.84/122 58 13.99	Buffer area
Longview School District	Longview School District 122	22	46.15274/-122.98525	Buffer area
Shell/Texaco Station	Shell/Texaco Station	23	46 8 51/122 57 52	Buffer area
Robert Radakovich Sr/ Port of Longview	Mt. Solo Landfill	24	46 8 59.04/123 00 51.68	Buffer area
Toyocom	Toyocom Devices of America	25	46 8 52.07/122 59 11.81	Buffer area
Ocean Beach Chevron	Ocean Beach Chevron	26	46 8 52/122 57 46	Buffer area
Teevin Brothers	Teevin Brothers	27	46.097391/122.956932	Buffer area
US Gypsum Co	US Gypsum Co	28	46 06 13.52/122 58 20.80	Buffer area
Rainer Shell	Sheel Gas Station	29	46.094352/122.963032	Buffer area

5.2.1.1 Existing Deep Aquifer Wells

Weyerhaeuser Company, who has three deep gravel aquifer wells, has been contacted and is considering decommissioning these wells. Millennium Bulk Terminals has been contacted to initiate plans for protection of their nine deep wells. At this time, Millennium Bulk Terminals does not have plans to abandon any of their wells and is restoring all nine wells to operating condition. Puget Sound Energy has two deep wells, constructed in 2001 and 2002 using modern construction methods that pose little risk of contamination to the City's wellfield.

5.2.2 Management Strategies and Implementation

The City's approach to management and implementation of the WHPP, a combination of ordinances and a monitoring well network, are discussed below.

5.2.2.1 Ordinances

Chapter 17 of the Longview Municipal Code (LMC) deals with the environment and includes sections on Critical Areas, stormwater management, and general environmental protection. This chapter of the LMC was expanded to include protection of the municipal water source aquifer. The water supply protection ordinance (Ord. No. 3127) was first adopted on 11 February 2010 to prohibit the practice of hydraulic fracturing at all locations within or beneath the corporate city limits. The ordinance also prohibits "any other activity that has the potential to significantly reduce the Mint Farm Aquifer recharge, aquifer flow, or aquifer water quality and threaten the use of the Mint Farm Aquifer as a municipal water supply."

The City intends to adopt a new ordinance further amending the LMC to establish the WHPA boundary and to provide additional detail on regulations to protect the aquifer. A copy of the draft ordinance is included in the WSP appendices.

5.2.2.2 Outside of Longview Jurisdiction

For areas within the WHPA but outside of Longview's jurisdiction, the City has approached Cowlitz County regarding their adoption of a wellhead protection ordinance that is similar to the City's. The City has also contacted Weyerhaeuser Company and Millennium Bulk Terminals regarding the potential for executing wellhead protection agreements if the County does not adopt a wellhead protection ordinance. Additionally, the City will contact the City of Rainier and Columbia County in Oregon regarding adoption of wellhead protection ordinances similar to the City's, to address that portion of the WHPA that lies within Oregon.

5.2.2.3 Monitoring Wells

The City is committed to continuing to sample select deep monitoring wells located along Industrial Way, including DW-1, DW-2, DW-5, DW-6, DW-7, and DW-9 on a semi-annual basis. These wells are within the primary flow path from the river to the Mint Farm and analyses of these wells will provide an early warning system to the City if an unanticipated contamination of the deep aquifer occurs. The wellhead protection program will utilize monitoring wells as an early identification of potential adverse changes in groundwater quality within the target aquifer. The City is considering additional monitoring wells and has contacted Weyerhaeuser Company and Millennium Bulk Terminals regarding the potential to install additional monitoring wells on their property.

Figure 5-6: Groundwater Monitoring Well Sites



5.2.3 Contingency Plan

Due to the characteristics of the deep aquifer, it is very unlikely that one or more wells would be impacted by a contamination event requiring immediate suspension of its use. A more likely scenario would be detection of a slight quantity of a drinking water contaminant in a monitoring well and/or production well.

If contamination is detected in a monitoring well or production well, the City will initiate a quality assurance/quality control review of the sampling and handling procedures and collect a confirmation sample as soon as possible. If the presence of a contaminant is confirmed, the City will consult with the DOH, and consideration should be given to sampling other wells in the wellfield, selected monitoring wells, and the treated water. Even if a drinking water Maximum Contaminant Limit (MCL) (the level at which consumers' health may be impacted after a prolonged exposure) is exceeded, the City will likely have time to address the problem without impacting public health.

If a production well, monitoring well or nearby deep aquifer well is impacted by contamination, the City will immediately notify BHWSD and the City of Kelso, water purveyors supplied by the MFRWTP. Similarly, the City will work with Ecology and the DOH to report the contamination and locate its source.

Depending on the level and extent of contamination, various operational options will be considered including:

- Using other wells in the wellfield
- Alternating use of individual wells
- Changing the length of time that each well is in operation
- Reducing water system demands by implementing the City's Water Shortage Response Plan ordinance (LMC 15.74) as discussed in Section 4.5.1
- Obtaining water from the City of Kelso through their intertie
- Equipping the City's Prudential Boulevard Well
- Obtaining water from another approved source of water
- Depending on the level of contamination, the City will consider providing treatment of water from one or more production wells. Treating and lowering the contaminant level in one production well may allow the City to blend this water with water containing a higher concentration of contaminant, to produce water containing a reduced average level. Blending is a common treatment technique for chemical contamination of wells.

5.2.4 Spill and Incident Response Planning

As previously stated, a spill or other contamination of the soil or shallow groundwater likely will not directly affect the deep aquifer. However, because of the potential for this contamination to migrate to the Consolidated Diking Improvement District's drainage ditches and/or Columbia River, the City must be notified of any event that may cause contamination of shallow groundwater or the drainage system. Current first response containment procedures should be followed rather than washing or flushing the spill into the ground or drainage system. Likewise,

the City should be notified of spills or discharges to the river that are not permitted or that exceed permit levels.

As stated above, the City will notify all first responders and governmental agencies with jurisdiction in the WHPA and requested their assistance in protecting the quality of the deep gravel aquifer. In addition to the list of agencies to be notified, the following entities will be requested to report spills to the City's emergency telephone operator:

- Cowlitz County Com Center (Dispatch)
- Longview Fire Department
- Longview Police Department
- Cowlitz 2 Fire & Rescue
- Washington State Patrol
- Cowlitz County Sheriff
- U.S. Coast Guard
- U.S. Army Corps of Engineers
- Columbia River Fire
- Port of Longview
- Port of St. Helens
- City of Rainier Police Department
- Washington State Department of Ecology
- U.S. Environmental Protection Agency
- Cowlitz Clean Sweep
- PNE Corporation
- Weyerhaeuser Company
- Longview Fibre Paper & Packaging Inc.

The City will also maintain an awareness of new developments or discharges to the Columbia River and monitor permit renewals and discharges on nearby upstream tributary rivers.