City of Portland, Oregon

Water Pollution Control Facilities (WPCF) Permit For
Class V Stormwater Underground Injection Control Systems

Permit Number: 102830

SYSTEMWIDE ASSESSMENT
Underground Injection Control Systems (UICs)

March 2015; Revised November 1, 2020

***Prepared By*:**
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The purpose of this Revised Systemwide Assessment is to identify, evaluate, track, and report on spatial and physical characteristics of existing and new City of Portland underground injection control systems (UICs) and to provide an ongoing mechanism to identify UICs that may impact groundwater through the discharge of surface drainage to the subsurface. The Revised Systemwide Assessment is a requirement of the Water Pollution Control Facility (WPCF) Permit that is to be completed at the 5-year mark of the current WPCF Permit #102830. The City is currently implementing the second WPCF Permit, issued by the Oregon Department of Environmental Quality (DEQ) in June 2015. The first WPCF Permit was issued to the City in June 2005.

As part of the first and second WPCF Permit requirements, the City submitted a Systemwide Assessment to DEQ in July 2006 and subsequently in June 2015. The components of the 2006 and 2015 Systemwide Assessment work are still valid and continue to be conducted under the 2015 Permit. Updates have been generated for this Revised Systemwide Assessment; however, the methods have not changed since 2015. Therefore, no significant changes are included in this update. The 2015 Permit indicates that if no significant changes occurred between 2015 and 2020, the fifth-year Systemwide Assessment may be included in the annual UIC Report. This Revised Systemwide Assessment describes the processes and how the City has updated existing datasets used to reevaluate the City's UICs. It is being submitted as Appendix A of the annual UIC Report.

The WPCF Permit requires the City to inventory all public UICs within the City of Portland and assess them relative to spatial and physical factors. The table below describes these assessment factors, identifies the section of the Revised Systemwide Assessment that addresses each factor, and summarizes the results of the assessment for each factor.

Assessment Factor	Systemwide Assessment Section	Revised Systemwide Assessment Results
An updated inventory of all injection systems that receive stormwater or other fluids and their location by latitude and longitude in decimal degrees using the NAD 83 datum	2.0	Tables updating the inventory of City-owned stormwater UICs and their locations will be available on the DEQ server November 1, 2020.
An estimate of vehicle trips per day for the area(s) drained by the injection system	3.0	Trips per day estimates are provided on the updated stormwater UIC inventory tables. As in 2015, these estimates are based on street classification, which is expressed as over or under 1,000 trips per day
An inventory of all stormwater UICs that discharge directly to groundwater	4.0	83 UICs identified (decrease from 84 in 2015)

Assessment Factor	Systemwide Assessment Section	Revised Systemwide Assessment Results
An inventory of all stormwater UICs that do not meet the setbacks from drinking water and irrigation wells	5.0	423 UICs identified (increase from 271 in 2015)
An inventory of all injection systems that are prohibited by OAR 340-044-0015(2)	6.0	No UICs identified (no change since 2015)
An inventory of all industrial facilities and commercial properties with activities that have the potential to discharge to City-owned or operated injection systems	7.0	1,607 commercial/industrial properties identified (increase from 1,199 in 2015)

1 Introduction

1.1 Purpose

The purpose of this Revised Systemwide Assessment is to identify, evaluate, track, and report on spatial and physical characteristics of existing and new City of Portland underground injection control systems (UICs) and to provide an ongoing mechanism to identify UICs that may impact groundwater through the discharge of surface drainage to the subsurface. The Revised Systemwide Assessment is a requirement of the Water Pollution Control Facility (WPCF) Permit that is to be completed at the 5-year mark of the current WPCF Permit #102830. The City is currently implementing the second WPCF Permit, issued by the Oregon Department of Environmental Quality (DEQ) in June 2015. The first WPCF Permit was issued to the City in June 2005.

As part of the first and second WPCF Permit requirements, the City submitted a Systemwide Assessment to DEQ in July 2006 and subsequently in June 2015. The components of the 2006 and 2015 Systemwide Assessment work are still valid and continue to be conducted under the 2015 Permit. Updates have been generated for this Revised Systemwide Assessment; however, the methods have not changed since 2015. Therefore, no significant changes are included in this update. The 2015 Permit indicates that if no significant changes have occurred between 2015 and 2020, the fifth-year Systemwide Assessment may be included in the annual UIC Report. This Revised Systemwide Assessment describes the processes and how the City has updated existing datasets used to reevaluate the City's UICs. It is being submitted as Appendix A of the annual UIC Report.

1.2 Overview of City UICs

As used in this document, **UIC** means any Class V underground injection control system owned or operated by the City of Portland. Examples of UICs include sumps, drywells, and hybrid infiltration facilities.

The City currently has approximately **9,238** active UICs that collect stormwater from public rights-of-way and discharge it to the subsurface. In the Portland area, groundwater serves as a backup drinking water supply to the Bull Run Reservoirs. The WPCF Permit establishes the UIC construction, operation, and maintenance requirements the City must implement to protect groundwater for use as a drinking water resource.

UICs are most prevalent in areas of the City east of the Willamette River where there is a greater occurrence of subsurface soils that support greater infiltration rates. UICs in these areas have become an essential element of stormwater management and in some cases are the only form of stormwater disposal available. Where some form of piped stormwater system exists, UICs also help reduce the need to install or increase the capacity of piped stormwater infrastructure. In addition to infrastructure purposes, UICs also quickly and efficiently reintroduce stormwater in the subsurface soils, filter and cool runoff, and reduce direct discharges from piped stormwater systems into local surface water bodies, including Johnson Creek, the Columbia Slough, and the Willamette River.

UICs are also an important component of street-side swales and green streets (vegetated stormwater management facilities) because they provide an infiltration point for overflow during large storm events when stormwater cannot be fully infiltrated through swales, planters, or other surface infiltration systems.

1.3 Regulatory Background

Congress enacted UIC rules in 1974 under the federal Safe Drinking Water Act (SDWA) and modified the rules in 1999. The U.S. Environmental Protection Agency (EPA) administers these rules under Title 40 of the Code of Federal Regulations (CFR) Parts 144–148. In Oregon, EPA has delegated the regulation of UICs to DEQ. Oregon Administrative Rules (OAR) 340-044 were adopted in conformance with the federal SDWA and regulate all groundwater as a potential source of drinking water.

1.4 Systemwide Assessment Approach

The WPCF Permit requires the City to inventory all public UICs within the City of Portland and assess them relative to spatial and physical factors. Table 1-1 describes these assessment factors and identifies the section of the Revised Systemwide Assessment that addresses each factor.

Table 1-1
Permit-Specified Systemwide Assessment Requirements

Assessment Factor	Systemwide Assessment Section
An updated inventory of all injection systems that receive stormwater or other fluids and their location by latitude and longitude in decimal degrees using the NAD 83 datum	2.0
An estimate of vehicle trips per day for the area(s) drained by the injection system	3.0
An inventory of all stormwater injection systems that discharge directly into groundwater	4.0
An inventory of all stormwater injection systems that do not meet the setbacks from drinking water and irrigation wells	5.0
An inventory of all injection systems that are prohibited by OAR 340-044-0015(2)	6.0
An inventory of all industrial facilities and commercial properties with activities that have the potential to discharge to City-owned or operated injection systems	7.0

1.5 Limitations on Use of the Revised System Assessment

The Revised Systemwide Assessment assesses the factors listed in Table 1-1. Portions of the assessment are based on estimated and modeled information. The results are not intended to be used as a definitive source for determination of compliance status.

2 Database

2.1 Introduction/Permit Requirements

The 2015 WPCF Permit requires the City to provide DEQ with an inventory of all injection systems that receive stormwater or other fluids and their locations by latitude and longitude in decimal degrees using the NAD 83 datum. This was also a requirement of the first WPCF Permit. The City submitted the first UIC database to DEQ on September 1, 2005, and provided identification numbers, physical characteristics, and location information for all City-owned UICs. Since that time, the City has submitted updates to DEQ each year. In addition, a list of all new and removed UICs is included in the City's annual UIC Management Plan (UICMP) report that is submitted to DEQ each year.

In accordance with the requirements of the second permit, updates to the UIC database will be reported annually as part of the UICMP annual report due November 1 of each year.

2.2 Data Sources

The primary source of data for this Revised Systemwide Assessment and future annual updates is the facility management system (Hansen) used by the Bureau of Environmental Services (BES). The sections below describe the Hansen system and geographic information systems (GIS) data and how they are used to develop the City of Portland's UIC database.

2.2.1 Hansen System

The Hansen system is BES's primary maintenance management system and also serves as the asset management and inventory control system for the City's sewer system. BES UICs and associated sedimentation manholes are inventoried and characterized primarily through Hansen and are a subset of the entire asset inventory contained within the Hansen system. The City has maintained Hansen system data since the early 1980s.

2.2.2 GIS Data

GIS data for City-owned and operated UICs comes from the Data Maintenance Environment (DME) system, which the City maintains in the ESRI ArcGIS platform. The DME system attaches Hansen attribute data (construction and maintenance information specific to each UIC) to the spatial location of the UIC. The DME system is the sanctioned and officially recognized spatial representation of BES facility information. A more detailed description of it is included as part of the UIC database update submittal of June 1, 2006. All UIC spatial and pretreatment information in the database used for this Revised Systemwide Assessment was queried from the DME system. As of April 1, 2010, this includes information about all UICs operated by other City bureaus.

The fields in the database (latitude, longitude, distance to nearest water well, distance to nearest wetland, distance to nearest surface water, and depth to groundwater) require spatial location information in order to calculate valid values in GIS. If a UIC does not have a corresponding

location, is because BES's standard practice is to remove abandoned facilities from the DME dataset. Abandoned UIC locations are retained as records in the Hansen system.

2.2.3 External Data

As part of this Revised Systemwide Assessment, spatial analysis was needed to estimate vertical separation distance from groundwater and estimate horizontal separation distance to wells and to industrial and commercial properties. This required the collection of location-specific information from data sources external to the Hansen and DME systems. Sections 4, 5, and 7 describe how these datasets were generated and used.

2.3 Data Used for Systemwide Assessment Tasks

The data used for this Revised Systemwide Assessment are from the FY 2020 database snapshot captured on June 30, 2020. Because of the dynamic nature of the Hansen system, this snapshot was created to provide a stable basis for analysis and reporting in this Revised Systemwide Assessment. At the time of data extraction, there were 9,940 active and permanently abandoned City-operated or -managed UICs. Of these, 9,238 City UICs were active.

The location-specific datasets from external sources have been updated as part of this Revised Systemwide Assessment.

BES continues to use static, unique IDs in the "Well #" field (DEQ ID #), as initially assigned for the first UIC quarterly database submitted on September 1, 2005. As agreed upon by BES and DEQ in a July 19, 2005, meeting, BES maintains the relationship between Well # and the BES facility ID. This will facilitate any future coordination between the BES and DEQ data management systems.

2.4 Update: UIC Inventory

All System Assessment reporting included in this Revised Systemwide Assessment is based on the FY 2020 database snapshot captured on June 30, 2020. The inventory of all injection systems that receive stormwater or other fluids, and their locations by latitude and longitude in decimal degrees using the NAD 83 datum, is provided in the updated tables available on the DEQ server November 1, 2020.

3 Estimated Traffic Counts/Vehicle Trips Per Day

3.1 Introduction/Permit Requirements

The 2015 WPCF Permit requires the City to estimate the vehicle trips per day for the area(s) drained by the injection systems. The City compiled traffic information as part of the first permit and continues to track traffic information as part of the 2015 Permit.

3.2 Current Traffic Count Information

As in 2015, the City continues to determine traffic counts based on modeled transportation right-of-way (ROW) traffic provided by the Portland Bureau of Transportation. With the use of GIS tools, the ROW traffic count information is overlaid on a map containing UIC catchment information. Estimated traffic counts are then determined for each UIC, based on ROW drainage patterns. This process estimates a specific traffic count number for each UIC.

3.3 Evaluation Process

The traffic model currently used by the City uses field-collected traffic information to estimate traffic counts for City-managed ROWs. Maintaining and updating this model is very resource intensive because it requires field traffic data to be collected and then input into the model. Prior to the 2015 Systemwide Assessment, City conducted an investigation to find a more consistent and manageable way to collect and report traffic count information. After reviewing available traffic information, BES determined that a better way to associate traffic counts with public ROWs was to use street type classifications provided in the City of Portland's Transportation System Plan (2006, Amended 2020). This traffic plan does not provide specific counts for streets, but rather provides a street classification system based on other criteria such as type of traffic (residential, collector, or arterial). The City overlaid these street classifications with the modeled traffic counts associated with specific street types.

This evaluation showed that streets identified in the traffic plan as collector streets consistently have traffic counts of greater than 1,000 trips per day. Streets identified as residential-only consistently have traffic counts of less than 1,000 trips per day. To simplify the evaluation process for the 2015 Permit, the City began reporting all UICs as receiving drainage from ROWs with either less than or greater than 1,000 trips per day instead of providing a specific estimated traffic count. All UICs that receive drainage from a street identified as a collector street will continue to be identified as greater than 1,000 trips per day, and all UICs that receive drainage from a street identified as residential will continue to be identified as having less than 1,000 trips per day. DEQ agreed to this simplified process for evaluating traffic counts before the City implemented it as part of the updated UIC database used for this report. There is no change to the evaluation process for this Revised Systemwide Assessment.

3.4 Update: Traffic Counts

The Revised Systemwide Assessment estimated vehicle trips per day are provided in the updated stormwater UIC inventory tables, available on the DEQ server November 1, 2020. As in 2015, these estimates are based on street classification, which is expressed as over or under 1,000 trips per day.

4 UICs that Discharge Directly to Groundwater

4.1 Introduction/Permit Requirements

The 2015 WPCF Permit requires an inventory of all stormwater UICs that discharge directly to groundwater. The City continues to track depth to groundwater for all UIC locations and provides that information to DEQ in the UIC database (submitted per Chapter 2 inventory).

The first UIC permit issued in June 2005 required the City to determine separation distances for all City-owned UICs. Because complete depth-to-groundwater estimates were not available, the City worked with the U.S. Geological Survey (USGS) to develop a depth-to-groundwater map for the Portland metropolitan area to determine compliance specific to permit-required separation distances.[1] The following sections of this report discuss the development of that map in more detail, along with the GIS tools used to identify UICs that potentially discharge directly to groundwater.

The 2008 USGS depth-to-groundwater map has not been updated; however, that map is still the best dataset for determining depth to groundwater across the City of Portland. The City will continue to use the map to determine separation distances for all City UICs.

4.2 USGS Depth-to-Groundwater Estimates

USGS, in cooperation with the City of Portland, City of Gresham, Clackamas County, and Multnomah County, conducted a study to estimate the depth to the water table and seasonal water table fluctuations in the Portland metropolitan area. This section briefly summarizes the methods used in that study. A more detailed explanation of the process is provided as part of the USGS report.

4.2.1 Baseline Depth-to-Groundwater Estimates

Baseline estimates of depth to groundwater were prepared using water level data from 660 wells and information from selected surface water features. Water level measurements from 630 of these wells were taken as part of several previous USGS monitoring programs. The remaining 30 wells were newly located and measured by the USGS for this project to provide information in areas of previously limited data. Water table positions were also estimated, using selected surface water features that appeared to have a hydraulic connection to groundwater. These surface water features included major springs, wetlands, lakes, streams, and rivers that represent areas of regional groundwater discharge.

USGS interpolated depth to groundwater through a statistical method called “kriging,” a type of spatial moving average. Although complex, kriging is generally considered to be the best method available for interpolation. Kriging parameters were carefully selected by USGS and tested to

[1] Snyder, D.T. 2008. *Estimated depth to groundwater and configuration of the water table in the Portland, Oregon area.* WSGS Scientific Investigation Report 2008-5059.

match the data and conditions for the Portland area. The result is a baseline map of estimated depth to water for the Portland area.

4.2.2 Estimates of Seasonal High-Water Table

For the Portland Basin study, USGS selected wells with 10 or more water level observations to assess the spatial variation of seasonal high water. USGS found this approach to be optimal for ensuring that sufficient observations were used to represent all seasons and that the observations would generally be uniformly distributed throughout the year. Of the 660 wells, 150 were used to assess variation in seasonal high water. Outlier measurements resulting from pumping influences or from field or data entry errors were removed before analysis.

Mapping of the seasonal water level changes revealed an apparent correlation of the magnitude of the changes with the hydrogeologic unit present at the water table. This suggests the importance of the effective porosity and thickness of the unsaturated zone in controlling available storage and seasonal water level change in areas that generally receive similar quantities of recharge. Seasonal water level variation was assigned to zones based on the surficial hydrogeologic unit and using the median values of seasonal water level change determined for each hydrogeologic unit. USGS assigned a seasonal variation of approximately 3 feet for most hydrogeologic units.

Depth to seasonal high water was estimated by subtracting the seasonal variation from the baseline depth to water value at each UIC location. For example, if the baseline depth to water level is 20 feet, the depth to seasonal high water is estimated to be approximately 17 feet below ground surface.

4.3 ArcGIS Process for Determining Separation Distance

Using USGS estimates of seasonal high groundwater, the City used the following ArcGIS analysis to identify stormwater UICs that may discharge directly to groundwater.

Two data sources were used to calculate separation distance at each UIC location:

- USGS depth-to-groundwater data: This dataset contains raw depth values from ground surface to groundwater in feet. This information was obtained as part of the USGS depth-to-groundwater process described above in Section 4.2.1.

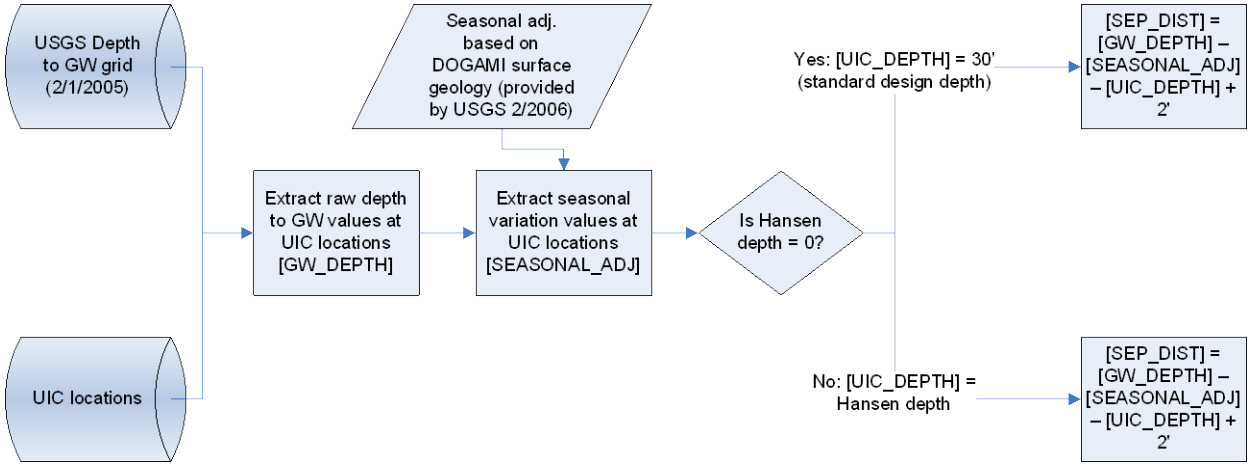
- Seasonal high-water adjustment data: This dataset contains seasonal groundwater variations, determined by hydrogeologic unit, as interpreted from surface geology units mapped by the Oregon Department of Geology and Mineral Industries (DOGAMI). A seasonal variability of approximately 3 feet was used, based on the USGS process described in Section 4.2.2.

Figure 4-1 shows the general process used to calculate separation distance. At each UIC location, USGS depth-to-groundwater and seasonal variation values were calculated from the datasets described above. Each UIC was then evaluated to determine if facility depth information was available in the Hansen database. If UIC depth information was in the Hansen database,

separation distance was calculated based on that depth information; if no depth information was available, separation distance was calculated based on the City of Portland standard sump design depth of 30 feet. Finally, 2 feet were added to all separation distance calculations to account for the standard depth of the sediment trap ring on the City of Portland standard sump design.

While most City of Portland UICs are considered standard sump types, some UICs are considered nonstandard—usually these are hybrid or horizontal (perf pipe) UICs. The nonstandard UICs are not subject to a 2-foot adjustment in the calculation of separation distance.

Figure 4-1
Process Used to Calculate Separation Distance at Each Sump Location



4.4 Update: UICs in Areas of High Groundwater

The City continues to use the process described in Sections 4.2 and 4.3. Based on these processes, it was determined that 83 stormwater UICs are estimated to potentially discharge directly to groundwater. This is down from 84 UICs that were reported in 2015, as one UIC was shallowed. Appendix A lists these UICs, along with a map of their locations.

Because depth to groundwater is based on estimates for seasonal highs, some of these UICs are not expected to discharge to groundwater year-round. Direct discharge UICs identified include UICs with standard sump construction in public ROWs and nonstandard UICs operated by Portland Parks & Recreation (landscaping runoff).

Under the first permit, the City was required to implement corrective actions for all UICs with less than 10 feet of separation distance, including UICs with direct discharge. The City completed several protectiveness demonstrations based on fate and transport modeling and multiple years of UIC stormwater sampling data. The modeling showed that direct discharge to groundwater from UICs is protective of groundwater. The result of the protectiveness demonstration allowed the City to maintain direct-discharge stormwater UICs, provided a sedimentation manhole was included as part of the UIC system. More information about the

protectiveness demonstration is contained in the UICMP submitted in conjunction with the 2015 Systemwide Assessment report. The program history in the UICMP identifies all protectiveness demonstrations that were completed during the first permit term.

This Systemwide Assessment lists only stormwater UICs that potentially discharge directly to groundwater. Separation distances between the bottom of a UIC and seasonal high groundwater for all UICs are reported as part of the UIC database.

4.5 Limitations of Analysis

The analysis and results presented above have the following limitations:

- Separation distance for all UICs is based on modeled depth-to-groundwater information provided by USGS. Although the USGS information is still the best available at this time, it can provide only estimates of seasonal high groundwater.

- All UICs that do not have reported facility depth information in the City's Hansen database are assumed to be 30 feet in depth. This is the standard construction depth for all new sump systems.

5 UICs Estimated to Be within 500 Feet of a Domestic Use Well or 2-Year Time of Travel of a Public Water Well

5.1 Introduction/Permit Requirements

The 2005 and 2015 WPCF Permits require this Systemwide Assessment to inventory and report all City-owned stormwater UICs that do not meet horizontal setback distances listed in Schedule A. This required the City to inventory all UICs that are located less than 500 feet from a domestic drinking or irrigation water well, within a 2-year time of travel of a public water well, or less than 500 feet from a public water well without a delineated time of travel. For both permit periods, the City completed a well inventory to identify all irrigation and drinking water wells located within the City of Portland and setback distances for all City-owned UICs.

After the original inventory was completed in 2006, a protectiveness demonstration[2] was performed that showed UICs within well setbacks and with 5 feet of vertical separation distance between the bottom of the UIC and seasonal high groundwater were protective of groundwater. Structural corrective actions were completed for all UICs that did not meet this requirement. That protectiveness demonstration is still valid for all UICs located within the permit-specified well setbacks. As part of the UICMP annual reporting process, all UIC monitoring data are evaluated to validate all completed protectiveness demonstrations, and the results are included in the 2020 annual report (*UICMP Annual Report No. 5 [2015 Permit]*).

5.2 Drinking and Irrigation Wells Inventory

As part of the Revised Systemwide Assessment, the City completed a detailed investigation of domestic and public water and irrigation wells. The purpose was to update the current list of wells located within the City of Portland that could be evaluated against all City-owned UICs to determine setback distances. The process is summarized below.

5.2.1 Identification of Possible Well Locations

A list of potential existing well locations was developed using the available data sources described below.

- *Oregon Water Resources Department (OWRD) Well Logs:* Well logs were obtained from the OWRD website. Well logs were queried from the site using township, section, range, and boundary criteria for the City of Portland. Well abandonment logs were also reviewed; these were paired up with drilling logs and removed from the list, since only non-abandoned wells were of concern for this investigation. After 2009, OWRD began digitizing location and well log information on a Well Report Mapping Tool; additional well data were obtained through this tool when not available on a well log.

[2] City of Portland. July 2008. UICs within Permit-Specified Well Setbacks Groundwater Protectiveness Demonstration No Further Action Request.

- *OWRD Water Rights Information:* Water rights information was obtained from the OWRD website. This information generally had much more detail about well location than the OWRD well logs. However, only large water use wells are required to obtain water rights, so most well logs have no water rights information. Also, a number of wells were found that had water rights information, but no well logs. These well locations were identified as part of the investigation but have no well log information to connect with.

- *USGS Well Location Information:* USGS conducted an inventory of wells in the Portland area around 1987–90. The City obtained both hard copies and electronic versions of the data. Electronic well locations were converted to GIS locations, yielding relatively precise location information.

- *Oregon Department of Health Services (DHS) Drinking Water Program:* The DHS Drinking Water Program website was used to find public water wells. Operators of public water wells are required to register their wells with DHS. There are a limited number of registered wells in Portland, but most of them had not been identified by other means.

- *Portland Water Bureau Records:* The Water Bureau provided BES with locations of its municipal water wells and a list of SODNR ("sewer only do not read") accounts and addresses. The Water Bureau considers the SODNR accounts to reflect residences that have private water wells but are connected to the sewer system for discharge purposes.

- *City of Portland Source Control Inspections:* Locations of several wells were found through various City inspection processes.

5.2.2 Information Consolidation

Well location information collected from the data sources described in Section 5.2.1 was reviewed and sorted to provide a comprehensive consolidated list of possible well locations and to facilitate a field investigation. The following activities were performed to develop the consolidated list of possible well locations:

- All available well logs were reviewed for relevant information, including best probable location, original well owner, well depth, static water level, and relevant well characteristics. Probable well locations were viewed using GIS tools to determine current ownership and the address of the owner.

- The property was cross-referenced with City records to determine if it had water and/or sanitary sewer service. If City records did not show a water connection, this indicated that the residents were using a well. This was used only as an indicator, to be verified in the field.

5.2.3 Field Verification

A field verification was conducted to investigate the location, ownership, and use of the well locations identified on the consolidated list. The field verification process included the following steps:

- Visit the site location and attempt to meet with the current owner/occupant.
- Complete an inventory checklist with the owner or occupant (whomever can provide the most accurate information).
- Locate, inspect, and photograph the well using aerial photographs, digital cameras, and information on property boundaries.
- Mark the approximate location of the well on an aerial map (for post-field coordinate confirmation).
- Where no one could be contacted at the site, leave behind an introduction letter, aerial photo, and well questionnaire form with a self-addressed envelope.

5.2.4 2020 Updated Well Data

As part of this Revised Systemwide Assessment, the existing dataset of wells was updated to incorporate any wells that had been added, removed, or had their type of use changed in the OWRD, DHS, and Water Bureau data sources since the last Systemwide Assessment was completed in 2015.

The updated dataset used for this Systemwide Assessment includes only wells that could be located and confirmed. It identifies 429 well locations within or in close proximity to the City of Portland boundaries. The 2015 assessment identified 434 wells. Though the total number of wells did not change significantly from 2015, the coverage used for the data evaluation was impacted by attributes such as well location and well use, in addition to new well installations.

Appendix B (Map B-1) shows all updated well locations.

Once the updated list of drinking and irrigation wells was completed, GIS evaluations were conducted, as described in the following sections, to develop an updated list of City owned stormwater UICs within 500 feet or a two-year time of travel of a well.

5.3 Determination of Two-Year Time-of-Travel Boundaries

Based on DHS records, 2-year time-of-travel boundaries were identified for the following public wells:

- Powell Valley Water District
- City Bible College
- Columbia South Shore Wellfield
- Mobile Village LLC (new)

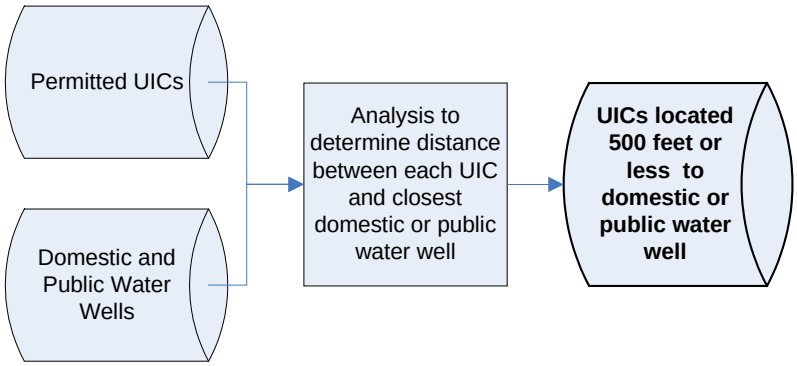
5.4 ArcGIS Process for Determining Distance between UICs and Wells

This section describes the process the City used to identify UICs located less than 500 feet from a domestic well, within a 2-year time of travel to a public water well, or less than 500 feet from a public water well without a delineated time of travel. Two primary ArcGIS analyses were used, as discussed below.

5.4.1 UICs within 500 Feet of a Well

Figure 5-1 shows the ArcGIS model used to develop a list of UICs located within 500 feet of a domestic or public water well. The 500-foot boundary applies to public water wells that do not have a 2-year time of travel or where the time of travel is less than 500 feet. The wells used in this analysis included those classified as inactive as well as those classified as active.

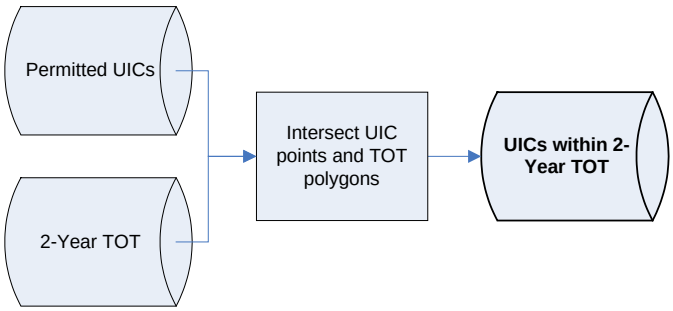
Figure 5-1
Process Used to Determine UICs Located within 500 Feet of a Domestic or Public Well



5.4.2 Two-Year Time-of-Travel Analysis for Public Water Wells

Figure 5-2 shows a simplified overview of the spatial query used to identify UICs that intersect the 2-year time-of-travel polygons established for the limited number of public water wells. The polygons are time-of-travel boundaries that have been reported to DHS for public water wells (i.e., those in the Powell Valley Water District and City Bible College).

Figure 5-2
Process Used to Determine UICs Located within 2-Year Time-of-Travel Polygons



5.5 Update: UICs within 500 Feet or 2-Year Time of Travel of a Well

For this Revised Systemwide Assessment, the City updated the existing well information and recalculated all setback distances (Section 5.2.4). Based on the original inventory process and the work completed to update the wells information, 423 stormwater UICs were identified within 500 feet or a 2-year time of travel to a drinking, irrigation, or public water well. The following is a breakdown of the total UICs:

- 312 stormwater UICs are estimated to be within 500 feet of a drinking water well (domestic and public). This is up from the total of 226 reported in 2015.

- 111 stormwater UICs are estimated to be within a 2-year time-of-travel boundary, but more than 500 feet from a public water well. This is up from the total of 45 reported in the 2015 Systemwide Assessment; DHS records have since confirmed domestic use for a well serving a manufactured home park at 13131 SE Stark St.

Appendix B lists these stormwater UICs in Tables B-1, and B-2 and shows them on Maps B-2 and B-3.

This Revised Systemwide Assessment reports only stormwater UICs estimated to be within 500 feet or a 2-year time of travel to a well. Using the updated well location information, distances of all UICs from domestic and public wells are reported in the UIC database used for this report.

5.6 Limitations of Analysis

The analysis and results presented above have the following limitations.

- Datasets discussed in Section 5.2.1 were limited by the following issues:

    - All well logs do not give a street address for the well, but rather have various alternate location formats. An attempt was made to identify a well location or a general area that could be followed up as part of the field survey.

  - Well drillers were not required to complete well logs before 1955, so data before that time are less reliable. For many of the wells dug before 1955, well logs were filled out many years later, so there is less information and often duplication. An attempt was made to identify well locations from the provided information if possible.

  - Some wells included in the USGS information were not found in the OWRD well logs or water rights.

  - Some wells included in the OWRD information were not included in the USGS information.

- Datasets discussed in Section 5.2.2 were limited by the following issues:

  - Well location was sometimes difficult to confirm because owner information from the well log was often incorrect, and the property may have been sold or the owner may live elsewhere.

  - Address changes and well logs were not updated once the logs were filed. Therefore, the address on the well log may not exist anymore, limiting the ability to locate the well.

- The spatial analysis conducted in Sections 5.4 and 5.5 included only wells that could be located and confirmed by City staff.

- Data used for the analysis are based on March 2020 information. Any wells installed or decommissioned since that time were not included in the investigation.

- As with the City's Hansen database, the well log databases used in the Revised Systemwide Assessment contain dynamic information that is constantly changing.

- Analysis of distances between a well and a UIC were performed with the assumption that all evaluated datasets were complete. Any information not provided in the described datasets was not included in the assessment.

6 Inventory of All Injection Systems Prohibited by OAR 340-044-0015(2)

6.1 Introduction/Permit Requirements

The 2015 WPCF Permit requires the Systemwide Assessment to include an inventory of all injection systems that are prohibited by OAR 340-044-0015(2)—i.e., injection systems in vehicle maintenance areas, fuel dispensing areas, floor pits, non-vehicle maintenance facilities floor drains, and fire station bay floor drains. This section describes the process the City used to investigate whether any UICs meet these restrictions.

6.2 Motor Vehicle Maintenance Floor Drain Investigation

The City does not currently have any motor vehicle maintenance floor drains that discharge to a UIC. The Pollution Prevention Outreach (P2O) Team, described below, has certified the condition of all internal drains of this type for groundwater protection.

The P2O Team is a coalition of government agencies with environmental management responsibilities within the Portland metropolitan area that have banded together to coordinate pollution prevention efforts. P2O Team members include staff from the City of Gresham, City of Portland, Clackamas County, Clean Water Services, Metro, DEQ, City of Troutdale, and Washington County.

The P2O Team sponsors the Eco-Logical Business Program, which certifies businesses that operate environmentally responsible business practices. Under the Eco-Logical Business Program, the P2O Team developed the Automotive Ecological Certification Program in 1997. Automotive maintenance and repair facilities were selected because they use hazardous materials, generate hazardous waste, and are typically not regulated or inspected by DEQ or other local, regional, or state agencies.

One of the program requirements is that all certified facilities must identify the discharge location of all internal and external drains and catch basins. All internal drains within the shop work areas, with the exception of approved wash areas going to the sanitary sewer system, must be sealed. All UICs must be identified, registered, and, if necessary, decommissioned. When the City of Portland certified all eight of its automotive maintenance and repair shops in 2000/2001, it determined that no UICs were present at any of the facilities, all internal drains had been sealed, and all catch basins were connected to either the municipal separate storm sewer system or combined sanitary sewer system. When the shops are recertified, the City will verify that all internal drains are still sealed. The City recertifies its repair and maintenance shops a minimum of every 3 to 5 years.

6.3 Fire Station Bay Drain Investigation

BES worked with the City of Portland Fire Bureau in 2005–06 to identify and evaluate all City fire station bay drains and their discharge points. The City currently operates 30 fire stations and an additional six training and administration buildings. The inventory of these buildings was conducted in two phases:

- In Phase One, all current and historical Fire Bureau building plans on file with the City were collected and reviewed. Information was gathered from paper and microfiche documents on file at the Bureau of Development Services and the Fire Bureau logistics division.

- In Phase Two, site visits of all Fire Bureau buildings were conducted to confirm identified building plan information.

All fire station bay drains discharge to the City sanitary sewer system or combined sewer system. Fire Bureau staff confirmed this information for this Revised Systemwide Assessment. The City's Stormwater Management Manual would require any new or upgraded fire stations to connect to the sanitary or combined sewer system.

6.4 Indoor Parking Garage Investigation

BES worked with the Bureau of General Services (BGS) in 2006 to identify and evaluate all indoor parking garages owned by the City. The City currently operates seven indoor parking garages. Assessment of these facilities was conducted in two phases:

- In Phase One, all current and historical building plans on file with the City were collected and reviewed. Information was gathered from paper and microfiche documents on file with the Bureau of Development Services.

- In Phase Two, site visits of the parking facilities were conducted to confirm identified building plan information.

The inventory identified no UICs that drain indoor parking garages owned or operated by the City. All indoor parking garage locations discharge to the City sanitary sewer system or combined sewer system. BGS staff confirmed this information for this Revised Systemwide Assessment. The City's Stormwater Management Manual would require any new or upgraded indoor parking structures to connect to the sanitary or combined sewer system.

6.5 Update: UICs Prohibited by OAR 340-044-0015(2)

As in 2015, the City does not currently have any prohibited UICs as detailed in this OAR.

7 Inventory of All Industrial Facilities and Commercial Properties with Activities That Have the Potential to Discharge to City-Owned UICs

7.1 Introduction/Permit Requirements

The 2015 WPCF Permit requires the Systemwide Assessment to include an inventory of all industrial facilities and commercial properties with activities that have the potential to discharge to City-owned UICs. Because of the changing nature of businesses and types of activities, system changes, and dataset updates, the Revised Systemwide Assessment is considered independent of the assessment completed in 2015. This section describes the process BES used to identify industrial facilities and commercial properties.

7.2 Identification of Commercial/Industrial Businesses

Two tools were considered to determine commercial/industrial activity types: the Portland Zoning Code designations and the North American Industry Classification System (NAICS) code classifications. NAICS classifications were selected for use, as described below.

7.2.1 Portland Zoning Code

The Portland Zoning Code is intended to implement Portland's Comprehensive Plan and related land use plans in a manner that protects the health, safety, and general welfare of the residents of Portland. Included within City of Portland Zoning Code Title 33 are designations for commercial zones, employment zones, and industrial use zones. Zonal code designations merely describe the potential for a business to engage in industrial or commercial activities, while NAICS codes are designations of industry and practices according to a business license. For this reason, the Portland Zoning Code designations are included in the inventory but were not used in the identification and selection process.

7.2.2 North American Industry Classification System (NAICS)

NAICS codes are used by businesses and government to classify business establishments according to type of economic activity or industry in Canada, Mexico, and the United States. NAICS codes assigned to establishments are based on the types of activities the establishments primarily conduct. NAICS codes have largely replaced the older Standard Industrial Classification (SIC) system.

This industry-based classification system is the current standard used by federal statistical agencies to classify businesses for the purpose of collecting, analyzing, and publishing statistical data related to the U.S. business economy. It is also used to track industrial and commercial activities as part of other regulatory municipal stormwater permit programs.[3]

There are 1,056 industry-based six-digit NAICS codes. As BES considered each industry, individual NAICS codes were selected based on whether the industry implies a potential for onsite commercial or industrial activities. By applying this criterion, 692 codes were selected and used as a filter for identifying commercial and industrial businesses. Appendix C (Table C-1) provides the final list of NAICS codes and code descriptions.

7.3 Datasets Used for Analysis

Two datasets were considered for identifying commercial or industrial businesses according to selected NAICS industry classification codes: 1) the licensure information for all licensed businesses located within the City of Portland, and 2) the Oregon State Fire Marshal (OSFM) Hazardous Substance Information Survey.

Businesses identified for the inventory are located on tax lots within a UIC drainage area and have a selected NAICS code that classifies the business type as more likely to create site drainage that could potentially contribute to a violation of the WPCF Permit. The identification process is described below.

7.3.1 Identification of Commercial/Industrial Businesses within the City of Portland

The Oregon Department of Employment (OED) maintains a database containing information about licensed businesses in the City of Portland. BES received permission to use this data to identify at least one NAICS code for each business that describes the primary type of industry. This comprehensive and digitized dataset contains **33,465** licensed businesses located within the City of Portland. This 2018 dataset is the most current dataset available.

Out of the 33,465 records, 7,429 records have codes that are included in the list of **692** selected NAICS codes; for the purposes of this assessment, these businesses are considered commercial/ industrial.

[3] Source: http://www.naics.com/info.htm.

7.3.2 Oregon State Fire Marshal Hazardous Substance Information Survey

In 1985, the Oregon Legislature passed the Oregon Community Right to Know and Protection Act. The purpose of this law is to provide first responders and the public with information about hazardous substances in their respective response areas and neighborhoods. The law directs the OSFM to survey business and government facilities for information about the presence of hazardous substances and to collect information about incidents involving hazardous substances. Facilities in Oregon that possess a reportable quantity[4] of a hazardous substance are required to report those substances on survey.[5]

Data downloaded from the OSFM contains business information, names and quantities of onsite hazardous materials, and NAICS codes for all facilities in Portland that reported and submitted the survey. OSFM data point locations were digitized using ArcGIS. A total of **1,691** out of **2,538** OSFM business records have NAICS codes included in the list of **692** selected NAICS codes. For the purposes of this assessment, these businesses are also considered commercial/ industrial.

7.3.3 City of Portland UIC Catchment Development

BES has developed a GIS tool to delineate urban drainage basins (catchments) using a combination of stormwater conveyance inventory data and high-resolution surface elevation data based on LiDAR.[6] The tool traces water flow both over land and through the City's drainage infrastructure to calculate the catchment area contributing flow to any point in the network selected by the user or to selected surface locations. The tool can use any set of points as locations to determine catchment area. These selected locations are (in order of priority):

- Stormwater inlets known to be draining to UIC pre-treatment systems, or
- Where inlets are not in the stormwater conveyance inventory, the pre-treatment system locations, or
- Where UICs are known to exist, but neither inlets nor pre-treatment systems are in the conveyance inventory, the UIC locations themselves. For UICs in series, the "upper" UIC is selected as the point of catchment delineation.

The tool starts with a stormwater drainage network. For BES, the source for this drainage network is BES's Hansen facility management system, which represents the best available data for all BES infrastructure. The UIC data are filtered, and locations for catchment delineations are selected as discussed above.

[4] 500 gallons, cubic feet, and pounds (liquids, non-liquefied gases and solids, respectively). Also, any quantity of a radioactive substance or radioactive waste.

[5] Source: Oregon State Fire Marshal

[6] Remote sensing technology that measures distance by illuminating a target with a laser and analyzing the reflected light.

The tool also requires the definition of surface drainage terrain. This is obtained using high-resolution digital elevation terrain data derived from the City's LiDAR data collection. Though collected at various time periods, the data available for most of the UIC areas of interest are of the highest quality and accuracy of all LiDAR data available. From this, a terrain model is created that is used in conjunction with the stormwater drainage network from the Hansen system.

The tool starts at the delineation points specified (in this case, UICs or their related stormwater drainage elements), and then traces up through stormwater drainage elements (pipes, ditches, inlets, or other stormwater conveyance elements). For the purposes of this discussion, the conveyance elements directly draining to each UIC are "Level 1" conveyance elements. When the tool finds the end of each stormwater drainage element associated with each UIC in Level 1, the delineation tool "switches" to the digital terrain data and finds all surface drainage pathways leading to the end of each stormwater drainage element. These surface drainage pathways are things such as curbs and gutters, small drainage swales, and land surface where stormwater can run across to a lower place. In this case, the lower places would be any Level 1 conveyance elements draining directly into UICs. This tracing up the land surfaces spreads out across the landscape until it either ends at the top of a local stormwater divide or at the outlet of another level (in this case, Level 2) of stormwater conveyance elements (pipes, ditches, inlets, etc.). The tool repeats this pattern of tracing up either conveyance elements or surface terrain until no more "uphill" area is available for stormwater to drain from. The area captured using this method is then associated with each original UIC, which was the starting point for the entire trace.

This GIS tool involves data preparation. Although the tool has been tested on a number of stormwater conveyance types for various BES projects and programs, it is still not entirely error free, though it is substantially faster than previous methods and is reliable enough to use, particularly since there are over 9,200 active UICs in the BES UIC inventory to delineate.

7.4 Update: Identification of Businesses That May Drain to City-Owned UICs

As in 2015, the process for identifying industrial facilities and commercial properties with the potential to discharge to a City-owned UIC was completed using the ArcGIS selection process. All commercial and industrial businesses that intersect delineated UIC subcatchment or drainage boundaries were identified, and a resulting list of business tax lots was developed**.** The final list identifies commercial and industrial businesses that are located within a tax lot that intersects a UIC subcatchment. In total, there are **1,703** businesses located within **1,607** properties that intersect **2,201** UIC subcatchments. Some properties contain more than one commercial/industrial business and a business may be listed more than once. Some UIC subcatchments contain more than one UIC, but only the primary UIC is listed. Appendix C lists these properties by business name, site address, and commercial and industrial activity codes with code descriptions, as well as the unique ID for the City-owned UIC that may receive drainage from the property.

7.5 Limitations of the Process

Although the best available information to date was used, this process has the following limitations:

- Business license data are included up to 2018.
- The process assumed that the OSFM data included complete and accurate x/y coordinates for digitization.
- The process assumed that the OSFM and business license data are complete. Any information not included within the query on the OSFM database, or provided by OED, was not included.
- The UIC subcatchment information approximates drainage based on best available data. The subcatchments are based on computer analysis and have not been field verified.
- The process assumes that if an intersection between a tax lot and a UIC subcatchment exists, some portion of the identified property may drain to that UIC. Actual drainage from an identified property may not have any impacts from the business site practices or the area of the property where work occurs or where chemicals are stored.

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