Surface Water Quality Characterization (Task 1.2)

LOTT Clean Water Alliance Reclaimed Water Infiltration Study

Technical Memorandum

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Acronyms and Abbreviations

BOD	Biological oxygen demand
cfs	Cubic feet per second
Ecology	Washington State Department of Ecology
EEA	Eurofins Eaton Analytical
LC/MS/MS	Liquid Chromatography/ Mass Spectrometry/Mass Spectrometry
LCS	Laboratory control samples
LOTT	LOTT Cleanwater Alliance
mg/L	Milligrams per liter
MRL	Method reporting limits
MS	Matrix spike
MSD	Matrix spike duplicate
N/A	Not applicable
ND	Not detected at the method reporting limit
ng/L	Nanograms per liter
NPDES	National Pollutant Elimination Discharge System
PPCP	Pharmaceuticals and personal care products
QA/QC	Quality assurance/quality control
RM	River mile
RPD	Relative percent difference
RWIS	Reclaimed Water Infiltration Study
SR	State Route
TMDL	Total maximum daily load
UGA	Urban growth area
USGS	United States Geological Survey
WSDOT	Washington State Department of Transportation
WY	Water Year

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1.0 Introduction

1.1 Background

The LOTT Clean Water Alliance (LOTT) is undertaking a multiyear Reclaimed Water Infiltration Study (study or RWIS). One of the project tasks (Task 1.2) is a water quality characterization of surface water potentially affected by reclaimed water infiltration. The study focused on two areas: 1) the surface water in the Woodland Creek watershed, which is downgradient of the current LOTT reclaimed water aquifer recharge facility (the Hawks Prairie Ponds and Recharge Basins), and 2) the surface waters in the Deschutes River watershed that are downgradient of future potential LOTT reclaimed water aquifer recharge sites. This is a technical data report describing the task goals, methods, monitoring results, and discussion. Results include flow measurements, in-situ water quality measurements, laboratory analytical results, and an assessment of quality assurance/ quality control (QA/QC) measurements. The discussion compares the water quality monitoring results performed for this study with results from previous monitoring studies.

1.2 Purpose of Surface Water Quality Monitoring

The purpose of the surface water quality monitoring task is to monitor the current surface water quality of the watersheds in the study area. This information will then be used to evaluate the existing water quality of surface waters and support a risk evaluation of reclaimed water use alternatives. The water quality characterization component of the RWIS is intended to answer the question, “What is the current quality of our local waters: groundwater, surface waters, drinking water, wastewater, and reclaimed water?” Some of the water quality parameters (i.e., residual chemicals such as pharmaceuticals and some personal care products) have not been sampled and analyzed for in surface water in these watersheds. Residual chemicals in surface waters could come from multiple sources including wastewater treatment plants, stormwater, agriculture runoff, residential lawns, septic tanks, etc. Establishing ambient water quality conditions is necessary in order to evaluate potential impacts to the environment from reclaimed water use.

The major goals for surface water quality monitoring (Task 1.2) are:

- Evaluate the existing water quality in the major surface water bodies in the study area.
- Collect surface water samples and analyze them for residual chemicals and conventional water quality parameters.
- Collect surface water samples representing summer low flow, a fall storm event, and winter high flow.
- Collect samples at or near the same locations used in prior studies (City of Lacey 2015; Washington State Department of Ecology [Ecology] 2006; Ecology 2012b; Thurston County 2015) for comparable data.
- Implement a QA/QC program that provides high accuracy and reproducibility.

The project study area, sampling methods and analytical procedures are described in the work plan titled, “Work Plan, Task 1.2, Surface Water Quality Characterization, Woodland Creek and Deschutes River” and dated July 6, 2015 (HDR 2015).

2.0 Description of Study Area

2.1 Physical Setting

The project study area included the Woodland Creek and Deschutes River watersheds. Woodland Creek is downgradient of the currently operating LOTT Hawks Prairie Ponds and Recharge Basins. LOTT has proposed future reclaimed water aquifer recharge facilities to be in the Deschutes River watershed.

2.2 Climate

The study area has a temperate marine climate, characterized by warm, dry summers and cool, wet winters (NOAA 2016). The long-term mean annual air temperature in Olympia is 50.5 degrees Fahrenheit (°F); August is the warmest month and January the coldest (mean monthly air temperatures of 64.1°F and 39.8°F, respectively). Afternoon temperatures are usually in the 70s in summer and from the upper 30s to lower 40s in winter.

A maritime influence moderates the climate in both the winter and summer (Phillips 1960). During the winter season, rainfall is usually of light to moderate intensity and frequent. The long-term mean annual precipitation is about 50 inches in Olympia (NOAA 2016), but ranges from about 35 to 65 inches in Thurston County (NOAA 1982). The areas of greater precipitation are in the southern portion of the county. Approximately 80 percent of the precipitation in Olympia falls between October and March. Most of the winter precipitation falls as rain at altitudes below 1,500 feet, as rain or snow between 1,500 and 2,500 feet, and as snow above 2,500 feet (Phillips 1960).

2.3 Woodland Creek Hydrology and Water Quality

The Woodland Creek watershed encompasses an area of approximately 29.7 square miles, and the creek has a total length of about 11 miles. The creek flows through the City of Lacey's Urban Growth Areas (UGAs) and Thurston County before emptying into Henderson Inlet (**Figure A-1**).

2.3.1 Flow Rates and Groundwater Interactions

Woodland Creek flows from the south to the north. The headwaters of Woodland Creek are a series of lakes with wetland areas. Hicks Lake flows into Pattison Lake and then Long Lake. At the outlet of Long Lake, the next mile of Woodland Creek is perennial, until entering Lake Lois. From Lake Lois to Beatty Springs, Woodland Creek is an intermittent channel that loses flow to groundwater and often dries up during the summer (Ecology 2006).

Just upstream of Beatty Springs, the creek channel enters a large wetland area and becomes diffuse. The channel re-forms north of the wetland, where Beatty Springs and College Springs contribute significant perennial flow to the creek. Woodland Creek is perennial from this point to the tidelands, gaining flow from groundwater and tributaries. Downstream (north) of Interstate 5 (I-5), the Woodland Creek channel deepens and has eroded through the upper sedimentary deposits, causing the creek channel to intersect the groundwater table (Logan et al. 2003). As a

result, the regional shallow groundwater discharges into the creek in the lower reach (Drost et al. 1999). There is a consistent gain in flow from groundwater at Beatty and College Springs (River Mile (RM) 3.4) and downstream to the mouth of the creek. A large wetland complex influences Woodland Creek between RM 3.1 and 3.4. Palm Creek, Eagle Creek, Fox Creek, and Jorgenson Creek contribute tributary flow to Woodland Creek before flowing into saltwater at Henderson Inlet at the southern end of Puget Sound. These tributaries each run less than 1 cubic foot per second (cfs) during the dry season. The first river mile of Woodland Creek is tidal. Flow measurements on Woodland Creek and tributaries between December 2002 and March 2004 (Ecology 2006) are summarized in **Appendix A** (**Table A-1**).

2.3.2 Surface Water Quality Washington State Regulatory Criteria

Henderson Inlet is designated under the Washington State water quality criteria as "extraordinary quality marine water" as described in WAC 173-201A-600(a) (Ecology 2012a). The tributaries to Henderson Inlet, including Woodland Creek, are considered "extraordinary quality water." All fresh surface waters that are tributaries to extraordinary quality marine waters are protected for the designated uses of core summer salmonid habitat and extraordinary primary contact recreation. Woodland Creek supports spawning and rearing for anadromous salmonids. The Woodland Creek surface water quality standards include the following:

- a 7-day average of the daily maximum temperatures (7-DADMax) of 16º Celsius (C);
- a lowest minimum 1-day dissolved oxygen concentration of 9.5 milligrams per liter (mg/L);
- pH between 6.5 and 8.5;
- a geometric mean of fecal coliform concentrations less than 50 colonies/100 mL, with not more than 10 percent of all samples obtained for calculating the geometric mean value exceeding 100 colonies/100 mL;
- Toxic substances may not be introduced above natural background levels in waters of the state that have the potential either singularly or cumulatively to adversely affect characteristic water uses, cause acute or chronic toxicity to the most sensitive biota dependent upon those waters, or adversely affect public health, as determined by the Washington State Department of Ecology (Ecology 2012a).

Woodland Creek currently exceeds (i.e., fails to meet) surface water quality criteria (i.e., category 4a or 5) for temperature, fecal coliform bacteria, and dissolved oxygen (Ecology 2016). Washington State and local agencies have been actively working to improve water quality.

2.3.3 Pollutant Loading Sources

In the 1990s, the Woodland Creek basin was one of the fastest growing areas in Thurston County (Thurston County WWM 1995). Ninety percent of the Woodland Creek watershed lies within the Lacey and Olympia UGAs (Clingman 2001). The basin still contains areas of undeveloped forests, although the dominant land use is suburban residential development. Residential subdivisions are growing rapidly in the area around the headwater lakes and near

the mouth of the stream basin. Residential development is most dense in the southern (upper) portion of the basin. In 1987, approximately 80 percent of the headwater lake shorelines (i.e., Hicks Lake, Pattison Lake, and Long Lake) and 16 percent of the creek shorelines in the Henderson basin were developed (Thurston County WWM 1995). More than a third of the land area in the watershed is comprised of parcels that utilize septic systems (City of Lacey 2002; Thurston County 2013). In 2007, 31 percent of the watershed was developed and considered impervious surface (Thurston County 2007). Urban development has encroached on approximately 322 acres of the 67 meter-wide riparian corridors in the Woodland Creek basin. The permitted discharges to Woodland Creek regulated under the National Pollutant Elimination Discharge System (NPDES) permits include the Nisqually Trout Farm #2 and stormwater discharges by the Washington Department of Transportation (WSDOT), Thurston County and the cities of Lacey and Olympia (Ecology 2006).

2.3.4 Previous Surface Water Quality Studies

Water quality monitoring in Woodland Creek has been conducted for several decades and most recently by Ecology (2006), the City of Lacey (2015), and Thurston County (2015). Ecology conducted an extensive study of water quality at several mainstem and tributary locations between 2002 and 2004, as part of the Henderson Inlet Watershed Fecal Coliform Bacteria, Dissolved Oxygen, pH, and Temperature Total Maximum Daily Load (TMDL) Study (Henderson Inlet Watershed TMDL) (Ecology 2006) (**Appendix A**, **Figure A-1**). The City of Lacey has been monitoring water temperature, pH, conductivity, dissolved oxygen, turbidity, fecal coliform, and nitrate + nitrite at RM 2.9 (Draham Road) since 2000 and more recently between Lake Lois and Long Lake. Thurston County has been monitoring water temperature, pH, conductivity, dissolved oxygen, turbidity, fecal coliform, total phosphorus, and nitrate + nitrite at Woodland Creek on a monthly basis at RM 2.9 (Draham Road) and RM 1.6 (Pleasant Glade Road) during select years (**Table A-4**).

The 2003 monitoring data from Ecology's Henderson Inlet Watershed TMDL (Ecology 2006) indicate that mainstem Woodland Creek downstream of Beatty Springs met the surface water quality criteria for water temperature (**Appendix A; Figure A-2**). The cool temperatures were attributed to major groundwater contributions to flow. The minimum dissolved oxygen levels (4.2 to 7.8 mg/L) were below the designated 9.5 mg/L criteria at RM 3.1 and 3.4 (**Appendix A, Table A-2**). The minimum dissolved oxygen concentration increased to 9.1 to 9.9 mg/L downstream at RM 1.6. The pH levels fell slightly below the criteria of 6.5 at the sites in and immediately downstream of the large wetland complex (RM 3.4 and 3.1) (Ecology 2006).

The Henderson Inlet Watershed TMDL (Ecology 2006) indicated elevated nutrient concentrations in Woodland Creek, relative to regional conditions. Nitrate + nitrite concentrations adjacent to Beatty Springs (RM 3.5) and just downstream of Beatty Springs (RM 3.4) averaged 2.8 and 2.0 mg/L during dry season sampling. Higher nitrate + nitrite levels were also seen in some of the tributaries during the dry season including: stormwater from I-5 (RM 3.1) (mean of 1.7 mg/L), Jorgenson Creek (mean of 1.3 mg/L), and Quail Creek (mean of 1.1 mg/L).

Nitrate + nitrite in groundwater collected from Beatty Springs and College Springs averaged 2.5 and 1.8 mg/L. There was more variability in the groundwater results than in the surface water at the springs. A previous study reported a range of nitrate + nitrite values from <0.10 to 9.3 mg/L in groundwater (Drost et al. 1998).

The Henderson Inlet Watershed TMDL (Ecology, 2006) concluded that it was likely that high nitrogen concentrations in groundwater are the main source of nitrogen loading to Woodland Creek during low flow conditions. All sites met the ammonia nitrogen criteria set forth in the standards. Ammonia nitrogen levels were generally low, with the highest levels seen at Woodland Creek RM 3.4 just downstream from Beatty Springs and the fish farm. Phosphorus levels in Woodland Creek were generally less than 0.10 mg/L for total phosphorus. Groundwater mean total phosphorus concentrations were similar at both Beatty and St. Martin's University Springs, ranging from 0.036 to 0.041 mg/L. Both total phosphorus and orthophosphate values for Woodland Creek were on the higher end of values for the region. Groundwater phosphorus results were similar to surface water concentrations in Woodland Creek and groundwater was determined to be a major source of phosphorus loading during low flow conditions.

The Henderson Inlet Watershed TMDL (Ecology 2006) identified fecal coliform contamination from stormwater and septic system contributions as a significant cause of water quality impairment. The occasional acidity of Woodland Creek (i.e., below the 6.5 standard) was attributed to natural conditions with tributary inflow associated with wetland complexes. Nutrient enrichment in Woodland Creek was attributed to on-site septic systems via groundwater discharge, and fertilizer via stormwater. Nutrient loading in the Woodland Creek basin has also been attributed to stormwater and septic system inputs to groundwater in other studies, including a "Current Conditions Report" prepared for Thurston County (PGG 2007).

Thurston County's most recent year of water quality monitoring data is 2012 for Woodland Creek at RM 1.6 and 2.9 (Thurston County 2015). In 2012, pH and fecal coliform met surface water quality standards, while dissolved oxygen had measurements below the 9.5 mg/L criteria (**Appendix A, Table A-4**). Total phosphorus concentrations were similar to those measured during the 2006 TMDL, with averages of 0.05 mg/L. Nitrate + nitrite concentrations were also similar to concentrations measured at these RMs during the 2006 TMDL. County water quality data are from monthly grab samples and may not fully represent the range of conditions that may be encountered during a more intensive survey (e.g., the 2006 TMDL). Also, instantaneous water temperature results cannot be directly compared with the 16 ºC 7-DADMax surface water quality standard.

The City of Lacey's most recent water year (WY) of monitoring data available for Woodland Creek were collected in WY 2014 at Draham Road (RM 2.9) (City of Lacey 2015). The more recent City of Lacey monitoring data at Draham Road (RM 2.9) were similar to Thurston County's 2012 results at the same location (Thurston County 2015).

2.4 Deschutes Watershed Hydrology and Water Quality

The Deschutes River watershed encompasses approximately 158 square miles and has a total length of about 60 miles. The Deschutes River originates in the forested and high relief Bald Hills, and flows northwest, before discharging into Capitol Lake **(Figure A-4**). Elevations in the watershed range from a few feet above sea level near Capitol Lake to 3,870 feet in the Bald Hills. Primary tributaries in the central and northern (lower) river include Silver Spring Creek, Spurgeon Creek, Ayer Creek, and Chambers Creek.

The Percival Creek watershed also discharges to Capitol Lake and Budd Inlet and encompasses approximately 10 square miles. Percival Creek originates in Trosper Lake and flows for approximately 3.5 miles to Capitol Lake. Black Lake Ditch is the only tributary and contributes flow from the Black Lake catchment.

2.4.1 Flow Rates and Groundwater Interactions

The headwaters of the Deschutes River are composed of high relief headwater tributaries in the Bald Hills. Between the Upper Deschutes Falls (RM 42.3) and Vail Road SE (RM 28.6), the river gains flow from tributary inputs, although the river loses flow to groundwater. Between Vail Road SE (RM 28.6) and State Route (SR) 507 (RM 20.5), the river transitions to a lower relief with more unconsolidated sediments and gains flow from groundwater, including a productive spring just upstream of SR 507. Between SR 507 (RM 20.5) and Military Road (RM 19.1), the river loses flow to groundwater.

The lower Deschutes River valley (RM 19 to Capitol Lake) is incised through the upper glacial deposits and results in regional groundwater discharging into the river (Drost 1999; Walsh et al. 2003; 2005). During low flow conditions, the lower reach Deschutes River flow is mostly from groundwater inflow. Ecology conducted a study in August 2003 to measure groundwater inflow by gaging the river and conducting a seepage run (Ecology 2007). The results of the seepage run indicate that of the 79 cfs in total river gains, only 8.3 cfs (about 10 percent) originated from tributary flow (**Appendix A, Table A-5; Figure A-6**). The remainder was from groundwater inflow. The largest groundwater inflow was 17 cfs between Military Road (RM 19.1) and Spurgeon Creek (RM 9.2), which intersects outwash sand and gravel, and 23 cfs between the Olympia Airport (RM 6.8) and the E Street Bridge (RM 0.5), which flows atop alluvial sand and gravel.

Flow in the Deschutes River at the E Street Bridge, RM 0.5 (USGS Station 12080010), ranges between over 1,700 cfs during high flow events to as low as 50 cfs during the dry season, as shown on **Appendix A** (**Figure A-5**) (Ecology 2012b). Average annual flows at RM 0.5 from 2000 through 2013 are approximately 442 cfs.

A low flow seepage run (i.e., a longitudinal flow survey) was conducted in Percival Creek on August 6, 2003, as part of an assessment of surface water/groundwater interactions conducted by Ecology (2007). Percival Creek is underlain throughout most of its length by generally loose deposits of coarse sand and fine gravel that were derived from reworked deposits of Vashon drift. Consistent gains in groundwater seepage occurred throughout the reaches (**Appendix A,**

Table A-6), although subsequent monitoring suggested that there were smaller reaches that alternated between gaining and losing flow (Ecology 2007).

The Deschutes River and Percival Creek watersheds also contain several small lakes. These lakes are called “kettle” or “pothole” lakes because they are formed from depressions created during glacial retreat. The lakes are essentially depressions in the topography that are thought to be filled by groundwater with minor inflow by precipitation or surface water run-off. Some of the lakes (e.g., Chambers Lake, Trosper Lake) outflow into tributary channels that flow into the Deschutes River and Percival Creek.

2.4.2 Surface Water Quality Washington State Regulatory Criteria

The lower Deschutes River has designated uses of fish spawning and rearing, and primary contact recreation, as described in WAC 173-201A-600(a) (Ecology 2012a). The river supports spawning and rearing for anadromous salmonids and resident trout. The surface water quality standards include:

- a 7-day average of the daily maximum temperatures (7-DADMax) of 17.5º C;
- a lowest minimum 1-day dissolved oxygen concentration of 8.0 mg/L;
- pH between 6.5 and 8.5;
- a geometric mean of fecal coliform concentrations less than 100 colonies/100 mL, with not more than 10 percent of all samples obtained for calculating the geometric mean value exceeding 200 colonies/100 mL.
- Toxic substances may not be introduced above natural background levels in waters of the state which have the potential either singularly or cumulatively to adversely affect characteristic water uses, cause acute or chronic toxicity to the most sensitive biota dependent upon those waters, or adversely affect public health, as determined by Ecology.

The Deschutes River currently exceeds (i.e., fails to meet) surface water quality standards for temperature, fecal coliform bacteria, pH, dissolved oxygen, and fine sediment (Ecology 2016a). Percival Creek exceeds (i.e., fails to meet) surface water quality criteria (i.e., category 4a or 5) for temperature and dissolved oxygen (Ecology 2016a).

2.4.3 Pollutant Loading Sources

Land use in the southern Deschutes River watershed headwaters is primarily composed of public and private forestry operations. The central and northern watershed is relatively low-relief and composed of woodlands and prairies with some commercial development and agricultural. Spurgeon Creek has a mix of both suburban and rural development and enters the central Deschutes River at RM 9.1. Land use in the northern (lower) portion of the Deschutes watershed is primarily composed of residential, urban, and commercial operations. The lower Deschutes watershed has large areas of extensive suburban and commercial development.

Much of the area in the mainstem Deschutes River, Chambers Creek, Ayer Creek, and Percival Creek are urbanized. Many of the residential developments in this area utilize septic systems.

Permitted discharges that are regulated through NPDES permits include the WSDOT Phase I stormwater permit; the Olympia, Tumwater, and Lacey Phase II stormwater permits; and several general permits for industrial stormwater and sand and gravel operations. All of these facilities operate under general NPDES permits.

Two dairies operate within the watershed with nutrient management plans certified by the Thurston Conservation District. The Washington Department of Fish and Wildlife operates the Tumwater Falls Hatchery as a seasonal salmonid rearing facility. These facilities all operate under individual NPDES permits. Many of the neighborhoods in the cities of Olympia and Tumwater and associated UGAs operate with homes on individual septic systems.

2.4.4 Previous Surface Water Quality Studies

Water quality data has been collected in the Deschutes watershed by the City of Olympia, Thurston County (2015), and Ecology (2012b; 2015). Thurston County has several surface water quality stations in the Deschutes River and Percival Creek watersheds, and recent monitoring has occurred at the Black Lake Ditch (a tributary to Percival Creek) and Chambers Creek (a tributary to the lower Deschutes River). Ecology has been monitoring Deschutes River water quality at RM 0.5 on a long-term basis. Ecology collected water quality data at several mainstem and tributary locations in the Deschutes River watershed in 2003 as part of the Deschutes River, Capitol Lake, and Budd Inlet Temperature, Fecal Coliform Bacteria, Dissolved Oxygen, pH, and Fine Sediment Total Maximum Daily Load Technical Report (Deschutes TMDL) (Ecology 2012b; 2015).

The Deschutes TMDL (Ecology 2012b; 2015) indicated that river seven-day average daily maximum temperatures in the mainstem of the Deschutes River increased about 5º C within 10 miles of Deschutes Falls. Peak temperatures declined about 4º C over the next 10 miles downstream. Temperatures rose somewhat before a secondary peak in temperatures around RM 5 (**Appendix A, Figure A-7**). Groundwater inflow to the river was attributed as the main reason for decreasing river temperatures (Ecology 2012b).

The Deschutes TMDL (Ecology 2012b; 2015) measured dissolved oxygen, pH, temperature, and conductivity at five locations at 15-minute intervals for approximately three days. All stations had values below the 8 mg/L dissolved oxygen surface water quality standard (**Appendix A, Figure A-8**). The station at river mile 28.6 had the lowest minimum dissolved oxygen concentration, and the station at RM 5.5 had the highest maximum pH levels. Total persulfate nitrogen and nitrate + nitrite nitrogen concentrations were elevated from between Capitol Lake and RM 20.9, relative to the upper Deschutes River and Capitol Lake stations (**Appendix A, Figure A-9**). Total phosphorus and orthophosphate increased steadily from upstream to downstream within the Deschutes River. A longitudinal survey conducted in mid-August 2003 identified locations where improvements in surface water quality occurred, likely associated with groundwater inputs, as shown in **Appendix A, Figure A-10** (Ecology 2012b).

The Deschutes TMDL (Ecology 2012b; 2015) concluded that fecal coliform, thermal, and nutrient loads need to be reduced in order to meet surface water quality criteria. The combined effects of current nonpoint and point sources exceeded the loading capacity of both Budd Inlet and Capitol Lake for nutrients. Septic systems were identified as potentially contributing excess nutrients and fecal coliform bacteria. The TMDL reports recommended reducing nutrient loading from septic systems in areas with high surface or groundwater nutrient concentrations. Areas with high surface or groundwater nutrient content include upstream of Offutt Lake, Chambers Lake and its outlet creek, Tempo Lake and its outlet creek, and the Ayer Creek watershed. Increasing effective shade to site potential was identified in the TMDL as the primary factor to improving temperature and temperature dependent parameters, such as dissolved oxygen. Increasing effective shade would also reduce algal productivity, thereby improving dissolved oxygen and pH conditions. The TMDL reports also recommended infiltrating stormwater and practicing low impact development as a preventative measure of future water quality impacts.

Monthly ambient monitoring has continued since the Deschutes TMDL in the lower Deschutes River (RM 0.5) and Chambers Creek. Thurston County's most recent year of water quality monitoring data for Chambers Creek were collected in 2012 (Thurston County 2015). Although more recent data for the Deschutes River at RM 0.5 are available, 2012 data are presented for comparison to the Chambers Creek data. During the 2012, pH, dissolved oxygen, and fecal coliform data met surface water quality standards (**Appendix A, Table A-7**). At the Deschutes River (RM 0.5), total nitrogen and nitrate + nitrite results were similar to the data reported in the TMDL. It should be noted that the County water quality data are monthly grab samples and may not fully represent the range of conditions that may be encountered during a more intensive survey (e.g., Ecology 2012b). Also, instantaneous water temperature results cannot be directly compared with the 16º C 7-DADMax surface water quality standard.

2.5 South Puget Sound Water Quality

This section discusses water quality issues currently affecting South Puget Sound. This discussion is intended to provide context for the surface water quality study results in this technical memorandum. The marine waterbodies in South Puget Sound that are most relevant to this study are Henderson Inlet (receiving waterbody for Woodland Creek) and Budd Inlet (receiving waterbody for the Deschutes River).

2.5.1 Hydrology and Circulation

Henderson Inlet and Budd Inlet are terminal inlets in South Puget Sound. Henderson Inlet averages about 25 feet in depth. A large portion of the lower inlet is exposed mudflats at low tide. Budd Inlet depths range from 100 feet (ft) in the north to mudflats in the shallow East and West Bays. Much of the inlet varies from 15 to 50 ft in depth. Tidal elevations in this area (South Puget Sound) range from +16 to -4 feet (Cleland, 2000). The tidal range in South Puget Sound is 14.6 ft, based on the difference between mean higher high water and mean lower low water; however, spring tides can exceed 18 ft.

In South Puget Sound, circulation and vertical mixing is controlled by the tides, marine water intrusions, and freshwater inputs. Puget Sound tides are mixed diurnal, with the tidal range

varying over a two-week cycle. About twice a month (full and new moon), the tide's range is at its maximum (spring tide). During spring tides, the largest amount of water moves back and forth. When the moon is at the first and third quarter, the tide's range is at its minimum and called a neap tide. During neap tides, less water moves back and forth. The movement of the tides brings in water that is cooler, more saline, and more dense than estuarine water. Most of this denser, cooler water flows along the bottom of Puget Sound (called a marine intrusion). On each flooding (inward flowing) tide, these marine intrusions travel landward at the bottom. On the ebbing (outward flowing) tide, the freshwater from tributaries and stormwater runoff travels toward the ocean at the surface. These hydrologic inputs, along with the morphology of South Puget Sound, determine circulation and vertical mixing. Circulation and vertical mixing affects the residence time of water and water quality dynamics, such as primary productivity and dissolved oxygen drawdown.

2.5.2 Surface Water Quality Washington State Regulatory Criteria

Henderson Inlet

Henderson Inlet is classified as an "extraordinary" aquatic life use, with shellfish harvest and primary contact recreation (Chapter 173-201A WAC). The criteria that support these beneficial uses are shown on **Table 2-1**. Water quality measurements that are of a lower quality than these criteria result in that waterbody being listed in categories 4 or 5 of the 303(d) list as unsupportive for designated beneficial uses, per the Clean Water Act, Section 303(d).

Henderson Inlet currently has a 303(d) category 5 listing (requiring a TMDL) for dissolved oxygen and a category 4a listing (has a TMDL in place) for fecal coliform bacteria (Ecology 2016a). The TMDL report for Henderson Inlet indicate low dissolved oxygen concentrations exist throughout the inlet in the early fall (Ecology 2016a). The Henderson Inlet TMDL measured the lowest dissolved oxygen levels near the bottom and toward the southern end of Henderson Inlet, with concentrations approaching 4 mg/L (Ecology 2006).

Budd Inlet

Budd Inlet is classified as "excellent" quality aquatic life use with shellfish harvest and primary contact recreation north of Priest Point Park (also known as Outer Budd Inlet). South of Priest Point Park is known as Inner Budd Inlet. Inner Budd Inlet is classified as "good" aquatic life use and secondary contact recreation. Both the Outer Budd Inlet and Inner Budd Inlet have 303(d) category 5 listings for dissolved oxygen and fecal coliform bacteria (Ecology 2016a).

Table 2-1. Marine surface water quality criteria for Henderson Inlet and Budd Inlet.

Parameter	Henderson Inlet (Extraordinary Aquatic Life; Primary Contact Recreation)	Budd Inlet North of Priest Point Park (Extraordinary Aquatic Life; Primary Contact Recreation)	Budd Inlet South of Priest Point Park (Good Aquatic Life; Secondary Contact Recreation)
Temperature (greatest 1-day maximum)	13°C	16°C	19°C
Turbidity	Turbidity must not exceed 5 nephelometric turbidity units (NTU) over background when the background is 50 NTU or less; or a 10 percent increase in turbidity when the background turbidity is more than 50 NTU.	Turbidity must not exceed 5 NTU over background when the background is 50 NTU or less; or a 10 percent increase in turbidity when the background turbidity is more than 50 NTU.	Turbidity must not exceed 10 NTU over background when the background is 50 NTU or less; or a 20 percent increase in turbidity when the background turbidity is more than 50 NTU.
Dissolved oxygen (lowest 1-day minimum)	7 mg/l	6 mg/l	5 mg/l
pH	Within 7.0 to 8.5; < 0.2 unit change from human influence	Within 7.0 to 8.5; < 0.5 unit change from human influence	Within 7.0 to 8.5; < 0.5 unit change from human influence
Bacteria	Fecal coliform organism levels must not exceed a geometric mean value of 10 colonies/100 mL, with not more than 10% of all samples (or any single sample when less than ten sample points exist) obtained for calculating the geometric mean value exceeding 43 colonies/100mL	Fecal coliform organism levels must not exceed a geometric mean value of 10 colonies/100 mL, with not more than 10% of all samples (or any single sample when less than ten sample points exist) obtained for calculating the geometric mean value exceeding 43 colonies/100mL	Fecal coliform organism levels must not exceed a geometric mean value of 70 colonies/100 mL, with not more than 10% of all samples (or any single sample when less than ten sample points exist) obtained for calculating the geometric mean value exceeding 208 colonies/100mL

Note: Surface water quality criteria are from the Washington State Department of Ecology Surface Water Quality Standards (WAC 173-201A; Ecology 2012a; http://www.ecy.wa.gov/Programs/wq/swqs/index.html).

2.5.3 Pollutant Loading Sources

Point and non-point sources of pollution may affect dissolved oxygen and fecal coliform in South Puget Sound. There are several point source discharges permitted under Washington's NPDES program that contribute pollutants directly to Budd and Henderson Inlets (**Table 2-2**). These only include municipal wastewater, industrial stormwater, and municipal stormwater Phase II permits discharging directly to Puget Sound waters (not to tributaries). Treated municipal wastewater adds nutrient loads to the marine waters, enhancing primary productivity. Stormwater from combined stormwater-sewer systems can decrease treatment efficiency at wastewater facilities. Combined sewer outflows (CSOs) are a source of pollutants that could affect both dissolved oxygen and fecal coliform concentrations in South Puget Sound.

Table 2-2. NPDES permitted facilities that discharge directly to Budd and Henderson Inlets.

Permit Type	Facility Name	Permit No.
Wastewater	LOTT Budd Inlet Treatment Plant	WA0037061
	Boston Harbor	WA0040291
	Seashore Villa	WA0037273
	Tamoshan	WA0037290
Industrial Stormwater	BMT-Northwest	SO3004476
	Dunlap Tow Olympia Log Yard/Chip Reld	SO3000106
	Holbrook Inc Olympia Public Yard	SO3003855
	Port of Olympia Ocean Terminal	SO3001168
Municipal Stormwater	City of Olympia	WAR04-5015
	City of Lacey	WAR04-5011
	City of Tumwater	WAR04-5020
	Thurston County	WAR04-5025
	WSDOT	WAR043000

Note: NPDES permit data were queried from the Washington State Department of Ecology Permit and Reporting Information System (Ecology 2016b).

Marine dissolved oxygen and fecal coliform are also affected by non-point source nutrient loads from the Deschutes River and other direct tributaries. In addition, biological productivity within Capitol Lake produces high seasonal organic matter levels, particularly during algae blooms occurring in late summer.

2.5.4 Previous Surface Water Quality Studies

Henderson Inlet

The Henderson Inlet TMDL Study (Ecology 2006) associated low dissolved oxygen concentrations with nutrient loads from tributaries, residential, commercial, or agriculture sources along the shoreline, water column stratification, and slow flushing or exchange with Puget Sound. The Henderson Inlet TMDL identified several load reduction strategies for fecal coliform bacteria and nutrient loading to Henderson Inlet, including improved stormwater management, an on-site septic operations and maintenance program, source investigation, outreach to landowners for non-point source management, and oversight of point source discharge permits. Implementation of these measures was assumed to improve marine dissolved oxygen levels, although the benefits from these nutrient reductions to marine dissolved oxygen were not quantified.

Budd Inlet

Three-dimensional hydrodynamic and water quality modeling was completed in 1998 (with field data collected in 1997) to support LOTT's NPDES wastewater discharge permit application (Aura Nova et al. 1998). The model simulated the marine conditions in Budd Inlet and Capitol Lake including tides, wind, precipitation, temperature, river flow and nutrient loads, and wastewater flow and nutrient loads to determine the effects of the wastewater discharge on water quality. One of the primary findings was that back-flushing Capitol Lake was likely to have a detrimental effect on Budd Inlet and a recommendation was made that the practice be discontinued (Aura Nova et al. 1998).

Budd Inlet and Capitol Lake TMDL studies began in 2003. The lowest dissolved oxygen concentrations in Budd Inlet tend to occur when the tides are transitioning from a strong neap to a strong spring condition. The greatest stagnation of water occurs just following a strong neap tide. Low dissolved oxygen levels coincide with the most stagnant water condition. Low dissolved oxygen levels progressively worsen from July through September, likely due to increased algal growth superimposed on the circulation patterns. Therefore, critical conditions generally occur following strong neap tides in September.

The Deschutes River, Capitol Lake, and Budd Inlet Temperature, Fecal Coliform Bacteria, Dissolved Oxygen, pH, and Fine Sediment Total Maximum Daily Load Technical Report (Ecology 2012b) applied a hydrodynamic water quality model to Capitol Lake and Budd Inlet under both the current configuration and potential estuary alternatives on dissolved oxygen. This TMDL modeling also evaluated the effect of Capitol Lake on nitrogen dynamics and dissolved oxygen concentrations in Budd Inlet. Fecal coliform was not evaluated for Budd Inlet in this study. Supplemental TMDL modeling on the marine waters of Budd Inlet and Capitol Lake evaluated the effects of point source and non-point sources of nitrogen and the presence of Capitol Lake versus a natural estuary (Ecology 2015). Ecology has been concurrently modeling water quality throughout central and South Puget Sound (Ecology 2014). The central and South Puget Sound hydrodynamic water quality model results define boundary conditions for the Budd Inlet model.

Future phases of modeling are anticipated to occur. Additional dissolved oxygen modeling is anticipated to be completed in 2017 (Ecology 2016c). Information on this modeling will be included in a Water Quality Improvement Report and Water Quality Implementation Plan, to be completed in the 2018 – 2019 time frame. The future Water Quality Improvement Report for Budd Inlet and Capitol Lake will establish numeric load and waste load allocations for point source dischargers needed to meet water quality standards. For example, the following statement was issued by Ecology on LOTT's Fact Sheet for NPDES Permit WA0037061, LOTT Alliance Budd Inlet Wastewater Treatment Plant (Ecology 2005):

"Depending on the outcome of the TMDL, the waste load allowed to be discharged into Budd Inlet from LOTT will change in this permit. The final water quality based limits determined by the TMDL will likely differ from the estimated final limits in this permit. These water quality based final limits cannot be determined until the TMDL is completed. Once the TMDL is complete, this permit will be modified or reissued to incorporate the new waste load limits."

3.0 Surface Water Quality Monitoring Methods

3.1 Design of Water Quality Monitoring Program

Samples were collected from six locations in the Woodland Creek watershed and six locations in the Deschutes River watersheds, respectively (**Table 3-1, Figures 3-1 and 3-2**). In each respective watershed, three mainstem and three tributary locations were selected for monitoring. LOTT reclaimed water aquifer recharge facilities are present (i.e., Woodland Creek for the LOTT Hawks Prairie Ponds and Recharge Basins) or are proposed (Deschutes River watershed) in the watersheds selected for water quality monitoring. The monitoring locations were selected to characterize water quality in the lower watersheds that are potentially affected by sources of organic and inorganic compounds, such as residential septic systems, stormwater, etc. A reference site in each watershed represents conditions upstream of any potential future reclaimed water influence.

3.1.1 Woodland Creek Sample Locations

The Woodland Creek watershed monitoring locations are described below and in **Table 3-1** (**Figure 3-1**).

- The Woodland Creek - Reference location on Woodland Creek is at River Mile (RM) 5.2, 300 feet downstream of confluence with Goose Lake; upstream of park foot bridge. This location represents conditions in the upper watershed and has both suburban and commercial influence.
- The Upper Woodland Creek monitoring location is at River Mile (RM) 3.40, just downstream of Beatty Springs (**Table 3-1, Figures 3-1 and 3-2**). During the summer and early fall, this location represents the upstream extent of continuous flow in the creek and is primarily fed by Beatty Springs.
- The Lower Woodland Creek location is at RM 1.6 at the crossing of Pleasant Glade Road. At this location, water quality may be influenced by additional residential and rural residential land use, as well as some commercial and light industrial land uses.
- Tributary monitoring locations are Beatty Springs, Eagle Creek, and Fox Creek. Eagle and Fox creeks contribute flow to Woodland Creek between the upper and lower Woodland Creek monitoring locations.
    - Fox Creek is mostly forested, and has low density rural development.
    - Eagle Creek is mostly within the Lacey UGA and has suburban residential development, stormwater discharges and commercial land use at its headwaters, and agriculture use adjacent to the stream in its lower reach.
    - Beatty Springs is a perennially flowing spring that flows into Woodland Creek near RM 3.45. Water quality from the springs represents local groundwater influence.

3.1.2 Deschutes River Sample Locations

The Deschutes River watershed monitoring locations are shown on **Table 3-1, Figure 3-2** and described below.

- The Deschutes River - Reference monitoring location on the Deschutes River upstream of Spurgeon Creek (RM 9.4) and reflects water quality under the influence of rural development in contrast to the more urbanized areas downstream (**Table 3-1, Figures 3-1 and 3-2)**.
- The Upper Deschutes River monitoring station is at RM 4.8 and has residential and commercial land uses within its contributing watershed.
- The Lower Deschutes River location is at RM 0.5 at the E Street Bridge and has residential and commercial land uses within its contributing watershed.
- Tributary monitoring locations in the Deschutes River watershed include Chambers Creek, Munn Lake, and Percival Creek.
    - Chambers Creek is a small tributary between the Upper and Lower Deschutes River monitoring locations that includes mostly residential land uses in its contributing sub-watershed.
    - Munn Lake does not have a surface water connection to the Deschutes River but is representative of the many lakes in the watershed that have a high density of residential development in its sub-watershed.
    - Percival Creek is a tributary to the Deschutes River that drains into the Deschutes River estuary (Capitol Lake). The Percival Creek sub-watershed contains residential, commercial, and light industrial land uses.

3.1.3 Sample Collection Schedule

Four samples were collected at all sites except for the “Reference” sites over a one-year period. These samples were collected over a range of seasonal conditions to evaluate the variability in the concentrations of constituents in local surface water (**Table 3-2**). The “Reference” sites were sampled once during summer low flows and once during winter high flows (**Table 3-2**). At all other non-Reference sites, HDR staff collected two summer low flow samples, one fall storm event sample, and one winter high flow sample. For the purpose of this effort, low flow was defined qualitatively as stream flow occurring during prolonged dry weather. A storm event was defined as a minimum of 0.30 inches of rain in the previous 24 hours, consistent with the Woodland Creek TMDL storm event definition (Ecology 2006). Sampling occurred within 48 hours of the event. High flow was defined as above annual median flow.

High flow at the Woodland Creek and tributary sites was determined by measuring at the Lower Woodland Creek station (i.e., Draham Rd. at RM 1.6) and comparing to the historical distribution. High flow at the Deschutes River and tributary sites was determined by comparing the real-time flow value at the Lower Deschutes site (USGS 12080010; Deschutes River at E St.

Bridge) to its historical distribution. Munn Lake was sampled concurrent with the stream and river stations in the Deschutes watershed, even though it is not flowing.

3.2 Monitoring Parameters

During each monitoring event, flow, water temperature, conductivity, specific conductance, pH, and dissolved oxygen were measured in the field (**Table 3.3**). Water samples were collected for laboratory analysis of a range of conventional, nutrient, bacterial, metals, and residual chemical concentrations.

3.3 Water Quality Sample Collection Procedures

Grab samples were collected according to the Ecology Standard Operating Procedure for manually obtaining surface water samples (Section 6 of EAP015). Samples were collected using laboratory grade gloves, directly from the stream or lake, into new laboratory bottles. Samples were taken from just below the surface (0.5 m depth). Stream and river measurements were taken from the thalweg or an area of flowing water. In-situ measurements were taken from Munn Lake along the shoreline, in an area free of macrophytes or floating algae. Field filtering was performed on the samples that were analyzed for metals using new QED high-flow 0.45-micron disposable filters and a portable peristaltic pump with new tubing for each sample. Sample bottles were pre-labeled, and the date and time of collection were recorded on the bottle immediately prior to collection. Samples were collected with bottles and preservative appropriate for the laboratory methods (**Table 3-3**).

Water temperature, conductivity, specific conductance, pH, and dissolved oxygen were measured in-situ at each location with a multi-probe YSI Professional Plus water quality meter. These data were recorded on field data sheets, by hand, along with the sample date, sample time, weather conditions, and field personnel.

3.4 Flow Measurement Procedures

Flow at all sites was measured with a top set wading rod and a Marsh-McBirney velocity probe, using the “mid-section method” (Ecology 2014). The Deschutes River flow was not measured during high flow monitoring because of safety concerns.

A longitudinal flow survey (seepage run) was completed on August 24 and 25, 2015, on Eagle, Fox and Woodland Creeks (**Appendix G**). The purpose of this effort was to document low flow conditions and to characterize groundwater inflow during baseflow conditions. Stream flow was measured at multiple points within Woodland Creek, Eagle Creek, and Fox Creek. Single point measurements were taken from Palm and Jorgensen creeks just upstream of their junctions with Woodland Creek. The flow rate from several springs was also measured.

3.5 Field Calibration and Quality Assurance/ Quality Control

A YSI Pro water quality meter was used to measure field water quality parameters and was calibrated daily, prior to in-situ measurements, for specific conductance, pH, and dissolved

oxygen. Daily pre-field calibration checks were recorded on field data sheets in order to obtain measurement accuracy objectives.

Water quality samples were identified on a chain-of-custody record. Information recorded included site name, sampler name(s), date and time of sample collection, sample identification, number of containers for each sample, analyses requested for each sample, and signature blocks for each individual who had custody of the sample(s). Samples were placed on ice in a cooler and shipped by next-day air delivery to Eurofins Eaton Analytical (EEA) in Monrovia, California. Bacteria samples were delivered to Centric Analytical in Port Orchard, Washington, during the day of sampling.

Quality control samples consisted of field and laboratory components. Field QA/QC samples consisted of one field duplicate sample per sampling event. The field duplicate was a second grab sample, collected immediately after the first site sample. The field duplicate characterizes natural variation and variability from both sample collection and laboratory analysis. Laboratory quality control consisted of laboratory control, method blank, surrogate, matrix spike, and matrix spike duplicate measurements.

At the conclusion of each monitoring event, a laboratory data validation review was completed to confirm accuracy and completeness for these items: sample identification, chain-of-custody and sample receiving, preservation methods, hold and extraction times, laboratory detection limits, surrogate recovery, blanks, spikes, duplicates, control samples, matrix spike, and matrix spike duplicate samples.

Table 3-1. Surface water monitoring locations

Sampling Location	River Mile[1]	Description
Woodland Creek Watershed		
Woodland Creek - Reference	5.2	Woodland Creek, 300 feet downstream of confluence with Goose Lake; upstream of park foot bridge.
Beatty Springs	*3.45T*	*Beatty Springs, at spring source, upstream of the fish ponds*[2]
Woodland Creek - Upper	3.4	Woodland Creek 10 meters upstream of College Springs confluence.
Eagle Creek	*2.25T*	*Eagle Creek, within 5 meters of the confluence with Woodland Creek*
Fox Creek	*1.9T*	*Fox Creek, immediately downstream of Pleasant Glade Road*
Woodland Creek - Lower	1.6	Woodland Creek, immediately upstream of Pleasant Glade Road
Deschutes River Watershed		
Deschutes River - Reference	9.4	Deschutes River, upstream of Spurgeon Creek (wade from right bank)
Deschutes River - Upper	5.1	Deschutes River, downstream of side channel at LOTT property (Rixie Rd. and 75th Ave SE) (wade from right bank)
Chambers Creek	*2.9T*	Chambers Creek, near the confluence with the Deschutes River
Deschutes River - Lower	0.5	Deschutes River, upstream of E Street Bridge (wade from right bank)
Munn Lake	N/A	Munn Lake, along shoreline (adjacent to boat ramp)
Percival Creek	*0T*	Percival Creek, near the confluence with Capitol Lake (just upstream of lake influence)

Notes:

N/A = Not Applicable

[1] Tributaries to Woodland Creek and the Deschutes River are indicated by italics. River miles for tributary sampling locations indicate the estimated confluence of tributary stations, as indicated by the "T" suffix.

[2] Samples and measurements were taken from the spring source pond, next to the pump house, from the bank.

[3] See Figure 3-1 for sample locations

Table 3-2. Monitoring Location and event dates.

Sampling Location	Low Flow	Low Flow	Storm Event	Winter Flow
Woodland Creek Watershed				
Woodland Creek- Reference	8/28/2015			12/7/2015
Beatty Springs	8/27/2015	9/14/2015	10/12/2015	12/7/2015
Woodland Creek- Upper	8/27/2015	9/14/2015	10/12/2015	12/7/2015
Eagle Creek	8/28/2015	9/14/2015	10/12/2015	12/7/2015
Fox Creek	8/27/2015	9/14/2015	10/12/2015	12/7/2015
Woodland Creek- Lower	8/27/2015	9/14/2015	10/12/2015	12/7/2015
Deschutes River Watershed				
Deschutes River- Reference	8/28/2015			12/8/2015
Deschutes River- Upper	8/28/2015	9/15/2015	10/13/2015	12/8/2015
Chambers Creek	9/10/2015	9/15/2015	10/13/2015	12/8/2015
Deschutes River- Lower	9/10/2015	9/15/2015	10/13/2015	12/8/2015
Munn Lake	8/28/2015	9/15/2015	10/13/2015	12/8/2015
Percival Creek	8/28/2015	9/15/2015	10/13/2015	12/8/2015

Table 3-3. Surface water quality monitoring parameters.

Parameter	Method
Residual Chemicals	EEA's PPCP LC/MS/MS Method (See PPCP list and reporting limits in Appendix B)
Nitrate, nitrite	EPA 300
Ammonia, TKN	EPA 350.1, 351.2
Total phosphorous, orthophosphate	EPA 365.1 & 365.2, SM4500P-E
Fecal coliform	SM 9223
Total coliform	SM 9223
Total organic carbon	SM 5310C
Biological oxygen demand	SM 5210B
Dissolved Metals (Ag, As, B, Br, Ca, Cd, Cl, Cr, Cu, F, Fe, Hg, Pb, Mg, Mn, Na, Pb, Ni, Se, Si, Zn)	EPA 200.7, 200.8 & 245.1
Total Recoverable Metals (Hg, Se)	EPA 200.8 & 245.1
Total dissolved solids	SM 2540C
Total suspended solids	SM2540-D
Alkalinity/carbonate	SM 2320B
Hardness	EPA 130.2
pH	EPA 150.1- field measurement
Conductance	EPA 120.1- field measurement
Dissolved Oxygen	SM 4500OG- field measurement
Conductivity	SM 2510- field measurement
Temperature	SM2550- field measurement

Notes:
1. Residual chemical also referred to as PPCPs = pharmaceuticals and personal care products.
2. Field parameters were collected including pH, specific conductance, dissolved oxygen, oxidation reduction potential (ORP) and temperature.
3. Dissolved metals were field filtered.
4. SM = Standard Methods method, EPA = Environmental Protection Agency method.

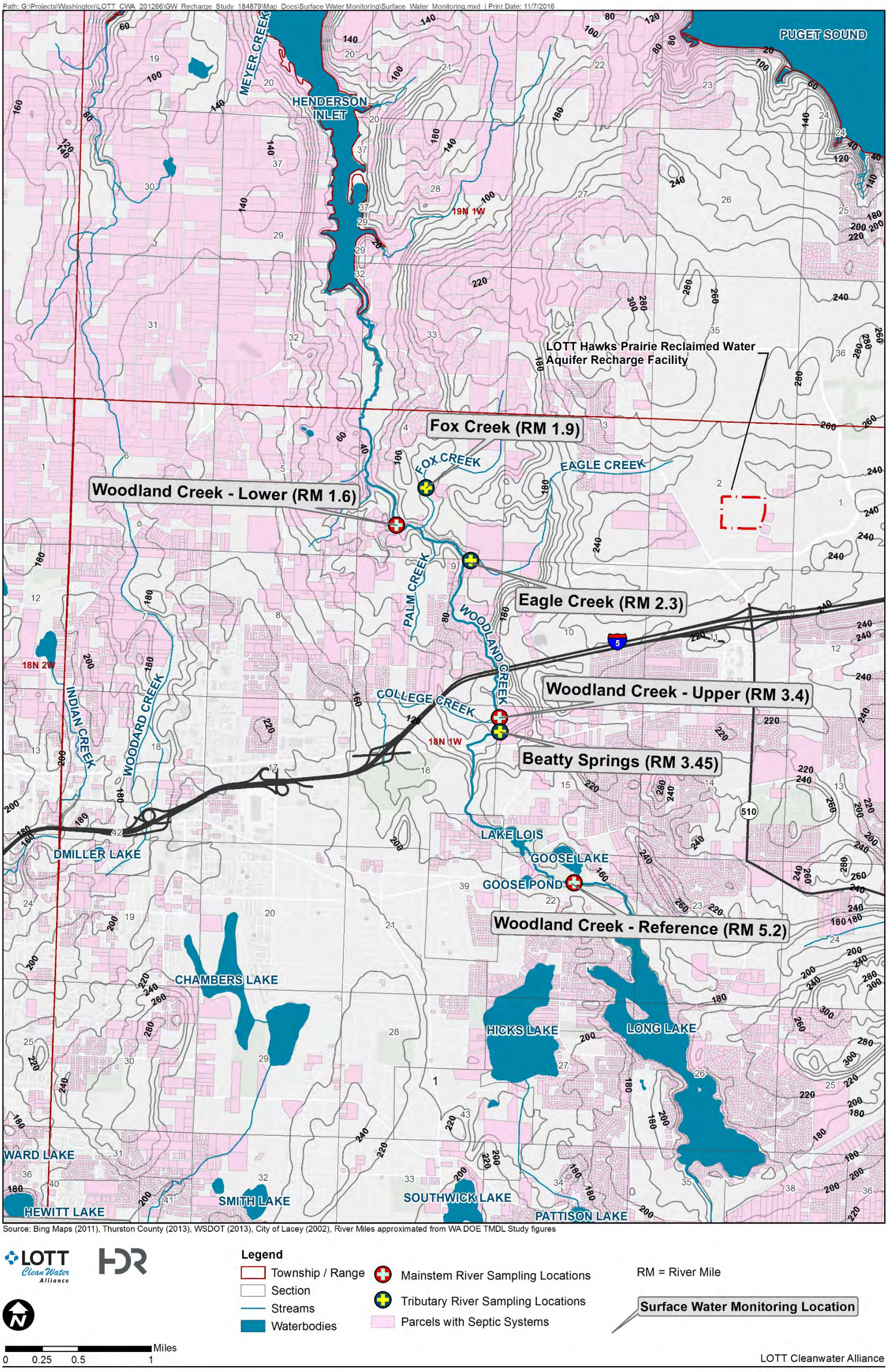

Figure 3-1. Woodland Creek Watershed Monitoring Locations.

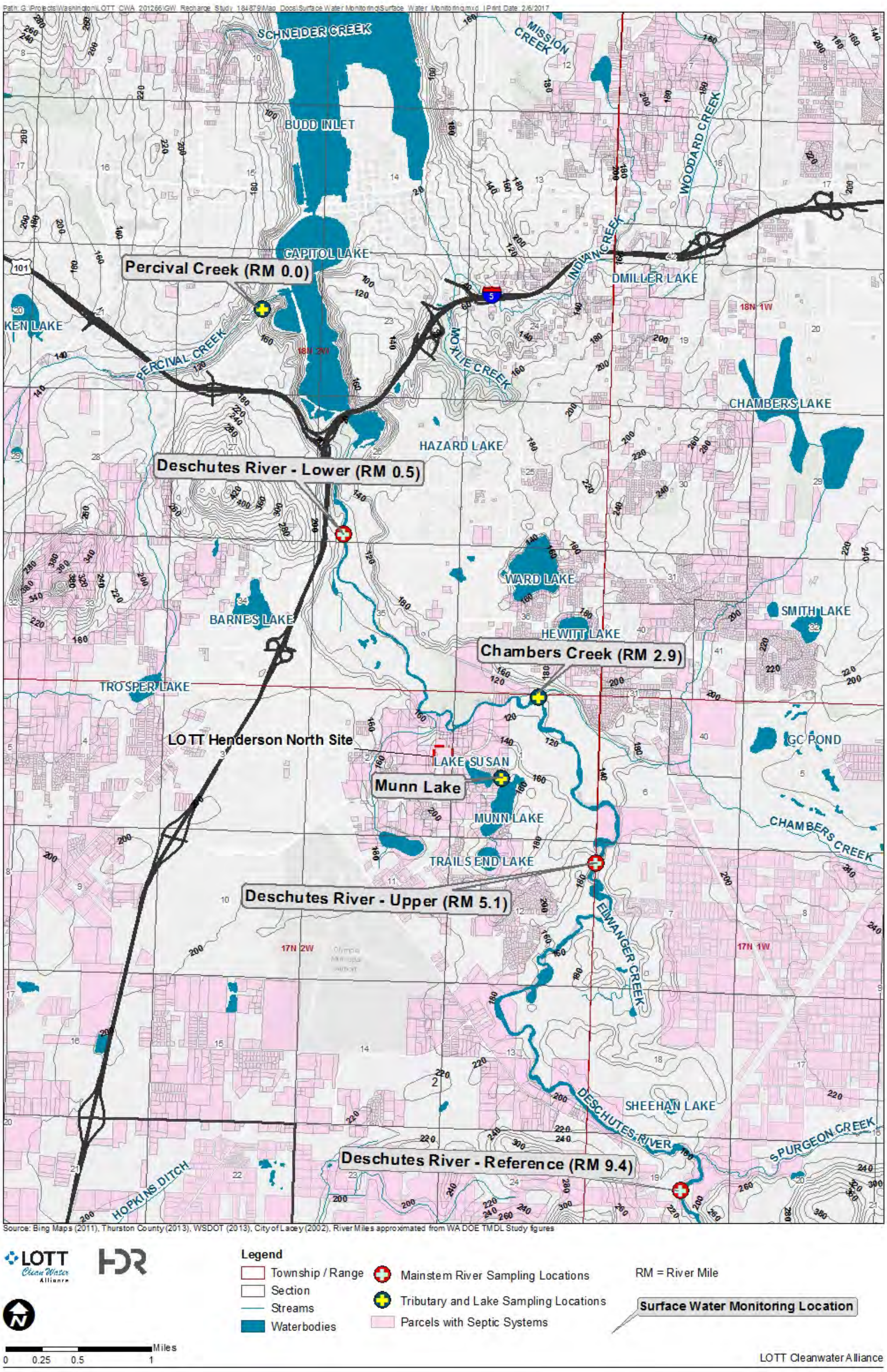

Figure 3-2. Deschutes River Watershed Monitoring Locations.

4.0 Results

4.1 Woodland Creek Monitoring Results

4.1.1 Flow Rates

All sampling locations were flowing during all monitoring events. All sampling sites were at low flow condition during the 8/24/15 and 9/14/15 summer sampling events (**Table 4-1; Figure 4-1**). The fall storm sampling event occurred on October 12, 2015, and was preceded by 0.83 inches of rainfall in the prior 48 hours. Although this was enough antecedent precipitation to meet the storm event criteria (0.30 inches in a 24-hour period, with sampling to occur within 48 hours of the event), it caused an increase in flow only at Fox Creek (relative to the prior sampling events). The winter sample was much more representative of storm conditions, with over two inches of precipitation the preceding seven days and one inch of precipitation during the day of sampling. Winter flows at the Woodland Creek - Reference site were much higher than in the Woodland Creek-Upper site during this sampling event (**Table 4-1**).

During the seepage run conducted on August 24 and 25, 2015, Woodland Creek was flowing out of Long Lake to the Pacific Avenue crossing (**Figure 3-1; Figure 4-2**). The increase in measured flow at RM 5.23, and subsequent decrease, may have been from groundwater and wetland inflow, but could also have been measurement error. The creek channel was dry downstream of Lake Lois until flow resumed near Beatty Springs. Flow generally increased from the confluence with Beatty Springs to the estuary. Significant flow inputs to Woodland Creek occurred primarily from Beatty Springs, College Springs, and generally from diffuse groundwater gains moving downstream. Eagle Creek, Fox Creek, Palm Creek, and Jorgensen Creek contributed flow, though all less than 1 cfs.

4.1.2 General Water Quality Parameters

Water temperature, dissolved oxygen, conductivity, specific conductance, and pH were measured in the field during each site visit (**Table 4-1**). Water temperatures decreased incrementally from August through December and decreased from upstream to downstream during low flow conditions (**Figure 4-3**). The Woodland Creek-Reference monitoring site was warmer than the 16 degree Celsius surface water quality standard. However, the instantaneous temperature measurements in this study are not directly comparable to the temperature standard, since the latter is a 7-day moving average of daily maximum values. Water temperature did not correlate to river mile during the high flow season (**Figure 4-4**).

Dissolved oxygen at each respective location was similar among monitoring events with the exception of marked increases in Fox Creek and the Woodland Creek - Reference site in December, relative to the summer and storm events. Dissolved oxygen concentrations at Beatty Springs, Fox Creek, Woodland Creek-Upper, and Woodland Creek-Lower were below the surface water quality standard of 9.5 mg/L. Very low dissolved oxygen at the Woodland Creek – Reference site was associated with extremely low flow and standing water in the channel.

Beatty Springs and Fox Creek had acidic pH below the surface water quality standard. Conductivity was similar among all sites during the two low flow and stormwater monitoring

events. All sites except Beatty Springs had decreased conductivity during the winter monitoring event.

4.1.3 Nutrients

Nitrate concentrations ranged between 1.4 and 1.5 mg/L at the upper and lower sites in Woodland Creek during low flow conditions (**Table 4-2; Figures 4- 5 and 4-6**). During winter high flow conditions, the lower Woodland Creek site had a lesser concentration than at the upper site. The upstream reference site had < 0.1 mg/L (not detected) Nitrate as nitrogen (Nitrate-N). Among the tributaries, Nitrate-N concentrations were greatest at Beatty Springs, ranging between 2.5 and 3.3 mg/L (**Table 4-2**). Fox Creek and Eagle Creek had lower Nitrate-N concentrations, relative to Beatty Springs, ranging between < 0.1 mg/L (not detected) and 1.4 mg/L. Nitrite-N was not detected in any samples. Orthophosphate concentrations were greater in Woodland Creek at the lower and upper site (0.04 to 0.07 mg/L) than at the reference site (0.01 mg/L). Among the tributaries sampled, Fox Creek had the greater orthophosphate concentrations (0.05 to 0.1 mg/L) than Beatty Springs and Eagle Creek (< 0.03 mg/L). These nutrient concentrations are within the ranges measured during previous studies and monitoring (Ecology 2006; Thurston County 2015; City of Lacey 2015).

4.1.4 Bacteria

Fecal coliform concentrations ranged from less than 1 to greater than 200 CFU/100 mL. Except for Beatty Springs, at least one sample at each site had more than 100 CFU/100 mL. The surface water standard is a geometric mean of 100 CFU/100 mL. Geometric means were not calculated because of the low sample size for each site (n = 4). The range of fecal coliform values was comparable to what the Thurston County Department of Health reported for recent water years (range of 0 – 400 CFU/100ml; Thurston County 2015; **Appendix A, Table A-4**).

4.1.5 Metals

None of the sites exceeded acute or chronic surface water quality standards for metals (**Table 4.2**). In general, metals concentrations were similar among the sites with the exception of Beatty Springs. Beatty Springs had lower iron and manganese concentrations (not detected).

4.1.6 Residual Chemicals

The most frequently encountered residual chemicals are two sugar substitutes: acesulfame-K (detected in 68% of all samples; 79 – 630 nanograms per liter [ng/L]) and sucralose (detected in 68% of all samples; 12 – 2,000 ng/L) (**Figure 4-7; Table 4-3**). Both chemicals were detected during all sampling events and were most frequently detected in Woodland Creek and Beatty Springs.

Among pharmaceuticals, carbamazepine, an anti-seizure medication, was detected in 18% of all samples (5.25 – 10 ng/L). However, all these detections were found at Beatty Springs during all sampling events and nowhere else. Two antibacterial chemicals, triclocarban (detected in 5% of all samples; 8.9 ng/L) and triclosan (detected in 9% of all samples; 5.25 – 10 ng/L), were infrequently found in the lower and upper Woodland Creek sites, with detections in the upper Woodland Creek site only during the stormwater event. Finally, iopromide, an X-ray contrasting

agent, was detected once per site during the storm event at both Fox Creek and Upper Woodland Creek sites, (detected in 9% of all samples; 23 ng/L for both detections).

Two herbicides (cyanazine and 2,4-D) and two pesticides (DEET and quinoline) were detected at the Woodland Creek watershed sites. Cyanazine was detected in three of the six sites (detected in 18% of all samples; 7 – 9.2 ng/L), whereas 2,4-D was only detected once at the reference site (detected in 5% of all samples; 36 ng/L). These herbicides were primarily detected during the first low flow monitoring event; cyanazine was also detected in Eagle Creek during the winter event. DEET was detected at the Woodland Creek - Reference site during the summer low flow period (detected in 5% of all samples; 31 ng/L) and quinoline was detected at Beatty Springs during the storm event (detected in 5% of all samples; 20 ng/L).

Among the remaining residual chemicals, TCEP (detected in 5% of all samples; 14 ng/L), a flame retardant, was detected one time at Beatty Springs during the summer low flow season. Propylparaben, a preservative, was detected one time during the summer low flow period, at the lower Woodland Creek site (detected in 5% of all samples; 18 ng/L).

Among the mainstem Woodland Creek sites, no longitudinal trends were apparent. The compounds 2,4-D and DEET were only detected at the reference site (**Table 4-3**). Lopromide and triclocarban were only detected at the upper site. Cyanazine and propylparaben was only detected at the lower site. The only residual chemicals commonly detected among all three Woodland Creek sites were the sugar substitutes, acesulfame-K and sucralose. Many of the detected concentrations, described above, are at or near the method reporting limits.

Among the three tributaries sampled, Beatty Springs had the most residual chemical detections, followed by Eagle Creek, and Fox Creek (**Table 4-3**). Beatty Springs had more detections of acesulfame-K and sucralose relative to the other tributaries. Beatty Springs was the only tributary site with detections of carbamazepine, quinolone, and TCEP. Fox Creek had two residual chemical detections throughout the sampling events; iopromide and sucralose.

Among the seasonal sampling events, the greatest number of residual chemicals was detected during the first low-flow and the stormwater events (7) and the least number of residual chemicals was detected in the winter high-flow event (4). Many of the residual chemicals detected in the stormwater event were not detected in low flow and winter high flow sampling events. The lower number of residual chemicals detected during the winter high-flow event may have been because of high precipitation and dilution.

4.2 Deschutes River Watershed

4.2.1 Flow Rates

The August 28, September 10, and September 15, 2015, summer, low flow sampling events were at base-flow conditions (**Table 4-4; Figure 4-8**). The fall storm sampling event occurred on October 13, 2015, and was preceded by 0.83 inches of rainfall in the prior 48 hours. All flows were higher than summer low flow conditions, except Chambers Creek. Chambers Creek flow was similar to the low flow events. The winter sample was taken on December 8, 2015, during flooding conditions, with one inch of precipitation the day prior to sampling and 2.5 inches of

precipitation during the day of sampling. Flow was not manually measured in the Deschutes River during the winter flow event, because the river was not wadeable.

4.2.2 General Water Quality Parameters

Water temperature, dissolved oxygen, conductivity, specific conductance, and pH were measured in the field during each site visit. Water temperatures decreased incrementally from August through December (**Figures 4-9 and 4-10; Table 4.4**). Summer water temperature in the Deschutes River was greater than the surface water quality standards 17.5ºC. However, the instantaneous temperature measurements from this study are not directly comparable to the 7-day average of the daily maximum temperatures metric that Ecology uses for its standard. Munn Lake had the greatest temperature change over time. Dissolved oxygen at each respective location was greater than the surface water quality standard of 8.0 mg/L, with the exception of Munn Lake. All sites had pH within the surface water quality standard range of 6.5 – 8.5 units. Conductivity was similar among all sites during the two low flow and storm monitoring events. All sites except Munn Lake had decreased conductivity during the winter monitoring event. Munn Lake had a low conductivity during all monitoring events; much lower than the groundwater conductivity in the study area.

4.2.3 Nutrients

Nitrate-N concentrations ranged between 0.4 and 0.8 mg/L in the mainstem Deschutes River (**Table 4-5; Figure 4- 11 and 4-12**). Nitrate-N concentrations were greater during the summer low flow period. Nitrate-N concentrations were within the range reported in past studies (Ecology 2012; **Appendix A, Table A-7, Figure A-9**). Among the tributaries, Nitrate-N concentrations were greatest at Chambers Creek, ranging between 0.78 and 1.9 mg/L (**Table 4-5**). Percival Creek had Nitrate-N concentrations between 0.16 mg/L and 0.31 mg/L. Munn Lake had very low Nitrate-N concentrations, and was only detected during the winter, at 0.11 mg/L. Nitrite-N was not detected at any sites. Most orthophosphate concentrations in the Deschutes River were near the detection limit, and ranged between < 0.01 mg/L (not detected) and 0.04 mg/L. Among the tributaries sampled, Percival Creek had greater orthophosphate concentrations (0.01 to 0.04 mg/L) than Chambers Creek (0.01 to 0.02 mg/L). Munn Lake only had one orthophosphate detection near the detection limit (0.01 mg/L).

4.2.4 Bacteria

Fecal coliform concentrations ranged from 3 to 180 CFU/100 mL in all Deschutes watershed samples (**Table 4-5**). Geometric means were not calculated because of the low sample size for each site (n = 4). These results generally coincide with past results from Ecology (2015) and Thurston County (2015).

4.2.5 Metals

None of the sites exceeded acute or chronic surface water quality standards for metals (**Table 4-5**). In general, metals concentrations were similar among the sites with the exception of Munn Lake. Munn Lake had lower concentrations of several dissolved and total metals.

4.2.6 Residual Chemicals

The most frequently encountered residual chemicals were the two sugar substitutes, acesulfame-K and sucralose (**Figure 4-13; Table 4-6**). Acesulfame-K was detected at all sites except the upper and reference sites on the Deschutes River (detected in 64% of samples; 21 – 280 ng/L). Sucralose was detected at all sites except for Munn Lake (detected in 50% of samples; 150 – 6300 ng/L). These two sugar substitutes were detected during all seasons, though sucralose was only detected in the mainflow Deschutes River sites during the winter high flow event.

Among pharmaceuticals, carbamazepine, an anti-seizure medication, was detected at Chambers Creek during the summer low flow and storm events (detected in 14% of all samples; 6.7 – 7.8 ng/L). Lincomycin, an antibiotic, was only detected at the upper Deschutes River site during the summer low flow season (detected in 5% of all samples; 14 ng/L). Diclofenac, an anti-seizure medication, was only detected at Percival Creek during the storm event (detected in 5% of samples; 7.4 ng/L). Atenolol (beta blocker; detected in 5% of all samples; 14 ng/L) and estrone (estrogenic hormone; detected in 9% of all samples; 1.3 – 2 ng/L) were only detected at Munn Lake during the summer low flow sampling events. Two x-ray contrasting agents, iohexal (detected in 5% of all samples; 33 ng/L) and iopromide (detected in 12% of all samples; 6 – 59 ng/L) were detected during the storm samping event. Iohexal was detected at Percival Creek, while iopromide was detected at Chambers Creek, Munn Lake, and Percival Creek.

Two herbicides (cyanazine and 2,4-D) and two pesticides (DEET and quinoline) were detected at the Deschutes River watershed sites. The herbicides, cyanazine and 2,4-D, were detected in 9% (6.5 ng/L) and 5% (21 ng/L) of all samples, respectively (**Figure 4-13; Tables 4-5,-6**). The herbicide 2,4-D was detected one time in Percival Creek during the storm event. Cyanazine was detected in Chambers Creek and the Lower Deschutes River station during the high flow winter sampling event. The pesticides DEET and quinoline were detected in 32% (11-390 ng/L) and 9% (9.2-16 ng/L), respectively (**Figure 4-13; Tables 4-5,-6**). DEET was detected during every sampling event at Munn Lake, during a summer low flow and winter high flow event at Percival Creek, and during the winter high flow event at the upper Deschutes River site. Quinoline was only detected during one summer low flow sampling event at Munn Lake and the upper Deschutes River sites.

Among the remaining residual chemicals, two flame retardants, TCEP (detected in 5% of all samples; 13 ng/L) and TCDPP (detected in 5% of all samples; 4,500 ng/L) were detected (**Figure 4-13; Tables 4-5,-6**). TCEP was detected one time at the upper Deschutes River site during the summer low flow season. TCDPP was detected one time at the lower Deschutes River site during the winter high flow season. Methylparaben (detected in 9% of all samples; 42 – 46 ng/L), and propylparaben (detected in 5% of all samples; 5.6 ng/L), both preservatives, were detected at Munn Lake (methylparaben only) and the lower Deschutes River site. Cotinine (nicotine degradate; detected in 14% of all samples; 12 – 44 ng/L) was detected during the summer low flow events at Munn Lake, Percival Creek, and the lower Deschutes River sites. 4-nonylphenol (detected in 9% of all samples; 180 - 220 ng/L) and 4-tert-octylphenol (detected in 9% of all samples; 140 – 170 ng/L), both surfactants, were only found at Munn Lake and the lower Deschutes River sites during the storm event.

Among the mainstem Deschutes River sites, there were fewer detections at the upper Deschutes River site (five detections) than the lower Deschutes River site (11 detections) (**Tables 4-5,-6**). Many of the detected concentrations, described above, are at or near the method reporting limits. The only residual chemical detected all three Deschutes River sites was sucralose. Except for sucralose, the Deschutes River sampling sites had mutually exclusive detections of residual chemicals (i.e., no common residual chemicals among any two sites).

Among the two tributary streams and one lake sampled, Munn Lake had the most residual chemicals detected (10), followed by Percival Creek (eight), and Chambers Creek (five) (**Tables 4-5,-6**). Munn Lake had detections of two surfactants, one sugar substitute, two pharmaceuticals, one nicotine degradate, one x-ray contract agent, one preservative, and two pesticides. Percival Creek had detections two sugar substitutes, one pharmaceutical, one nicotine degradate, one pesticide, and two x-ray contrasting agents, and one herbicide. Chambers Creek had detections of two sugar substitutes, one pharmaceutical, one x-ray contrasting agent, and one herbicide. In general, there were more detections in tributaries and Munn Lake than in the mainstem Deschutes River.

Among the seasonal sampling events, the greatest number of residual chemicals was detected during the stormwater event (12) and the least number of residual chemicals was detected in the winter high-flow event (5). Many of the residual chemicals detected in the stormwater event were not detected in low flow and winter high flow sampling events. The lower number of residual chemicals detected during the winter high-flow event may have been because of high precipitation and dilution.

4.3 Quality Assurance/ Quality Control

A detailed account of field and laboratory quality control results is presented in the data validation report (**Appendix D**). A summary of the verification and validation results are as follows:

4.3.1 Holding Times

Residual Chemicals

Upon initial review, several analytes for Method LC-MS-MS (the analytical method employed for residual chemicals) were determined to have exceeded hold times. Detections were initially qualified as J- and non-detects were qualified as UJ. However, a subsequent hold time study was conducted in 2016 to determine the effects of long hold times on the pharmaceuticals and personal care products (PPCPs) and perflourinated compounds (PFCs) analyzed by method LC-MS-MS. A summary of that hold time study and its results is provided in **Appendix D**. In brief, the study found that 90 of the 98 compounds evaluated appeared to have remained stable throughout an 84 day period (i.e., beyond the longest hold time experienced in this study). Eight compounds appear to show evidence of degradation or analytical variability, as follows:

- Two compounds (metazachlor and metolachlor) began to degrade after approximately two weeks. Because all metazachlor and metolachlor samples were analyzed past a two week hold time, all of the results for these two parameters are assigned an “R” data quality flag, indicating the data are rejected. For the surface

water quality evaluation described in this technical memorandum, this impacts only the metazachlor data, as metolachlor was not analyzed for (this compound was added to the laboratory's standard analytical list after the start of this effort).

- Four compounds (amoxicillin, azithromycin, cimetidine, and nonyl-phenol) show analytical variability on individual days and between days. Therefore, the results for these compounds should be considered semi quantitative (i.e., concentration results are estimates). "J" data quality flags are assigned for all of the results for these compounds (non-detects are assigned a "UJ" flag). Only azithromycin was detected in surface water.
- Two compounds (nifedipine and theophyline) show concentrations consistently under or over the laboratory control sample (LCS) limits, but no evidence of inconsistent variability or degradation. This appears to be the result of a sample matrix effect or calibration artifact for this sample. "J" data quality flags are assigned for all of the results for these compounds (non-detects are assigned a "UJ" flag). Nifedipine was not detected in any surface water samples. Theophyline was not analyzed for (this compound was added to the laboratory's standard analytical list after the start of this effort).

Bacteria

One sample for fecal coliform and total coliform exceeded hold time, and was J qualified.

4.3.2 Quantitation Limits

Method reporting limits (MRLs) were met for all analytes except alkalinity, bromide, calcium, copper, and total organic carbon. The actual reporting limits for each of these analytes were reported in the results. In addition, several analytes were qualified with a J (when detected) or UJ (when not detected) when the reporting level standard exceeded MRL recovery QC limits.

4.3.3 Matrix Spike/Matrix Spike Duplicate (MS/MSD) Recoveries and Relative Percent Differences

To assess potential matrix effects, an environmental sample and a duplicate are spiked with known concentrations of target analytes. The percent recovery of the target analytes is compared to statistical control limits. Analytes that failed both MS and MSD were J qualified as estimated. Analytes with MS/MSD recoveries below 10 percent were rejected. Only six values were rejected.

4.3.4 Laboratory Control Sample Recoveries

Laboratory Control Samples (LCS) are samples of known concentration that are carried through the extraction and analysis process. The percent recovery is the percentage of the theoretical concentration, and has statistical control limits indicating that the analytical process is "in control." An LCS sample was run in duplicate with the project samples. LCS recoveries were all within the QC limits with exception of a limited number of batches for 4-nonylphenol and biological oxygen demand (BOD). In instances where the LCS recovery is high, but the native result is ND, there is no impact on the data since ND with high recovery is still ND.

4.3.5 Method Blank

An aliquot of reagent water was carried through the entire analytical process. The method blank results indicate any possible contamination exposure during the sample handling, digestion, or extraction process and analysis. In most instances, compounds were not detected at or above the method reporting limits. For compounds that were detected at or above the reporting limit, the result of the native sample was either a non-detect or ten times greater than the method blank result. Therefore, no qualifications were made.

4.3.6 Field Duplicate and Relative Percent Differences

A duplicate sample was collected during each sampling event. Relative percent differences (RPDs) ranged from 0 to 179 percent. Generally, an RPD of less than 20 percent is desirable. RPDs that exceeded 20 percent occurred for a small subset of analytes for all four field duplicate samples. RPDs from field duplicate samples represent variation that occurs in the environment (natural variation), sample collection, and laboratory. Therefore, RPDs exceeding 20 percent may reflect the variability of trace residual chemicals in the environment, but also incorporates variation associated with the limits of analytical methods at these low concentrations.

Residual chemical results have been discussed in sections 4.1 and 4.2 in terms of the primary samples only. However, among the primary samples with field duplicates, residual chemicals were detected 13 times in either field duplicate and corresponding primary sample (**Table 4-7**). In three of these 13 instances, the residual chemical was detected in both the primary and corresponding field duplicate samples. Two of the three instances had an RPD that exceeded 20 percent. In the remaining 10 instances, the detected residual chemical was only detected in either the primary sample or the corresponding field duplicate, but not both samples. In the 8/27/16 Fox Creek sample, no residual chemicals were detected, but four residual chemicals (acesulfame-K, sucralose, cyanazine, and DACT) were detected in the corresponding field duplicate sample. In the 9/14/16 Fox Creek sample, no residual chemicals were detected, but two residual chemicals (cotinine and TDCPP) were detected in the corresponding field duplicate sample. In the 10/12/16 Beatty Springs sample, acesulfame-K, carbamazepine, and quinolone were detected. The corresponding field duplicate sample also had detections of acesulfame-K and carbamazepine, but also had detections of azithromycin, sucralose, and sulfamethoxazole. In the 12/8/16 Munn Lake sample, both the primary and corresponding field duplicate sample detected DEET.

Table 4-1. Woodland Creek Watershed field measurements.

Site	Date	Time	Flow (cfs)	Temperature (Deg C)	Dissolved Oxygen (mg/L)	Specific Conductance (µS/cm)	Conductivity (µS/cm)	pH (units)
Beatty Springs	8/27/2015	1500	ND	14.5	**7.5**	160	128	**6.33**
Beatty Springs	9/14/2015	1300	ND	13.6	**6.9**	159	124	**6.37**
Beatty Springs	10/12/2015	1220	ND	13.2	**5.8**	157	122	**6.48**
Beatty Springs	12/7/2015	1300	ND	11.9	**5.2**	153	114	6.52
Eagle Creek	8/28/2015	730	0.2	12.6	10.2	154	117	7.23
Eagle Creek	9/14/2015	1130	0.2	11.6	10.4	152	113	7.2
Eagle Creek	10/12/2015	1050	0.2	10.8	9.9	156	113	7.31
Eagle Creek	12/7/2015	1100	2.4	--	11.1	100	70	6.97
Fox Creek	8/27/2015	1130	0.2	14.2	**2.5**	152	120	**6.43**
Fox Creek	9/14/2015	800	0.3	13.8	**3**	150	118	**6.42**
Fox Creek	10/12/2015	800	0.6	11.4	**3.8**	146	108	6.57
Fox Creek	12/7/2015	850	2.8	--	**7.4**	61	60	**5.56**
Woodland Creek-Reference	8/28/2015	850	0.6	17.5	**0.6**	144	123	6.51
Woodland Creek-Reference	12/7/2015	1400	22.9	7.6	**8.3**	125	83	7.09
Woodland Creek-Upper	8/27/2015	1530	4.3	14.7	10.9	154	123	6.85
Woodland Creek-Upper	9/14/2015	1330	6.8	12.7	**9.2**	157	120	6.84
Woodland Creek-Upper	10/12/2015	1315	5.6	12.6	**8.7**	157	120	6.94
Woodland Creek-Upper	12/7/2015	1215	11.6	8.7	10.9	106	73	6.95
Woodland Creek-Lower	8/27/2015	1347	11.4	12.9	10.3	174	134	7.34
Woodland Creek-Lower	9/14/2015	1030	12.1	11.5	10.4	175	130	7.41
Woodland Creek-Lower	10/12/2015	945	11.1	10.9	10.5	174	127	7.39
Woodland Creek-Lower	12/7/2015	940	32.3	8.9	11.2	136	94	7.23

Notes:-- = The analyte was not analyzed
Bold values indicate exceedance of the surface water quality standard (WAC 173-201A-600(a) (Ecology, 2012).
Water temperature standard is a 7-day average of the daily maximum temperatures (7 DADMax) of 16º Celsius (C);
Dissolved oxygen standard is a lowest minimum 1-day dissolved oxygen concentration of 9.5 mg/L;
pH standard is between 6.5 and 8.5

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Table 4-2. Woodland Creek Watershed analytical water quality results.

Analyte	Units	MRL	Surface Water Quality Standard	Beatty Springs					Eagle Creek				Fox Creek						Woodland Creek - Lower				Woodland Creek - Upper				Woodland Creek - Reference	
				8/27/2015	9/14/2015	10/12/2015	10/12/2015 (FD)	12/7/2015	8/28/2015	9/14/2015	10/12/2015	12/7/2015	8/27/2015	8/27/2015 (FD)	9/14/2015	9/14/2015 (FD)	10/12/2015	12/7/2015	8/27/2015	9/14/2015	10/12/2015	12/7/2015	8/27/2015	9/14/2015	10/12/2015	12/7/2015	8/28/2015	12/7/2015
General Water Quality Parameters																												
Bicarbcarbonate Alkalinity (as HCO3)	mg/L	2	N/A	55	54	56	56	56	75	76	77	40	79	77	77	77	76	43	77	78	78	60	64	66	64	45	69	58
Alkalinity (as CaCO3)	mg/L	2	N/A	45	44	46	46	46	62	62	63	33	64	63	63	63	62	35	63	64	64	49	52	54	53	37	56	47
Total Dissolved Solids (TDS)	mg/L	10	N/A	96	100	110	110	96	100	100	120	96	100	110	100	92	130	90	110	120	130	110	100	100	100	80	110	82
Total Suspended Solids (TSS)	mg/L	10	N/A	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	13	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	28	*ND*	*ND*
Total Organic Carbon	mg/L	0.3	N/A	1.1	0.45	0.4	0.49	0.36	1.8	1.2	1.8	6.1	5.9	1.1	8.1	8.1	6.2	7.8	0.9	1.3	1.7	3.9	0.37	1.1	1.1	2.9	6.1	4.5
Bromide	ug/L	5	N/A	28	26	29	29	32	18	16	16	9.9	19	29	16	16	17	6.1	29	29	29	23	36	32	36	20	38	25
Chloride	mg/L	1	N/A	6.4	6.3	5.8	5.8	5.9	3.5	3	3.6	3.3	4.4	5.2	4.3	4.3	3.8	3	5.2	5.2	5.1	4.7	5.6	5.6	5.4	4	5.3	4.7
Fluoride	mg/L	0.05	N/A	*ND*	*ND*	*ND*	*ND*	*ND*	0.053	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Sulfate	mg/L	0.5	N/A	8.4	8.4	7.6	7.6	7.8	6.1	6	5.9	5.3	2.3	8	2.6	2.6	3.5	3.9	8.1	8.1	7.6	6.2	7.8	8	7.4	5.2	4.4	5.5
Total Hardness as CaCO3 by ICP	mg/L	3	N/A	56	57	54	54	49	63	62	64	37	63	68	63	62	62	36	70	70	71	53	57	59	57	43	60	46
Anion Sum - Manual Calculation	meq/L	0.001	N/A	1.5	1.5	1.4	1.4	1.4	1.5	1.5	1.5	0.95	1.5	1.7	1.4	1.4	1.4	0.9	1.7	1.7	1.7	1.3	1.5	1.5	1.5	1.1	1.4	1.2
Cation Sum - Calculated	meq/L	0.001	N/A	1.5	1.6	1.5	1.5	1.4	--	1.6	1.6	1	1.6	1.8	1.6	1.5	1.5	0.97	1.7	1.8	1.8	1.4	1.5	1.6	1.5	1	--	1.2
Cation Sum - Manual Calculation	meq/L	0	N/A	--	--	--	--	--	1.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.5	--
Cation Sum - Manual Calculation	%	0	N/A	*ND*	4	1	2	0.27	*ND*	4	2	4.1	4	4	5	2	3	3.4	1	3	3	2.9	1	3	1	1.6	4	0.53
Metals Dissolved																												
Arsenic	ug/L	1	190	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	1 J	*ND*	*ND*	*ND*	*ND*	*ND*	1.3 J	*ND*	*ND*	*ND*	3.4	*ND*	*ND*	*ND*	*ND*	1.3	*ND*
Calcium	mg/L	1	N/A	14	14	13	13	13	13	14	14	10	12	15	12	12	11	7	15	15	15	12	13	14	13	9.1	13	11
Iron	mg/L	0.02	N/A	*ND*	*ND*	*ND*	*ND*	*ND*	0.25	0.26	0.16	0.21	0.85	0.046	0.98	0.97	0.52	0.16	0.045	0.046	0.058	0.071	*ND*	0.025	*ND*	0.058	0.18	0.034
Magnesium	mg/L	0.1	N/A	5.4	5.4	5.2	5.3	5.1	6.5	7	6.9	3.2	7.8	7.8	8	7.7	7.7	4.6	7.8	8.1	8	5.7	6	6.8	6.1	3.8	5.8	4.6
Manganese	ug/L	2	N/A	*ND*	*ND*	*ND*	*ND*	*ND*	46	42	30	16	190	22	240	240	150	5.3	21	20	16	15	6.3	6.5	2.6	6	61	*ND*
Potassium	mg/L	1	N/A	1.3	1.3	1.3	1.1	1.3	1.7	1.8	1.7	1.1	1.6	1.8	1.8	1.6	1.9	1.3	1.8	2	2	1.5	1.4	1.8	1.3	1.1	*ND*	1.1
Silicon	mg/L	0.2	N/A	11	12	11	12	11	15	17	16	9	16	15	16	15	15	9.3	15	16	16	10	12	13	12	8.5	11	6
Sodium	mg/L	1	N/A	8.5	8.8	8.2	8.4	8	6.6	7.1	6.8	5.2	6.9	7.7	6.9	6.5	6.4	4.6	7.5	7.8	7.4	6.5	7.6	7.8	7.3	5.4	6.9	5.6
Metals Total																												
Calcium	mg/L	1	N/A	14	14	13	13	12	14	14	14	9.9	12	15	12	12	12	6.8	15	15	15	12	13	13	13	10	14	11
Magnesium	mg/L	0.1	N/A	5.2	5.3	5.2	5.3	4.7	6.9	6.7	7	3.1	8.1	7.4	8	7.9	7.9	4.5	7.8	7.9	8.1	5.7	6	6.4	6	4.4	6	4.6
Nutrients																												
Total Nitrate, Nitrite-N, CALC	mg/L	0.1	N/A	3.3	3.3	2.7	2.8	2.5	0.41	0.4	0.37	1.2	*ND*	1.4	*ND*	*ND*	*ND*	0.48	1.4	1.4	1.3	0.83	1.5	1.4	1.5	1.5	*ND*	*ND*
Nitrate as Nitrogen by IC	mg/L	0.1	N/A	3.3	3.3	2.7	2.8	2.5	0.41	0.4	0.37	1.2	*ND*	1.4	*ND*	*ND*	*ND*	0.48	1.4	1.4	1.3	0.83	1.5	1.4	1.5	1.5	*ND*	*ND*
Ammonia Nitrogen	mg/L	0.05	N/A	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	0.074	*ND*	0.11	0.11	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	0.11	0.1	0.14	0.089	*ND*	*ND*

Analyte	Units	MRL	Surface Water Quality Standard	Beatty Springs					Eagle Creek				Fox Creek						Woodland Creek - Lower				Woodland Creek - Upper				Woodland Creek - Reference	
				8/27/2015	9/14/2015	10/12/2015	10/12/2015 (FD)	12/7/2015	8/28/2015	9/14/2015	10/12/2015	12/7/2015	8/27/2015	8/27/2015 (FD)	9/14/2015	9/14/2015 (FD)	10/12/2015	12/7/2015	8/27/2015	9/14/2015	10/12/2015	12/7/2015	8/27/2015	9/14/2015	10/12/2015	12/7/2015	8/28/2015	12/7/2015
Kjeldahl Nitrogen	mg/L	0.2	N/A	ND	ND	ND	ND	ND	ND	ND	0.23	0.49	0.36	ND	0.45	0.44	0.45	0.36	ND	ND	0.3	0.33	0.33	0.31	0.42	0.8	0.35	0.47
Total phosphorus as P	mg/L	0.02	N/A	ND	0.029	0.052	0.057	ND	0.11	0.045	0.068	0.028	0.1	0.027	0.16	0.16	0.14	ND	0.036	0.053	0.13	0.026	0.078	0.061	0.087	0.14	0.071	ND
Orthophosphate as P	mg/L	0.01	N/A	0.014	0.014	0.021	0.022	0.021	0.027	0.02	0.028	0.026	0.094	0.048	0.12	0.1	0.064	0.017	0.053	0.047	0.057	0.038	0.037	0.04	0.062	0.07	ND	0.011
Bacteria																												
Fecal Coliform	CFU/100mL	1	See Note	ND	<1	1	ND	ND	>200	16	82	33	78	52	7	34	180	18	180	220	81	110	3	31	8	340	140	27
Total Coliform	MPN/100mL	1	N/A	100	93	75	--	66	>2419.6	920	870	920	960	--	>2419.6	--	2400	290	1700	1400	1200	1300	980	870	920	>2419.6	>2419.6	330
Residual Chemicals																												
2,4-D	ng/L	5	N/A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	36	ND
Acesulfame-K	ng/L	20	N/A	540	630	400	550	430	ND	ND	ND	79	ND	170	ND	ND	ND	ND	160	220	140	130	220	240	240	260	160	150
Azithromycin	ng/L	20	N/A	ND UJ	ND UJ	ND UJ	94 J+	ND UJ	ND UJ	ND UJ	ND UJ	ND UJ	ND UJ	ND UJ	ND UJ	ND UJ	ND UJ	ND UJ	ND UJ	ND UJ	ND UJ	ND UJ	ND UJ	ND UJ	ND UJ	ND UJ	ND UJ	ND UJ
Carbamazepine	ng/L	5	N/A	10	7.1	5.4	8	5.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cotinine	ng/L	10	N/A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	36	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cyanazine	ng/L	5	N/A	9.2	ND	ND	ND	ND	7.9	ND	ND	7	ND	7	ND	ND	ND	ND	7.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
DACT	ng/L	5	N/A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	23	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DEET	ng/L	10	N/A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	31	ND
Iopromide	ng/L	5	N/A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	23	ND	ND	ND	ND	ND	ND	ND	23	ND	ND	ND
Propylparaben	ng/L	5	N/A	ND	ND	ND	ND	ND	ND	ND UJ	ND	ND	ND	ND	ND UJ	ND	ND	ND	ND	18 J	ND	ND	ND	ND	ND	ND	ND	ND
Quinoline	ng/L	5	N/A	ND	ND	20 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Sucralose	ng/L	100	N/A	600	720	ND	2000	510	ND	ND	320	140	ND	170	ND	ND	ND	240	190	ND	120	200	300	330	1300	630	300	520 J+
Sulfamethoxazole	ng/L	5	N/A	ND	ND	ND	15	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TCEP	ng/L	10	N/A	14	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TDCPP	ng/L	100	N/A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Triclocarban	ng/L	5	N/A	ND	ND	ND UJ	ND	ND	ND	ND	ND UJ	ND	ND	ND	ND	ND	ND UJ	ND	ND	ND	ND	ND	ND	ND	8.9	ND	ND	ND
Triclosan	ng/L	10	N/A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	16	ND	ND	ND	ND	14	ND	ND	ND

Notes:

1. Table only shows analytes that were detected in at least one sample. Refer to Appendix C for the full analytical results.
2. Fecal Coliform surface water quality standard is a geometric mean of fecal coliform concentrations less than 50 colonies /100 mL, with not more than 10 percent of all samples obtained for calculating the geometric mean value exceeding 100 colonies /100 mL.

-- = The analyte was not analyzed;
N/A = not applicable;
mg/L = milligrams per liter (ppm); µg/L = micrograms per liter (ppb); ng/L = nanograms per liter (ppt); µS/cm = microsiemens per centimeter; mV = millivolts; MPN/100ml = Most Probable Number (colony forming units) per 100 ml;
PFU/100ml = Plaque Forming Units per 100 ml;
FD = Field Duplicate;
MRL = Minimum Reporting Level; N/A = Not Applicable (analyte not analyzed); ND = Not Detected above MRL;
Low DL = Low Detection Limit method for hormones;
J = Value is detected and the result is estimated;
J- = Value is detected and the result is estimated and biased low;
J+ = Value is detected and the result is estimated and biased high;
UJ = Result is a non-detect and the value is estimated;
R = Result rejected.

Table 4-3. Residual chemical presence at Woodland Creek watershed sampling locations.

Analyte	Class	Beatty Springs	Eagle Creek	Fox Creek	Woodland Creek - Lower	Woodland Creek - Upper	Woodland Creek - Reference
2,4-D	Herbicide						L1
Acesulfame-K	Sugar Substitute	L1,L2,S,W	W		L1,L2,S,W	L1,L2,S,W	L1,W
Carbamazepine	Anti seizure	L1,L2,S,W					
Cyanazine	Triazine Herbicide	L1	L1,W		L1		
DEET	Mosquito Repellant						L1
Iopromide	X-ray Contrast Agent			S		S	
Propylparaben	Preservative				L2		
Quinoline	Phosphate Pesticide	S					
Sucralose	Sugar Substitute	L1,L2,W	S,W	W	L1,S,W	L1,L2,S,W	L1,W
TCEP	Flame Retardant	L1					
Triclocarban	Antibacterial					S	
Triclosan	Antibacterial				L2	S	

Notes:
L1 = summer low flow 1, L2 = summer low flow 2, S = storm event, W = winter high flow;
Blank cells= no detections for that analyte and event.

Table 4-4. Deschutes River Watershed field measurements.

Site	Date	Time	Flow (cfs)	Temperature (Deg C)	Dissolved Oxygen (mg/L)	Specific Conductance (µS/cm)	Conductivity (µS/cm)	pH (units)
Chambers Creek	9/10/2015	1235	1.5	14.4	8.59	158.1	126	6.93
Chambers Creek	9/15/2015	1135	1.4	11.9	8.64	157.6	118	6.93
Chambers Creek	10/13/2015	1130	1.3	12.9	8.13	163.7	125.8	7.01
Chambers Creek	12/8/2015	1200	24	9.9	10.9	62.3	44.3	6.69
Deschutes River Upper	8/28/2015	1500	49.4	**19.1**	10.43	155.4	137.7	7.92
Deschutes River Upper	9/15/2015	1300	48.08	13.6	10.32	155.8	121.5	7.77
Deschutes River Upper	10/13/2015	1300	62.18	14.2	10.97	147.6	117.1	7.61
Deschutes River Upper	12/8/2015	1300	--	9.5	11.5	52.7	37.1	7
Deschutes River-Lower	9/10/2015	1145	88	14.5	10.53	153.6	122.9	7.23
Deschutes River-Lower	9/15/2015	930	81	12.3	8.19	154.3	116.9	7.14
Deschutes River-Lower	10/13/2015	930	107	13	9.09	150.7	116.2	7.22
Deschutes River-Lower	12/8/2015	1000	3,210	--	12.13	53.5	37.4	7.06
Deschutes River-Reference	8/28/2015	1345	42	**18.5**	11.21	162.6	142.4	7.79
Deschutes River-Reference	12/8/2015	1400	--	9.6	11.93	51	36.1	7.02
Munn Lake	8/28/2015	1130	NA	**23.4**	**6.11**	36.9	35.8	6.81
Munn Lake	9/15/2015	1015	NA	**18.9**	**5.31**	36.9	32.6	6.55
Munn Lake	10/13/2015	1030	NA	16.3	**4.44**	37.6	31.4	6.7
Munn Lake	12/8/2015	1100	NA	7.3	9.51	33.6	22.3	6.65
Percival Creek	8/28/2015	1035	9.2	**17.6**	8.97	127.3	109.6	7.44
Percival Creek	9/15/2015	800	9.2	13.6	9.2	132.2	103.4	7.47
Percival Creek	10/13/2015	800	17.36	15.3	9.37	121.9	99.4	7.51
Percival Creek	12/8/2015	850	157.02	9	13.11	77.5	53.7	7.15

Notes:
-- = The analyte was not analyzed
Bold values indicate exceedance of the surface water quality standard (WAC 173-201A-600(a) (Ecology, 2012a).
Water temperature standard a 7-day average of the daily maximum temperatures (7 DADMax) of 17.5º Celsius (C);
Dissolved oxygen standard is a lowest minimum 1-day dissolved oxygen concentration of 8 mg/L;
pH standard is between 6.5 and 8.5

Table 4-5. Deschutes River Watershed analytical water quality results.

Analyte	Units	MRL	Surface Water Quality Standard	Chambers Creek				Munn Lake					Percival Creek				Deschutes River - Lower				Deschutes River - Upper				Deschutes River - Reference	
				9/10/2015	9/15/2015	10/13/2015	12/8/2015	8/28/2015	9/15/2015	10/13/2015	12/8/2015	12/8/2015 (FD)	8/28/2015	9/15/2015	10/13/2015	12/8/2015	9/10/2015	9/15/2015	10/13/2015	12/8/2015	8/28/2015	9/15/2015	10/13/2015	12/8/2015	8/28/2015	12/8/2015
General Water Quality Parameters																										
Bicarbcarbonate Alkalinity (as HCO3)	mg/L	2	N/A	68	68	68	20	15	15	16	12	12	60	65	59	34	62	63	61	19	56	58	57	19	57	19
Alkalinity (as CaCO3)	mg/L	2	N/A	56	56	56	16	12	12	13	9.8	9.8	49	53	48	28	51	52	50	16	46	48	47	16	46	16
Total Dissolved Solid (TDS)	mg/L	10	N/A	120	100	120	58	32	43	27	23	30	100	90	64	56	120	100	86	55	110	110	94	53	110	47
Total Suspended Solids (TSS)	mg/L	10	N/A	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	18	*ND*	*ND*	*ND*	99	*ND*	*ND*	*ND*	42	*ND*	74
Total Organic Carbon	mg/L	0.3	N/A	1.8	1.5	2.3	9.6	7.7	7.9	7.6	6.2	6	4.3	4.1	5.1	6.1	1.5	1.4	1.7	5.1	1.6	1.4	1.8	4.4	1.4	4
Bromide	ug/L	5	N/A	17	14	17	5.7	*ND*	*ND*	8.8	*ND*	*ND*	20	20	25	11	19	17	17	*ND*	20	17	17	*ND*	21	*ND*
Chloride	mg/L	1	N/A	4.4	4.4	4.8	2.9	1.9	1.9	1.9	2	2	4.8	4.9	4.4	3.1	10	10	9.7	2.1	14	14	12	2.2	15	2.1
Sulfate	mg/L	0.5	N/A	7.4	7.6	7.7	2.8	*ND*	*ND*	*ND*	*ND*	*ND*	3.2	3.1	2.6	3.2	4.6	4.7	4.1	1.7	4	3.9	3.5	1.7	3.9	1.6
Total Hardness as CaCO3	mg/L	3	N/A	58	65	61	23	13	13	13	10	11	52	52	48	32	53	57	56	28	54	54	50	24	53	26
Biochemical Oxygen Demand	mg/L	3	N/A	*ND*	*ND*	*ND UJ*	*ND*	*ND*	*ND*	3.1 J	*ND*	*ND*	*ND*	*ND*	*ND UJ*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND UJ*	*ND*	*ND*	*ND*
Anion Sum - Manual Calculation	meq/L	0.001	N/A	1.5	1.5	1.5	0.52	0.3	0.3	0.3	0.27	0.27	1.2	1.3	1.2	0.73	1.4	1.5	1.4	0.45	1.4	1.5	1.4	0.45	1.5	0.45
Cation Sum - Calculated	meq/L	0.001	N/A	1.6	1.6	1.6	0.56	0.36	0.36	0.35	0.29	0.29	1.3	1.3	1.2	0.72	1.6	1.5	1.4	0.55	--	1.5	1.4	0.53	--	0.48
Cation Sum - Manual Calculation	meq/L	0	N/A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.5	--	--	--	1.6	--
Cation Sum - Manual Calculation	%	0	N/A	3	3	3	3.4	10	9	5	4.2	4	4	1	3	0.35	5	1	1	9.4	2	1	*ND*	7.8	2	3.9
Metals Dissolved																										
Arsenic	ug/L	1	190	*ND*	*ND*	*ND*	4.3	1.2	*ND*	1	*ND*	*ND*	1.1	*ND*	1.5	2.1 J	*ND*	*ND*	*ND*	*ND UJ*	*ND*	*ND*	*ND*	1.4 J	*ND*	1 J
Calcium	mg/L	1	N/A	16	15	15	5.2	3.1	3.1	3	2.5	2.5	11	12	11	7	14	14	13	5.1	14	14	13	5.1	14	4.7
Copper	ug/L	2	6.16	*ND*	*ND*	*ND*	*ND*	4	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Iron	mg/L	0.02	N/A	0.05	0.049	0.05	0.2	0.083	0.086	0.042	0.064	0.065	0.12	0.13	0.093	0.18	0.13	0.14	0.12	0.66	0.06	0.068	0.062	0.26	0.056	0.35
Magnesium	mg/L	0.1	N/A	6.1	6	6.1	1.9	1.3	1.3	1.3	0.99	1	5	5.4	4.8	2.4	5.4	5.4	4.8	1.6	4.6	4.7	4.2	1.5	4.5	1.3
Manganese	ug/L	2	N/A	8.4	9.4	8.4	5.2	12	16	4	8.4	7.8	15	13	8.4	16	27	29	25	14	7.2	6.2	6.9	5.7	8.2	7.9
Potassium	mg/L	1	N/A	1.4	1.4	1.7	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	1.2	1.2	1.2	*ND*	1.4	1.3	1.2	*ND*	1.2	1.3	1.2	*ND*	1.3	*ND*
Silicon	mg/L	0.2	N/A	15	15	15	5.5	0.94	1.2	1.2	1.4	1.4	11	10	5.9	5.6	14	14	13	9.4	12	13	12	8.2	12	8
Sodium	mg/L	1	N/A	7.2	7.4	7.4	3.3	2.1	2.2	2.2	1.9	1.8	5.9	6.3	5.7	4	8.5	8.6	7.9	3.6	9.2	9.6	8.7	3.4	9.7	3.2
Metals Total																										
Calcium	mg/L	1	N/A	14	16	15	5.6	3	3.1	3.1	2.5	2.7	12	12	11	8.2	13	14	14	6.6	14	14	13	5.8	14	6.3
Magnesium	mg/L	0.1	N/A	5.7	6	5.8	2.1	1.3	1.3	1.3	1	1.1	5.3	5.3	4.9	2.9	5.1	5.4	5.1	2.9	4.7	4.6	4.3	2.2	4.5	2.6
Nutrients																										
Nitrate+Nitrite	mg/L	0.1	N/A	1.6	1.6	1.9	0.78	*ND*	*ND*	*ND*	0.11	0.1	0.16	0.28	0.2	0.31	0.7	0.74	0.63	0.61	0.74	0.58	0.4	0.6	0.8	0.61
Nitrate as Nitrogen by IC	mg/L	0.1	N/A	1.6	1.6	1.9	0.78	*ND*	*ND*	*ND*	0.11	0.1	0.16	0.28	0.2	0.31	0.7	0.74	0.63	0.61	0.74	0.58	0.4	0.6	0.8	0.61
Ammonia Nitrogen	mg/L	0.05	N/A	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	0.19	0.19	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Kjeldahl Nitrogen	mg/L	0.2	N/A	0.21	0.34	0.21	0.61	0.41	0.71	0.74	0.58	0.62	1.1	0.4	0.45	0.53	*ND*	0.21	0.2	0.56	0.59	*ND*	0.2	0.29	0.22	0.6 J-
Total phosphorus as P	mg/L	0.02	N/A	0.056	0.031	0.29	0.02	0.053	0.035	0.15	*ND*	*ND*	0.1	0.035	0.18	0.05	0.053	0.033	0.29	0.082	*ND*	*ND*	0.23	0.092	*ND*	0.12

Analyte	Units	MRL	Surface Water Quality Standard	Chambers Creek				Munn Lake					Percival Creek				Deschutes River - Lower				Deschutes River - Upper				Deschutes River - Reference	
				9/10/2015	9/15/2015	10/13/2015	12/8/2015	8/28/2015	9/15/2015	10/13/2015	12/8/2015	12/8/2015 (FD)	8/28/2015	9/15/2015	10/13/2015	12/8/2015	9/10/2015	9/15/2015	10/13/2015	12/8/2015	8/28/2015	9/15/2015	10/13/2015	12/8/2015	8/28/2015	12/8/2015
Orthophosphate as P	mg/L	0.01	N/A	0.017	0.015	0.015	0.012	ND	ND	ND	0.01	ND	0.013	0.016	0.023	0.035	0.021	0.019	0.021	0.059	ND	0.013	0.013	0.042	ND	0.09
Bacteria																										
Fecal Coliform	CFU/100 mL	1	See Notes	68	180	49	180	15	15	33	3	4	130	68	51	54	110	26	27	69	60 J	30	28	54	55	65
Total Coliform	MPN/100 mL	1	N/A	1100	>2419.6	1400	>2419.6	>2419.6	>2419.6	820	150	--	270	>2419.6	2400	920	1400	1000	1600	1700	>2419.6 J	870	650	870	870	690
Residual Chemicals																										
2,4-D	ng/L	5	N/A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	21	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-nonylphenol - semi quantitative	ng/L	100	N/A	ND UJ	NDUJ	ND UJ	ND UJ	ND UJ	ND UJ	180 J+	ND UJ	ND UJ	ND UJ	ND UJ	ND UJ	ND UJ	ND UJ	ND UJ	220 J+	ND UJ	ND UJ	ND UJ	ND UJ	ND UJ	ND UJ	ND UJ
4-tert-octylphenol	ng/L	50	N/A	ND	ND	ND	ND	ND	ND	170 J	ND	ND	ND	ND	ND	ND	ND	ND	140 J	ND	ND	ND	ND	ND	ND	ND
Acesulfame-K	ng/L	20	N/A	250	230	280	37	24	22	29	ND	ND	68	67	75	45	29	21	24	ND	ND	ND	ND	ND	ND	ND
Atenolol	ng/L	5	N/A	ND	ND	ND	ND	ND	14	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbamazepine	ng/L	5	N/A	7.8	6.7	7.7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cotinine	ng/L	10	N/A	ND	ND	ND	ND	ND	13	ND	ND	ND	ND	12	ND	ND	ND	44	ND	ND	ND	ND	ND	ND	ND	ND
Cyanazine	ng/L	5	N/A	ND	ND	ND	6.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	6.5	ND	ND	ND	ND	ND	ND
DEET	ng/L	10	N/A	ND	ND	ND	ND	27	18	21	22	20	11	ND	ND	12	ND	ND	ND	ND	ND	ND	ND	390	ND	ND
Diclofenac	ng/L	5	N/A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	7.4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Estrone (Low DL)	ng/L	0.5	N/A	ND	ND	--	--	1.3	2	--	--	ND	ND	ND	--	--	ND	ND	--	--	ND	ND	--	--	ND	--
Iohexal	ng/L	10	N/A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	33	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Iopromide	ng/L	5	N/A	ND	ND	6	ND	ND	ND	59	ND	ND	ND	ND	17	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Lincomycin	ng/L	10	N/A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	14	ND	ND	ND	ND	ND
Methylparaben	ng/L	20	N/A	ND	ND	ND	ND	ND	ND	42	ND	ND	ND	ND	ND	ND	ND	ND	46	ND	ND	ND	ND	ND	ND	ND
Propylparaben	ng/L	5	N/A	ND	ND UJ	ND	ND	ND	ND UJ	ND	ND	ND	ND	ND UJ	ND	ND	ND	ND UJ	5.6	ND	ND	ND	ND	ND	ND	ND
Quinoline	ng/L	5	N/A	ND	ND	ND	ND	16	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	9.2	ND	ND	ND	ND	ND
Sucralose	ng/L	100	N/A	330	210	130	130	ND	ND	ND	ND	ND	150	140	6300	250	ND	ND	ND	200	ND	ND	ND	140	ND	140
TCEP	ng/L	10	N/A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	13	ND	ND	ND	ND	ND
TDCPP	ng/L	100	N/A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4500	ND	ND	ND	ND	ND	ND

Notes:

1. Table only shows analytes that were detected in at least one sample. Refer to Appendix C for the full analytical results.
2. Fecal Coliform surface water quality standard is a geometric mean of fecal coliform concentrations less than 50 colonies /100 mL, with not more than 10 percent of all samples obtained for calculating the geometric mean value exceeding 100 colonies /100 mL.

-- = The analyte was not analyzed;
N/A = not applicable;
mg/L = milligrams per liter (ppm); µg/L = micrograms per liter (ppb); ng/L = nanograms per liter (ppt); µS/cm = microsiemens per centimeter; mV = millivolts; MPN/100ml = Most Probable Number (colony forming units) per 100 ml; PFU/100ml = Plaque Forming Units per 100 ml;
FD = Field Duplicate;
MRL = Minimum Reporting Level; N/A = Not Applicable (analyte not analyzed); ND = Not Detected above MRL;
Low DL = Low Detection Limit method for hormones;
J = Value is detected and the result is estimated;
J- = Value is detected and the result is estimated and biased low;
J+ = Value is detected and the result is estimated and biased high;
UJ = Result is a non-detect and the value is estimated;
R = Result rejected.

Table 4-6. Residual chemical presence at Deschutes River watershed sampling locations.

Analyte	Class	Chambers Creek	Munn Lake	Percival Creek	Deschutes River - Lower	Deschutes River - Upper	Deschutes River - Reference
2,4-D	Herbicide			S			
4-nonylphenol	Surfactant		S		S		
4-tert-octylphenol	Surfactant		S		S		
Acesulfame-K	Sugar Substitute	L1,L2,S,W	L1,L2,S	L1,L2,S,W	L1,L2,S		
Atenolol	Beta Blocker		L2				
Carbamazepine	Anti seizure	L1,L2,S					
Cotinine	Nicotine Degradate		L2	L2	L2		
Cyanazine	Triazine Herbicide	W			W		
DEET	Mosquito Repellant		L1,L2,S,W	L1,W		W	
Diclofenac	Anti-Inflammatory			S			
Estrone	Estrogenic Hormone		L1,L2				
Iohexal	X-ray Contrast Agent			S			
Iopromide	X-ray Contrast Agent	S	S	S			
Lincomycin	Antibiotic					L1	
Methylparaben	Preservative		S		S		
Propylparaben	Preservative				S		
Quinoline	Phosphate Pesticide		L1			L1	
Sucralose	Sugar Substitute	L1,L2,S,W		L1,L2,S,W	W	W	W
TCEP	Flame Retardant					L1	
TDCPP	Flame Retardant				W		

Notes:
L1 = summer low flow 1, L2 = summer low flow 2, S = storm event, W = winter high flow;
Blank cells= no detections for that analyte and event.

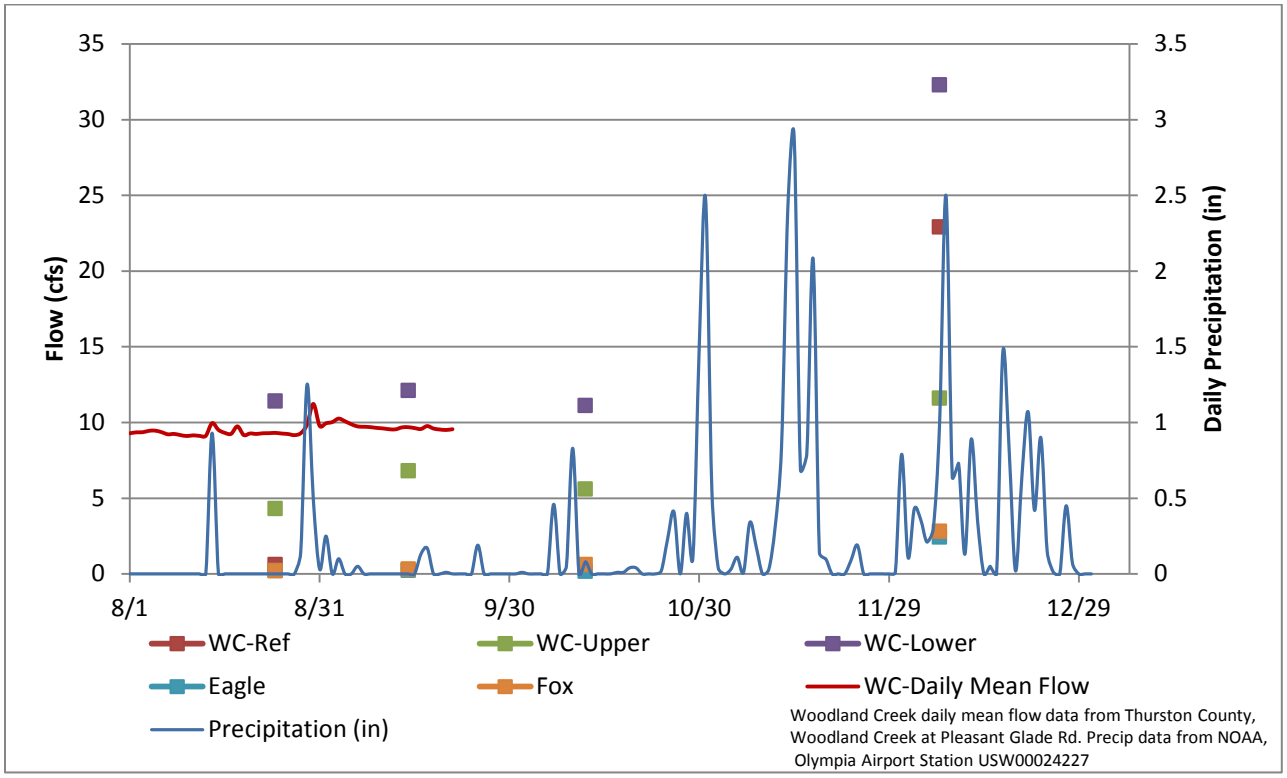
Table 4-7. Residual chemical detections in field duplicate samples.

			Fox Creek	Fox Creek (Field Duplicate)	Fox Creek	Fox Creek (Field Duplicate)	Beatty Springs	Beatty Springs (Field Duplicate)	Munn Lake	Munn Lake (Field Duplicate)
Analyte	**Units**	**MRL**	**8/27/2015**	**8/27/2015**	**9/14/2015**	**9/14/2015**	**10/12/2015**	**10/12/2015**	**12/8/2015**	**12/8/2015**
Acesulfame-K	ng/L	20	*ND*	**170**	*ND*	*ND*	**400**	**550**	*ND*	*ND*
Azithromycin	ng/L	20	*ND UJ*	*ND UJ*	*ND UJ*	*ND UJ*	*ND UJ*	**94 J+**	*ND UJ*	*ND UJ*
Carbamazepine	ng/L	5	*ND*	*ND*	*ND*	*ND*	**5.4**	**8**	*ND*	*ND*
Cotinine	ng/L	10	*ND*	*ND*	*ND*	**36**	*ND*	*ND*	*ND*	*ND*
Cyanazine	ng/L	5	*ND*	**7**	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
DACT	ng/L	5	*ND*	**23**	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
DEET	ng/L	10	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	**22**	**20**
Quinoline	ng/L	5	*ND*	*ND*	*ND*	*ND*	**20 J**	*ND*	*ND*	*ND*
Sucralose	ng/L	100	*ND*	**170**	*ND*	*ND*	*ND*	**2000**	*ND*	*ND*
Sulfamethoxazole	ng/L	5	*ND*	*ND*	*ND*	*ND*	*ND*	**15**	*ND*	*ND*
TDCPP	ng/L	100	*ND*	*ND*	*ND*	**100**	*ND*	*ND*	*ND*	*ND*

Notes:

1. Table only shows analytes that were detected in at least one sample. Refer to Appendix C for the full analytical results. .

ng/L = nanograms per
MRL = Minimum Reporting Level; ND = Not Detected above MRL;
J = Value is detected and the result is estimated;
J+ = Value is detected and the result is estimated and biased high;
UJ = Result is a non-detect and the value is estimated;



Notes: WC-Ref = Woodland Creek-Reference, WC-Upper = Woodland Creek-Upper, WC-Lower = Woodland Creek-Lower, Eagle = Eagle Creek, Fox = Fox Creek.

Figure 4-1. Measured flow at the Woodland Creek sampling sites and long-term recorded flow and precipitation.

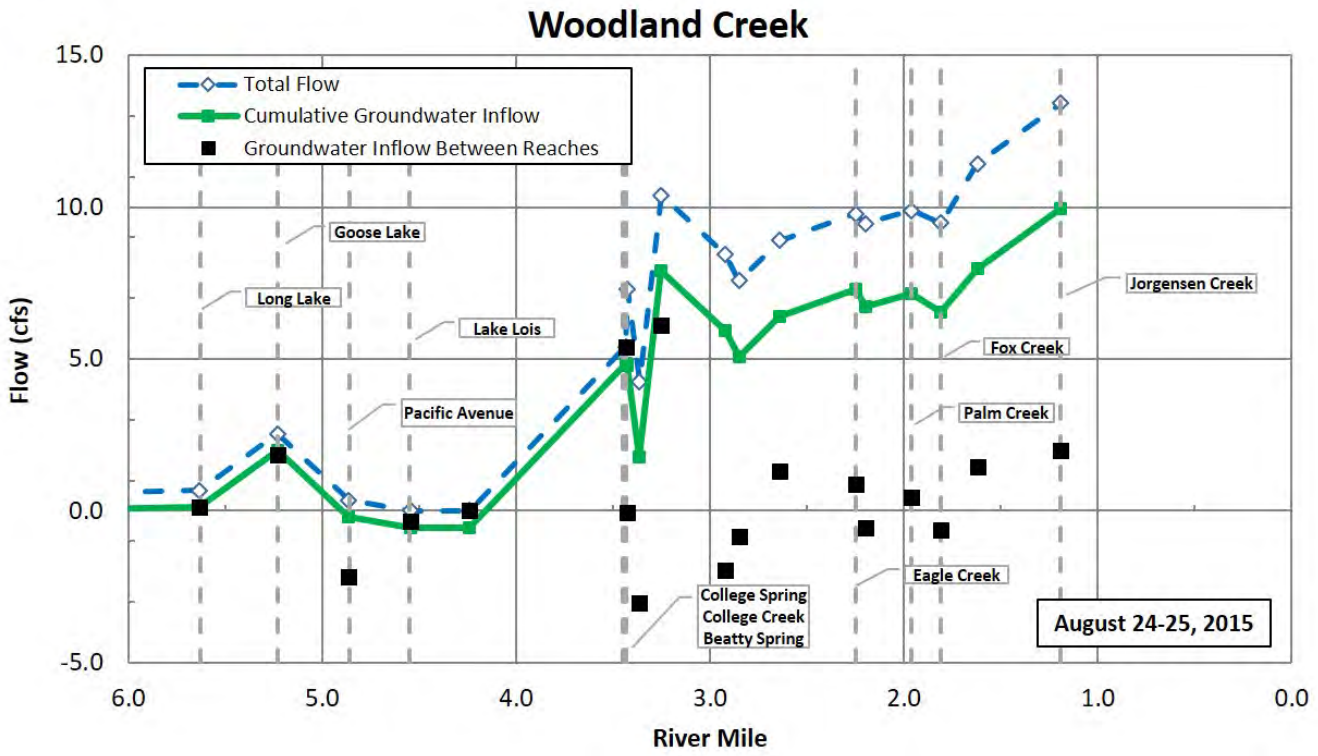


Figure 4-2. Woodland Creek measured surface water flow and calculated groundwater inflow on August 24-25.

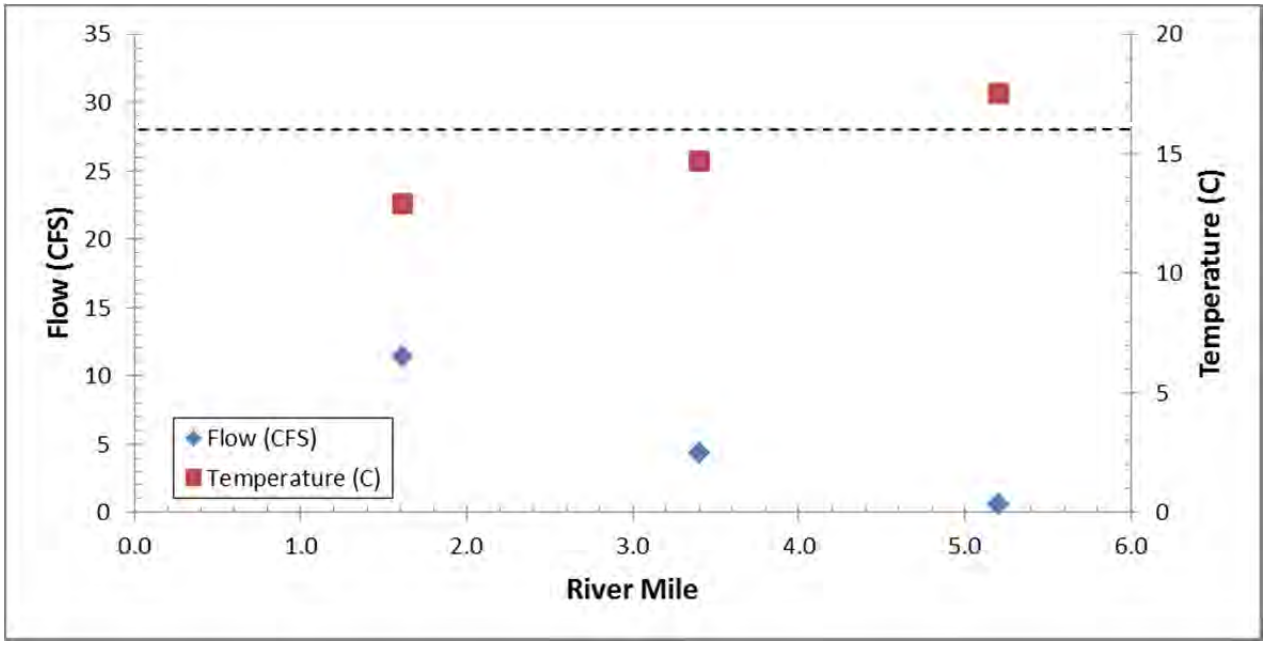


Figure 4-3. Woodland Creek longitudinal profile of temperature and flow (August 27 and 28, 2015; low flow).

Note: The dashed line indicates the water temperature standards of 16 ºC7-day average daily maximum temperature. Note that the measured temperature values are single instantaneous measurements.

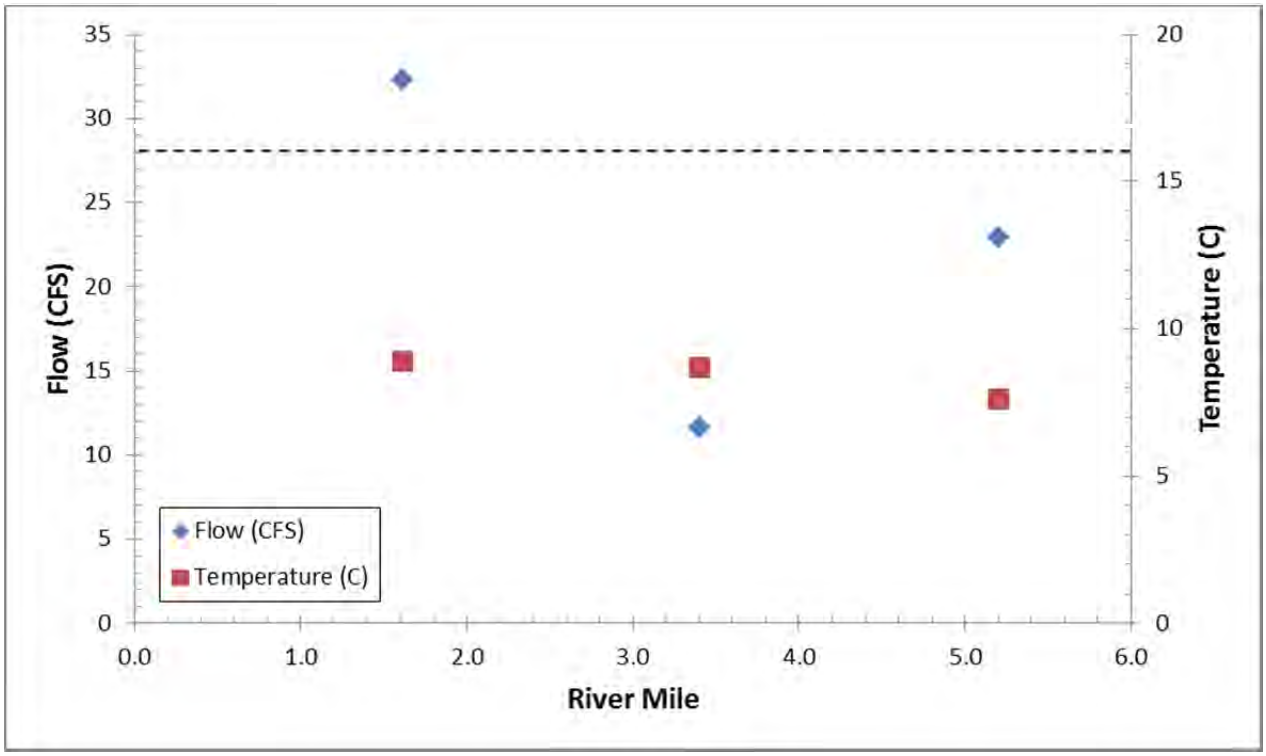


Figure 4-4. Woodland Creek longitudinal profile of temperature and flow (December 7, 2015; high flow).

Note: The dashed line indicates the water temperature standards of 16 ºC7-day average daily maximum temperature. Note that the measured temperature values are single instantaneous measurements.

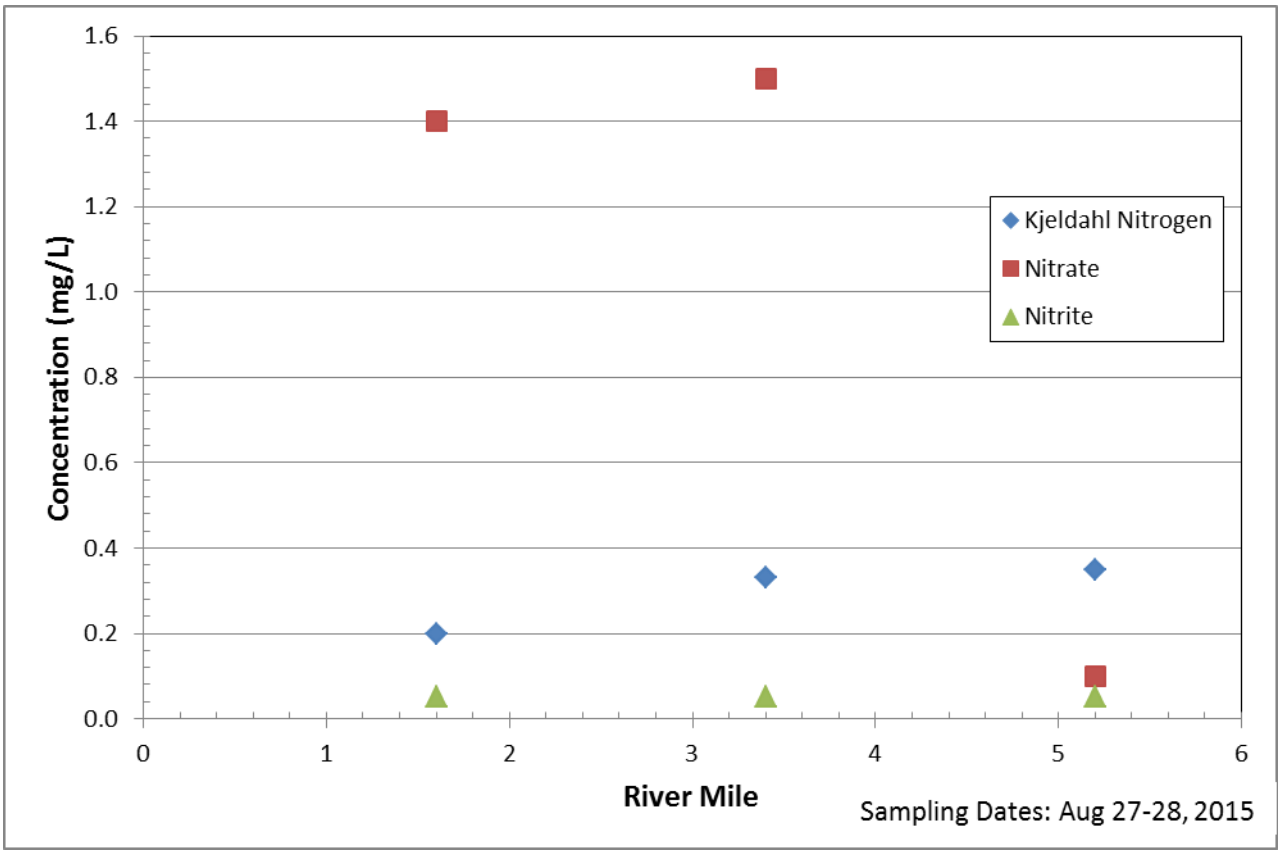


Figure 4-5. Woodland Creek longitudinal profile of total kjeldahl nitrogen, nitrate, and nitrite concentrations at Woodland Creek watershed monitoring sites (low flow).

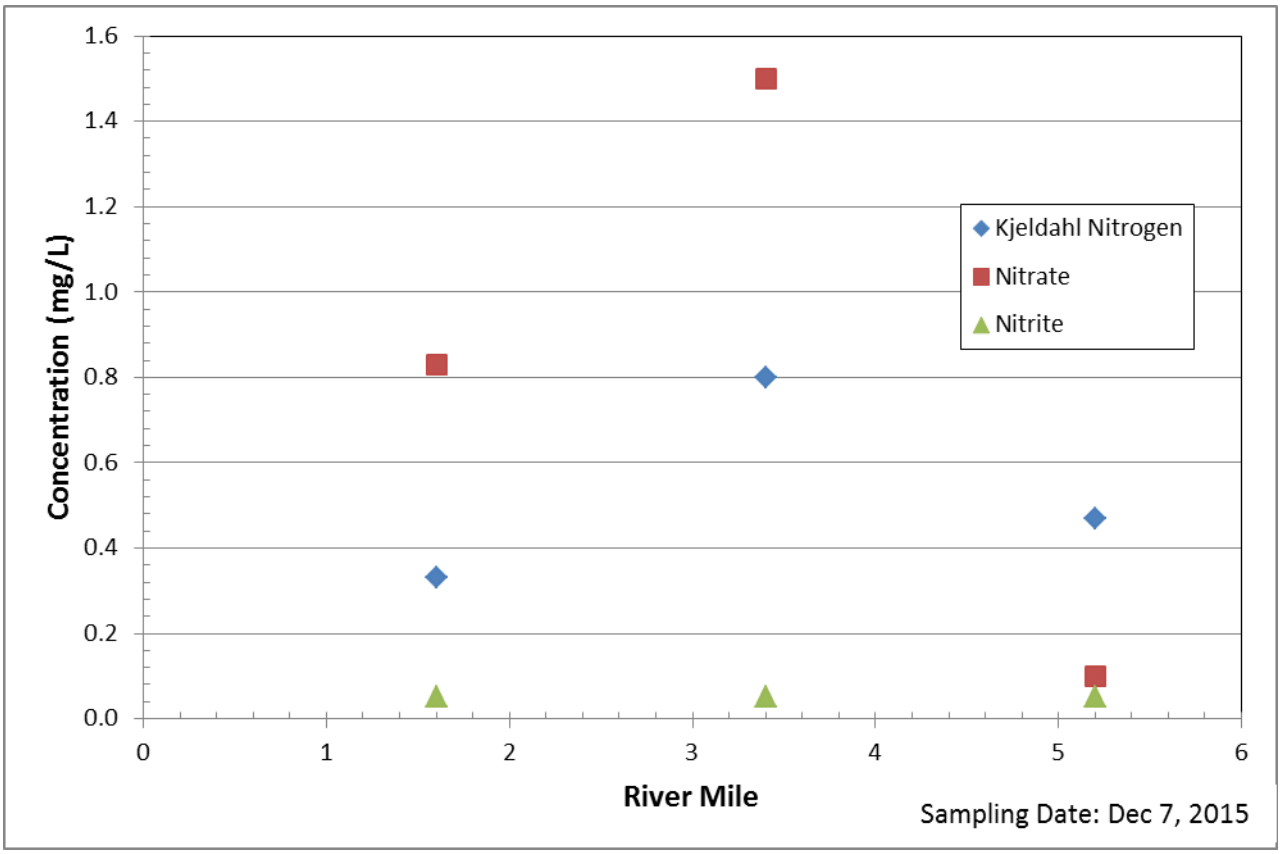


Figure 4-6. Woodland Creek longitudinal profile of total kjeldahl nitrogen, nitrate, and nitrite concentrations at Woodland Creek watershed monitoring sites (high flow).

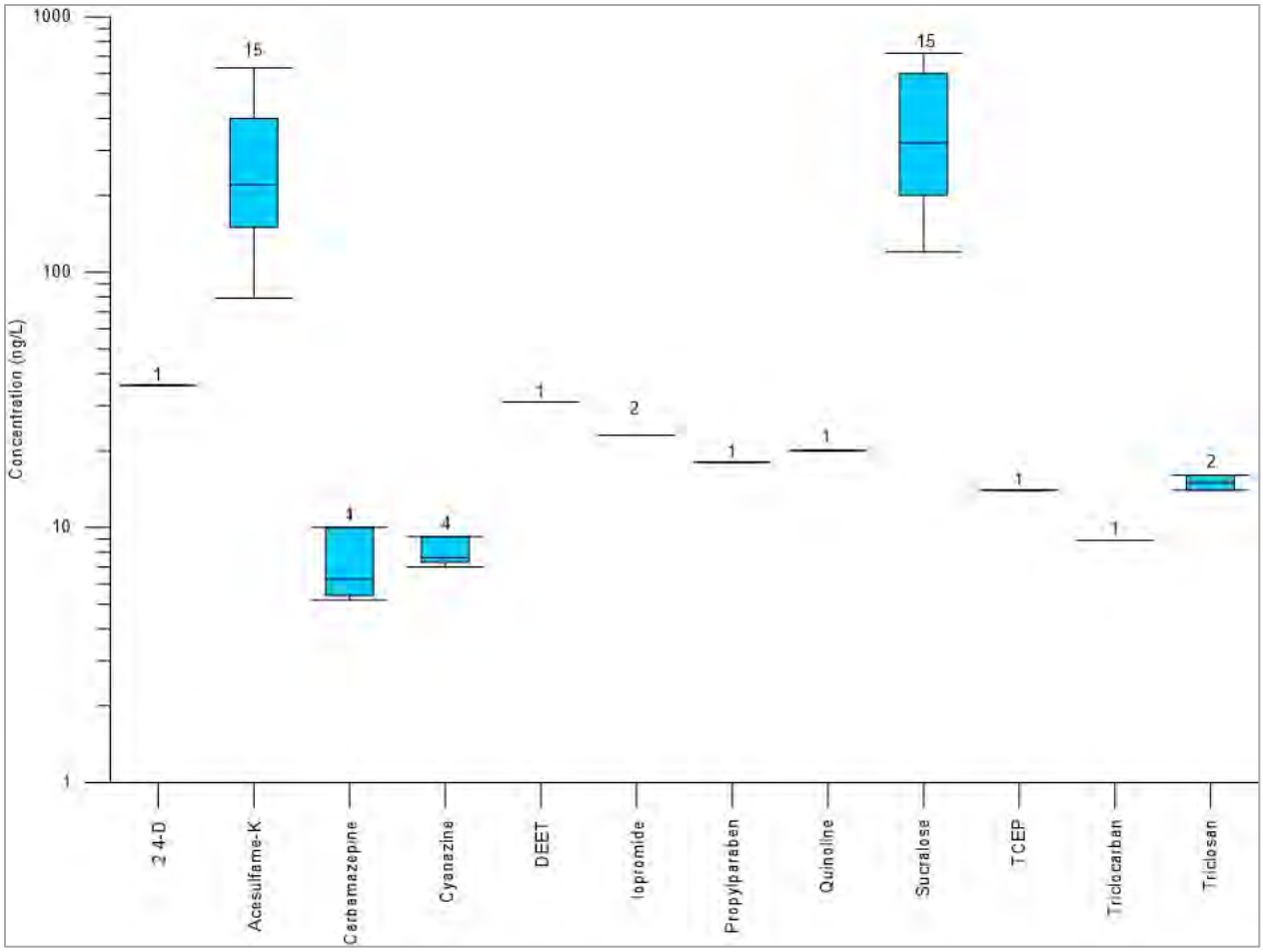


Figure 4-7. Box plots of detected residual chemicals for all Woodland Creek sites and sampling events (n = 22).

Note: These boxplots only include detected residual chemical concentrations, as denoted by the number above each respective box plot. A total of 22 samples were collected.

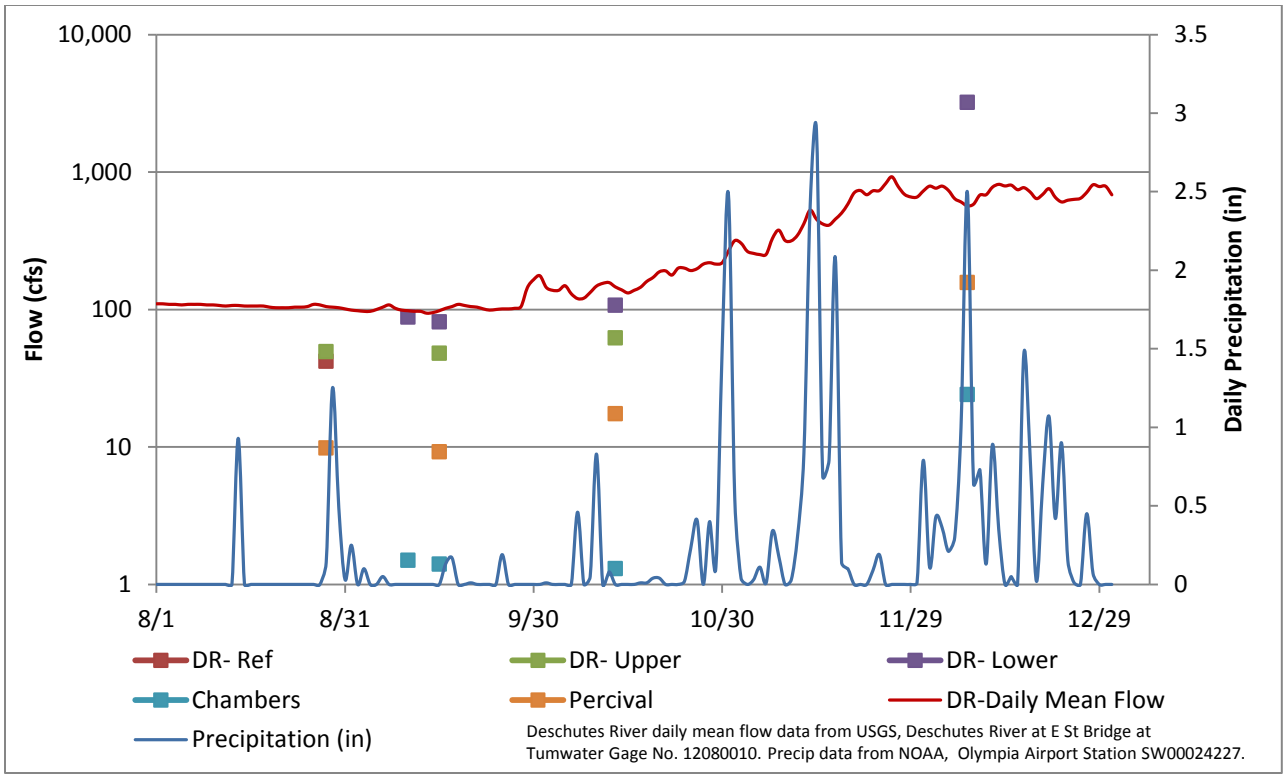


Figure 4-8. Deschutes River watershed sites flow and daily precipitation.

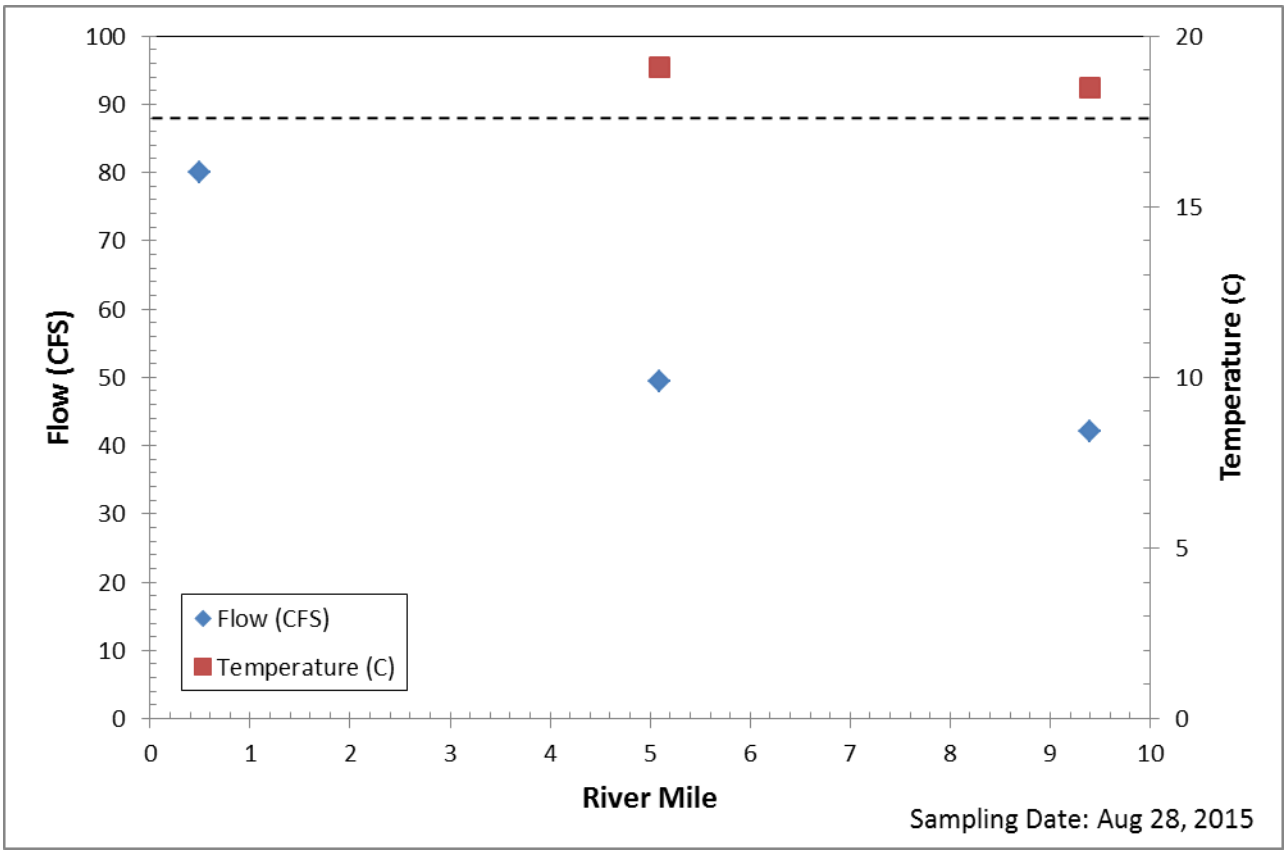


Figure 4-9. Deschutes River longitudinal profile of temperature and flow (low flow).

Note: The dashed line indicates the water temperature standards of 17.5 ºC 7-day average daily maximum temperature. Note that the measured temperature values are single instantaneous measurements.

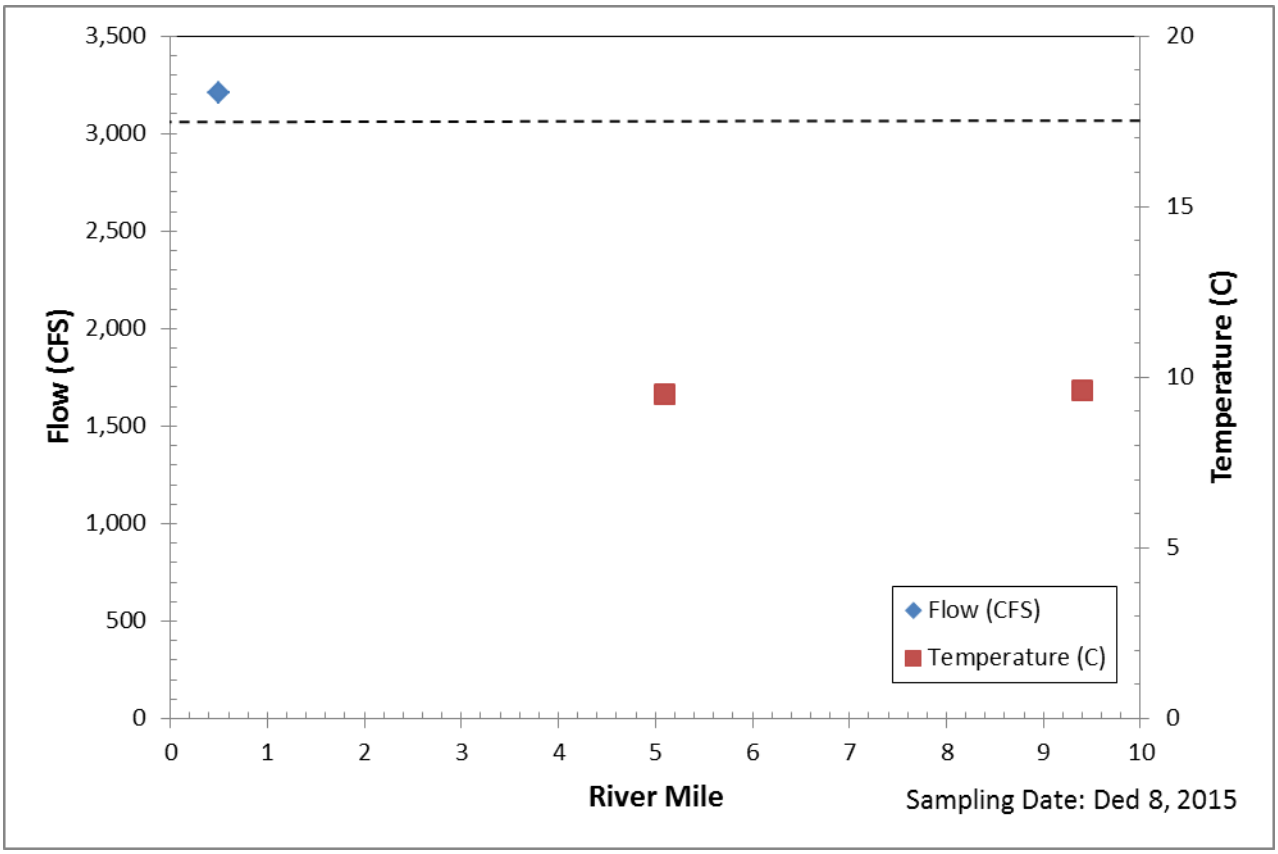


Figure 4-10. Deschutes River longitudinal profile of temperature and flow (high flow).

Note: The dashed line indicates the water temperature standards of 17.5 ºC 7-day average daily maximum temperature. Note that the measured temperature values are single instantaneous measurements.

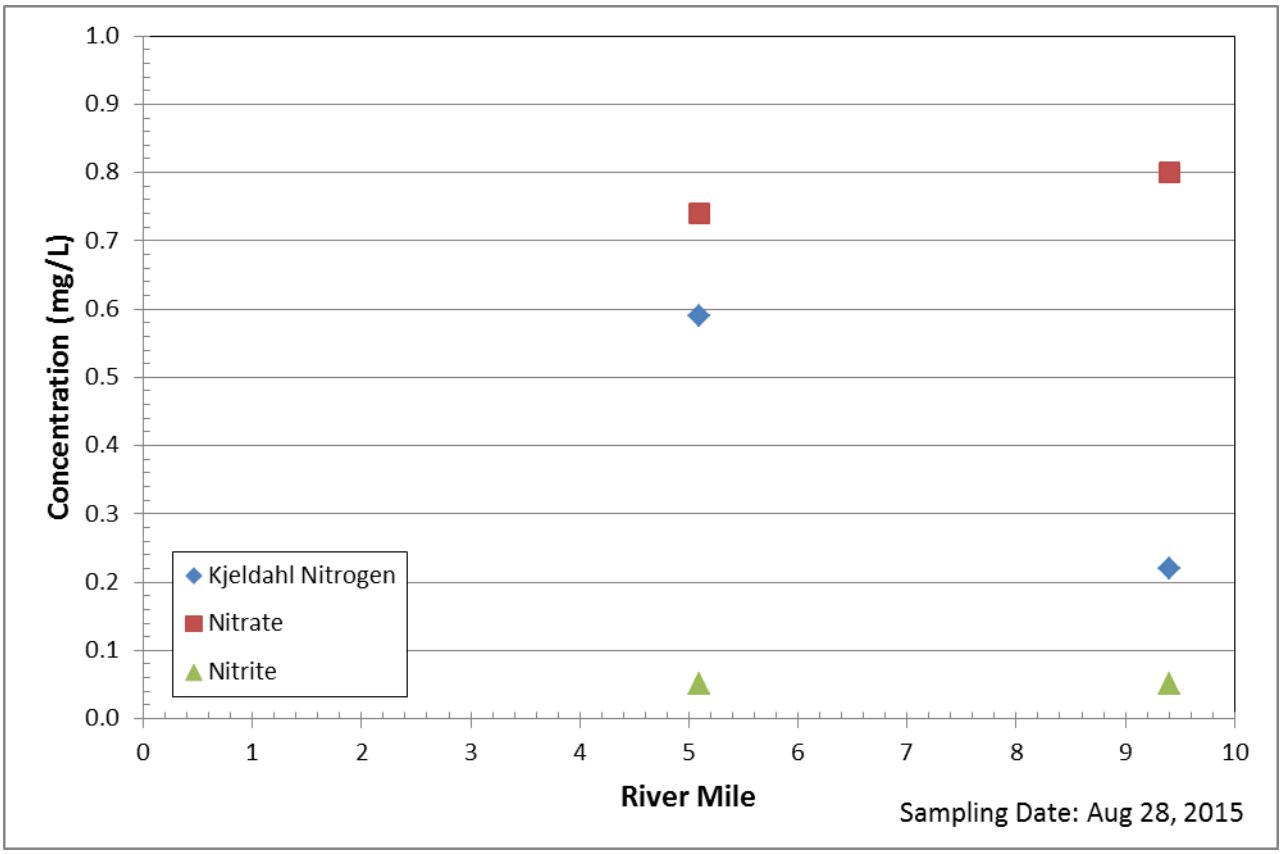


Figure 4-11. Deschutes River longitudinal profile of total kjeldahl nitrogen, nitrate, and nitrite concentrations at Woodland Creek watershed monitoring sites (low flow).

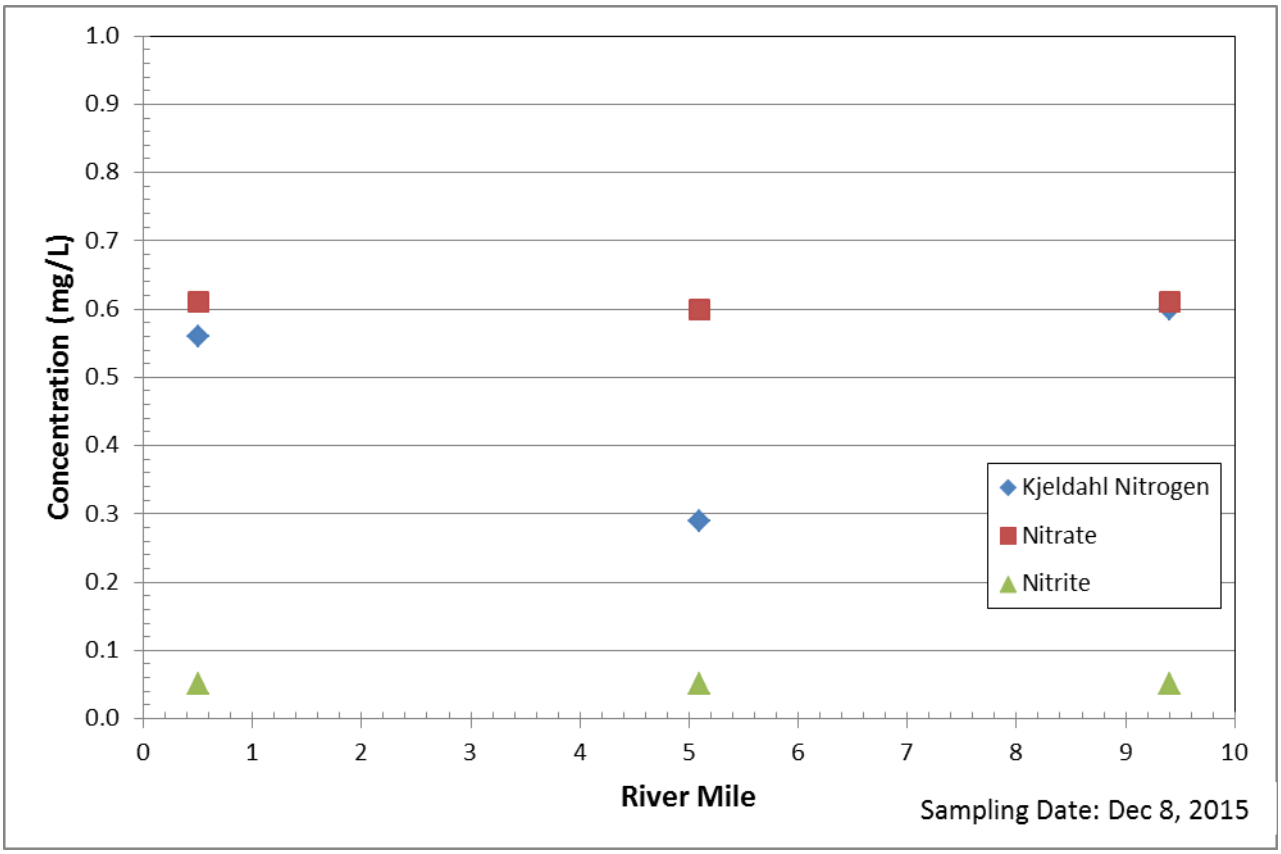


Figure 4-12. Deschutes River longitudinal profile of total kjeldahl nitrogen, nitrate, and nitrite concentrations at Woodland Creek watershed monitoring sites (high flow).

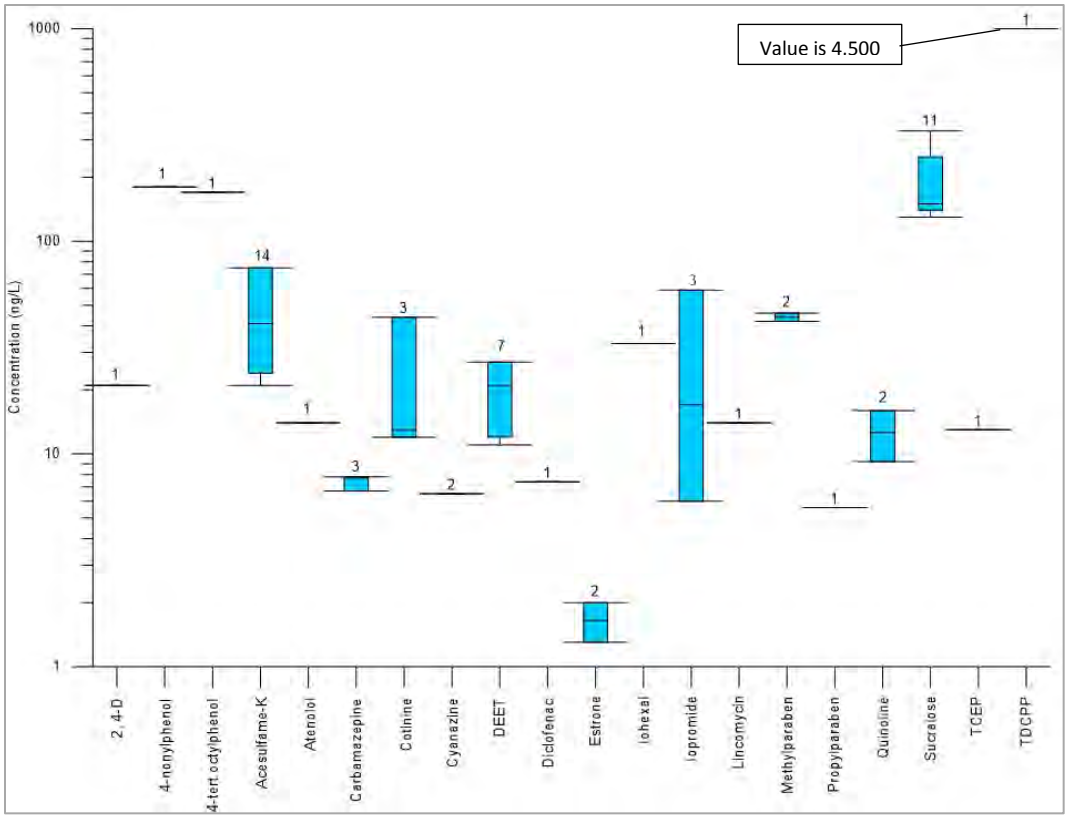


Figure 4-13. Box plots of detected residual chemicals from all Deschutes River watershed sites and sampling events (n = 22).

Note: These boxplots only include detected residual chemical concentrations, as denoted by the number above each respective box plot. A total of 22 samples were collected.

5.0 Comparison to Other Studies of Residual Chemicals in Surface Water

This section compares the residual chemicals detected in the current study with findings from other studies. Findings were compiled from studies in freshwater (**Appendix E**) and marine water (**Appendix F**).

5.1 Fresh Water

Twenty-two regional studies that evaluate the presence of residual organic chemicals in fresh water were identified from the literature. These case studies are summarized in **Table 5-1** and cover a wide geography throughout the United States, as well as China, France, the United Kingdom, and the Netherlands. Seventeen of the twenty-two studies tested waterbodies influenced by treated wastewater (i.e., publicly owned treatment works discharge). The remaining five studies tested waterbodies influenced by only urban areas (Kolpin et al. 2004), only agricultural operations (Larson et al. 1999), and both urban areas and agricultural operations (Barnes et al. 2002; Kolpin et al. 2002; Ryberg et al. 2010).

Table 5-2 compares the combined results from the Woodland Creek and Deschutes River Study Areas with the findings from these studies.

- The regional studies with the most overlapping detections of residual chemicals are Kolpin et al. (2002), Kolpin et al. (2004), Guo et al. (2010), Brown et al. (2009), and Sengupta et al. (2014). These studies had a wide spectrum of target residual chemical analyses. The Kolpin et al (2002; 2004) studies were associated with urban area influence, while Guo et al. (2010), Brown et al. (2009), and Sengupta et al. (2014) were associated with treated wastewater influence.
- Carbamazepine (anti-seizure medication) was detected in nine studies at concentrations similar to what was observed in this study. Eight of the studies were associated with treated wastewater, but Kolpin et al. (2004) was only associated with urban influence.
- Triclocarban and triclosan (antibacterials) were detected in one and five studies, respectively. Triclosan detections occurred in surface waters influenced by both treated wastewater and urban areas. Triclosan concentrations were sometimes an order of magnitude higher than what was measured in the LOTT surface water study.
- Estrone, an estrogenic hormone, was detected in six studies. Estrone detections occurred in surface waters influenced by both treated wastewater and urban areas.
- The flame retardants TCEP or TDCPP were detected in five studies and were typically at greater concentrations than those observed in the LOTT surface water study. Flame retardants were detected in surface waters influenced by both treated wastewater and urban areas.
- The herbicide cyanizine was detected in the Larson et al. (1999) study. DACT and 2,4-D were not detected in the regional studies reviewed. Larson et al. (1999) sampled surface waters influenced by agriculture.

- Cotinine, a nicotine degradate, was detected in four of the regional studies reviewed. Cotinine was detected in surface waters influenced by both treated wastewater and urban areas.
- DEET, a pesticide used as a personal care product, was detected in five of the regional studies reviewed at concentrations similar to those observed in the LOTT surface water study. DEET was detected in surface waters influenced by both treated wastewater and urban areas.
- Propylparaben, a preservative, was only detected in one regional study that tested the effect of treated wastewater effluent on surface waters (Guo et al. 2010).
- The surfactants 4-nonylphenol diethoxylate and 4-tert-octylphenol were detected in four regional studies, respectively. These surfactants were detected in surface waters influenced by both treated wastewater and urban areas.

Appendix E provides a summary for all of the compounds detected in the 22 study results reported in the literature. The results show that pharmaceuticals, antibiotics, pesticides/herbicides, PFCs, and flame retardants have been detected in surface waters sampled in these twenty-two studies.

5.2 Marine Water

Twenty-three regional studies that evaluate the presence of residual organic chemicals in marine surface water were identified from the literature. These case-studies are summarized on **Table 5-3** and cover coastal waters, inlets, and estuaries in the United States and several other countries. **Appendix F** provides a summary for all of the compounds detected in the twenty-three study results reported in the literature. The results show that pharmaceuticals, antibiotics, pesticides/herbicides, PFCs, and flame retardants have been found in marine waters. The marine water quality literature review data were not compared to the LOTT RWIS freshwater surface water quality sampling results, because they represent a different water matrix and the results are not comparable.

Among the twenty-three marine studies, seventy-eight pharmaceutical chemicals, eighteen antibiotics, twelve hormones, eleven personal care products, twenty-five types of flame retardants, two perfluorinated compounds, one alkylphenol, two corrosion inhibitors, one dioxin, one furan, six plasticizers, nineteen herbicide/ pesticides, and thirteen surfactants were detected. Ibuprofen and carbamazepine were the most frequently reported pharmaceuticals, while caffeine was another frequently observed residual chemical. Estrone was the most frequently reported hormone. Sulfamethoxazole and trimethoprim were the most frequently reported antibiotics.

Among the five studies that occurred in Puget Sound and Hood Canal (James et al. Draft Manuscript; Keil et al. 2011; Miller-Schulze et al. draft manuscript; Dougherty et al. 2010; Meador et al. 2016), one sweetener, twenty-three pharmaceutical chemicals, ten antibiotics, six hormones, ten personal care products, one flame retardant, four plasticizers, four herbicide/ pesticides, and one surfactant were detected. Similar to other marine studies, ibuprofen, and carbamazepine were the most frequently reported pharmaceuticals, and caffeine was also

frequently detected. Sulfadimethoxine and sulfamethoxazole were the most frequently reported antibiotics.

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Table 5-1. Summary of residual chemical studies conducted in fresh surface waters.

Author	Barber et al. (2006)	Barnes et al. (2002)	Boyd et al. (2002)	Boyd et al. (2003)	Brown et al. (2009)	J.M. Conley et al. (2008)	Schultz et al. (2010)	Guo and Krasner (2009)	Guo et al. (2010)	Hoehn et al. (2007)	Kolpin et al. (2002)	Kolpin et al. (2004)
Location	Various locations along Boulder Creek watershed, CO	139 streams in 39 states	Lake Mead, Colorado River, Las Vegas Wash	Surface waters in Louisiana, US and Ontario, CA	St. Vrain Creek, Colorado	Various locations along Tennessee River	Boulder Creek, CO, and Fourmile Creek, IA	Various locations in CA, PA, OK, NJ, and CO	Various in Sacramento-San Joaquin River Delta, Colorado River, and Santa Ana River	Upper Silver Creek, Coyote Creek in SW California	139 streams in the United States (In 30 States)	Iowa
Media	Surface Water (River) Upstream and Downstream of Wastewater Treatment Facilities and Agricultural Areas	Surface Water (Streams) Influenced by Urbanized Areas and Livestock Operations	Surface Water (River and Lake) Influenced by Wastewater Treatment Facilities	Surface Water (river), Untreated, Partially Treated, and Treated Wastewater Effluent, Untreated and Treated Drinking Water	Surface Water (River) Upstream and Downstream of Wastewater Treatment Facilities and Tributaries	Surface Water (River) Upstream and Downstream of Wastewater Treatment Facilities and Tributaries	Surface Water (River), Bed Sediment, and Fish Tissue Upstream and Downstream of Wastewater Treatment Facilities	Drinking Water Intake and Surface Water (River) Upstream and Downstream of Wastewater Treatment Facilities, Wastewater Treatment Effluent	Surface Water (River and Lake) Upstream and Downstream of Wastewater Treatment Facilities, Wastewater Treatment Effluent	Surface Water (River) Influenced by Recycled Water, Wastewater Treatment Effluent, Groundwater	Surface Water (Streams) Downstream of Urban Areas and Livestock Production	Surface Water (Streams) Upstream and Downstream of Urban Areas
Year Samples Collected	2000	1999-2000	2000-2001	2001-2002	2005	Dec. 2006- Oct. 2007	2006	2006-2007	2006-2007	2006	1999-2000	2001
No. of samples	Not Reported	Not Reported	15	Not Reported	14	120	Not Reported	28	126	Not Reported	139	76
No. of residual compounds tested	153	95	33	11	61	14	10	3	49	Not Reported	95	105
No. of residual chemical detected	58	82	13	5	36	14	10	3	27	10	82	62
Types of parameters analyzed	Pharmaceuticals, stimulants, alkyl phenols, steroids, pesticides	Steroids/ hormones, pharmaceuticals, alkylphenols, herbicides/ pesticides, plasticizers, antibiotics, PAHs, personal care products	Pharmaceuticals	Pharmaceuticals, plasticizers, hormones/ steroids	Antioxidants, preservatives, personal care products, herbicides/ pesticides, alkylphenols, antibiotics, flame retardants, pharmaceuticals, plasticizers, PAHs, steroids	Pharmaceuticals	Pharmaceuticals	Pharmaceuticals, personal care products	Pesticides, personal care products, pharmaceuticals, PAHs	Perfluorinated compounds	Veterinary and human antibiotics, pharmaceuticals, plasticizers, insecticides, PAHs, personal care products, fire retardants, disinfectants, solvents, antioxidants, alkylphenols, and fragrance	Antibiotics, pharmaceuticals, herbicides, insecticides, flame retardants, plasticizers, etc.

Author	Larson et al. (1999)	Lindstrom et al. (2010)	Liu et al. (2015)	Roberts et al. (2005)	Ryberg et al. (2010)	Sellin et al. (2009)	Sengupta et al. (2014)	Tamtam et al. (2008)	Vethaak et al. (2002)	Wiegel (2004)
Location	58 rivers and streams across U.S.	88 sites in the Upper Mississippi Basin	New Qinhuai River, Ynliang River, Jinchuan River, Yangtzee River (China)	Lower River Tyne, United Kingdom	27 urban streams across the U.S.	Nebraska	Los Angeles River and San Gabriel River, California	Seine River between Paris and Poses, France	Various locations in Netherlands	Elbe River, Saale River, and various tributaries of the Elbe, Germany, Czech Republic
Media	Surface Water (Rivers and Streams) Influenced by Agriculture	Surface Water (River & Tributaries) Influenced by Wastewater Treatment Facilities	Surface Water (River) and Fish Tissue Influenced by Wastewater Treatment Facilities	Surface Water (River) Influenced by Wastewater Treatment Facilities, Wastewater Treatment Effluent	Surface Water (Urban Streams) Influenced by Urbanized and Agricultural Areas	Surface Water (River) and Fish Tissue Upstream and Downstream of Wastewater Treatment Facilities	Surface Water (River) Upstream and Downstream of Wastewater Treatment Facilities	Surface Water (River) Influenced by Wastewater Treatment Facilities and Urban Areas, Surface Water (Tributaries Upstream of Confluence)	Untreated and Treated Wastewater Effluent, Manure, Rain Water, Surface Water, Fish Tissue, Mussel, Sediment, Sewage Sludge	Surface Water (River and Tributaries) Influenced by Wastewater Treatment Facilities
Year Samples Collected	1992-1995	2008	2013	2004	1992-2008	2006	2011	2006	1999-2001	1998-2000
No. of samples	2200	177	15 water samples, number of fish NA	18	~1,000	Not Reported	Not Reported	Approx. 30	Not Reported	Not Reported
No. of residual compounds tested	46	Not Reported	8	13	16	5	74	17	Not Reported	Not Reported
No. of residual chemical detected	46	Not Reported	7	7	Not Reported	3	38	17	Not Reported	22
Types of parameters analyzed	Pesticides/ herbicides	Perfluorinated compounds	Antibiotics, pharmaceuticals, steroids/hormones	Pharmaceuticals	Herbicides/ pesticides/ insecticides	Estrogenic Compounds and Stimulant (Caffeine)	Personal care products, pesticides, hormones, pharmaceuticals	Antibiotics, pharmaceuticals	Hormones/steroids, alkylphenols, plasticizers, flame retardants	Pharmaceuticals

Table 5-2. Comparison of residual chemicals detected in Woodland Creek and Deschutes River study area with findings from regional studies conducted in fresh waters that detected those common residual chemicals.

	LOTT Surface Water Study					Barber et al. (2006)					Barnes et al. (2002)					Boyd et al. (2002)					Boyd et al. (2003)					Brown et al. (2009)				
	MRL	Min	Mean	Max	Detect. Freq. (%)	MDL	Min	Median	Max	Detect. Freq. (%)	DL	Min	Median	Max	Detect. Freq. (%)	MRL	Min	Median	Max	Detect. Freq. (%)	LOD	Min	Median	Max	Detect. Freq. (%)	LRL	Min	Median	Max	Detect. Freq. (%)
Carbamazepine	5	5.2	7.2	10	16	--	--	--	--	--	--	--	--	--	--	--	ND	--	140	35%	--	--	--	--	--	--	--	--	--	--
Triclocarban	5	8.9	8.9	8.9	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Triclosan	10	14	15.0	16	4	1	NR	NR	170	29-57%	--	--	--	--	--	--	--	--	--	--	0.2	ND	ND	ND	0%	1	NR	201	770	NR
Azithromycin	20	94	94.0	94	2	--	--	--	--	--	--	--	--	--	--	NR	ND	ND	ND	0%	--	--	--	--	--	--	--	--	--	--
Lincomycin	10	14	14.0	14	2	--	--	--	--	--	50	20	65	730	13.80%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sulfamethoxazole	5	15	15.0	15	2	20	NR	NR	220	43%	100	20	150	1900	9.00%	23	<23	NR	200	47%	--	--	--	--	--	--	--	--	--	--
Diclofenac	5	7.4	7.4	7.4	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Atenolol	5	14	14.0	14	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Estrone	0.5	1.3	1.7	2	4	1	ND	ND	ND	0%	5	8	27	112	3.50%	--	--	--	--	--	0.4	68.3	NR	124.6	NR	NR	NR	NR	NR	NR
TCEP	10	13	13.5	14	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	500	NR	134	290	NR
TDCPP	100	100	2300.0	4500	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	500	NR	174	460	NR
2,4-D	5	21	28.5	36.0	4	100	ND	ND	ND	0%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyanazine	5	6.5	7.3	9.2	16	4-18	ND	ND	ND	0%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DACT	5	23	23.0	23	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cotinine	10	12	26.3	44	8	2-20	NR	NR	220	29-43%	--	--	--	--	--	23	3	NR	130	65%	--	--	--	--	--	1000	NR	145	330	NR
DEET	10	11	56.4	390	20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	500	NR	142	370	NR
Quinoline	5	9.2	15.1	20	6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylparaben	20	42	44.0	46	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Propylparaben	5	5.6	11.8	18	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acesulfame-K	20	21	185.6	630	66	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sucralose	100	120	571.7	6300	60	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-nonylphenol diethoxylate	100	180	200	220.0	4	1	NR	NR	3100	29-86%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Tert-octylphenol	50	140	155.0	170	4	1	NR	NR	50	43-100%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1000	NR	101	190	NR
Iohexal	10	33	33.0	33	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Iopromide	5	6	25.6	59	10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

	LOTT Surface Water Study					Guo et al. (2008)					Guo et al. (2010)					J.M. Conley et al. (2008)					Kolpin et al. (2002)					Kolpin et al. (2004)				
	MRL	Min	Mean	Max	Detect. Freq. (%)	MRL	Min	Median	Max	Detect. Freq. (%)	MRL	Min	Median	Max	Detect. Freq. (%)	MRL	Min	Median	Max	Detect. Freq. (%)	RL	Min	Median	Max	Detect. Freq. (%)	MRL	Min	Median	Max	Detect. Freq. (%)
Carbamazepine	5	5.2	7.2	10	16	1	2	20	188	--	1	<1	3-128	267	88-93%	--	2.9	5	23.1	79.7	--	--	--	--	--	10.7	NR	NR	263	4.3-70%
Triclocarban	5	8.9	8.9	8.9	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Triclosan	10	14	15.0	16	4	--	--	--	--	--	5	<5	<5	13	25%	--	--	--	--	--	50	NR	140	2300	57.6	1000	NR	NR	140	10%
Azithromycin	20	94	94.0	94	2	--	--	--	--	--	1	<1	3	600	16-25%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Lincomycin	10	14	14.0	14	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	50	NR	60	730	19.2	10	NR	NR	10	3.30%
Sulfamethoxazole	5	15	15.0	15	2	--	--	--	--	--	1	<1	10-89	721	84-93%	NR	3.1	7.9	33	85.9	50	NR	150	1900	12.5	23	NR	NR	63	4.3-16.3%
Diclofenac	5	7.4	7.4	7.4	2	--	--	--	--	--	5	<5	<5	15	8%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Atenolol	5	14	14.0	14	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Estrone	0.5	1.3	1.7	2	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5	NR	27	112	7.1	--	--	--	--	--
TCEP	10	13	13.5	14	4	--	--	--	--	--	5	<5	<5-208	1320	26-100%	--	--	--	--	--	40	NR	100	540	57.6	500	NR	NR	250	18.3-23.3%
TDCPP	100	100	2300.0	4500	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	100	NR	100	160	12.9	500	NR	NR	400	16.70%
2,4-D	5	21	28.5	36.0	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyanazine	5	6.5	7.3	9.2	16	--	--	--	--	--	20	ND	ND	ND	0%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DACT	5	23	23.0	23	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cotinine	10	12	26.3	44	8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	23	NR	24	90	38.1	23	NR	NR	528	17.4-53.3%
DEET	10	11	56.4	390	20	--	--	--	--	--	20	<20	<20-77	361	13-98%	--	--	--	--	--	40	NR	60	1100	74.1	500	NR	NR	130	4.3-6.7%
Quinoline	5	9.2	15.1	20	6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylparaben	20	42	44.0	46	4	--	--	--	--	--	20	<20	<20	744	5-10%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Propylparaben	5	5.6	11.8	18	4	--	--	--	--	--	20	<20	<20	83	3%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acesulfame-K	20	21	185.6	630	66	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sucralose	100	120	571.7	6300	60	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-nonylphenol diethoxylate	100	180	200	220.0	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1100	NR	1000	9000	36.5	5000	NR	NR	1100	10-17.4%
4-Tert-octylphenol	50	140	155.0	170	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1000	NR	NR	220	6.70%
Iohexal	10	33	33.0	33	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Iopromide	5	6	25.6	59	10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

	LOTT Surface Water Study					Larson et al. (1999)					Liu et al. (2015) - Water Samples					Liu et al. (2015) - Fish Tissue Samples (ng/g)					Sellin et al. (2008)				
	MRL	Min	Mean	Max	Detect. Freq. (%)	MRL	Min	Range of Medians	Max	Detect. Freq. (%)	LQL	Min	Mean	Max	Detect. Freq. (%)	LQL	Min	Mean	Max	Detect. Freq. (%)	MRL	Min	Mean	Max	Detect. Freq. (%)
Carbamazepine	5	5.2	7.2	10	16	--	--	--	--	--	NR	NR	2	6.9	100	NR	NR	0.55	NR	NR	--	--	--	--	--
Triclocarban	5	8.9	8.9	8.9	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Triclosan	10	14	15.0	16	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Azithromycin	20	94	94.0	94	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Lincomycin	10	14	14.0	14	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sulfamethoxazole	5	15	15.0	15	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diclofenac	5	7.4	7.4	7.4	2	--	--	--	--	--	NR	NR	56.5	356	100	NR	NR	1.9	NR	NR	--	--	--	--	--
Atenolol	5	14	14.0	14	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Estrone	0.5	1.3	1.7	2	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	NR	2.6-22.9	NR	NR
TCEP	10	13	13.5	14	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TDCPP	100	100	2300.0	4500	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-D	5	21	28.5	36.0	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyanazine	5	6.5	7.3	9.2	16	NR	NR	<1-300	NR	8%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DACT	5	23	23.0	23	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cotinine	10	12	26.3	44	8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DEET	10	11	56.4	390	20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Quinoline	5	9.2	15.1	20	6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylparaben	20	42	44.0	46	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Propylparaben	5	5.6	11.8	18	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acesulfame-K	20	21	185.6	630	66	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sucralose	100	120	571.7	6300	60	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-nonylphenol diethoxylate	100	180	200	220.0	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Tert-octylphenol	50	140	155.0	170	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Iohexal	10	33	33.0	33	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Iopromide	5	6	25.6	59	10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

	LOTT Surface Water Study					Sengupta et al. (2013)					Tamtam et al. (2008)					Vethaak et al. (2002) - water sample results					Wiegel et al. (2004)				
	MRL	Min	Mean	Max	Detect. Freq. (%)	DL	Min	Range of Means	Max	Detect. Freq. (%)	MRL	Min	Range of Means	Max	Detect. Freq. (%)	LOD	Min	Median	Max	Detect. Freq. (%)	DL	Min	Median	Max	Detect. Freq. (%)
Carbamazepine	5	5.2	7.2	10	16	NR	NR	NR	330	NR	--	--	--	--	--	--	--	--	--	--	NR	<20	<20-1200	2500	NR
Triclocarban	5	8.9	8.9	8.9	2	NR	NR	NR	102	NR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Triclosan	10	14	15.0	16	4	NR	NR	NR	26.3	NR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Azithromycin	20	94	94.0	94	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Lincomycin	10	14	14.0	14	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sulfamethoxazole	5	15	15.0	15	2	NR	NR	NR	932	NR	NR	NR	37-140	544	100%	--	--	--	--	--	NR	<30	NR	70	NR
Diclofenac	5	7.4	7.4	7.4	2	NR	NR	NR	124	NR	--	--	--	--	--	--	--	--	--	--	NR	<1	NR	69	NR
Atenolol	5	14	14.0	14	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Estrone	0.5	1.3	1.7	2	4	NR	NR	NR	<2.5	NR	--	--	--	--	--	0.3	<0.3	1	7.2	43%	--	--	--	--	--
TCEP	10	13	13.5	14	4	NR	NR	NR	785	NR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TDCPP	100	100	2300.0	4500	4	NR	NR	NR	1345	NR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-D	5	21	28.5	36.0	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyanazine	5	6.5	7.3	9.2	16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DACT	5	23	23.0	23	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cotinine	10	12	26.3	44	8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DEET	10	11	56.4	390	20	NR	NR	NR	860	NR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Quinoline	5	9.2	15.1	20	6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylparaben	20	42	44.0	46	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Propylparaben	5	5.6	11.8	18	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acesulfame-K	20	21	185.6	630	66	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sucralose	100	120	571.7	6300	60	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-nonylphenol diethoxylate	100	180	200	220.0	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Tert-octylphenol	50	140	155.0	170	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Iohexal	10	33	33.0	33	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Iopromide	5	6	25.6	59	10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

-- = The analyte was not analyzed
ND = not detected at the minimum reporting level
NR = not reported
mg/L = milligrams per liter (ppm); µg/L = micrograms per liter (ppb)
ng/L = nanograms per liter (ppt)
µS/cm = microsiemens per centimeter;
mV = millivolts
MPN/100ml = Most Probable Number (colony forming units) per 100 ml
PFU/100ml = Plaque Forming Units per 100 ml
MRL = Minimum Reporting Level

Table 5-3. Summary of regional residual chemical studies conducted in marine waters.

Author	Bay et al. (2011)	Bay et al. (2012)	Bayen et al. (2013)	Comeau et al. (2008)	David et al. (2012)	Dodder et al. (2013)	Dougherty et al. (2010)	Hedgespeth et al. 2012)	Huang et al. (2011)	James et al. (draft manuscript)	Keil et al. (2011)	Klosterhaus et al. (2013)
Location	Southern California, USA	Southern California Waters, USA	Singapore	Nova Scotia, Canada	Sacremento - San Joaquin River Delta, California, USA	California Coast. USA	Liberty Bay, Washington, USA	Charleston Harbor, North Carolina, USA	Guangzhou, China	Puget Sound, Washington, USA	Puget Sound, Washington, USA/ Barkley Sound, British Columbia, Canada	San Francisco Bay, California, USA
Media	Seawater, Wastewater Effluent, Sediment, Fish Tissue	Seawater, Sediment, Fish Tissue, Treated wastewater effluent	Seawater	Seawater, Treated Wastewater Effluent	Estuarine Water	Mussel Tissue	Seawater, Groundwater	Wastewater Influent & Effluent, Seawater	Wastewater Influent & Effluent, Sewage Sludge, River Water	Seawater	Seawater	Seawater, Sediment, Fish Tissue, Cormorant Eggs, Harbor Seal Tissue
Year Samples Collected	2006	2006 - 2007	2011	2005	2002 - 2010	2009 - 2010	2007	2009 - 2010	2007 - 2008	2013 - 2014	2010	2002 - Present
No. of samples	Not Reported	Not Reported	Not Reported	48	834	Not Reported	Not Reported	Not Reported	Not Reported	193	Not Reported	5 - 275
No. of residual compounds tested	61	56 (Seawater, Effluent) 98 (Sediment) 79 (Fish Tissue)	40	11	Not Reported	167	25	19	8	23	37	82
No. of residual chemical detected	7	17 (Effluent) 5 (Seawater) 5 (Sediment) 5 (Fish Tissue)	13	11	7	67	12	7	8	21	37 (Puget Sound) 28 (Barkley Sound)	48
Types of parameters analyzed	Pharmaceuticals, flame retardants, personal care products, plasticizers, alkylphenols	Pharmaceuticals, personal care products, industrial and commercial compounds, pesticides	Pharmaceuticals, pesticides	Pharmaceuticals	Flame retardants, metals, pesticides,	Pharmaceuticals, personal care products, flame retardants, pesticides	Pharmaceuticals, personal care products, pesticides, flame retardants	Pharmaceuticals, personal care products, hormones	Pharmaceuticals	Pharmaceuticals, personal care products, pesticides	Pharmaceuticals, personal care products	Pharmaceuticals, personal care products, alkyphenols, flame retardants, perfluorinated chemicals

Author	Meador et al. (2016)	Miller-Schulze et al. (draft manuscript)	Moreno-Gonzalez et al. (2015)	Nodler et al. (2014)	Oram et al. (2008)	Oros et al. (2005)	Pait et al. (2006)	Sapozhnikova et al. (2007)	Singh et al. (2009)	Thomas, Hilton (2004)	Wille et al. (2010)
Location	Puget Sound, Washington, USA	Puget Sound, Washington, USA	Mar Menor Lagoon, Murcia, Spain	Germany, Italy, Greece, Turkey, USA, Israel, Spain	San Francisco Bay, California, USA	San Francisco Estuary, California, USA	Chesapeake Bay, Biscayne Bay, & Gulf of the Farallones	San Diego, California, USA	South Florida, USA	Estuaries, England, United Kingdom	Belgian Coastal Harbors, Belgium
Media	Seawater, Effluent, Fish Tissues		Seawater, Sediment	Seawater	Seawater, Freshwater, Sediment, Wastewater Effluent	Seawater, Sediment, Bivalves	Surface Water	Seawater	Surface Water	Seawater	Seawater
Year Samples Collected	2013-2014	2013	2010 - 2011	2009 - 2011	2002 - 2006	2002	2002	Not Reported	2004 - 2006	2002	2007 - 2009
No. of samples	Not Reported	Not Reported	Not Reported	153	Not Reported	33	Not Reported	30	Not Reported	22	76
No. of residual compounds tested	150	18	21	43	40	16	13	6	20	14	13
No. of residual chemical detected	"81 (Effluent) 25 (Seawater) 42 (Fish tissue)"	Not Reported	Not Reported	43	2	16	Not Reported	3	11	9	7
Types of parameters analyzed	Phramaceuticals, personal care products, industrial compounds	Pharmaceuticals, personal care products, pesticides	Pharmaceuticals	Pharmaceuticals, corrosion inhibitors, pesticides	Flame Retardants	Flame retardants	Pharmaceuticals	Pesticides	Pharmaceuticals	Pharmaceuticals	Pharmaceuticals

6.0 Summary and Conclusions

A surface water quality characterization was completed in the Woodland Creek and Deschutes River watershed in northern Thurston County, Washington. This monitoring task had the following goals:

- Collect surface water samples and analyze for residual chemicals and conventional constituents.
- Collect samples during surface water low flow, high flow, and stormwater periods.
- Collect samples at or near the same locations used in prior studies (City of Lacey 2015; Ecology 2006; Ecology 2012b; Thurston County 2015) so that data can be compared.
- Implement a QA/QC program that provides high accuracy and reproducibility.

Samples were collected in 2015 during the summer low flow period, a storm event, and during winter high flow conditions. The Woodland Creek watershed includes the operating LOTT Hawks Prairie Ponds and Recharge Basins. The Deschutes River watershed includes a potential future LOTT aquifer recharge site.

6.1 Woodland Creek Watershed

The Woodland Creek headwaters are composed of three lakes connected by extensive wetlands. The stream channel emerging from the lakes loses flow to groundwater in the upper reaches, until approximately RM 4.5, where the groundwater table is shallow and spring flow emerges from Woodland Creek south of I-5 at Beatty Springs, College Springs, and at a large wetland complex. Flow in Woodland Creek and its tributaries are predominately from groundwater during low flow periods. Elevated nitrate from high groundwater levels and dense residential developments on septic tanks have been identified as a water quality issue in the southeast part of the Hawks Prairie Area in prior reports. Groundwater discharges of nutrients to Woodland Creek have been identified as the major source of nutrients in the creek.

Twenty-two surface water (or spring) samples were collected from Woodland Creek and its tributaries. Surface water quality met Ecology's surface water quality standards with the exception of some dissolved oxygen, pH, and fecal coliform concentrations. These findings are consistent with previous studies (Ecology 2006). Also, elevated Nitrate-N concentrations occurred in the Lower Woodland Creek. The results confirm the findings of prior studies by Ecology (2006), PGG (2007), the City of Lacey (2015), and Thurston County (2015) that indicate that elevated nutrient concentrations in the Woodland Creek Basin remains a significant groundwater quality issue and that groundwater is the major source of nutrient loading to these surface waters.

The residual chemicals most commonly detected are acesulfame-K and sucralose (15 detections for each chemical, respectively) at concentrations up to 630 and 2,000 ng/L, respectively. These chemicals were detected during all seasons sampled. Carbamazepine, an anti-seizure medication, was detected at Beatty Springs during all seasons at concentrations up to 10 ng/L. Several other residual chemicals were detected sporadically among the monitoring sites, with most only once, and during the summer low flow or during the first flush storm event.

There was no longitudinal trend of increasing or decreasing residual chemicals along Woodland Creek.

6.2 Deschutes River Watershed

The Deschutes River watershed encompasses approximately 158 square miles and has a total length of about 60 miles. The Deschutes River originates in the forested and high relief Bald Hills, and flows northwest, before discharging into Capitol Lake. Primary tributaries in the central and northern (lower) river include Silver Spring Creek, Spurgeon Creek, Ayer Creek, and Chambers Creek.

The Percival Creek watershed also discharges to the Deschutes River Estuary/Capitol Lake and Budd Inlet and encompasses approximately 10 square miles. Percival Creek originates in Trosper Lake and flows for approximately 3.5 miles to Capitol Lake. Black Lake Ditch is the only tributary and contributes flow from the Black Lake catchment.

A total of twenty-two surface water samples were collected from the Deschutes River and tributaries. Surface water quality met surface water quality standards with the exception of low dissolved oxygen in Munn Lake and high fecal coliform concentrations in Chambers Creek and Percival Creek. Nitrate-N concentrations in the Deschutes River were lower than in Woodland Creek, but were generally consistent with previous Nitrate-N concentrations reported by previous monitoring (Ecology 2012b). The results confirm the previous TMDL findings that fecal coliform, thermal, and nutrient loads need to be reduced in order to meet surface water quality criteria (Ecology 2012a; 2015).

The residual chemicals most commonly detected in the Deschutes River watershed sites are acesulfame-K and sucralose (15 and 11 detections, respectively) at concentrations up to 280 and 6,300 ng/L, respectively. These chemicals were detected during all seasons sampled, but most frequently in Chambers Creek and Percival Creek. Sucralose was detected at all sites except for Munn Lake. Other chemicals that are typically found in residential wastewater (i.e., septic drain field discharges) were detected sporadically among the sites, and only during the low flow and storm events.

Two flame retardants (TCEP and TCDPP) were detected. TCEP was detected one time at the upper Deschutes River site during the summer low flow season. TCDPP was detected one time at the lower Deschutes River site during the winter high flow season.

Two herbicides (Cyanazine and 2,4-D) were detected. Cyanazine was detected one time in Percival Creek during the storm event. Cyanazine was detected in Chambers Creek and the Lower Deschutes River station during the high flow winter sampling event.

Two pesticides (DEET and quinoline) were detected. DEET was detected during every sampling event at Munn Lake, during a summer low flow and winter high flow event at Percival Creek, and during the winter high flow event at the upper Deschutes River site. Quinoline was only detected during one summer low flow sampling event at Munn Lake and the upper Deschutes River sites.

In general, there was an increasing trend of residual chemical detections from upstream to downstream in the Deschutes River, with only one detection at the reference site, five detections at the upper site, and eleven detections at the lower site.

6.3 Conclusions

This effort provides a comprehensive characterization of residual chemicals in select reaches of Woodland Creek, the Deschutes River, and select tributaries. These data will provide input and focus for future analyses associated with the RWIS, including the human health and ecological risk assessment (Task 3).

7.0 References

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Appendix A

Figures and Tables from Previous Studies

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Table A-1. Summary of Woodland Creek river flow measurements collected by the Washington State Department of Ecology (Ecology) (2006) between December 2002 and March 2004

Monitoring Location	River Mile	River or Spring Flow (cfs)		
		Min	Max	Mean
Beatty Springs near headwaters	*3.45*	*0.8*	*7.6*	*4.0*
Woodland Creek downstream of Trout Farm #2	3.4	3.6	19.8	11.4
College Creek	*3.35*	*0.8*	*13.9*	*4.3*
Woodland Cr, downstream of I-5	3.1	5.7	36.1	14.5
Woodland Cr at Draham Road	2.9	6.6	32.0	17.4
Woodland Creek at 21st Court	2.6	8.2	32.4	18.4
Eagle Creek	*2.25*	*0.2*	*5.6*	*1.5*
Palm Creek	*1.95*	*0.0*	*2.6*	*0.7*
Fox Creek	*1.9*	*0.3*	*6.5*	*2.2*
Woodland creek at Pleasant Glade Road	1.6	9.8	49.4	23.7
Jorgenson Creek	*1.2*	*0.6*	*2.6*	*1.3*
Woodland Creek at Hollywood Development	1.0	12.6	67.1	29.2

Notes: Tributaries to Woodland Creek are indicated by italics. River miles for the confluence of tributary stations are estimated. Tributary locations are shown in Figure A-1.

Table A-2. Woodland Creek field water quality monitoring parameters (DO, pH, temperature and conductivity) from 2003 monitoring (Ecology, 2006a; Table 19)

Sites and Monitoring Period	D.O. (mg/L) min-max	D.O. (% saturation) min-max	pH (SU) min-max	Temperature (°C) min-max	Conductivity (µmhos) min-max
Woodland Creek RM 3.4					
March 31 - April 3, 2003	7.8 - 9.7	72 - 89	6.6 - 7.3	8.5 - 12.7	72 - 89
July 24 - 28, 2003	4.2 - 7.6	38 - 73	6.4 - 6.8	11.0 - 14.6	122 - 126
August 22 - 26, 2003	4.6 - 8.0	42 -77	6.5 - 6.8	10.6 - 14.3	Failed QA
September 17 - 19, 2003	5.2 - 11.5	47 - 105	6.4 - 7.6	11.1 - 15.4	Failed QA
Woodland Creek RM 3.1					
December 30, 2002 - January 2, 2003	7.0 - 9.5	61 - 78	6.5 - 7.2	6.8 - 9.4	Failed QA
March 31 - April 3, 2003	7.6 - 9.2	69 - 84	6.9 - 7.1	9.0 - 12.3	53 - 69
July 24 - 28, 2003	7.2 - 8.4	65 - 79	7.5 - 7.7	10.9 - 14.1	146 - 149
August 22 - 26, 2003	6.6 - 8.0	60 - 75	6.8 - 7.0	10.4 - 13.8	104 - 124
September 17 - 19, 2003	6.5 - 7.5	60 -72	6.4 - 6.9	11.2 - 13.6	Failed QA
Woodland Creek RM 1.6					
July 29 - August 1, 2003	9.9 - 11.6	93 - 109	7.2 - 7.4	11.2 - 14.1	Failed QA
August 15 -18, 2003	9.4 - 10.0	90 - 93	7.3 - 7.4	11.5 - 13.6	146 - 149
October 2 - 6, 2003	9.1 - 10.0	83 - 90	7.4 - 7.6	10.6 - 11.6	126 - 128

Notes:

1. DO= dissolved oxygen; RM = river mile

Table A-3. St. Martin's University and Beatty Springs surface water quality data (average values) from 2002-2003 (Ecology, 2006a; Table A-4)

Location	Temp ^{0}C	Lab Conductivity	DO mg/L	NO2/3 mg/L	TPN mg/L	Ortho-P mg/L	TP mg/L
St Martins College Spring	10.3	177	5.3	1.75	1.82	0.036	0.036
Beatty Springs	11.6	150	6.9	2.51	2.49	0.020	0.041

Notes: Temp = temperature; Lab = laboratory; DO = dissolved oxygen; NO2/3 = nitrate + nitrite; TPN = total persulfate nitrogen; Ortho-P = orthophosphorus; TP = Total Phosphorus

Table A-4. Summary of Woodland Creek monthly grab sample water quality results at RM 1.6 and 2.9 for WY 2012 collected by the Thurston County Environmental Health Program (Thurston County, 2015) and RM 2.9 for WY 2014 collected by the City of Lacey.

Parameter	State Water Quality Criteria	Woodland Creek at Pleasant Glade Rd. (RM 1.6)[1]			Woodland Creek at Draham Rd. (RM 2.9)[1]			Woodland Creek at Draham Rd. (RM 2.9)[2]		
		Minimum	Maximum	Average	Minimum	Maximum	Average	Minimum	Maximum	Average
Temperature (ºC)	<16[3]	7.2	14.8	10.8	7.4	16.2	11.3	6.9	14.6	10.6
Flow (cfs)	--	13.4	61.4	30.5	10.6	38.4	24.2	11.0	50.0	23.1
Conductivity (umhos/cm)	--	122	171	152	130	163	149	129	159	146
pH (units)	6.5 – 8.5	6.9	7.5	7.2	6.8	7.2	6.9	6.2	7.7	7.2
Dissolved Oxygen (mg/L)	≥9.5	9.5	13.1	10.8	8.5	12.7	9.8	7.5	9.6	8.3
Turbidity (NTU)	--	0.7	30.0	4.1	0.7	3.0	1.7	1.6	8.1	2.7
Fecal Coliform (org/100ml)	≤50 geometric mean (not more than 10% samples >100)	5	230	32 (geometric mean)	0	95	9 (geometric mean)	7	400	46 (geometric mean)
Total Phosphorus (mg/L)	--	0.03	0.07	0.05	0.04	0.07	0.05			
Nitrate + Nitrite (mg/L)	--	0.83	1.56	1.17	0.78	1.47	1.06	0.80	1.37	1.01

Notes:

1. Data obtained from Thurston County surface water quality on-line database, http://www.co.thurston.wa.us/health_fpforms/ehswat/swdata.html, stations HENWL0030 and HENWL0000.
2. Data obtained from The City of Lacey on April 6, 2015.
3. The temperature criteria of 16^0 C is a 7-day average of the daily maximum temperatures. The criteria should be compared to an arithmetic average of seven consecutive measures of daily maximum temperatures.

Table A-5. Deschutes River seepage run flow measurements taken in on August 5, 2003 (Ecology, 2007)

Monitoring Location	River Mile	River Discharge (cfs)
Deschutes R. above upper falls	42.3	12.2
Deschutes R. at WEYCO 1000 Rd	37.4	16.0
Deschutes R. at Old Camp Lane	32.3	14.1
Deschutes R. at Vail Rd SE	28.6	17.7
Deschutes R. at Woodbrook Lane	26.2	19.5
Deschutes R. Vail Loop Rd	24.9	23.8
Spring near HWY 507	*20.7T*	*3.3*
Deschutes R. below SR 507	20.5	30.7
Deschutes R. at Military Rd	19.1	29.1
Silver Spring Creek, near mouth	*17.0T*	*2.0*
Deschutes R. at Waldrick Rd	14.5	41.5
Deschutes R. off Cowlitz Dr	13.4	44.6
Deschutes R. above Spurgeon Ck	9.2	49.6
Spurgeon Creek near mouth	*9.1T*	*3.5*
Deschutes R. near 84th Ave SE	6.8	51.7
Deschutes R. above Ayer Ck	5.6	53.1
Ayer Creek	*5.5T*	*2.0*
Chambers Creek, at 58th Ave	*2.9T*	*1.2*
Deschutes R. at Henderson Blvd SE	2.7	70.8
Unnamed creek	*NDT*	*1.5*
Deschutes R. at E-St. in Tumwater	0.5	79.1

Notes:

1. Tributary inflow downstream of RM 25 is indicated in italics. River miles for the confluence of tributary stations are estimated and have a “T” suffix,.
1. ND = No Data

Table A-6. Percival Creek seepage run flow measurements taken in on August 6, 2003 (Ecology, 2007)

Monitoring Location	River Mile	Discharge (cfs)
Percival Ck at Trosper Rd	3.3	1.0
Black Lk ditch	*NA*	*3.5*
Percival Ck below Black Lk. Ditch Confluence	1.1	5.9
Percival Ck near mouth (RM 0.1)	0.1	7.1

Tributary inflow from the Black Lake ditch is indicated in italics.

Table A-7. Summary of WY 2012 water quality at the Deschutes River (RM 0.5) and Chambers Creek (tributary to the lower Deschutes River)

Parameter	State Water Quality Criteria	Deschutes River (RM 0.5)[1]			Chambers Creek near 58th Ave[2]		
		Minimum	Maximum	Average	Minimum	Maximum	Average
Temperature (ºC)	17.5[3]	5.4	16.2	11.4	4.4	16.5	11.0
Flow (cfs)		97.0	1,540.0	443.2	1.9	25.8	8.6
Conductivity (umhos/cm)		63.0	151.0	113.3	79.0	157.0	123.1
pH	6.5 – 8.5	7.3	7.8	7.6	6.6	7.2	7.0
Dissolved Oxygen (mg/L)	≥8.0	10.4	11.9	11.1	10.2	12.7	11.0
Turbidity (NTU)		1.7	23.0	5.1	0.3	3.7	1.5
Fecal Coliform (org/100ml)	≤100 geometric mean (not more than 10% samples >200)	5.0	91.0	15.7 (geometric mean)	0.0	120.0	12.5 (geometric mean)
Total Phosphorus (mg/L)		0.02	0.07	0.03	0.02	0.03	0.02
Nitrate + Nitrite (mg/L)		0.43	0.88	0.66	0.6	2.3	1.4
Ammonia-N (mg/L)		0.01	0.02	0.01	NM	NM	NM
Orthophosphorus (mg/L)		0.01	0.02	0.02	NM	NM	NM
Total Suspended Solids (mg/L)		3.0	43.0	9.3	NM	NM	NM
Total Persulfate Nitrogen (mg/L)		0.5	0.9	0.7	NM	NM	NM

Notes:

1. WA Department of Ecology station 13A060, obtained from the Ecology website, http://www.ecy.wa.gov/apps/watersheds/riv/station.asp?sta=13A060
2. Thurston County station DESCH0300, obtained from the Thurston County website, http://www.co.thurston.wa.us/health_fpforms/ehswat/swdata.html
3. The temperature criteria of 17.5^0 C is a 7-day average of the daily maximum temperatures. The criteria should be compared to an arithmetic average of seven consecutive measures of daily maximum temperatures.

NM= not measured

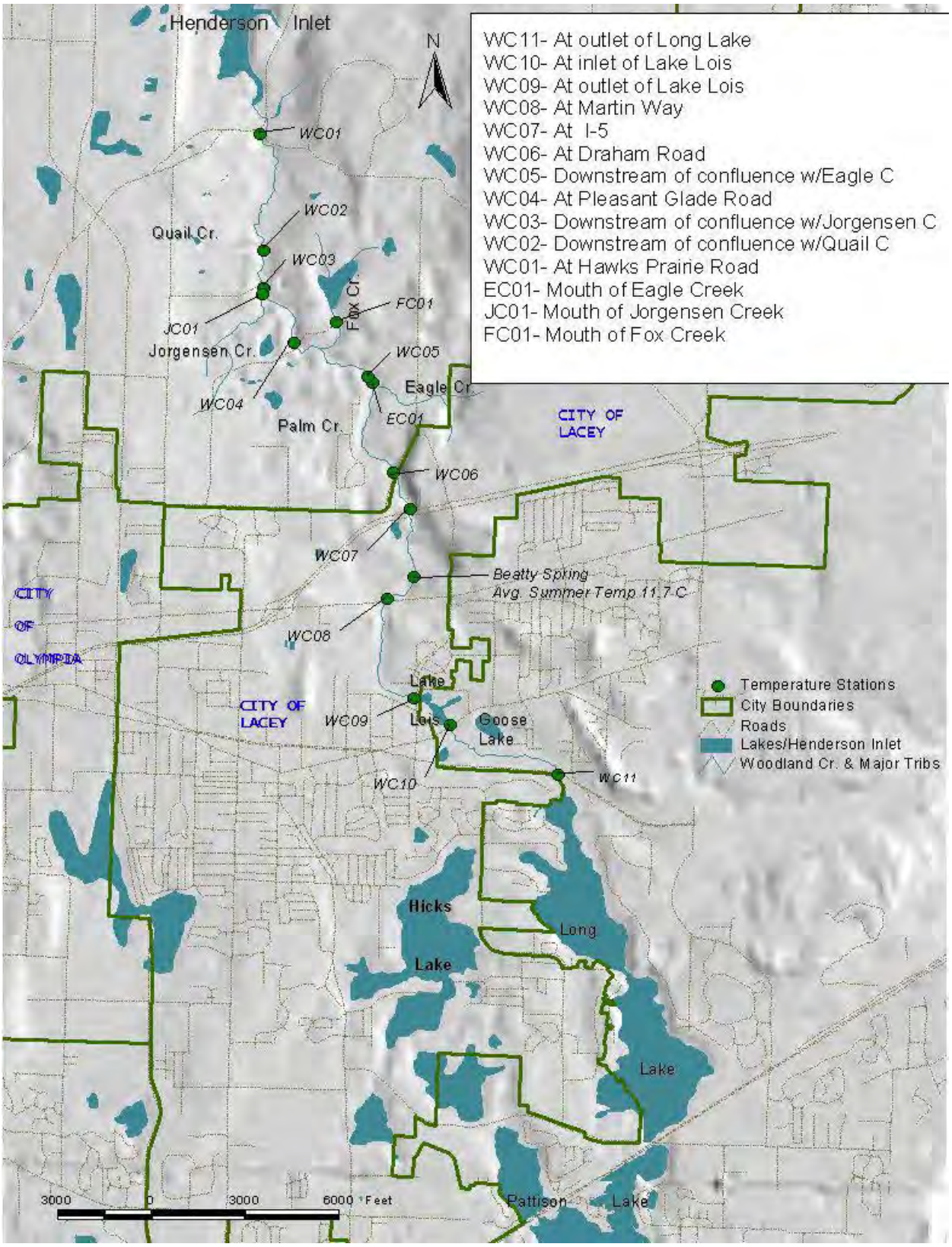

Figure A-1. Surface water temperature stations used in Ecology (2006) monitoring of Woodland Creek

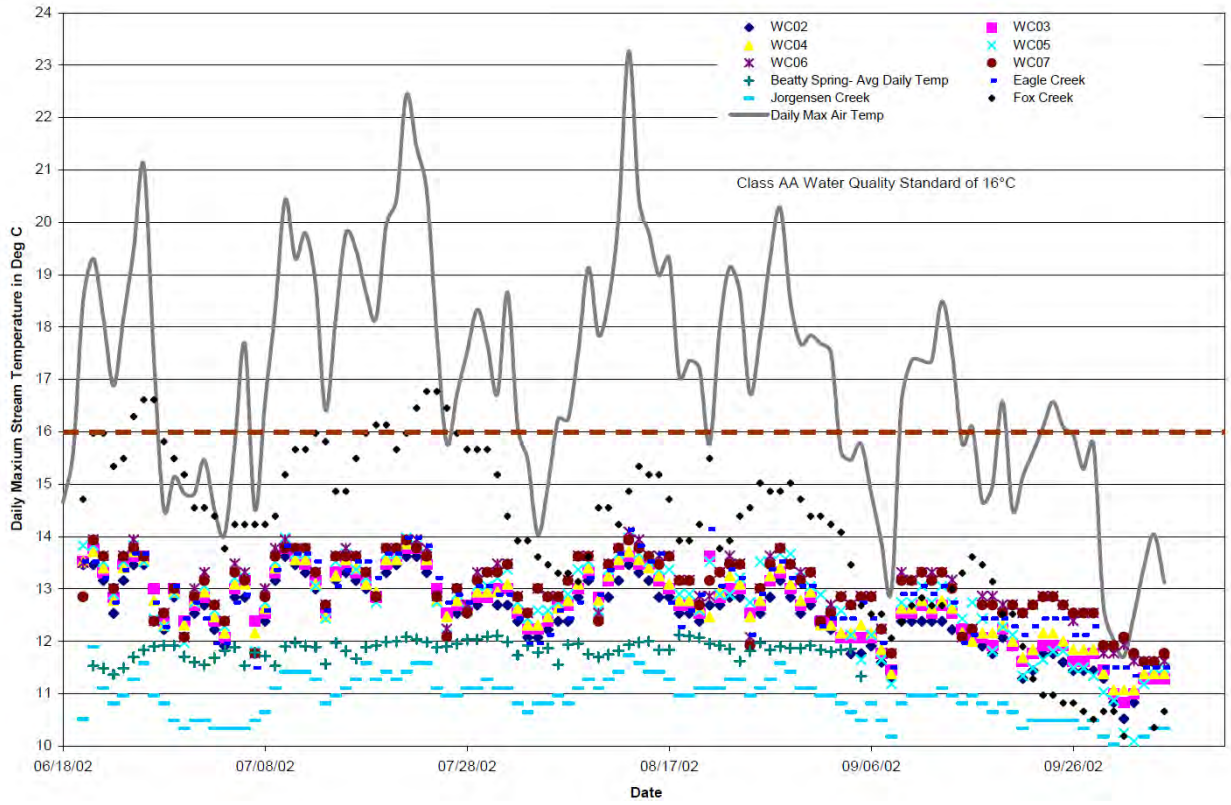

Figure A-2. Surface water temperature monitoring data in Woodland Creek in 2002 (Ecology, 2006a). Notes: Station names in the legend correspond with locations in Figure 1. The dashed red line is the surface water quality standard; a 7-day average of the daily maximum temperatures of 16º Celsius.

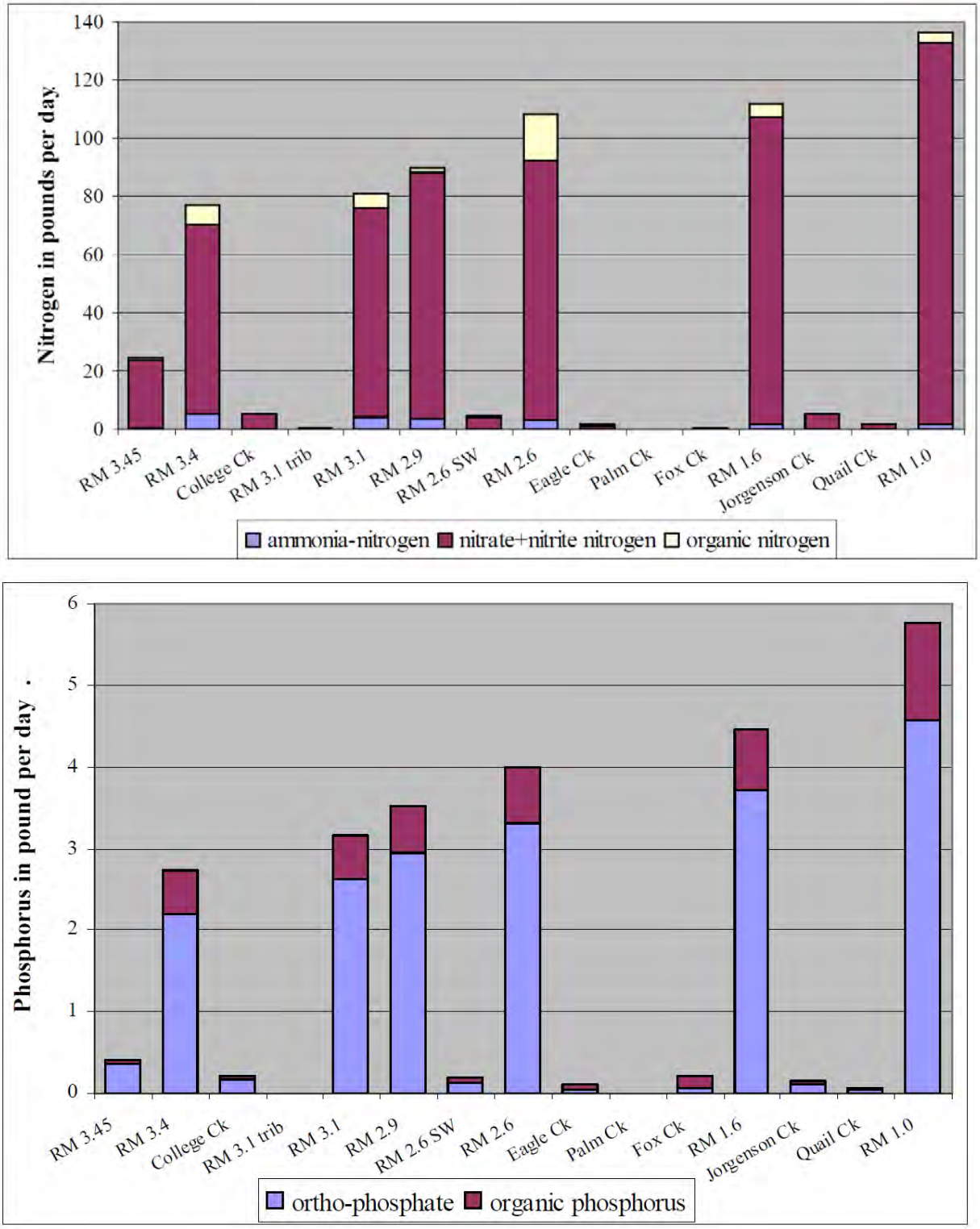

Figure A-3. Average nitrogen and phosphorous loading in Woodland Creek, June-September, 2003 (Ecology 2006)

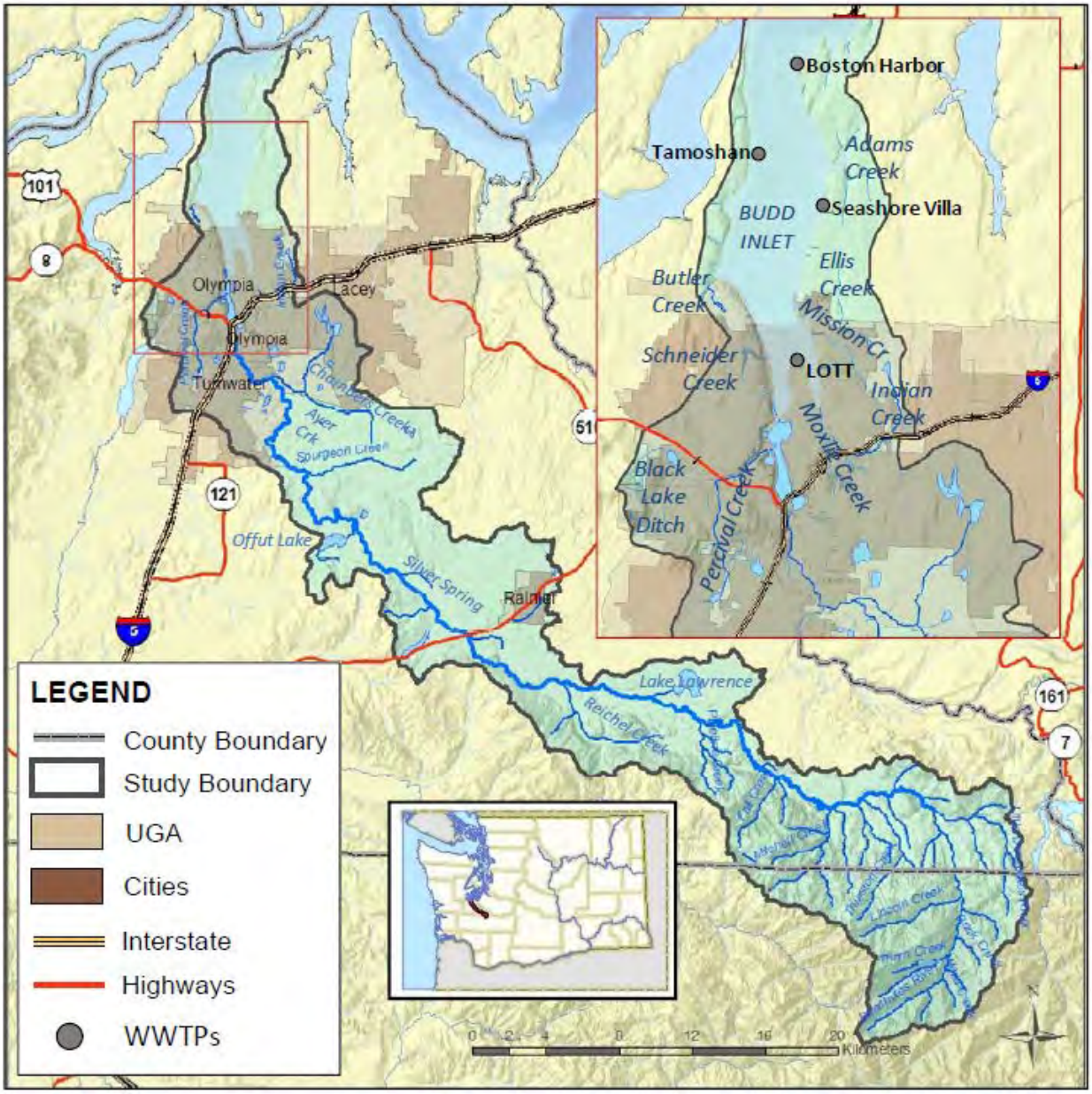

Figure A-4. Deschutes River, Capitol Lake and Budd Inlet TMDL Study Area (Ecology 2012; Figure 2);

Note: UGA = urban growth area.

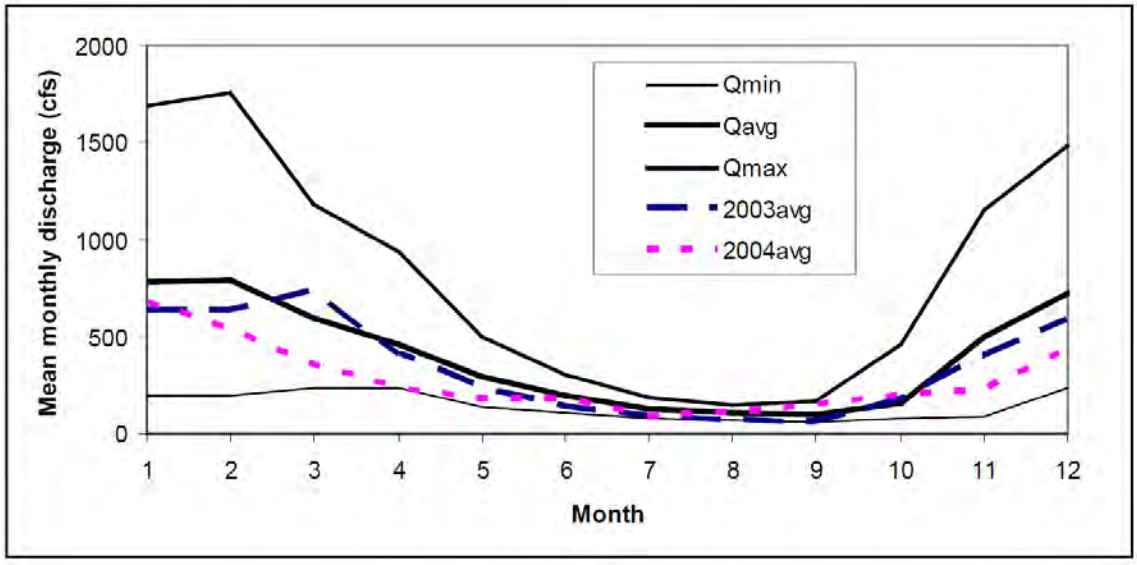

Figure A-5. Deschutes River flow at E. Street Bridge, RM 0.05 long-term average and 2003/2004 data (Ecology, 2012).

Note:Qmin = minimum monthly discharge; Qavg = average monthly discharge; Qmax = maximum monthly discharge.

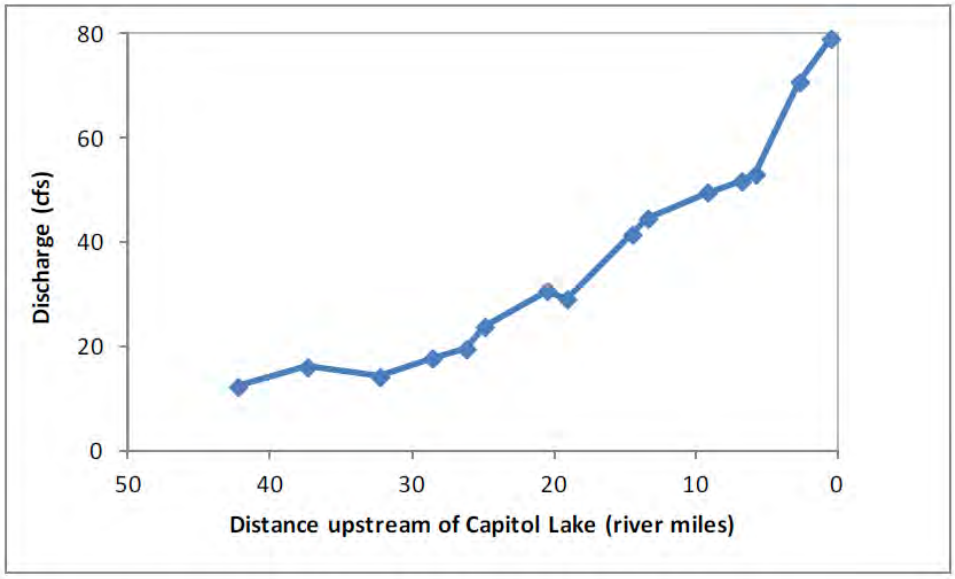

Figure A-6. Deschutes River flow by river mile, August 2-4, 2004 (Ecology, 2012)

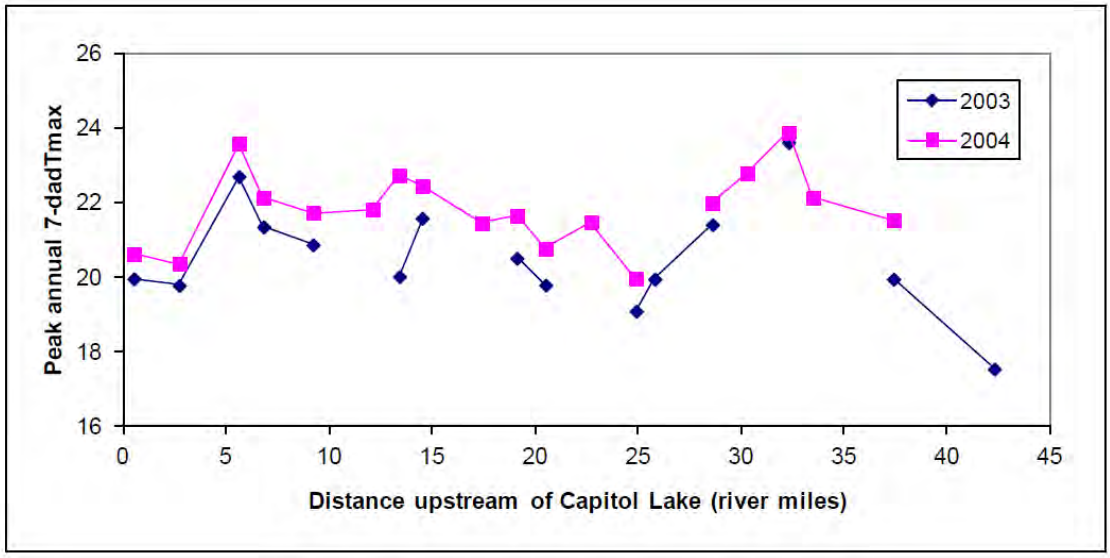

Figure A-7. Measured 7-day average daily maximum temperature (Celsius) along Deschutes River (Ecology, 2012)

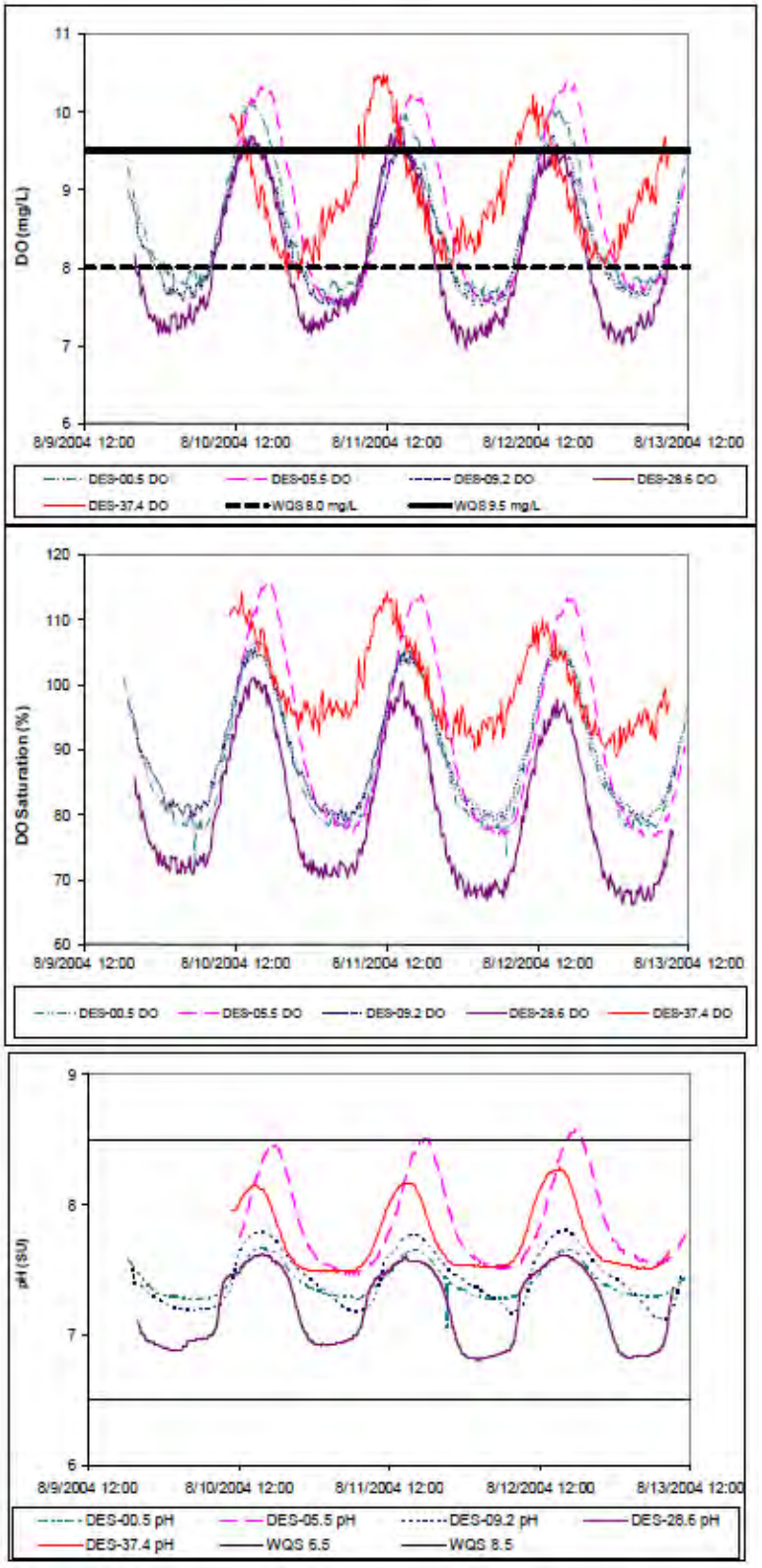

Figure A-8. Deschutes River continuous dissolved oxygen (DO), DO saturation, and pH results at five stations (Ecology, 2012; Figure 22)
(Note: Sampling locations are from downstream to upstream, last part of sample id is river mile.)

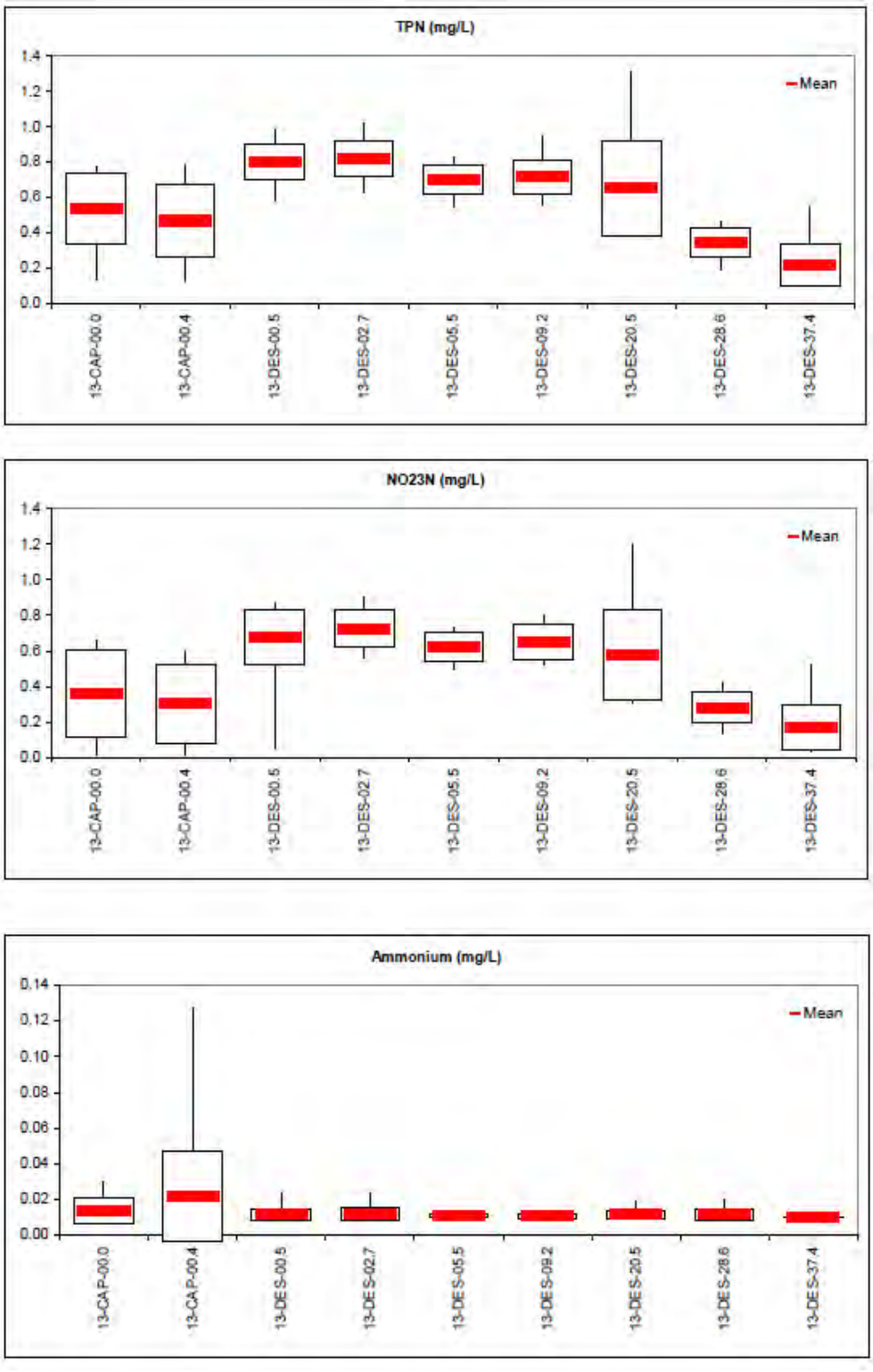

Figure A-9. Deschutes River nitrogen concentrations (Ecology, 2012; Figure 23)

(Note: monthly to bi-monthly sampling, downstream to upstream sampling locations from left to right on x-axis, last part of sample id is mainstem Deschutes River Mile; boxes indicate 25th and 75th percentiles, while whiskers extend to the minimum and maximum values)

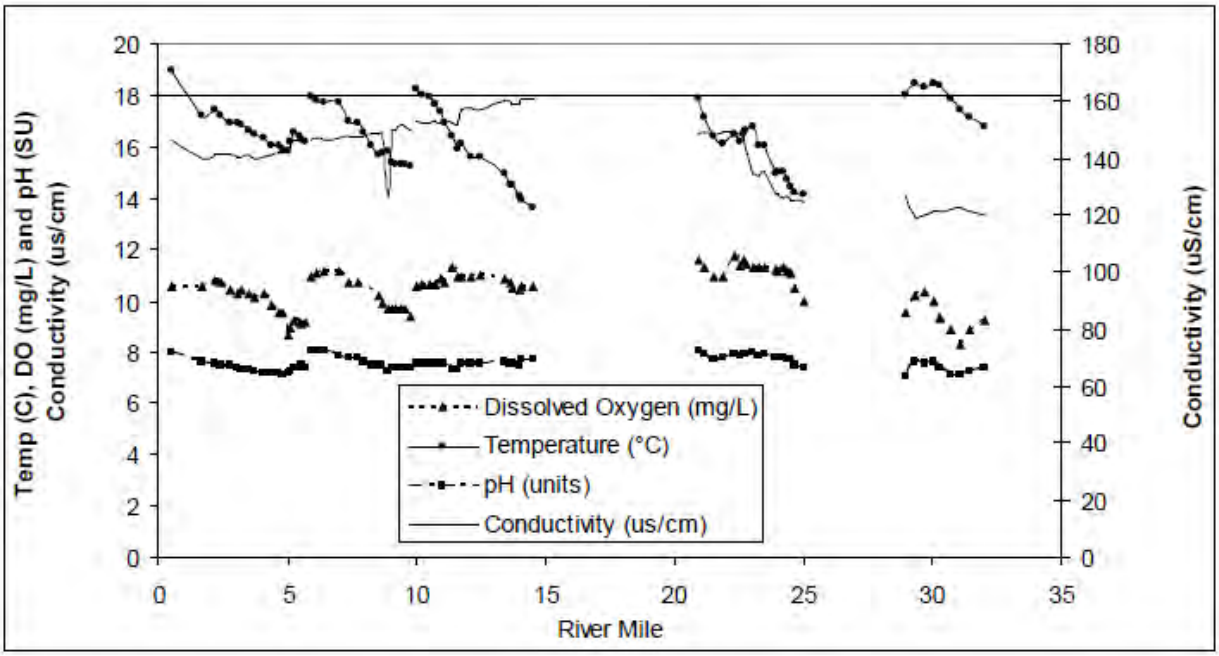

Figure A-10. Deschutes River temperature (Temp), dissolved oxygen (DO), pH, and conductivity longitudinal profiles recorded August 11- 15, 2003 (Ecology, 2012; Figure 26).

Note: Conductivity is plotted on the secondary y-axis on the right side of the graph.

Appendix B

Residual Chemical Method Reporting Limits

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Residual Chemicals	Units	Method Reporting Limit		Residual Chemicals	Units	Method Reporting Limit
1,7-Dimethylxanthine	ng/L	10		Iohexal	ng/L	10
2,4-D	ng/L	5		Iopromide	ng/L	5
4-nonylphenol	ng/L	100		Isobutylparaben	ng/L	5
4-tert-octylphenol	ng/L	50		Isoproturon	ng/L	100
Acesulfame-K	ng/L	20		Ketoprofen	ng/L	5
Acetaminophen	ng/L	5		Ketorolac	ng/L	5
Albuterol	ng/L	5		Lidocaine	ng/L	5
Amoxicillin (semi-quantitative)	ng/L	20		Lincomycin	ng/L	10
Andorostenedione	ng/L	5		Linuron	ng/L	5
Atenolol	ng/L	5		Lopressor	ng/L	20
Atrazine	ng/L	5		Meclofenamic Acid	ng/L	5
Azithromycin	ng/L	20		Meprobamate	ng/L	5
Bendroflumethiazide	ng/L	5		Metazachlor	ng/L	5
Bezafibrate	ng/L	5		Metformin	ng/L	10
BPA	ng/L	10		Methylparaben	ng/L	20
Bromacil	ng/L	5		Metolachlor	ng/L	5
Butalbital	ng/L	5		Naproxen	ng/L	10
Butylparben	ng/L	5		Nifedipine	ng/L	20
Caffeine	ng/L	5		Norethisterone	ng/L	5
Carbadox	ng/L	5		OUST (Sulfameturon,methyl)	ng/L	5
Carbamazepine	ng/L	5		Oxolinic acid	ng/L	10
Carisoprodol	ng/L	5		Pentoxifylline	ng/L	5
Chloramphenicol	ng/L	10		Phenazone	ng/L	5
Chloridazon	ng/L	5		Primidone	ng/L	5
Chlorotoluron	ng/L	5		Progesterone	ng/L	5
Cimetidine	ng/L	5		Propazine	ng/L	5
Clofibric Acid	ng/L	5		Propylparaben	ng/L	5
Cotinine	ng/L	10		Quinoline	ng/L	5
Cyanazine	ng/L	5		Simazine	ng/L	5
DACT	ng/L	5		Sucralose	ng/L	100
DEA	ng/L	5		Sulfachloropyridazine	ng/L	5
DEET	ng/L	10		Sulfadiazine	ng/L	5
Dehydronifedipine	ng/L	5		Sulfadimethoxine	ng/L	5
DIA	ng/L	5		Sulfamerazine	ng/L	5
Diazepam	ng/L	5		Sulfamethazine	ng/L	5
Diclofenac	ng/L	5		Sulfamethizole	ng/L	5

Residual Chemicals	Units	Method Reporting Limit
Dilantin	ng/L	20
Diltiazem	ng/L	5
Diuron	ng/L	5
Erythromycin	ng/L	10
Estradiol	ng/L	5
Estrone	ng/L	5
Ethinyl Estradiol - 17 alpha	ng/L	5
Ethylparaben	ng/L	20
Flumeqine	ng/L	10
Fluoxetine	ng/L	10
Gemfibrozil	ng/L	5
Ibuprofen	ng/L	10

Residual Chemicals	Units	Method Reporting Limit
Sulfamethoxazole	ng/L	5
Sulfathiazole	ng/L	5
TCEP	ng/L	10
TCPP	ng/L	100
TDCPP	ng/L	100
Testosterone	ng/L	5
Theobromine	ng/L	10
Theophylline	ng/L	20
Thiabendazole	ng/L	5
Triclocarban	ng/L	5
Triclosan	ng/L	10
Trimethoprim	ng/L	5
Warfarin	ng/L	5

Appendix C

Tabular Summary of Surface Water Monitoring Results

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			Beatty Springs		Beatty Springs		Beatty Springs		Beatty Springs Field Duplicate		Beatty Springs		Eagle Creek		Eagle Creek		Eagle Creek		Eagle Creek		Fox Creek		Fox Creek Field Duplicate		Fox Creek		Fox Creek Field Duplicate		Fox Creek		Fox Creek	
			8/27/2015		9/14/2015		10/12/2015		10/12/2015		12/7/2015		8/28/2015		9/14/2015		10/12/2015		12/7/2015		8/27/2015		8/27/2015		9/14/2015		9/14/2015		10/12/2015		12/7/2015	
Analyte	Units	MRL	Result	Q	Result	Q	Result	Q	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
General Water Quality Parameters																															
Bicarbcarbonate Alkalinity (as HCO3)	mg/L	2	55		54		56		56		56		75		76		77		40		79		77		77		77		76		43	
Alkalinity as CaCO3	mg/L	2	45		44		46		46		46		62		62		63		33		64		63		63		63		62		35	
Carbonate (CO_3)	mg/L	2	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Total Dissolved Solids (TDS)	mg/L	10	96		100		110		110		96		100		100		120		96		100		110		100		92		130		90	
Total Suspended Solids (TSS)	mg/L	10	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		13		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Total Organic Carbon	mg/L	0.3	1.1		0.45		0.4		0.49		0.36		1.8		1.2		1.8		6.1		5.9		1.1		8.1		8.1		6.2		7.8	
Bromide	ug/L	5	28		26		29		29		32		18		16		16		9.9		19		29		16		16		17		6.1	
Chloride	mg/L	1	6.4		6.3		5.8		5.8		5.9		3.5		3		3.6		3.3		4.4		5.2		4.3		4.3		3.8		3	
Sulfate	mg/L	0.5	8.4		8.4		7.6		7.6		7.8		6.1		6		5.9		5.3		2.3		8		2.6		2.6		3.5		3.9	
Fluoride	mg/L	0.05	*ND*		*ND*		*ND*		*ND*		*ND*		0.053		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Total Hardness as CaCO3	mg/L	3	56		57		54		54		49		63		62		64		37		63		68		63		62		62		36	
Biochemical Oxygen Demand	mg/L	3	*ND*		*ND*		*ND*		*ND*		*ND*	*UJ*	*ND*		*ND*		*ND*		*ND*	*UJ*	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	*UJ*
Anion Sum	meq/L	0.001	1.5		1.5		1.4		1.4		1.4		1.5		1.5		1.5		0.95		1.5		1.7		1.4		1.4		1.4		0.9	
Cation Sum	meq/L	0.001	1.5		1.6		1.5		1.5		1.4		1.5		1.6		1.6		1		1.6		1.8		1.6		1.5		1.5		0.97	
Anion and Cation Balance Error	%	0	*ND*		4		1		2		0.27		*ND*		4		2		4.1		4		4		5		2		3		3.4	
Hydroxide as OH Calculated	mg/L	2	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Metals Dissolved																															
Arsenic	ug/L	1	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		1	J	*ND*		*ND*		*ND*		*ND*		*ND*		1.3	J
Boron	mg/L	0.05	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Cadmium	ug/L	0.5	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Calcium	mg/L	1	14		14		13		13		13		13		14		14		10		12		15		12		12		11		7	
Chromium	ug/L	1	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Copper	ug/L	2	*ND*		*ND*		*ND*		*ND*		*ND (< 4)*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Iron	mg/L	0.02	*ND*		*ND*		*ND*		*ND*		*ND*		0.25		0.26		0.16		0.21		0.85		0.046		0.98		0.97		0.52		0.16	
Lead	ug/L	0.5	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Magnesium	mg/L	0.1	5.4		5.4		5.2		5.3		5.1		6.5		7		6.9		3.2		7.8		7.8		8		7.7		7.7		4.6	
Manganese	ug/L	2	*ND*		*ND*		*ND*		*ND*		*ND*		46		42		30		16		190		22		240		240		150		5.3	
Mercury	ug/L	0.2	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Nickel	ug/L	5	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Potassium	mg/L	1	1.3		1.3		1.3		1.1		1.3		1.7		1.8		1.7		1.1		1.6		1.8		1.8		1.6		1.9		1.3	
Selenium	ug/L	5	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Silicon	mg/L	0.2	11		12		11		12		11		15		17		16		9		16		15		16		15		15		9.3	
Silver	ug/L	0.5	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Sodium	mg/L	1	8.5		8.8		8.2		8.4		8		6.6		7.1		6.8		5.2		6.9		7.7		6.9		6.5		6.4		4.6	
Zinc	ug/L	20	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Metals Total																															
Calcium	mg/L	1	14		14		13		13		12		14		14		14		9.9		12		15		12		12		12		6.8	
Magnesium	mg/L	0.1	5.2		5.3		5.2		5.3		4.7		6.9		6.7		7		3.1		8.1		7.4		8		7.9		7.9		4.5	
Mercury	ug/L	0.2	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Selenium	ug/L	5	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Nutrients																															
Nitrate+Nitrite	mg/L	0.1	3.3		3.3		2.7		2.8		2.5		0.41		0.4		0.37		1.2		*ND*		1.4		*ND*		*ND*		*ND*		0.48	
Nitrate as NO3 (calc)	mg/L	0.44	15		15		12		12		11		1.8		1.8		1.6		5.3		*ND*		6.2		*ND*		*ND*		*ND*		2.1	
Nitrate as Nitrogen by IC	mg/L	0.1	3.3		3.3		2.7		2.8		2.5		0.41		0.4		0.37		1.2		*ND*		1.4		*ND*		*ND*		*ND*		0.48	
Nitrite	mg/L	0.05	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Ammonia Nitrogen	mg/L	0.05	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		0.074		*ND*		0.11		0.11		*ND*		*ND*	
Kjeldahl Nitrogen	mg/L	0.2	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		0.23		0.49		0.36		*ND*		0.45		0.44		0.45		0.36	
Total phosphorus as P	mg/L	0.02	*ND*		0.029		0.052		0.057		*ND*		0.11		0.045		0.068		0.028		0.1		0.027		0.16		0.16		0.14		*ND*	
Orthophosphate as P	mg/L	0.01	0.014		0.014		0.021		0.022		0.021		0.027		0.02		0.028		0.026		0.094		0.048		0.12		0.1		0.064		0.017	
Bacterial Parameters																															
Total Coliform Bacteria	MPN/100mL	1	100		93		75		100		66		>2419.6		920		870		920		960		760		>2419.6		1600		2400		290	
Fecal Coliform Bacteria	CFU/100mL	1	*ND*		<1		1		*ND*		*ND*		>200		16		82		33		78		52		7		34		180		18	

			Beatty Springs		Beatty Springs		Beatty Springs		Beatty Springs Field Duplicate		Beatty Springs		Eagle Creek		Eagle Creek		Eagle Creek		Eagle Creek		Fox Creek		Fox Creek Field Duplicate		Fox Creek		Fox Creek Field Duplicate		Fox Creek		Fox Creek	
			8/27/2015		9/14/2015		10/12/2015		10/12/2015		12/7/2015		8/28/2015		9/14/2015		10/12/2015		12/7/2015		8/27/2015		8/27/2015		9/14/2015		9/14/2015		10/12/2015		12/7/2015	
Analyte	Units	MRL	Result	Q	Result	Q	Result	Q	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Residual Chemicals																																
1,7-Dimethylxanthine	ng/L	10	ND		ND		ND		ND	R	ND		ND		ND		ND		ND		ND	R	ND		ND		ND	UJ	ND		ND	
17 alpha - Ethynylestradiol	ng/L	0.5	ND		ND		--		--		--		ND		ND		--		--		ND		ND		ND		ND		--		--	
17 beta - Estradiol	ng/L	0.5	ND		ND		--		--		--		ND		ND		--		--		ND		ND		ND		ND		--		--	
2,4-D	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
4-n-Octylphenol diethoxylate	ng/L	100	ND		ND		--		--		--		ND		ND		--		--		ND		ND		ND		ND		--		--	
4-n-Octylphenol monoethoxylate	ng/L	100	ND		ND		--		--		--		ND		ND		--		--		ND		ND		ND		ND		--		--	
4-nonylphenol	ng/L	100	ND		ND		ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ
4-tert-octylphenol	ng/L	50	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Acesulfame-K	ng/L	20	540		630		400		550		430		ND		ND		ND		79		ND		170		ND		ND		ND		ND	
Acetaminophen	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Albuterol	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Amoxicillin	ng/L	20	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ
Andorostenedione	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Atenolol	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Atrazine	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Azithromycin	ng/L	20	ND	UJ	ND	UJ	ND	UJ	94	J+	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ
Bendroflumethiazide	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Bezafibrate	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
BPA	ng/L	10	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Bromacil	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Butalbital	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Butylparben	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Caffeine	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Carbadox	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	UJ	ND		ND		ND		ND		ND	
Carbamazepine	ng/L	5	10		7.1		5.4		8		5.2		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Carisoprodol	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Chloramphenicol	ng/L	10	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Chloridazon	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	UJ	ND		ND		ND	UJ	ND		ND	
Chlorotoluron	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Cimetidine	ng/L	5	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ
Clofibric Acid	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Cotinine	ng/L	10	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		36		ND		ND	
Cyanazine	ng/L	5	9.2		ND		ND		ND		ND		7.9		ND		ND		7		ND		7		ND		ND		ND		ND	
DACT	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		23		ND		ND		ND		ND	
DEA	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
DEET	ng/L	10	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Dehydronifedipine	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
DIA	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Diazepam	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Diclofenac	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Dilantin	ng/L	20	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Diltiazem	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Diuron	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Erythromycin	ng/L	10	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Estradiol	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Estrone	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Estrone	ng/L	0.5	ND		ND		--		--		--		ND		ND		--		--		ND		ND		ND		ND		--		--	
Ethinyl Estradiol - 17 alpha	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Ethylparaben	ng/L	20	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Flumeqine	ng/L	10	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Fluoxetine	ng/L	10	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	UJ	ND		ND		ND		ND		ND	
Gemfibrozil	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Ibuprofen	ng/L	10	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Iohexal	ng/L	10	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Iopromide	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		23		ND	
Isobutylparaben	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Isoproturon	ng/L	100	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Ketoprofen	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Ketorolac	ng/L	5	ND		ND		ND		ND	UJ	ND		ND		ND		ND		ND		ND	UJ	ND		ND		ND		ND		ND	
Lidocaine	ng/L	5	ND		ND		ND		ND	UJ	ND		ND		ND		ND		ND		ND		ND		ND		ND	UJ	ND		ND	
Lincomycin	ng/L	10	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Linuron	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	

			Beatty Springs		Beatty Springs		Beatty Springs		Beatty Springs Field Duplicate		Beatty Springs		Eagle Creek		Eagle Creek		Eagle Creek		Eagle Creek		Fox Creek		Fox Creek Field Duplicate		Fox Creek		Fox Creek Field Duplicate		Fox Creek		Fox Creek	
			8/27/2015		9/14/2015		10/12/2015		10/12/2015		12/7/2015		8/28/2015		9/14/2015		10/12/2015		12/7/2015		8/27/2015		8/27/2015		9/14/2015		9/14/2015		10/12/2015		12/7/2015	
Analyte	Units	MRL	Result	Q	Result	Q	Result	Q	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Lopressor	ng/L	20	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		UJ		ND		ND	
Meclofenamic Acid	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND				ND		ND	
Meprobamate	ng/L	5	ND		ND		ND		ND	UJ	ND		ND		ND		ND		ND		ND		ND		ND		UJ		ND		ND	
Metazachlor	ng/L	5	ND	R	ND	R	ND	R	ND	R	ND	R	ND	R	ND	R	ND	R	ND	R	ND	R	ND	R	ND	R	ND	R	ND	R	ND	R	ND	R
Methylparaben	ng/L	20	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND				ND		ND	
Naproxen	ng/L	10	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND				ND		ND	
Nifedipine	ng/L	20	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ
Nonylphenol Diethoxylate	ng/L	100	ND		ND		--		--		--		ND		ND		--		--		ND		ND		ND		ND		--		--	
Nonylphenol Monoethoxylate	ng/L	100	ND		ND		--		--		--		ND		ND		--		--		ND		ND		ND		ND		--		--	
Norethisterone	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Oxolinic acid	ng/L	10	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Pentoxifylline	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	UJ	ND		ND		ND		ND		ND	
Phenazone	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	UJ	ND		ND		ND		ND		ND	
Primidone	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Progesterone	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Propazine	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Propylparaben	ng/L	5	ND		ND		ND		ND		ND		ND		ND	UJ	ND		ND		ND		ND		ND	UJ	ND		ND		ND	
Quinoline	ng/L	5	ND		ND		20	J	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Simazine	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Sucralose	ng/L	100	600		720		ND		2000		510		ND		ND		320		140		ND		170		ND		ND		ND		240	
Sulfachloropyridazine	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Sulfadiazine	ng/L	5	ND		ND		ND		ND	R	ND		ND		ND		ND		ND		ND	R	ND		ND		ND	UJ	ND		ND	
Sulfadimethoxine	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Sulfamerazine	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Sulfamethazine	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Sulfamethizole	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Sulfamethoxazole	ng/L	5	ND		ND		ND		15		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Sulfathiazole	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
TCEP	ng/L	10	14		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
TCPP	ng/L	100	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
TDCPP	ng/L	100	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		100		ND		ND	
Testosterone	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Theobromine	ng/L	10	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Thiabendazole	ng/L	5	ND		ND		ND		ND	UJ	ND		ND		ND		ND		ND		ND	UJ	ND		ND		ND		ND		ND	
Triclocarban	ng/L	5	ND		ND		ND	UJ	ND		ND		ND		ND		ND	UJ	ND		ND		ND		ND		ND		ND	UJ	ND	
Triclosan	ng/L	10	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Trimethoprim	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Warfarin	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	

			Woodland Creek Lower		Woodland Creek Lower		Woodland Creek Lower		Woodland Creek Lower		Woodland Creek Upper		Woodland Creek Upper		Woodland Creek Upper		Woodland Creek Upper		Woodland Creek Reference		Woodland Creek Reference	
			8/27/2015		9/14/2015		10/12/2015		12/7/2015		8/27/2015		9/14/2015		10/12/2015		12/7/2015		8/28/2015		12/7/2015	
Analyte	Units	MRL	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
General Water Quality Parameters																						
Bicarbcarbonate Alkalinity (as HCO3)	mg/L	2	77		78		78		60		64		66		64		45		69		58	
Alkalinity as CaCO3	mg/L	2	63		64		64		49		52		54		53		37		56		47	
Carbonate (CO_3)	mg/L	2	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Total Dissolved Solids (TDS)	mg/L	10	110		120		130		110		100		100		100		80		110		82	
Total Suspended Solids (TSS)	mg/L	10	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		28		*ND*		*ND*	
Total Organic Carbon	mg/L	0.3	0.9		1.3		1.7		3.9		0.37		1.1		1.1		2.9		6.1		4.5	
Bromide	ug/L	5	29		29		29		23		36		32		36		20		38		25	
Chloride	mg/L	1	5.2		5.2		5.1		4.7		5.6		5.6		5.4		4		5.3		4.7	
Sulfate	mg/L	0.5	8.1		8.1		7.6		6.2		7.8		8		7.4		5.2		4.4		5.5	
Fluoride	mg/L	0.05	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Total Hardness as CaCO3	mg/L	3	70		70		71		53		57		59		57		43		60		46	
Biochemical Oxygen Demand	mg/L	3	*ND*		*ND*		*ND*		*ND*	*UJ*	*ND*		*ND*		*ND*		*ND*	*UJ*	3.3		*ND*	*UJ*
Anion Sum	meq/L	0.001	1.7		1.7		1.7		1.3		1.5		1.5		1.5		1.1		1.4		1.2	
Cation Sum	meq/L	0.001	1.7		1.8		1.8		1.4		1.5		1.6		1.5		1		1.5		1.2	
Anion and Cation Balance Error	%	0	1		3		3		2.9		1		3		1		1.6		4		0.53	
Hydroxide as OH Calculated	mg/L	2	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Metals Dissolved																						
Arsenic	ug/L	1	*ND*		*ND*		*ND*		3.4		*ND*		*ND*		*ND*		*ND*		1.3		*ND*	
Boron	mg/L	0.05	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Cadmium	ug/L	0.5	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Calcium	mg/L	1	15		15		15		12		13		14		13		9.1		13		11	
Chromium	ug/L	1	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Copper	ug/L	2	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND (< 4)*		*ND*		*ND*		*ND*	
Iron	mg/L	0.02	0.045		0.046		0.058		0.071		*ND*		0.025		*ND*		0.058		0.18		0.034	
Lead	ug/L	0.5	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Magnesium	mg/L	0.1	7.8		8.1		8		5.7		6		6.8		6.1		3.8		5.8		4.6	
Manganese	ug/L	2	21		20		16		15		6.3		6.5		2.6		6		61		*ND*	
Mercury	ug/L	0.2	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Nickel	ug/L	5	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Potassium	mg/L	1	1.8		2		2		1.5		1.4		1.8		1.3		1.1		*ND*		1.1	
Selenium	ug/L	5	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Silicon	mg/L	0.2	15		16		16		10		12		13		12		8.5		11		6	
Silver	ug/L	0.5	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Sodium	mg/L	1	7.5		7.8		7.4		6.5		7.6		7.8		7.3		5.4		6.9		5.6	
Zinc	ug/L	20	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Metals Total																						
Calcium	mg/L	1	15		15		15		12		13		13		13		10		14		11	
Magnesium	mg/L	0.1	7.8		7.9		8.1		5.7		6		6.4		6		4.4		6		4.6	
Mercury	ug/L	0.2	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Selenium	ug/L	5	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Nutrients																						
Nitrate+Nitrite	mg/L	0.1	1.4		1.4		1.3		0.83		1.5		1.4		1.5		1.5		*ND*		*ND*	
Nitrate as NO3 (calc)	mg/L	0.44	6.3		6.2		5.8		3.7		6.6		6.2		6.8		6.8		*ND*		*ND*	
Nitrate as Nitrogen by IC	mg/L	0.1	1.4		1.4		1.3		0.83		1.5		1.4		1.5		1.5		*ND*		*ND*	
Nitrite	mg/L	0.05	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Ammonia Nitrogen	mg/L	0.05	*ND*		*ND*		*ND*		*ND*		0.11		0.1		0.14		0.089		*ND*		*ND*	
Kjeldahl Nitrogen	mg/L	0.2	*ND*		*ND*		0.3		0.33		0.33		0.31		0.42		0.8		0.35		0.47	
Total phosphorus as P	mg/L	0.02	0.036		0.053		0.13		0.026		0.078		0.061		0.087		0.14		0.071		*ND*	
Orthophosphate as P	mg/L	0.01	0.053		0.047		0.057		0.038		0.037		0.04		0.062		0.07		*ND*		0.011	
Bacterial Parameters																						
Total Coliform Bacteria	MPN/100mL	1	1700		1400		1200		1300		980		870		920		>2419.6		>2419.6		330	
Fecal Coliform Bacteria	CFU/100mL	1	180		220		81		110		3		31		8		340		140		27	

			Woodland Creek - Lower		Woodland Creek - Lower		Woodland Creek - Lower		Woodland Creek - Lower		Woodland Creek - Upper		Woodland Creek - Upper		Woodland Creek - Upper		Woodland Creek - Upper		Woodland Creek - Reference		Woodland Creek - Reference	
			8/27/2015		9/14/2015		10/12/2015		12/7/2015		8/27/2015		9/14/2015		10/12/2015		12/7/2015		8/28/2015		12/7/2015	
Analyte	Units	MRL	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Residual Chemicals																						
1,7-Dimethylxanthine	ng/L	10	ND		ND		ND		ND		ND		ND		ND		ND	R	ND		ND	
17 alpha - Ethynylestradiol	ng/L	0.5	ND		ND		--		--		ND		ND		--		--		ND		--	
17 beta - Estradiol	ng/L	0.5	ND		ND		--		--		ND		ND		--		--		ND		--	
2,4-D	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		36		ND	
4-n-Octylphenol diethoxylate	ng/L	100	ND		ND		--		--		ND		ND		--		--		ND		--	
4-n-Octylphenol monoethoxylate	ng/L	100	ND		ND		--		--		ND		ND		--		--		ND		--	
4-nonylphenol	ng/L	100	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ
4-tert-octylphenol	ng/L	50	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Acesulfame-K	ng/L	20	160		220		140		130		220		240		240		260		160		150	
Acetaminophen	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Albuterol	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Amoxicillin	ng/L	20	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ
Andorostenedione	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Atenolol	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Atrazine	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Azithromycin	ng/L	20	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ
Bendroflumethiazide	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Bezafibrate	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
BPA	ng/L	10	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Bromacil	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND	UJ	ND		ND	
Butalbital	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Butylparben	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Caffeine	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Carbadox	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Carbamazepine	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Carisoprodol	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Chloramphenicol	ng/L	10	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	UJ
Chloridazon	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND	UJ	ND		ND	
Chlorotoluron	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Cimetidine	ng/L	5	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ
Clofibric Acid	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Cotinine	ng/L	10	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Cyanazine	ng/L	5	7.3		ND		ND		ND		ND		ND		ND		ND		ND		ND	
DACT	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
DEA	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
DEET	ng/L	10	ND		ND		ND		ND		ND		ND		ND		ND		31		ND	
Dehydronifedipine	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
DIA	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Diazepam	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Diclofenac	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Dilantin	ng/L	20	ND		ND		ND		ND		ND		ND		ND		ND	UJ	ND		ND	
Diltiazem	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Diuron	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Erythromycin	ng/L	10	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Estradiol	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Estrone	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Estrone	ng/L	0.5	ND		ND		--		--		ND		ND		--		--		ND		--	
Ethinyl Estradiol - 17 alpha	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Ethylparaben	ng/L	20	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Flumeqine	ng/L	10	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Fluoxetine	ng/L	10	ND		ND		ND		ND		ND		ND		ND		ND	UJ	ND		ND	
Gemfibrozil	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Ibuprofen	ng/L	10	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Iohexal	ng/L	10	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Iopromide	ng/L	5	ND		ND		ND		ND		ND		ND		23		ND		ND		ND	
Isobutylparaben	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Isoproturon	ng/L	100	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Ketoprofen	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Ketorolac	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Lidocaine	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND	UJ	ND		ND	
Lincomycin	ng/L	10	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Linuron	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	

			Woodland Creek Lower 8/27/2015		Woodland Creek Lower 9/14/2015		Woodland Creek Lower 10/12/2015		Woodland Creek Lower 12/7/2015		Woodland Creek Upper 8/27/2015		Woodland Creek Upper 9/14/2015		Woodland Creek Upper 10/12/2015		Woodland Creek Upper 12/7/2015		Woodland Creek Reference 8/28/2015		Woodland Creek Reference 12/7/2015	
Analyte	Units	MRL	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Lopressor	ng/L	20	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Meclofenamic Acid	ng/L	5	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Meprobamate	ng/L	5	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Metazachlor	ng/L	5	*ND*	R	*ND*	R	*ND*	R	*ND*	R	*ND*	R	*ND*	R	*ND*	R	*ND*	R	*ND*	R	*ND*	R
Methylparaben	ng/L	20	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Naproxen	ng/L	10	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Nifedipine	ng/L	20	*ND*	*UJ*	*ND*	*UJ*	*ND*	*UJ*	*ND*	*UJ*	*ND*	*UJ*	*ND*	*UJ*	*ND*	*UJ*	*ND*	*UJ*	*ND*	*UJ*	*ND*	*UJ*
Nonylphenol Diethoxylate	ng/L	100	*ND*		*ND*		--		--		*ND*		*ND*		--		--		*ND*		--	
Nonylphenol Monoethoxylate	ng/L	100	*ND*		*ND*		--		--		*ND*		*ND*		--		--		*ND*		--	
Norethisterone	ng/L	5	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Oxolinic acid	ng/L	10	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Pentoxifylline	ng/L	5	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Phenazone	ng/L	5	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Primidone	ng/L	5	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Progesterone	ng/L	5	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Propazine	ng/L	5	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Propylparaben	ng/L	5	*ND*		18	J	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Quinoline	ng/L	5	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Simazine	ng/L	5	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Sucralose	ng/L	100	190		*ND*		120		200		300		330		1300		630		300		520	J+
Sulfachloropyridazine	ng/L	5	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Sulfadiazine	ng/L	5	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	*UJ*	*ND*		*ND*	
Sulfadimethoxine	ng/L	5	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Sulfamerazine	ng/L	5	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	*UJ*	*ND*		*ND*	
Sulfamethazine	ng/L	5	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Sulfamethizole	ng/L	5	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	*UJ*	*ND*		*ND*	
Sulfamethoxazole	ng/L	5	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Sulfathiazole	ng/L	5	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
TCEP	ng/L	10	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
TCPP	ng/L	100	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
TDCPP	ng/L	100	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Testosterone	ng/L	5	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Theobromine	ng/L	10	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Thiabendazole	ng/L	5	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Triclocarban	ng/L	5	*ND*		*ND*		*ND*	*UJ*	*ND*		*ND*		*ND*		8.9		*ND*		*ND*		*ND*	
Triclosan	ng/L	10	*ND*		16		*ND*		*ND*		*ND*		*ND*		14		*ND*		*ND*		*ND*	
Trimethoprim	ng/L	5	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Warfarin	ng/L	5	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	

MRL = Minimum Reporting Level; ND = Not Detected above MRL; "---" = Not Analyzed; Qual = Data Qualifier
mg/L = milligrams per liter (ppm); µg/L = micrograms per liter (ppb); ng/L = nanograms per liter (ppt)
µS/cm = microsiemens per centimeter; mV = millivolts
MPN/100ml = Most Probable Number (colony forming units) per 100 ml; CFU/100ml = Colony Forming Units per 100 ml
Notes:
1) Some analytes are listed twice as they were analyzed via multiple methods.
2) Data qualifiers:
J = Value is detected and the result is estimated.
J- = Value is detected and the result is estimated and biased low.
J+ = Value is detected and the result is estimated and biased high.
UJ = Result is a non-detect and the value is estimated.
R = Result rejected.

Analyte	Units	MRL	Munn Lake 8/28/2015 Result	Qual	Munn Lake 9/15/2015 Result	Qual	Munn Lake 10/13/2015 Result	Qual	Munn Lake 12/8/2015 Result	Qual	Munn Lake Field Duplicate 12/8/2015 Result	Qual	Chambers Creek 9/10/2015 Result	Qual	Chambers Creek 9/15/2015 Result	Qual	Chambers Creek 10/13/2015 Result	Qual	Chambers Creek 12/8/2015 Result	Qual	Percival Creek 8/28/2015 Result	Qual	Percival Creek 9/15/2015 Result	Qual	Percival Creek 10/13/2015 Result	Qual	Percival Creek 12/8/2015 Result	Qual
General Water Quality Parameters																												
Bicarbcarbonate Alkalinity (as HCO3)	mg/L	2	15		15		16		12		12		68		68		68		20		60		65		59		34	
Alkalinity as CaCO3	mg/L	2	12		12		13		9.8		9.8		56		56		56		16		49		53		48		28	
Carbonate (CO_3)	mg/L	2	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Total Dissolved Solids (TDS)	mg/L	10	32		43		27		23		30		120		100		120		58		100		90		64		56	
Total Suspended Solids (TSS)	mg/L	10	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		18	
Total Organic Carbon	mg/L	0.3	7.7		7.9		7.6		6.2		6		1.8		1.5		2.3		9.6		4.3		4.1		5.1		6.1	
Bromide	ug/L	5	*ND*		*ND*		8.8		*ND*		*ND*		17		14		17		5.7		20		20		25		11	
Chloride	mg/L	1	1.9		1.9		1.9		2		2		4.4		4.4		4.8		2.9		4.8		4.9		4.4		3.1	
Sulfate	mg/L	0.5	*ND*		*ND*		*ND*		*ND*		*ND*		7.4		7.6		7.7		2.8		3.2		3.1		2.6		3.2	
Fluoride	mg/L	0.05	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Total Hardness as CaCO3	mg/L	3	13		13		13		10		11		58		65		61		23		52		52		48		32	
Biochemical Oxygen Demand	mg/L	3	*ND*		*ND*		3.1	J	*ND*		*ND*		*ND*		*ND*		*ND*	*UJ*	*ND*		*ND*		*ND*		*ND*	*UJ*	*ND*	
Anion Sum	meq/L	0.001	0.3		0.3		0.3		0.27		0.27		1.5		1.5		1.5		0.52		1.2		1.3		1.2		0.73	
Cation Sum	meq/L	0.001	0.36		0.36		0.35		0.29		0.29		1.6		1.6		1.6		0.56		1.3		1.3		1.2		0.72	
Anion and Cation Balance Error	%	0	10		9		5		4.2		4		3		3		3		3.4		4		1		3		0.35	
Hydroxide as OH Calculated	mg/L	2	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Metals Dissolved																												
Arsenic	ug/L	1	1.2		*ND*		1		*ND*		*ND*		*ND*		*ND*		*ND*		4.3		1.1		*ND*		1.5		2.1	J
Boron	mg/L	0.05	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Cadmium	ug/L	0.5	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Calcium	mg/L	1	3.1		3.1		3		2.5		2.5		16		15		15		5.2		11		12		11		7	
Chromium	ug/L	1	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Copper	ug/L	2	4		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Iron	mg/L	0.02	0.083		0.086		0.042		0.064		0.065		0.05		0.049		0.05		0.2		0.12		0.13		0.093		0.18	
Lead	ug/L	0.5	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Magnesium	mg/L	0.1	1.3		1.3		1.3		0.99		1		6.1		6		6.1		1.9		5		5.4		4.8		2.4	
Manganese	ug/L	2	12		16		4		8.4		7.8		8.4		9.4		8.4		5.2		15		13		8.4		16	
Mercury	ug/L	0.2	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Nickel	ug/L	5	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Potassium	mg/L	1	*ND*		*ND*		*ND*		*ND*		*ND*		1.4		1.4		1.7		*ND*		1.2		1.2		1.2		*ND*	
Selenium	ug/L	5	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Silicon	mg/L	0.2	0.94		1.2		1.2		1.4		1.4		15		15		15		5.5		11		10		5.9		5.6	
Silver	ug/L	0.5	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Sodium	mg/L	1	2.1		2.2		2.2		1.9		1.8		7.2		7.4		7.4		3.3		5.9		6.3		5.7		4	
Zinc	ug/L	20	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Metals Total																												
Calcium	mg/L	1	3		3.1		3.1		2.5		2.7		14		16		15		5.6		12		12		11		8.2	
Magnesium	mg/L	0.1	1.3		1.3		1.3		1		1.1		5.7		6		5.8		2.1		5.3		5.3		4.9		2.9	
Mercury	ug/L	0.2	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Selenium	ug/L	5	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Nutrients																												
Nitrate+Nitrite	mg/L	0.1	*ND*		*ND*		*ND*		0.11		0.1		1.6		1.6		1.9		0.78		0.16		0.28		0.2		0.31	
Nitrate as NO3 (calc)	mg/L	0.44	*ND*		*ND*		*ND*		0.51		0.47		7		7.3		8.5		3.4		0.73		1.2		0.9		1.4	
Nitrate as Nitrogen by IC	mg/L	0.1	*ND*		*ND*		*ND*		0.11		0.1		1.6		1.6		1.9		0.78		0.16		0.28		0.2		0.31	
Nitrite	mg/L	0.05	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Ammonia Nitrogen	mg/L	0.05	*ND*		*ND*		*ND*		0.19		0.19		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Kjeldahl Nitrogen	mg/L	0.2	0.41		0.71		0.74		0.58		0.62		0.21		0.34		0.21		0.61		1.1		0.4		0.45		0.53	
Total phosphorus as P	mg/L	0.02	0.053		0.035		0.15		*ND*		*ND*		0.056		0.031		0.29		0.02		0.1		0.035		0.18		0.05	
Orthophosphate as P	mg/L	0.01	*ND*		*ND*		*ND*		0.01		*ND*		0.017		0.015		0.015		0.012		0.013		0.016		0.023		0.035	
Bacterial Parameters																												
Total Coliform Bacteria	MPN/100mL	1	>2419.6		>2419.6		820		150		220		1100		>2419.6		1400		>2419.6		270		>2419.6		2400		920	
Fecal Coliform Bacteria	CFU/100mL	1	15		15		33		3		4		68		180		49		180		130		68		51		54	

			Munn Lake		Munn Lake		Munn Lake		Munn Lake		Munn Lake Field Duplicate		Chambers Creek		Chambers Creek		Chambers Creek		Chambers Creek		Percival Creek		Percival Creek		Percival Creek		Percival Creek	
			8/28/2015		9/15/2015		10/13/2015		12/8/2015		12/8/2015		9/10/2015		9/15/2015		10/13/2015		12/8/2015		8/28/2015		9/15/2015		10/13/2015		12/8/2015	
Analyte	Units	MRL	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Residual Chemicals																												
1,7-Dimethylxanthine	ng/L	10	ND		ND		ND		ND		ND		ND		ND		ND	R	ND		ND		ND		ND		ND	
17 alpha - Ethynylestradiol	ng/L	0.5	ND		ND		--		--		--		ND		ND		--		--		ND		ND		--		--	
17 beta - Estradiol	ng/L	0.5	ND		ND		--		--		--		ND		ND		--		--		ND		ND		--		--	
2,4-D	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		21		ND	
4-n-Octylphenol diethoxylate	ng/L	100	ND		ND		--		--		--		ND		ND		--		--		ND		ND		--		--	
4-n-Octylphenol monoethoxylate	ng/L	100	ND		ND		--		--		--		ND		ND		--		--		ND		ND		--		--	
4-nonylphenol	ng/L	100	ND	UJ	ND	UJ	180	J+	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ
4-tert-octylphenol	ng/L	50	ND		ND		170	J	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Acesulfame-K	ng/L	20	24		22		29		ND		ND		250		230		280		37		68		67		75		45	
Acetaminophen	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Albuterol	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Amoxicillin	ng/L	20	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ
Andorostenedione	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Atenolol	ng/L	5	ND		14		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Atrazine	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Azithromycin	ng/L	20	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ
Bendroflumethiazide	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Bezafibrate	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
BPA	ng/L	10	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Bromacil	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Butalbital	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Butylparben	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Caffeine	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Carbadox	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND	UJ	ND		ND		ND		ND		ND	
Carbamazepine	ng/L	5	ND		ND		ND		ND		ND		7.8		6.7		7.7		ND		ND		ND		ND		ND	
Carisoprodol	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Chloramphenicol	ng/L	10	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Chloridazon	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND	UJ	ND		ND		ND		ND		ND	
Chlorotoluron	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Cimetidine	ng/L	5	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ
Clofibric Acid	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Cotinine	ng/L	10	ND		13		ND		ND		ND		ND		ND		ND		ND		ND		12		ND		ND	
Cyanazine	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		6.5		ND		ND		ND		ND	
DACT	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
DEA	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
DEET	ng/L	10	27		18		21		22		20		ND		ND		ND		ND		11		ND		ND		12	
Dehydronifedipine	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
DIA	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Diazepam	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Diclofenac	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		7.4		ND	
Dilantin	ng/L	20	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Diltiazem	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Diuron	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Erythromycin	ng/L	10	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Estradiol	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Estrone	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Estrone	ng/L	0.5	1.3		2		--		--		--		ND		ND		--		--		ND		ND		--		--	
Ethinyl Estradiol - 17 alpha	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Ethylparaben	ng/L	20	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Flumeqine	ng/L	10	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Fluoxetine	ng/L	10	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Gemfibrozil	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Ibuprofen	ng/L	10	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Iohexal	ng/L	10	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		33		ND	
Iopromide	ng/L	5	ND		ND		59		ND		ND		ND		ND		6		ND		ND		ND		17		ND	
Isobutylparaben	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Isoproturon	ng/L	100	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Ketoprofen	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Ketorolac	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND	UJ	ND		ND		ND		ND		ND	
Lidocaine	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND	UJ	ND		ND		ND		ND		ND	
Lincomycin	ng/L	10	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Linuron	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	

			Munn Lake		Munn Lake		Munn Lake		Munn Lake		Munn Lake Field Duplicate		Chambers Creek		Chambers Creek		Chambers Creek		Chambers Creek		Percival Creek		Percival Creek		Percival Creek		Percival Creek	
			8/28/2015		9/15/2015		10/13/2015		12/8/2015		12/8/2015		9/10/2015		9/15/2015		10/13/2015		12/8/2015		8/28/2015		9/15/2015		10/13/2015		12/8/2015	
Analyte	Units	MRL	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Lopressor	ng/L	20	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Meclofenamic Acid	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Meprobamate	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND	UJ	ND		ND		ND		ND		ND	
Metazachlor	ng/L	5	ND	R	ND	R	ND	R	ND	R	ND	R	ND	R	ND	R	ND	R	ND	R	ND	R	ND	R	ND	R	ND	R
Methylparaben	ng/L	20	ND		ND		42		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Naproxen	ng/L	10	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Nifedipine	ng/L	20	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ
Nonylphenol Diethoxylate	ng/L	100	ND		ND		--		--		--		ND		ND		--		--		ND		ND		--		--	
Nonylphenol Monoethoxylate	ng/L	100	ND		ND		--		--		--		ND		ND		--		--		ND		ND		--		--	
Norethisterone	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Oxolinic acid	ng/L	10	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Pentoxifylline	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND	UJ	ND		ND		ND		ND		ND	
Phenazone	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		UJ		ND		ND		ND		ND	
Primidone	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Progesterone	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Propazine	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Propylparaben	ng/L	5	ND		ND	UJ	ND		ND		ND		ND		ND	UJ	ND		ND		ND		ND	UJ	ND		ND	
Quinoline	ng/L	5	16		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Simazine	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Sucralose	ng/L	100	ND		ND		ND		ND		ND		330		210		130		130		150		140		6300		250	
Sulfachloropyridazine	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Sulfadiazine	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND	UJ	ND		ND		ND		ND		ND	
Sulfadimethoxine	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Sulfamerazine	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND	UJ	ND		ND		ND		ND		ND	
Sulfamethazine	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND	UJ	ND		ND		ND		ND		ND	
Sulfamethizole	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND	UJ	ND		ND		ND		ND		ND	
Sulfamethoxazole	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Sulfathiazole	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND	UJ	ND		ND		ND		ND		ND	
TCEP	ng/L	10	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
TCPP	ng/L	100	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
TDCPP	ng/L	100	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Testosterone	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Theobromine	ng/L	10	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Thiabendazole	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND	UJ	ND		ND		ND		ND		ND	
Triclocarban	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND	UJ	ND		ND		ND		ND		ND	
Triclosan	ng/L	10	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Trimethoprim	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Warfarin	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	

Analyte	Units	MRL	Deschutes River - Lower 9/10/2015 Result	Qual	Deschutes River - Lower 9/15/2015 Result	Qual	Deschutes River - Lower 10/13/2015 Result	Qual	Deschutes River - Lower 12/8/2015 Result	Qual	Deschutes River - Upper 8/28/2015 Result	Qual	Deschutes River - Upper 9/15/2015 Result	Qual	Deschutes River - Upper 10/13/2015 Result	Qual	Deschutes River - Upper 12/8/2015 Result	Qual	Deschutes River - Reference 8/28/2015 Result	Qual	Deschutes River - Reference 12/8/2015 Result	Qual
General Water Quality Parameters																						
Bicarbcarbonate Alkalinity (as HCO3)	mg/L	2	62		63		61		19		56		58		57		19		57		19	
Alkalinity as CaCO3	mg/L	2	51		52		50		16		46		48		47		16		46		16	
Carbonate (CO_3)	mg/L	2	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Total Dissolved Solids (TDS)	mg/L	10	120		100		86		55		110		110		94		53		110		47	
Total Suspended Solids (TSS)	mg/L	10	*ND*		*ND*		*ND*		99		*ND*		*ND*		*ND*		42		*ND*		74	
Total Organic Carbon	mg/L	0.3	1.5		1.4		1.7		5.1		1.6		1.4		1.8		4.4		1.4		4	
Bromide	ug/L	5	19		17		17		*ND*		20		17		17		*ND*		21		*ND*	
Chloride	mg/L	1	10		10		9.7		2.1		14		14		12		2.2		15		2.1	
Sulfate	mg/L	0.5	4.6		4.7		4.1		1.7		4		3.9		3.5		1.7		3.9		1.6	
Fluoride	mg/L	0.05	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Total Hardness as CaCO3	mg/L	3	53		57		56		28		54		54		50		24		53		26	
Biochemical Oxygen Demand	mg/L	3	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	*UJ*	*ND*		*ND*		*ND*	
Anion Sum	meq/L	0.001	1.4		1.5		1.4		0.45		1.4		1.5		1.4		0.45		1.5		0.45	
Cation Sum	meq/L	0.001	1.6		1.5		1.4		0.55		1.5		1.5		1.4		0.53		1.6		0.48	
Anion and Cation Balance Error	%	0	5		1		1		9.4		2		1		*ND*		7.8		2		3.9	
Hydroxide as OH Calculated	mg/L	2	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Metals Dissolved																						
Arsenic	ug/L	1	*ND*		*ND*		*ND*		*ND*	*UJ*	*ND*		*ND*		*ND*		1.4	J	*ND*		1	J
Boron	mg/L	0.05	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Cadmium	ug/L	0.5	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Calcium	mg/L	1	14		14		13		5.1		14		14		13		5.1		14		4.7	
Chromium	ug/L	1	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Copper	ug/L	2	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Iron	mg/L	0.02	0.13		0.14		0.12		0.66		0.06		0.068		0.062		0.26		0.056		0.35	
Lead	ug/L	0.5	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Magnesium	mg/L	0.1	5.4		5.4		4.8		1.6		4.6		4.7		4.2		1.5		4.5		1.3	
Manganese	ug/L	2	27		29		25		14		7.2		6.2		6.9		5.7		8.2		7.9	
Mercury	ug/L	0.2	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Nickel	ug/L	5	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Potassium	mg/L	1	1.4		1.3		1.2		*ND*		1.2		1.3		1.2		*ND*		1.3		*ND*	
Selenium	ug/L	5	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Silicon	mg/L	0.2	14		14		13		9.4		12		13		12		8.2		12		8	
Silver	ug/L	0.5	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Sodium	mg/L	1	8.5		8.6		7.9		3.6		9.2		9.6		8.7		3.4		9.7		3.2	
Zinc	ug/L	20	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Metals Total																						
Calcium	mg/L	1	13		14		14		6.6		14		14		13		5.8		14		6.3	
Magnesium	mg/L	0.1	5.1		5.4		5.1		2.9		4.7		4.6		4.3		2.2		4.5		2.6	
Mercury	ug/L	0.2	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Selenium	ug/L	5	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Nutrients																						
Nitrate+Nitrite	mg/L	0.1	0.7		0.74		0.63		0.61		0.74		0.58		0.4		0.6		0.8		0.61	
Nitrate as NO3 (calc)	mg/L	0.44	3.1		3.3		2.8		2.7		3.2		2.6		1.8		2.7		3.6		2.7	
Nitrate as Nitrogen by IC	mg/L	0.1	0.7		0.74		0.63		0.61		0.74		0.58		0.4		0.6		0.8		0.61	
Nitrite	mg/L	0.05	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Ammonia Nitrogen	mg/L	0.05	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Kjeldahl Nitrogen	mg/L	0.2	*ND*		0.21		0.2		0.56		0.59		*ND*		0.2		0.29		0.22		0.6	J-
Total phosphorus as P	mg/L	0.02	0.053		0.033		0.29		0.082		*ND*		*ND*		0.23		0.092		*ND*		0.12	
Orthophosphate as P	mg/L	0.01	0.021		0.019		0.021		0.059		*ND*		0.013		0.013		0.042		*ND*		0.09	
Bacterial Parameters																						
Total Coliform Bacteria	MPN/100mL	1	1400		1000		1600		1700		>2419.6	J	870		650		870		870		690	
Fecal Coliform Bacteria	CFU/100mL	1	110		26		27		69		60	J	30		28		54		55		65	

			Deschutes River - Lower		Deschutes River - Lower		Deschutes River - Lower		Deschutes River - Lower		Deschutes River - Upper		Deschutes River - Upper		Deschutes River - Upper		Deschutes River - Upper		Deschutes River - Reference		Deschutes River - Reference	
			9/10/2015		9/15/2015		10/13/2015		12/8/2015		8/28/2015		9/15/2015		10/13/2015		12/8/2015		8/28/2015		12/8/2015	
Analyte	Units	MRL	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Residual Chemicals																						
1,7-Dimethylxanthine	ng/L	10	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
17 alpha - Ethynylestradiol	ng/L	0.5	ND		ND		--		--		ND		ND		--		--		ND		--	
17 beta - Estradiol	ng/L	0.5	ND		ND		--		--		ND		ND		--		--		ND		--	
2,4-D	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
4-n-Octylphenol diethoxylate	ng/L	100	ND		ND		--		--		ND		ND		--		--		ND		--	
4-n-Octylphenol monoethoxylate	ng/L	100	ND		ND		--		--		ND		ND		--		--		ND		--	
4-nonylphenol	ng/L	100	ND	UJ	ND	UJ	220	J+	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ
4-tert-octylphenol	ng/L	50	ND		ND		140	J	ND		ND		ND		ND		ND		ND		ND	
Acesulfame-K	ng/L	20	29		21		24		ND		ND		ND		ND		ND		ND		ND	
Acetaminophen	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Albuterol	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Amoxicillin	ng/L	20	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ
Andorostenedione	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Atenolol	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Atrazine	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Azithromycin	ng/L	20	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ
Bendroflumethiazide	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Bezafibrate	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
BPA	ng/L	10	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Bromacil	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Butalbital	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Butylparben	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Caffeine	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Carbadox	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Carbamazepine	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Carisoprodol	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Chloramphenicol	ng/L	10	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Chloridazon	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Chlorotoluron	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Cimetidine	ng/L	5	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ
Clofibric Acid	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Cotinine	ng/L	10	ND		44		ND		ND		ND		ND		ND		ND		ND		ND	
Cyanazine	ng/L	5	ND		ND		ND		6.5		ND		ND		ND		ND		ND		ND	
DACT	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
DEA	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
DEET	ng/L	10	ND		ND		ND		ND		ND		ND		ND		390		ND		ND	
Dehydronifedipine	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
DIA	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Diazepam	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Diclofenac	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Dilantin	ng/L	20	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Diltiazem	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Diuron	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Erythromycin	ng/L	10	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Estradiol	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Estrone	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Estrone	ng/L	0.5	ND		ND		--		--		ND		ND		--		--		ND		--	
Ethinyl Estradiol - 17 alpha	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Ethylparaben	ng/L	20	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Flumeqine	ng/L	10	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Fluoxetine	ng/L	10	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Gemfibrozil	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Ibuprofen	ng/L	10	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Iohexal	ng/L	10	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Iopromide	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Isobutylparaben	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Isoproturon	ng/L	100	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Ketoprofen	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Ketorolac	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Lidocaine	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Lincomycin	ng/L	10	ND		ND		ND		ND		14		ND		ND		ND		ND		ND	
Linuron	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	

			Deschutes River - Lower 9/10/2015		Deschutes River - Lower 9/15/2015		Deschutes River - Lower 10/13/2015		Deschutes River - Lower 12/8/2015		Deschutes River - Upper 8/28/2015		Deschutes River - Upper 9/15/2015		Deschutes River - Upper 10/13/2015		Deschutes River - Upper 12/8/2015		Deschutes River - Reference 8/28/2015		Deschutes River - Reference 12/8/2015	
Analyte	Units	MRL	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Lopressor	ng/L	20	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Meclofenamic Acid	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Meprobamate	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Metazachlor	ng/L	5	ND	R	ND	R	ND	R	ND	R	ND	R	ND	R	ND		ND	R	ND	R	ND	R
Methylparaben	ng/L	20	ND		ND		46		ND		ND		ND		ND		ND		ND		ND	
Naproxen	ng/L	10	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Nifedipine	ng/L	20	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ
Nonylphenol Diethoxylate	ng/L	100	ND		ND		--		--		ND		ND		--		--		ND		--	
Nonylphenol Monoethoxylate	ng/L	100	ND		ND		--		--		ND		ND		--		--		ND		--	
Norethisterone	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Oxolinic acid	ng/L	10	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Pentoxifylline	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Phenazone	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Primidone	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Progesterone	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Propazine	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Propylparaben	ng/L	5	ND		ND	UJ	5.6		ND		ND		ND		ND		ND		ND		ND	
Quinoline	ng/L	5	ND		ND		ND		ND		9.2		ND		ND		ND		ND		ND	
Simazine	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Sucralose	ng/L	100	ND		ND		ND		200		ND		ND		ND		140		ND		140	
Sulfachloropyridazine	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Sulfadiazine	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Sulfadimethoxine	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Sulfamerazine	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Sulfamethazine	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Sulfamethizole	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Sulfamethoxazole	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Sulfathiazole	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
TCEP	ng/L	10	ND		ND		ND		ND		13		ND		ND		ND		ND		ND	
TCPP	ng/L	100	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
TDCPP	ng/L	100	ND		ND		ND		4500		ND		ND		ND		ND		ND		ND	
Testosterone	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Theobromine	ng/L	10	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Thiabendazole	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Triclocarban	ng/L	5	ND		ND		ND		ND		ND		ND		ND	UJ	ND		ND		ND	
Triclosan	ng/L	10	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Trimethoprim	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Warfarin	ng/L	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	

MRL = Minimum Reporting Level; ND = Not Detected above MRL; "---" = Not Analyzed; Qual = Data Qualifier
mg/L = milligrams per liter (ppm); µg/L = micrograms per liter (ppb); ng/L = nanograms per liter (ppt)
µS/cm = microsiemens per centimeter; mV = millivolts
MPN/100ml = Most Probable Number (colony forming units) per 100 ml; CFU/100ml = Colony Forming Units per 100 ml
Notes:
1) Some analytes are listed twice as they were analyzed via multiple methods.
2) Data qualifiers:
J = Value is detected and the result is estimated.
J- = Value is detected and the result is estimated and biased low.
J+ = Value is detected and the result is estimated and biased high.
UJ = Result is a non-detect and the value is estimated.
R = Result rejected.

Appendix D

Data Validation Report

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DATA VALIDATION REPORT

Woodland Creek and Deschutes River Surface Water Sampling Events

Laboratory: Eurofins Eaton Analytical

Laboratory Report Numbers: 544127, 544128, 550503, 550543, 550669, 550672, 550677, 553117, 553164, 553166, 553169, 553171, 553173, 553257, 553258, 553259, 553285, 557538, 557539, 557554, 557555, 557560, 557562, 557781, 557785, 557793, 557843, 557844, 562207, 565805, 565807, 565813, 565822, 565834, 565836, 566001, 566004, 566066, 566117, 566118, and 566119

Dates of Sampling: 8/28/2015, 8/27/2015, 9/10/2015, 9/14/2015, 9/15/2015, 10/12/2015, 10/13/2015, 12/7/2015, and 12/8/2015

INTRODUCTION

This report presents data validation for the four 2015 Woodland Creek and Deschutes River Sampling events for LOTT Clean Water Alliance (LOTT). These samples were collected in accordance with the procedures and protocols specified in the *Work Plan - Surface Water Quality Characterization Woodland Creek and Deschutes River*. The laboratory data report and Quality Assurance and Quality Control (QA/QC) data are included in this data validation report.

Verification and validation steps addressed in this report are:

- Sampling Procedures and Chain of Custody
- Holding Times
- Detection Limit
- Minimum Reporting Level (MRL) Check
- Surrogate Spike Recoveries
- Laboratory Matrix Spike/Matrix Spike Duplicates (MS/MSD) Recoveries and Relative Percent Differences (RPD)
- Laboratory Control Sample (LCS) Recoveries
- Laboratory Method Blank
- Duplicate Field Sample

Data that do not satisfy some verification and validation steps are qualified. Qualifier definitions are as follows, unless otherwise noted in subsequent sections:

- J = Analyte is detected and the result is an estimate
- J- = Analyte is detected and the result is an estimate, biased low
- J+ = Analyte is detected and the result is an estimate, biased high
- UJ = Analyte is not detected and the result is an estimate

- R = Result is rejected

SAMPLING PROCEDURES and CHAIN OF CUSTODY

Samples were collected from four sampling events from the following locations: Beatty Springs, Eagle Creek, Fox Creek, Woodland Creek - Lower, Woodland Creek - Upper, in the Woodland Creek watershed and Chambers Creek, Deschutes River- Lower, Deschutes River- Upper, Munn Lake, and Percival Creek in the Deschutes River watershed. Grab samples were collected directly from the stream, into new laboratory bottles. Lake samples were taken from just below the surface (0.5 m depth) from the northern shoreline, at the public boat ramp. Field filtering was performed on the samples that were analyzed for metals using new QED high-flow 0.45-micron disposable filters and a portable peristaltic pump with new tubing for each sample. Samples were labeled, sealed, placed in a cooler, and delivered to Eurofins Eaton Analytical in Monrovia, California. Bacteria samples were delivered to Centric Analytical in Port Orchard, Washington.

Table D-1. Laboratory Analytical Parameters for Surface Water Samples Collected

Parameter	Method	Hold Time	
Residual Chemicals	EEA's PPCP LC/MS/MS Method	28 days	LCS, Method Blank, MRL Check, MS/MSD
Nitrate, nitrite	EPA 300, 351.1, 351.2	48 hours	LCS, Method Blank, MRL Check, MS/MSD
Ammonia, TKN	EPA 350.1, 351.2	28 days	LCS, Method Blank, MRL Check, MS/MSD
Total phosphorous, orthophosphate	EPA 365.1&365.2, SM4500P-E	28 days	LCS, Method Blank, MRL Check, MS/MSD
Fecal coliform	SM 9222D	8 hours	None
Total coliform	SM 9222B	30 hours	None
Total organic carbon	SM 5310C	28 days	LCS, Method Blank, MRL Check, MS/MSD
Biological oxygen demand	SM 5210B	48 hours	LCS, Method Blank, MRL Check, MS/MSD
Dissolved Metals (Ag, As, B, Br, Ca, Cd, Cl, Cr, Cu, F, Fe, Hg, Pb, Mg, Mn, Na, Pb, Ni, Se, Si, Zn)	EPA 200 series	180 days (28 days for Hg)	LCS, Method Blank, MRL Check, MS/MSD
Total Recoverable Metals (Hg, Se)	EPA 200 series, SM 7470A	180 days (28 days for Hg)	LCS, Method Blank, MRL Check, MS/MSD

Parameter	Method	Hold Time	
Total dissolved solids	SM 2540C	7 days	LCS, Method Blank, MRL Check, MS/MSD
Total suspended solids	SM2540-D	7 days	LCS, Method Blank, MRL Check, MS/MSD
Alkalinity/carbonate	SM 2320B	14 days	LCS, Method Blank, MRL Check, MS/MSD
Hardness	EPA 130.2	14 days	LCS, Method Blank, MRL Check, MS/MSD

A copy of the completed chain-of-custody (COC) forms is included in the Data Packages for all batches analyzed for the sampling event. The forms were properly filled out and include relinquished and received signatures. Shipments were received by the laboratory on the day following sampling. The cooler temperatures ranged from 0.2^{o} to 5.8^{o} C, and frozen wet ice was present in each cooler.

HOLDING TIMES

The maximum holding times of surface water for the various analyses are included in **Table D-1**. Samples were extracted and analyzed within the holding times with the following exceptions:

- One sample analyzed for Method SM 9222B exceeded hold time for lab report 550543. The sample was J qualified.
- One sample analyzed for Method SM 9222D exceeded hold time for lab report 550543. The sample J qualified.
- Upon initial review, several analytes for method LC-MS-MS were determined to have exceeded hold times for lab samples 544127, 544128, 550503, 550543, 550669, 550672, 550677, 553117, 553164, 553166, 553169, 553171, 553173, 553257, 553258, 553259, 553285, 557538, 557539, 557554, 557555, 557560, 557562, 557781, 557785, 557793, 557843, and 557844. Detections were initially qualified as J- and non-detects were qualified as UJ. However, a subsequent hold time study was conducted in 2016 to determine the effects of long hold times on the pharmaceuticals and personal care products (PPCPs) and perflourinated compounds (PFCs) analyzed by method LC-MS-MS. A brief summary of that hold time study and its results is provided below.

Method LC-MS-MS Hold Time Study

The laboratory hold times for PPCPs and PFCs analyzed by Method LC-MS-MS in the examination of surface water quality ranged from 2 to 53 days. Although EEA's laboratory method has no formalized hold times for these compounds, these hold times are longer than the 28 day analytical schedule EEA customarily utilizes for processing such samples.

To evaluate the effects of these extended hold times, EEA conducted a study to evaluate the effects of extending the hold times to 84 days for PPCPs. EEA also prepared information documenting that PFCs are very stable. The methods and the detailed results of that study are presented in a summary memorandum by HDR dated November 9, 2016, and in EEA's report, "Holding Time Study Results for PPCPs and Metformin, LOTT Clean Water Alliance Project" dated November 4, 2016. Both documents are included as Attachment A to this data validation report.

The results of the hold time study indicate that 90 of the 98 compounds evaluated appear to remain stable throughout the 84 day period. Eight compounds appear to show evidence of degradation or analytical variability, as follows:

- Two compounds (metazachlor and metolachlor) began to degrade after approximately two weeks. All metazachlor samples were analyzed past a two week hold time, all of the results for these two parameters are assigned an "R" data quality flag, indicating the data are rejected. Metolachlor was not analyzed in surface water samples.
- Four compounds (amoxicillin, azithromycin, cimetidine, and nonyl-phenol) show analytical variability on individual days and between days. Therefore, the results for these compounds should be considered semi quantitative (i.e., concentration results are estimates). "J" data quality flags are assigned for all of the results for these compounds (non-detects are assigned a "UJ" flag).
- Two compounds (nifedipine and theophyline) show concentrations consistently under or over the laboratory control sample (LCS) limits, but no evidence of inconsistent variability or degradation. This appears to be the result of a sample matrix effect or calibration artifact for this sample. "J" data quality flags are assigned for all of nifedipine results (non-detects are assigned a "UJ" flag). Theophyline was not analyzed in surface water samples.

DETECTION LIMIT

Detection limits are specified by the analytical methods. Minimum reporting limits (MRLs) are provided in **Table D-2** below. Analytes with results below the MRL are defined as "ND" (Not Detected).

Table D-2. Minimum Reporting Limits for Surface Water Analytes

Analyte	MRL	units	Analyte	MRL	units
Alkalinity in CaCO3	2	mg/L	Orthophosphate as P	0.01	mg/L
Ammonia Nitrogen	0.05	mg/L	pH	0.1	units
Arsenic	1	ug/L	Potassium	1	mg/L
Bicarb. Alkalinity as HCO3 calc.	1	mg/L	Selenium	5	ug/L
Boron	2	mg/L	Silica	0.5	mg/L
Bromide	0.05	ug/L	Silver	0.5	ug/L
Cadmium	5	ug/L	Sodium	1	mg/L
Carbonate as CO3 Calculated	2	mg/L	Specific Conductance	2	uS/cm
Calcium	0.5	mg/L	Sulfate	0.5	mg/L
Chloride	1	mg/L	Total Dissolved Solid (TDS)	10	mg/L

Analyte	MRL	units	Analyte	MRL	units
Chromium	1	ug/L	Total Hardness as CaCO3	3	mg/L
Copper	2	ug/L	Total Nitrate, Nitrite-N	0.1	mg/L
Iron	0.02	mg/L	Total Organic Carbon	0.3	mg/L
Kjeldahl Nitrogen	0.2	mg/L	Total Phosphorus as P	0.02	mg/L
Lead	0.5	ug/L	Zinc	20	ug/L
Magnesium	0.1	mg/L	Chloroform (Trichloromethane)	0.5	ug/L
Manganese	2	ug/L	Total THM	0.5	ug/L
Mercury	0.2	ug/L	Bromodichloromethane	0.5	ug/L
Nickel	5	ug/L	Bromoform	0.5	ug/L
Nitrate as Nitrogen	0.1	mg/L	Chloro-dibromomethane	0.5	ug/L
Nitrate as NO3 (calc.)	0.44	mg/L	Fecal Coliform	1.1	cfu/100 ml
Nitrite Nitrogen	0.05	mg/L	Total Coliform Bacteria	0.5	cfu/100 ml
			Total Coliform Bacteria (P/A)	1	/100 ml
Pharmaceuticals, Hormones, and Personal Care Products					
1,7-Dimethylxanthine	10	ng/L	Iohexal	10	ng/L
2,4-D	5	ng/L	Iopromide	5	ng/L
4-nonylphenol - semi quantitative	100	ng/L	Isobutylparaben	5	ng/L
4-tert-octylphenol	50	ng/L	Isoproturon	100	ng/L
Acesulfame-K	20	ng/L	Ketoprofen	5	ng/L
Acetaminophen	5	ng/L	Ketorolac	5	ng/L
Albuterol	5	ng/L	Lidocaine	5	ng/L
Amoxicillin (semi-quantitative)	20	ng/L	Lincomycin	10	ng/L
Androstenedione	5	ng/L	Linuron	5	ng/L
Atenolol	5	ng/L	Lopressor	20	ng/L
Atrazine	5	ng/L	Meclofenamic Acid	5	ng/L
Azithromycin	20	ng/L	Meprobamate	5	ng/L
Bendroflumethiazide	5	ng/L	Metazachlor	5	ng/L
Bezafibrate	5	ng/L	Methylparaben	20	ng/L
Bromacil	5	ng/L	Metolachlor	5	ng/L
Butalbital	5	ng/L	Naproxen	10	ng/L
Butylparben	5	ng/L	Nifedipine	20	ng/L
Caffeine	5	ng/L	Norethisterone	5	ng/L
Carbadox	5	ng/L	Oxolinic acid	10	ng/L
Carbamazepine	5	ng/L	Pentoxifylline	5	ng/L
Carisoprodol	5	ng/L	Phenazone	5	ng/L
Chloramphenicol	10	ng/L	Primidone	5	ng/L
Chloridazon	5	ng/L	Progesterone	5	ng/L
Chlorotoluron	5	ng/L	Propazine	5	ng/L
Cimetidine	5	ng/L	Propylparaben	5	ng/L
Clofibric Acid	5	ng/L	Quinoline	5	ng/L
Cotinine	10	ng/L	Simazine	5	ng/L
Cyanazine	5	ng/L	Sucralose	100	ng/L
DACT	5	ng/L	Sulfachloropyridazine	5	ng/L
Dehydronifedipine	5	ng/L	Sulfadiazine	5	ng/L
DEA	5	ng/L	Sulfadimethoxine	5	ng/L
DEET	10	ng/L	Sulfamerazine	5	ng/L

Analyte	MRL	units	Analyte	MRL	units
DIA	5	ng/L	Sulfamethazine	5	ng/L
Diazepam	5	ng/L	Sulfamethizole	5	ng/L
Diclofenac	5	ng/L	Sulfamethoxazole	5	ng/L
Dilantin	20	ng/L	Sulfathiazole	5	ng/L
Diltiazem	5	ng/L	TCEP	10	ng/L
Diuron	5	ng/L	TDCPP	100	ng/L
Erythromycin	10	ng/L	TCPP	100	ng/L
Estradiol	5	ng/L	Testosterone	5	ng/L
Estrone	5	ng/L	Theobromine	10	ng/L
Ethinyl Estradiol - 17 alpha	5	ng/L	Theophylline	20	ng/L
Ethylparaben	20	ng/L	Triclocarban	5	ng/L
Flumeqine	10	ng/L	Triclosan	10	ng/L
Fluoxetine	10	ng/L	Trimethoprim	5	ng/L
Gemfibrozil	5	ng/L	Warfarin	5	ng/L
Ibuprofen	10	ng/L			

MRLs were met for all but 5 analytes (Table D-3).

Table D-3. Analytes exceeding anticipated method reporting limits.

Analyte	MRL Specified	MRL Obtained
Bicar. Alkalinity as HCO3 calc	1 mg/L	2 mg/L
Bromide	0.05 ug/L	5 ug/L
Calcium	0.5 mg/L	1 mg/L
Copper [1]	2 mg/L	4 mg/L
Total Organic Carbon[2]	0.3 mg/L	0.6 mg/L

1. The MRL for samples 201511120092B, 201511120102B and 201512080400B in lab reports 562207, 565813, and 565836 was raised by a factor of 2 due to laboratory dilution.
2. The MRL for sample 201511120104A in lab report 566004 was raised by a factor of 2 due to laboratory dilution.

MINIMUM REPORTING LEVEL (MRL) CHECK

A reporting level standard is included with every batch/analytical run to confirm the instrument response with the given batch. The following qualifications were made for data exceeding MRL recoveries QC limits:

Table D-4. MRL Checks Exceeding QC Limits

Lab Report Number	Sample ID	Analyte	Native Value	MRL_CHECK	QC Limits (%)	Qualifier
553166	201507200070	Propylparaben	ND	317%	50-150	UJ
544128	201507200071					
553173	201507200076					
553258	201507200074					
553259	201507200077					
553285	201507200075					
557538	201510130159	Triclocarban	ND	-2.89	50-150%	UJ
557555	201510130236					
557560	201510130250					
557562	201510130253					
557843	201510140367					
557844	201510140369					
557781	201510140210	Azithromycin	ND	219%	50-150	UJ
557785	201510140218					
557793	201510140241					
557844	201510140369					
557843	201510140367					
566001	201511120099	Arsenic Total ICAP/MS	ND	238%	50-150	UJ
565822	201511120085	Arsenic Total ICAP/MS	1 ug/L	238%	50-150	J
565834	201511120086	Arsenic Total ICAP/MS	1.3 ug/L	238%	50-150	J
566066	201511120088	Arsenic Total ICAP/MS	1 ug/L	238%	50-150	J
566117	201511120094	Arsenic Total ICAP/MS	2.1 ug/L	238%	50-150	J
566118	201511120090	Arsenic Total ICAP/MS	1.4 ug/L	238%	50-150	J
557781	201510140210	4-tert-octylphenol	170 ng/L	840%	50-150	J
557793	201510140241	4-tert-octylphenol	140 ng/L	840%	50-150	J

LABORATORY MATRIX SPIKES/SPIKE DUPLICATES (MS/MSD) RECOVERIES and RELATIVE PERCENT DIFFERENCES (RPD)

To assess potential matrix effects, an environmental sample and a duplicate are spiked with known concentrations of target analytes. The percent recovery of the target analytes is compared to statistical control limits.

Analytes that failed both MS and MSD are qualified as estimated. Analytes that were not detected and that had MS/MSD recoveries below 10 percent were rejected. Analytes that failed on only the MS or the MSD are considered acceptable and the data are not qualified for these analytes. Sample concentrations that exceed the spike added concentrations by more than a factor of four are not flagged.

MS and MSD recoveries were all within the QC limits with the following exceptions noted in **Table D-5**. In addition, in instances where the spike recovery is high, but the results are ND, there is no impact on the data since ND with high recovery is still ND. Samples spiked for MS/MSD from non-LOTT projects were not evaluated.

Table D-5. Laboratory Matrix Spikes and Spike Duplicates Exceeding QC Limits

Lab Report Number	Sample ID	Analyte	Native Value	MS % Yield	MSD % Yield	QC Limits (%)	Qualifier
544127	201507200046	1,7-Dimethylxanthine[1]	ND	0.798	0.911	60-140	R
544127	201507200046	Azithromycin[1]	ND	52	39	60-140	UJ
544127	201507200046	Carbadox[1]	ND	38	41	60-140	UJ
544127	201507200046	Chloridazon[1]	ND	12	14	60-140	UJ
544127	201507200046	Cimetidine[1]	ND	18	18	60-140	UJ
544127	201507200046	Fluoxetine[1]	ND	55	52	60-140	UJ
544127	201507200046	Ketorolac[1]	ND	54	51	60-140	UJ
544127	201507200046	Pentoxifylline[1]	ND	16	19	60-140	UJ
544127	201507200046	Phenazone[1]	ND	40	42	60-140	UJ
544127	201507200046	Sulfadiazine[1]	ND	3	3.2	60-140	R
544127	201507200046	Thiabendazole[1]	ND	23	23	60-140	UJ
553117	201507200078	1,7-Dimethylxanthine[2]	ND	19	22	60-140	UJ
553117	201507200078	Chloridazon[2]	ND	23	27	60-140	UJ
553117	201507200078	Cimetidine[2]	ND	40	46	60-140	UJ
553117	201507200078	Lidocaine[2]	ND	47	52	60-140	UJ
553117	201507200078	Lopressor[2]	ND	49	49	60-140	UJ
553117	201507200078	Meprobamate[2]	ND	49	49	60-140	UJ
553117	201507200078	Sulfadiazine[2]	ND	20	22	60-140	UJ
557539	20150130161	1,7-Dimethylxanthine	ND	6	6	60-140	R
557539	20150130161	Azithromycin	94	201	190	60-140	J+
557539	20150130161	Ketorolac	ND	44	45	60-140	UJ
557539	20150130161	Lidocaine	ND	29	30	60-140	UJ
557539	20150130161	Meprobamate	ND	53	55	60-140	UJ
557539	20150130161	Thiabendazole	ND	51	51	60-140	UJ
557539	20150130161	Sulfadiazine	ND	6.9	6.9	60-140	R
557844	201510140369	1,7-Dimethylxanthine	ND	4.9	4.3	60-140	R
557844	201510140369	Carbadox	ND	25	19	60-140	UJ
557844	201510140369	Chloridazon	ND	40	42	60-140	UJ
557844	201510140369	Cimetidine	ND	29	38	60-140	UJ
557844	201510140369	Ketorolac	ND	35	36	60-140	UJ
557844	201510140369	Lidocaine	ND	28	28	60-140	UJ
557844	201510140369	Meprobamate	ND	49	46	60-140	UJ
557844	201510140369	Pentoxifylline	ND	27	27	60-140	UJ

Lab Report Number	Sample ID	Analyte	Native Value	MS % Yield	MSD % Yield	QC Limits (%)	Qualifier
557844	201510140369	Sulfadiazine	ND	1.1	0.939	60-140	UJ
557844	201510140369	Sulfamerazine	ND	22	26	60-140	UJ
557844	201510140369	Sulfamethazine	ND	42	43	60-140	UJ
557844	201510140369	Sulfamethizole	ND	51	48	60-140	UJ
557844	201510140369	Sulfathiazole	ND	37	35	60-140	UJ
557844	201510140369	Thiabendazole	ND	39	42	60-140	UJ
562207	201511120084	1,7-Dimethylxanthine	ND	4.2	4.6	60-140	R
562207	201511120084	Azithromycin	ND	13	13	60-140	UJ
562207	201511120084	Bromacil	ND	35	35	60-140	UJ
562207	201511120084	Chloridazon	ND	42	38	60-140	UJ
562207	201511120084	Dilantin	ND	34	32	60-140	UJ
562207	201511120084	Fluoxetine	ND	56	50	60-140	UJ
562207	201511120084	Lidocaine	ND	53	50	60-140	UJ
562207	201511120084	Sulfadiazine	ND	22	21	60-140	UJ
562207	201511120084	Sulfamerazine	ND	45	40	60-140	UJ
562207	201511120084	Sulfathiazole	ND	44	36	60-140	UJ
565807	201512080380	Chloramphenicol	ND	57	53	60-140	UJ
565807	201512080380	Sucralose	520	144	144	60-140	J+
566066	201511120088	Kjeldahl Nitrogen	0.6	84	86	90-110	J-

[1]Analytes for field duplicate sample 201507200054 in lab report 544127 also qualified.

[2]MS/MSD analysis was performed on field duplicate sample. Analytes for parent sample 201507200071 in lab report 544128 also qualified.

The RPDs for the MS/MSD were within acceptable laboratory tolerances, with the following exceptions:

- Propylparaben for sample 201507200072 in lab report 553169 had an MS/MSD RPD of 45% versus a QC limit of 40%. The sample was J qualified.

LABORATORY CONTROL SAMPLE (LCS) RECOVERIES

Laboratory Control Samples (LCS) are samples of known concentration that are carried through the extraction and analysis process. The percent recovery is the percentage of the theoretical concentration, and has statistical control limits indicating that the analytical process is "in control."

An LCS sample was run in duplicate with the work order samples. LCS recoveries were all within the QC limits with the exceptions noted in **Table D-6**. In addition, in instances where the LCS recovery is high, but the native result is ND, there is no impact on the data since ND with high recovery is still ND.

Table D-6. Laboratory Control Samples Exceeding QC Limits

Lab Report Number	Sample ID	Analyte	Native Value	LCS1 Yield %	LCS2 Yield %	QC Limits (%)	Qualifier
557781	201510140210	4-nonylphenol - semi quantitative	180	161	164	60-140	J+
557785	201510140218	Biochemical Oxygen DemandTotl	ND	82	N/A	85-115	UJ
557793	201510140241	4-nonylphenol - semi quantitative	220	161	164	60-140	J+
557844	201510140369	Biochemical Oxygen DemandTotl	ND	82	N/A	85-115	UJ
562207	201511120084	Biochemical Oxygen DemandTotl	ND	76	N/A	85-115	UJ
565805	201512080377	Biochemical Oxygen DemandTotl	ND	76	N/A	85-115	UJ
565807	201512080380	Biochemical Oxygen DemandTotl	ND	76	N/A	85-115	UJ
565813	201512080399	Biochemical Oxygen DemandTotl	ND	76	N/A	85-115	UJ
565822	201511120085	Biochemical Oxygen DemandTotl	ND	76	N/A	85-115	UJ
565834	201511120086	Biochemical Oxygen DemandTotl	ND	76	N/A	85-115	UJ

The RPDs for the LCS1 and LCS were within acceptable laboratory tolerances, with the following exceptions:

- Quinoline for sample 201510130159 in lab report 557538 had an RPD of 39% versus a QC limit of 30%. The sample was J qualified.

LABORATORY METHOD BLANK

An aliquot of reagent water was carried through the entire analytical process. The method blank results indicate any possible contamination exposure during the sample handling, digestion, or extraction process and analysis. In most instances, compounds were not detected at or above the method reporting limits. For compounds that were detected at or above the reporting limit, the result of the native sample was either a non-detect or ten times grater than the method blank result. Therefore, no qualifications were made.

DUPLICATE FIELD SAMPLE

A duplicate sample was secured for during each sampling event. RPDs ranged from 0% to 179%. Generally, an RPD of less than 20 percent is desirable. **Tables D-7 through D-10** lists the RPDs that exceeded 20%.

Table D-7. Field Duplicate RPDs Exceeding 20% - Fox Creek – August 2015 Sampling Event

Analyte	Fox Creek	Field Duplicate	RPD
Orthophosphate as P	0.094	0.048	65%
Calcium Total ICAP	12	15	22%
Total Coliform	960	760	23%
Fecal Coliform	78	52	40%
Total phosphorus as P	0.1	0.027	115%
Total Organic Carbon	5.9	1.1	137%
Calcium Total ICAP	12	15	22%
Iron Total ICAP	0.85	0.046	179%
Manganese Total ICAP/MS	190	22	158%
Bromide	19	29	42%
Sulfate	2.3	8	111%

RPD = [(Parent Sample) – (Field Duplicate)]/[mean(Parent Sample, Field Duplicate)] X 100

Table D-8. Field Duplicate RPDs Exceeding 20% - Fox Creek – September 2015 Sampling Event

Analyte	Fox Creek	Field Duplicate	RPD
Fecal Coliform	7	34	132

RPD = [(Parent Sample) – (Field Duplicate)]/[mean(Parent Sample, Field Duplicate)] X 100

Table D-9. Field Duplicate RPDs Exceeding 20% - Betty Springs – October 2015 Sampling Event

Analyte	Beatty Springs	Field Duplicate	RPD
Turbidity	0.26	0.39	40%
Acesulfame-K	400	550	32%
Carbamazepine	5.4	8	39%
Cation Sum - Manual Calculation	1	2	67%
Total Coliform	75	100	29%
Total Organic Carbon	0.4	0.49	20%

RPD = [(Parent Sample) – (Field Duplicate)]/[mean(Parent Sample, Field Duplicate)] X 100

Table D-10. RPDs Exceeding 20% - Munn Lake – December 2015 Sampling Event

Analyte	Munn Lake	Field Duplicate	RPD
Total Dissolved Solid (TDS)	23	30	26%
Total Coliform	150	220	38%
Fecal Coliform	3	4	29%

RPD = [(Parent Sample) – (Field Duplicate)]/[mean(Parent Sample, Field Duplicate)] X 100

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Attachment A

Hold Time Study Documentation

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Memorandum

To: Wendy Steffensen, LOTT Clean Water Alliance	
From: John Koreny and Jeff Hansen, HDR	Project: LOTT Reclaimed Water Infiltration Study
CC:	
Date: November 9, 2016	Job No: 238761

RE: Hold Time Analysis, PPCPs and Metformin

Background

Eurofins Eaton Analytical, Inc. (EEA), the laboratory under contract to provide analytical services in support of LOTT's Reclaimed Water Infiltration Study, or RWIS) has completed an analysis to determine the effects of extended hold times on pharmaceuticals and personal care products (PPCPs), perfluorinated compounds (PFCs) and metformin (referred to collectively as "residual chemicals" in the RWIS). This analysis was completed to address questions that have arisen regarding the 28 to 70 day hold times that occurred between sample collection and analysis during the 2015 groundwater, surface water, and reclaimed water quality characterization efforts regarding PPCPs, PFCs and metformin. Although EEA's laboratory method has no formalized hold times for these compounds, these hold times are longer than the 28 day analytical schedule EEA customarily utilizes for processing such samples. (Other parameters analyzed as part of the RWIS were almost all run within established formal hold times.) The full details of this issue are explained in a May, 16, 2016 memorandum by HDR.

Some of the reviewers of the draft Task 1 (Water Quality Characterization) technical memoranda have asked whether extended hold times for these compounds may have caused bias in the reported concentrations of PPCPs, PFCs and metformin. In response, EEA prepared information documenting that PFCs are very stable with hold times past 70 days (presented in the HDR May 16, 2016 memorandum). EEA also agreed to conduct a hold time study evaluating the effects of extending the hold times to 70 days for PPCPs and metformin. The methods and results of that study are presented in EEA's November 4, 2016 report, "Holding Time Study Results for PPCPs and Metformin, LOTT Clean Water Alliance Project," and the full analytical results are presented in an electronic spreadsheet. Both items are incorporated by reference to this memorandum.

Summary of Method

A full explanation of EEA's methods are presented in EEA's November 4, 2016 report. A brief description is below:

- Three Class A reclaimed water samples (each comprised of four 1-liter bottles with preservative) were collected at the Martin Way Reclaimed Water Plant on June 15, 2016. Upon receipt by EEA, the four bottles comprising each sample were composited so as to provide 4-liter sample volumes for each sample. These were then analyzed for PPCPs and metformin. Between 19 and 22 compounds were detected above the method detection limits in the three samples.
- One sample was then spiked on June 30, 2016, with a known concentration in the range of 1 to 4 parts per billion (ppb) for each of 98 compounds. Eleven replicates of the spiked sample were each run on LC-MS-MS instrumentation at 0, 2, 4, 7, 16, 30, 45, 60, 69 and 84 days after the spike. For each run, a 1 to 10 dilution was employed to ensure that the results were within the

range of the LOTT sample results and within the range of the calibration curve for the instrument.

- Two Laboratory Control Samples (LCS) were prepared using spiked reagent water and run for each of the periods specified above. The purpose of the LCS is to identify the range of variability in the method and instrument results.

Summary of Results

The results of the study indicate that 90 of the 98 compounds evaluated appear to remain stable throughout the 84 day period. Eight compounds appear to show evidence of degradation or analytical variability.

- Two compounds (metazachlor and metolachlor) begin to degrade after approximately two weeks. "R" data quality flags are recommended for samples analyzed after approximately two weeks indicating that the data are unreliable. An "R" flag indicates that, "The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified." (Ecology, 2016)[1].
- Four compounds (amoxicillin, azithromycin, cimetidine, and nonyl-phenol) show analytical variability on individual days and between days. Therefore, the results for those should be considered semi quantitative (i.e., concentration results are estimates). "J" data quality flags are recommended in the reports for all of the results for these compounds. A "J" flag indicates that, "The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample." (Ecology, 2016).
- Two compounds (nifedipine and theophyline) show concentrations consistently under or over the laboratory control sample (LCS) limits, but no evidence of inconsistent variability or degradation. This appears to be the result of a sample matrix effect or calibration artifact for this sample. "J" data quality flags are recommended for these two compounds.

Recommendations

The following recommendations are proposed for the technical memoranda documenting the 2015 groundwater, surface water and wastewater/reclaimed water sampling and water quality analysis.

- The EEA November 4, 2016 hold time study report will be included by reference into each of HDR's reports. The results will be summarized in the laboratory data validation section of each report.
- The laboratory data summary tables will be flagged as suggested by EEA (and as summarized above).
    - Because all metazachlor and metolachlor samples were analyzed past a two week hold time, all of the results for these two parameters will be assigned an "R" data quality flag.
    - All amoxicillin, azithromycin, cimetidine, nifedipine, nonyl-phenol and theophyline results will be assigned a "J" data quality flag. All of these chemicals (with the exception of theophyline, which was not included in the original list of analytes sampled for in wastewater and reclaimed water) were detected at least once in raw wastewater, while only nifedipine and nonyl-phenol were also detected in reclaimed water. None of these compounds were detected in any of the groundwater and surface water samples, with the exception of a detection of nonyl-phenol in one groundwater well.

[1] Source: http://www.ecy.wa.gov/programs/eap/mar_wat/datacodes.html.

    - All other data quality flags regarding hold times will be removed for PPCPs, PFCs and metformin from the summary tables in the report.

- Future PPCP, PFC and metformin analysis for the LOTT RWIS project will be run within a 28-day hold time from the date of sample collection.

eurofins | Eaton Analytical

November 4, 2016

To: John Koreny and Jeff Hansen, HDR Engineering, Inc.

From: Andy Eaton and Ali Haghani, Eurofins Eaton Analytical, Inc. (EEA)

cc: Vanessa Berry (EEA), Brad Cahoon (EEA), Daniel Lashbrook (EEA), Robert Dean (EEA)

Subject: Holding Time Study Results for PPCPs (EEA Method 9609 and Metformin), LOTT Clean Water Alliance Project

Introduction

A study was completed by Eurofins Eaton Analytical, Inc. (EEA) to determine the effects of holding preserved refrigerated water samples for a period of up to 84 days (12 weeks) prior to analysis using EEA's Method 9609 "Pharmaceuticals and Personal Care Products (PPCPs)" and Metformin. This study was completed as part of the LOTT Clean Water Alliance (LOTT) project evaluating the presence of PPCPs (also referred to by LOTT as Residual Chemicals) in surface water, groundwater and treated wastewater (reclaimed water) in the South Puget Sound area of Washington State. The reason for conducting the hold time study is that during the prior sampling of groundwater, surface water and reclaimed water, hold times were up to 10 weeks after sampling for the PPCP and Metformin laboratory analysis. The purpose of the hold time study is to examine the effects these extended hold times may have on the analytical results and to recommend whether data quality flags should be included in laboratory reporting.

The hold time study was completed by spiking one reclaimed water sample with a known concentration of the target PPCP compounds and performing 11 replicate analyses on the sample each at periods of 0, 2, 4, 7, 16, 30, 45, 60, 69, and 84 days.

The results of the study indicate that 92 out of the 98 compounds reported appear to remain stable through the length of the hold time study. Six compounds appear to show evidence of either degradation or analytical variability.

- Two compounds (metazachlor and metolachlor) begin to degrade after approximately 2 weeks. "R" data quality flags are recommended in the reports for all of the results for these compounds after degradation starts.

- Additionally, four compounds (amoxicillin, azithromycin, cimetidine, and nonyl-phenol) show analytical variability on individual days and between days; thus, results for those should be considered semi quantitative (results are estimates). "J" flags are recommended in the reports for all of the results for these compounds.

In addition, two compounds (nifedipine and theophyline) show concentrations consistently under or over the laboratory control sample (LCS) limits, but no evidence of inconsistent variability or degradation. This appears to be the result of a sample matrix effect or calibration artifact for this sample. ”J” flags are recommended in the reports for these compounds.

Methods

The methods used for the holding time study are summarized below.

- Three 4-liter grab samples were collected by HDR from the LOTT Martin Way Reclaimed Water Plant on June 15, 2016, using bottles provided by EEA, containing sodium omadine and ascorbic acid as preservatives. The samples were placed on ice and transmitted by next-day air delivery to EEA’s laboratory in Monrovia, California.

- The three 4-liter samples were received on June 16, 2016 and were each composited to create samples A, B and C. The three samples were analyzed using Liquid Chromatography-Tandem Mass Spectrometry (LC-MS-MS) as per the Method 9609 process on June 16 and for metformin on June 17, within 2 days of receipt, and retested the following week using high resolution mass spectrometry.

- All of the samples exhibited similar results. However, Sample A was chosen for the hold time study because it had fewer unknown peaks than the other two after looking at the full scan high resolution mass spectrometry data.

- EEA then prepared the spike sample on June 30, 2016, which was 15 days after the sample was collected. EEA spiked a 100 ml aliquot of Sample A with 1- 4 ppb of each target analyte and then transferred it to 5ml amber vials and stored refrigerated.

- The spiked Sample A was then run on the LC-MS-MS at periods of 0, 2, 4, 7, 16, 30, 45, 60, 69, and 84 days after spiking the sample on June 30, 2016. For each run, one of the vials was brought to room temperature, diluted 1/10 into 11 auto-sampler vials, the internal standard was added, and each vial analyzed. The 1/10 dilution ensured that all compounds would be within the range of the results for the LOTT study and within the range of the calibration curve (so multiple dilutions would not be required and the study could be completed within the allocated time period). Eleven replicates were analyzed on each day in order to provide a more robust understanding of the effects of hold times and analytical precision.

- With each batch we included two freshly prepared Laboratory Control Standards (LCS) consisting of reagent water spiked with the target analytes, to monitor instrument performance in the absence of matrix effects and holding time effects.

- Fresh calibration working stock standards (WSS) were prepared periodically, as noted below. Calibration stock preparation dates are indicated on the raw data worksheets. The original calibration standard was changed after 16 days because we started at that time to see changes in albuterol and we were not sure if it was the matrix or the WSS. After day 16 a fresh working stock standard was prepared for calibrations and the LCS for each analytical sequence to avoid any questions regarding calibration stability.

Results

Evaluation of Results

- Results are presented in the form of percent recoveries (i.e., with 100% reflecting the known spiked concentration). To facilitate analysis of the data for observing trends, all results were normalized to the day 0 recoveries by averaging all 11 of the day 0 recovery measurements (measurements made the same day as the sample was spiked) for each compound and comparing subsequent measurements to that average.

- To evaluate possible degradation, data were compared to both recovery ranges calculated from both the 20 LCS samples analyzed with these holding time samples and the limits set in the lab Laboratory Information Management System (LIMS) database for the LCS samples, which are based on longer term observed historical precision. Additionally, when the compounds were also included in EPA method 1694, results were reviewed against the limits found in that method, which are generally much wider than the EEA limits. Note that all of these limits are for reagent water and do not take into account any matrix effects expected from analyzing reclaimed water samples.

- In some cases data are missing for a particular analyte on some days because the calibration did not come out on that day for that compound or no peak was identified by the mass spectrometer. The causes for these aberrant data are not clear. These are shown as blanks in the tables and Excel workbook.

Presentation of Results

The project results are summarized in Tables 1 to 3. Table 1 includes the summary data (normalized against day 0) and the EEA conclusions regarding stability. Table 2 includes the LCS limits, as described below. Table 3 includes the raw data, as described below.

Also, the full analytical data package is provided electronically in the Excel workbook titled, “HDR-Lott project holding time study 20160929”. The Excel workbook has multiple tabs within it, including:

- Tab “raw data”: Raw data as percent recovery not normalized and normalized results compared to the average of day 0 recoveries and standard deviations and relative standard deviations of the 11 replicates on each day
- Tab “LCS Calculated Control Limits”: Upper and lower Laboratory Control Sample (LCS) control limits calculated from the 20 associated QC samples (LCS – spiked reagent water).
- Tab “Summary and Conclusions”: Summary of normalized data, LCS limits, and EEA conclusions on stability of each compound
- Tab “HDR Target List”: HDR target analyte list.
- Tab “1694 QC limits”: LCS limits found in EPA method 1694.
- Tab “Spiked levels”: Spiking levels for each compound for holding time study and concentration expected in samples when analyzed
- Tab “WSS recoveries over time”: Information on working stock standard recoveries reanalyzed on each day with the new WSS used for calibration on that analysis day to determine any potential problems with standard preparation on a given day.
- Tab “Rerun WSS day 0”: Ratio of working stock standard (WSS) from analysis day compared to initial day 0 WSS (based on the average of the LCS samples on day 0 which were prepared from the day 0 WSS). This is another way to determine if compounds in individual WSS might have been incorrectly prepared on a given day or even if the day 0 WSS had any preparation issues. Note that the primary stock standard diluted and used to prepare the WSS was not changed through the course of the study.
- Tab “Cal Tech and Internal standard”: Detailed information on calibration technique (internal standard calibration or external calibration) used for each compound, including the compound used as an internal standard for quantitation when the internal standard technique was used and the mix used for individual compounds, as preparing the 98 compounds required the use of 9 unique stock standard mixes.
- Tab “analysis of unspiked sample”. This shows the results for the original 3 samples of reclaimed water submitted for evaluation for use in the

spiking study. Because all samples had similar concentrations, sample MWRW-A was used for spiking.

Summary of Results

The results of the study indicate that 92 out of the 98 compounds reported appear to remain stable through the length of the hold time study. Six compounds appear to show evidence of either degradation or analytical variability.

- Two herbicides are clearly degrading over the course of the 84 day study (metazachlor and metolachlor). Both of these show significant degradation in this matrix within ~2 weeks. Metazachlor is almost completely gone, but metolachlor is still present after 84 days, but at only ~ 30% of the original concentration. Results for these two compounds should be flagged as “R”, rejected data, for samples analyzed after two weeks. Note that metolachlor was also included in the LOTT results provided using Method 525, but with higher reporting limits.

- Three compounds (cimetidine, amoxicillin, and nonyl-phenol) all showed poor precision during the study (and are normally considered semiquantitative by EEA) and results are inconclusive because of that and should be flagged with a “J”, as estimated results. No data are available for azithromycin because calibration results were poor, and it could not be included in the holding time study, so data for this compound should also be flagged with a “J”, as estimated results.

- In addition, two compounds (nifedipine and theophyline) show concentrations consistently under or over the laboratory control sample (LCS) limits, but no evidence of inconsistent variability or degradation. This appears to be the result of a sample matrix effect or calibration artifact for this sample. ”J” flags are recommended in the reports for these compounds.

Table 1. Summary Data and Conclusions

Working Stock Standard ID						WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 07-15-16	WSS-07-25-16	WSS 08-15-16	WSS 08-29-16	WSS 09-07-16	WSS-09-21-16	EEA conclusions regarding stability				
Analytical Date						7/1/2016	7/3/2016	7/5/2016	7/8/2016	7/17/2016	7/31/2016	8/15/2016	8/30/2016	9/7/2016	9/21/2016					
Days Since Spike						0	2	4	7	16	30	45	60	69	84					
	EEA Method LCS Lower Limit (%)	EEA Method LCS Upper Limit (%)	Study LCS Lower Limit (%)	Study LCS Upper Limit (%)												Stable, Most Results Within LCS Limits During Full Study Period, Fully Quantitative Results, No QC Flag	Stable With Degradation Occuring After 2 Weeks, QC "R" QC Flag Results After Degradation Starts	Results Highly Variable, Semi-Quantitative, Recommend "J" QC Flag All Results as Estimates	Results Often Outside LCS Limits, But No Degradation or Extreme Variability (Possible Matrix or Calibration Artifact in HT study, J flag)	Comment
17 alpha ethynylestradiol - M-H					**Average**	89.2	88.3	89.3	88.5	82.3	77.2	99.3	110.7	127.5	95.1					
					Stdev	9.3	5.2	7.1	6.5	7.5	3.9	8.4	8.5	17.9	13.9					
	60	140	72	138	Normalized	100%	99%	100%	99%	92%	87%	111%	124%	143%	107%	x				
					% Rsd	10.4%	5.8%	7.9%	7.3%	9.1%	5.1%	8.5%	7.7%	14.0%	14.7%					
17B-Estradiol - M-H					**Average**	97.9	98.1	95.7	94.2	81.6	78.8	105.1	106.8	118.8	96.6					
					Stdev	4.7	2.9	2.2	10.5	7.9	3.7	7.0	6.7	14.9	7.6					
	60	140	72	140	Normalized	100%	100%	98%	96%	83%	81%	107%	109%	121%	99%	x				
					% Rsd	4.8%	2.9%	2.3%	11.1%	9.6%	4.7%	6.7%	6.2%	12.5%	7.9%					
2,4-D					**Average**	125.1	89.0	122.8	123.7	111.8	85.2	107.6	111.1	143.6	143.8					
					Stdev	15.0	10.1	10.3	10.7	11.5	6.1	10.1	8.0	17.9	19.1					
	60	140	54	141	Normalized	100%	71%	98%	99%	89%	68%	86%	89%	115%	115%	x				
					% Rsd	12.0%	11.3%	8.4%	8.7%	10.3%	7.2%	9.3%	7.2%	12.4%	13.3%					
4-tert-OctylphenoL					**Average**	84.5	120.9	122.5	129.7	63.5	81.4	127.5	109.6	104.4	97.6					
					Stdev	6.6	10.3	8.5	15.5	21.8	4.5	13.2	15.4	12.0	10.8					
	60	140	59	121	Normalized	100%	143%	145%	154%	75%	96%	151%	130%	124%	116%	x				
					% Rsd	7.8%	8.5%	7.0%	11.9%	34.3%	5.6%	10.4%	14.1%	11.5%	11.0%					
Acesulfame					**Average**	95.6	97.0	95.3	94.8	96.6	88.2	104.8	99.5	119.0	125.5					
					Stdev	6.3	6.4	8.2	9.4	3.1	5.3	6.9	5.5	3.2	7.7					
	60	140	93	110	Normalized	100%	101%	100%	99%	101%	92%	110%	104%	124%	131%	x				
					% Rsd	6.6%	6.6%	8.6%	9.9%	3.2%	6.0%	6.6%	5.5%	2.7%	6.1%					
Acetaminophen					**Average**	89.7	103.9	110.9	105.7	86.2	75.9	105.0	85.9	73.1	80.9					
					Stdev	10.6	15.4	7.1	15.0	13.1	8.6	7.8	8.9	8.5	5.7					
	60	140	84	113	Normalized	100%	116%	124%	118%	96%	85%	117%	96%	82%	90%	x				
					% Rsd	11.9%	14.8%	6.4%	14.2%	15.1%	11.3%	7.5%	10.3%	11.7%	7.0%					
Albuterol					**Average**	105.9	107.2	105.6	119.8	127.7	74.5	152.4	592.6	102.8	122.5					
					Stdev	10.2	6.4	19.1	18.9	16.4	22.6	22.3	206.9	15.8	14.1					
	60	140	24	156	Normalized	100%	101%	100%	113%	121%	70%	144%	560%	97%	116%	x				Working std problem on day 60
					% Rsd	9.6%	6.0%	18.1%	15.8%	12.9%	30.3%	14.7%	34.9%	15.4%	11.5%					

Working Stock Standard ID						WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 07-15-16	WSS-07-25-16	WSS 08-15-16	WSS 08-29-16	WSS 09-07-16	WSS-09-21-16	EEA conclusions regarding stability				
Analytical Date						7/1/2016	7/3/2016	7/5/2016	7/8/2016	7/17/2016	7/31/2016	8/15/2016	8/30/2016	9/7/2016	9/21/2016					
Days Since Spike						0	2	4	7	16	30	45	60	69	84					
	EEA Method LCS Lower Limit (%)	EEA Method LCS Upper Limit (%)	Study LCS Lower Limit (%)	Study LCS Upper Limit (%)												Stable, Most Results Within LCS Limits During Full Study Period, Fully Quantitative Results, No QC Flag	Stable With Degradation Occuring After 2 Weeks, QC "R" QC Flag Results After Degradation Starts	Results Highly Variable, Semi-Quantitative, Recommend "J" QC Flag All Results as Estimates	Results Often Outside LCS Limits, But No Degradation or Extreme Variability (Possible Matrix or Calibration Artifact in HT study, J flag)	Comment
Amoxicilin					**Average**	32.5	28.8	38.3	35.5	310.2	101.2	408.7	678.3	682.7	604.5					
					Stdev	13.8	6.2	14.8	10.7	46.1	17.1	55.9	62.5	63.9	61.4					
	60	140	61	147	Normalized	100%	89%	118%	109%	953%	311%	1256%	2085%	2099%	1858%			x		Continuing WSS did not match day 0. Considered semi-quantitative
					% Rsd	42.4%	21.4%	38.6%	30.1%	14.9%	16.9%	13.7%	9.2%	9.4%	10.2%					
Andorostenedione					**Average**	68.9	61.4	65.0	72.7	85.4	49.8	78.7	91.1	87.7	101.1					
					Stdev	7.8	8.7	6.1	10.0	10.3	5.7	10.7	19.2	8.9	12.1					
	60	140	63	139	Normalized	100%	89%	94%	106%	124%	72%	114%	132%	127%	147%	x				
					% Rsd	11.3%	14.2%	9.3%	13.8%	12.0%	11.5%	13.6%	21.1%	10.1%	12.0%					
Atenolol					**Average**	47.3	38.0	39.4	47.4	40.9	33.7	46.7	69.2	56.9	51.7					
					Stdev	4.7	2.8	2.6	4.3	1.9	2.1	3.9	9.4	2.9	2.3					
	60	140	67	138	Normalized	100%	80%	83%	100%	86%	71%	99%	146%	120%	109%	x				
					% Rsd	10.0%	7.3%	6.7%	9.0%	4.6%	6.3%	8.4%	13.6%	5.1%	4.5%					
Atrazine					**Average**	72.7	72.1	71.9	66.7	85.1	65.3	73.5	63.4	85.4	76.6					
					Stdev	3.5	5.6	4.0	9.2	2.3	3.3	3.9	5.2	3.2	5.9					
	60	140	82	121	Normalized	100%	99%	99%	92%	117%	90%	101%	87%	117%	105%	x				
					% Rsd	4.9%	7.8%	5.5%	13.7%	2.7%	5.0%	5.3%	8.2%	3.8%	7.7%					
Azithromycin	60	140	not tested															x		Unable to get reliable calibration. Semi quant
Bendroflumethiazide - M-H					**Average**	171.0	170.4	174.8	166.0	102.5	261.8	125.3	114.9	137.3	112.2					
					Stdev	12.8	13.7	12.7	11.5	4.5	11.4	7.8	17.0	7.8	8.4					
	60	140	74	116	Normalized	100%	100%	102%	97%	60%	153%	73%	67%	80%	66%	x				Continuing WSS did not match day 0 WSS. Drop due to calibration issues
					% Rsd	7.5%	8.0%	7.3%	7.0%	4.4%	4.4%	6.2%	14.8%	5.7%	7.5%					
Bezafibrate					**Average**	166.9	166.4	163.2	179.4	137.7	145.4	206.4	177.0	188.9	185.4					
					Stdev	10.9	7.1	9.9	8.8	9.5	6.1	15.2	18.1	13.7	13.5					
	60	140	74	126	Normalized	100%	100%	98%	107%	82%	87%	124%	106%	113%	111%	x				
					% Rsd	6.5%	4.3%	6.1%	4.9%	6.9%	4.2%	7.3%	10.2%	7.3%	7.3%					
Bisphenol A					**Average**	101.8	94.6	95.2	97.0	89.8	72.8	97.1	104.4	98.2	93.4					
					Stdev	10.7	2.3	3.2	6.8	4.4	3.4	3.4	21.5	3.6	3.4					
	60	140	90	110	Normalized	100%	93%	94%	95%	88%	72%	95%	103%	96%	92%	x				
					% Rsd	10.5%	2.5%	3.3%	7.0%	4.9%	4.7%	3.5%	20.6%	3.6%	3.7%					
Bromacil					**Average**	132.8	129.8	135.1	145.0	111.3	131.0	163.6	118.4	133.4	142.3					

Working Stock Standard ID						WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 07-15-16	WSS-07-25-16	WSS 08-15-16	WSS 08-29-16	WSS 09-07-16	WSS-09-21-16	EEA conclusions regarding stability				
Analytical Date						7/1/2016	7/3/2016	7/5/2016	7/8/2016	7/17/2016	7/31/2016	8/15/2016	8/30/2016	9/7/2016	9/21/2016					
Days Since Spike						0	2	4	7	16	30	45	60	69	84					
	EEA Method LCS Lower Limit (%)	EEA Method LCS Upper Limit (%)	Study LCS Lower Limit (%)	Study LCS Upper Limit (%)												Stable, Most Results Within LCS Limits During Full Study Period, Fully Quantitative Results, No QC Flag	Stable With Degradation Occuring After 2 Weeks, QC "R" QC Flag Results After Degradation Starts	Results Highly Variable, Semi-Quantitative, Recommend "J" QC Flag All Results as Estimates	Results Often Outside LCS Limits, But No Degradation or Extreme Variability (Possible Matrix or Calibration Artifact in HT study, J flag)	Comment
					Stdev	9.5	10.1	9.5	13.1	9.0	6.3	9.3	21.1	10.4	13.6					
	60	140	79	111	Normalized	100%	98%	102%	109%	84%	99%	123%	89%	100%	107%	x				
					% Rsd	7.2%	7.8%	7.0%	9.0%	8.1%	4.8%	5.7%	17.8%	7.8%	9.5%					
Clofibric acid					**Average**	131.7	134.6	124.7	131.4	124.3	101.8	126.7	103.1	118.9	124.9					
					Stdev	4.9	5.5	3.7	4.7	8.7	4.8	5.1	6.1	19.8	7.5					
	60	140	75	129	Normalized	100%	102%	95%	100%	94%	77%	96%	78%	90%	95%	x				
					% Rsd	3.7%	4.1%	3.0%	3.6%	7.0%	4.7%	4.1%	5.9%	16.6%	6.0%					
Butalbital					**Average**	106.0	113.7	114.4	134.8	120.6	112.7	122.4	133.4	141.3	137.2					
					Stdev	8.4	9.4	7.3	10.7	6.8	4.6	10.3	40.1	11.7	9.6					
	60	140	75	116	Normalized	100%	107%	108%	127%	114%	106%	115%	126%	133%	129%	x				
					% Rsd	7.9%	8.2%	6.4%	7.9%	5.7%	4.1%	8.5%	30.1%	8.3%	7.0%					
Butylparaben-NEG					**Average**	96.5	98.0	96.9	98.1	92.1	98.1	121.0	106.6	146.0	115.6					
					Stdev	3.3	3.5	2.8	7.4	3.1	4.3	4.4	3.8	16.9	4.3					
	60	140	68	129	Normalized	100%	102%	100%	102%	95%	102%	125%	110%	151%	120%	x				WSS bias on day 69.
					% Rsd	3.4%	3.6%	2.9%	7.5%	3.4%	4.3%	3.7%	3.5%	11.6%	3.7%					
Caffeine					**Average**	99.2	110.2	110.2	99.4	98.1	94.2	105.4	120.8	112.2	111.1					
					Stdev	23.5	30.2	19.8	26.9	33.6	29.1	37.3	52.9	19.5	37.9					
	60	140	86	121	Normalized	100%	111%	111%	100%	99%	95%	106%	122%	113%	112%	x				
					% Rsd	23.7%	27.4%	18.0%	27.0%	34.3%	30.9%	35.4%	43.8%	17.3%	34.1%					
Carbadox					**Average**	107.8	104.2	103.7	99.1	106.8	84.3	110.6	121.8	120.7	130.1					
					Stdev	10.4	10.0	11.5	15.5	7.6	14.0	12.1	14.7	22.2	20.4					
	60	140	61	140	Normalized	100%	97%	96%	92%	99%	78%	103%	113%	112%	121%	x				
					% Rsd	9.7%	9.6%	11.1%	15.7%	7.1%	16.6%	10.9%	12.1%	18.4%	15.6%					
Carbamazepine					**Average**	129.4	126.7	128.2	130.6	121.1	96.0	120.6	124.4	132.9	128.6					
					Stdev	4.5	3.7	5.5	10.1	7.2	4.3	4.9	6.4	5.8	6.2					
	60	140	81	118	Normalized	100%	98%	99%	101%	94%	74%	93%	96%	103%	99%	x				
					% Rsd	3.5%	2.9%	4.3%	7.8%	5.9%	4.5%	4.1%	5.2%	4.4%	4.8%					
Carisoprodol					**Average**	115.1	126.0	140.6	142.5	101.9	184.6	185.4	100.1	143.8	151.1					
					Stdev	17.6	21.2	29.8	28.8	15.0	156.5	68.0	31.8	16.0	24.7					
	60	140	53	139	Normalized	100%	109%	122%	124%	89%	160%	161%	87%	125%	131%	x				
					% Rsd	15.3%	16.9%	21.2%	20.2%	14.7%	84.8%	36.7%	31.8%	11.1%	16.3%					
Chloramphenicol_M-H					**Average**	104.4	102.6	97.7	101.7	106.6	86.0	102.9	77.4	98.3	97.9					
					Stdev	6.9	5.7	7.8	9.0	9.0	6.9	7.6	3.9	11.2	9.5					
	60	140	66	134	Normalized	100%	98%	94%	97%	102%	82%	99%	74%	94%	94%	x				
					% Rsd	6.6%	5.6%	8.0%	8.8%	8.5%	8.1%	7.4%	5.0%	11.4%	9.7%					

Working Stock Standard ID						WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 07-15-16	WSS-07-25-16	WSS 08-15-16	WSS 08-29-16	WSS 09-07-16	WSS-09-21-16	EEA conclusions regarding stability					
Analytical Date						7/1/2016	7/3/2016	7/5/2016	7/8/2016	7/17/2016	7/31/2016	8/15/2016	8/30/2016	9/7/2016	9/21/2016						
Days Since Spike						0	2	4	7	16	30	45	60	69	84						
	EEA Method LCS Lower Limit (%)	EEA Method LCS Upper Limit (%)	Study LCS Lower Limit (%)	Study LCS Upper Limit (%)												Stable, Most Results Within LCS Limits During Full Study Period, Fully Quantitative Results, No QC Flag	Stable With Degradation Occuring After 2 Weeks, QC "R" QC Flag Results After Degradation Starts	Results Highly Variable, Semi-Quantitative, Recommend "J" QC Flag All Results as Estimates	Results Often Outside LCS Limits, But No Degradation or Extreme Variability (Possible Matrix or Calibration Artifact in HT study, J flag)		Comment
Chloridazon					**Average**	82.1	80.0	91.5	92.0	72.4	86.5	111.0	91.2	118.4	130.9						
					Stdev	9.4	7.7	10.4	8.7	24.1	7.3	11.4	9.5	8.9	16.7						
	60	140	75	120	Normalized	100%	97%	111%	112%	88%	105%	135%	111%	144%	159%	x					Positive bias in day 69 and 84 WSS
					% Rsd	11.5%	9.6%	11.3%	9.5%	33.3%	8.5%	10.3%	10.4%	7.5%	12.7%						
Chlorotoluron					**Average**	98.8	94.3	100.9	104.5	95.7	102.2	142.1	121.7	143.9	139.0						
					Stdev	6.2	5.0	4.8	10.0	4.5	5.4	7.9	10.3	9.4	9.6						
	60	140	75	123	Normalized	100%	95%	102%	106%	97%	103%	144%	123%	146%	141%	x					No obvious reason for increase in results.
					% Rsd	6.3%	5.3%	4.8%	9.6%	4.7%	5.2%	5.5%	8.4%	6.5%	6.9%						
Cimetidine - PRM					**Average**	39.2	52.9	33.6	108.2	18.9	no data	17.2	no data	35.2	14.5						
					Stdev	3.3	3.8	3.8	7.5	5.9	no data	4.5	no data	6.9	3.3						
	60	140	71	133	Normalized	100%	135%	86%	276%	48%	no data	44%	no data	90%	37%			x			Difficult to calibrate-semi-quant.
					% Rsd	8.5%	7.2%	11.4%	6.9%	31.3%	no data	26.3%	no data	19.5%	22.5%						
Cotinine - PRM					**Average**	113.3	115.1	127.6	96.6	100.5	84.7	97.3	116.8	115.2	123.3						
					Stdev	8.7	6.3	11.5	6.7	8.7	11.7	7.5	23.6	9.5	12.7						
	60	140	75	120	Normalized	100%	102%	113%	85%	89%	75%	86%	103%	102%	109%	x					
					% Rsd	7.7%	5.5%	9.0%	6.9%	8.6%	13.8%	7.8%	20.2%	8.2%	10.3%						
Cyanazine					**Average**	73.9	75.6	74.1	72.6	54.6	64.0	70.8	50.3	70.7	67.7						
					Stdev	3.5	2.4	2.7	5.1	45.8	3.3	3.8	28.5	4.4	3.3						
	60	140	88	112	Normalized	100%	102%	100%	98%	74%	87%	96%	68%	96%	92%	x					
					% Rsd	4.7%	3.2%	3.7%	7.0%	84.0%	5.2%	5.4%	56.6%	6.3%	4.9%						
DACT					**Average**	179.2	156.5	208.0	174.0	158.0	185.1	197.4	215.3	142.9	199.2						
					Stdev	26.4	33.1	31.4	30.0	19.9	26.7	33.8	63.9	18.3	23.4						
	60	140	61	128	Normalized	100%	87%	116%	97%	88%	103%	110%	120%	80%	111%	x					
					% Rsd	14.8%	21.1%	15.1%	17.3%	12.6%	14.4%	17.1%	29.7%	12.8%	11.7%						
DEA					**Average**	92.8	88.7	97.1	106.9	73.0	64.8	101.2	67.2	96.3	131.5						
					Stdev	18.0	15.8	12.3	28.6	16.3	12.2	16.9	17.7	10.8	45.0						
	60	140	86	117	Normalized	100%	96%	105%	115%	79%	70%	109%	72%	104%	142%	x					No obvious cause for day 84 change.
					% Rsd	19.4%	17.8%	12.6%	26.8%	22.4%	18.8%	16.7%	26.3%	11.2%	34.2%						
DEET					**Average**	80.7	79.3	83.1	86.2	85.0	77.1	91.5	85.4	81.1	84.3						
					Stdev	4.6	4.9	3.8	5.0	3.5	4.4	6.6	8.7	4.5	3.9						
	60	140	76	117	Normalized	100%	98%	103%	107%	105%	96%	113%	106%	101%	105%	x					
					% Rsd	5.7%	6.2%	4.5%	5.8%	4.1%	5.8%	7.2%	10.2%	5.5%	4.7%						

Working Stock Standard ID						WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 07-15-16	WSS-07-25-16	WSS 08-15-16	WSS 08-29-16	WSS 09-07-16	WSS-09-21-16	EEA conclusions regarding stability				
Analytical Date						7/1/2016	7/3/2016	7/5/2016	7/8/2016	7/17/2016	7/31/2016	8/15/2016	8/30/2016	9/7/2016	9/21/2016					
Days Since Spike						0	2	4	7	16	30	45	60	69	84					
	EEA Method LCS Lower Limit (%)	EEA Method LCS Upper Limit (%)	Study LCS Lower Limit (%)	Study LCS Upper Limit (%)												Stable, Most Results Within LCS Limits During Full Study Period, Fully Quantitative Results, No QC Flag	Stable With Degradation Occuring After 2 Weeks, QC "R" QC Flag Results After Degradation Starts	Results Highly Variable, Semi-Quantitative, Recommend "J" QC Flag All Results as Estimates	Results Often Outside LCS Limits, But No Degradation or Extreme Variability (Possible Matrix or Calibration Artifact in HT study, J flag)	Comment
Dehydronifedipine					**Average**	89.8	80.3	79.9	81.2	80.4	72.5	77.7	75.4	93.3	90.9					
					Stdev	4.5	5.0	6.0	5.2	6.9	4.0	4.6	4.5	6.3	3.7					
	60	140	82	127	Normalized	100%	89%	89%	90%	90%	81%	87%	84%	104%	101%	x				
					% Rsd	5.0%	6.2%	7.6%	6.4%	8.6%	5.5%	5.9%	6.0%	6.8%	4.1%					
DIA					**Average**	84.1	91.2	86.1	86.6	81.8	77.8	99.4	88.7	98.3	96.7					
					Stdev	12.0	8.9	10.1	18.6	11.0	9.6	9.3	12.1	9.5	15.0					
	60	140	90	111	Normalized	100%	108%	102%	103%	97%	92%	118%	105%	117%	115%	x				
					% Rsd	14.3%	9.7%	11.7%	21.4%	13.4%	12.3%	9.4%	13.7%	9.7%	15.5%					
Diazepam					**Average**	87.2	89.6	87.4	89.2	83.8	83.1	91.3	92.8	107.0	114.2					
					Stdev	3.2	1.7	4.5	5.6	4.2	4.2	3.9	7.5	5.8	4.4					
	60	140	86	116	Normalized	100%	103%	100%	102%	96%	95%	105%	106%	123%	131%	x				
					% Rsd	3.7%	1.9%	5.2%	6.3%	5.0%	5.0%	4.3%	8.1%	5.4%	3.8%					
Diclofenac- M-H					**Average**	96.3	99.5	100.4	101.4	94.4	77.2	105.7	102.8	127.4	104.2					
					Stdev	3.1	5.3	6.0	7.0	6.5	4.8	9.5	3.3	15.2	7.2					
	60	140	68	141	Normalized	100%	103%	104%	105%	98%	80%	110%	107%	132%	108%	x				
					% Rsd	3.2%	5.3%	6.0%	6.9%	6.9%	6.2%	9.0%	3.3%	11.9%	6.9%					
Dilantin - M-H					**Average**	96.0	90.8	89.5	96.5	109.0	82.1	105.2	93.0	131.9	104.3					
					Stdev	7.5	5.2	6.6	11.0	11.0	4.4	12.3	7.0	15.9	7.8					
	60	140	55	119	Normalized	100%	94%	93%	101%	114%	85%	109%	97%	137%	109%	x				
					% Rsd	7.8%	5.7%	7.4%	11.4%	10.1%	5.3%	11.7%	7.5%	12.1%	7.5%					
Diltiazem					**Average**	179.7	200.8	205.9	229.4	128.8	180.4	163.9	121.6	137.1	126.0					
					Stdev	9.7	12.8	9.0	10.1	9.7	10.9	12.6	12.0	13.1	6.9					
	60	140	74	126	Normalized	100%	112%	115%	128%	72%	100%	91%	68%	76%	70%	x				Continuing WSS did not match day 0; decrease is a calibration issue.
					% Rsd	5.4%	6.4%	4.4%	4.4%	7.5%	6.0%	7.7%	9.9%	9.6%	5.5%					
Diuron					**Average**	94.8	96.6	88.8	89.2	88.6	86.2	100.3	103.0	120.3	98.7					
					Stdev	2.2	3.3	3.6	4.8	4.1	2.2	3.6	4.3	12.6	4.5					
	60	140	75	131	Normalized	100%	102%	94%	94%	93%	91%	106%	109%	127%	104%	x				
					% Rsd	2.3%	3.4%	4.1%	5.4%	4.7%	2.6%	3.6%	4.2%	10.5%	4.6%					
Erythromycin					**Average**	110.2	171.3	147.0	161.8	78.5	203.2	144.8	96.3	103.1	82.0					
					Stdev	7.8	11.1	17.5	17.4	5.8	9.0	8.5	7.3	15.3	6.8					
	60	140	64	137	Normalized	100%	155%	133%	147%	71%	184%	131%	87%	94%	74%	x				Continuing WSS did not match day 0; drop is a Calibration issue
					% Rsd	7.1%	6.5%	11.9%	10.8%	7.5%	4.4%	5.9%	7.5%	14.9%	8.3%					

Working Stock Standard ID						WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 07-15-16	WSS-07-25-16	WSS 08-15-16	WSS 08-29-16	WSS 09-07-16	WSS-09-21-16	EEA conclusions regarding stability				
Analytical Date						7/1/2016	7/3/2016	7/5/2016	7/8/2016	7/17/2016	7/31/2016	8/15/2016	8/30/2016	9/7/2016	9/21/2016					
Days Since Spike						0	2	4	7	16	30	45	60	69	84					
	EEA Method LCS Lower Limit (%)	EEA Method LCS Upper Limit (%)	Study LCS Lower Limit (%)	Study LCS Upper Limit (%)												Stable, Most Results Within LCS Limits During Full Study Period, Fully Quantitative Results, No QC Flag	Stable With Degradation Occuring After 2 Weeks, QC "R" QC Flag Results After Degradation Starts	Results Highly Variable, Semi-Quantitative, Recommend "J" QC Flag All Results as Estimates	Results Often Outside LCS Limits, But No Degradation or Extreme Variability (Possible Matrix or Calibration Artifact in HT study, J flag)	Comment
Estrone					**Average**	107.8	102.4	106.3	127.7	95.0	82.9	96.6	104.0	112.3	90.1					
					Stdev	8.3	7.4	9.2	9.3	10.8	5.8	12.7	18.3	13.0	7.4					
	60	140	75	124	Normalized	100%	95%	99%	118%	88%	77%	90%	97%	104%	84%	x				
					% Rsd	7.7%	7.2%	8.7%	7.3%	11.4%	7.0%	13.2%	17.6%	11.6%	8.2%					
Ethylparaben					**Average**	105.5	107.5	106.3	108.3	100.1	110.4	112.5	110.2	149.1	123.4					
					Stdev	2.1	2.5	1.8	16.6	6.4	10.1	4.0	5.3	15.5	4.8					
	60	140	70	132	Normalized	100%	102%	101%	103%	95%	105%	107%	104%	141%	117%	x				Day 69 WSS biased high.
					% Rsd	2.0%	2.3%	1.7%	15.3%	6.4%	9.2%	3.6%	4.9%	10.4%	3.9%					
Flumequine					**Average**	107.9	104.8	103.7	108.6	97.2	96.5	107.1	119.0	131.6	138.8					
					Stdev	6.4	6.5	7.7	12.3	9.1	5.5	6.4	14.4	9.2	11.2					
	60	140	80	121	Normalized	100%	97%	96%	101%	90%	89%	99%	110%	122%	129%	x				
					% Rsd	5.9%	6.2%	7.5%	11.3%	9.4%	5.7%	6.0%	12.1%	7.0%	8.0%					
Fluoxetine					**Average**	150.2	178.7	207.9	217.5	67.0	195.4	76.0	87.7	85.3	86.8					
					Stdev	10.8	40.1	36.2	34.4	3.8	24.7	11.7	17.5	13.4	14.2					
	60	140	59	146	Normalized	100%	119%	138%	145%	45%	130%	51%	58%	57%	58%	x				Continuing WSS did not match day 0; drop is a calibration issue.
					% Rsd	7.2%	22.4%	17.4%	15.8%	5.6%	12.6%	15.4%	19.9%	15.7%	16.3%					
Gemfibrozil					**Average**	114.0	114.9	118.1	113.9	114.7	64.6	84.7	85.8	137.7	188.6					
					Stdev	6.5	3.9	3.6	8.7	28.0	3.6	4.0	15.7	4.9	22.0					
	60	140	68	137	Normalized	100%	101%	104%	100%	101%	57%	74%	75%	121%	165%	x				High bias on day 69 and 84 WSS.
					% Rsd	5.7%	3.4%	3.0%	7.7%	24.4%	5.6%	4.7%	18.3%	3.5%	11.6%					
Ibuprofen					**Average**	99.8	101.6	95.6	98.3	84.4	86.2	102.4	111.6	142.4	112.1					
					Stdev	3.2	2.2	3.3	6.8	10.3	3.4	4.1	5.5	15.5	3.5					
	60	140	62	140	Normalized	100%	102%	96%	98%	85%	86%	103%	112%	143%	112%	x				
					% Rsd	3.2%	2.2%	3.4%	6.9%	12.3%	4.0%	4.1%	5.0%	10.9%	3.1%					
Iohexol - M+H					**Average**	87.8	84.1	83.7	84.5	66.7	83.0	76.0	102.8	130.1	112.7					
					Stdev	15.8	10.8	12.7	16.1	6.4	9.4	7.3	9.8	27.7	11.6					
	60	140	72	158	Normalized	100%	96%	95%	96%	76%	95%	87%	117%	148%	128%	x				
					% Rsd	18.0%	12.8%	15.2%	19.1%	9.6%	11.3%	9.6%	9.6%	21.3%	10.3%					
Iopromide - PRM					**Average**	97.1	78.8	73.5	95.2	79.4	74.4	68.7	79.5	95.0	98.3					
					Stdev	7.3	11.5	9.1	17.7	12.2	7.0	8.5	26.3	9.5	8.9					
	60	140	59	164	Normalized	100%	81%	76%	98%	82%	77%	71%	82%	98%	101%	x				
					% Rsd	7.5%	14.6%	12.4%	18.6%	15.4%	9.4%	12.4%	33.1%	10.0%	9.1%					
Isobuylparaben					**Average**	96.5	98.0	97.0	98.0	92.0	98.2	121.0	106.7	146.0	115.4					

Working Stock Standard ID						WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 07-15-16	WSS-07-25-16	WSS 08-15-16	WSS 08-29-16	WSS 09-07-16	WSS-09-21-16	EEA conclusions regarding stability				
Analytical Date						7/1/2016	7/3/2016	7/5/2016	7/8/2016	7/17/2016	7/31/2016	8/15/2016	8/30/2016	9/7/2016	9/21/2016					
Days Since Spike						0	2	4	7	16	30	45	60	69	84					
	EEA Method LCS Lower Limit (%)	EEA Method LCS Upper Limit (%)	Study LCS Lower Limit (%)	Study LCS Upper Limit (%)												Stable, Most Results Within LCS Limits During Full Study Period, Fully Quantitative Results, No QC Flag	Stable With Degradation Occuring After 2 Weeks, QC "R" QC Flag Results After Degradation Starts	Results Highly Variable, Semi-Quantitative, Recommend "J" QC Flag All Results as Estimates	Results Often Outside LCS Limits, But No Degradation or Extreme Variability (Possible Matrix or Calibration Artifact in HT study, J flag)	Comment
					Stdev	3.3	3.5	2.8	7.4	3.1	4.3	4.5	3.8	16.9	4.2					
	60	140	68	129	Normalized	100%	102%	100%	102%	95%	102%	125%	111%	151%	120%	x				Day 69 WSS biased high.
					% Rsd	3.4%	3.6%	2.9%	7.5%	3.4%	4.3%	3.7%	3.5%	11.6%	3.6%					
Isoproturon					**Average**	109.4	100.4	97.2	97.2	113.9	98.6	106.7	94.3	117.9	122.1					
					Stdev	6.0	3.6	6.1	7.1	11.2	6.4	5.1	5.6	5.9	7.7					
	60	140	83	129	Normalized	100%	92%	89%	89%	104%	90%	98%	86%	108%	112%	x				
					% Rsd	5.5%	3.6%	6.3%	7.3%	9.8%	6.5%	4.8%	6.0%	5.0%	6.3%					
Ketoprofen					**Average**	75.8	69.7	62.2	74.1	82.4	54.0	65.9	76.4	79.0	80.4					
					Stdev	4.1	4.8	5.2	6.9	5.8	3.9	6.1	6.5	4.3	6.4					
	60	140	67	125	Normalized	100%	92%	82%	98%	109%	71%	87%	101%	104%	106%	x				
					% Rsd	5.4%	6.8%	8.4%	9.3%	7.0%	7.2%	9.3%	8.6%	5.5%	8.0%					
Ketorolac					**Average**	70.0	65.4	63.3	70.1	76.4	48.2	59.4	61.1	70.2	79.8					
					Stdev	5.5	4.6	4.1	5.2	9.3	4.1	4.0	6.7	4.3	5.7					
	60	140	70	129	Normalized	100%	94%	90%	100%	109%	69%	85%	87%	100%	114%	x				
					% Rsd	7.9%	7.0%	6.5%	7.3%	12.2%	8.4%	6.8%	10.9%	6.1%	7.1%					
Lidocaine					**Average**	100.3	102.2	95.8	116.9	96.3	77.3	106.1	91.0	74.4	100.2					
					Stdev	7.7	5.6	6.6	10.0	10.0	6.4	10.0	13.0	5.8	8.1					
	60	140	73	143	Normalized	100%	102%	96%	116%	96%	77%	106%	91%	74%	100%	x				
					% Rsd	7.7%	5.5%	6.8%	8.6%	10.4%	8.3%	9.4%	14.3%	7.8%	8.1%					
Lincomycin					**Average**	101.2	119.2	128.4	144.3	102.0	128.5	101.9	140.5	122.1	127.5					
					Stdev	18.5	25.8	20.9	26.4	15.0	18.6	11.8	22.9	14.0	11.5					
	60	140	55	153	Normalized	100%	118%	127%	143%	101%	127%	101%	139%	121%	126%	x				
					% Rsd	18.3%	21.7%	16.2%	18.3%	14.7%	14.5%	11.6%	16.3%	11.4%	9.0%					
Linuron					**Average**	90.9	88.3	91.2	85.7	82.5	75.3	91.3	105.0	139.2	107.1					
					Stdev	2.6	2.9	2.9	7.1	3.6	3.7	4.2	4.1	16.1	4.6					
	60	140	72	134	Normalized	100%	97%	100%	94%	91%	83%	100%	115%	153%	118%	x				day 69 WSS biased high
					% Rsd	2.9%	3.3%	3.1%	8.2%	4.4%	4.9%	4.6%	3.9%	11.6%	4.3%					
Lopressor-Metoprolol					**Average**	113.7	115.1	108.3	109.5	102.7	95.3	127.9	122.0	123.4	119.4					
					Stdev	6.5	4.8	6.1	8.6	5.7	5.5	5.8	9.9	15.3	8.0					
	60	140	78	141	Normalized	100%	101%	95%	96%	90%	84%	112%	107%	109%	105%	x				
					% Rsd	5.7%	4.2%	5.6%	7.8%	5.6%	5.8%	4.5%	8.1%	12.4%	6.7%					
Meclofenamic Acid					**Average**	96.3	96.9	99.7	102.3	94.5	77.1	105.7	102.8	127.4	104.3					
					Stdev	3.1	5.4	6.1	7.7	6.5	4.7	9.5	3.3	15.2	7.2					
	60	140	67	142	Normalized	100%	101%	103%	106%	98%	80%	110%	107%	132%	108%	x				

Working Stock Standard ID						WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 07-15-16	WSS-07-25-16	WSS 08-15-16	WSS 08-29-16	WSS 09-07-16	WSS-09-21-16	EEA conclusions regarding stability					
Analytical Date						7/1/2016	7/3/2016	7/5/2016	7/8/2016	7/17/2016	7/31/2016	8/15/2016	8/30/2016	9/7/2016	9/21/2016						
Days Since Spike						0	2	4	7	16	30	45	60	69	84						
	EEA Method LCS Lower Limit (%)	EEA Method LCS Upper Limit (%)	Study LCS Lower Limit (%)	Study LCS Upper Limit (%)												Stable, Most Results Within LCS Limits During Full Study Period, Fully Quantitative Results, No QC Flag	Stable With Degradation Occuring After 2 Weeks, QC "R" QC Flag Results After Degradation Starts	Results Highly Variable, Semi-Quantitative, Recommend "J" QC Flag All Results as Estimates	Results Often Outside LCS Limits, But No Degradation or Extreme Variability (Possible Matrix or Calibration Artifact in HT study, J flag)		Comment
					% Rsd	3.2%	5.6%	6.1%	7.5%	6.9%	6.1%	9.0%	3.3%	11.9%	6.9%						
Meprobamate					**Average**	98.9	95.5	109.3	89.3	96.1	202.6	74.8	80.7	78.7	55.8						
					Stdev	15.9	19.4	24.7	25.4	21.6	38.0	15.7	15.7	10.0	15.1						
	60	140	76	144	Normalized	100%	97%	110%	90%	97%	205%	76%	82%	80%	56%	x					
					% Rsd	16.1%	20.3%	22.6%	28.4%	22.5%	18.8%	21.1%	19.5%	12.7%	27.1%						
Metazachlor					**Average**	70.7	64.2	52.2	52.1	35.5	15.6	9.7	4.7	4.5	-2.1						
					Stdev	4.0	2.3	2.7	4.8	3.2	1.1	0.7	0.9	0.7	0.3						
	60	140	76	131	Normalized	100%	91%	74%	74%	50%	22%	14%	7%	6%	-3%		x				degrades significantly in matrix after 15 days
					% Rsd	5.6%	3.6%	5.1%	9.1%	9.0%	7.3%	7.7%	18.5%	16.6%	-11.9%						
Metformin					**Average**	156.8	135.4	163.9	160.8	142.8	138.7	138.1	111.7	129.3	165.0						
					Stdev	26.6	21.4	38.2	38.0	15.4	23.6	18.2	30.5	18.7	19.1						
	60	140	58	143	Normalized	100%	86%	105%	103%	91%	88%	88%	71%	82%	105%	x					
					% Rsd	16.9%	15.8%	23.3%	23.6%	10.8%	17.0%	13.2%	27.3%	14.5%	11.6%						
Methylparaben - M-H					**Average**	124.3	124.2	115.7	119.4	117.2	113.6	141.3	122.4	159.2	118.5						
					Stdev	5.0	10.0	9.6	14.1	7.7	6.5	8.9	5.1	17.0	9.6						
	60	140	65	135	Normalized	100%	100%	93%	96%	94%	91%	114%	98%	128%	95%	x					
					% Rsd	4.0%	8.1%	8.3%	11.8%	6.6%	5.7%	6.3%	4.2%	10.7%	8.1%						
Metolachlor					**Average**	90.5	85.6	81.2	77.0	58.2	42.5	38.5	26.4	26.0	17.8						
					Stdev	4.7	3.1	2.8	5.1	2.6	2.0	1.9	1.8	1.3	0.9						
	60	140	89	114	Normalized	100%	95%	90%	85%	64%	47%	42%	29%	29%	20%		x				degrades after 15 days, but still present
					% Rsd	5.2%	3.7%	3.5%	6.6%	4.5%	4.6%	5.0%	6.8%	4.8%	5.1%						
Naproxen					**Average**	124.7	116.6	115.5	116.8	103.7	95.8	122.5	131.5	138.5	123.9						
					Stdev	5.2	6.3	8.4	12.1	9.6	6.8	13.3	8.6	19.9	13.3						
	60	140	75	127	Normalized	100%	94%	93%	94%	83%	77%	98%	105%	111%	99%	x					
					% Rsd	4.2%	5.4%	7.3%	10.3%	9.2%	7.1%	10.9%	6.5%	14.4%	10.8%						
Nifedipine					**Average**	106.1	123.9	125.7	165.0	157.8	103.9	180.5	142.5	260.0	137.6						
					Stdev	4.2	5.2	6.7	14.1	10.6	5.1	11.5	8.7	25.0	7.6						
	60	140	8	122	Normalized	100%	117%	118%	156%	149%	98%	170%	134%	245%	130%	x				x	Variability in WSS.
					% Rsd	3.9%	4.2%	5.3%	8.5%	6.7%	5.0%	6.4%	6.1%	9.6%	5.5%						
Nonyl-phenol					**Average**	117.1	216.6	235.2	284.6	84.0	172.7	210.5	144.8	161.0	138.5						
					Stdev	5.9	20.6	23.5	28.6	10.3	16.9	21.6	25.4	10.3	21.0						
	60	140	48	143	Normalized	100%	185%	201%	243%	72%	148%	180%	124%	138%	118%	x		x			Variability in WSS - semi quantitative.

Working Stock Standard ID						WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 07-15-16	WSS-07-25-16	WSS 08-15-16	WSS 08-29-16	WSS 09-07-16	WSS-09-21-16	EEA conclusions regarding stability				
Analytical Date						7/1/2016	7/3/2016	7/5/2016	7/8/2016	7/17/2016	7/31/2016	8/15/2016	8/30/2016	9/7/2016	9/21/2016					
Days Since Spike						0	2	4	7	16	30	45	60	69	84					
	EEA Method LCS Lower Limit (%)	EEA Method LCS Upper Limit (%)	Study LCS Lower Limit (%)	Study LCS Upper Limit (%)												Stable, Most Results Within LCS Limits During Full Study Period, Fully Quantitative Results, No QC Flag	Stable With Degradation Occuring After 2 Weeks, QC "R" QC Flag Results After Degradation Starts	Results Highly Variable, Semi-Quantitative, Recommend "J" QC Flag All Results as Estimates	Results Often Outside LCS Limits, But No Degradation or Extreme Variability (Possible Matrix or Calibration Artifact in HT study, J flag)	Comment
					% Rsd	5.1%	9.5%	10.0%	10.1%	12.3%	9.8%	10.3%	17.6%	6.4%	15.2%					
Norethisterone					**Average**	90.9	93.6	84.6	105.9	102.6	76.4	98.9	125.6	94.7	104.0					
					Stdev	8.5	5.0	6.5	20.1	15.9	6.4	7.0	52.3	8.4	8.1					
	60	140	72	146	Normalized	100%	103%	93%	117%	113%	84%	109%	138%	104%	114%	x				
					% Rsd	9.4%	5.3%	7.7%	18.9%	15.5%	8.4%	7.1%	41.6%	8.8%	7.8%					
Oxolinic Acid					**Average**	88.5	113.2	105.4	104.9	117.4	97.0	120.6	130.9	125.7	136.5					
					Stdev	7.1	5.1	11.1	10.3	13.0	6.3	6.6	9.5	8.7	7.2					
	60	140	71	145	Normalized	100%	128%	119%	119%	133%	110%	136%	148%	142%	154%	x				
					% Rsd	8.0%	4.5%	10.5%	9.8%	11.0%	6.5%	5.5%	7.3%	6.9%	5.3%					
Paraxanthine					**Average**	56.1	46.8	44.0	42.9	56.9	57.4	76.8	77.5	80.7	76.7					
					Stdev	6.5	4.3	4.6	7.5	4.9	9.1	8.0	21.7	8.5	12.2					
	60	140	70	120	Normalized	100%	83%	78%	76%	101%	102%	137%	138%	144%	137%	x				
					% Rsd	11.7%	9.1%	10.5%	17.6%	8.5%	15.9%	10.4%	28.0%	10.6%	15.9%					
Pentoxifylline					**Average**	61.2	80.5	71.2	70.2	74.7	56.1	92.4	63.3	76.3	74.2					
					Stdev	6.2	9.6	9.4	10.3	11.2	7.5	5.1	14.0	8.7	9.6					
	60	140	72	144	Normalized	100%	132%	116%	115%	122%	92%	151%	103%	125%	121%	x				
					% Rsd	10.2%	12.0%	13.3%	14.7%	15.0%	13.4%	5.5%	22.1%	11.4%	13.0%					
Phenazone					**Average**	110.8	115.4	113.6	109.2	115.4	86.9	118.0	92.1	87.9	102.7					
					Stdev	7.3	8.2	9.2	11.0	10.9	6.8	8.3	14.8	5.7	11.2					
	60	140	67	147	Normalized	100%	104%	102%	98%	104%	78%	106%	83%	79%	93%	x				
					% Rsd	6.6%	7.1%	8.1%	10.0%	9.4%	7.8%	7.1%	16.0%	6.5%	10.9%					
Primidone					**Average**	42.9	54.3	46.9	59.0	42.8	29.7	43.9	66.5	28.5	53.5					
					Stdev	10.4	7.4	4.0	8.3	9.2	6.2	8.0	11.3	3.9	7.7					
	60	140	64	146	Normalized	100%	126%	109%	138%	100%	69%	102%	155%	66%	125%	x				
					% Rsd	24.3%	13.6%	8.6%	14.1%	21.6%	20.8%	18.1%	17.1%	13.8%	14.4%					
Progesterone					**Average**	95.7	92.0	87.5	112.3	86.1	74.1	113.8	103.5	100.7	93.6					
					Stdev	9.2	8.2	8.9	11.3	6.6	6.9	12.1	12.6	7.9	10.1					
	60	140	71	143	Normalized	100%	96%	91%	117%	90%	77%	119%	108%	105%	98%	x				
					% Rsd	9.6%	8.9%	10.2%	10.1%	7.7%	9.2%	10.6%	12.2%	7.8%	10.8%					
Propazine					**Average**	95.9	91.6	86.8	87.9	96.2	79.1	91.4	89.3	118.1	99.7					
					Stdev	5.0	4.2	6.8	12.5	14.2	7.0	6.9	12.3	6.3	7.1					
	60	140	75	137	Normalized	100%	96%	90%	92%	100%	82%	95%	93%	123%	104%	x				
					% Rsd	5.2%	4.6%	7.9%	14.3%	14.7%	8.9%	7.5%	13.7%	5.3%	7.2%					
Propylparaben					**Average**	97.4	96.6	94.7	101.4	97.9	103.6	120.1	112.6	152.0	130.0					
					Stdev	2.4	3.5	3.6	6.9	6.1	3.0	3.8	8.0	16.4	7.3					

Working Stock Standard ID						WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 07-15-16	WSS-07-25-16	WSS 08-15-16	WSS 08-29-16	WSS 09-07-16	WSS-09-21-16	EEA conclusions regarding stability					
Analytical Date						7/1/2016	7/3/2016	7/5/2016	7/8/2016	7/17/2016	7/31/2016	8/15/2016	8/30/2016	9/7/2016	9/21/2016						
Days Since Spike						0	2	4	7	16	30	45	60	69	84						
	EEA Method LCS Lower Limit (%)	EEA Method LCS Upper Limit (%)	Study LCS Lower Limit (%)	Study LCS Upper Limit (%)												Stable, Most Results Within LCS Limits During Full Study Period, Fully Quantitative Results, No QC Flag	Stable With Degradation Occuring After 2 Weeks, QC "R" QC Flag Results After Degradation Starts	Results Highly Variable, Semi-Quantitative, Recommend "J" QC Flag All Results as Estimates	Results Often Outside LCS Limits, But No Degradation or Extreme Variability (Possible Matrix or Calibration Artifact in HT study, J flag)		Comment
	60	140	68	136	Normalized	100%	99%	97%	104%	101%	106%	123%	116%	156%	133%	x					High bias in WSS from day 69.
					% Rsd	2.5%	3.6%	3.8%	6.8%	6.3%	2.9%	3.2%	7.1%	10.8%	5.6%						
Quinoline					**Average**	95.3	83.2	79.9	86.6	79.4	70.7	87.7	95.0	108.9	84.2						
					Stdev	8.4	5.3	6.3	7.7	3.8	7.1	4.1	7.4	6.1	4.5						
	60	140	85	115	Normalized	100%	87%	84%	91%	83%	74%	92%	100%	114%	88%	x					
					% Rsd	8.8%	6.4%	7.9%	8.8%	4.8%	10.0%	4.6%	7.8%	5.6%	5.4%						
Simazine					**Average**	108.0	115.8	106.6	101.8	98.5	96.8	111.1	99.1	107.5	115.1						
					Stdev	4.6	6.4	3.4	9.1	6.7	4.8	4.9	4.4	7.0	5.2						
	60	140	87	109	Normalized	100%	107%	99%	94%	91%	90%	103%	92%	100%	107%	x					
					% Rsd	4.3%	5.5%	3.2%	8.9%	6.8%	4.9%	4.4%	4.4%	6.5%	4.5%						
Sucralose - M-H					**Average**	209.8	162.6	143.6	146.2	164.7	150.9	257.6	167.2	180.1	232.2						
					Stdev	26.8	31.3	19.3	25.0	25.1	30.3	12.9	50.1	45.5	43.4						
	60	140	90	114	Normalized	100%	78%	68%	70%	79%	72%	123%	80%	86%	111%	x					
					% Rsd	12.8%	19.3%	13.5%	17.1%	15.2%	20.1%	5.0%	29.9%	25.2%	18.7%						
Sulfachloropyridazine					**Average**	25.2	27.9	30.3	19.5	45.3	23.6	33.8	21.9	49.3	28.1						
					Stdev	8.9	11.2	9.1	4.1	10.1	8.9	7.5	6.8	7.3	5.4						
	60	140	65	133	Normalized	100%	111%	120%	78%	180%	94%	134%	87%	196%	112%	x					
					% Rsd	35.4%	40.1%	30.1%	20.7%	22.4%	37.6%	22.2%	31.1%	14.8%	19.1%						
Sulfadiazine					**Average**	96.2	109.6	100.2	76.8	59.7	86.0	126.9	108.3	132.2	86.0						
					Stdev	20.3	55.0	36.8	26.2	27.5	36.0	48.6	14.4	21.8	23.6						
	60	140	85	121	Normalized	100%	114%	104%	80%	62%	89%	132%	113%	137%	89%	x					
					% Rsd	21.2%	50.2%	36.8%	34.2%	46.0%	41.9%	38.3%	13.3%	16.5%	27.4%						
Sulfadimethoxine					**Average**	108.8	126.0	126.3	112.1	100.4	86.3	90.9	78.3	117.9	107.6						
					Stdev	11.0	12.5	14.3	18.9	11.1	2.9	7.9	5.1	12.1	12.0						
	60	140	65	137	Normalized	100%	116%	116%	103%	92%	79%	84%	72%	108%	99%	x					
					% Rsd	10.1%	9.9%	11.3%	16.8%	11.0%	3.4%	8.7%	6.5%	10.3%	11.2%						
Sulfamerazine					**Average**	115.9	113.1	97.3	118.3	120.5	116.8	104.3	90.4	104.2	104.3						
					Stdev	32.5	36.1	27.0	42.3	40.6	47.7	60.5	31.5	40.0	53.2						
	60	140	71	135	Normalized	100%	98%	84%	102%	104%	101%	90%	78%	90%	90%	x					
					% Rsd	28.0%	31.9%	27.8%	35.8%	33.7%	40.8%	58.0%	34.9%	38.4%	51.0%						
Sulfamethazine					**Average**	124.3	124.6	128.0	96.6	138.6	131.6	118.0	90.9	89.3	133.6						
					Stdev	33.5	38.1	59.2	31.9	58.2	35.9	27.9	37.3	62.0	38.7						
	60	140	71	137	Normalized	100%	100%	103%	78%	112%	106%	95%	73%	72%	107%	x					
					% Rsd	26.9%	30.6%	46.2%	33.0%	42.0%	27.3%	23.6%	41.1%	69.5%	28.9%						
Sulfamethizole					**Average**	230.9	207.3	214.2	167.5	287.5	293.8	263.8	220.4	186.4	183.2						

Working Stock Standard ID						WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 07-15-16	WSS-07-25-16	WSS 08-15-16	WSS 08-29-16	WSS 09-07-16	WSS-09-21-16	EEA conclusions regarding stability				
Analytical Date						7/1/2016	7/3/2016	7/5/2016	7/8/2016	7/17/2016	7/31/2016	8/15/2016	8/30/2016	9/7/2016	9/21/2016					
Days Since Spike						0	2	4	7	16	30	45	60	69	84					
	EEA Method LCS Lower Limit (%)	EEA Method LCS Upper Limit (%)	Study LCS Lower Limit (%)	Study LCS Upper Limit (%)												Stable, Most Results Within LCS Limits During Full Study Period, Fully Quantitative Results, No QC Flag	Stable With Degradation Occuring After 2 Weeks, QC "R" QC Flag Results After Degradation Starts	Results Highly Variable, Semi-Quantitative, Recommend "J" QC Flag All Results as Estimates	Results Often Outside LCS Limits, But No Degradation or Extreme Variability (Possible Matrix or Calibration Artifact in HT study,J flag)	Comment
					Stdev	40.5	46.7	42.5	34.5	38.7	46.0	46.3	68.4	76.9	87.6					
	60	140	76	115	Normalized	100%	90%	93%	73%	125%	127%	114%	95%	81%	79%	x				
					% Rsd	17.5%	22.5%	19.8%	20.6%	13.4%	15.7%	17.5%	31.0%	41.2%	47.8%					
Sulfamethoxazole					**Average**	88.8	90.3	88.9	88.2	87.3	65.1	82.6	84.3	90.2	89.2					
					Stdev	11.1	12.8	9.9	13.6	14.2	6.3	12.6	9.6	6.3	11.6					
	60	140	93	108	Normalized	100%	102%	100%	99%	98%	73%	93%	95%	102%	100%	x				
					% Rsd	12.5%	14.2%	11.2%	15.4%	16.2%	9.7%	15.2%	11.4%	7.0%	13.0%					
Sulfathiazole					**Average**	70.2	67.8	60.4	70.7	67.8	54.0	57.9	85.8	105.2	80.7					
					Stdev	9.2	7.5	7.4	15.2	10.4	11.0	16.1	13.7	14.0	15.3					
	60	140	62	133	Normalized	100%	97%	86%	101%	97%	77%	82%	122%	150%	115%	x				
					% Rsd	13.1%	11.1%	12.3%	21.5%	15.4%	20.4%	27.7%	16.0%	13.3%	18.9%					
Sulfometuron methyl					**Average**	54.2	46.9	50.1	42.9	54.7	46.1	56.7	60.1	82.1	85.3					
					Stdev	3.4	3.2	3.8	2.7	4.0	2.9	3.9	10.6	6.7	3.3					
	60	140	65	122	Normalized	100%	86%	92%	79%	101%	85%	104%	111%	151%	157%	x				High bias in some WSS.
					% Rsd	6.4%	6.8%	7.6%	6.2%	7.2%	6.3%	6.8%	17.6%	8.2%	3.9%					
TCEP					**Average**	65.5	72.1	68.7	67.5	48.0	49.1	65.9	81.2	87.4	103.6					
					Stdev	8.4	5.4	5.1	5.4	7.4	7.1	23.3	4.9	9.6	8.9					
	60	140	71	124	Normalized	100%	110%	105%	103%	73%	75%	101%	124%	134%	158%	x				
					% Rsd	12.8%	7.5%	7.5%	8.1%	15.3%	14.4%	35.4%	6.0%	11.0%	8.6%					
TCPP					**Average**	88.3	96.1	95.2	106.3	135.2	100.2	143.6	185.9	201.9	101.8					
					Stdev	7.1	7.6	7.4	13.9	22.3	13.3	13.9	212.8	36.7	7.8					
	40	160	18	203	Normalized	100%	109%	108%	120%	153%	113%	163%	210%	228%	115%	x				
					% Rsd	8.0%	7.9%	7.8%	13.1%	16.5%	13.3%	9.7%	114.5%	18.2%	7.7%					
TDCPP - PRM					**Average**	77.9	55.4	64.9	57.2	53.4	43.6	44.0	70.4	70.1	47.2					
					Stdev	10.9	6.5	6.6	17.8	6.7	5.4	4.5	10.1	7.7	6.8					
	40	160	26	171	Normalized	100%	71%	83%	73%	69%	56%	56%	90%	90%	61%	x				
					% Rsd	14.0%	11.8%	10.1%	31.1%	12.6%	12.4%	10.1%	14.4%	11.0%	14.4%					
Testosterone					**Average**	103.0	105.5	103.2	106.5	81.1	82.1	88.2	111.2	99.5	81.4					
					Stdev	7.9	8.7	7.7	6.6	5.8	5.4	5.5	17.8	6.2	3.2					
	60	140	71	127	Normalized	100%	102%	100%	103%	79%	80%	86%	108%	97%	79%	x				
					% Rsd	7.6%	8.3%	7.4%	6.2%	7.2%	6.6%	6.2%	16.0%	6.2%	4.0%					
Theobromine					**Average**	60.1	70.9	70.4	80.2	79.2	81.5	79.8	125.9	111.1	120.5					
					Stdev	10.5	13.8	18.4	18.3	12.1	12.7	34.0	159.3	8.9	12.9					
	60	140	55	139	Normalized	100%	118%	117%	133%	132%	135%	133%	209%	185%	200%	x				
					% Rsd	17.5%	19.5%	26.1%	22.7%	15.3%	15.6%	42.6%	126.5%	8.0%	10.7%					

Working Stock Standard ID						WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 07-15-16	WSS-07-25-16	WSS 08-15-16	WSS 08-29-16	WSS 09-07-16	WSS-09-21-16	EEA conclusions regarding stability					
Analytical Date						7/1/2016	7/3/2016	7/5/2016	7/8/2016	7/17/2016	7/31/2016	8/15/2016	8/30/2016	9/7/2016	9/21/2016						
Days Since Spike						0	2	4	7	16	30	45	60	69	84						
	EEA Method LCS Lower Limit (%)	EEA Method LCS Upper Limit (%)	Study LCS Lower Limit (%)	Study LCS Upper Limit (%)												Stable, Most Results Within LCS Limits During Full Study Period, Fully Quantitative Results, No QC Flag	Stable With Degradation Occuring After 2 Weeks, QC "R" QC Flag Results After Degradation Starts	Results Highly Variable, Semi-Quantitative, Recommend "J" QC Flag All Results as Estimates	Results Often Outside LCS Limits, But No Degradation or Extreme Variability (Possible Matrix or Calibration Artifact in HT study, J flag)		Comment
Theophyline					**Average**	40.9	49.8	70.0	38.5	84.0	185.3	236.2	263.0	132.9	165.7						
					Stdev	10.6	13.4	12.2	11.2	18.6	36.2	77.4	103.9	13.9	15.4						
	60	140	56	132	Normalized	100%	122%	171%	94%	205%	453%	577%	643%	325%	405%	x			x		WSS high bias after day 0 WSS.
					% Rsd	25.8%	27.0%	17.5%	29.2%	22.1%	19.5%	32.8%	39.5%	10.5%	9.3%						
Thiabendazole					**Average**	85.6	92.1	97.7	98.4	98.0	35.0	100.6	82.1	102.7	96.1						
					Stdev	8.4	7.6	5.3	8.0	5.5	2.3	5.4	7.4	4.2	6.2						
	60	140	81	119	Normalized	100%	108%	114%	115%	114%	41%	118%	96%	120%	112%	x					
					% Rsd	9.8%	8.3%	5.4%	8.2%	5.7%	6.6%	5.4%	9.0%	4.1%	6.4%						
Triclocarban					**Average**	130.3	109.1	103.3	112.9	66.8	59.2	82.3	58.0	89.5	56.9						
					Stdev	8.8	5.7	6.1	4.7	4.9	4.4	9.3	5.1	13.1	5.5						
	60	140	61	148	Normalized	100%	84%	79%	87%	51%	45%	63%	45%	69%	44%	x					Continuing WSS did not match day 0 WSS, decrease due to calibration.
					% Rsd	6.8%	5.2%	5.9%	4.2%	7.4%	7.4%	11.4%	8.8%	14.6%	9.6%						
Triclosan					**Average**	113.1	121.0	111.4	151.4	90.4	104.8	130.5	100.3	139.0	100.3						
					Stdev	3.5	3.9	3.8	4.3	4.8	6.9	6.8	5.2	13.8	5.6						
	60	140	33	131	Normalized	100%	107%	99%	134%	80%	93%	115%	89%	123%	89%		x				
					% Rsd	3.1%	3.2%	3.4%	2.8%	5.3%	6.5%	5.2%	5.2%	9.9%	5.6%						
Trimethoprim					**Average**	90.8	85.4	91.3	87.7	84.1	69.4	88.7	94.3	94.0	93.2						
					Stdev	4.9	4.7	8.6	9.6	7.0	4.4	9.1	5.9	7.4	3.2						
	60	140	82	116	Normalized	100%	94%	101%	97%	93%	77%	98%	104%	104%	103%		x				
					% Rsd	5.4%	5.5%	9.5%	10.9%	8.3%	6.4%	10.3%	6.3%	7.9%	3.4%						
Warfarin					**Average**	124.8	126.6	126.8	135.7	115.8	118.7	171.1	145.5	193.7	154.4						
					Stdev	3.7	5.0	6.6	5.7	5.7	5.5	14.5	7.2	22.2	15.0						
	60	140	50	128	Normalized	100%	101%	102%	109%	93%	95%	137%	117%	155%	124%		x				
					% Rsd	3.0%	3.9%	5.2%	4.2%	4.9%	4.6%	8.5%	5.0%	11.4%	9.7%						

Table 2. Laboratory Control Sample Results

Sample	Working Stock Standard ID Analytical Date Days Since Spike Compound	WSS 06-30-16 7/1/2016 0	WSS 06-30-16 7/3/2016 2	WSS 06-30-16 7/5/2016 4	WSS 06-30-16 7/8/2016 7	WSS 07-15-16 7/17/2016 16	WSS-07-25-16 7/31/2016 30	WSS 08-15-16 8/15/2016 45	WSS 08-29-16 8/30/2016 60	WSS 09-07-16 9/7/2016 69	WSS-09-21-16 9/21/2016 84	Average	St. Dev.	3x St. Dev.	Lower Control Limit (Average Minus 3x St. Dev.)	Upper Control Limit (Average Plus 3x St. Dev.)
LCS1	17alpha ethynylestradiol - M-H	105.9	103.1	98.3	108.8	96.2	103.4	96.3	102.5	127.1	86.5	105.3	11.0	33.0	72.3	138.3
LCS2	17alpha ethynylestradiol - M-H	96.2	98.7	96.7	101.8	108.0	118.0	109.6	126.0	124.4	99.4					
LCS1	17B-Estradiol - M-H	109.1	101.2	101.8	105.3	92.6	100.5	103.3	105.1	121.3	92.0	105.7	11.3	33.8	71.9	139.5
LCS2	17B-Estradiol - M-H	102.2	100.3	92.8	111.0	105.0	99.5	111.4	126.1	136.3	97.3					
LCS1	2,4-D	102.7	66.8	98.9	103.5	96.5	94.5	98.4	98.2	128.8	90.6	97.1	14.5	43.4	53.7	140.5
LCS2	2,4-D	97.3	62.8	90.3	98.8	96.9	98.4	101.1	104.3	121.7	91.7					
LCS1	4-tert-OctylphenoL	84.9	86.8	79.9	112.2	87.7	88.2	82.5	100.6	109.2	90.4	90.2	10.4	31.1	59.1	121.3
LCS2	4-tert-OctylphenoL	68.8	89.5	82.9	101.2	90.3	78.5	87.5	98.3	95.7	88.9					
LCS1	Acesulfame	98.2	100.5	99.9	109.7	104.3	100.2	99.1	103.0	99.2	102.6	101.5	3.0	8.9	92.5	110.4
LCS2	Acesulfame	100.2	99.7	102.6	106.3	99.9	101.7	103.4	98.6	97.3	102.6					
LCS1	Acetaminophen	93.4	101.7	101.8	104.2	96.5	96.9	95.7	100.7	101.4	89.1	98.2	4.8	14.5	83.7	112.8
LCS2	Acetaminophen	90.4	99.9	97.8	101.3	106.5	96.7	96.7	102.9	101.4	89.6					
LCS1	Albuterol	79.2	117.8	85.9	99.3	122.7	91.9	96.8		61.2	63.0	89.8	21.9	65.8	24.0	155.6
LCS2	Albuterol	88.4	101.9	73.1	105.0	98.6	64.0	134.3		70.0	62.9					
LCS1	Amoxicilin	95.6	102.6	98.0	100.5	75.2	104.5	98.9	98.2	122.9	88.6	103.9	14.2	42.6	61.3	146.6
LCS2	Amoxicilin	97.5	106.2	100.1	110.2	128.8	92.6	113.4	99.6	139.8	105.7					
LCS1	Andorostenedione	126.5	88.7	99.5	114.6	92.0	96.9	128.1	97.8	95.2	109.6	101.0	12.7	38.2	62.7	139.2
LCS2	Andorostenedione	100.0	86.9	87.2	100.5	123.8	93.4	98.3	95.5	91.8	93.4					
LCS1	Atenolol	123.8	94.4	107.2	118.1	89.6	76.6	100.6	107.6	100.6	107.8	102.4	11.8	35.4	67.0	137.8
LCS2	Atenolol	118.5	98.3	107.0	113.8	98.0	98.7	87.1	101.5	88.2	110.6					
LCS1	Atrazine	97.3	112.2	99.6	109.5	97.8	98.0	95.2	92.4	100.1	102.2	101.6	6.6	19.8	81.8	121.4
LCS2	Atrazine	105.9	101.3	100.9	102.2	113.7	97.1	105.9	86.8	106.1	107.1					
LCS1	Bendroflumethiazide - M-H	103.7	97.3	97.7	107.3	83.7	94.2	90.2	99.3	85.0	103.9	94.6	7.0	21.1	73.6	115.7
LCS2	Bendroflumethiazide - M-H	94.4	91.2	95.4	106.2	89.7	90.1	93.8	93.9	83.0	92.6					
LCS1	Bezafibrate	96.4	92.9	98.8	106.8	87.9	92.4	85.6	98.3	106.7	112.3	100.0	8.8	26.4	73.6	126.4
LCS2	Bezafibrate	96.0	102.6	103.5	118.7	98.0	92.1	107.1	96.6	113.7	93.0					
LCS1	Bisphenol A	101.7	100.4	98.1	109.4	99.9	98.5	100.1	100.1	97.6	95.6	100.3	3.4	10.1	90.3	110.4
LCS2	Bisphenol A	101.0	102.2	103.3	106.1	101.4	98.2	101.0	99.9	95.9	96.0					
LCS1	Bromacil	99.4	92.0	94.8	101.9	88.7	92.7	101.0	83.9	91.7	98.1	95.2	5.4	16.2	79.0	111.5
LCS2	Bromacil	97.2	97.1	98.2	98.7	85.5	92.3	104.2	92.7	93.5	101.0					
LCS1	Clofibric acid	105.0	101.1	98.2	99.7	97.7	99.7	94.9	95.7	132.8	92.8	102.0	9.0	27.1	74.9	129.2
LCS2	Clofibric acid	102.2	100.0	94.6	93.8	99.4	98.7	103.6	107.8	115.1	107.7					
LCS1	Butalbital	100.4	99.2	103.3	111.9	85.6	93.0	91.5	90.6	94.9	88.7	95.5	6.7	20.2	75.3	115.6
LCS2	Butalbital	92.9	103.2	98.6	105.3	96.2	90.6	88.9	94.7	90.2	90.3					
LCS1	Butylparaben-NEG	98.2	94.8	101.5	96.5	88.9	96.0	93.8	99.6	124.3	96.4	98.7	10.1	30.4	68.2	129.1
LCS2	Butylparaben-NEG	95.8	91.6	87.1	97.6	95.1	84.7	103.1	113.9	120.3	94.6					
LCS1	Caffeine	99.6	98.1	99.3	114.8	104.3	99.9	103.2	92.4	102.3	101.6	103.6	5.9	17.6	86.0	121.2
LCS2	Caffeine	106.5	100.8	104.7	115.6	112.1	101.3	104.8	96.4	105.6	108.1					
LCS1	Carbadox	109.5	91.6	100.0	107.6	87.8	73.5	101.0	99.3	141.8	95.2	100.4	13.0	39.1	61.3	139.6
LCS2	Carbadox	101.0	93.7	99.5	102.8	96.2	94.3	95.0	109.9	112.9	96.1					
LCS1	Carbamazepine	96.5	95.1	105.9	112.5	103.4	93.9	100.4	96.6	105.8	90.1	99.3	6.2	18.5	80.7	117.8
LCS2	Carbamazepine	103.8	98.1	99.8	102.6	105.8	98.8	97.9	85.1	99.2	94.5					
LCS1	Carisoprodol	98.6	101.6	107.3	117.7	103.0	106.5	81.2	100.3	98.6	127.6	95.8	14.4	43.1	52.7	138.8
LCS2	Carisoprodol	94.5	79.6	91.1	80.3	110.8	85.9	75.6	97.7	79.8	77.7					
LCS1	Chloramphenicol_M-H	99.8	103.5	89.5	108.2	92.2	101.0	103.5	104.7	128.3	103.5	100.1	11.3	33.9	66.2	134.0
LCS2	Chloramphenicol_M-H	82.0	91.7	82.6	96.4	100.7	93.8	102.1	110.9	118.3	89.0					
LCS1	Chloridazon	101.7	98.9	102.7	106.5	88.7	94.8	94.2	88.4	97.1	108.0	97.9	7.5	22.5	75.4	120.4
LCS2	Chloridazon	92.9	99.5	101.0	98.4	85.6	94.4	102.2	89.5	96.7	116.9					

Sample	Working Stock Standard ID Analytical Date Days Since Spike Compound	WSS 06-30-16 7/1/2016 0	WSS 06-30-16 7/3/2016 2	WSS 06-30-16 7/5/2016 4	WSS 06-30-16 7/8/2016 7	WSS 07-15-16 7/17/2016 16	WSS-07-25-16 7/31/2016 30	WSS 08-15-16 8/15/2016 45	WSS 08-29-16 8/30/2016 60	WSS 09-07-16 9/7/2016 69	WSS-09-21-16 9/21/2016 84	Average	St. Dev.	3x St. Dev.	Lower Control Limit (Average Minus 3x St. Dev.)	Upper Control Limit (Average Plus 3x St. Dev.)
LCS1	Chlorotoluron	105.7	97.3	95.2	108.5	84.7	94.4	92.6	99.4	92.3	107.8	99.3	8.0	24.0	75.3	123.3
LCS2	Chlorotoluron	112.0	99.0	103.4	113.5	91.6	91.5	105.8	102.0	88.7	101.3					
LCS1	Cimetidine - PRM	119.0	109.2	105.7	99.2	79.3		103.7	103.5	120.3	104.2	101.9	10.4	31.2	70.7	133.2
LCS2	Cimetidine - PRM	96.7	111.8	96.7	101.4	103.9		82.7	104.4	99.8	93.2					
LCS1	Cotinine - PRM	94.7	99.2	106.4	115.5	101.7	91.9	100.7	98.6	103.4	89.6	97.7	7.5	22.5	75.2	120.2
LCS2	Cotinine - PRM	90.3	98.5	105.9	104.3	96.3	89.6	94.7	93.7	97.0	81.9					
LCS1	Cyanazine	99.0	98.7	100.5	109.5	101.4	101.2	96.9	102.6	98.9	97.7	99.9	3.9	11.7	88.2	111.6
LCS2	Cyanazine	94.9	99.0	98.7	104.7	99.2	95.2	103.0	92.7	98.4	105.6					
LCS1	DACT	104.0	104.4	98.5	110.8	87.8	99.3	107.2	99.1	97.9	115.7	94.7	11.2	33.6	61.1	128.3
LCS2	DACT	89.0	83.9	89.3	91.3	96.0	92.7	82.8	97.0	72.9	74.3					
LCS1	DEA	100.2	105.9	104.2	107.8	96.5	97.8	96.2	102.0	96.6	109.8	101.2	5.2	15.6	85.6	116.8
LCS2	DEA	98.7	106.1	103.1	101.2	95.5	93.2	106.9	95.4	97.1	109.7					
LCS1	DEET	104.6	109.6	103.8	110.2	93.8	96.1	93.0	88.0	94.8	100.2	96.3	6.8	20.5	75.8	116.8
LCS2	DEET	95.1	94.8	98.4	100.3	96.6	90.7	91.8	87.3	86.1	91.3					
LCS1	Dehydronifedipine	107.2	94.0	96.4	110.1	96.9	96.9	114.0	100.1	100.2	96.4	104.3	7.5	22.5	81.8	126.8
LCS2	Dehydronifedipine	122.8	100.9	107.1	109.7	110.4	108.3	107.4	94.8	105.9	107.2					
LCS1	DIA	100.1	101.2	101.3	109.2	98.9	101.9	99.5	102.5	95.7	98.8	100.4	3.5	10.6	89.7	111.0
LCS2	DIA	94.3	103.1	103.0	101.5	99.8	102.1	100.6	103.5	93.8	96.5					
LCS1	Diazepam	99.5	102.3	100.8	111.5	92.8	98.1	96.9	98.9	99.6	105.1	101.1	4.9	14.8	86.3	115.9
LCS2	Diazepam	101.4	106.5	102.1	107.0	97.1	99.1	95.0	105.3	94.7	108.5					
LCS1	Diclofenac- M-H	98.5	98.1	98.7	104.8	92.2	97.7	100.1	108.2	137.3	105.6	104.3	12.2	36.7	67.6	141.1
LCS2	Diclofenac- M-H	97.2	96.1	97.9	101.8	98.4	100.3	104.2	104.7	139.1	105.4					
LCS1	Dilantin - M-H	82.5	95.1	87.8	104.5	79.0	81.1	95.1	102.5	97.2	97.9	86.8	10.6	31.7	55.1	118.5
LCS2	Dilantin - M-H	75.8	81.1	77.1	86.8	69.9	68.9	98.7	82.3	80.9	92.4					
LCS1	Diltiazem	107.8	84.2	106.9	106.4	92.9	96.7	92.4	88.9	95.3	112.7	100.1	8.6	25.7	74.3	125.8
LCS2	Diltiazem	108.0	94.0	103.5	117.2	103.2	94.2	94.2	101.6	94.5	107.3					
LCS1	Diuron	111.4	100.0	100.1	105.7	92.0	98.1	97.6	101.5	127.1	98.1	102.8	9.3	27.8	75.1	130.6
LCS2	Diuron	100.9	100.8	91.5	105.7	95.5	97.3	99.0	111.6	123.3	99.2					
LCS1	Erythromycin	97.7	78.4	99.4	91.0	104.0	95.4	82.8	95.0	120.4	108.5	100.8	12.1	36.3	64.5	137.0
LCS2	Erythromycin	100.3	85.2	96.8	108.7	118.5	96.8	96.2	110.7	123.9	105.5					
LCS1	Estrone	96.3	97.9	100.9	111.9	103.5	97.2	87.2	110.6	88.6	98.6	99.7	8.1	24.4	75.3	124.0
LCS2	Estrone	104.4	95.3	100.5	111.9	97.4	95.0	99.6	101.8	112.3	82.8					
LCS1	Ethylparaben	100.2	93.3	93.7	100.2	90.9	98.5	93.0	103.5	130.1	94.8	101.1	10.4	31.3	69.7	132.4
LCS2	Ethylparaben	96.1	92.1	95.4	104.0	98.4	93.3	105.9	117.1	121.0	99.8					
LCS1	Flumequine	97.6	91.9	92.0	109.6	95.4	93.4	96.2	98.6	112.4	94.6	100.4	6.9	20.7	79.7	121.0
LCS2	Flumequine	105.0	98.8	103.1	105.4	100.8	95.9	104.7	91.0	112.4	108.6					
LCS1	Fluoxetine	110.8	97.3	108.1	113.4	95.6	97.8	67.3	97.8	101.1	99.0	102.5	14.4	43.2	59.3	145.8
LCS2	Fluoxetine	113.7	111.9	109.7	106.4	97.1	113.8	70.3	116.4	95.5	127.9					
LCS1	Gemfibrozil	104.6	101.7	105.6	101.2	108.8	93.8	98.6	99.5	83.4	111.6	102.2	11.5	34.6	67.6	136.8
LCS2	Gemfibrozil	107.5	101.3	100.7	108.3	139.8	92.5	107.9	97.4	87.5	93.1					
LCS1	Ibuprofen	100.2	106.8	94.1	103.0	87.0	100.1	91.8	102.5	135.6	91.5	100.6	13.0	38.9	61.7	139.5
LCS2	Ibuprofen	100.1	97.9	93.0	107.7	80.4	96.2	95.8	107.2	129.6	91.4					
LCS1	Iohexol - M+H	132.2	95.6	100.1	117.6	85.6	108.8	103.2	120.7	138.5	107.9	114.6	14.3	42.9	71.7	157.5
LCS2	Iohexol - M+H	127.7	115.0	126.2	117.0	113.4	97.1	102.4	127.4	132.1	124.3					
LCS1	Iopromide - PRM	103.0	93.1	102.8	110.3	94.3	86.0	108.9	88.7	103.1	87.3	111.2	17.4	52.3	58.9	163.5
LCS2	Iopromide - PRM	127.1	136.0	136.6	131.5	131.3	111.7	123.7	95.2	123.3	130.2					
LCS1	Isobuylparaben	98.2	94.9	101.7	96.5	88.8	96.0	93.8	99.7	124.3	96.3	98.7	10.2	30.5	68.2	129.1
LCS2	Isobuylparaben	95.8	91.7	87.1	97.5	95.0	84.8	103.1	113.9	120.3	94.5					
LCS1	isoproturon	101.4	108.7	98.2	109.9	99.8	97.1	106.3	98.9	106.7	96.1	105.9	7.6	22.8	83.1	128.8
LCS2	isoproturon	121.7	111.6	113.3	111.8	116.9	103.3	113.3	92.4	106.1	105.1					
LCS1	Ketoprofen	95.4	101.7	94.9	115.3	108.2	93.2	104.8	100.3	103.3	105.6	95.9	9.5	28.6	67.3	124.5

Sample	Compound	Working Stock Standard ID Analytical Date Days Since Spike	WSS 06-30-16 7/1/2016 0	WSS 06-30-16 7/3/2016 2	WSS 06-30-16 7/5/2016 4	WSS 06-30-16 7/8/2016 7	WSS 07-15-16 7/17/2016 16	WSS-07-25-16 7/31/2016 30	WSS 08-15-16 8/15/2016 45	WSS 08-29-16 8/30/2016 60	WSS 09-07-16 9/7/2016 69	WSS-09-21-16 9/21/2016 84	Average	St. Dev.	3x St. Dev.	Lower Control Limit (Average Minus 3x St. Dev.)	Upper Control Limit (Average Plus 3x St. Dev.)
LCS2	Ketoprofen		93.7	81.2	79.1	87.6	104.6	97.2	86.6	86.4	90.3	88.4					
LCS1	Ketorolac		98.5	101.4	94.3	112.9	107.7	89.6	107.6	96.0	98.4	107.9	99.7	9.8	29.5	70.2	129.2
LCS2	Ketorolac		93.9	91.5	90.8	93.4	120.0	97.3	89.7	87.1	95.4	119.9					
LCS1	Lidocaine		100.3	101.6	94.9	110.2	101.1	96.8	104.0	100.3	94.0	105.3	108.0	11.8	35.3	72.7	143.3
LCS2	Lidocaine		123.0	115.4	106.3	115.1	125.0	102.5	119.6	102.6	101.7	140.3					
LCS1	Lincomycin		99.4	90.1	99.1	108.5	81.6	89.2	86.7	91.1	115.6	108.5	103.8	16.4	49.1	54.8	152.9
LCS2	Lincomycin		106.9	100.6	104.9	106.6	121.2	95.4	96.6	94.0	152.7	127.7					
LCS1	Linuron		104.0	99.3	105.7	104.4	93.4	101.3	89.3	104.4	127.2	96.6	102.9	10.4	31.2	71.7	134.1
LCS2	Linuron		104.7	94.7	101.5	98.3	97.1	100.8	94.6	112.4	131.2	97.3					
LCS1	Lopressor-Metoprolol		112.9	103.7	100.7	104.3	94.6	109.0	97.4	110.8	125.9	125.3	109.9	10.5	31.5	78.3	141.4
LCS2	Lopressor-Metoprolol		116.2	111.5	97.2	109.5	98.5	106.3	104.9	120.9	114.7	132.9					
LCS1	Meclofenamic Acid		98.4	96.2	97.6	107.0	92.4	97.4	100.1	108.3	137.3	105.7	104.1	12.5	37.5	66.6	141.6
LCS2	Meclofenamic Acid		97.2	92.7	97.5	102.4	98.5	100.1	104.2	104.7	139.1	105.5					
LCS1	Meprobamate		102.4	93.4	95.4	114.0	110.9	92.5	104.3	99.4	101.2	111.6	110.0	11.2	33.7	76.3	143.7
LCS2	Meprobamate		121.1	116.9	119.4	126.4	133.5	110.9	123.7	104.7	108.6	110.2					
LCS1	Metazachlor		91.5	100.7	94.8	112.8	98.6	94.4	105.1	92.0	104.7	115.2	103.4	9.2	27.6	75.7	131.0
LCS2	Metazachlor		111.2	106.3	93.9	105.2	114.1	101.0	110.1	87.8	106.1	122.0					
LCS1	Metformin		90.1	87.4	105.4	112.9	120.3	88.1	101.0	106.4	110.4	112.5	100.8	14.2	42.7	58.0	143.5
LCS2	Metformin		110.8	72.4	81.2	116.5	103.6	80.8	122.6	91.2	94.4	107.0					
LCS1	Methylparaben - M-H		96.7	97.1	93.4	105.9	89.1	93.2	92.5	99.9	127.8	91.1	100.0	11.7	35.2	64.8	135.2
LCS2	Methylparaben - M-H		97.0	96.3	85.9	107.6	99.9	90.3	107.3	113.7	126.4	88.9					
LCS1	Metolachlor		105.0	101.0	104.1	108.2	95.3	102.8	102.9	105.7	100.8	96.6	101.5	4.1	12.4	89.1	113.9
LCS2	Metolachlor		107.5	100.8	104.3	105.2	102.9	98.1	100.7	98.4	94.2	95.1					
LCS1	Naproxen		106.8	95.1	98.0	107.5	91.0	89.9	99.8	102.4	123.1	93.0	100.6	8.7	26.1	74.6	126.7
LCS2	Naproxen		99.2	92.2	97.5	103.2	102.2	90.8	96.8	109.8	116.3	98.5					
LCS1	Nifedipine		36.2	80.4	72.9	91.8	52.5	70.1	71.6	86.0	85.2	89.4	64.9	19.0	57.0	7.8	121.9
LCS2	Nifedipine		28.4	53.4	50.3	54.8	42.6	41.7	63.5	85.9	73.5	66.8					
LCS1	Nonyl-phenol		72.9	86.1	101.1	111.9	98.5	69.5	76.9	96.9	107.8	84.4	95.6	15.9	47.6	48.0	143.2
LCS2	Nonyl-phenol		71.5	85.0	113.0	112.7	93.3	97.1	118.9	98.7	122.3	93.3					
LCS1	Norethisterone		95.5	103.4	93.0	106.5	92.3	104.4	96.2	107.9	108.6	97.2	109.1	12.4	37.3	71.8	146.4
LCS2	Norethisterone		106.2	110.1	102.8	117.7	138.7	124.1	124.8	126.7	109.2	116.8					
LCS1	Oxolinic Acid		100.4	101.9	95.5	112.7	100.1	92.2	98.8	90.0	105.4	95.1	108.0	12.3	37.0	71.0	145.0
LCS2	Oxolinic Acid		128.4	116.5	123.7	121.6	120.3	101.2	121.2	95.6	115.9	122.7					
LCS1	Paraxanthine		101.6	93.7	93.2	104.9	101.8	94.7	100.1	103.9	94.1	86.1	94.9	8.2	24.7	70.1	119.6
LCS2	Paraxanthine		84.7	86.6	88.2	86.3	92.7	111.2	108.9	91.0	86.7	86.7					
LCS1	Pentoxifylline		90.6	104.1	97.8	110.4	97.4	94.7	106.8	92.6	107.5	102.4	107.8	12.1	36.3	71.5	144.1
LCS2	Pentoxifylline		122.8	115.9	108.3	122.6	101.6	103.9	132.2	96.5	124.7	123.9					
LCS1	Phenazone		102.6	100.2	95.0	105.6	95.4	93.7	98.1	94.3	94.7	98.7	107.2	13.3	39.9	67.3	147.1
LCS2	Phenazone		135.1	128.2	118.1	120.2	117.8	104.9	123.5	94.0	101.8	122.9					
LCS1	Primidone		99.8	97.9	89.2	122.3	100.0	108.3	124.3	103.2	89.7	111.4	105.1	13.5	40.6	64.5	145.6
LCS2	Primidone		91.3	109.1	86.2	103.8	129.7	96.7	126.0	117.2	86.9	108.2					
LCS1	Progesterone		116.2	91.7	99.3	111.2	107.7	103.6	127.6	109.7	99.2	107.7	107.1	11.9	35.7	71.4	142.9
LCS2	Progesterone		100.4	103.9	101.9	117.6	108.4	85.2	139.7	105.6	106.9	99.3					
LCS1	Propazine		96.4	101.3	102.9	108.0	102.3	94.9	100.6	99.4	102.7	92.2	106.1	10.2	30.7	75.5	136.8
LCS2	Propazine		113.6	115.6	113.8	116.3	131.9	95.1	121.1	97.0	106.0	111.2					
LCS1	Propylparaben		100.0	95.8	97.0	103.5	90.9	99.0	91.2	98.9	126.9	97.7	102.2	11.3	33.9	68.3	136.1
LCS2	Propylparaben		98.2	95.9	86.9	106.4	102.4	95.1	106.1	117.3	131.4	103.6					
LCS1	Quinoline		100.2	100.8	105.7	114.8	103.5	93.5	94.3	103.1	101.1	100.2	100.2	4.9	14.7	85.5	114.9
LCS2	Quinoline		104.7	95.4	102.5	95.9	99.3	98.9	96.5	100.6	95.8	97.0					
LCS1	Simazine		93.4	99.5	99.8	104.8	98.7	99.8	97.7	97.8	101.4	95.9	97.7	3.6	10.9	86.8	108.5
LCS2	Simazine		89.6	100.8	99.1	96.6	93.7	100.7	100.3	95.1	96.3	92.1					

Sample	Working Stock Standard ID Analytical Date Days Since Spike Compound	WSS 06-30-16 7/1/2016 0	WSS 06-30-16 7/3/2016 2	WSS 06-30-16 7/5/2016 4	WSS 06-30-16 7/8/2016 7	WSS 07-15-16 7/17/2016 16	WSS-07-25-16 7/31/2016 30	WSS 08-15-16 8/15/2016 45	WSS 08-29-16 8/30/2016 60	WSS 09-07-16 9/7/2016 69	WSS-09-21-16 9/21/2016 84	Average	St. Dev.	3x St. Dev.	Lower Control Limit (Average Minus 3x St. Dev.)	Upper Control Limit (Average Plus 3x St. Dev.)
LCS1	Sucralose - M-H	95.1	102.3	105.7	103.9	96.4	98.1	97.2	108.1	102.1	104.0	101.8	3.9	11.8	90.1	113.6
LCS2	Sucralose - M-H	102.4	101.0	104.5	100.0	100.9	105.7	107.8	101.7	95.0	105.2					
LCS1	Sulfachloropyridazine	92.1	95.4	95.3	111.3	103.6	92.9	101.3	95.8	103.7	115.2	99.2	11.4	34.1	65.1	133.3
LCS2	Sulfachloropyridazine	90.2	88.6	87.7	98.9	86.5	92.7	100.5	91.7	106.1	134.4					
LCS1	Sulfadiazine	96.7	104.2	105.5	108.8	107.6	105.3	107.4	96.3	111.6	99.8	103.0	6.0	18.0	85.0	121.0
LCS2	Sulfadiazine	92.6	98.0	97.7	98.8	102.5	103.7	115.5	99.9	110.4	97.5					
LCS1	Sulfadimethoxine	100.5	96.0	100.9	105.0	95.8	100.6	92.2	96.5	133.8	92.1	101.0	12.1	36.3	64.8	137.3
LCS2	Sulfadimethoxine	89.3	97.2	92.6	92.9	95.0	103.6	102.2	111.4	131.4	91.4					
LCS1	Sulfamerazine	92.5	92.8	94.8	105.8	93.0	89.3	101.5	90.1	110.3	103.9	102.7	10.7	32.0	70.7	134.7
LCS2	Sulfamerazine	108.0	111.7	102.5	114.4	105.1	86.7	115.9	96.3	113.5	126.2					
LCS1	Sulfamethazine	102.1	95.2	101.7	111.7	88.5	95.2	98.5	109.6	130.3	113.6	104.1	11.0	33.0	71.0	137.1
LCS2	Sulfamethazine	98.1	90.8	95.0	105.2	98.6	94.7	107.9	106.3	126.6	111.6					
LCS1	Sulfamethizole	98.5	92.3	99.5	108.4	82.7	91.6	92.0	94.1	94.2	106.5	95.4	6.4	19.2	76.3	114.6
LCS2	Sulfamethizole	93.4	94.1	98.4	103.7	89.8	88.8	89.3	93.9	94.6	103.0					
LCS1	Sulfamethoxazole	99.7	101.4	101.2	106.4	101.9	99.8	100.1	102.6	101.5	102.2	100.5	2.4	7.3	93.3	107.8
LCS2	Sulfamethoxazole	100.5	98.9	104.1	102.2	98.1	98.0	98.9	96.5	96.6	100.2					
LCS1	Sulfathiazole	95.8	93.9	93.7	101.6	89.5	91.5	99.2	95.1	131.8	100.5	97.2	11.9	35.7	61.6	132.9
LCS2	Sulfathiazole	85.7	82.1	80.4	100.8	102.3	84.6	94.8	114.3	111.3	95.8					
LCS1	Sulfometuron methyl	103.1	96.6	95.4	108.3	95.9	92.2	103.1	84.7	104.8	98.0	93.3	9.5	28.5	64.7	121.8
LCS2	Sulfometuron methyl	93.7	87.5	94.8	83.0	85.7	105.8	92.2	69.5	84.9	85.9					
LCS1	TCEP	111.9	102.5	99.9	107.3	92.9	96.5	108.7	97.4	101.4	98.6	97.9	8.8	26.5	71.4	124.4
LCS2	TCEP	103.7	95.8	89.6	107.7	75.0	100.7	94.0	88.2	101.4	85.2					
LCS1	TCPP	108.8	99.3	103.7	117.0	124.0	117.0	119.3	84.6	165.3	82.2	110.4	30.9	92.7	17.7	203.1
LCS2	TCPP	119.8	98.0	84.2	111.3	77.2	120.0	117.3	85.7	203.8	69.8					
LCS1	TDCPP - PRM	124.3	99.8	101.7	111.7	113.6	101.5	137.6	101.1	138.4	80.5	98.4	24.2	72.6	25.8	171.1
LCS2	TDCPP - PRM	101.2	77.2	74.3	78.4	131.3	81.6	76.8	110.3	83.1	44.3					
LCS1	Testosterone	101.1	106.3	104.5	118.1	94.8	99.0	98.2	101.4	92.2	82.7	98.9	9.3	28.0	70.9	126.9
LCS2	Testosterone	100.4	103.6	110.8	112.8	82.4	96.9	95.4	93.4	98.7	85.5					
LCS1	Theobromine	66.2	102.6	106.5	111.4	114.8	82.8	101.3	99.1	101.0	111.2	97.3	14.0	42.0	55.3	139.3
LCS2	Theobromine	67.1	92.7	108.1	107.3	98.9	113.1	81.8	93.0	96.6	90.8					
LCS1	Theophyline	77.7	91.3	101.8	106.1	114.3	105.6	83.2	99.0	94.4	110.2	94.1	12.6	37.8	56.3	131.9
LCS2	Theophyline	70.1	96.2	90.0	88.1	108.3	92.5	67.7	93.7	90.3	100.7					
LCS1	Thiabendazole	100.7	97.5	96.3	108.5	90.0	95.4	100.0	89.5	97.5	104.3	100.4	6.3	19.0	81.3	119.4
LCS2	Thiabendazole	105.7	102.2	105.0	112.3	109.8	98.4	96.5	95.3	95.4	107.0					
LCS1	Triclocarban	128.5	97.0	101.8	105.6	74.9	99.8	103.2	89.2	129.2	98.4	104.5	14.6	43.9	60.6	148.4
LCS2	Triclocarban	125.2	102.1	101.2	112.2	92.8	95.4	121.7	99.4	123.3	88.9					
LCS1	Triclosan	73.4	77.1	82.8	91.6	80.4	83.3	73.2	85.0	124.5	91.6	81.6	16.3	49.0	32.5	130.6
LCS2	Triclosan	60.8	60.7	60.3	79.0	76.3	62.4	75.8	96.8	110.8	85.6					
LCS1	Trimethoprim	96.4	87.5	95.8	108.8	105.2	101.9	104.1	100.7	103.6	96.2	98.6	5.7	17.0	81.6	115.5
LCS2	Trimethoprim	103.5	91.1	94.8	90.0	102.3	103.6	100.4	94.4	94.7	96.2					
LCS1	Warfarin	89.8	93.1	92.4	99.9	67.2	84.8	92.1	96.3	115.5	90.4	89.0	12.9	38.8	50.2	127.8
LCS2	Warfarin	80.9	80.1	77.7	92.2	61.4	73.2	99.0	105.3	99.4	89.9					

Table 3. Raw Laboratory Results

	Working Stock Standard ID	WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 07-15-16	WSS-07-25-16	WSS 08-15-16	WSS 08-29-16	WSS 09-07-16	WSS-09-21-16
	Analytical Date	7/1/16	7/3/16	7/5/16	7/8/16	7/17/16	7/31/16	8/15/16	8/30/16	9/7/16	9/21/16
	Days Since Spike	0	2	4	7	16	30	45	60	69	84
Compound	**Sample Name**										
17 alpha ethynylestradiol - M-H	LCS1	105.9	103.1	98.3	108.8	96.2	103.4	96.3	102.5	127.1	86.5
	HDR-1	92.9	82.7	95.1	90.9	84.8	74.4	105.2	109.2	148.4	125.3
	HDR-2	90.6	88.6	87.2	85.9	75.9	75.7	101.2	114.5	93.8	106.1
	HDR-3	81.4	88.1	84.7	87.1	80.7	77.4	91.6	106.2	117.2	82.3
	HDR-4	85.9	91.0	86.1	86.3	67.3	73.7	87.5	97.2	103.6	85.9
	HDR-5	80.9	97.2	84.7	97.2	80.5	79.4	96.0	123.8	121.4	79.7
	HDR-6	87.9	87.6	86.7	84.0	96.8	75.1	101.0	121.1	141.2	95.2
	HDR-7	86.5	89.9	89.2	83.7	85.9	74.2	88.4	114.1	129.5	91.7
	HDR-8	115.4	90.2	105.5	83.1	78.7	72.8	95.9	104.8	124.1	103.5
	HDR-9	86.9	84.1	97.0	103.8	84.2	82.7	100.5	109.7	142.3	89.3
	HDR-10	86.2	78.5	82.6	86.7	88.6	79.4	112.0	117.7	132.2	106.0
	HDR-11	86.8	93.6	83.1	84.8	82.3	84.8	112.4	99.5	149.2	81.3
	LCS2	96.2	98.7	96.7	101.8	108.0	118.0	109.6	126.0	124.4	99.4
17B-Estradiol - M-H	LCS1	109.1	101.2	101.8	105.3	92.6	100.5	103.3	105.1	121.3	92.0
	HDR-1	100.9	99.4	93.8	104.5	98.1	84.3	120.1	105.5	115.1	113.7
	HDR-2	97.6	101.3	96.5	97.1	75.4	76.8	106.2	107.0	84.0	103.6
	HDR-3	93.7	96.7	98.5	99.4	83.9	79.3	99.4	105.2	121.9	86.4
	HDR-4	94.4	96.5	98.1	98.5	77.8	74.0	104.0	95.1	100.9	95.3
	HDR-5	101.2	96.2	98.6	89.3	70.0	82.6	105.1	112.9	118.1	96.8
	HDR-6	99.4	91.4	92.6	97.3	89.6	77.1	105.6	101.2	132.9	101.9
	HDR-7	89.9	98.4	94.7	102.8	84.4	79.8	110.8	114.4	118.5	91.9
	HDR-8	105.8	99.8	94.8	94.5	76.3	74.3	96.7	108.3	128.8	97.8
	HDR-9	92.7	100.9	97.7	96.7	82.5	75.1	109.1	111.9	122.7	92.2
	HDR-10	101.3	98.3	94.3	90.5	74.8	79.1	94.6	98.1	131.6	89.1
	HDR-11	99.5	100.7	93.5	65.7	84.2	84.2	104.6	115.4	132.0	93.7
	LCS2	102.2	100.3	92.8	111.0	105.0	99.5	111.4	126.1	136.3	97.3
2,4-D	LCS1	102.7	66.8	98.9	103.5	96.5	94.5	98.4	98.2	128.8	90.6
	HDR-1	111.0	96.6	122.4	137.2	129.0	96.4	104.6	101.2	160.0	175.0
	HDR-2	127.0	100.0	132.7	125.2	95.9	89.4	113.0	104.8	110.7	157.8
	HDR-3	108.5	104.8	131.5	133.3	120.8	85.9	129.8	117.8	149.5	160.8
	HDR-4	126.2	77.0	121.8	135.8	124.8	83.5	96.3	107.0	112.5	132.0
	HDR-5	121.5	83.6	119.6	110.1	106.7	92.8	121.6	126.3	146.6	156.7
	HDR-6	134.1	76.7	108.8	129.6	108.9	86.2	102.0	111.5	157.3	138.3
	HDR-7	113.5	98.5	119.5	125.0	94.3	87.3	106.9	100.9	128.6	158.0
	HDR-8	149.1	90.6	113.4	127.0	113.3	77.5	101.4	111.4	155.9	112.3
	HDR-9	128.1	88.4	132.7	120.1	119.9	78.3	104.7	110.3	152.8	130.0
	HDR-10	106.6	87.2	139.3	113.5	114.2	79.5	104.5	109.5	151.2	137.5
	HDR-11	150.0	75.9	108.5	104.2	101.5	80.1	99.3	121.0	154.8	123.4
	LCS2	97.3	62.8	90.3	98.8	96.9	98.4	101.1	104.3	121.7	91.7
	LCS1	84.9	86.8	79.9	112.2	87.7	88.2	82.5	100.6	109.2	90.4
4-tert-OctylphenoL	HDR-1	80.8	118.9	119.6	143.8	-0.3	87.4	145.3	106.4	105.3	116.4
	HDR-2	96.1	144.6	126.0	142.8	77.1	87.1	156.0	106.5	110.9	109.2
	HDR-3	82.4	131.6	105.2	144.0	74.0	81.0	126.8	101.3	100.3	91.8
	HDR-4	79.5	112.3	113.5	134.9	65.2	71.7	121.4	108.1	81.0	76.4
	HDR-5	90.5	128.2	121.3	106.7	69.8	84.8	117.8	146.2	96.3	99.1
	HDR-6	86.1	108.7	125.1	132.8	64.5	79.0	122.9	104.4	112.3	97.3

Working Stock Standard ID		WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 07-15-16	WSS-07-25-16	WSS 08-15-16	WSS 08-29-16	WSS 09-07-16	WSS-09-21-16
Analytical Date		7/1/16	7/3/16	7/5/16	7/8/16	7/17/16	7/31/16	8/15/16	8/30/16	9/7/16	9/21/16
Days Since Spike		0	2	4	7	16	30	45	60	69	84
Compound	**Sample Name**										
	HDR-7	79.4	118.2	126.5	146.6	64.0	81.9	120.8	107.1	107.6	90.5
	HDR-8	78.1	121.2	119.3	134.3	64.4	78.8	111.5	106.6	97.7	97.6
	HDR-9	86.1	114.9	129.3	123.3	78.5	84.7	119.3	101.5	99.5	89.7
	HDR-10	76.2	116.7	138.2	110.2	73.2	79.7	124.4	129.1	129.1	105.7
	HDR-11	93.6	114.1	123.5	106.9	68.4	78.9	136.7	88.1	108.8	99.5
	LCS2	68.8	89.5	82.9	101.2	90.3	78.5	87.5	98.3	95.7	88.9
Acesulfame	LCS1	98.2	100.5	99.9	109.7	104.3	100.2	99.1	103.0	99.2	102.6
	HDR-1	103.5	103.0	103.0	96.1	96.8	92.5	112.1	97.9	117.2	114.3
	HDR-2	97.5	101.9	103.1	87.9	101.3	86.5	91.1	97.2	115.6	137.4
	HDR-3	88.5	99.2	97.4	105.4	97.7	87.4	96.5	99.1	119.5	132.3
	HDR-4	102.9	90.0	81.4	93.9	95.8	90.6	104.0	91.9	116.1	122.5
	HDR-5	101.1	101.2	86.7	94.6	96.6	96.4	103.1	102.8	125.0	128.6
	HDR-6	86.7	99.5	105.4	105.8	99.6	85.3	110.3	94.9	120.9	126.6
	HDR-7	92.7	89.2	99.3	106.7	92.6	87.7	114.7	98.9	115.6	129.6
	HDR-8	93.5	96.5	88.0	96.3	90.0	87.9	103.8	98.2	116.1	130.5
	HDR-9	95.4	83.7	97.3	86.9	97.3	94.9	109.9	110.1	119.7	112.2
	HDR-10	87.9	101.3	86.3	94.7	97.8	82.5	102.3	108.2	121.0	119.8
	HDR-11	102.1	101.0	100.0	74.9	97.5	78.2	104.8	95.7	122.4	126.9
	LCS2	100.2	99.7	102.6	106.3	99.9	101.7	103.4	98.6	97.3	102.6
Acetaminophen	LCS1	93.4	101.7	101.8	104.2	96.5	96.9	95.7	100.7	101.4	89.1
	HDR-1	92.9	101.1	103.8	99.4	82.4	85.2	109.2	85.2	83.3	83.2
	HDR-2	91.1	101.3	97.8	121.0	67.6	81.0	108.6	83.7	76.5	81.1
	HDR-3	84.0	128.2	111.3	105.8	77.4	69.1	109.8	82.4	72.2	73.3
	HDR-4	73.8	90.4	109.7	101.1	75.4	60.7	108.8	84.6	60.8	80.0
	HDR-5	88.8	96.0	123.9	109.3	94.4	81.4	111.9	111.7	88.2	69.5
	HDR-6	94.1	96.9	115.4	124.1	88.3	74.4	106.9	83.8	75.3	78.8
	HDR-7	96.8	84.7	119.5	101.5	117.8	92.5	111.4	79.4	65.2	83.7
	HDR-8	75.0	105.9	107.9	116.6	79.8	71.9	89.9	80.4	61.7	80.1
	HDR-9	87.4	89.1	112.1	116.2	91.0	74.9	106.5	82.3	74.9	88.9
	HDR-10	89.3	122.1	107.2	98.1	84.2	71.4	90.5	88.6	77.0	87.4
	HDR-11	113.0	127.4	111.0	69.7	89.7	73.0	101.4	83.1	69.0	83.7
	LCS2	90.4	99.9	97.8	101.3	106.5	96.7	96.7	102.9	101.4	89.6
Albuterol	LCS1	79.2	117.8	85.9	99.3	122.7	91.9	96.8	248.8	61.2	63.0
	HDR-1	101.7	109.4	88.2	122.0	125.8	83.6	178.8	731.0	89.7	127.6
	HDR-2	109.3	111.0	128.1	141.8	152.6	110.4	152.2	391.6	126.0	132.1
	HDR-3	94.4	98.0	96.4	137.7	156.8	84.0	175.7	619.1	103.2	149.6
	HDR-4	102.6	106.3	84.7	136.8	108.9	56.8	115.6	561.6	92.0	119.5
	HDR-5	119.3	103.4	99.6	140.7	113.6	93.3	175.1	478.2	101.8	121.2
	HDR-6	95.6	105.5	122.0	112.4	120.0	86.2	146.6	479.5	108.6	130.7
	HDR-7	93.9	101.4	75.1	109.7	104.2	73.7	133.1	589.4	96.0	117.5
	HDR-8	112.3	117.6	132.0	109.8	127.1	93.5	136.7	576.6	90.0	102.3
	HDR-9	115.8	114.9	122.6	80.9	132.6	43.4	147.9	575.2	78.8	133.6
	HDR-10	121.4	112.4	99.2	123.0	129.6	48.2	133.1	1136.2	128.1	108.0
	HDR-11	98.5	99.2	113.4	103.5	133.2	45.9	181.4	380.5	117.0	105.0
	LCS2	88.4	101.9	73.1	105.0	98.6	64.0	134.3	56.7	70.0	62.9

Working Stock Standard ID		WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 07-15-16	WSS-07-25-16	WSS 08-15-16	WSS 08-29-16	WSS 09-07-16	WSS-09-21-16
Analytical Date		7/1/16	7/3/16	7/5/16	7/8/16	7/17/16	7/31/16	8/15/16	8/30/16	9/7/16	9/21/16
Days Since Spike		0	2	4	7	16	30	45	60	69	84
Compound	**Sample Name**										
Amoxicilin	LCS1	95.6	102.6	98.0	100.5	75.2	104.5	98.9	98.2	122.9	88.6
	HDR-1	39.1	33.5	54.5	42.1	304.8	123.0	474.9	750.1	728.1	577.0
	HDR-2	31.8	38.8	18.3	48.7	333.8	113.9	445.2	727.5	578.9	650.1
	HDR-3	13.1	19.9	59.8	40.4	264.6	105.1	443.8	625.1	717.3	580.4
	HDR-4	45.5	31.9	18.0	47.1	338.5	75.1	419.8	657.9	701.4	583.7
	HDR-5	28.3	21.4	42.2	33.9	279.6	87.0	393.6	600.5	655.3	690.4
	HDR-6	39.5	25.2	29.2	46.5	226.8	106.5	368.8	735.5	668.8	588.5
	HDR-7	10.4	36.6	36.5	28.9	311.9	92.5	427.6	646.5	771.7	611.4
	HDR-8	23.2	31.5	57.7	37.8	362.4	119.2	339.2	609.5	609.5	636.5
	HDR-9	26.5	23.7	30.6	26.7	267.5	112.5	436.6	638.6	755.0	685.6
	HDR-10	51.6	25.4	44.8	18.4	350.1	72.5	289.8	786.0	606.3	471.4
	HDR-11	48.9	29.4	29.9	20.4	371.8	106.0	456.4	684.6	717.4	574.3
	LCS2	97.5	106.2	100.1	110.2	128.8	92.6	113.4	99.6	139.8	105.7
Andorostenedione	LCS1	126.5	88.7	99.5	114.6	92.0	96.9	128.1	97.8	95.2	109.6
	HDR-1	63.4	68.9	67.7	81.1	67.3	61.4	71.4	91.7	77.0	98.1
	HDR-2	63.8	78.6	74.2	77.8	69.8	46.8	88.2	83.4	94.0	92.9
	HDR-3	59.5	58.0	60.8	83.4	101.7	54.8	70.9	79.7	74.9	94.0
	HDR-4	64.0	48.4	55.4	78.5	82.2	39.9	82.2	75.3	93.3	84.7
	HDR-5	55.9	64.6	65.3	69.6	92.0	54.3	72.9	125.0	91.1	89.3
	HDR-6	77.0	57.8	62.0	66.5	87.2	50.7	79.1	81.3	95.8	102.6
	HDR-7	74.3	63.4	60.8	76.6	94.6	44.5	92.1	97.3	86.4	108.3
	HDR-8	74.3	60.2	60.1	76.9	81.5	49.2	60.1	96.0	78.8	101.7
	HDR-9	73.0	68.4	70.4	68.1	92.7	49.2	88.0	78.7	97.1	109.0
	HDR-10	73.6	50.1	64.4	74.1	82.5	50.3	68.9	126.1	98.3	101.5
	HDR-11	79.1	56.8	74.3	47.1	87.5	46.7	92.4	67.6	78.4	129.6
	LCS2	100.0	86.9	87.2	100.5	123.8	93.4	98.3	95.5	91.8	93.4
Atenolol	LCS1	123.8	94.4	107.2	118.1	89.6	76.6	100.6	107.6	100.6	107.8
	HDR-1	49.8	38.6	35.6	53.5	41.3	37.3	52.2	57.5	57.9	56.0
	HDR-2	45.8	43.1	40.6	49.1	41.2	33.6	42.0	59.2	56.5	53.3
	HDR-3	51.9	36.0	37.6	51.8	37.8	31.7	41.3	68.2	55.0	51.0
	HDR-4	42.6	36.8	40.3	47.3	43.0	31.5	48.7	64.4	54.0	51.6
	HDR-5	54.6	40.0	42.0	50.1	42.9	34.8	45.6	73.7	60.6	51.6
	HDR-6	48.5	33.7	39.2	45.2	38.2	30.9	46.8	66.8	53.8	49.8
	HDR-7	47.6	38.1	44.7	48.6	39.6	31.7	42.4	69.3	60.4	49.2
	HDR-8	40.0	36.0	36.2	46.1	39.5	35.9	48.0	70.3	53.3	53.0
	HDR-9	47.0	42.0	39.4	43.4	43.0	34.3	44.5	71.3	57.7	47.8
	HDR-10	40.8	36.3	40.8	48.6	41.2	36.1	52.3	93.5	61.1	51.1
	HDR-11	51.9	37.2	37.5	37.8	42.1	33.4	50.0	67.4	55.1	53.9
	LCS2	118.5	98.3	107.0	113.8	98.0	98.7	87.1	101.5	88.2	110.6
Atrazine	LCS1	97.3	112.2	99.6	109.5	97.8	98.0	95.2	92.4	100.1	102.2
	HDR-1	70.1	68.3	66.4	75.0	82.0	68.3	71.3	67.0	85.5	66.3
	HDR-2	71.4	67.4	78.5	71.7	82.7	67.0	71.2	64.5	84.9	77.3
	HDR-3	74.6	73.6	72.2	69.5	87.2	65.5	72.6	62.9	91.6	82.8
	HDR-4	78.3	73.0	71.8	69.7	82.6	69.0	78.2	66.7	88.4	74.1
	HDR-5	69.4	82.9	68.7	71.6	86.4	68.5	72.6	64.5	85.0	81.7
	HDR-6	76.2	72.2	76.4	65.3	83.0	65.8	77.7	70.9	81.3	81.8
	HDR-7	67.9	74.5	77.5	65.6	87.5	66.0	75.5	61.8	84.5	74.5
	HDR-8	74.4	64.0	70.2	71.0	84.1	64.1	71.0	63.9	84.7	83.8

Working Stock Standard ID		WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 07-15-16	WSS-07-25-16	WSS 08-15-16	WSS 08-29-16	WSS 09-07-16	WSS-09-21-16
Analytical Date		7/1/16	7/3/16	7/5/16	7/8/16	7/17/16	7/31/16	8/15/16	8/30/16	9/7/16	9/21/16
Days Since Spike		0	2	4	7	16	30	45	60	69	84
Compound	**Sample Name**										
	HDR-9	76.3	79.2	69.1	62.4	86.0	64.1	77.3	64.7	79.7	76.2
	HDR-10	68.3	71.8	71.7	70.6	88.3	57.8	76.3	50.0	86.6	67.3
	HDR-11	73.0	66.0	68.4	41.2	86.1	61.8	65.1	60.9	87.4	77.2
	LCS2	105.9	101.3	100.9	102.2	113.7	97.1	105.9	86.8	106.1	107.1
Bendroflumethiazide - M-H	LCS1	103.7	97.3	97.7	107.3	83.7	94.2	90.2	99.3	85.0	103.9
	HDR-1	181.1	183.9	182.5	183.9	103.9	264.2	141.6	118.5	142.7	130.1
	HDR-2	182.3	186.6	189.6	173.9	101.7	281.8	130.8	112.2	142.9	115.3
	HDR-3	175.2	194.9	175.6	179.4	107.4	276.1	125.7	116.0	128.2	117.1
	HDR-4	169.4	172.0	164.1	166.3	97.3	255.3	130.7	136.1	125.4	104.0
	HDR-5	182.7	162.4	199.6	160.3	99.4	268.9	120.1	144.8	150.4	101.5
	HDR-6	164.2	169.1	173.8	170.4	108.2	256.5	129.9	114.3	135.5	115.4
	HDR-7	163.5	176.7	176.8	152.9	101.6	246.7	121.7	110.0	131.1	117.0
	HDR-8	158.7	154.5	163.1	163.0	98.2	271.6	115.1	116.6	130.3	109.9
	HDR-9	162.7	157.5	158.5	143.3	110.9	250.8	115.1	112.2	139.6	101.0
	HDR-10	148.9	159.9	177.8	163.1	97.9	254.3	126.4	77.5	143.5	109.1
	HDR-11	192.2	156.9	161.1	170.0	101.5	253.3	121.3	105.1	140.9	113.6
	LCS2	94.4	91.2	95.4	106.2	89.7	90.1	93.8	93.9	83.0	92.6
Bezafibrate	LCS1	96.4	92.9	98.8	106.8	87.9	92.4	85.6	98.3	106.7	112.3
	HDR-1	170.9	174.7	169.0	190.6	151.1	146.8	240.4	186.0	189.5	207.9
	HDR-2	177.7	177.2	165.9	186.1	140.2	153.6	202.2	171.3	178.4	188.5
	HDR-3	162.8	174.6	168.4	182.8	135.8	145.8	222.0	168.0	175.9	165.9
	HDR-4	162.3	161.9	150.2	188.3	122.2	133.2	200.9	189.7	169.3	174.6
	HDR-5	182.3	167.7	179.8	170.2	133.8	150.0	197.5	215.2	191.0	186.4
	HDR-6	160.4	165.1	166.8	182.1	137.9	148.1	215.8	184.5	188.4	193.3
	HDR-7	165.4	165.6	164.6	181.7	127.3	138.3	199.8	169.7	191.5	202.6
	HDR-8	161.1	170.0	150.7	178.2	132.0	141.4	183.7	170.5	186.7	174.5
	HDR-9	159.3	156.5	162.0	174.6	153.3	149.4	200.9	185.3	219.8	169.7
	HDR-10	149.0	160.0	170.5	178.7	135.1	151.3	210.2	145.8	203.7	193.8
	HDR-11	184.8	157.8	147.5	159.8	145.7	141.7	197.3	160.7	183.4	182.0
	LCS2	96.0	102.6	103.5	118.7	98.0	92.1	107.1	96.6	113.7	93.0
Bisphenol A	LCS1	101.7	100.4	98.1	109.4	99.9	98.5	100.1	100.1	97.6	95.6
	HDR-1	94.7	94.9	92.2	102.7	90.8	75.0	97.6	98.1	101.5	96.0
	HDR-2	95.8	94.4	95.0	100.7	88.7	72.0	96.9	101.9	99.0	94.2
	HDR-3	96.8	97.6	96.9	101.5	94.7	71.1	97.6	98.8	96.3	91.0
	HDR-4	101.0	94.1	92.2	97.4	86.0	70.4	92.3	95.5	91.7	85.5
	HDR-5	95.1	92.5	96.8	100.8	90.1	77.8	98.1	106.5	99.4	92.9
	HDR-6	99.9	96.5	91.8	95.5	87.4	74.4	103.4	98.9	101.0	97.2
	HDR-7	132.9	94.6	100.0	100.1	89.2	70.1	97.9	94.4	103.4	94.9
	HDR-8	99.6	95.5	98.6	97.8	80.6	65.5	91.3	93.8	92.9	95.9
	HDR-9	99.0	93.1	93.7	93.0	97.1	75.2	95.0	98.7	100.1	90.6
	HDR-10	101.6	89.6	98.6	99.4	90.4	75.4	100.6	168.2	96.6	92.3
	HDR-11	102.8	97.7	91.2	78.5	92.8	73.7	97.9	93.1	98.2	96.5
	LCS2	101.0	102.2	103.3	106.1	101.4	98.2	101.0	99.9	95.9	96.0
Bromacil	LCS1	99.4	92.0	94.8	101.9	88.7	92.7	101.0	83.9	91.7	98.1
	HDR-1	132.7	140.0	137.0	151.8	124.0	143.8	178.7	119.8	143.2	157.1
	HDR-2	138.5	136.6	149.0	143.7	102.1	135.4	176.3	118.9	131.2	133.6
	HDR-3	138.4	124.5	133.8	131.6	105.1	122.5	162.5	106.8	131.6	173.9
	HDR-4	130.1	111.5	127.6	156.2	104.4	130.8	159.4	114.8	130.8	134.3

Working Stock Standard ID		WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 07-15-16	WSS-07-25-16	WSS 08-15-16	WSS 08-29-16	WSS 09-07-16	WSS-09-21-16
Analytical Date		7/1/16	7/3/16	7/5/16	7/8/16	7/17/16	7/31/16	8/15/16	8/30/16	9/7/16	9/21/16
Days Since Spike		0	2	4	7	16	30	45	60	69	84
Compound	**Sample Name**										
	HDR-5	135.0	129.7	146.3	145.5	109.1	138.2	162.5	140.2	147.3	132.4
	HDR-6	132.8	123.4	134.4	149.6	120.1	127.2	160.8	105.3	117.3	137.8
	HDR-7	128.7	140.4	130.5	156.7	99.1	122.7	164.9	101.2	126.7	129.5
	HDR-8	127.4	144.0	145.1	148.7	108.0	131.2	146.8	103.2	150.4	139.9
	HDR-9	136.6	133.8	132.0	140.4	121.4	130.5	161.4	117.5	136.9	133.9
	HDR-10	110.9	123.4	135.0	157.6	122.6	128.1	171.8	172.1	120.3	139.8
	HDR-11	149.8	120.3	115.4	113.2	108.6	130.1	154.5	103.0	131.9	153.1
	LCS2	97.2	97.1	98.2	98.7	85.5	92.3	104.2	92.7	93.5	101.0
Clofibric acid	LCS1	105.0	101.1	98.2	99.7	97.7	99.7	94.9	95.7	132.8	92.8
	HDR-1	132.1	133.6	126.7	141.3	127.6	108.2	137.0	111.6	131.9	134.4
	HDR-2	126.0	140.2	122.9	129.0	114.3	100.6	129.2	103.0	81.3	131.9
	HDR-3	140.9	138.6	123.5	130.5	110.9	95.7	120.3	106.2	114.1	122.1
	HDR-4	122.1	132.3	126.8	135.1	121.2	100.8	120.8	96.6	91.8	122.4
	HDR-5	132.1	140.4	129.7	131.0	115.4	108.3	127.7	114.1	114.7	132.8
	HDR-6	130.8	135.5	129.7	132.8	123.3	105.9	128.5	102.0	130.3	126.3
	HDR-7	131.3	125.1	125.1	135.9	137.9	97.6	131.7	106.9	104.7	114.7
	HDR-8	132.0	126.8	125.1	128.9	130.5	94.2	123.1	94.3	145.2	116.1
	HDR-9	133.2	139.9	124.9	130.1	135.7	105.1	123.0	99.0	135.5	115.8
	HDR-10	137.3	138.2	118.2	127.9	128.5	101.1	123.1	100.8	125.4	133.5
	HDR-11	131.1	129.6	119.0	123.5	121.8	102.0	129.4	100.1	133.4	124.1
	LCS2	102.2	100.0	94.6	93.8	99.4	98.7	103.6	107.8	115.1	107.7
Butalbital	LCS1	100.4	99.2	103.3	111.9	85.6	93.0	91.5	90.6	94.9	88.7
	HDR-1	118.7	121.3	114.3	149.6	135.4	120.6	139.1	117.6	154.4	154.8
	HDR-2	99.9	123.3	120.1	126.3	118.5	111.1	138.7	117.3	160.2	134.9
	HDR-3	108.2	107.0	107.0	136.8	117.7	107.4	126.6	124.9	132.8	132.8
	HDR-4	101.3	96.5	105.4	133.8	124.3	113.1	118.8	130.5	145.0	131.2
	HDR-5	101.7	118.7	121.3	125.9	123.9	108.3	114.4	160.6	129.6	146.9
	HDR-6	94.6	116.0	117.5	132.5	125.8	111.3	113.1	122.8	124.3	151.7
	HDR-7	115.8	119.1	111.7	126.5	117.0	110.9	124.7	109.2	143.6	132.8
	HDR-8	107.6	111.3	115.3	143.7	110.3	107.8	107.2	115.3	126.6	137.1
	HDR-9	108.4	125.9	106.8	127.7	112.6	117.0	115.0	109.8	151.1	128.1
	HDR-10	94.5	100.9	129.2	124.4	121.0	119.8	129.1	246.4	145.1	132.6
	HDR-11	115.5	110.5	109.6	156.1	120.0	113.0	119.4	113.2	141.0	126.1
	LCS2	92.9	103.2	98.6	105.3	96.2	90.6	88.9	94.7	90.2	90.3
Butylparaben-NEG	LCS1	98.2	94.8	101.5	96.5	88.9	96.0	93.8	99.6	124.3	96.4
	HDR-1	100.0	101.5	100.2	104.9	92.6	105.3	129.3	107.7	151.3	119.1
	HDR-2	90.9	96.4	95.6	102.1	89.2	96.0	126.1	107.0	110.2	118.3
	HDR-3	97.9	96.3	92.2	100.1	89.1	97.9	122.7	108.2	140.0	118.8
	HDR-4	97.4	100.4	96.8	100.5	87.1	95.0	120.2	100.6	127.7	105.3
	HDR-5	94.7	100.3	100.8	99.8	88.9	102.1	115.7	110.8	141.2	113.2
	HDR-6	99.2	98.5	98.8	97.2	94.1	98.9	125.0	108.6	163.0	118.5
	HDR-7	94.7	103.2	98.5	98.3	95.3	97.6	118.3	108.5	143.4	116.9
	HDR-8	102.3	92.6	96.4	100.7	94.3	91.7	118.2	107.8	143.9	113.5
	HDR-9	96.6	96.6	95.7	101.7	95.7	104.5	121.4	110.3	165.8	115.4
	HDR-10	92.8	92.4	98.7	96.3	95.5	96.1	115.5	99.0	165.9	119.9
	HDR-11	95.5	100.0	92.6	77.0	91.8	94.6	118.1	104.5	153.8	112.8
	LCS2	95.8	91.6	87.1	97.6	95.1	84.7	103.1	113.9	120.3	94.6
Caffeine	LCS1	99.6	98.1	99.3	114.8	104.3	99.9	103.2	92.4	102.3	101.6

Working Stock Standard ID		WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 07-15-16	WSS-07-25-16	WSS 08-15-16	WSS 08-29-16	WSS 09-07-16	WSS-09-21-16
Analytical Date		7/1/16	7/3/16	7/5/16	7/8/16	7/17/16	7/31/16	8/15/16	8/30/16	9/7/16	9/21/16
Days Since Spike		0	2	4	7	16	30	45	60	69	84
Compound	**Sample Name**										
	HDR-1	81.3	111.6	107.4	92.5	69.6	93.0	187.8	117.1	108.4	86.8
	HDR-2	80.7	105.6	99.9	102.4	120.4	68.4	117.1	84.8	102.1	137.4
	HDR-3	77.0	95.5	112.1	40.4	164.3	92.7	122.1	107.0	137.2	198.3
	HDR-4	92.4	114.5	80.5	102.6	97.0	72.2	115.3	103.5	127.8	101.3
	HDR-5	112.7	132.8	158.9	116.4	83.2	114.7	49.9	122.1	134.2	69.3
	HDR-6	143.8	111.3	107.1	115.6	135.2	90.1	105.8	107.5	74.9	109.5
	HDR-7	66.0	111.1	91.6	98.8	76.5	63.8	59.0	107.1	98.3	103.3
	HDR-8	130.6	183.9	108.5	136.5	42.3	71.8	102.5	129.2	133.7	89.4
	HDR-9	102.0	99.8	107.9	95.1	81.3	155.5	72.7	89.7	99.4	69.7
	HDR-10	97.1	72.9	123.1	126.0	98.6	81.2	123.5	274.4	115.5	148.4
	HDR-11	107.6	73.0	115.7	67.4	110.6	133.1	103.8	86.1	102.5	108.9
	LCS2	106.5	100.8	104.7	115.6	112.1	101.3	104.8	96.4	105.6	108.1
Carbadox	LCS1	109.5	91.6	100.0	107.6	87.8	73.5	101.0	99.3	141.8	95.2
	HDR-1	93.0	117.6	90.7	114.3	102.1	98.9	105.9	115.8	131.2	117.6
	HDR-2	92.8	88.3	114.0	114.2	115.5	66.5	121.4	108.4	85.6	160.7
	HDR-3	102.9	97.8	112.1	118.8	101.0	88.8	102.6	101.8	111.0	121.2
	HDR-4	110.2	99.3	114.1	88.8	99.6	100.7	109.9	124.7	115.1	163.2
	HDR-5	116.5	98.8	113.0	105.7	105.5	101.4	104.1	149.7	127.4	114.2
	HDR-6	114.2	92.4	83.9	86.1	117.3	66.8	119.3	130.7	120.8	156.5
	HDR-7	100.5	103.8	100.6	104.3	101.2	77.1	117.9	138.6	105.8	136.8
	HDR-8	112.2	110.0	86.7	100.0	95.3	85.0	126.0	111.4	101.2	114.2
	HDR-9	110.5	104.9	112.3	89.0	115.8	97.6	124.3	133.1	147.3	117.6
	HDR-10	105.5	116.8	104.6	103.5	111.9	76.0	97.1	112.6	166.3	112.4
	HDR-11	128.1	116.5	109.1	66.0	109.2	68.5	88.6	112.7	115.8	117.2
	LCS2	101.0	93.7	99.5	102.8	96.2	94.3	95.0	109.9	112.9	96.1
Carbamazepine	LCS1	96.5	95.1	105.9	112.5	103.4	93.9	100.4	96.6	105.8	90.1
	HDR-1	124.2	132.1	118.9	133.8	114.2	96.4	119.3	116.9	133.2	137.5
	HDR-2	124.0	134.5	128.9	134.5	118.1	96.0	124.5	120.5	138.6	134.4
	HDR-3	135.4	125.1	125.1	134.8	119.2	91.1	116.8	131.7	128.7	135.8
	HDR-4	129.6	127.4	125.2	125.7	113.8	92.9	123.2	128.2	132.9	133.1
	HDR-5	124.2	125.4	123.0	137.9	113.8	101.0	119.3	130.1	140.4	124.1
	HDR-6	129.4	124.6	132.1	131.6	123.2	99.0	129.7	126.5	136.5	131.2
	HDR-7	134.3	126.6	135.4	134.6	122.2	97.5	113.7	121.7	124.5	125.4
	HDR-8	125.5	124.5	131.5	130.8	114.6	89.4	114.9	117.2	128.7	119.2
	HDR-9	133.2	127.8	124.8	129.1	129.6	101.9	118.1	122.6	141.6	122.3
	HDR-10	128.9	122.0	127.8	141.5	131.3	91.4	120.5	135.4	132.0	128.7
	HDR-11	135.2	123.8	137.2	102.9	132.3	99.3	126.4	117.2	125.4	122.8
	LCS2	103.8	98.1	99.8	102.6	105.8	98.8	97.9	85.1	99.2	94.5
Carisoprodol	LCS1	98.6	101.6	107.3	117.7	103.0	106.5	81.2	100.3	98.6	127.6
	HDR-1	108.5	117.9	147.8	141.5	117.8	129.4	334.8	107.9	138.6	167.6
	HDR-2	113.8	111.0	168.6	134.9	95.6	144.8	156.6	85.0	123.0	183.1
	HDR-3	102.8	121.0	139.3	134.6	93.0	116.1	268.0	91.1	143.7	200.1
	HDR-4	113.5	116.4	126.7	142.6	115.5	99.9	163.5	81.3	141.4	165.1
	HDR-5	151.3	163.0	200.6	156.5	129.7	602.9	88.0	95.2	164.7	126.1
	HDR-6	137.3	124.0	128.2	114.5	89.4	105.8	209.9	92.9	121.1	146.7
	HDR-7	91.7	128.5	119.1	116.3	92.9	141.4	140.1	99.5	129.6	138.5
	HDR-8	111.8	169.5	107.9	165.8	97.1	95.8	156.7	95.8	143.7	130.5
	HDR-9	127.1	104.4	105.1	105.3	99.1	352.6	138.6	94.7	157.1	124.3

Working Stock Standard ID		WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 07-15-16	WSS-07-25-16	WSS 08-15-16	WSS 08-29-16	WSS 09-07-16	WSS-09-21-16
Analytical Date		7/1/16	7/3/16	7/5/16	7/8/16	7/17/16	7/31/16	8/15/16	8/30/16	9/7/16	9/21/16
Days Since Spike		0	2	4	7	16	30	45	60	69	84
Compound	**Sample Name**										
	HDR-10	95.6	123.1	174.6	145.1	78.6	97.3	208.4	190.7	171.0	141.6
	HDR-11	112.2	107.0	128.6	210.1	111.8	144.3	174.6	67.5	148.0	138.5
	LCS2	94.5	79.6	91.1	80.3	110.8	85.9	75.6	97.7	79.8	77.7
Chloramphenicol_M-H	LCS1	99.8	103.5	89.5	108.2	92.2	101.0	103.5	104.7	128.3	103.5
	HDR-1	98.2	116.6	103.1	114.7	125.4	94.6	106.9	74.4	106.7	113.4
	HDR-2	109.1	102.9	89.1	101.5	95.6	89.8	99.8	82.9	74.5	109.1
	HDR-3	105.7	105.6	99.3	104.6	101.3	79.2	103.2	75.8	97.6	107.3
	HDR-4	97.9	97.4	105.3	102.3	108.3	77.9	84.8	75.0	82.2	91.6
	HDR-5	112.2	101.7	107.5	104.8	98.4	95.4	101.3	76.2	96.1	104.0
	HDR-6	106.2	101.4	97.5	96.2	110.1	87.1	109.3	83.3	107.2	90.1
	HDR-7	113.3	103.4	83.1	100.3	105.7	84.0	111.4	82.4	93.4	89.0
	HDR-8	108.0	98.8	98.8	107.6	114.5	78.5	97.8	71.9	102.7	85.9
	HDR-9	98.7	107.0	101.7	99.6	103.7	91.2	102.2	79.2	109.6	102.4
	HDR-10	91.3	98.1	87.5	107.5	113.6	90.7	103.5	76.2	105.0	91.8
	HDR-11	107.3	96.4	101.7	79.1	96.0	77.1	112.3	74.4	106.4	91.8
	LCS2	82.0	91.7	82.6	83.3	100.7	93.8	102.1	110.9	118.3	89.0
Chloridazon	LCS1	101.7	98.9	102.7	106.5	88.7	94.8	94.2	88.4	97.1	108.0
	HDR-1	96.8	87.5	79.4	100.4	95.6	83.3	127.4	81.6	110.5	114.6
	HDR-2	102.8	79.5	90.9	104.9	76.4	101.4	130.3	95.2	131.3	129.2
	HDR-3	82.3	93.3	84.8	83.2	77.5	88.0	122.2	96.0	114.1	106.3
	HDR-4	76.0	70.7	88.7	90.2	69.9	77.8	106.6	104.2	124.7	132.4
	HDR-5	77.9	73.9	88.0	94.8	75.3	77.1	110.1	106.4	110.3	104.6
	HDR-6	74.8	89.3	95.2	90.8	76.4	84.9	109.4	78.3	125.6	129.7
	HDR-7	85.5	76.0	82.4	88.3	3.0	81.9	108.0	91.8	127.8	138.0
	HDR-8	79.4	84.5	101.8	104.0	76.1	85.6	101.6	92.2	104.9	157.6
	HDR-9	75.6	77.7	81.4	81.1	89.5	89.8	91.6	91.5	111.2	139.0
	HDR-10	76.4	70.2	113.2	94.4	81.6	96.4	105.7	77.4	126.2	147.4
	HDR-11	75.7	77.3	100.8	79.7	75.0	85.0	108.5	88.7	116.1	141.2
	LCS2	92.9	99.5	101.0	98.4	85.6	94.4	102.2	89.5	96.7	116.9
Chlorotoluron	LCS1	105.7	97.3	95.2	108.5	84.7	94.4	92.6	99.4	92.3	107.8
	HDR-1	99.9	102.8	105.1	115.7	100.7	110.8	155.8	125.1	155.3	160.9
	HDR-2	104.7	98.5	106.9	112.7	97.3	109.2	144.8	123.5	150.4	149.8
	HDR-3	104.4	101.7	99.1	106.6	96.8	100.5	147.9	116.5	131.9	141.5
	HDR-4	102.1	87.9	96.1	103.2	93.5	97.0	147.6	129.6	131.9	131.7
	HDR-5	96.3	92.1	109.6	106.8	95.1	101.9	134.5	146.8	149.6	128.9
	HDR-6	91.1	93.5	99.9	109.5	94.0	101.0	145.5	120.9	143.5	135.2
	HDR-7	97.9	95.4	100.0	106.5	90.8	95.8	134.2	116.1	133.7	140.7
	HDR-8	91.8	92.0	97.1	106.4	87.7	105.6	127.9	116.3	135.9	136.6
	HDR-9	97.6	94.3	95.6	94.6	103.9	107.5	137.4	121.1	149.3	127.6
	HDR-10	90.9	88.9	104.1	108.8	94.3	96.3	144.6	107.3	157.8	136.1
	HDR-11	110.1	89.8	96.1	79.0	98.9	98.1	143.4	115.0	143.2	140.3
	LCS2	112.0	99.0	103.4	113.5	91.6	91.5	105.8	102.0	88.7	101.3
Cimetidine - PRM	LCS1	119.0	109.2	105.7	99.2	79.3		103.7	103.5	120.3	104.2
	HDR-1	38.1	54.9	38.9	109.5	27.1		12.9		30.9	9.6
	HDR-2	43.1	49.2	34.0	109.6	21.4		13.9		28.3	15.9
	HDR-3	38.1	50.7	37.9	101.7	15.9		12.6		23.8	14.0
	HDR-4	43.1	62.3	35.2	120.6	10.2		18.0		29.8	18.1
	HDR-5	38.8	49.5	34.8	121.1	18.4		19.5		37.9	20.0

Working Stock Standard ID		WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 07-15-16	WSS-07-25-16	WSS 08-15-16	WSS 08-29-16	WSS 09-07-16	WSS-09-21-16
Analytical Date		7/1/16	7/3/16	7/5/16	7/8/16	7/17/16	7/31/16	8/15/16	8/30/16	9/7/16	9/21/16
Days Since Spike		0	2	4	7	16	30	45	60	69	84
Compound	**Sample Name**										
	HDR-6	43.9	53.7	34.6	99.9	15.7		16.0		32.1	15.3
	HDR-7	38.2	52.7	34.1	101.4	16.9		20.3		40.7	11.8
	HDR-8	39.4	54.7	25.8	103.7	15.7		17.7		38.4	16.5
	HDR-9	38.6	53.7	27.8	110.5	24.4		19.2		37.6	15.2
	HDR-10	31.8	52.0	33.6	111.1	13.1		27.4		40.1	9.5
	HDR-11	38.0	48.9	32.6	101.4	29.1		11.9		47.7	14.0
	LCS2	96.7	111.8	96.7	68.7	103.9		82.7	104.4	99.8	93.2
Cotinine - PRM	LCS1	94.7	99.2	106.4	115.5	101.7	91.9	100.7	98.6	103.4	89.6
	HDR-1	95.0	115.8	114.7	98.7	110.0	69.2	100.9	113.8	112.5	124.3
	HDR-2	110.6	107.1	118.0	93.0	83.7	70.2	93.9	111.2	112.6	122.8
	HDR-3	113.7	116.9	118.7	99.1	99.2	88.5	100.6	109.1	104.8	108.1
	HDR-4	118.5	116.0	123.2	96.5	99.9	79.8	97.4	91.7	109.1	131.3
	HDR-5	120.2	118.6	138.6	99.2	102.9	76.6	80.5	121.7	115.4	142.9
	HDR-6	113.5	116.3	136.8	99.2	95.9	104.0	103.0	100.5	118.6	96.6
	HDR-7	106.6	108.4	123.4	88.4	107.7	100.3	101.9	106.5	103.4	123.2
	HDR-8	123.5	123.8	151.9	98.3	101.9	74.5	89.1	109.2	108.8	132.6
	HDR-9	116.5	120.1	N/F	111.8	91.4	86.0	108.4	120.8	131.8	116.4
	HDR-10	104.3	103.2	123.9	88.5	114.9	90.9	95.2	182.9	118.8	127.4
	HDR-11	123.5	120.3	127.1	90.1	97.9	92.2	99.6	117.4	131.5	131.0
	LCS2	90.3	98.5	105.9	104.3	96.3	89.6	94.7	93.7	97.0	81.9
Cyanazine	LCS1	99.0	98.7	100.5	109.5	101.4	101.2	96.9	102.6	98.9	97.7
	HDR-1	72.3	77.1	75.2	73.0	70.0	70.0	64.4	-35.1	70.8	70.7
	HDR-2	74.0	73.3	75.2	77.3	79.2	62.8	68.1	54.9	65.5	65.1
	HDR-3	81.4	75.5	76.2	73.0	74.4	59.7	70.2	62.0	66.6	71.8
	HDR-4	70.6	72.4	76.1	70.8	-37.9	60.8	74.3	58.7	64.2	66.9
	HDR-5	74.2	76.4	77.2	78.9	74.8	66.1	69.9	63.3	72.1	71.4
	HDR-6	72.1	78.9	71.8	70.4	73.6	65.1	75.5	55.8	78.3	64.3
	HDR-7	78.7	79.3	71.5	78.8	74.7	69.0	75.3	60.5	66.7	65.2
	HDR-8	74.2	74.1	74.1	74.6	-38.0	63.2	66.6	54.1	74.3	67.8
	HDR-9	74.6	72.2	77.4	68.0	77.8	64.6	69.9	59.3	71.0	69.0
	HDR-10	69.9	75.9	71.8	72.2	74.4	61.5	75.4	61.4	73.9	70.3
	HDR-11	70.8	76.7	69.0	61.6	77.2	61.3	69.0	58.7	74.3	61.7
	LCS2	94.9	99.0	98.7	104.7	99.2	95.2	103.0	92.7	98.4	105.6
DACT	LCS1	104.0	104.4	98.5	110.8	87.8	99.3	107.2	99.1	97.9	115.7
	HDR-1	181.1	199.1	248.2	152.5	186.2	182.9	251.8	224.6	188.9	214.6
	HDR-2	179.2	164.7	227.4	239.2	144.4	187.9	190.1	263.3	153.7	211.9
	HDR-3	133.1	196.9	202.3	186.0	162.0	173.5	234.9	310.3	150.1	229.2
	HDR-4	198.7	120.2	197.1	157.6	156.3	160.8	154.2	330.7	145.4	174.7
	HDR-5	215.1	157.4	224.0	183.4	184.9	212.6	230.1	162.1	125.4	202.3
	HDR-6	153.4	111.0	162.7	158.7	155.5	168.5	205.3	126.6	126.4	164.2
	HDR-7	154.1	123.2	234.6	158.2	136.1	181.1	202.1	170.9	143.2	184.8
	HDR-8	161.8	187.0	241.1	182.1	121.8	183.3	151.9	201.9	139.6	167.9
	HDR-9	213.3	148.2	178.2	184.4	164.9	165.2	161.0	226.7	124.7	202.3
	HDR-10	181.3	125.6	156.7	120.6	150.2	253.2	178.5	173.0	143.1	231.9
	HDR-11	200.0	187.8	216.1	191.2	175.9	167.3	211.8	177.9	131.2	207.1
	LCS2	89.0	83.9	89.3	91.3	96.0	92.7	82.8	97.0	72.9	74.3
DEA	LCS1	100.2	105.9	104.2	107.8	96.5	97.8	96.2	102.0	96.6	109.8
	HDR-1	86.4	93.6	77.3	88.9	72.3	75.6	88.8	49.4	98.0	258.5

Working Stock Standard ID		WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 07-15-16	WSS-07-25-16	WSS 08-15-16	WSS 08-29-16	WSS 09-07-16	WSS-09-21-16
Analytical Date		7/1/16	7/3/16	7/5/16	7/8/16	7/17/16	7/31/16	8/15/16	8/30/16	9/7/16	9/21/16
Days Since Spike		0	2	4	7	16	30	45	60	69	84
Compound	**Sample Name**										
	HDR-2	64.7	97.7	91.9	100.3	84.6	72.5	110.1	40.8	103.8	140.9
	HDR-3	94.7	85.7	97.9	106.9	44.9	47.5	81.8	70.8	95.2	134.9
	HDR-4	99.9	99.3	117.0	152.8	64.8	90.0	83.0	50.1	83.9	121.9
	HDR-5	103.2	89.3	88.7	148.6	98.6	61.9	107.6	75.0	84.7	84.8
	HDR-6	73.6	56.6	109.6	82.1	82.5	68.6	121.3	74.2	99.8	118.6
	HDR-7	105.7	84.9	80.3	80.6	79.7	50.1	110.8	100.7	105.6	115.4
	HDR-8	88.6	67.6	99.9	141.6	76.4	57.3	116.6	61.1	86.2	107.4
	HDR-9	118.9	105.6	109.7	94.3	88.3	64.3	93.0	55.5	113.8	122.9
	HDR-10	69.8	85.4	100.7	109.2	55.8	68.5	122.8	84.9	81.9	105.8
	HDR-11	115.2	110.5	94.9	70.9	54.5	56.5	76.8	76.7	106.2	134.9
	LCS2	98.7	106.1	103.1	101.2	95.5	93.2	106.9	95.4	97.1	109.7
DEET	LCS1	104.6	109.6	103.8	110.2	93.8	96.1	93.0	88.0	94.8	100.2
	HDR-1	81.6	80.8	81.2	88.4	91.7	77.6	90.8	84.0	75.6	85.0
	HDR-2	78.9	88.5	88.9	96.7	84.6	84.4	98.6	76.7	84.0	89.9
	HDR-3	80.7	82.9	83.8	83.6	84.7	67.7	98.6	79.0	81.4	82.3
	HDR-4	79.1	70.4	75.5	86.0	80.8	74.6	92.5	95.4	80.5	80.8
	HDR-5	82.9	77.1	82.6	90.4	86.5	76.1	86.7	105.2	87.3	79.4
	HDR-6	76.1	82.2	85.9	84.2	84.4	78.4	96.0	77.0	78.3	92.2
	HDR-7	85.1	82.7	87.7	85.3	80.0	76.1	96.0	82.9	84.2	86.3
	HDR-8	78.7	78.3	84.9	89.0	82.7	77.7	76.8	81.2	77.0	81.7
	HDR-9	81.7	78.4	79.7	79.2	89.6	83.7	84.7	88.4	82.7	84.0
	HDR-10	72.4	73.2	82.1	86.7	86.3	76.3	94.4	89.1	87.2	81.0
	HDR-11	90.1	78.0	82.1	79.1	83.3	75.6	91.7	80.3	74.0	84.5
	LCS2	95.1	94.8	98.4	100.3	96.6	90.7	91.8	87.3	86.1	91.3
Dehydronifedipine	LCS1	107.2	94.0	96.4	110.1	96.9	96.9	114.0	100.1	100.2	96.4
	HDR-1	82.3	76.0	69.6	80.3	70.4	72.6	78.4	68.1	89.3	88.0
	HDR-2	89.6	83.4	87.4	81.9	75.6	74.0	75.7	71.7	83.8	93.6
	HDR-3	94.9	76.7	73.9	85.8	77.7	69.6	73.6	82.1	87.5	93.6
	HDR-4	90.0	88.0	77.7	84.5	72.8	73.5	73.6	78.7	89.2	84.9
	HDR-5	83.8	73.5	83.0	89.7	76.8	79.0	75.2	77.9	105.0	91.0
	HDR-6	94.9	81.7	86.6	79.3	83.8	76.1	84.8	76.9	93.0	91.0
	HDR-7	95.9	87.5	84.7	82.6	82.1	69.2	81.5	75.9	90.8	91.9
	HDR-8	85.2	75.1	72.2	79.6	76.5	65.3	76.3	73.0	91.8	85.4
	HDR-9	90.4	83.9	81.8	78.1	89.1	75.7	73.1	72.9	100.1	91.4
	HDR-10	90.6	77.8	77.8	82.7	89.7	68.3	86.5	81.5	100.1	97.8
	HDR-11	90.2	79.8	84.2	69.3	89.7	74.4	76.1	70.5	95.8	91.6
	LCS2	122.8	100.9	107.1	109.7	110.4	108.3	107.4	94.8	105.9	107.2
DIA	LCS1	100.1	101.2	101.3	109.2	98.9	101.9	99.5	102.5	95.7	98.8
	HDR-1	81.2	101.6	89.0	65.3	86.9	87.2	102.8	69.5	103.3	118.4
	HDR-2	108.3	107.3	101.1	86.1	74.2	87.0	106.7	96.1	100.2	88.4
	HDR-3	97.3	92.9	71.1	101.3	86.9	76.4	94.8	89.5	98.8	108.6
	HDR-4	92.5	84.1	70.3	123.5	77.5	85.5	103.2	84.6	94.8	81.7
	HDR-5	77.0	94.7	84.1	83.9	105.2	62.2	94.7	87.0	92.0	78.4
	HDR-6	80.2	87.5	82.2	101.9	66.6	70.9	106.2	107.4	113.5	87.6
	HDR-7	77.0	95.3	97.6	84.9	81.6	88.6	91.1	98.4	95.7	111.9
	HDR-8	74.6	76.2	84.9	67.6	72.9	85.3	102.8	89.0	92.2	86.1
	HDR-9	71.9	88.9	96.8	96.3	82.1	65.7	106.9	90.2	109.0	89.8
	HDR-10	71.5	92.6	80.5	81.9	73.0	69.2	106.9	97.2	103.9	93.1

Working Stock Standard ID		WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 07-15-16	WSS-07-25-16	WSS 08-15-16	WSS 08-29-16	WSS 09-07-16	WSS-09-21-16
Analytical Date		7/1/16	7/3/16	7/5/16	7/8/16	7/17/16	7/31/16	8/15/16	8/30/16	9/7/16	9/21/16
Days Since Spike		0	2	4	7	16	30	45	60	69	84
Compound	**Sample Name**										
	HDR-11	93.4	81.9	89.2	60.3	93.4	77.4	77.0	66.2	78.3	119.4
	LCS2	94.3	103.1	103.0	101.5	99.8	102.1	100.6	103.5	93.8	96.5
Diazepam	LCS1	99.5	102.3	100.8	111.5	92.8	98.1	96.9	98.9	99.6	105.1
	HDR-1	85.1	89.5	79.8	88.5	85.4	85.3	98.4	91.2	112.8	115.8
	HDR-2	87.7	91.9	92.2	89.7	86.7	86.8	88.7	91.4	106.3	115.7
	HDR-3	91.5	91.2	87.4	98.0	85.6	77.8	89.8	94.9	105.1	113.1
	HDR-4	86.0	89.2	81.4	86.4	74.4	75.3	86.9	94.4	98.2	105.8
	HDR-5	87.7	88.4	87.0	92.2	82.9	85.0	93.8	113.0	109.0	115.1
	HDR-6	82.6	87.0	87.3	89.8	86.4	84.4	94.4	89.5	105.5	117.4
	HDR-7	88.9	91.3	95.7	92.8	85.4	86.8	90.8	89.1	103.1	118.9
	HDR-8	87.0	89.6	89.3	92.9	77.6	77.5	85.9	85.7	98.7	109.7
	HDR-9	87.5	87.4	85.5	82.9	87.9	86.9	88.4	96.5	115.6	109.0
	HDR-10	82.5	88.5	89.9	91.3	83.3	84.6	95.7	86.8	114.0	115.5
	HDR-11	93.0	91.2	85.9	77.0	86.4	83.2	91.5	88.8	109.1	119.9
	LCS2	101.4	106.5	102.1	107.0	97.1	99.1	95.0	105.3	94.7	108.5
Diclofenac- M-H	LCS1	98.5	98.1	98.7	104.8	92.2	97.7	100.1	108.2	137.3	105.6
	HDR-1	103.0	112.7	114.9	110.7	108.2	83.7	130.3	95.3	144.3	114.5
	HDR-2	97.0	96.7	106.1	96.7	86.4	79.7	113.4	100.7	99.1	112.3
	HDR-3	94.4	95.4	98.7	104.7	85.7	77.0	106.1	100.9	128.0	100.9
	HDR-4	94.2	103.5	101.5	111.7	90.6	73.2	100.3	102.5	98.1	107.1
	HDR-5	95.5	101.1	101.2	100.3	89.4	81.9	99.5	106.8	129.3	107.1
	HDR-6	96.5	100.8	98.6	106.2	96.8	79.1	110.2	104.7	137.7	106.8
	HDR-7	99.1	97.1	96.2	100.1	95.5	74.7	101.5	105.1	124.9	101.2
	HDR-8	99.1	99.3	100.1	99.0	98.1	68.1	99.2	105.4	132.1	97.2
	HDR-9	93.5	99.3	98.2	103.0	100.3	82.4	102.5	105.8	137.3	89.6
	HDR-10	95.0	93.7	97.1	95.5	94.9	72.9	101.6	100.1	136.9	109.0
	HDR-11	92.2	94.5	91.5	87.6	92.5	76.1	98.0	103.2	133.2	100.3
	LCS2	97.2	96.1	97.9	101.8	98.4	100.3	104.2	104.7	139.1	105.4
Dilantin - M-H	LCS1	82.5	95.1	87.8	104.5	79.0	81.1	95.1	102.5	97.2	97.9
	HDR-1	78.7	89.2	75.5	82.5	96.5	78.3	100.1	96.5	115.1	91.5
	HDR-2	89.8	90.4	92.7	96.4	99.3	81.1	88.1	77.9	110.2	101.2
	HDR-3	104.0	85.3	81.6	107.5	101.8	82.3	87.5	86.8	132.0	116.6
	HDR-4	94.3	96.5	85.1	103.2	97.1	86.3	102.4	102.2	122.9	101.6
	HDR-5	95.8	92.9	94.7	102.6	103.6	84.4	101.0	94.1	142.8	108.9
	HDR-6	99.8	96.2	98.3	97.3	117.2	79.3	115.3	96.8	167.7	102.8
	HDR-7	94.8	96.5	89.7	107.1	114.2	82.0	110.4	98.4	133.0	106.1
	HDR-8	93.8	82.7	89.2	104.6	103.4	72.3	119.4	93.1	137.4	113.0
	HDR-9	104.4	89.0	89.6	91.6	122.7	83.5	98.2	96.6	121.3	110.0
	HDR-10	104.3	84.0	92.5	97.3	115.0	84.3	126.7	95.1	142.7	102.3
	HDR-11	96.7	95.6	95.6	72.0	128.5	88.7	107.7	85.3	125.8	92.8
	LCS2	75.8	81.1	77.1	86.8	69.9	68.9	98.7	82.3	80.9	92.4
Diltiazem	LCS1	107.8	84.2	106.9	106.4	92.9	96.7	92.4	88.9	95.3	112.7
	HDR-1	181.7	192.9	200.3	236.1	148.5	184.1	179.2	119.1	134.8	134.8
	HDR-2	191.6	230.3	211.3	240.4	135.6	180.5	185.4	119.0	135.8	131.8
	HDR-3	181.4	206.5	207.3	229.3	124.7	174.6	165.1	119.9	127.2	123.7
	HDR-4	176.9	183.2	189.6	229.7	121.4	161.5	146.6	118.9	121.9	114.0
	HDR-5	183.7	211.1	203.7	226.8	128.4	190.1	154.3	151.3	139.7	125.3
	HDR-6	166.7	205.2	207.0	230.0	124.7	190.6	166.0	118.3	128.1	134.1

Working Stock Standard ID		WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 07-15-16	WSS-07-25-16	WSS 08-15-16	WSS 08-29-16	WSS 09-07-16	WSS-09-21-16
Analytical Date		7/1/16	7/3/16	7/5/16	7/8/16	7/17/16	7/31/16	8/15/16	8/30/16	9/7/16	9/21/16
Days Since Spike		0	2	4	7	16	30	45	60	69	84
Compound	**Sample Name**										
	HDR-7	179.8	202.0	201.0	235.8	117.5	169.0	172.2	117.6	141.5	131.0
	HDR-8	173.7	200.2	207.9	242.1	114.4	169.2	143.8	105.6	124.4	119.8
	HDR-9	183.8	194.6	199.2	218.3	132.3	194.9	159.9	120.8	169.4	118.3
	HDR-10	162.2	188.1	224.7	228.2	134.6	191.1	163.8	134.6	144.5	122.7
	HDR-11	195.5	194.9	212.6	206.7	134.9	178.8	166.9	112.2	140.6	130.0
	LCS2	108.0	94.0	103.5	117.2	103.2	94.2	94.2	101.6	94.5	107.3
Diuron	LCS1	111.4	100.0	100.1	105.7	92.0	98.1	97.6	101.5	127.1	98.1
	HDR-1	93.0	98.9	88.2	94.8	91.4	88.1	97.2	101.4	123.1	103.3
	HDR-2	95.1	98.7	86.6	90.6	82.9	85.1	100.6	100.1	92.1	96.3
	HDR-3	94.2	95.0	88.9	91.2	82.8	85.4	95.6	104.5	126.2	99.8
	HDR-4	92.8	97.5	87.8	91.0	83.2	86.5	96.0	103.1	102.9	95.9
	HDR-5	94.2	101.4	91.7	92.6	87.1	88.3	103.8	104.0	114.8	101.5
	HDR-6	98.7	96.2	94.9	90.3	92.6	88.9	106.4	105.8	129.8	97.3
	HDR-7	95.1	98.6	94.1	88.1	90.1	83.2	101.8	104.7	120.4	94.2
	HDR-8	95.7	94.5	84.8	89.2	87.7	84.0	99.2	101.9	128.1	104.6
	HDR-9	96.9	99.1	90.1	88.1	93.1	86.5	104.3	107.7	131.6	93.0
	HDR-10	90.7	93.7	86.0	89.6	93.4	83.1	97.4	92.2	132.1	106.0
	HDR-11	96.1	89.7	83.7	75.9	90.4	89.3	101.3	107.5	122.2	94.4
	LCS2	100.9	100.8	91.5	105.7	95.5	97.3	99.0	111.6	123.3	99.2
Erythromycin	LCS1	97.7	78.4	99.4	91.0	104.0	95.4	82.8	95.0	120.4	108.5
	HDR-1	116.7	158.9	135.5	170.9	85.0	209.1	144.0	85.9	103.9	87.6
	HDR-2	96.9	162.2	127.2	148.3	73.8	207.4	148.4	89.0	80.3	83.5
	HDR-3	120.1	162.9	130.6	156.6	70.3	196.6	146.1	97.3	101.1	85.9
	HDR-4	118.8	173.1	149.5	161.5	71.0	189.1	145.0	88.6	73.9	74.6
	HDR-5	115.2	163.6	142.3	159.8	74.7	199.4	147.0	100.0	102.0	80.9
	HDR-6	101.5	181.1	133.1	169.4	81.3	214.5	163.4	101.1	113.6	78.1
	HDR-7	112.7	189.6	144.8	180.5	78.0	209.9	132.8	102.3	98.5	84.8
	HDR-8	112.1	164.4	146.0	180.7	78.1	195.0	130.1	93.5	102.2	66.4
	HDR-9	112.7	190.6	188.3	175.7	85.6	217.8	145.5	94.3	124.2	89.1
	HDR-10	101.9	169.3	156.8	156.6	87.4	197.5	146.2	96.0	117.8	88.6
	HDR-11	104.2	169.1	162.8	119.9	77.9	199.3	144.5	111.1	116.3	82.2
	LCS2	100.3	85.2	96.8	108.7	118.5	96.8	96.2	110.7	123.9	105.5
Estrone	LCS1	96.3	97.9	100.9	111.9	103.5	97.2	87.2	110.6	88.6	98.6
	HDR-1	106.3	99.8	102.4	132.6	110.7	83.1	106.0	111.1	106.2	95.2
	HDR-2	96.7	116.8	112.4	136.3	111.0	86.0	92.3	82.5	119.1	92.8
	HDR-3	117.9	106.7	125.2	147.0	97.3	76.1	93.6	85.8	94.9	102.4
	HDR-4	101.2	98.2	90.7	127.0	81.9	72.1	88.7	99.2	102.8	90.2
	HDR-5	106.7	97.4	112.5	118.3	102.8	92.6	89.8	137.9	128.2	73.0
	HDR-6	98.7	97.7	105.8	124.4	86.5	88.1	124.5	84.3	132.9	95.9
	HDR-7	106.2	111.0	105.9	125.5	100.1	86.5	90.5	104.3	100.0	90.7
	HDR-8	119.3	95.6	110.2	135.4	82.6	79.5	94.0	98.8	99.8	85.6
	HDR-9	107.8	92.4	108.0	117.0	82.7	79.7	94.1	107.4	111.9	87.1
	HDR-10	103.5	103.5	100.7	122.1	91.5	86.0	111.3	133.9	111.8	89.3
	HDR-11	121.1	107.8	95.8	118.7	98.2	82.7	77.9	98.6	127.3	88.4
	LCS2	104.4	95.3	100.5	111.9	97.4	95.0	99.6	101.8	112.3	82.8
Ethylparaben	LCS1	100.2	93.3	93.7	100.2	90.9	98.5	93.0	103.5	130.1	94.8
	HDR-1	103.6	108.7	109.0	117.6	101.8	119.1	113.3	105.8	151.2	125.6
	HDR-2	104.6	103.9	106.8	110.5	88.7	112.2	114.2	108.4	116.5	129.2

Working Stock Standard ID		WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 07-15-16	WSS-07-25-16	WSS 08-15-16	WSS 08-29-16	WSS 09-07-16	WSS-09-21-16
Analytical Date		7/1/16	7/3/16	7/5/16	7/8/16	7/17/16	7/31/16	8/15/16	8/30/16	9/7/16	9/21/16
Days Since Spike		0	2	4	7	16	30	45	60	69	84
Compound	**Sample Name**										
	HDR-3	101.7	109.7	106.7	110.5	93.5	93.8	105.3	112.6	156.1	127.8
	HDR-4	105.5	111.0	106.6	115.1	95.7	113.3	109.0	108.1	126.1	121.3
	HDR-5	103.4	105.0	107.5	115.6	94.1	121.9	112.2	122.6	151.5	124.0
	HDR-6	106.6	108.7	107.0	112.9	101.9	119.2	120.3	105.8	166.3	122.3
	HDR-7	106.4	109.3	107.7	112.9	107.1	99.7	111.4	113.8	143.6	120.8
	HDR-8	106.6	103.2	104.2	114.1	102.4	93.5	108.6	110.4	148.2	120.0
	HDR-9	106.4	107.9	102.3	114.2	109.6	116.0	116.3	107.9	166.4	116.9
	HDR-10	109.7	107.4	106.3	108.8	105.4	110.3	114.5	103.1	158.1	132.0
	HDR-11	106.1	107.7	105.2	58.8	101.1	115.4	112.6	113.6	156.5	117.8
	LCS2	96.1	92.1	95.4	104.0	98.4	93.3	105.9	117.1	121.0	99.8
Flumequine	LCS1	97.6	91.9	92.0	109.6	95.4	93.4	96.2	98.6	112.4	94.6
	HDR-1	99.8	117.0	99.9	112.8	86.6	107.9	120.2	112.2	145.9	159.6
	HDR-2	113.4	110.5	107.5	109.5	95.0	100.8	101.6	127.7	135.2	149.7
	HDR-3	108.8	104.2	95.6	113.4	99.3	90.9	107.7	122.9	132.0	141.6
	HDR-4	112.7	107.4	96.0	114.8	86.2	95.0	101.0	127.8	131.2	126.4
	HDR-5	100.2	98.5	102.2	118.8	92.0	97.8	113.1	116.4	138.8	140.6
	HDR-6	105.4	108.1	107.9	113.2	97.7	95.8	109.8	113.4	145.0	132.3
	HDR-7	117.4	103.0	115.9	112.5	97.3	92.4	108.1	111.1	125.0	135.2
	HDR-8	99.0	97.3	95.1	101.4	87.4	87.5	107.5	109.2	125.6	132.5
	HDR-9	106.0	107.6	108.2	107.8	106.2	97.7	102.9	104.7	121.4	153.1
	HDR-10	109.6	94.1	96.9	116.2	114.3	95.1	108.8	155.6	130.7	128.5
	HDR-11	114.7	104.9	115.3	74.4	106.6	100.8	97.0	108.1	116.9	127.7
	LCS2	105.0	98.8	103.1	105.4	100.8	95.9	104.7	91.0	112.4	108.6
Fluoxetine	LCS1	110.8	97.3	108.1	113.4	95.6	97.8	67.3	97.8	101.1	99.0
	HDR-1	136.2	227.6	166.9	203.4	67.1	194.2	75.8	83.0	88.8	84.8
	HDR-2	141.5	188.5	196.9	240.2	66.6	217.6	87.4	77.7	75.3	107.0
	HDR-3	156.9	247.2	278.1	265.4	64.4	193.6	81.8	81.0	77.6	72.9
	HDR-4	134.5	160.8	166.0	208.1	70.6	180.5	60.7	83.7	75.1	68.6
	HDR-5	152.5	130.8	169.2	180.3	63.7	185.5	81.6	103.6	83.9	81.3
	HDR-6	144.1	163.6	191.6	224.1	70.3	183.6	76.3	82.0	122.3	91.4
	HDR-7	164.3	184.5	218.1	216.5	60.4	245.5	100.8	70.8	81.9	116.1
	HDR-8	168.0	227.6	259.3	256.7	64.2	171.1	61.1	75.0	76.6	78.6
	HDR-9	153.8	132.6	215.4	197.1	65.8	174.6	68.4	88.9	82.1	79.9
	HDR-10	145.9	147.1	215.7	249.2	71.4	174.1	72.2	133.9	91.2	82.5
	HDR-11	154.2	155.7	209.7	151.4	72.4	229.5	70.1	85.7	83.1	91.7
	LCS2	113.7	111.9	109.7	106.4	97.1	113.8	70.3	116.4	95.5	127.9
Gemfibrozil	LCS1	104.6	101.7	105.6	101.2	108.8	93.8	98.6	99.5	83.4	111.6
	HDR-1	120.9	109.7	116.3	115.8	81.2	63.8	88.3	94.7	137.2	189.6
	HDR-2	107.5	113.1	119.3	113.7	77.2	66.2	79.3	79.0	137.6	189.7
	HDR-3	117.1	121.0	119.2	111.8	81.2	63.1	85.2	86.6	135.2	230.1
	HDR-4	120.0	110.1	110.4	107.6	86.1	65.7	84.5	93.8	138.8	205.3
	HDR-5	119.4	121.7	114.1	123.4	110.5	72.9	83.6	94.5	142.2	152.0
	HDR-6	102.0	114.5	118.4	119.4	136.7	63.7	90.6	94.7	130.8	215.3
	HDR-7	109.5	116.7	119.8	126.4	134.9	58.6	84.8	76.6	135.9	166.7
	HDR-8	114.5	114.6	121.1	107.6	125.8	60.9	82.8	94.8	129.8	179.1
	HDR-9	117.6	116.5	120.5	110.7	144.1	65.9	87.7	96.9	138.5	187.9
	HDR-10	106.5	113.3	123.4	120.8	143.3	66.1	76.9	43.2	145.6	182.1
	HDR-11	119.5	113.1	116.7	95.5	140.6	64.2	87.7	88.6	143.6	176.3

Working Stock Standard ID		WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 07-15-16	WSS-07-25-16	WSS 08-15-16	WSS 08-29-16	WSS 09-07-16	WSS-09-21-16
Analytical Date		7/1/16	7/3/16	7/5/16	7/8/16	7/17/16	7/31/16	8/15/16	8/30/16	9/7/16	9/21/16
Days Since Spike		0	2	4	7	16	30	45	60	69	84
Compound	**Sample Name**										
	LCS2	107.5	101.3	100.7	108.3	139.8	92.5	107.9	97.4	87.5	93.1
Ibuprofen	LCS1	100.2	106.8	94.1	103.0	87.0	100.1	91.8	102.5	135.6	91.5
	HDR-1	100.3	104.8	95.2	110.5	107.8	90.0	108.9	113.3	146.9	114.2
	HDR-2	99.3	100.5	95.3	102.2	94.8	86.5	105.1	108.8	108.3	117.8
	HDR-3	106.3	103.3	93.0	98.3	89.1	88.5	99.4	111.9	140.7	109.1
	HDR-4	101.1	103.1	98.6	99.6	91.9	85.2	102.0	98.7	123.3	113.0
	HDR-5	96.6	99.9	98.9	101.9	78.7	91.1	100.7	114.9	138.7	113.1
	HDR-6	96.2	101.4	96.9	93.4	80.3	83.8	108.1	118.5	154.5	114.1
	HDR-7	95.0	99.1	99.3	94.8	76.0	88.5	99.4	111.9	140.8	108.1
	HDR-8	100.0	105.4	91.2	104.3	77.2	82.9	96.4	107.8	143.1	107.1
	HDR-9	102.2	99.2	92.2	94.0	81.5	88.1	99.6	109.7	161.9	111.0
	HDR-10	99.4	99.8	99.7	97.6	75.4	83.2	106.7	118.5	150.4	116.5
	HDR-11	101.6	100.8	91.2	84.6	75.8	80.1	99.9	113.9	158.2	108.9
	LCS2	100.1	97.9	93.0	107.7	80.4	96.2	95.8	107.2	129.6	91.4
Iohexol - M+H	LCS1	132.2	95.6	100.1	117.6	85.6	108.8	103.2	120.7	138.5	107.9
	HDR-1	74.4	96.3	84.6	90.3	76.3	75.4	74.5	121.2	171.7	129.6
	HDR-2	101.0	79.6	81.2	93.0	66.6	67.6	68.5	102.9	84.8	105.6
	HDR-3	64.6	67.2	79.0	84.2	68.7	90.9	64.8	104.0	128.2	97.1
	HDR-4	84.2	86.9	86.1	90.7	63.8	95.9	72.7	96.4	117.5	100.5
	HDR-5	73.5	100.9	72.6	85.1	72.7	95.8	86.2	116.3	117.9	106.5
	HDR-6	102.8	87.2	101.7	102.9	59.1	86.5	69.5	93.0	109.7	103.9
	HDR-7	67.5	83.0	75.0	89.0	62.8	79.8	73.8	106.9	115.9	124.2
	HDR-8	88.8	70.9	83.8	93.4	74.3	75.0	83.4	99.4	111.5	108.6
	HDR-9	96.4	73.8	90.1	84.3	62.2	90.1	79.5	107.3	144.2	113.6
	HDR-10	105.3	84.4	105.5	76.8	56.3	76.4	87.0	88.6	162.3	129.9
	HDR-11	107.1	95.0	60.6	40.3	70.4	80.2	76.1	95.1	166.9	120.6
	LCS2	127.7	115.0	126.2	117.0	113.4	97.1	102.4	127.4	132.1	124.3
Iopromide - PRM	LCS1	103.0	93.1	102.8	110.3	94.3	86.0	108.9	88.7	103.1	87.3
	HDR-1	86.0	70.5	52.6	91.1	64.1	83.3	65.6	53.5	103.3	101.5
	HDR-2	98.2	74.1	78.6	99.4	69.0	63.7	66.2	58.2	111.8	111.3
	HDR-3	95.5	57.1	62.4	99.5	73.9	66.8	55.4	72.2	77.8	111.0
	HDR-4	87.6	91.3	74.4	99.1	69.5	80.7	78.0	73.2	99.2	91.0
	HDR-5	97.4	67.2	76.5	111.5	74.5	78.4	59.6	72.2	98.9	97.6
	HDR-6	96.3	92.6	84.3	94.8	78.3	80.6	80.3	82.1	93.7	94.9
	HDR-7	102.6	90.5	77.9	104.1	76.8	75.8	63.1	76.3	85.9	91.2
	HDR-8	88.8	76.2	68.2	91.7	76.6	63.8	73.2	86.3	95.7	102.1
	HDR-9	106.8	90.5	75.6	88.2	92.0	76.3	69.1	71.8	94.5	84.8
	HDR-10	106.5	77.6	76.6	118.7	103.2	70.5	81.1	153.7	99.7	106.2
	HDR-11	102.5	79.0	81.3	49.4	95.7	78.0	63.8	74.7	84.4	89.5
	LCS2	127.1	136.0	136.6	131.5	131.3	111.7	123.7	95.2	123.3	130.2
Isobuylparaben	LCS1	98.2	94.9	101.7	96.5	88.8	96.0	93.8	99.7	124.3	96.3
	HDR-1	99.9	101.5	100.2	104.9	92.5	105.3	129.4	107.8	151.3	118.8
	HDR-2	90.9	96.5	95.6	102.1	89.1	96.0	126.2	106.9	110.2	118.1
	HDR-3	98.1	96.3	92.3	100.1	89.0	98.0	122.7	108.3	139.9	118.8
	HDR-4	97.5	100.6	96.9	100.4	87.0	95.1	120.2	100.7	127.7	105.3
	HDR-5	94.7	100.3	100.8	99.7	88.7	102.2	115.7	110.8	141.2	113.3
	HDR-6	99.2	98.5	98.8	97.1	94.0	98.9	125.1	108.6	162.9	117.9
	HDR-7	94.5	103.2	98.5	98.2	95.2	97.6	118.3	108.5	143.4	116.4

Working Stock Standard ID		WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 07-15-16	WSS-07-25-16	WSS 08-15-16	WSS 08-29-16	WSS 09-07-16	WSS-09-21-16
Analytical Date		7/1/16	7/3/16	7/5/16	7/8/16	7/17/16	7/31/16	8/15/16	8/30/16	9/7/16	9/21/16
Days Since Spike		0	2	4	7	16	30	45	60	69	84
Compound	**Sample Name**										
	HDR-8	102.3	92.6	96.4	100.8	94.2	91.7	118.2	107.8	143.9	113.4
	HDR-9	96.5	96.6	95.8	101.6	95.6	104.6	121.4	110.3	165.8	115.3
	HDR-10	92.8	92.4	98.7	96.2	95.4	96.1	115.6	99.0	166.0	119.6
	HDR-11	95.4	100.0	92.6	77.0	91.7	94.7	118.1	104.6	153.8	112.8
	LCS2	95.8	91.7	87.1	97.5	95.0	84.8	103.1	113.9	120.3	94.5
isoproturon	LCS1	101.4	108.7	98.2	109.9	99.8	97.1	106.3	98.9	106.7	96.1
	HDR-1	96.1	99.4	85.2	95.2	101.2	101.5	108.7	89.6	120.5	115.2
	HDR-2	108.7	101.1	103.9	101.0	102.1	98.6	111.7	95.5	123.8	140.3
	HDR-3	113.5	95.8	94.7	103.2	103.6	90.0	101.8	99.1	116.7	125.7
	HDR-4	105.5	107.4	93.2	99.4	106.7	102.4	103.5	99.1	114.4	118.3
	HDR-5	106.9	100.5	94.7	110.6	109.0	110.3	104.0	94.6	131.1	120.9
	HDR-6	112.5	102.1	103.3	92.2	118.3	100.6	111.6	92.5	117.3	131.8
	HDR-7	115.2	102.8	102.9	93.5	114.7	97.9	106.3	91.9	118.2	119.8
	HDR-8	103.3	94.7	92.4	94.1	109.2	89.4	107.6	87.3	117.1	116.4
	HDR-9	115.5	101.3	101.0	93.4	132.7	102.8	97.3	91.5	110.9	117.8
	HDR-10	112.7	101.9	94.5	102.5	128.9	90.4	115.4	106.6	116.9	120.7
	HDR-11	113.1	96.9	103.8	83.8	126.1	100.4	105.4	89.1	109.6	116.0
	LCS2	121.7	111.6	113.3	111.8	116.9	103.3	113.3	92.4	106.1	105.1
Ketoprofen	LCS1	95.4	101.7	94.9	115.3	108.2	93.2	104.8	100.3	103.3	105.6
	HDR-1	67.1	69.6	53.1	73.2	73.9	57.0	62.6	70.4	76.0	73.1
	HDR-2	72.8	75.3	68.3	71.7	75.9	52.0	62.9	82.0	82.5	86.8
	HDR-3	77.1	65.1	60.4	80.5	84.9	48.3	57.8	82.5	77.5	86.8
	HDR-4	76.3	72.8	61.5	75.8	75.6	54.9	71.8	85.2	78.6	83.7
	HDR-5	78.3	64.4	60.3	83.5	77.1	55.5	61.1	75.7	80.5	81.9
	HDR-6	79.0	77.0	71.1	74.4	87.6	58.4	74.8	72.6	83.4	88.6
	HDR-7	82.1	72.9	67.0	76.1	82.1	56.6	67.0	74.9	85.4	75.7
	HDR-8	75.6	61.6	57.7	73.7	84.0	47.5	69.9	78.1	79.0	67.8
	HDR-9	78.2	71.4	59.1	73.0	89.6	56.5	62.1	83.1	74.6	77.3
	HDR-10	75.8	67.9	60.1	76.8	86.9	49.9	75.2	63.5	81.1	83.2
	HDR-11	71.1	68.2	65.3	56.2	88.4	57.3	59.6	72.8	70.1	79.7
	LCS2	93.7	81.2	79.1	87.6	104.6	97.2	86.6	86.4	90.3	88.4
Ketorolac	LCS1	98.5	101.4	94.3	112.9	107.7	89.6	107.6	96.0	98.4	107.9
	HDR-1	66.9	70.7	57.3	71.8	76.7	52.8	68.5	62.3	73.8	79.9
	HDR-2	79.4	66.7	63.1	72.7	60.1	45.0	57.8	55.9	70.1	74.8
	HDR-3	76.5	59.9	59.8	66.5	63.1	46.4	56.8	61.0	67.9	93.2
	HDR-4	65.7	63.9	56.2	67.8	70.7	43.0	55.6	75.7	73.1	80.5
	HDR-5	62.5	63.4	67.1	80.3	76.8	55.5	60.6	59.7	73.4	78.2
	HDR-6	70.1	70.2	69.0	71.3	80.2	51.0	61.1	56.9	69.1	85.5
	HDR-7	72.9	71.1	63.1	70.4	85.4	46.2	61.5	64.2	68.2	78.8
	HDR-8	64.7	63.7	64.3	62.9	70.2	42.6	57.9	50.6	69.4	80.3
	HDR-9	64.6	70.2	67.4	63.8	86.7	50.2	55.0	58.9	68.9	73.8
	HDR-10	73.6	58.9	63.5	76.0	86.3	49.7	62.8	58.8	77.2	79.3
	HDR-11	72.7	60.9	65.4	67.8	83.9	47.4	55.6	68.5	60.7	73.2
	LCS2	93.9	91.5	90.8	93.4	120.0	97.3	89.7	87.1	95.4	119.9
Lidocaine	LCS1	100.3	101.6	94.9	110.2	101.1	96.8	104.0	100.3	94.0	105.3
	HDR-1	88.6	103.6	84.2	104.9	90.6	68.8	117.0	85.6	75.3	107.3
	HDR-2	102.7	102.6	97.7	126.1	83.3	74.2	110.3	86.9	69.5	109.7
	HDR-3	112.9	100.2	100.8	129.2	91.3	75.5	99.1	98.3	77.3	99.7

Working Stock Standard ID		WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 07-15-16	WSS-07-25-16	WSS 08-15-16	WSS 08-29-16	WSS 09-07-16	WSS-09-21-16
Analytical Date		7/1/16	7/3/16	7/5/16	7/8/16	7/17/16	7/31/16	8/15/16	8/30/16	9/7/16	9/21/16
Days Since Spike		0	2	4	7	16	30	45	60	69	84
Compound	**Sample Name**										
	HDR-4	89.8	104.2	89.9	113.8	92.5	70.9	98.6	92.9	65.0	96.7
	HDR-5	101.9	94.5	96.4	121.1	92.2	85.4	102.6	82.2	82.6	100.3
	HDR-6	95.5	111.0	91.7	117.4	88.4	82.0	125.1	88.3	80.7	96.8
	HDR-7	105.0	109.2	95.7	113.8	99.9	75.9	97.1	82.0	71.9	88.7
	HDR-8	93.5	93.1	89.5	120.4	90.7	70.3	90.6	78.2	74.8	84.8
	HDR-9	108.1	103.5	105.5	110.9	116.2	88.4	110.1	94.8	81.5	102.0
	HDR-10	106.1	104.6	104.4	130.1	106.2	76.7	112.2	125.8	72.2	107.6
	HDR-11	99.4	97.4	98.3	97.9	108.3	82.3	103.9	85.8	67.4	108.1
	LCS2	123.0	115.4	106.3	115.1	125.0	102.5	119.6	102.6	101.7	140.3
Lincomycin	LCS1	99.4	90.1	99.1	108.5	81.6	89.2	86.7	91.1	115.6	108.5
	HDR-1	112.4	147.9	139.1	131.2	86.1	120.4	126.7	111.3	117.1	132.1
	HDR-2	126.8	134.3	136.4	154.4	127.6	140.6	110.9	161.2	130.4	122.0
	HDR-3	121.2	74.0	122.9	184.2	96.8	93.4	118.1	165.0	104.9	143.7
	HDR-4	92.1	138.6	117.4	145.8	105.2	134.0	93.7	132.5	137.8	111.5
	HDR-5	108.5	102.6	119.4	166.5	99.5	164.2	92.9	134.9	132.6	139.9
	HDR-6	85.5	143.3	134.1	136.0	83.8	142.6	99.2	130.0	117.8	126.7
	HDR-7	104.5	106.7	131.5	156.4	122.6	136.2	99.1	156.4	99.9	139.5
	HDR-8	79.6	139.2	138.0	158.1	97.3	112.6	87.9	116.9	118.0	136.8
	HDR-9	120.8	77.6	173.9	136.9	85.3	131.1	99.1	108.3	109.5	120.1
	HDR-10	90.0	120.4	107.3	137.2	117.5	118.2	98.5	173.8	142.8	115.8
	HDR-11	71.8	126.5	92.4	80.4	100.6	119.7	94.4	154.7	131.8	114.0
	LCS2	106.9	100.6	104.9	106.6	121.2	95.4	96.6	94.0	152.7	127.7
Linuron	LCS1	104.0	99.3	105.7	104.4	93.4	101.3	89.3	104.4	127.2	96.6
	HDR-1	95.4	88.6	92.1	88.1	86.0	80.9	92.1	101.1	155.0	110.4
	HDR-2	92.1	86.8	97.0	88.5	77.7	75.2	98.0	102.5	101.9	113.0
	HDR-3	90.4	87.1	90.8	88.2	80.2	70.0	91.5	103.5	138.4	106.0
	HDR-4	87.2	91.3	90.3	91.5	78.4	75.2	85.8	99.5	123.0	110.5
	HDR-5	90.4	94.6	86.3	88.1	81.7	80.7	93.9	105.6	130.7	114.7
	HDR-6	95.6	88.3	92.5	87.4	83.5	77.8	97.9	110.8	142.7	109.0
	HDR-7	91.3	85.8	92.5	85.4	85.0	76.3	89.8	102.4	138.9	102.9
	HDR-8	89.3	85.6	88.5	87.3	82.5	74.9	85.9	109.8	144.1	103.1
	HDR-9	88.7	90.4	92.9	84.4	90.1	75.5	88.6	108.1	147.3	102.1
	HDR-10	90.5	84.6	88.3	88.8	79.7	71.9	88.5	101.3	158.8	102.7
	HDR-11	89.4	87.9	91.9	65.1	82.9	69.9	92.1	110.1	150.3	103.0
	LCS2	104.7	94.7	101.5	98.3	97.1	100.8	94.6	112.4	131.2	97.3
Lopressor-Metoprolol	LCS1	112.9	103.7	100.7	104.3	94.6	109.0	97.4	110.8	125.9	125.3
	HDR-1	110.8	112.9	92.8	114.2	99.5	104.0	131.0	111.6	124.0	108.7
	HDR-2	102.3	118.9	104.9	105.4	93.3	96.7	124.2	110.1	92.0	116.0
	HDR-3	112.8	112.5	107.6	108.2	93.4	100.3	137.0	113.2	119.4	122.3
	HDR-4	116.2	125.3	106.0	111.7	101.1	94.2	119.9	114.3	109.6	107.7
	HDR-5	112.8	113.1	110.4	117.2	101.4	92.3	124.3	133.1	126.0	124.1
	HDR-6	108.2	115.0	108.2	107.9	105.5	93.3	130.3	121.8	135.1	123.6
	HDR-7	119.2	116.6	108.0	119.3	105.1	92.1	118.4	128.1	106.2	114.0
	HDR-8	110.1	114.0	112.6	115.5	105.4	90.7	125.5	113.5	131.2	117.5
	HDR-9	123.7	105.6	114.9	108.8	107.6	103.6	133.0	131.9	142.2	117.3
	HDR-10	123.5	117.4	113.0	108.6	112.2	85.9	131.1	137.1	135.7	130.7
	HDR-11	111.0	115.1	112.9	87.3	104.9	95.3	132.1	127.2	135.8	131.9
	LCS2	116.2	111.5	97.2	109.5	98.5	106.3	104.9	120.9	114.7	132.9

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Analytical Date		7/1/16	7/3/16	7/5/16	7/8/16	7/17/16	7/31/16	8/15/16	8/30/16	9/7/16	9/21/16
Days Since Spike		0	2	4	7	16	30	45	60	69	84
Compound	**Sample Name**										
Meclofenamic Acid	LCS1	98.4	96.2	97.6	107.0	92.4	97.4	100.1	108.3	137.3	105.7
	HDR-1	102.9	109.7	114.0	112.8	108.3	83.5	130.3	95.3	144.3	114.6
	HDR-2	97.5	94.2	106.0	97.5	86.5	79.5	113.4	100.7	99.2	112.4
	HDR-3	94.5	92.7	98.0	106.5	85.9	76.9	106.3	100.9	128.0	101.0
	HDR-4	94.1	103.7	100.5	112.2	90.7	73.1	100.3	102.5	98.1	107.2
	HDR-5	95.4	98.3	100.2	104.4	89.6	81.7	99.4	106.8	129.4	107.2
	HDR-6	96.5	97.2	97.6	105.9	96.9	79.0	110.2	104.7	137.7	106.9
	HDR-7	99.0	93.8	95.3	102.5	95.6	74.6	101.5	105.1	124.9	101.3
	HDR-8	99.1	96.2	100.6	97.7	98.2	68.0	99.2	105.4	132.1	97.3
	HDR-9	93.4	95.7	97.2	104.4	100.5	82.3	102.8	105.8	137.3	89.7
	HDR-10	94.9	92.2	96.3	95.0	95.0	73.3	101.6	100.1	136.9	109.1
	HDR-11	92.1	92.1	90.6	86.5	92.6	75.9	98.0	103.2	133.2	100.4
	LCS2	97.2	92.7	97.5	102.4	98.5	100.1	104.2	104.7	139.1	105.5
Meprobamate	LCS1	102.4	93.4	95.4	114.0	110.9	92.5	104.3	99.4	101.2	111.6
	HDR-1	103.6	77.9	95.0	61.9	104.7	240.8	99.1	101.9	71.9	76.2
	HDR-2	126.4	107.8	138.8	70.4	75.5	191.0	62.1	43.4	97.1	53.3
	HDR-3	93.8	77.7	69.6	106.1	88.4	262.9	67.1	86.6	65.5	31.7
	HDR-4	74.0	107.1	63.1	145.4	106.8	169.3	75.1	97.3	75.8	41.9
	HDR-5	90.5	69.5	122.0	57.8	107.2	194.3	90.9	77.2	94.4	61.2
	HDR-6	104.4	100.9	118.4	92.0	54.6	264.1	40.5	72.6	75.0	50.0
	HDR-7	74.8	99.6	98.2	89.0	107.9	212.9	67.1	74.4	76.4	76.5
	HDR-8	98.4	72.4	120.9	80.9	131.4	169.8	80.2	87.4	81.9	71.0
	HDR-9	115.6	130.0	129.0	91.5	73.4	177.5	78.1	91.4	82.3	62.1
	HDR-10	95.3	115.0	123.2	113.5	95.1	192.4	86.2	73.9	66.6	38.4
	HDR-11	111.1	92.3	123.9	73.7	112.2	154.0	76.6	81.9	78.6	51.4
	LCS2	121.1	116.9	119.4	126.4	133.5	110.9	123.7	104.7	108.6	110.2
Metazachlor	LCS1	91.5	100.7	94.8	112.8	98.6	94.4	105.1	92.0	104.7	115.2
	HDR-1	61.4	65.1	49.6	47.9	30.4	16.9	10.4	5.1	3.9	-1.6
	HDR-2	67.1	63.2	54.3	53.6	32.8	16.2	10.8	5.4	4.3	-2.2
	HDR-3	73.1	61.1	51.3	53.5	36.0	14.7	9.8	5.7	4.1	-2.3
	HDR-4	70.9	66.8	51.7	53.4	35.2	16.5	9.4	4.2	4.2	-2.4
	HDR-5	72.2	59.4	53.5	58.7	33.9	16.2	8.9	5.1	5.0	-1.9
	HDR-6	73.8	63.3	57.7	52.3	35.4	16.4	9.3	4.2	4.5	-1.9
	HDR-7	72.9	65.0	53.6	51.2	34.9	14.8	10.5	5.0	5.0	-2.3
	HDR-8	67.4	64.6	50.9	52.9	32.6	13.2	9.1	4.5	4.1	-2.2
	HDR-9	72.1	65.3	51.4	52.0	38.9	16.3	8.9	5.9	3.8	-2.2
	HDR-10	75.5	66.0	47.4	57.0	41.3	14.5	8.7	3.4	6.3	-2.4
	HDR-11	71.1	66.6	53.1	40.5	38.8	15.6	10.3	3.2	3.8	-2.1
	LCS2	111.2	106.3	93.9	105.2	114.1	101.0	110.1	87.8	106.1	122.0
Metformin	LCS1	90.1	87.4	105.4	112.9	120.3	88.1	101.0	106.4	110.4	112.5
	HDR-1	174.5	125.6	165.6	154.1	128.7	121.7	121.2	165.0	140.9	143.5
	HDR-2	195.4	136.8	155.1	151.2	166.6	133.4	133.4	118.4	140.7	162.5
	HDR-3	170.3	123.3	181.8	245.6	136.9	117.6	149.9	129.3	103.7	181.3
	HDR-4	140.4	96.7	122.6	105.0	136.7	115.6	128.0	78.7	108.7	164.1
	HDR-5	122.0	172.6	166.5	197.9	159.9	161.1	172.0	95.8	117.8	160.0
	HDR-6	134.4	128.3	143.5	147.4	131.6	189.4	132.1	81.5	150.0	164.0
	HDR-7	167.6	159.4	131.8	152.7	147.1	163.3	125.3	105.5	114.6	200.8
	HDR-8	160.6	133.7	250.2	170.6	133.6	135.5	170.7	116.7	166.2	130.0

Working Stock Standard ID		WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 07-15-16	WSS-07-25-16	WSS 08-15-16	WSS 08-29-16	WSS 09-07-16	WSS-09-21-16
Analytical Date		7/1/16	7/3/16	7/5/16	7/8/16	7/17/16	7/31/16	8/15/16	8/30/16	9/7/16	9/21/16
Days Since Spike		0	2	4	7	16	30	45	60	69	84
Compound	**Sample Name**										
	HDR-9	117.1	133.1	210.3	133.9	117.2	125.2	124.3	96.9	129.2	155.8
	HDR-10	149.2	120.5	140.0	150.0	158.6	143.2	124.9	161.7	126.6	174.1
	HDR-11	193.2	159.6	135.1	N/A	153.6	119.3	137.4	79.2	124.3	179.4
	LCS2	110.8	72.4	81.2	116.5	103.6	80.8	122.6	91.2	94.4	107.0
Methylparaben - M-H	LCS1	96.7	97.1	93.4	105.9	89.1	93.2	92.5	99.9	127.8	91.1
	HDR-1	117.9	141.0	131.0	134.9	130.4	112.7	155.2	119.5	167.5	127.0
	HDR-2	122.9	122.8	107.7	118.6	104.7	125.2	127.2	122.7	125.4	119.5
	HDR-3	129.4	125.6	117.1	111.6	110.8	107.7	143.1	114.3	161.2	120.5
	HDR-4	121.7	133.5	105.9	127.9	112.6	114.9	129.1	116.7	138.1	114.1
	HDR-5	118.7	126.2	113.2	109.3	114.5	125.7	131.6	124.6	152.9	126.5
	HDR-6	124.5	131.5	130.9	128.9	124.3	112.6	140.5	130.9	171.7	100.2
	HDR-7	129.0	123.8	103.1	118.4	117.8	109.8	144.6	127.8	153.3	125.0
	HDR-8	118.4	103.6	111.7	119.1	116.5	114.1	140.7	117.6	161.8	106.5
	HDR-9	133.2	126.5	124.9	130.4	122.4	108.9	142.7	127.2	189.1	132.0
	HDR-10	123.9	114.3	116.4	129.3	125.2	111.5	149.9	122.4	168.4	121.4
	HDR-11	127.4	117.7	111.2	84.9	110.3	106.1	149.7	122.6	161.6	111.3
	LCS2	97.0	96.3	85.9	107.6	99.9	90.3	107.3	113.7	126.4	88.9
Metolachlor	LCS1	105.0	101.0	104.1	108.2	95.3	102.8	102.9	105.7	100.8	96.6
	HDR-1	85.8	88.5	75.8	76.4	61.9	42.4	39.1	25.6	26.6	18.7
	HDR-2	90.5	90.5	84.9	80.4	58.6	43.7	41.0	25.5	25.3	18.3
	HDR-3	91.9	84.7	82.8	79.9	57.0	39.9	38.2	26.4	25.5	17.9
	HDR-4	88.5	80.5	80.1	76.7	54.0	39.4	35.5	25.3	24.0	15.7
	HDR-5	91.1	84.3	81.1	78.8	58.2	45.3	37.8	30.5	27.9	17.4
	HDR-6	86.7	86.9	81.8	78.2	60.2	43.3	40.0	25.8	25.7	18.8
	HDR-7	92.5	90.0	84.6	80.1	56.3	41.7	40.0	27.1	25.1	18.4
	HDR-8	88.8	85.3	81.7	79.0	54.8	40.7	35.4	25.1	25.1	17.3
	HDR-9	93.8	84.3	78.2	76.3	62.0	45.0	38.2	25.3	27.0	17.2
	HDR-10	84.6	82.0	83.3	78.8	59.3	43.8	37.1	29.1	28.1	18.4
	HDR-11	101.7	84.4	78.6	62.3	57.7	42.8	40.7	25.1	26.2	17.6
	LCS2	107.5	100.8	104.3	105.2	102.9	98.1	100.7	98.4	94.2	95.1
Naproxen	LCS1	106.8	95.1	98.0	107.5	91.0	89.9	99.8	102.4	123.1	93.0
	HDR-1	119.1	126.7	107.2	127.5	116.1	107.3	156.6	134.1	150.7	155.8
	HDR-2	117.6	111.5	124.3	123.1	88.3	94.5	128.4	134.2	100.5	119.5
	HDR-3	124.4	124.8	122.7	106.4	96.0	90.4	123.3	134.0	158.2	132.4
	HDR-4	121.5	113.2	109.9	120.8	96.8	87.6	110.0	119.9	113.1	130.0
	HDR-5	134.1	118.6	125.6	127.0	94.6	104.5	132.3	129.2	144.1	115.8
	HDR-6	128.7	112.2	108.3	119.0	114.3	94.7	111.2	126.9	147.0	127.8
	HDR-7	123.9	125.6	115.7	119.5	114.0	86.4	117.6	129.5	132.1	121.7
	HDR-8	130.8	113.1	112.2	115.7	111.0	94.4	120.9	120.2	125.7	111.4
	HDR-9	125.1	108.5	129.2	130.6	109.3	103.3	116.9	127.1	159.0	112.0
	HDR-10	119.4	113.1	108.7	105.7	101.6	94.1	117.5	145.9	161.8	128.1
	HDR-11	126.8	115.2	106.4	89.5	98.5	96.7	112.3	145.4	130.8	108.7
	LCS2	99.2	92.2	97.5	103.2	102.2	90.8	96.8	109.8	116.3	98.5
Nifedipine	LCS1	36.2	80.4	72.9	91.8	52.5	70.1	71.6	86.0	85.2	89.4
	HDR-1	98.3	116.3	118.3	163.6	144.2	105.8	157.2	134.1	247.4	125.0
	HDR-2	104.5	115.1	117.5	163.3	142.0	101.6	167.5	140.6	228.0	137.9
	HDR-3	103.0	128.0	131.0	165.0	155.1	105.5	173.6	141.1	255.6	137.6
	HDR-4	109.7	128.4	123.4	175.3	149.4	97.4	178.7	136.0	209.8	127.1

Working Stock Standard ID		WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 07-15-16	WSS-07-25-16	WSS 08-15-16	WSS 08-29-16	WSS 09-07-16	WSS-09-21-16
Analytical Date		7/1/16	7/3/16	7/5/16	7/8/16	7/17/16	7/31/16	8/15/16	8/30/16	9/7/16	9/21/16
Days Since Spike		0	2	4	7	16	30	45	60	69	84
Compound	**Sample Name**										
	HDR-5	106.9	126.5	135.6	173.4	150.0	108.2	178.8	147.9	262.8	147.4
	HDR-6	109.1	120.8	137.6	167.1	169.6	106.8	190.2	149.3	279.1	151.7
	HDR-7	108.6	119.7	128.7	171.0	168.1	106.7	180.5	151.0	256.7	136.0
	HDR-8	110.6	123.4	124.2	175.7	156.7	97.8	184.7	146.2	261.9	137.6
	HDR-9	111.1	127.3	122.2	172.7	171.6	113.0	186.8	148.2	292.9	138.0
	HDR-10	101.7	130.4	121.6	162.8	168.3	96.4	199.2	122.9	287.4	139.4
	HDR-11	103.5	127.0	122.0	125.3	160.2	103.9	188.6	150.6	278.2	136.4
	LCS2	28.4	53.4	50.3	54.8	42.6	41.7	63.5	85.9	73.5	66.8
Nonyl-phenol	LCS1	72.9	86.1	101.1	111.9	98.5	69.5	76.9	96.9	107.8	84.4
	HDR-1	117.0	226.0	214.2	305.7	91.8	200.0	243.1	129.1	156.9	180.4
	HDR-2	125.4	232.2	224.8	290.9	79.4	158.0	221.1	155.6	163.8	159.1
	HDR-3	118.9	190.5	207.4	296.5	69.5	164.0	217.5	152.0	171.3	126.0
	HDR-4	120.9	225.3	232.9	316.0	82.8	171.5	175.3	119.8	152.2	111.9
	HDR-5	117.9	202.6	231.6	324.0	83.0	186.2	200.6	138.8	169.0	142.8
	HDR-6	120.4	216.5	233.0	281.7	85.9	182.9	226.8	150.2	177.4	150.3
	HDR-7	115.2	235.3	225.2	276.7	78.2	175.4	185.8	136.0	140.5	128.0
	HDR-8	107.9	180.1	217.8	256.4	66.3	143.4	201.4	120.6	157.3	120.1
	HDR-9	108.4	235.0	288.9	265.5	96.8	192.5	208.2	149.9	167.9	150.1
	HDR-10	111.3	198.0	252.3	293.5	96.9	156.7	240.8	211.4	158.8	141.4
	HDR-11	124.7	240.7	259.5	223.5	93.3	169.6	195.3	129.6	156.1	113.4
	LCS2	71.5	85.0	113.0	112.7	93.3	97.1	118.9	98.7	122.3	93.3
Norethisterone	LCS1	95.5	103.4	93.0	106.5	92.3	104.4	96.2	107.9	108.6	97.2
	HDR-1	75.2	95.1	77.1	101.2	83.5	74.8	102.9	103.9	103.7	105.4
	HDR-2	94.2	97.4	95.5	114.0	93.5	83.8	92.8	111.0	92.9	106.5
	HDR-3	88.2	89.9	79.8	124.7	86.1	67.2	94.6	106.4	89.7	95.2
	HDR-4	84.5	103.0	89.9	110.6	78.1	72.9	102.9	115.7	79.3	91.7
	HDR-5	82.5	93.9	85.2	122.8	110.9	77.4	99.7	116.9	105.6	101.6
	HDR-6	99.1	92.3	89.0	100.1	103.4	89.3	105.9	104.5	105.2	100.2
	HDR-7	91.1	99.0	83.9	108.8	111.5	77.2	95.4	110.2	100.4	113.0
	HDR-8	85.8	84.3	80.2	107.6	101.8	68.0	85.0	102.2	91.7	100.1
	HDR-9	100.7	92.1	93.0	111.4	130.6	80.2	97.1	117.2	87.2	106.8
	HDR-10	102.4	92.3	76.1	113.9	113.9	73.8	100.6	282.6	89.5	121.1
	HDR-11	96.0	90.8	81.1	49.9	115.0	76.0	110.9	111.4	96.6	102.4
	LCS2	106.2	110.1	102.8	117.7	138.7	124.1	124.8	126.7	109.2	116.8
Oxolinic Acid	LCS1	100.4	101.9	95.5	112.7	100.1	92.2	98.8	90.0	105.4	95.1
	HDR-1	84.1	111.4	83.6	87.8	104.0	92.5	124.8	117.3	134.5	132.6
	HDR-2	83.2	109.1	112.9	97.3	108.2	89.6	114.2	126.6	123.7	143.6
	HDR-3	101.0	109.5	102.3	101.7	105.9	91.9	119.3	141.8	121.4	140.9
	HDR-4	86.5	121.8	100.2	100.5	107.9	96.2	117.5	134.1	123.5	125.3
	HDR-5	85.1	109.9	116.8	93.6	109.7	99.8	108.4	136.8	144.0	127.1
	HDR-6	85.3	119.2	114.5	105.8	120.2	107.0	134.2	132.0	135.6	136.2
	HDR-7	80.7	109.0	112.7	116.7	113.0	100.1	119.8	120.6	120.0	147.8
	HDR-8	82.7	111.4	88.5	112.1	114.6	88.8	123.8	122.3	115.1	132.6
	HDR-9	98.3	118.4	103.4	118.1	141.6	103.2	119.5	127.8	120.0	135.9
	HDR-10	97.5	107.4	109.9	118.3	129.6	93.0	119.7	149.6	125.8	144.8
	HDR-11	89.4	117.6	114.7	102.3	136.6	104.4	125.2	130.6	119.1	134.6
	LCS2	128.4	116.5	123.7	121.6	120.3	101.2	121.2	95.6	115.9	122.7
Paraxanthine	LCS1	101.6	93.7	93.2	104.9	101.8	94.7	100.1	103.9	94.1	86.1

Working Stock Standard ID		WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 07-15-16	WSS-07-25-16	WSS 08-15-16	WSS 08-29-16	WSS 09-07-16	WSS-09-21-16
Analytical Date		7/1/16	7/3/16	7/5/16	7/8/16	7/17/16	7/31/16	8/15/16	8/30/16	9/7/16	9/21/16
Days Since Spike		0	2	4	7	16	30	45	60	69	84
Compound	**Sample Name**										
	HDR-1	50.4	41.5	47.2	45.6	64.8	43.4	70.8	64.5	84.8	85.0
	HDR-2	60.1	42.5	51.7	37.3	53.2	55.9	80.7	71.8	101.4	78.2
	HDR-3	61.1	44.9	43.6	61.8	59.1	48.0	71.8	63.5	75.1	83.6
	HDR-4	60.2	45.6	35.1	44.9	58.9	53.2	74.2	66.5	77.4	75.7
	HDR-5	66.5	42.7	43.2	35.1	53.3	65.2	77.5	79.2	83.7	71.1
	HDR-6	54.5	46.8	44.0	38.7	56.5	63.9	94.2	78.8	78.3	72.4
	HDR-7	59.2	52.5	43.7	40.3	52.4	65.2	84.4	79.6	78.7	100.8
	HDR-8	46.4	53.9	44.1	43.3	55.2	58.0	63.9	60.8	68.3	74.1
	HDR-9	57.0	50.0	50.5	46.1	60.1	68.5	71.8	66.5	73.4	85.2
	HDR-10	56.9	44.1	39.7	44.4	49.3	44.2	77.6	138.8	84.3	58.1
	HDR-11	45.0	50.5	41.9	34.6	63.7	65.6	78.3	82.7	81.9	59.2
	LCS2	84.7	86.6	88.2	86.3	92.7	111.2	108.9	91.0	86.7	86.7
Pentoxifylline	LCS1	90.6	104.1	97.8	110.4	97.4	94.7	106.8	92.6	107.5	102.4
	HDR-1	49.9	63.2	60.8	65.0	69.9	40.5	87.5	46.1	70.6	72.9
	HDR-2	68.3	93.2	64.1	61.9	59.3	50.8	93.7	56.5	88.0	66.6
	HDR-3	63.6	73.5	66.9	56.9	69.1	48.1	98.7	72.2	67.0	68.7
	HDR-4	56.2	89.9	69.6	77.4	58.7	54.3	86.7	49.9	79.9	68.4
	HDR-5	57.1	79.5	64.1	72.1	69.2	61.3	90.6	62.3	82.6	69.0
	HDR-6	63.2	85.5	62.9	65.0	81.9	62.0	97.0	61.0	83.5	69.0
	HDR-7	60.6	93.1	85.7	82.3	87.3	61.2	94.4	60.4	75.9	99.3
	HDR-8	58.9	72.3	64.2	68.2	70.4	52.8	95.2	52.4	63.0	82.1
	HDR-9	57.3	74.2	79.5	76.8	79.6	58.2	89.1	72.0	84.4	79.5
	HDR-10	71.5	76.0	83.9	89.3	94.0	62.9	84.4	97.1	64.3	70.3
	HDR-11	66.6	85.0	81.3	57.7	82.5	65.1	99.4	66.2	80.0	71.0
	LCS2	122.8	115.9	108.3	122.6	101.6	103.9	132.2	96.5	124.7	123.9
Phenazone	LCS1	102.6	100.2	95.0	105.6	95.4	93.7	98.1	94.3	94.7	98.7
	HDR-1	104.7	119.6	99.5	97.1	108.2	79.6	127.9	74.8	101.5	90.3
	HDR-2	105.0	122.4	114.7	121.6	103.3	84.2	118.7	87.1	85.7	100.4
	HDR-3	109.3	105.4	102.9	114.7	116.8	85.0	111.9	98.2	82.0	89.5
	HDR-4	112.6	121.7	109.9	95.6	107.2	89.4	121.6	98.6	89.7	87.1
	HDR-5	119.9	118.1	118.3	125.5	110.8	99.6	123.1	81.1	88.4	104.2
	HDR-6	121.7	107.8	123.5	110.6	123.3	95.6	112.7	92.0	90.9	108.9
	HDR-7	109.4	130.6	119.9	124.7	111.8	83.0	113.7	92.5	85.3	98.0
	HDR-8	97.1	117.4	109.9	104.6	103.9	82.8	105.7	82.0	84.7	111.3
	HDR-9	117.2	112.9	126.3	104.0	116.3	88.1	107.3	97.2	89.2	112.3
	HDR-10	107.3	104.9	103.0	101.3	133.0	76.9	130.9	129.4	89.8	123.8
	HDR-11	114.9	108.5	121.5	101.2	134.6	91.6	124.2	80.2	79.8	103.7
	LCS2	135.1	128.2	118.1	120.2	117.8	104.9	123.5	94.0	101.8	122.9
Primidone	LCS1	99.8	97.9	89.2	122.3	100.0	108.3	124.3	103.2	89.7	111.4
	HDR-1	29.9	54.3	42.7	57.5	47.8	27.8	50.7	57.6	33.4	48.3
	HDR-2	39.6	58.2	54.7	61.6	31.2	37.0	47.9	62.5	34.0	65.1
	HDR-3	32.1	44.9	53.5	55.4	36.8	25.3	37.2	68.3	28.8	51.8
	HDR-4	42.7	60.1	45.0	67.4	26.8	37.3	44.8	61.9	30.5	59.7
	HDR-5	45.2	52.9	46.8	59.7	40.6	32.8	41.8	73.8	33.1	48.0
	HDR-6	41.1	56.1	49.4	57.0	50.4	34.6	52.5	64.0	25.4	56.0
	HDR-7	52.1	56.1	46.6	72.2	36.0	26.7	23.5	60.1	26.4	40.5
	HDR-8	31.1	43.7	44.7	65.1	52.2	19.1	44.6	51.7	22.9	45.9
	HDR-9	65.5	43.4	42.5	51.9	56.1	32.8	46.3	58.9	23.6	55.9

Working Stock Standard ID		WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 07-15-16	WSS-07-25-16	WSS 08-15-16	WSS 08-29-16	WSS 09-07-16	WSS-09-21-16
Analytical Date		7/1/16	7/3/16	7/5/16	7/8/16	7/17/16	7/31/16	8/15/16	8/30/16	9/7/16	9/21/16
Days Since Spike		0	2	4	7	16	30	45	60	69	84
Compound	**Sample Name**										
	HDR-10	49.2	63.7	45.6	60.6	46.0	20.8	48.7	88.9	26.3	64.5
	HDR-11	43.3	63.4	44.5	40.7	47.1	32.4	44.9	83.5	28.8	52.3
	LCS2	91.3	109.1	86.2	103.8	129.7	96.7	126.0	117.2	86.9	108.2
Progesterone	LCS1	116.2	91.7	99.3	111.2	107.7	103.6	127.6	109.7	99.2	107.7
	HDR-1	98.9	95.7	80.1	113.7	87.8	67.7	110.2	99.2	102.1	95.2
	HDR-2	92.0	100.2	108.5	115.1	78.7	79.1	114.5	91.0	96.2	99.7
	HDR-3	90.6	98.3	84.2	129.9	92.6	62.5	103.9	112.4	87.4	85.9
	HDR-4	97.4	79.6	78.2	107.4	85.3	68.1	90.4	102.8	104.9	78.0
	HDR-5	81.9	87.2	78.0	123.9	83.5	76.6	111.0	132.5	101.2	89.9
	HDR-6	85.8	97.8	90.0	110.0	86.8	71.5	132.8	117.3	103.4	117.0
	HDR-7	116.7	103.6	90.5	117.9	82.7	82.8	111.6	94.7	106.2	91.1
	HDR-8	94.6	87.1	88.6	112.0	76.6	79.7	123.2	97.6	85.0	86.2
	HDR-9	99.2	86.5	92.1	111.5	85.2	78.2	131.5	103.4	108.1	96.3
	HDR-10	93.6	80.3	92.2	109.0	86.4	67.7	109.2	94.4	106.1	90.5
	HDR-11	102.3	95.6	80.5	84.7	101.1	81.6	113.8	92.9	106.7	100.3
	LCS2	100.4	103.9	101.9	117.6	108.4	85.2	139.7	105.6	106.9	99.3
Propazine	LCS1	96.4	101.3	102.9	108.0	102.3	94.9	100.6	99.4	102.7	92.2
	HDR-1	85.5	93.8	71.8	84.0	68.5	68.5	79.6	80.6	110.0	84.2
	HDR-2	94.5	100.4	86.1	81.7	85.8	77.8	86.7	84.8	117.1	94.4
	HDR-3	99.2	84.0	80.9	100.2	88.0	71.3	82.7	103.1	116.1	101.2
	HDR-4	94.7	95.9	82.2	90.1	84.4	81.1	89.1	104.2	121.7	92.6
	HDR-5	94.4	89.1	91.5	90.8	92.3	91.7	88.3	93.7	131.9	102.8
	HDR-6	101.9	90.5	93.3	90.2	101.5	86.1	95.8	96.1	122.4	108.0
	HDR-7	96.4	90.5	95.4	95.0	104.5	81.5	98.4	93.5	112.0	99.1
	HDR-8	90.9	89.3	85.8	89.3	96.1	74.0	95.0	90.7	118.0	102.9
	HDR-9	95.6	90.8	86.9	90.8	107.6	82.4	93.1	90.8	113.4	101.1
	HDR-10	98.6	90.4	86.7	100.3	111.5	72.5	103.0	59.5	122.5	109.7
	HDR-11	103.2	93.0	93.6	54.2	117.4	83.5	93.2	84.9	113.5	100.7
	LCS2	113.6	115.6	113.8	116.3	131.9	95.1	121.1	97.0	106.0	111.2
Propylparaben	LCS1	100.0	95.8	97.0	103.5	90.9	99.0	91.2	98.9	126.9	97.7
	HDR-1	95.1	97.1	93.5	106.4	102.2	104.8	122.2	104.7	164.0	128.8
	HDR-2	98.3	94.0	94.8	104.9	87.3	101.4	123.1	108.8	114.5	124.9
	HDR-3	95.1	101.3	94.2	98.4	91.4	102.7	119.4	107.1	150.5	127.1
	HDR-4	94.9	97.3	96.1	103.2	93.4	98.5	115.6	104.7	129.2	123.9
	HDR-5	98.3	102.5	100.5	103.9	91.3	107.1	127.3	115.9	153.3	134.0
	HDR-6	96.0	98.3	96.4	104.7	105.0	106.2	120.2	112.5	159.6	129.5
	HDR-7	94.9	94.1	99.1	97.9	101.9	106.2	116.5	114.2	152.7	129.6
	HDR-8	101.7	89.6	91.7	105.2	101.4	98.9	120.9	106.3	162.5	127.0
	HDR-9	98.4	96.1	93.2	105.0	104.3	106.4	121.9	111.5	164.0	145.8
	HDR-10	100.7	96.8	95.7	103.4	102.3	104.6	119.7	130.4	152.8	139.1
	HDR-11	98.2	95.6	87.1	82.4	96.6	103.3	113.6	122.4	169.0	119.9
	LCS2	98.2	95.9	86.9	106.4	102.4	95.1	106.1	117.3	131.4	103.6
Quinoline	LCS1	100.2	100.8	105.7	114.8	103.5	93.5	94.3	103.1	101.1	100.2
	HDR-1	89.3	88.1	79.6	95.1	80.9	77.3	84.1	87.0	117.9	92.0
	HDR-2	99.8	80.2	83.6	84.9	79.6	62.0	89.8	95.5	105.1	82.9
	HDR-3	98.3	90.7	82.5	89.6	74.7	73.1	89.6	91.3	97.0	83.8
	HDR-4	90.4	77.4	66.9	81.2	76.1	69.7	83.5	86.2	106.5	78.8
	HDR-5	83.9	83.7	74.7	78.5	74.7	75.7	95.7	102.4	113.4	81.4

Working Stock Standard ID		WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 07-15-16	WSS-07-25-16	WSS 08-15-16	WSS 08-29-16	WSS 09-07-16	WSS-09-21-16
Analytical Date		7/1/16	7/3/16	7/5/16	7/8/16	7/17/16	7/31/16	8/15/16	8/30/16	9/7/16	9/21/16
Days Since Spike		0	2	4	7	16	30	45	60	69	84
Compound	**Sample Name**										
	HDR-6	87.8	79.9	86.4	89.1	77.2	81.5	90.7	99.9	111.4	83.3
	HDR-7	92.1	84.9	88.7	90.0	83.0	78.5	84.7	94.5	103.8	87.7
	HDR-8	109.3	89.9	78.7	72.6	86.8	65.7	84.8	89.0	114.3	82.6
	HDR-9	89.7	73.0	85.6	91.5	81.3	62.9	83.1	98.5	104.7	77.4
	HDR-10	98.9	83.1	75.6	98.6	81.6	61.3	87.5	110.7	110.6	85.5
	HDR-11	108.5	84.2	76.5	81.5	77.3	70.1	91.7	90.2	113.6	90.7
	LCS2	104.7	95.4	102.5	95.9	99.3	98.9	96.5	100.6	95.8	97.0
Simazine	LCS1	93.4	99.5	99.8	104.8	98.7	99.8	97.7	97.8	101.4	95.9
	HDR-1	103.7	118.7	104.2	103.8	106.3	101.9	112.5	94.7	107.4	117.9
	HDR-2	108.5	124.9	106.1	106.1	100.8	106.4	114.2	100.1	105.1	118.6
	HDR-3	111.0	106.3	103.5	103.1	102.1	91.2	111.6	103.3	108.4	121.3
	HDR-4	106.9	120.1	108.8	105.2	87.3	90.8	107.6	102.6	103.2	113.8
	HDR-5	110.3	117.2	107.2	110.3	94.0	95.8	115.0	102.5	110.7	105.1
	HDR-6	100.1	114.7	105.8	103.1	104.8	93.4	109.7	95.1	106.6	112.3
	HDR-7	108.6	114.1	105.6	106.5	104.8	99.2	111.6	93.7	93.4	121.6
	HDR-8	107.9	111.2	110.6	99.0	87.4	95.3	102.5	97.1	108.4	111.6
	HDR-9	116.0	104.8	103.4	95.4	97.2	99.5	113.0	103.8	123.2	109.7
	HDR-10	102.4	121.9	103.4	109.4	96.9	98.4	104.4	104.2	109.8	119.3
	HDR-11	112.2	119.8	114.1	77.6	102.0	93.4	120.0	93.2	106.3	115.4
	LCS2	89.6	100.8	99.1	96.6	93.7	100.7	100.3	95.1	96.3	92.1
Sucralose - M-H	LCS1	95.1	102.3	105.7	103.9	96.4	98.1	97.2	108.1	102.1	104.0
	HDR-1	202.2	231.9	139.8	128.2	156.9	114.4	248.9	145.8	152.7	346.0
	HDR-2	194.7	196.7	163.7	179.4	176.7	203.6	253.6	298.1	181.6	248.1
	HDR-3	251.0	139.4	149.0	186.3	204.5	187.9	255.0	189.1	253.4	241.0
	HDR-4	185.1	147.3	136.7	170.5	147.5	172.6	262.4	132.2	146.2	204.6
	HDR-5	207.8	164.1	146.7	148.9	154.9	158.0	282.0	189.3	248.3	251.2
	HDR-6	203.3	141.2	148.3	142.2	201.1	154.0	250.0	132.4	187.2	195.7
	HDR-7	238.0	190.4	180.9	140.9	123.9	137.1	275.4	172.5	179.9	220.1
	HDR-8	214.7	147.5	126.1	138.3	162.7	124.9	234.9	150.5	111.5	228.6
	HDR-9	247.8	157.8	105.4	123.9	142.6	155.3	259.1	151.8	220.1	221.0
	HDR-10	199.6	146.2	136.6	148.2	153.7	102.8	261.7	169.8	132.8	215.3
	HDR-11	163.2	126.2	147.0	101.1	186.9	149.3	250.5	107.9	167.8	182.3
	LCS2	102.4	101.0	104.5	100.0	100.9	105.7	107.8	101.7	95.0	105.2
Sulfachloropyridazine	LCS1	92.1	95.4	95.3	111.3	103.6	92.9	101.3	95.8	103.7	115.2
	HDR-1	24.0	24.8	24.4	14.3	42.3	8.8	29.2	12.9	51.7	27.6
	HDR-2	21.5	25.7	23.1	27.2	37.0	18.7	19.4	10.6	48.0	31.7
	HDR-3	45.9	10.2	17.0	18.8	47.2	15.1	27.1	28.9	44.8	30.2
	HDR-4	21.3	23.0	28.4	19.6	41.2	25.9	35.1	23.6	56.7	27.0
	HDR-5	18.3	21.1	23.2	17.3	48.3	24.9	30.5	19.7	60.6	35.4
	HDR-6	13.4	32.9	37.8	23.6	65.7	32.3	28.7	15.1	46.0	21.9
	HDR-7	23.6	54.6	32.0	21.0	25.2	21.0	37.6	27.3	41.4	32.9
	HDR-8	36.9	19.5	31.5	16.3	43.8	35.2	43.7	29.7	43.3	32.2
	HDR-9	26.4	33.7	35.3	24.2	46.3	34.4	41.1	29.2	48.0	29.6
	HDR-10	22.0	31.0	29.7	16.1	55.2	13.9	42.7	24.3	60.9	23.5
	HDR-11	23.8	30.7	51.0	16.5	46.0	30.1	36.2	19.7	40.5	17.4
	LCS2	90.2	88.6	87.7	98.9	86.5	92.7	100.5	91.7	106.1	134.4

Working Stock Standard ID		WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 07-15-16	WSS-07-25-16	WSS 08-15-16	WSS 08-29-16	WSS 09-07-16	WSS-09-21-16
Analytical Date		7/1/16	7/3/16	7/5/16	7/8/16	7/17/16	7/31/16	8/15/16	8/30/16	9/7/16	9/21/16
Days Since Spike		0	2	4	7	16	30	45	60	69	84
Compound	**Sample Name**										
Sulfadiazine	LCS1	96.7	104.2	105.5	108.8	107.6	105.3	107.4	96.3	111.6	99.8
	HDR-1	91.1	81.8	102.0	67.4	49.7	104.1	88.8	112.4	117.8	81.2
	HDR-2	57.0	63.1	52.3	73.1	45.4	76.6	104.7	97.2	110.3	141.5
	HDR-3	97.4	178.4	91.9	72.5	74.2	111.5	145.8	133.7	143.1	101.3
	HDR-4	100.6	196.6	91.8	58.5	39.1	96.0	140.0	90.7	144.5	84.9
	HDR-5	101.2	188.1	109.6	139.8	89.2	68.0	170.1	130.6	149.3	95.6
	HDR-6	116.2	81.2	46.9	59.6	77.9	86.9	101.1	105.9	93.8	79.4
	HDR-7	126.0	141.3	91.2	73.8	5.5	65.9	227.7	99.7	124.0	78.3
	HDR-8	73.6	68.0	136.3	77.7	32.2	62.4	42.5	109.9	120.1	79.6
	HDR-9	120.0	70.5	82.5	45.9	69.9	60.4	108.7	118.7	140.6	65.3
	HDR-10	88.6	54.4	178.6	99.3	95.4	40.4	111.6	94.5	173.6	91.7
	HDR-11	86.0	82.7	119.3	N/A	78.2	174.3	154.7	98.5	137.0	46.9
	LCS2	92.6	98.0	97.7	98.8	102.5	103.7	115.5	99.9	110.4	97.5
Sulfadimethoxine	LCS1	100.5	96.0	100.9	105.0	95.8	100.6	92.2	96.5	133.8	92.1
	HDR-1	93.7	145.4	104.1	121.9	92.8	90.1	82.7	77.7	131.6	111.3
	HDR-2	102.9	124.2	110.2	124.1	91.1	86.9	94.8	73.5	99.6	112.2
	HDR-3	106.9	125.3	123.7	103.0	91.3	85.9	87.7	78.3	123.7	114.8
	HDR-4	91.6	144.9	138.0	127.7	92.7	85.2	87.5	75.2	97.6	112.5
	HDR-5	119.4	111.6	153.0	116.3	94.9	85.9	94.2	86.0	119.0	92.5
	HDR-6	125.2	136.3	138.9	121.3	100.3	91.2	97.6	70.6	126.9	95.4
	HDR-7	109.8	127.3	128.9	112.9	106.5	85.2	104.8	84.0	107.8	104.2
	HDR-8	116.9	109.7	125.4	109.1	97.8	83.6	88.7	79.0	121.6	109.9
	HDR-9	101.8	112.3	131.2	127.5	129.3	88.9	79.4	75.8	129.3	92.8
	HDR-10	107.6	119.0	110.6	107.9	105.4	85.4	99.5	85.8	128.8	134.2
	HDR-11	121.0	129.4	124.7	60.9	102.5	80.9	83.2	75.2	110.8	103.9
	LCS2	89.3	97.2	92.6	92.9	95.0	103.6	102.2	111.4	131.4	91.4
Sulfamerazine	LCS1	92.5	92.8	94.8	105.8	93.0	89.3	101.5	90.1	110.3	103.9
	HDR-1	138.0	86.1	61.8	107.5	108.0	54.0	41.1	58.8	138.9	55.2
	HDR-2	91.5	130.8	146.9	94.6	84.5	171.4	63.5	53.8	139.4	81.6
	HDR-3	65.8	158.3	107.4	95.5	113.7	96.1	91.3	57.5	84.8	167.9
	HDR-4	91.6	101.8	89.3	137.0	146.7	121.3	88.9	100.5	80.2	224.4
	HDR-5	118.4	101.6	77.6	200.3	92.3	148.6	51.5	118.7	80.6	45.5
	HDR-6	187.0	154.4	104.8	75.0	220.7	211.2	94.6	73.4	64.0	120.2
	HDR-7	99.2	35.0	117.0	179.4	82.1	128.6	119.0	92.2	51.0	107.5
	HDR-8	101.8	148.4	88.7	146.3	131.3	108.7	99.7	98.0	156.9	91.6
	HDR-9	122.5	129.1	102.5	83.5	139.4	66.4	107.2	70.8	136.9	89.1
	HDR-10	144.0	100.3	120.7	107.1	125.2	113.6	269.0	115.8	149.9	52.4
	HDR-11	115.2	98.2	53.1	74.6	81.7	65.2	121.2	155.5	63.3	111.7
	LCS2	108.0	111.7	102.5	114.4	105.1	86.7	115.9	96.3	113.5	126.2
Sulfamethazine	LCS1	102.1	95.2	101.7	111.7	88.5	95.2	98.5	109.6	130.3	113.6
	HDR-1	150.8	131.2	184.7	64.9	58.3	157.3	126.0	41.8	54.6	113.4
	HDR-2	97.1	156.4	91.2	78.4	148.5	103.6	136.1	94.6	17.9	188.0
	HDR-3	62.9	194.1	67.7	67.3	108.9	118.5	85.1	58.7	128.3	41.2
	HDR-4	132.1	90.9	37.6	123.1	143.4	143.5	123.4	107.1	106.0	176.0
	HDR-5	190.6	132.0	201.5	124.4	169.3	174.6	149.2	52.9	82.3	119.2
	HDR-6	100.8	99.8	205.0	62.1	47.7	120.5	129.4	55.9	47.8	125.0
	HDR-7	114.8	173.6	65.1	105.4	228.2	84.0	120.0	99.2	254.1	148.2
	HDR-8	147.0	96.1	174.0	154.7	231.4	154.0	57.6	87.3	85.7	123.1

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Analytical Date		7/1/16	7/3/16	7/5/16	7/8/16	7/17/16	7/31/16	8/15/16	8/30/16	9/7/16	9/21/16
Days Since Spike		0	2	4	7	16	30	45	60	69	84
Compound	**Sample Name**										
	HDR-9	117.0	125.8	124.9	103.6	144.1	182.5	139.1	168.2	70.2	135.5
	HDR-10	114.8	100.8	152.8	118.5	126.2	138.4	92.7	110.5	60.4	157.3
	HDR-11	139.4	69.5	103.5	60.6	118.7	70.4	138.9	124.3	74.8	142.8
	LCS2	98.1	90.8	95.0	105.2	98.6	94.7	107.9	106.3	126.6	111.6
Sulfamethizole	LCS1	98.5	92.3	99.5	108.4	82.7	91.6	92.0	94.1	94.2	106.5
	HDR-1	202.2	140.0	178.4	200.4	290.4	215.2	230.6	152.0	183.4	77.7
	HDR-2	266.4	254.9	242.2	174.9	215.1	304.5	238.6	123.8	108.8	193.0
	HDR-3	254.7	188.5	206.6	92.5	307.7	369.9	328.3	155.0	51.1	123.2
	HDR-4	268.7	174.4	184.4	160.7	267.9	273.0	303.3	278.1	276.3	93.0
	HDR-5	174.3	225.2	190.9	158.4	262.5	330.2	259.0	251.1	243.2	285.5
	HDR-6	306.7	202.2	274.9	183.1	324.4	335.5	326.6	264.4	267.5	281.9
	HDR-7	218.0	280.2	148.4	184.5	286.2	242.9	257.9	230.7	253.2	81.7
	HDR-8	209.1	171.9	187.9	224.6	268.5	252.9	185.8	332.3	104.7	169.5
	HDR-9	180.9	277.3	217.1	147.0	360.3	315.4	303.5	279.7	229.8	172.4
	HDR-10	219.3	199.6	240.2	174.9	264.9	275.4	217.2	142.3	205.4	333.5
	HDR-11	239.7	166.4	285.7	141.0	314.8	317.1	251.1	214.9	127.2	203.7
	LCS2	93.4	94.1	98.4	103.7	89.8	88.8	89.3	93.9	94.6	103.0
Sulfamethoxazole	LCS1	99.7	101.4	101.2	106.4	101.9	99.8	100.1	102.6	101.5	102.2
	HDR-1	97.9	97.1	69.9	105.7	92.3	66.5	102.8	85.8	90.3	90.0
	HDR-2	83.6	98.8	101.6	85.9	78.6	64.1	63.9	80.2	93.9	83.1
	HDR-3	86.1	91.4	84.6	106.7	81.6	59.5	87.0	74.9	88.1	90.4
	HDR-4	95.7	79.0	76.8	85.9	98.0	55.8	67.8	93.6	80.6	78.5
	HDR-5	80.7	76.5	98.3	92.6	117.3	64.9	67.2	81.1	90.4	83.7
	HDR-6	81.4	94.9	90.5	88.6	66.6	58.4	97.2	93.0	101.5	98.6
	HDR-7	112.5	112.3	94.3	97.8	82.2	79.7	82.4	81.7	93.7	113.3
	HDR-8	69.9	80.7	96.8	77.5	83.6	66.4	85.0	66.4	95.1	89.3
	HDR-9	91.9	76.2	89.3	93.2	78.3	66.1	86.5	98.6	91.6	86.6
	HDR-10	91.0	79.3	95.5	76.2	78.9	65.8	91.8	78.4	79.8	69.2
	HDR-11	86.1	107.3	80.4	60.2	102.6	68.6	77.3	93.1	87.5	98.2
	LCS2	100.5	98.9	104.1	102.2	98.1	98.0	98.9	96.5	96.6	100.2
Sulfathiazole	LCS1	95.8	93.9	93.7	101.6	89.5	91.5	99.2	95.1	131.8	100.5
	HDR-1	80.1	63.0	55.9	86.4	67.3	60.7	62.9	94.4	114.4	70.1
	HDR-2	82.2	60.7	56.9	69.8	75.6	68.5	81.7	100.6	97.6	104.6
	HDR-3	63.5	77.2	49.0	64.4	77.9	49.8	48.6	80.5	114.4	91.2
	HDR-4	60.6	82.3	56.9	66.3	75.1	36.4	32.2	99.2	71.7	95.2
	HDR-5	80.3	69.5	51.4	77.3	62.2	50.4	45.3	72.6	97.9	88.1
	HDR-6	58.6	71.8	67.2	87.1	79.7	37.1	60.6	88.9	101.0	87.1
	HDR-7	74.2	63.2	63.9	72.5	62.4	62.6	70.6	73.1	103.8	68.3
	HDR-8	65.0	62.6	64.7	69.9	80.9	61.9	46.0	87.2	109.8	60.2
	HDR-9	74.5	73.4	65.5	81.9	54.4	65.2	42.2	100.8	118.7	67.2
	HDR-10	58.1	59.9	74.1	71.1	54.1	55.4	78.5	57.5	104.2	62.9
	HDR-11	75.1	62.0	58.5	31.2	56.5	46.0	67.9	88.8	123.5	93.1
	LCS2	85.7	82.1	80.4	100.8	102.3	84.6	94.8	114.3	111.3	95.8
Sulfometuron methyl	LCS1	103.1	96.6	95.4	108.3	95.9	92.2	103.1	84.7	104.8	98.0
	HDR-1	55.6	51.8	44.2	45.6	53.9	47.7	63.3	59.2	84.8	90.2
	HDR-2	53.9	44.6	50.1	44.3	55.7	45.9	58.5	55.4	88.6	91.9
	HDR-3	58.8	42.4	51.0	41.7	57.9	41.8	51.7	62.0	82.0	82.8
	HDR-4	50.6	46.5	45.4	41.0	51.5	49.7	54.3	69.9	95.0	86.6

Working Stock Standard ID		WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 07-15-16	WSS-07-25-16	WSS 08-15-16	WSS 08-29-16	WSS 09-07-16	WSS-09-21-16
Analytical Date		7/1/16	7/3/16	7/5/16	7/8/16	7/17/16	7/31/16	8/15/16	8/30/16	9/7/16	9/21/16
Days Since Spike		0	2	4	7	16	30	45	60	69	84
Compound	**Sample Name**										
	HDR-5	46.8	47.1	47.1	40.7	52.7	43.6	55.3	57.0	83.2	84.0
	HDR-6	52.8	51.4	55.9	41.8	58.5	50.6	56.1	57.3	82.8	81.6
	HDR-7	56.5	48.2	54.1	43.0	48.5	44.5	50.7	51.2	83.5	84.9
	HDR-8	54.3	44.2	46.6	43.5	48.7	43.6	60.4	49.8	74.3	86.5
	HDR-9	54.9	47.6	52.8	38.9	58.4	46.6	54.3	52.8	81.0	84.2
	HDR-10	58.6	42.8	52.8	48.8	57.1	43.9	60.2	87.3	77.3	84.6
	HDR-11	54.0	49.0	51.1	42.8	59.3	49.0	58.3	59.8	70.1	81.3
	LCS2	93.7	87.5	94.8	83.0	85.7	105.8	92.2	69.5	84.9	85.9
TCEP	LCS1	111.9	102.5	99.9	107.3	92.9	96.5	108.7	97.4	101.4	98.6
	HDR-1	57.2	72.0	70.6	72.1	47.9	49.6	70.1	74.1	86.1	100.2
	HDR-2	62.8	72.3	67.9	69.4	55.2	60.4	72.7	85.4	96.1	95.0
	HDR-3	57.0	68.9	68.8	60.6	50.0	37.6	68.4	80.2	66.4	110.3
	HDR-4	64.1	71.3	59.3	72.2	56.8	46.0	70.9	80.6	79.5	102.9
	HDR-5	77.0	72.5	72.7	73.3	59.6	48.2	76.7	84.2	100.4	93.4
	HDR-6	69.5	71.4	78.9	74.6	44.2	58.5	91.6	72.7	97.3	119.9
	HDR-7	65.7	78.7	67.1	67.2	49.7	47.2	63.6	83.5	87.3	104.9
	HDR-8	63.6	82.4	71.5	66.3	35.2	55.1	58.2	80.8	85.1	97.9
	HDR-9	58.1	65.0	62.7	62.5	41.4	39.1	67.2	90.2	94.3	95.4
	HDR-10	61.4	74.6	66.8	66.4	47.2	48.7	84.5	80.1	86.8	102.4
	HDR-11	83.5	63.5	69.9	58.0	41.1	49.4	1.4	81.9	82.3	117.7
	LCS2	103.7	95.8	89.6	107.7	75.0	100.7	94.0	88.2	101.4	85.2
TCPP	LCS1	108.8	99.3	103.7	117.0	124.0	117.0	119.3	84.6	165.3	82.2
	HDR-1	73.5	93.4	81.7	104.2	120.1	78.1	138.3	98.7	196.2	102.5
	HDR-2	90.2	94.7	96.3	103.1	153.8	97.0	121.9	104.4	137.9	119.0
	HDR-3	92.7	87.3	98.5	111.9	147.5	110.7	134.0	145.1	186.0	97.4
	HDR-4	80.1	93.2	106.3	114.6	168.9	95.3	144.6	88.0	168.7	106.6
	HDR-5	84.5	110.0	95.8	115.2	170.4	97.8	143.2	120.7	174.5	97.8
	HDR-6	93.5	100.6	86.8	100.5	125.8	112.8	152.4	137.2	215.5	109.1
	HDR-7	92.2	92.7	98.6	117.7	119.7	122.2	146.6	121.0	194.3	92.8
	HDR-8	99.5	95.6	93.0	118.0	100.6	87.4	134.7	108.9	249.7	92.8
	HDR-9	87.7	103.9	100.7	105.9	123.1	112.0	132.1	147.5	224.1	99.0
	HDR-10	86.9	102.2	86.9	109.2	135.8	102.6	170.1	824.4	206.9	105.8
	HDR-11	91.0	83.6	102.2	68.5	121.4	86.7	161.7	149.1	266.7	97.4
	LCS2	119.8	98.0	84.2	111.3	77.2	120.0	117.3	85.7	203.8	69.8
TDCPP - PRM	LCS1	124.3	99.8	101.7	111.7	113.6	101.5	137.6	101.1	138.4	80.5
	HDR-1	65.5	56.9	58.4	68.0	49.4	47.8	53.3	65.9	73.2	59.9
	HDR-2	77.8	73.1	75.9	51.8	47.5	41.3	46.1	70.7	60.7	52.3
	HDR-3	70.3	55.6	60.4	49.8	51.4	44.0	47.6	73.1	76.9	47.3
	HDR-4	63.2	52.3	61.6	50.8	54.4	38.7	44.7	57.2	55.2	35.9
	HDR-5	80.3	58.0	61.2	49.4	55.1	51.0	42.1	73.2	61.6	46.8
	HDR-6	86.5	54.2	67.5	53.7	54.4	49.6	41.6	74.7	67.3	48.9
	HDR-7	71.9	52.4	54.3	52.1	48.0	38.0	45.2	57.3	75.4	51.4
	HDR-8	75.0	54.5	70.1	48.1	47.4	41.0	36.0	68.7	72.8	38.1
	HDR-9	99.4	50.8	67.5	46.5	53.8	41.0	41.2	70.0	74.1	49.1
	HDR-10	91.3	48.0	73.2	51.2	71.5	51.0	40.8	95.3	78.8	49.0
	HDR-11	76.0	53.1	64.2	108.1	54.3	36.3	45.3	68.3	75.3	41.0
	LCS2	101.2	77.2	74.3	78.4	131.3	81.6	76.8	110.3	83.1	44.3
Testosterone	LCS1	101.1	106.3	104.5	118.1	94.8	99.0	98.2	101.4	92.2	82.7

Working Stock Standard ID		WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 07-15-16	WSS-07-25-16	WSS 08-15-16	WSS 08-29-16	WSS 09-07-16	WSS-09-21-16
Analytical Date		7/1/16	7/3/16	7/5/16	7/8/16	7/17/16	7/31/16	8/15/16	8/30/16	9/7/16	9/21/16
Days Since Spike		0	2	4	7	16	30	45	60	69	84
Compound	**Sample Name**										
	HDR-1	101.3	114.2	92.2	106.1	84.3	92.8	89.2	98.0	95.5	79.5
	HDR-2	106.2	108.4	113.7	105.2	83.1	85.3	93.5	115.4	97.7	83.5
	HDR-3	112.6	113.5	110.0	118.0	76.8	78.2	92.0	108.3	100.6	80.1
	HDR-4	98.5	95.2	94.5	101.1	74.8	86.9	88.4	111.3	93.0	78.2
	HDR-5	91.2	99.5	100.7	101.8	86.4	80.4	85.4	146.2	108.4	83.8
	HDR-6	101.2	104.2	115.9	107.1	88.3	84.3	92.0	102.2	95.7	85.7
	HDR-7	115.9	120.5	103.5	111.8	83.1	73.1	82.4	98.7	98.1	83.1
	HDR-8	101.5	111.5	104.0	115.4	68.2	76.0	80.4	95.1	89.1	74.1
	HDR-9	93.4	102.6	101.3	99.1	84.2	80.8	81.2	109.3	104.8	81.3
	HDR-10	99.6	97.5	104.5	109.0	83.2	82.4	87.4	143.0	108.0	83.3
	HDR-11	111.8	93.8	95.2	97.1	79.7	83.3	97.8	96.2	103.4	82.4
	LCS2	100.4	103.6	110.8	112.8	82.4	96.9	95.4	93.4	98.7	85.5
Theobromine	LCS1	66.2	102.6	106.5	111.4	114.8	82.8	101.3	99.1	101.0	111.2
	HDR-1	77.6	94.7	37.5	62.6	74.9	88.5	86.3	24.9	104.0	131.2
	HDR-2	57.3	67.0	44.0	90.9	90.7	86.1	51.1	134.8	132.6	119.7
	HDR-3	74.5	59.0	68.7	125.5	66.1	61.9	40.6	72.7	105.0	132.3
	HDR-4	57.3	83.6	82.3	72.2	99.4	94.4	53.8	94.8	112.2	140.4
	HDR-5	58.7	57.7	94.7	80.0	90.5	85.7	109.0	46.0	114.2	120.9
	HDR-6	38.3	64.8	98.3	86.2	88.8	61.9	61.4	74.6	116.7	91.1
	HDR-7	52.8	73.4	70.7	75.1	72.4	76.3	159.2	87.3	109.6	115.7
	HDR-8	60.9	88.0	67.3	89.9	66.9	99.0	98.2	89.4	106.4	119.1
	HDR-9	59.1	73.1	64.0	66.3	75.4	78.6	77.2	84.5	105.5	113.9
	HDR-10	66.6	70.6	70.2	73.7	83.9	70.6	86.9	598.8	116.0	127.3
	HDR-11	58.6	48.4	76.6	60.3	62.4	93.1	54.6	77.0	100.0	114.3
	LCS2	67.1	92.7	108.1	107.3	98.9	113.1	81.8	93.0	96.6	90.8
Theophyline	LCS1	77.7	91.3	101.8	106.1	114.3	105.6	83.2	99.0	94.4	110.2
	HDR-1	54.2	51.8	69.1	33.5	72.2	162.3	378.4	357.5	132.4	182.2
	HDR-2	50.6	79.2	73.0	55.9	79.8	245.5	268.3	360.4	136.3	166.1
	HDR-3	36.9	58.1	58.4	25.9	106.6	177.3	323.9	226.0	159.5	175.8
	HDR-4	47.0	47.9	74.4	30.1	75.0	167.4	181.7	255.6	130.7	174.4
	HDR-5	22.8	47.7	78.1	39.3	113.0	218.0	197.1	288.8	135.4	161.1
	HDR-6	28.7	51.1	53.2	40.8	84.2	198.1	271.0	140.4	129.9	128.9
	HDR-7	43.7	56.4	83.1	45.6	63.8	197.4	307.3	193.7	140.8	167.1
	HDR-8	44.7	36.4	58.2	59.6	79.2	210.6	161.8	149.0	108.8	178.7
	HDR-9	34.0	54.1	54.4	33.3	91.0	176.5	190.2	229.2	117.4	165.8
	HDR-10	54.6	33.0	80.9	27.4	105.8	104.9	140.8	486.9	122.8	148.4
	HDR-11	32.9	31.7	87.7	31.5	53.7	180.8	177.4	205.2	147.4	174.1
	LCS2	70.1	96.2	90.0	88.1	108.3	92.5	67.7	93.7	90.3	100.7
Thiabendazole	LCS1	100.7	97.5	96.3	108.5	90.0	95.4	100.0	89.5	97.5	104.3
	HDR-1	84.3	98.5	95.1	90.9	108.9	37.8	103.7	73.5	101.4	99.9
	HDR-2	93.7	101.8	99.9	97.9	97.9	33.3	102.7	79.3	99.4	101.4
	HDR-3	87.9	91.3	97.9	96.3	91.9	30.9	106.8	77.9	105.3	93.3
	HDR-4	84.6	75.7	86.1	104.7	102.8	32.9	99.3	82.6	106.8	83.7
	HDR-5	84.1	89.7	102.0	93.5	99.1	37.4	99.3	101.9	109.9	87.8
	HDR-6	76.8	91.4	99.3	101.4	98.6	33.3	98.1	84.8	99.7	98.6
	HDR-7	92.6	101.3	102.4	112.6	89.8	34.2	104.5	80.3	105.2	101.6
	HDR-8	84.9	86.8	100.3	102.9	93.9	36.0	89.5	78.4	96.8	95.6
	HDR-9	82.1	93.5	102.8	94.7	100.7	37.8	95.0	82.6	105.3	92.8

Working Stock Standard ID		WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 07-15-16	WSS-07-25-16	WSS 08-15-16	WSS 08-29-16	WSS 09-07-16	WSS-09-21-16
Analytical Date		7/1/16	7/3/16	7/5/16	7/8/16	7/17/16	7/31/16	8/15/16	8/30/16	9/7/16	9/21/16
Days Since Spike		0	2	4	7	16	30	45	60	69	84
Compound	**Sample Name**										
	HDR-10	69.8	86.2	98.5	104.4	101.1	36.8	99.7	84.5	103.4	98.4
	HDR-11	101.1	96.7	90.5	82.8	93.1	35.2	108.6	77.7	96.8	103.6
	LCS2	105.7	102.2	105.0	112.3	109.8	98.4	96.5	95.3	95.4	107.0
Triclocarban	LCS1	128.5	97.0	101.8	105.6	74.9	99.8	103.2	89.2	129.2	98.4
	HDR-1	117.1	101.1	96.4	115.0	73.2	64.8	93.8	59.8	97.0	64.6
	HDR-2	130.0	102.0	96.3	110.6	66.3	52.7	90.8	55.1	70.8	61.7
	HDR-3	117.4	101.9	100.5	112.8	61.4	61.7	74.7	55.5	79.7	63.0
	HDR-4	133.0	109.5	102.0	113.0	68.2	59.4	66.0	48.3	75.5	51.6
	HDR-5	121.5	115.8	100.2	110.3	67.3	63.6	78.5	62.7	81.6	56.3
	HDR-6	145.4	110.8	110.0	117.4	70.8	55.4	87.9	58.5	98.6	53.5
	HDR-7	131.6	110.1	109.8	111.5	66.8	63.1	71.3	59.3	85.6	52.4
	HDR-8	131.4	110.1	97.4	115.5	59.5	59.3	78.1	54.0	83.7	49.7
	HDR-9	132.1	116.7	113.6	114.5	69.9	63.1	86.5	58.4	113.9	53.0
	HDR-10	132.5	106.2	101.7	101.5	72.8	54.2	94.3	68.5	102.9	64.2
	HDR-11	141.0	115.4	108.0	119.6	59.4	54.4	83.0	58.3	95.5	56.0
	LCS2	125.2	102.1	101.2	112.2	92.8	95.4	121.7	99.4	123.3	88.9
Triclosan	LCS1	73.4	77.1	82.8	91.6	80.4	83.3	73.2	85.0	124.5	91.6
	HDR-1	112.1	122.7	106.6	152.5	98.0	104.0	134.4	100.8	150.0	102.6
	HDR-2	111.5	126.6	113.2	154.6	89.0	94.9	136.1	100.3	115.9	105.0
	HDR-3	106.8	120.8	114.1	154.0	83.3	103.4	126.8	100.5	134.0	104.8
	HDR-4	112.4	120.4	114.6	155.2	85.2	95.6	121.5	91.8	117.6	91.6
	HDR-5	109.6	129.0	116.8	151.7	88.3	115.1	131.8	103.6	136.2	100.7
	HDR-6	116.0	117.0	111.2	153.4	96.0	101.9	133.9	104.6	151.2	98.6
	HDR-7	113.7	120.7	113.7	146.6	93.0	115.4	115.5	101.1	137.7	97.6
	HDR-8	112.7	115.8	113.6	157.0	85.4	103.2	128.2	95.1	130.6	92.0
	HDR-9	117.2	118.7	109.3	147.1	94.3	109.6	136.7	97.6	156.5	98.2
	HDR-10	112.7	119.6	107.1	150.3	93.4	108.9	134.0	111.3	152.8	110.6
	HDR-11	119.5	119.6	105.5	142.8	88.7	101.0	136.0	96.4	146.1	102.0
	LCS2	60.8	60.7	60.3	79.0	76.3	62.4	75.8	96.8	110.8	85.6
Trimethoprim	LCS1	96.4	87.5	95.8	108.8	105.2	101.9	104.1	100.7	103.6	96.2
	HDR-1	89.4	83.8	98.8	111.2	87.5	66.3	96.6	94.4	88.8	95.0
	HDR-2	88.0	86.0	95.8	92.6	87.1	67.8	76.5	91.6	96.5	86.8
	HDR-3	91.3	86.0	91.4	90.7	78.5	67.3	91.9	96.6	88.8	94.6
	HDR-4	97.7	88.2	86.7	83.1	77.9	69.9	92.8	88.1	109.1	91.8
	HDR-5	89.8	78.0	102.1	83.7	73.2	76.8	85.6	105.8	94.0	96.4
	HDR-6	100.2	95.1	80.0	82.8	93.1	72.4	86.5	98.1	95.8	91.2
	HDR-7	90.7	83.7	98.6	73.7	97.0	65.4	104.9	98.7	94.4	88.9
	HDR-8	91.1	84.0	73.0	92.9	84.1	62.1	91.7	98.5	92.1	96.0
	HDR-9	82.4	82.2	90.4	88.0	80.3	76.2	80.1	89.4	99.1	94.8
	HDR-10	86.1	90.6	94.9	82.0	85.9	70.3	74.4	85.1	79.1	96.3
	HDR-11	91.8	81.2	92.2	83.8	80.8	69.3	94.5	91.5	96.6	93.3
	LCS2	103.5	91.1	94.8	90.0	102.3	103.6	100.4	94.4	94.7	96.2
Warfarin	LCS1	89.8	93.1	92.4	99.9	67.2	84.8	92.1	96.3	115.5	90.4
	HDR-1	126.2	128.4	141.1	141.1	130.8	128.6	200.5	148.0	236.3	185.6
	HDR-2	118.5	123.6	130.5	144.8	117.9	117.4	189.1	149.8	158.0	171.6
	HDR-3	127.5	121.3	126.8	137.9	116.5	121.7	182.5	148.5	191.4	153.7
	HDR-4	121.7	131.4	121.8	137.3	111.3	107.3	159.5	137.5	167.3	140.8
	HDR-5	124.6	126.3	133.4	135.0	112.1	113.7	170.8	138.4	184.2	144.0

Working Stock Standard ID		WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 06-30-16	WSS 07-15-16	WSS-07-25-16	WSS 08-15-16	WSS 08-29-16	WSS 09-07-16	WSS-09-21-16
Analytical Date		7/1/16	7/3/16	7/5/16	7/8/16	7/17/16	7/31/16	8/15/16	8/30/16	9/7/16	9/21/16
Days Since Spike		0	2	4	7	16	30	45	60	69	84
Compound	**Sample Name**										
	HDR-6	128.6	130.9	121.0	135.6	113.2	122.6	173.7	144.5	204.8	144.4
	HDR-7	123.3	136.6	129.9	135.4	116.6	117.3	163.1	141.9	180.5	151.8
	HDR-8	128.0	119.9	124.0	139.0	111.8	116.8	153.8	139.6	183.5	145.7
	HDR-9	120.1	123.6	124.3	134.7	117.8	122.9	165.0	142.9	208.6	150.6
	HDR-10	124.0	123.2	124.9	126.5	116.3	118.7	155.5	163.3	207.1	170.7
	HDR-11	130.4	127.6	117.2	125.0	109.9	118.3	168.8	146.6	208.8	139.7
	LCS2	80.9	80.1	77.7	92.2	61.4	73.2	99.0	105.3	99.4	89.9

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Appendix E

Freshwater Residual Chemical Results from Literature

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Appendix E – Freshwater Literature Review References

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	Sellin et al. (2008)					J.M. Conley et al. (2008)					Barber et al. (2006)					Furlong et al. (2009) - water sample results					Furlong et al. (2009) - sediment results (ng/g)					Furlong et al. (2009) - fish tissue results (ng/g)					Kolpin et al. (2002)					Kolpin et al. (2004)					Hoehn et al. (2007)					Guo et al. (2008)				
	MRL	Min	Mean	Max	Detect. Freq. (%)	MRL	Min	Median	Max	Detect. Freq. (%)	MRL	Min	Median	Max	Detect. Freq. (%)	LOQ	Min	Median	Max	Detect. Freq. (%)	LOQ	Min	Median	Max	Detect. Freq. (%)	LOQ	Min	Median	Max	Detect. Freq. (%)	RL	Min	Median	Max	Detect. Freq. (%)	RL	Min	Median	Max	Range of Detect. Freq. (%)	DL	Min	Range of Means	Max	Detect. Freq. (%)	MRL	Min	Median	Max	Detect. Freq. (%)
Pharmaceuticals/Stimulants (ng/L)																																																	
Acetaminophen							2.1	2.9	12.3	13.3																				9		110	10000	23.8	9			1950	20-43.5%											
Atorvastatin							3	6.8	101.3	4.7																																									
Benzafibrate																																																	
Bupropion																0.5	ND		104		0.25	ND		2.12		0.015	ND		0.348																					
Caffeine	1		2.1-2834				18.1	28.8	175.7	92.2		ND		350																						14			1390	56.7-82.6%						1	7	85	687	
Carbamazepine							2.9	5	23.1	79.7																										10.7			263	4.3-70%						1	2	20	188	
Cimetidine																														7		74	580	9.5	7			338	4.3-30%										
Citalopram																0.5	ND		86.4		0.25	0.36		14.95		0.015	ND		0.195																					
Clotrimazole																																																	
Codeine																																			240			119	20%										
Cotinine												ND		220																					23			528	17.4-53.3%										
Dehydronifedipine																														10		12	30	14.3	10			2	4.3-10%										
Dextropropoxyphene																																																	
Diazepam																																																	
Diclofenac																																																	
1,7-Dimethlyxanthine																														18		110	3100	28.6	18			294	30.4-53.3%										
Diltiazem							1.3	1.9	9.7	10.2		ND		25																12		21	49	13.1																
EDTA												ND		210																																				
Enalprilat																														15		46	46	1.2																
Fenoprofen																																																	
Fluoxetine							3.9	7	10.1	1.6						0.5	<LOQ		7.8		0.25	0.39		19.37		0.015	ND		0.491		18		12	12	1.2																
Fluvoxamine																0.5	ND		0.83																														
Gemfibrozil																														15		48	790	3.6																
Ibuprofen																														18		200	1000	9.5																
Indomethacine																																																	
Isopropyl Phenazone																																																	
Levofloxacin							6.2	11.9	59.3	6.3																																								
Lovastatin							10.6	18.3	102.9	2.3																																								
Metformin																														3		110	150	4.8																
Mitotane																																																	
Naproxen																																																	
Norfluoxetine							2.88	2.88	2.88	0.6						0.5	ND		2.7		0.25	ND		3.17		0.015	ND		0.886																						
Norsertraline																0.5	ND		8.9		0.25	ND		10.7		0.015	ND		6.128																					
Ornidazole																																																	
Paroxetine																0.5	ND		3.1		0.25	ND		3.43		0.015	ND		0.195																					
Phenazone																																																	
Phenytoin																																																	
Primidone																																																1	2	10	66	
Propanolol																																																	
Ranitidine																														10		10	10	1.2	10			27	6.70%										
Sertraline							2.4	3.5	12.4	3.1						0.5	ND		5.92		0.25	0.27		17.71		0.015	ND		4.244																						
Tamoxifen																																																	
Trimethoprim							2.3	5.6	63.6	32																										14			35	26.70%										
Venlafaxine																0.5	ND		359		0.25	1.62		25.29		0.015	ND		1.12		0.05	ND		<LOQ																
Steroids/Hormones (ng/L)																																																	
Alfatradiol																														5		30	74	5.7																
cis-androsterone																														5		17	214	14.3																
Cholesterol																														1500		1	10000	55.3	2000			4300	60.9-86.4%										
Coprostanol												ND		10																600		700	9800	35.3																
Equilenin																														5		140	278	2.8																
Equilin																														5		147	147	1.4																
Estradiol	1		1.5-14.5																											500		160	200	10.6																
17α-Estradiol																																																	
17β-Estradiol																																																	
Estriol																														5		19	51	21.4																
Estrone	1		2.6-22.9																											5		27	112	7.1																
Ethinyl estradiol																														5		73	831	15.7																
Mestranol																														5		74	407	10																
19-norethisterone																														5		48	872	12.8																
Progesterone																														5		110	199	4.3																
Beta-sitosterol																																			2000			2900	43.5-81.8%										
Stigmastanol																														2000		2000	4000	5.6																
Testosterone																														5		116	214	2.8																
Antibiotics (ng/L)																																																	
Azithromycin																																																	
Chlortetracycline																														100		420	690	2.4	20			100	0-4.3%										
Ciprofloxacin							4.7	6.9	54.2	10.2																				20		20	30	2.6	10			30	3.30%										
Clarithromycin																																																	
Danofloxacin																																																	
Enoxacin																																																	
Enrofloxacin																																			10			10	3%										
Erythromycin-H2O																														50		100	1700	21.5	20			220	10%										
Flumequine																																																	
Lincomycin																														50		60	730	19.2	10			10	3.30%										
Norfloxacin																														20		120	120	0.9	10			30	3.30%										
Ofloxacin																																																	
Oxolinic Acid																																																	
Oxytetracycline																														100		340	340	1.2																
Roxithromycin																														30		50	180	4.8																
Sarafloxacin																																																	
Sulfadimethoxine																														50		60	60	1.2	10			10	4.30%										
Sulfamethazine																														50		20	120	4.8																
Sulfamethizole																														50		0.13	0.13	1																
Sulfamethoxazole							3.1	7.9	33	85.9		ND		220																50		150	1900	12.5	23			63	4.3-16.3%										
Tetracycline																														100		110	110	1.2	20			300	6.70%										
Triclosan												ND		170																50		140	2300	57.6																
Tylosin																														50		40	280	13.5																
Personal Care Products (ng/L)																																																	
Acetophenone																														150		150	410	9.4	500			220	3.30%										

	Sellin et al. (2008)					J.M. Conley et al. (2008)					Barber et al. (2006)					Furlong et al. (2009) - water sample results					Furlong et al. (2009) - sediment results (ng/g)					Furlong et al. (2009) - fish tissue results (ng/g)					Kolpin et al. (2002)					Kolpin et al. (2004)					Hoehn et al. (2007)					Guo et al. (2008)				
	MRL	Min	Mean	Max	Detect. Freq. (%)	MRL	Min	Median	Max	Detect. Freq. (%)	MRL	Min	Median	Max	Detect. Freq. (%)	LOQ	Min	Median	Max	Detect. Freq. (%)	LOQ	Min	Median	Max	Detect. Freq. (%)	LOQ	Min	Median	Max	Detect. Freq. (%)	RL	Min	Median	Max	Detect. Freq. (%)	RL	Min	Median	Max	Range of Detect. Freq. (%)	DL	Min	Range of Means	Max	Detect. Freq. (%)	MRL	Min	Median	Max	Detect. Freq. (%)
AHTN																																		500			1200	8.7-36.7%										
Benzophenone																																		500			110	10%										
DEET																														40		60	1100	74.1	500			130	4.3-6.7%										
Galaxolide																																																		
HHCB																																		500			260	4.5-20%										
Isoborneol																																		500			120	4.30%										
Limonene																																		500			94	3.30%										
3-Methyl-1H-indole (Skatol)																																																		
Methyl Paraben																																																		
Methly salicylate																																		500			190	6.7-26.1%										
Propylparaben																																																		
Tonalide																																																		
Triclocarban																																																		
Triethyl citrate																																		500			170	16.70%										
Flame Retardants (ng/L)																																																		
BB 15																																																		
BB 49																																																		
BB 52																																																		
BB 101																																																		
BB 153																																																		
BB 169																																																		
BB 209																																																		
BDE-47																																																		
BDE-85																																																		
BDE-99																																																		
BDE-138																																																		
BDE-153																																																		
BDE-209																																																		
BDE-100																																																		
TBP																																		500			140	4.3-10%										
TBEB																																																		
TBEP																																		500			870	4.3-26.7%										
TCEP																														40		100	540	57.6	500			250	18.3-23.3%										
TCPP																																																		
TDPP																														100		100	160	12.9	500			400	16.70%										
TDCPP																																																		
TPP																														10		40	220	14.1																
Perfluorinated Compounds (ng/L)																																																		
EtFOSAA																																															26				
PFBA																																																		
PFBS																																																		
PFDA																																																		
PFDoA																																																		
PFHpA																																														5-16				
PFHxS																																														9-11				
PFHxA																																																		
PFNA																																														5-10				
PFOA																																												0.4		10-120				
PFOS																																											1		14-374				
PFPA																																																		
PFUA																																																		
Alkylphenols (ng/L)																																																		
Nonylphenol												15		345																50		800	40000	50.6	5000			880	4.3-6.7%										
4-nonylphenol monoethoxylate																														1000		1000	20000	45.9																
4-nonylphenol diethoxylate																														1100		1000	9000	36.5	5000			1100	10-17.4%										
Diethoxynonylphenol																																																		
Octylphenol																																																		
4-octylphenol monoethoxylate																														100		200	2000	43.5																
4-octylphenol diethoxylate																														200		100	1000	23.5																
4-Tert-octylphenol																																			1000			220	6.70%										
Diethoxyoctylphenol																																																		
Ethoxyoctylphenol																																																		
Plasticizers (ng/L)																																																		
Bisphenol A																														90		140	12000	41.2	1000			740	4.3-16.7%										
BBP																																																		
bis(2-ethylhexyl) adipate																														2000		3000	10000	3.5																
Camphor																																			500			84	3.30%										
DBP																																																		
DCHP																																																		
DEHP																														2500		7000	20000	10.6																
DEP																														250		200	420	11.1																
DMP																																																		
DMPP																																																		
DOP																																																		
DPP																																																		
ethanol,2-butoxy-phosphate																														200		510	6700	45.9																
Phenol																														250		700	1300	8.2	500			1200	21.7-30%										
Phthalic anhydride																														250		700	1000	17.6																
Triphenyl phosphate																																			500			120	3.30%										
Herbicide/Pesticide (ng/L)																																																		
Atrazine												ND		17																																					
Bifenthrin																																																		
Bromacil																																			500			390	9.1-21.7%										
Butylate																																																		
Carbaryl																														60		40	100	16.5																
Carbofuran																																																		
Cis-Chlordane																														40		20	100	4.7																
Chlorpyrifos																														20		60	310	15.3	500			7	4.30%										
Clofibric Acid																																																		

	Sellin et al. (2008)					J.M. Conley et al. (2008)					Barber et al. (2006)					Furlong et al. (2009) - water sample results					Furlong et al. (2009) - sediment results (ng/g)					Furlong et al. (2009) - fish tissue results (ng/g)					Kolpin et al. (2002)					Kolpin et al. (2004)					Hoehn et al. (2007)					Guo et al. (2008)				
	MRL	Min	Mean	Max	Detect. Freq. (%)	MRL	Min	Median	Max	Detect. Freq. (%)	MRL	Min	Median	Max	Detect. Freq. (%)	LOQ	Min	Median	Max	Detect. Freq. (%)	LOQ	Min	Median	Max	Detect. Freq. (%)	LOQ	Min	Median	Max	Detect. Freq. (%)	RL	Min	Median	Max	Detect. Freq. (%)	RL	Min	Median	Max	Range of Detect. Freq. (%)	DL	Min	Range of Means	Max	Detect. Freq. (%)	MRL	Min	Median	Max	Detect. Freq. (%)
Cyanazine																																																	
Deethylatrazine																																																	
Desisopropyl-atrazine																																																
Diazinon												ND		100																30		70	350	25.9	500			1100	3.3-13%										
Dichlobenil												ND		6650																																				
1,4-dichlorobenzene																														30		90	4300	25.9	14			35	26.70%										
Dieldrin																														80		180	210	4.7															
Diethanolamine																																																
Diuron																																																
Fipronil																																																
Fipronil disulfinyl																																																
Fipronil sulfide																																																
Fipronil sulfone																																																
Lindane																														50		20	110	5.9															
Linuron																																																
Malathion																																																
Metalaxyl																																																
Methoxychlor																																																
Methyl Parathion																														60		10	10	1.2															
Metolachlor																																						500			640	80-100%									
Naphthalene																														20		20	80	16.5	500			82	10%										
Pendimethalin																																																
Pentachlorophenol																																				2000			51	6.70%									
Permethrin																																																
Prometon																																				500			75	9.1-52.2%									
Simazine																																																
Tebuthiuron																																																
Triflurain																																																
Antioxidants (ng/L)																																																
2,6-di-tert-butylphenol																														80		60	110	3.5															
2,6-di-tert-butyl-1,4-benzoquinone																														100		130	460	9.4															
3-tert-butyl-4-hydroxy anisole (BHA)																														120		100	200	2.4															
Butylated hydroxy toluene																														80		100	100	2.4															
5-methyl-1H-benzotriazole																																				2000			270	4.3-4.5%									
4-methyl phenol																														40		50	540	24.7															
PAH (ng/L)																																																
Anthracene																														50		70	110	4.7															
Benzo[a]pyrene																														50		40	240	9.4	500			60	9.1										
Fluoranthene																														30		40	1200	29.4	500			250	13.6										
2-Methylnaphthalene																																				500			56	3.3									
Phenanthrene																														60		40	530	11.8	500			72	9.1										
Pyrene																														30		50	840	28.2	500			160	13.6										
Other (ng/L)																																																
Anthraquinone																																				500			66	9.1									
3-beta-Coprostanol																																				2000			1300	4.5-20%									
Bromoform																																				500			160	4.3-4.5%									
Indole																																																
Tetrachloroethylene																														30		70	700	23.5															

	Guo et al. (2010)					Brown et al. (2008)					Liu et al. (2015) - Water Samples					Liu et al. (2015) - Fish Tissue Samples (ng/g)					Tamtam et al. (2008)					Sengupta et al. (2013)					Larson et al. (1999)					Boyd et al. (2002)					Barnes et al. (2002)					Roberts et al. (2005)					Lindstrom et al. (2010)				
	MRL	Min	Median	Max	Detect. Freq. (%)	LRL	Min	Median	Max	Detect. Freq. (%)	LQL	Min	Mean	Max	Detect. Freq. (%)	LQL	Min	Mean	Max	Detect. Freq. (%)	MRL	Min	Range of Means	Max	Detect. Freq. (%)	DL	Min	Range of Means	Max	Detect. Freq. (%)	MRL	Min	Range of Medians	Max	Detect. Freq. (%)	MRL	Min	Median	Max	Detect. Freq. (%)	DL	Min	Median	Max	Detect. Freq. (%)	DL	Min	Median	Max	Detect. Freq. (%)	DL	Min	Median	Max	Detect. Freq. (%)
Pharmaceuticals/Stimulants (ng/L)																																																							
Acetaminophen	1	<1	<1-10	460	5-68%																						25.8								9	<9		26	59%																	
Atorvastatin																																																						
Benzafibrate																																																					
Bupropion																																																					
Caffeine	5	<5	<5-47	2160	47-100%	500		185	740																										14	2		138	100%																	
Carbamazepine	1	<1	3-128	267	88-93%								2	6.9	100			0.55											330								ND		140	35%																	
Cimetidine																																			7	<7		63	35%																	
Citalopram																																																						
Clotrimazole																																																			6	21.5	34					
Codeine																																			24	<24		53	35%																	
Cotinine						1000		145	330																										23	3		130	65%																	
Dehydronifedipine																																			10	0.4		10	35%																	
Dextropropoxyphene																																																			8	<8	<8	98				
Diazepam																											6.1																													
Diclofenac	5	<5	<5	15	8%								56.5	356	100			1.9										124																													
1,7-Dimethlyxanthine																																			18	8		42	76%																	
Diltiazem																																			12	7		12	35%																	
EDTA																																																						
Enalprilat																																																						
Fenoprofen																																																						
Fluoxetine																																																						
Fluvoxamine																																																						
Gemfibrozil	5	<5	5-28	590	53-75%																						324																													
Ibuprofen	10	<10	<10-17	530	3-65%								18.6	86	80			ND										40.5																													
Indomethacine																																																						
Isopropyl Phenazone																																																						
Levofloxacin																																																						
Lovastatin																																																						
Metformin																																																						
Mitotane	20	<20	<20	82	15-21%																																																		
Naproxen																																																						
Norfluoxetine																																																						
Norsertraline																																																						
Ornidazole																							28	58	0-33%																																	
Paroxetine																																																					
Phenazone																																																						
Phenytoin	5	<5	4-120	325	50-90%																						291																													
Primidone	2	<2	3-89	158	70-93%																																																	
Propanolol													0.15	0.5	94			0.14																																					
Ranitidine																																																					
Sertraline																																																						
Tamoxifen																																																					
Trimethoprim																							12-27		45	20-70%				180						14	<14		98	35%	30	30	150	710	9.00%		4	9	19					
Venlafaxine																																																					
Steroids/Hormones (ng/L)																																																						
Alfatradiol																																																					
cis-androsterone																																																		5	1	17	214	6.90%					
Cholesterol						2000		884	2450																																									18	570	12800	50.70%					
Coprostanol						2000		525	1230																																								1	83	9800	43.10%					
Equilenin																																																		5	3	140.5	278	1.40%					
Equilin																																																		5	147	147	147	0.70%					
Estradiol																											<1.25																									5	1	9-29.5	93	2.80%					
17α-Estradiol																																																							
17β-Estradiol																																																						
Estriol																																																		5	3	19	43	10.40%					
Estrone																											<2.5																									5	8	27	112	3.50%					
Ethinyl estradiol													0.56	5.9	13			19.11																																	5	31	94.5	273	2.80%					
Mestranol																																																		5	11	17	407	2.10%					
19-norethisterone																																																		5	20	48	872	6.30%					
Progesterone																																																		5	35	110	199	2.10%					
Beta-sitosterol						2000		600	1300																																															
Stigmastanol						2000		530	1600																																															
Testosterone																																																		5	5	17	214	2.10%					
Antibiotics (ng/L)																																																						
Azithromycin	1	<1	3	600	16-25%																																																		
Chlortetracycline																																																						
Ciprofloxacin	10		25	69	28%																		<10	<10	0-10%																									20	10	20	30	2.10%					
Clarithromycin																																				ND		3	6%																	
Danofloxacin																							19	19	0-9%																																	
Enoxacin																							<10	11	0-10%																																	
Enrofloxacin																							<10-10	10	0-10%																																	
Erythromycin-H2O													13	85.3	100			5.92																		50	<50		184	35%	50	30	150	1700	15.20%	4	<4	<4	70					
Flumequine																							11-18	32	20-100%																																	
Lincomycin																																																		50	20	65	730	13.80%					
Norfloxacin																							22-46																													20	120	120	120	0.70%					
Ofloxacin																								30	55	0-20%																																	
Oxolinic Acid																								13	19	0-18%																																	
Oxytetracycline																																																						
Roxithromycin													19.5	66.5	100			9.49																																	30	30	50	180	3.40%					
Sarafloxacin																							<10-10	10	0-10%																																	
Sulfadimethoxine																																																						
Sulfamethazine																							<10	<10	0-40%																													50	20	20	120	3.40%					
Sulfamethizole																																																		100	130	130	130	0.70%					
Sulfamethoxazole	1	<1	10-89	721	84-93%																		37-140	544	100%					932						23	<23		200	47%	100	20	150	1900	9.00%									
Tetracycline																																																						
Triclosan	5	<5	<5	13	25%	1		201	770																		26.3																													
Tylosin																																																		50	20	45	280	9.70%					
Personal Care Products (ng/L)																																																						
Acetophenone						500		137	210																																															

	Guo et al. (2010)					Brown et al. (2008)				
	MRL	Min	Median	Max	Detect. Freq. (%)	LRL	Min	Median	Max	Detect. Freq. (%)
AHTN						500		74	450	
Benzophenone						500		86	200	
DEET	20	<20	<20-77	361	13-98%	500		142	370	
Galaxolide										
HHCB						500		260	2540	
Isoborneol										
Limonene										
3-Methyl-1H-indole (Skatol)						1000		27	58	
Methyl Paraben	20	<20	<20	744	5-10%					
Methly salicylate										
Propylparaben	20	<20	<20	83	3%					
Tonalide										
Triclocarban										
Triethyl citrate						500		119	670	
Flame Retardants (ng/L)										
BB 15										
BB 49										
BB 52										
BB 101										
BB 153										
BB 169										
BB 209										
BDE-47										
BDE-85										
BDE-99										
BDE-138										
BDE-153										
BDE-209										
BDE-100										
TBP						500		83	320	
TBEB										
TBEP						500		780	9370	
TCEP	5	<5	<5-208	1320	26-100%	500		134	290	
TCPP										
TDPP										
TDCPP						500		174	460	
TPP										
Perfluorinated Compounds (ng/L)										
EtFOSAA										
PFBA										
PFBS										
PFDA										
PFDoA										
PFHpA										
PFHxS										
PFHxA										
PFNA										
PFOA										
PFOS										
PFPA										
PFUA										
Alkylphenols (ng/L)										
Nonylphenol	50	<50	<50	143	5%	5000		734	2270	
4-nonylphenol monoethoxylate										
4-nonylphenol diethoxylate										
Diethoxynonylphenol						5000		1870	12400	
Octylphenol	20	<20	<20	68	3%					
4-octylphenol monoethoxylate										
4-octylphenol diethoxylate										
4-Tert-octylphenol						1000		101	190	
Diethoxyoctylphenol						1000		248	840	
Ethoxyoctylphenol						1000		230	340	
Plasticizers (ng/L)										
Bisphenol A	30	<30	<30	140	3%	1000		250	520	
BBP										
bis(2-ethylhexyl) adipate										
Camphor						500		37	57	
DBP										
DCHP										
DEHP										
DEP										
DMP										
DMPP										
DOP										
DPP										
ethanol,2-butoxy-phosphate										
Phenol						500		252	860	
Phthalic anhydride										
Triphenyl phosphate						500		52	190	
Herbicide/Pesticide (ng/L)										
Atrazine	20	<1	<1-2	6	25-70%					
Bifenthrin										
Bromacil										
Butylate										
Carbaryl										
Carbofuran										
Cis-Chlordane										
Chlorpyrifos										
Clofibric Acid										

	Liu et al. (2015) - Water Samples					Liu et al. (2015) - Fish Tissue Samples (ng/g)					Tamtam et al. (2008)					Sengupta et al. (2013)				
	LQL	Min	Mean	Max	Detect. Freq. (%)	LQL	Min	Mean	Max	Detect. Freq. (%)	MRL	Min	Range of Means	Max	Detect. Freq. (%)	DL	Min	Range of Means	Max	Detect. Freq. (%)
AHTN																				
Benzophenone																				
DEET																			860	
Galaxolide																			2750	
HHCB																				
Isoborneol																				
Limonene																				
3-Methyl-1H-indole (Skatol)																				
Methyl Paraben																				
Methly salicylate																				
Propylparaben																				
Tonalide																			188	
Triclocarban																			102	
Triethyl citrate																				
Flame Retardants (ng/L)																				
BB 15																				
BB 49																				
BB 52																				
BB 101																				
BB 153																				
BB 169																				
BB 209																				
BDE-47																			2.2	
BDE-85																				
BDE-99																			0.9	
BDE-138																				
BDE-153																				
BDE-209																				
BDE-100																				
TBP																				
TBEB																				
TBEP																				
TCEP																			785	
TCPP																			2900	
TDPP																				
TDCPP																			1345	
TPP																				
Perfluorinated Compounds (ng/L)																				
EtFOSAA																				
PFBA																				
PFBS																				
PFDA																				
PFDoA																				
PFHpA																				
PFHxS																				
PFHxA																				
PFNA																				
PFOA																				
PFOS																				
PFPA																				
PFUA																				
Alkylphenols (ng/L)																				
Nonylphenol																				
4-nonylphenol monoethoxylate																				
4-nonylphenol diethoxylate																				
Diethoxynonylphenol																				
Octylphenol																				
4-octylphenol monoethoxylate																				
4-octylphenol diethoxylate																				
4-Tert-octylphenol																				
Diethoxyoctylphenol																				
Ethoxyoctylphenol																				
Plasticizers (ng/L)																				
Bisphenol A																			<25.0	
BBP																				
bis(2-ethylhexyl) adipate																				
Camphor																				
DBP																				
DCHP																				
DEHP																				
DEP																				
DMP																				
DMPP																				
DOP																				
DPP																				
ethanol,2-butoxy-phosphate																				
Phenol																				
Phthalic anhydride																				
Triphenyl phosphate																				
Herbicide/Pesticide (ng/L)																				
Atrazine																			17.1	
Bifenthrin																			3.6	
Bromacil																				
Butylate																				
Carbaryl																				
Carbofuran																				
Cis-Chlordane																				
Chlorpyrifos																			4.9	
Clofibric Acid																				

	Larson et al. (1999)					Boyd et al. (2002)					Barnes et al. (2002)					Roberts et al. (2005)					Lindstrom et al. (2010)				
	MRL	Min	Range of Medians	Max	Detect. Freq. (%)	MRL	Min	Median	Max	Detect. Freq. (%)	DL	Min	Median	Max	Detect. Freq. (%)	DL	Min	Median	Max	Detect. Freq. (%)	DL	Min	Median	Max	Detect. Freq. (%)
AHTN																									
Benzophenone																									
DEET																									
Galaxolide																									
HHCB																									
Isoborneol																									
Limonene																									
3-Methyl-1H-indole (Skatol)																									
Methyl Paraben																									
Methly salicylate																									
Propylparaben																									
Tonalide																									
Triclocarban																									
Triethyl citrate																									
Flame Retardants (ng/L)																									
BB 15																									
BB 49																									
BB 52																									
BB 101																									
BB 153																									
BB 169																									
BB 209																									
BDE-47																									
BDE-85																									
BDE-99																									
BDE-138																									
BDE-153																									
BDE-209																									
BDE-100																									
TBP																									
TBEB																									
TBEP																									
TCEP																									
TCPP																									
TDPP																									
TDCPP																									
TPP																									
Perfluorinated Compounds (ng/L)																									
EtFOSAA																									
PFBA																					1		2.73	458	84.0%
PFBS																					1		0.71	84.1	77.0%
PFDA																					1		0.71	42	88.0%
PFDoA																					1		0.71	24.7	90.2%
PFHpA																					1		2.16	90.2	94.2%
PFHxS																					1		0.71	169	89.0%
PFHxA																					1		1.59	53.4	98.8%
PFNA																					1		0.71	72.9	87.0%
PFOA																					1		2.07	125	97.1%
PFOS																					1		3.01	245	97.1%
PFPA																					1		0.71	31.5	66.0%
PFUA																					1		0.71	29.1	79.0%
Alkylphenols (ng/L)																									
Nonylphenol																									
4-nonylphenol monoethoxylate																									
4-nonylphenol diethoxylate																									
Diethoxynonylphenol																									
Octylphenol																									
4-octylphenol monoethoxylate																									
4-octylphenol diethoxylate																									
4-Tert-octylphenol																									
Diethoxyoctylphenol																									
Ethoxyoctylphenol																									
Plasticizers (ng/L)																									
Bisphenol A																									
BBP																									
bis(2-ethylhexyl) adipate																									
Camphor																									
DBP																									
DCHP																									
DEHP																									
DEP																									
DMP																									
DMPP																									
DOP																									
DPP																									
ethanol,2-butoxy-phosphate																									
Phenol																									
Phthalic anhydride																									
Triphenyl phosphate																									
Herbicide/Pesticide (ng/L)																									
Atrazine			<1-800		88%																				
Bifenthrin																									
Bromacil																									
Butylate																									
Carbaryl			<1-8		6%																				
Carbofuran			<1-200		2%																				
Cis-Chlordane																									
Chlorpyrifos			<1-10		5%																				
Clofibric Acid																									

	Guo et al. (2010)					Brown et al. (2008)					Liu et al. (2015) - Water Samples					Liu et al. (2015) - Fish Tissue Samples (ng/g)					Tamtam et al. (2008)					Sengupta et al. (2013)					Larson et al. (1999)					Boyd et al. (2002)					Barnes et al. (2002)					Roberts et al. (2005)					Lindstrom et al. (2010)				
	MRL	Min	Median	Max	Detect. Freq. (%)	LRL	Min	Median	Max	Detect. Freq. (%)	LQL	Min	Mean	Max	Detect. Freq. (%)	LQL	Min	Mean	Max	Detect. Freq. (%)	MRL	Min	Range of Means	Max	Detect. Freq. (%)	DL	Min	Range of Means	Max	Detect. Freq. (%)	MRL	Min	Range of Medians	Max	Detect. Freq. (%)	MRL	Min	Median	Max	Detect. Freq. (%)	DL	Min	Median	Max	Detect. Freq. (%)	DL	Min	Median	Max	Detect. Freq. (%)	DL	Min	Median	Max	Detect. Freq. (%)
Cyanazine																															<1-300		8%																							
Deethylatrazine																																																							
Desisopropyl-atrazine	20	<20	<20	450	3-25%																																																			
Diazinon																															<1-50		7%																							
Dichlobenil																																																						
1,4-dichlorobenzene						500		81	210																																														
Dieldrin																																																						
Diethanolamine																															<1-80		8%																							
Diuron	5	<5	81-83	9440	88-98%																																																	
Fipronil																													13.6																							
Fipronil disulfinyl																													13.8																							
Fipronil sulfide																													2																							
Fipronil sulfone																													10.6																							
Lindane																																																					
Linuron	5	<5	<5	8	5-18%																																																
Malathion																																																					
Metalaxyl						500		<250	66																																													
Methoxychlor	20	<20	<20	66	18%																																															
Methyl Parathion																																																				
Metolachlor																															<1-200		48%																							
Naphthalene						500		23	27																																												
Pendimethalin																																																			
Pentachlorophenol																																																			
Permethrin																													1.7																							
Prometon																															<1-100		30%																							
Simazine	20	<20	<20	408	38-50%																										<1-110		57%																							
Tebuthiuron																																																			
Triflurain																																																			
Antioxidants (ng/L)																																																			
2,6-di-tert-butylphenol																																																			
2,6-di-tert-butyl-1,4-benzoquinone																																																			
3-tert-butyl-4-hydroxy anisole (BHA)						5000		98	120																																												
Butylated hydroxy toluene																																																			
5-methyl-1H-benzotriazole						2000		781	1530																																												
4-methyl phenol						1000		205	1400																																												
PAH (ng/L)																																																			
Anthracene																																																			
Benzo[a]pyrene	25	<25	<25	422	8%																																															
Fluoranthene						500		<250	8.6																																												
2-Methylnaphthalene																																																			
Phenanthrene						500		<250	13																																												
Pyrene																																																			
Other (ng/L)																																																			
Anthraquinone																																																		
3-beta-Coprostanol																																																		
Bromoform																																																		
Indole						500		63	230																																											
Tetrachloroethylene																																																		

	Ryberg et al. (2010)					Wiegel et al. (2004)					Vethaak et al. (2002) - water sample results					Vethaak et al. (2002) - sediment results (ng/g dw)					Vethaak et al. (2002) - fish tissue (ng/g ww)					Vethaak et al. (2002) - Mussel tissue (ng/g ww)					Boyd et al. (2003)				
	DL	Min	Median	Max	Detect. Freq. (%)	DL	Min	Median	Max	Detect. Freq. (%)	LOD	Min	Median	Max	Detect. Freq. (%)	LOD	Min	Median	Max	Detect. Freq. (%)	LOD	Min	Median	Max	Detect. Freq. (%)	LOD	Min	Median	Max	Detect. Freq. (%)	LOD	Min	Median	Max	Detect. Freq. (%)
Pharmaceuticals/Stimulants (ng/L)																																	
Acetaminophen							<5		66																						0.2		0.2	
Atorvastatin																																	
Benzafibrate							<50		130																								
Bupropion																																	
Caffeine																																	
Carbamazepine							<20	<20-1200	2500																								
Cimetidine																																	
Citalopram																																	
Clotrimazole																																	
Codeine																																	
Cotinine																																	
Dehydronifedipine																																	
Dextropropoxyphene																																	
Diazepam																																	
Diclofenac							<1		69																								
1,7-Dimethlyxanthine																																	
Diltiazem																																	
EDTA																																	
Enalprilat																																	
Fenoprofen							<2		54																								
Fluoxetine																																	
Fluvoxamine																																	
Gemfibrozil							<2		27																								
Ibuprofen							<2		146																								
Indomethacine							<5		60																								
Isopropyl Phenazone							<2		69																								
Levofloxacin																																	
Lovastatin																																	
Metformin																																	
Mitotane																																	
Naproxen							<1		32																						0.4	22		107	
Norfluoxetine																																	
Norsertraline																																	
Ornidazole																																	
Paroxetine																																	
Phenazone							<10		85																								
Phenytoin																																	
Primidone																																	
Propanolol																																	
Ranitidine																																	
Sertraline																																	
Tamoxifen																																	
Trimethoprim							<30		40																								
Venlafaxine																																	
Steroids/Hormones (ng/L)																																	
Alfatradiol											0.3	<0.3	0.4	0.4	1%																		
cis-androsterone																																	
Cholesterol																																	
Coprostanol																																	
Equilenin																																	
Equilin																																	
Estradiol																																	
17α-Estradiol											0.3	<0.3	0.4	0.4																			
17β-Estradiol											0.8	<0.8	1	1																			
Estriol																																	
Estrone											0.3	<0.3	1	7.2	43%																0.4	68.3		124.6	
Ethinyl estradiol											0.3	<0.3	0.4	0.4	1%																		
Mestranol																																	
19-norethisterone																																	
Progesterone																																	
Beta-sitosterol																																	
Stigmastanol																																	
Testosterone																																	
Antibiotics (ng/L)																																	
Azithromycin																																	
Chlortetracycline																																	
Ciprofloxacin																																	
Clarithromycin							<30		40																								
Danofloxacin																																	
Enoxacin																																	
Enrofloxacin																																	
Erythromycin-H2O							30		70																								
Flumequine																																	
Lincomycin																																	
Norfloxacin																																	
Ofloxacin																																	
Oxolinic Acid																																	
Oxytetracycline																																	
Roxithromycin							<30		40																								
Sarafloxacin																																	
Sulfadimethoxine																																	
Sulfamethazine																																	
Sulfamethizole																																	
Sulfamethoxazole							<30		70																								
Tetracycline																																	
Triclosan																																	
Tylosin																																	
Personal Care Products (ng/L)																																	
Acetophenone																																	

	Ryberg et al. (2010)					Wiegel et al. (2004)					Vethaak et al. (2002) - water sample results					Vethaak et al. (2002) - sediment results (ng/g dw)					Vethaak et al. (2002) - fish tissue (ng/g ww)					Vethaak et al. (2002) - Mussel tissue (ng/g ww)					Boyd et al. (2003)				
	DL	Min	Median	Max	Detect. Freq. (%)	DL	Min	Median	Max	Detect. Freq. (%)	LOD	Min	Median	Max	Detect. Freq. (%)	LOD	Min	Median	Max	Detect. Freq. (%)	LOD	Min	Median	Max	Detect. Freq. (%)	LOD	Min	Median	Max	Detect. Freq. (%)	LOD	Min	Median	Max	Detect. Freq. (%)
AHTN																																	
Benzophenone																																	
DEET																																	
Galaxolide																																	
HHCB																																	
Isoborneol																																	
Limonene																																	
3-Methyl-1H-indole (Skatol)																																	
Methyl Paraben																																	
Methly salicylate																																	
Propylparaben																																	
Tonalide																																	
Triclocarban																																	
Triethyl citrate																																	
Flame Retardants (ng/L)																																	
BB 15																					0.01	<0.01	0.082	23	51.4%	0.5	<0.5	0.28	1.3	85.7%					
BB 49																0.05	<0.05	0.004	0.004	4.8%	0.01	<0.01	0.006	0.2	71.4%	0.02	<0.02	0.08	0.08	100.0%					
BB 52																0.05	<0.05	0.004	0.004	4.8%	0.01	<0.01	0.006	0.2	71.4%	0.02	<0.02	0.08	0.08	28.6%					
BB 101																0.09	<0.09	0.2	0.2	4.8%	0.008	<0.008	0.5	0.41	82.9%	0.04	<0.04	0.03	0.05	14.3%					
BB 153																0.1	<0.1	0.35	1.5	66.7%	0.015	<0.015	0.16	4.7	91.4%	0.05	<0.05	0.1	0.8	71.4%					
BB 169																0.3	<0.3	1	1.6	14.3%	0.034	<0.034	0.09	0.3	20.0%	0.16	<0.16	0.16	6.7	50.0%					
BB 209																0.3	<0.3	1.6	4.4	33.3%						0.6	<0.6	0.7	0.7	7.1%					
BDE-47																0.3	<0.3	1.1	7.1	100.0%	1.5	<1.5	4	130	97.1%	0.8	<0.8	1.8	17	92.9%					
BDE-85																0.1	<0.1	0.1	0.3	33.3%	0.011	<0.011	0.032	0.23	45.7%	0.2	<0.2	0.2	0.2	64.3%					
BDE-99																3.3	<3.3	1	5.5	95.2%	0.011	<0.011	0.55	4.6	88.6%	0.5	<0.5	1.2	10.7	92.9%					
BDE-138																0.2	<0.2	0.4	0.4	4.8%	0.02	<0.02	0.01	0.01	2.9%	0.1	<0.1	0.1	0.1	7.1%					
BDE-153																0.1	<0.1	2.3	5	71.4%	0.018	<0.018	1.3	4.1	94.3%	0.7	<0.7	0.16	1.5	92.9%					
BDE-209																9	<9	22	510	95.2%	0.35	<0.35	0.28	0.9	20.0%	3.7	<3.7	4.9	4.9	21.4%					
BDE-100																	0.07	0.19	0.75	100.0%		0.12	0.81	9.46	100.0%		0.19	0.2	0.64	87.5%					
TBP																																	
TBEB																																	
TBEP																																	
TCEP																																	
TCPP																																	
TDPP																																	
TDCPP																																	
TPP																																	
Perfluorinated Compounds (ng/L)																																	
EtFOSAA																																	
PFBA																																	
PFBS																																	
PFDA																																	
PFDoA																																	
PFHpA																																	
PFHxS																																	
PFHxA																																	
PFNA																																	
PFOA																																	
PFOS																																	
PFPA																																	
PFUA																																	
Alkylphenols (ng/L)																																	
Nonylphenol																																	
4-nonylphenol monoethoxylate																																	
4-nonylphenol diethoxylate																																	
Diethoxynonylphenol																																	
Octylphenol																																	
4-octylphenol monoethoxylate																																	
4-octylphenol diethoxylate																																	
4-Tert-octylphenol																																	
Diethoxyoctylphenol																																	
Ethoxyoctylphenol																																	
Plasticizers (ng/L)																																	
Bisphenol A						<1			114		8.8	<8.8	45	1000	51.5%	1.1	<1.1	3.2	43	77.8%		0.18	1.2	2.6	100.0%		0.22	0.36	1.8	100.0%	0.1	62.8		75	
BBP											10	<10	77	1800	95.4%	4.5	<4.5	14	60	66.7%	0.22	<0.22	4.2	9.1	43.2%	0.07	<0.07	16	56	75.0%					
bis(2-ethylhexyl) adipate																																	
Camphor																																	
DBP											66	<66	250	3100	93.1%		34	390	1000	14.3%	0.71	<0.71	31	150	51.9%		30	365	1900	100.0%					
DCHP											3.1	<3.1	7.6	60	33.3%	1.6	<1.6	3.9	11	19.0%	0.22	<0.22	6.3	39	54.1%	0.16	<0.16	1.2	7.2	35.7%					
DEHP											900	<900	320	5000	93.1%	123	<123	600	7600	90.5%	2.2	<2.2	72	1500	93.8%	2.2	<2.2	82	400	58.8%					
DEP											70	<70	430	2300	27.6%	65	<65	133	1200	93.8%	6.7	<6.7	64	320	87.5%		11	71	92	100.0%					
DMP											4.5	<4.5	17	190	69.0%		1.27	14	2500	95.2%	0.19	<0.19	1.1	5.4	43.2%	0.14	<0.14	0.81	3.8	100.0%					
DMPP											50	<50	380	2400	86.2%	400	<400	250	1700	14.3%															
DOP											2	<2	15	78	27.6%	2.05	<2.05	11	55	61.9%	0.03	<0.03	1.9	71	51.4%	0.03	<0.03	3.5	11	100.0%					
DPP											1.9	<1.9	6	8	8.0%	0.53	<0.53	300	1800	57.1%	0.08	<0.08	1.7	15	62.2%	0.16	<0.16	0.23	0.96	41.7%					
ethanol,2-butoxy-phosphate																																	
Phenol																																	
Phthalic anhydride																																	
Triphenyl phosphate																																	
Herbicide/Pesticide (ng/L)																																	
Atrazine		3	13	40000																													
Bifenthrin																																	
Bromacil																																	
Butylate																																	
Carbaryl		6.5	11	20000																													
Carbofuran																																	
Cis-Chlordane																																	
Chlorpyrifos		3	3	0.34																													
Clofibric Acid																														0.6	103		103	

	Ryberg et al. (2010)					Wiegel et al. (2004)					Vethaak et al. (2002) - water sample results					Vethaak et al. (2002) - sediment results (ng/g dw)					Vethaak et al. (2002) - fish tissue (ng/g ww)					Vethaak et al. (2002) - Mussel tissue (ng/g ww)					Boyd et al. (2003)				
	DL	Min	Median	Max	Detect. Freq. (%)	DL	Min	Median	Max	Detect. Freq. (%)	LOD	Min	Median	Max	Detect. Freq. (%)	LOD	Min	Median	Max	Detect. Freq. (%)	LOD	Min	Median	Max	Detect. Freq. (%)	LOD	Min	Median	Max	Detect. Freq. (%)	LOD	Min	Median	Max	Detect. Freq. (%)
Cyanazine																																	
Deethylatrazine		4	11	1500																													
Desisopropyl-atrazine																																	
Diazinon		2	10	1400																													
Dichlobenil																																	
1,4-dichlorobenzene																																	
Dieldrin																																	
Diethanolamine																																	
Diuron																																	
Fipronil		5	8	360																													
Fipronil disulfinyl																																	
Fipronil sulfide																																	
Fipronil sulfone																																	
Lindane																																	
Linuron																																	
Malathion		7	14	1500																													
Metalaxyl																																	
Methoxychlor																																	
Methyl Parathion																																	
Metolachlor		3	5	5400																													
Naphthalene																																	
Pendimethalin		7	11	480																													
Pentachlorophenol																																	
Permethrin																																	
Prometon		4	15	3200																													
Simazine		3.5	12	39000																													
Tebuthiuron		3	8	2800																													
Triflurain		1	3	67																													
Antioxidants (ng/L)																																	
2,6-di-tert-butylphenol																																	
2,6-di-tert-butyl-1,4-benzoquinone																																	
3-tert-butyl-4-hydroxy anisole (BHA)																																	
Butylated hydroxy toluene																																	
5-methyl-1H-benzotriazole																																	
4-methyl phenol																																	
PAH (ng/L)																																	
Anthracene																																	
Benzo[a]pyrene																																	
Fluoranthene																																	
2-Methylnaphthalene																																	
Phenanthrene																																	
Pyrene																																	
Other (ng/L)																																	
Anthraquinone																																	
3-beta-Coprostanol																																	
Bromoform																																	
Indole																																	
Tetrachloroethylene																																	

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Appendix F

Marine Residual Chemical Results from Literature

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Appendix F – Marine Literature Review References

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	Bay et al.(2012)					James et al.					Comeau et al.(2007)					Dodder et al.(2013)				
	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)
Sweeteners (ng/L)																				
Sucralose							7		100000	93										
Pharmaceuticals/Stimulants (ng/L)																				
Acetaminophen							0.2		10000	44										
Acetylsalicylic Acid																				
Albendazole																				
Albuterol																				
Alprazolam																				
Amitriptyline																	0	0	6.2	13
Amphetamine																	0	0	20	14
Atenolol			0.4		90												0	0	13	6
Azaperol																				
Azaperone																				
Benzoylecgonine																				
Bezafibrate											12	ND	6	11						
Caffeine							2		30000	76		15	10-1100	1400			0	0	140	19
Carazolol																				
Carbamazepine							0.02		500	67										
Cetirizine																				
Citalopram																				
Cocaine																	0	0	1.7	36
Codeine																				
Clofibric Acid																				
Cotinine							0.3		1000	27										
Dehydronifedipine																				
Desmethyldiltiazem																				
Dextropropoxyphene																				
Diazepam																				
Diclofenac											3	4	3	6						
Diltiazem																				
1,7-Dimethylxanthine																				
Diphenhydramine																	0	0	11	16
Enrofloxacin																	0	0	12	14
Fluoxetine																				
Gemfibrozil			0.9		90						11	14	6-8	53						
Haloperidol																				
Hydrochlorothiazide																				
Hydrocodone																				
10-hydroxy-amitriptyline																				
Ibuprofen							0.4		9000	45	6	6	3-160	230						
Indomethacin																				
Iohexol																				
Iomeprol																				
Iopamidol																				
Iopromide																				
Irbesartan																				
Ketoprofen											11	12	6	12						
Loratadine																				
Lorazepam																				
Losartan																				
Mefenamic Acid																				
Meprobamate																				
Metformin																				
Methylprednisolone																	0	0	210	15
1-Methylxanthine																				
3-Methylxanthine																				
Metoprolol																				
Nadolol																				
Naproxen			0.7		75						5	8	8-110	130						
Nicotine							0.7		800	33										
Norfluoxetine																				
Oxycodone																				
Paracetamol																				
Paraxanthine							0.7		2000	65										
Paroxetine																				
Phenazone																				
Pravastatin																				
Primidone																				
Propanolol																				
Propoxyphene																				
Propyphenazone																				
Ranitidine																				
Salicylic acid											47	45	15-70	140						
Sertraline																	0	1.3	5.5	64
Sotalol																				
Tamoxifen																				
Tamsulosin																				
Theobromine							11		80000	35										
Theophylline																				
Torasemide																				
Valsartan																				
Warfarin																				
Xylazine																				
Antibiotics (ng/L)																				
Azithromycin																				
Ciprofloxacin																				
Clarithromycin																				
Ethromycin																				
Erythromycin-H2O																	0	0	2	11
Lomefloxacin																	0	18	170	62
Ofloxacin																	0	0	18	10
Ractopamine							0.01		3	33										
Roxithromycin																				

	Hedgspeth et al.(2012)					Huang et al.(2011)					Keil et al.(2011)					Klosterhaus et al. (2013)				
	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)
Sweeteners (ng/L)																				
Sucralose																				
Pharmaceuticals/Stimulants (ng/L)																				
Acetaminophen	10		12.3		41.7															
Acetylsalicylic Acid												0	2	40	31					
Albendazole																				
Albuterol																			1	7
Alprazolam																				
Amitriptyline																			0.6	40
Amphetamine																			9.7	40
Atenolol																			37	100
Azaperol																				
Azaperone																				
Benzoylecgonine																			7.2	100
Bezafibrate						2			20	33										
Caffeine	5		16.6		100								5	1	5				132	80
Carazolol																				
Carbamazepine																			44	100
Cetirizine																				
Citalopram																				
Cocaine																			2.4	80
Codeine																				
Clofibric Acid						2			80	81										
Cotinine	3.75		4.91		58.3														25	27
Dehydronifedipine																			1.3	80
Desmethyldiltiazem																			1.7	40
Dextropropoxyphene																				
Diazepam																			0.5	20
Diclofenac						6			115	36										
Diltiazem																			13.7	80
1,7-Dimethylxanthine																				
Diphenhydramine																			1.9	80
Enrofloxacin																				
Fluoxetine	3.75																			
Gemfibrozil						1			23	94									38	100
Haloperidol																				
Hydrochlorothiazide																				
Hydrocodone																			7.2	20
10-hydroxy-amitriptyline																			0.3	40
Ibuprofen	5		7.6		8.3	56			1200	61				1	10				38	7
Indomethacin						6			40	3										
Iohexol																				
Iomeprol																				
Iopamidol																				
Iopromide																				
Irbesartan																				
Ketoprofen																				
Loratadine																				
Lorazepam																				
Losartan																				
Mefenamic Acid																				
Meprobamate																			36	100
Metformin																				
Methylprednisolone																				
1-Methylxanthine																				
3-Methylxanthine																				
Metoprolol																			26	60
Nadolol																				
Naproxen						2			33	33									8.2	20
Nicotine																				
Norfluoxetine	3.75		6.59		8.3															
Oxycodone																				
Paracetamol																				
Paraxanthine																				
Paroxetine																				
Phenazone																				
Pravastatin																				
Primidone																				
Propanolol																				
Propoxyphene																			0.7	40
Propyphenazone																				
Ranitidine																				
Salicylic acid						20	2		7000	81		8	60	1200	98					
Sertraline																				
Sotalol																				
Tamoxifen																				
Tamsulosin																				
Theobromine																				
Theophylline																				
Torasemide																				
Valsartan																			92	100
Warfarin																				
Xylazine																				
Antibiotics (ng/L)																				
Azithromycin																				
Ciprofloxacin																				
Clarithromycin																			18	40
Ethromycin																				
Erythromycin-H2O																			41.6	93
Lomefloxacin																				
Ofloxacin																				
Ractopamine																				
Roxithromycin																				

	Miller-Schulze et al.					Moreno-Gonzalez et al. (2015)					Pait et al. (2006)					Singh et al. (2009)					V	
	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min
Sweeteners (ng/L)																						
Sucralose	0.39	4.4	27 - 88	140																		
Pharmaceuticals/Stimulants (ng/L)																						
Acetaminophen	0.041	0.078	0.78 - 6.6	89								1.9		3.3								
Acetylsalicylic Acid																						
Albendazole						0.05				65												
Albuterol																						
Alprazolam						0.2				4												
Amitriptyline																						
Amphetamine																						
Atenolol																					50	80
Azaperol						0.2			0.8	48												
Azaperone						0.2				36												
Benzoylecgonine																						
Bezafibrate																					5	5
Caffeine	44	<4.4	12.0 - 23.0	270								4.5		240			5.7		68			
Carazolol						0.06				33												
Carbamazepine	0.18	<0.052	0.35 - 0.95	8.4		1.1			4.9	25		1.1		30							5	4
Cetirizine																						
Citalopram																						
Cocaine																						
Codeine						0.3			1.8	32		1.4		8.9								
Clofibric Acid																						
Cotinine	0.38	<0.38	1.1 - 1.4	12								1.4		20								
Dehydronifedipine												1.8		2.7								
Desmethyldiltiazem																						
Dextropropoxyphene																						
Diazepam																						
Diclofenac																						
Diltiazem												1.8		3.2								
1,7-Dimethylxanthine														210								
Diphenhydramine																						
Enrofloxacin																						
Fluoxetine														2.6								
Gemfibrozil						0.04			3.3	55												
Haloperidol																						
Hydrochlorothiazide						0.7			21.6	56												
Hydrocodone																						
10-hydroxy-amitriptyline																						
Ibuprofen	25	<0.17	4.8	52																		
Indomethacin																						
Iohexol																						
Iomeprol																						
Iopamidol																						
Iopromide																						
Irbesartan						0.05			16.8	25												
Ketoprofen																						
Loratadine						0.5				98												
Lorazepam						0.6			41.8	55												
Losartan						2.3			104	2												
Mefenamic Acid																						
Meprobamate																						
Metformin																						
Methylprednisolone																						
1-Methylxanthine																						
3-Methylxanthine																						
Metoprolol						0.02			0.73	95												
Nadolol						0.2				21												
Naproxen																						
Nicotine																						
Norfluoxetine																						
Oxycodone						0.4			6.8	36												
Paracetamol																						
Paraxanthine	0.16	<7.0	0.95 - 3.1	48																		
Paroxetine						0.9				4												
Phenazone						0.7				5												
Pravastatin																						
Primidone																						
Propanolol						0.1			0.5	46											1	1
Propoxyphene																						
Propyphenazone						0.6				2												
Ranitidine						0.4				2												
Salicylic acid						0.8			19.8	97											5	11
Sertraline																						
Sotalol						0.1			0.8	10												
Tamoxifen																						
Tamsulosin						0.3				25												
Theobromine	8.8	<8.8	4.4 - 19	950																		
Theophylline																						
Torasemide						0.3			1.8	2												
Valsartan						0.3			38	63												
Warfarin						0.2				45												
Xylazine						1.2			13.8	100												
Antibiotics (ng/L)																						
Azithromycin						3.3			164	93												
Ciprofloxacin																						
Clarithromycin						0.6			9.6	90												
Ethromycin						0.3			78.4	68												
Erythromycin-H2O																						
Lomefloxacin																						
Ofloxacin																						
Ractopamine	0.023	<0.013	0.012	4.3																		
Roxithromycin																						

	Bay et al.(2012)					James et al.					Comeau et al.(2007)					Dodder et al.(2013)				
	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)
Sulfadimethoxine							0.01		10	19										
Sulfamethazine							0.03		4	28							0	0	430	36
Sulfamethizole																				
Sulfamethoxazole			0.5		70		0.02		70	64										
Sulfathiazole							0.02		0.3	11										
Thiabendazole																				
Triamterene																				
Triclocarban																				
Triclosan																				
Trimethoprim			0.7		60															
Hormones (ng/l)																				
B-Estradiol																				
Diethylstilbestrol																				
Equilenin																				
Equilin																				
17α-Ethinylestradiol																				
17α-Estradiol																				
17β-Estradiol																				
Estriol																				
Estrone																				
Mestranol																				
Progesterone																				
Testisteribe																				
Testosterone																				
Personal Care Products (ng/L)																				
Benzylparaben							0.1		0.3	3										
DEET																				
Ethylparaben							0.6		800	23										
Lillial																				
Methylparaben							2		400	40										
Musk Ketone																				
Musk Mosken																				
Musk Xylene																				
Oxybenzone																				
Propylparaben							0.6		700	27										
Ensulizole							0.4		900	60										
Flame Retardants (ng/L)																				
BDE-17																	0	0	3.7	8
BDE-28																	0	0	4.2	8
BDE-28/33																				
BDE-47																	0	3.2	68	83
BDE-47 + BDE-99																				
BDE-49/71																	0	0	9.5	9
BDE-66																	0	0	17	11
BDE-75																	0	0	5.2	6
BDE-85																				
BDE-99																	0	1.6	38	61
BDE-100																	0	0	15	39
BDE-138/166																				
BDE-153																	0	0	2.8	8
BDE-154																	0	0	1.3	6
BDE-183																	0	0	2.3	8
BDE-190																				
BDE-206																				
BDE-207																				
BDE-208																				
BDE-209																				
BTBPE																	0	0	2	11
HBCD, alpha																	0	0	1.5	42
HBCD, beta																	0	0	0.4	32
HBCD, gamma																	0	0.4	2.5	58
TCEP																				
Perfluorinated Compounds (ng/L)																				
PFDoDA																	0	0	29	28
PFUnDA																	0	0	2.8	12
Alkylphenols (ng/L)																				
4-Nonylphenol																	96	200	3000	100
Corrosion Inhibitors (ng/L)																				
1H -benzotriazole																				
Tolyltriazole																				
Dioxins / Furans (ng/L)																				
Octa-chlorinated dibenzo dioxin																				
Octa-chlorinated dibeznofuran																				
Plasticizers (ng/L)																				
Bisphenol A																				
Butylbenzyl Phthalate																				
Di-n-butyl phthalate																				
Dibutyl Phthalate																				
Diethylhexyl Phthalate																				
Dicyclohexyl Phthalate																				
Herbicide/Pesticide (ng/L)																				
Atrazine							0.03		6	60										
Chlordane																				
Chlorpyrifos																	0	0	36	27
Clotrimazole																				
Dacthal																	0	0	47	37
DDT																				
Dezethylatrazine																				
Diazinon																				
Dieldrin																				
Diuron																				
Igarol 1051																				
Isoproturon																				

	Hedgspeth et al.(2012)					Huang et al.(2011)					Keil et al.(2011)					Klosterhaus et al. (2013)				
	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)
Sulfadimethoxine																				
Sulfamethazine																				
Sulfamethizole																			16	7
Sulfamethoxazole																			1060	80
Sulfathiazole																				
Thiabendazole																			2.5	20
Triamterene																			9.6	100
Triclocarban	2.5		3.19		16.7															
Triclosan	10		12.6		16.7															
Trimethoprim																			9	20
Hormones (ng/l)																				
B-Estradiol												0	10	38	30					
Diethylstilbestrol	5														3					
Equilenin	2.5																			
Equilin	2.5																			
17α-Ethinylestradiol	2.5											5	25	45	30					
17α-Estradiol	2.5																			
17β-Estradiol	1																			
Estriol	1																			
Estrone	1																			
Mestranol												0	3	5	26					
Progesterone	5											0	10	400	49					
Testisteribe	1																			
Testosterone																				
Personal Care Products (ng/L)																				
Benzylparaben																				
DEET																			21	100
Ethylparaben																				
Lillial												0		12	15					
Methylparaben																				
Musk Ketone												0	8	900	28					
Musk Mosken												0	5	600	32					
Musk Xylene												5	37	100	17					
Oxybenzone																				
Propylparaben																				
Ensulizole																				
Flame Retardants (ng/L)																				
BDE-17																				
BDE-28																				
BDE-28/33																				
BDE-47																				
BDE-47 + BDE-99																			0.5	100
BDE-49/71																				
BDE-66																				
BDE-75																				
BDE-85																				
BDE-99																				
BDE-100																				
BDE-138/166																				
BDE-153																				
BDE-154																				
BDE-183																				
BDE-190																				
BDE-206																				
BDE-207																				
BDE-208																				
BDE-209																			2.7	76
BTBPE																				
HBCD, alpha																				
HBCD, beta																				
HBCD, gamma																				
TCEP																				
Perfluorinated Compounds (ng/L)																				
PFDoDA																				
PFUnDA																				
Alkylphenols (ng/L)																				
4-Nonylphenol																			73	61
Corrosion Inhibitors (ng/L)																				
1H -benzotriazole																				
Tolyltriazole																				
Dioxins / Furans (ng/L)																				
Octa-chlorinated dibenzo dioxin																				
Octa-chlorinated dibeznofuran																				
Plasticizers (ng/L)																				
Bisphenol A												0	10	45	65					
Butylbenzyl Phthalate																			14	64
Di-n-butyl phthalate																			35	46
Dibutyl Phthalate												100	750	3000	26					
Diethylhexyl Phthalate												1	60	800	100				459	33
Dicyclohexyl Phthalate												0	2	15	50					
Herbicide/Pesticide (ng/L)																				
Atrazine																				
Chlordane												2	5	20	10					
Chlorpyrifos																				
Clotrimazole																				
Dacthal																				
DDT																				
Dezethylatrazine																				
Diazinon												0	7	25	41					
Dieldrin																				
Diuron																				
Igarol 1051																				
Isoproturon																				

	Miller-Schulze et al.					Moreno-Gonzalez et al. (2015)					Pait et al. (2006)					Singh et al. (2009)						
	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min
Sulfadimethoxine	0.95	<0.046	0.48	5.1																		
Sulfamethazine	0.19	<0.0079		3.3																		
Sulfamethizole																						
Sulfamethoxazole	0.041	<0.041	1.3 - 2.3	5.6		0.3			94	37				11							10	13
Sulfathiazole																						
Thiabendazole														3.8								
Triamterene																						
Triclocarban																						
Triclosan																	ND		9.2			
Trimethoprim						0.1			1.5	100				1.4							10	13
Hormones (ng/l)																						
B-Estradiol																						
Diethylstilbestrol																						
Equilenin																						
Equilin																	1.9		5.5			
17α-Ethinylestradiol																						
17α-Estradiol																						
17β-Estradiol																	ND		1.8			
Estriol																						
Estrone																	0.66		5.2			
Mestranol																						
Progesterone																						
Testisteribe																						
Testosterone																						
Personal Care Products (ng/L)																						
Benzylparaben																						
DEET																	5.5		68			
Ethylparaben	0.43	<0.10	0.22	2																		
Lillial																						
Methylparaben	5	<3.7	2.5	20																		
Musk Ketone																						
Musk Mosken																						
Musk Xylene																						
Oxybenzone																						
Propylparaben	1.8	<0.40	0.91	5.4																		
Ensulizole	0.93	<0.90	1.0 - 1.1	500																		
Flame Retardants (ng/L)																						
BDE-17																						
BDE-28																						
BDE-28/33																						
BDE-47																						
BDE-47 + BDE-99																						
BDE-49/71																						
BDE-66																						
BDE-75																						
BDE-85																						
BDE-99																						
BDE-100																						
BDE-138/166																						
BDE-153																						
BDE-154																						
BDE-183																						
BDE-190																						
BDE-206																						
BDE-207																						
BDE-208																						
BDE-209																						
BTBPE																						
HBCD, alpha																						
HBCD, beta																						
HBCD, gamma																						
TCEP																						
Perfluorinated Compounds (ng/L)																						
PFDoDA																						
PFUnDA																						
Alkylphenols (ng/L)																						
4-Nonylphenol																						
Corrosion Inhibitors (ng/L)																						
1H -benzotriazole																						
Tolyltriazole																						
Dioxins / Furans (ng/L)																						
Octa-chlorinated dibenzo dioxin																						
Octa-chlorinated dibeznofuran																						
Plasticizers (ng/L)																						
Bisphenol A																	4.4		190			
Butylbenzyl Phthalate																						
Di-n-butyl phthalate																						
Dibutyl Phthalate																						
Diethylhexyl Phthalate																						
Dicyclohexyl Phthalate																						
Herbicide/Pesticide (ng/L)																						
Atrazine	0.068	<0.047	0.034 - 0.18	1.2																		
Chlordane																						
Chlorpyrifos																						
Clotrimazole																						
Dacthal																						
DDT																						
Dezethylatrazine																						
Diazinon																						
Dieldrin																						
Diuron																						
Igarol 1051																						
Isoproturon																						

	Bay et al.(2012)					James et al.					Comeau et al.(2007)					Dodder et al.(2013)				
	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)
Linuron																				
M1 (G26575)																				
Mecoprop							0.03		500	68										
Metazachlor																				
Quintozene																	0	0	1.7	7
Terbuthylazine																				
Terbufos																	0	0	2.3	11
Surfactant (ng/L)																				
4-NP																				
4-NP1EO																	6.3	45	300	100
4-NP2EO																	0	7.4	140	88
N-Ethyl-perfluorooctane-sulfonamide																				
Perfluorbutanesulfonate																				
Perfluorobutanoate																				
Perfluorodecanoate																				
Perfluoroheptanoate																				
Perfluorohexanesulfonate																				
Perfluorohexanoate																				
Perfluoroononanoate																				
Perfluorooctanesulfonate																				
Perfluorooctanoate																				
Perfluoropentanoate																				

	Hedgspeth et al.(2012)					Huang et al.(2011)					Keil et al.(2011)					Klosterhaus et al. (2013)				
	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)
Linuron																				
M1 (G26575)																				
Mecoprop																				
Metazachlor																				
Quintozene																				
Terbuthylazine																				
Terbufos																				
Surfactant (ng/L)																				
4-NP																				
4-NP1EO																				
4-NP2EO																				
N-Ethyl-perfluorooctane-sulfonamide																			5.36	10
Perfluorbutanesulfonate																			7.89	9
Perfluorobutanoate																			62.2	27
Perfluorodecanoate																			12	9
Perfluoroheptanoate																			67	45
Perfluorohexanesulfonate																			13	36
Perfluorohexanoate																			221	63
Perfluoroononanoate																			15	42
Perfluorooctanesulfonate																			44	55
Perfluorooctanoate																			76	82
Perfluoropentanoate																			151	58

	Miller-Schulze et al.					Moreno-Gonzalez et al. (2015)					Pait et al. (2006)					Singh et al. (2009)						
	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min
Linuron																						
M1 (G26575)																						
Mecoprop	0.041	0.003	0.088 - 0.86	31																		
Metazachlor																						
Quintozene																						
Terbuthylazine																						
Terbufos																						
Surfactant (ng/L)																						
4-NP																						
4-NP1EO																						
4-NP2EO																						
N-Ethyl-perfluorooctane-sulfonamide																						
Perfluorbutanesulfonate																						
Perfluorobutanoate																						
Perfluorodecanoate																						
Perfluoroheptanoate																						
Perfluorohexanesulfonate																						
Perfluorohexanoate																						
Perfluoroononanoate																						
Perfluorooctanesulfonate																						
Perfluorooctanoate																						
Perfluoropentanoate																						

	Millie et al. (2010)			Sapozhnikova et al.					Oram et al. (2008)					Nodler et al. (2014)					Bayen et al. (2013)					Thomas, Hilton (2004)					Bay et al. (2011)					Dougherty et al.(2010)					Oros et al. (2005)					David et al. (2012)					Meador et al.(2016)				
	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)
Sweeteners (ng/L)																																																				
Sucralose																																																				
Pharmaceuticals/Stimulants (ng/L)																																																			
Acetaminophen																																																			
Acetylsalicylic Acid																																																		
Albendazole																																																		
Albuterol																																																12		
Alprazolam																																																		
Amitriptyline																																															0.19		0.21	
Amphetamine																																															2.2		29	
Atenolol		293	8											3.5		13 - 23	194															3		6												3		22	
Azaperol																																																		
Azaperone																																																		
Benzoylecgonine														2.3		6.3 - 15	54																													0.5		0.8	
Bezafibrate		18	25											3.5		3.5 - 7.8	7.8																																
Caffeine														4.3		11 - 358	3068		59	<59		655	11												1	5		6.2											
Carazolol																																																		
Carbamazepine		321	76											2.2		2.9 - 22	157		0.3	<0.3		10.9	63																									1.9			
Cetirizine														2.2		2.7 - 6.2	13																																
Citalopram														3.2		4.3 - 19	27																																
Cocaine																																																0.3			
Codeine																																																		
Clofibric Acid																													20	98	105	111	9																		
Cotinine														4		5.1 - 7.9	71																																
Dehydronifedipine																																																		
Desmethyldiltiazem																																																		
Dextropropoxyphene																													8	13	33	80	14																		
Diazepam																																																		
Diclofenac														2		4.6 - 9.2	9.7		1.5	<1.5		11.6	44						8	33	90	195	32																		
Diltiazem																			0.9	<0.9		1.7	4																								0.52		0.75	
1,7-Dimethlyxanthine																																																		
Diphenhydramine																			0.3	<0.3		4.6	15																								0.96		1.5	
Enrofloxacin																																																		
Fluoxetine														16		66	90																																
Gemfibrozil														2		4.3 - 14	43		0.09	<0.09		19.8	85												0.3		0.4 - 10									3.4		4.5	
Haloperidol														4		39	56																																
Hydrochlorothiazide																																																		
Hydrocodone																																																		
10-hydroxy-amitriptyline																																																		
Ibuprofen														3.6		7.5 - 109	109		2.2	<2.2		9.1	67						8	88	342	928	50						2.5			8								
Indomethacin																																																		
Iohexol														21		24 - 76	861																																
Iomeprol														19		19 - 98	1159																																
Iopamidol														19		29 -140	1027																																
Iopromide														19		30 - 109	199																																
Irbesartan																																																		
Ketoprofen																																																		
Loratadine														2.7		4.1 - 33	57																																
Lorazepam																																																		
Losartan																																																		
Mefenamic Acid																													20	34	58	196	23																		
Meprobamate																																																		
Metformin																																																105		832	
Methylprednisolone																																																		
1-Methylxanthine														21		61 - 318	1645																																
3-Methylxanthine														28		175 - 420	1608																																
Metoprolol														4.1		5.6 - 18	158																																
Nadolol																																																		
Naproxen														4.8		8.5	8.5		0.9	<0.9		7.3	11												5		8												
Nicotine																																																		
Norfluoxetine																																																		
Oxycodone																																																		
Paracetamol														3.7		11 - 99	2983																																
Paraxanthine														3.2		14 - 166	1075																																
Paroxetine																																																		
Phenazone														2		2.0 - 4.3	5.9																																
Pravastatin																																																		
Primidone														2.7		6.4	10																																
Propanolol	24	49																											4	10	18	56	41						0.5			0.7								
Propoxyphene																																																		
Propyphenazone																																																		
Ranitidine																																																0.75			
Salicylic acid	855	91																																																
Sertraline																																																		
Sotalol														4.8		10 - 37	67																																
Tamoxifen														6		23	93												4	13	29	71	18																		
Tamsulosin																																																		
Theobromine														5.1		13 - 179	1471																																
Theophylline														3.4		5.4 - 27	141																																
Torasemide																																																		
Valsartan																																																5.4			
Warfarin																																																		
Xylazine																																																		
Antibiotics (ng/L)																																																		
Azithromycin																																																2.2			
Ciprofloxacin																																																7.3			
Clarithromycin														7.5		8.5 - 86	130																																
Ethromycin														7.5		5.8 - 28	217																															3.3		
Erythromycin-H2O																																																		
Lomefloxacin																																																		
Ofloxacin																																																		
Ractopamine																																																		
Roxithromycin														9.5		16 - 97	141																																

	Millie et al. (2010)			Sapozhnikova et al.					Oram et al. (2008)					Nodler et al. (2014)					Bayen et al. (2013)					Thomas, Hilton (2004)					Bay et al. (2011)					Dougherty et al.(2010)					Oros et al. (2005)					David et al. (2012)					Meador et al.(2016)				
	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)
Sulfadimethoxine																																																				
Sulfamethazine																																																				
Sulfamethizole																																																			
Sulfamethoxazole		96	12											2.6		3.6 - 21	61												0.3		0.3 - 1														1.5		4.2		
Sulfathiazole																																																			
Thiabendazole																																																			
Triamterene																																																			
Triclocarban																																																			
Triclosan																			0.55	<0.55		10.5	74																												
Trimethoprim		29	5																					4	6.8	24	569	50	0.3		0.5			0.5			6.7															
Hormones (ng/l)																																																			
B-Estradiol																																																			
Diethylstilbestrol																																																			
Equilenin																																																			
Equilin																																																			
17α-Ethinylestradiol																																																			
17α-Estradiol																																																			
17β-Estradiol																																																			
Estriol																																																			
Estrone																			0.8	<0.8		11	19						0.2		0.2																				
Mestranol																																																			
Progesterone																																																			
Testisteribe																																																			
Testosterone																																																			
Personal Care Products (ng/L)																																																			
Benzylparaben																																																			
DEET																																				1	2.3		3.3												
Ethylparaben																																																			
Lillial																																																			
Methylparaben																																																			
Musk Ketone																																																			
Musk Mosken																																																			
Musk Xylene																																																			
Oxybenzone																																																			
Propylparaben																																																			
Ensulizole																																																			
Flame Retardants (ng/L)																																																			
BDE-17																																																			
BDE-28																																																			
BDE-28/33																																																			
BDE-47										0.02		0.34																																								
BDE-47 + BDE-99																																																			
BDE-49/71																																																			
BDE-66																																																			
BDE-75																																																			
BDE-85																																																			
BDE-99																																																			
BDE-100																																																			
BDE-138/166																																																			
BDE-153																																																			
BDE-154																																																			
BDE-183																																																			
BDE-190																																																			
BDE-206																																																			
BDE-207																																																			
BDE-208																																																			
BDE-209										0.01		0.53																																								
BTBPE																																																			
HBCD, alpha																																																			
HBCD, beta																																																		
HBCD, gamma																																																		
TCEP																																				10			19.3												
Perfluorinated Compounds (ng/L)																																																			
PFDoDA																																																			
PFUnDA																																																			
Alkylphenols (ng/L)																																																			
4-Nonylphenol																																																			
Corrosion Inhibitors (ng/L)																																																			
1H -benzotriazole														4.7		7.9 - 104	189																																
Tolyltriazole														4.9		7 - 87	240																																
Dioxins / Furans (ng/L)																																																			
Octa-chlorinated dibenzo dioxin																																																			
Octa-chlorinated dibeznofuran																																																			
Plasticizers (ng/L)																																																			
Bisphenol A																			96	<96		694	48																												
Butylbenzyl Phthalate																																																			
Di-n-butyl phthalate																																																			
Dibutyl Phthalate																																																			
Diethylhexyl Phthalate																																																			
Dicyclohexyl Phthalate																																																			
Herbicide/Pesticide (ng/L)																																																			
Atrazine														1.4		1.5 - 7.7	33			1.4	<1.4		22.2	37																												
Chlordane																																																			
Chlorpyrifos																																																			
Clotrimazole																								1	3.8	8.5	22	59																						
Dacthal																																																			
DDT																																																			
Dezethylatrazine														1.7		1.8 - 2.0	4.4																																
Diazinon																																																			
Dieldrin																																																			
Diuron					2		12	93						3.3		5.5 - 211	211																																
Igarol 1051					1		304	100																																										
Isoproturon														3		4.2 - 7.1	13																																

	Millie et al. (2010)			Sapozhnikova et al.					Oram et al. (2008)					Nodler et al. (2014)					Bayen et al. (2013)					Thomas, Hilton (2004)					Bay et al. (2011)					Dougherty et al.(2010)					Oros et al. (2005)					David et al. (2012)					Meador et al.(2016)				
	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)	MRL	Min	Med	Max	Detect Freq (%)
Linuron																			2.9	<2.9		81.9	44																															
M1 (G26575)					1		68	93																																												
Mecoprop														1.2		2.5 - 7.8	18																		5	7.9		12.3																	
Metazachlor														1.8		12	21																																			
Quintozene																																																				
Terbuthylazine														3		7.8 - 68	440																																			
Terbufos																																																			
Surfactant (ng/L)																																																		
4-NP																																																	41		
4-NP1EO																																																		
4-NP2EO																																																		
N-Ethyl-perfluorooctane-sulfonamide																																																		
Perfluorbutanesulfonate																																																		
Perfluorobutanoate																																																		
Perfluorodecanoate																																																		
Perfluoroheptanoate																																																		
Perfluorohexanesulfonate																																																		
Perfluorohexanoate																																																		
Perfluorononanoate																																																		
Perfluorooctanesulfonate																																																		
Perfluorooctanoate																																																		
Perfluoropentanoate																																																		

Appendix G
Woodland Creek Groundwater Inflow/Outflow

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Technical Memorandum

To: LOTT RWIS Project File

From: Peter Wurden and John Koreny, HDR

Date: September 10, 2015

Subject: Woodland Creek Stream Flow Measurement and Ground Water Inflow Analysis

Introduction

Stream flow monitoring was completed on August 24 to 25, 2015 on Eagle, Fox and Woodland Creeks near Lacey, Washington. The purpose of the stream flow monitoring was to document low-flow conditions and to characterize groundwater inflow during baseflow conditions.

Field Methods

Stream flow monitoring was conducted by two independent teams of two, who accessed the streams on foot from the nearest roadway. Information was gathered at multiple points within Woodland Creek, Eagle Creek, and Fox Creek. Single point measurements were taken from Palm Creek and Jorgensen Creek just upstream of their junctions with Woodland Creek. The flow rate from several springs was also measured. Information collected by both teams included:

- Width of the channel, perpendicular to flow (feet).
- Depth of flow (feet), taken in one-foot increments along the width of the channel.
- Stream flow rate (feet per second), taken at regular intervals along the width of the channel.
- GPS location of each measurement.

Both teams used a Marsh McBirney Flo-Mate velocity meter, top set rod, and tape measure to collect stream flow data, and a Trimble 6000 handheld GPS unit to record the location of each measurement. The locations of flow measurements are shown on **Figure G-1** and listed in **Table G-1**.

Table G-1: Flow Measurement Locations

Stream Name	Flow Measurement Location Name	River Miles
Woodland Creek	Rail Grade 600 feet downstream of Long Lake	5.63
	Woodland Creek - Reference	5.23
	Downstream of Pacific Ave SE	4.86
	Lake Lois Outlet	4.55
	USFWS east of Desmond Drive	4.24
	Woodland Creek - Upper	3.43
	Woodland Creek (DSC)	3.43
	Woodland Creek 400 feet downstream of College Springs	3.36
	Woodland Creek 600 feet upstream of I-5	3.25
	Woodland Creek 50 feet downstream of Draham RD	2.92
	Woodland Creek 500 feet downstream of Draham RD	2.85
	Woodland Creek 3000 downstream of Draham RD	2.64
	Woodland Creek 50 feet upstream of Eagle Creek	2.25
	Woodland Creek 300 feet downstream of Eagle Creek	2.21
	Woodland Creek 100 feet upstream of Palm Creek	1.96
	Woodland Creek 100 feet upstream of Fox Creek	1.81
	Woodland Creek - Lower	1.62
	Woodland Creek 100 feet upstream of Jorgensen Creek	1.19
Fox Creek	Fox Creek at Hawks Prairie RD	1.64
	Fox Creek at Carpenter RD	1.28
	Fox Creek at Pleasant Glade RD*	0.23
	Fox Creek at Woodland Creek	0.00
Eagle Creek	Eagle Creek at Stormwater Ponds	1.97
	Eagle 2	1.32
	Eagle 3	1.16
	Eagle 4	1.10
	Eagle 9	0.46
	Eagle Creek at Carpenter RD	0.33
College Spring	Flow 7 College Springs	0.02
Neuenschwander Spring	Eagle 7 Neuenschwander Spring	0.15
North Spring	Eagle 8 North Spring	0.13

*Denotes Water Quality Monitoring Location

Precipitation and Climate Conditions

Table G-2 below compares the average monthly precipitation values for 2015 to the period of record between 1951 and 2008. Based on the comparison, August 2015 was a wetter month then average, with 1.53 inches more precipitation than average.

Table G-2: 2015 Monthly Precipitation vs. Long Term Average Monthly Precipitation.

2015 Monthly Precipitation vs. Long Term Average Precipitation - Olympia Airport NOAA Gauge[1]								
Time Period	**January**	**February**	**March**	**April**	**May**	**June**	**July**	**August**
Monthly Precipitation (in) (2015)	6.69	5.28	5.94	1.93	0.67	0.14	0.15	2.84
Average Long Term Monthly Precipitation (in) (1951 - 2008)	8.51	5.82	4.85	3.11	1.84	1.42	0.67	1.31

Notes:

1. Precipitation data are from NOAA Weather Station USW00024227, Olympia Airport, WA, US.

Table G-3 compares the Woodland Creek stage data measured at the "Woodland Creek at Pleasant Glade Road" stream gaging station operated by Thurston County. August 2015 (during the sampling period) and the August average stage data between 2007 and 2015 are shown. Based on the comparison, the stream stage in August 2015 is on average 0.27 feet lower than average. This shows that our August 2015 sampling was conducted during a low flow period.

Table G-3: August 2015 Stream Stage vs. August 2007 – 2015 at "Woodland Creek at Pleasant Glade Road" Gaging Station[1].

Date	2015 Stage (ft)	Average Stage (2008 - 2015) (ft)
8/1/2015	0.667	0.945
8/2/2015	0.674	0.945
8/3/2015	0.675	0.945
8/4/2015	0.682	0.945
8/5/2015	0.683	0.945
8/6/2015	0.674	0.945
8/7/2015	0.662	0.945
8/8/2015	0.665	0.945
8/9/2015	0.656	0.945
8/10/2015	0.651	0.945
8/11/2015	0.655	0.945
8/12/2015	0.651	0.945
8/13/2015	0.652	0.945
8/14/2015	0.709	0.945

Date	2015 Stage (ft)	Average Stage (2008 - 2015) (ft)
8/15/2015	0.686	0.945
8/16/2015	0.671	0.945
8/17/2015	0.665	0.945
8/18/2015	0.696	0.945
8/19/2015	0.657	0.945
8/20/2015	0.668	0.945
8/21/2015	0.665	0.945
8/22/2015	0.669	0.945
8/23/2015	0.669	0.945
8/24/2015	0.671	0.945
8/25/2015	0.667	0.945
8/26/2015	0.664	0.945
8/27/2015	0.657	0.945
8/28/2015	0.669	0.945
8/29/2015	0.704	0.945
8/30/2015	0.776	0.945
8/31/2015	0.706	0.945

Notes:
1. Flow data were downloaded from the Thurston County Resource Stewardship, Streamflow Monitoring web page: http://www.co.thurston.wa.us/monitoring/flow/flow-woodland.htm

= Field Work Period

Stream Flow Monitoring Results

The ground water inflow between each flow measurement location was calculated for Woodland Creek, Eagle Creek, and Fox Creek. The results are shown on **Tables G-4 through G-6**, below, and on **Figures G-2 through G-4**.

Woodland Creek

Twenty stream flow measurements were collected in Woodland Creek at the locations shown on **Figure G-1**. Water was observed in the channel from the outlet of Long Lake at river mile 5.63 until the outlet of Lake Lois at river mile 4.54, where the channel was dry. The channel remained dry to river mile 3.71, where ground water inflow was evident beginning in a wetland complex about 0.38 miles up the channel from the I-5 highway. There wasn't a single defined channel in this wetland. The surface water connection between this wetland and the downstream Woodland Creek channel was not delineated in the field. When flow occurs in the upper Woodland Creek channel, surface water may move from the wetland to the downstream channel by sheet flow or shallow subsurface flow and seeps. During the seepage run, flow

resumed with the inflow from Beatty Springs (RM 3.45) and College Springs (RM 3.43). Beatty Springs emerges from a hillside into rearing ponds managed by a trout farm. This spring water flows through the trout ponds and discharges to a natural channel. This is the most upstream point of flowing water during the low flow period. College Springs converges with Woodland Creek at river mile 3.43.

Groundwater inflow within Woodland Creek fluctuated, total flow measurements and inflow calculations can be found on **Table G-4**, below, and on **Figure G-2**.

Table G-4: Woodland Creek Total Flow and Groundwater Inflow Table

Woodland Creek				
Location	**River Mile (mi)**	**Total Flow (CFS)**	**Groundwater Inflow Between Reaches (CFS)**	**Cumulative Groundwater Inflow (CFS)**
Rail Grade 600 feet downstream of Long Lake	5.63	0.67	0.12	0.12
Woodland Creek – Reference*	5.23	2.53	1.86	1.98
Downstream ofPacific Ave SE	4.86	0.34	-2.18	-0.20
Lake Lois Outlet	4.55	0.00	-0.34	-0.55
USFWS east of Desmond Drive	4.24	0.00	0.00	-0.55
Woodland Creek – Upper*	3.43	5.41	5.41	4.86
College Springs Flow	3.43	1.94		
Woodland Creek (DSC)	3.43	7.29	-0.06	4.80
Woodland Creek 400 feet downstream of College Springs	3.36	4.26	-3.02	1.78
Woodland Creek 600 feet upstream of I-5	3.25	10.39	6.12	7.90
Woodland Creek 50 feet downstream of Draham RD	2.92	8.43	-1.95	5.94
Woodland Creek 500 feet downstream of Draham RD	2.85	7.58	-0.85	5.09
Woodland Creek 3000 downstream of Draham RD	2.64	8.90	1.32	6.41
Woodland Creek 50 feet upstream of Eagle Creek	2.25	9.78	0.87	7.29
Eagle Creek Flow *	2.25	0.24		
Woodland Creek 300 feet downstream of Eagle Creek	2.21	9.45	-0.56	6.72
Woodland Creek 100 feet upstream of Palm Creek	1.96	9.88	0.43	7.16
Palm Creek Flow	1.96	0.22		
Woodland Creek 100 feet upstream of Fox Creek	1.81	9.47	-0.63	6.53
Fox Creek Flow	1.81	0.51		
Woodland Creek - Lower*	1.62	11.43	1.44	7.97
Woodland Creek 100 feet upstream of Jorgensen Creek	1.19	13.41	1.99	9.95
Jorgensen Creek Flow	1.19	0.70		

*Denotes Water Quality Monitoring Location

In general, the channel was heavily vegetated with trees, grasses, and shrubs from the outlet of Long Lake at river mile 5.63 to river mile 3.71, where it entered a wetland complex. Downstream of the wetland complex a defined channel emerged and heavy vegetation continued to river mile 0.71. At this point, the channel exited the forest and entered an incised channel within an open floodplain. The vegetation in this area consisted primarily of tall grasses growing on sandy banks. Just downstream of Johnson Point Road NE the banks lose their vegetation and the channel enters tidal mud flats to its outlet at Henderson Inlet. The width of the channel fluctuated, but remained on average about 19 feet wide from the outlet of Long Lake to river mile 2.25, where it began transitioning to an average width of 17 feet.

The streambed material in the channel consisted primarily of gravel and small cobbles from the outlet of Long Lake at river mile 5.63 to river mile 5.23 just upstream of Lake Lois. At this point the streambed material transitioned to primarily small gravel and sand particles as the channel passed through a wetland complex. At river mile 4.24 the streambed material had transitioned back to primarily gravel and small cobbles, which continued to river mile 3.71 where the channel entered another wetland complex. Emerging from the wetland, the streambed material was composed primarily of small gravel and sand particles, which transitioned back to larger gravel pieces and small cobbles by river mile 2.92. At river mile 1.96 near the junction of Woodland Creek and Palm Creek the streambed material began transitioning to small particles, primarily gravel, sand, and silt. Particle sizes continued to decrease and transition to sand and silt until the channel outlet at Henderson Inlet. In the last mile the floodplain broadens and the stream channel is tidally influenced and the primary vegetation is grasses and shrubs.

College Springs

College Springs emerges from a forested area west of Woodland Creek and converges with Woodland Creek at river mile 3.43.

Fox Creek

Four flow measurements were collected in Fox Creek at the locations shown on **Figure G-1**. The channel was dry at river mile 1.64, where it crosses Hawks Prairie Road. The channel remained dry until river mile 1.28, where groundwater inflow was emerging from a wetland complex just west of Carpenter Road approximately 0.25 miles south of Hawks Prairie Road. Total flow measurements and inflow calculations can be found in **Table G-5**, below, and on **Figure G-3**.

Table G-5: Fox Creek Total Flow and Groundwater Inflow Table

Fox Creek				
Location	River Mile (mi)	Flow (CFS)	Groundwater Inflow Between Reaches (CFS)	Cumulative Groundwater Inflow (CFS)
Fox Creek at Hawks Prairie RD	1.64	0.00	0.00	0.00
Fox Creek at Carpenter RD	1.28	0.05	0.05	0.05
Fox Creek at Pleasant Glade RD*	0.23	0.24	0.19	0.24
Fox Creek at Woodland Creek	0.00	0.51	0.28	0.51

*Denotes Water Quality Monitoring Location

Vegetation in and around the channel varied, at river mile 1.64 the channel was located in an open field, and partially enclosed by blackberry brambles. Based on aerial imagery, the channel re-enters the forest at river mile 1.54, 0.1 miles south of the crossing with Hawks Prairie Road. From river mile 1.28 to the junction with Woodland Creek the channel was heavily vegetated with trees, grasses, and shrubs. Groundwater inflow within the channel increased steadily from river mile 1.28 where there was a groundwater inflow rate of 0.02 cubic feet per second (CFS), to the junction with Woodland Creek, where there was a groundwater inflow rate of 0.28 CFS.

At river mile 1.54 the channel was approximately 5 feet wide, and the streambed material was primarily gravel with the largest particles appearing approximately 2 inches in diameter. At river mile 1.28 where groundwater inflow was emerging from a wetland complex, there was a 1 foot wide channel containing some small gravel and sand particles. A second wetland / pond feature was discovered at river mile 0.23, where Fox Creek crosses under Pleasant Glade Road. Upstream of the road water was impounded several feet deep. After crossing under the road, the stream formed a 5 foot wide channel with streambed material composed primarily of sand and small gravel particles until the junction with Woodland Creek.

Eagle Creek

Seven flow measurements were collected in Eagle Creek at the locations shown on **Figure 1**. The channel was dry at the stormwater pond at river mile 1.97, and had lost definition by river mile 1.16. Flow resumed at river mile 0.46, where the channel regains definition when it converges with Neuenschwander Spring and North Spring. The groundwater inflow at river mile 0.46 was 0.07 CFS, which decreased to the junction with Woodland Creek where the stream was losing water at a rate of 0.12 CFS. Total flow measurements and inflow calculations can be found on **Table G-6**, below, and on **Figure G-4**.

Table G-6: Eagle Creek Total Flow and Groundwater Inflow Table

Eagle Creek				
Location	**River Mile (mi)**	**Flow (CFS)**	**Groundwater Inflow Between Reaches (CFS)**	**Cumulative Groundwater Inflow (CFS)**
Eagle Creek at Stormwater Ponds	1.98	0.00	0.00	0.00
Eagle 2	1.32	0.00	0.00	0.00
Eagle 3	1.16	0.00	0.00	0.00
Eagle 4	1.10	0.00	0.00	0.00
North Spring Flow	0.46	0.14		
Eagle 9	0.46	0.21	0.07	0.07
Eagle Creek at Carpenter RD	0.33	0.36	0.15	0.21
Eagle Creek at Woodland Creek*	0.00	0.24	-0.12	0.09

*Denotes Water Quality Monitoring Location

From the stormwater ponds at river mile 1.97 to river mile 1.35, Eagle Creek flows through a suburban development paralleling 32nd Ave NE. After this point the stream enters a densely forested area, and then at river mile 0.67 transitions to an open field. The stream remains in the field until river mile 0.1, where it re-enters dense forest to its junction with Woodland Creek. The stream width was measured at river miles 0.33 and 0.46 to be approximately 14 feet wide, which decreased to a width of 5 feet at the junction with Woodland Creek. Where the channel was defined, streambed material was composed primarily of small cobbles and gravel particles to river mile 0.46 where it began transitioning to smaller sand and gravel particles to the junction with Woodland Creek.

Jorgensen Creek

One measurement was collected at Jorgensen Creek, approximately 50 feet upstream of the confluence with Woodland Creek at river mile 1.19. The location of this measurement is shown on **Figure G-1**. Jorgensen Creek was heavily vegetated at its junction with Woodland Creek, and this appears to continue upstream based on aerial imagery. At the junction, the stream was 4 feet wide and the streambed material was composed primarily of gravel and sand.

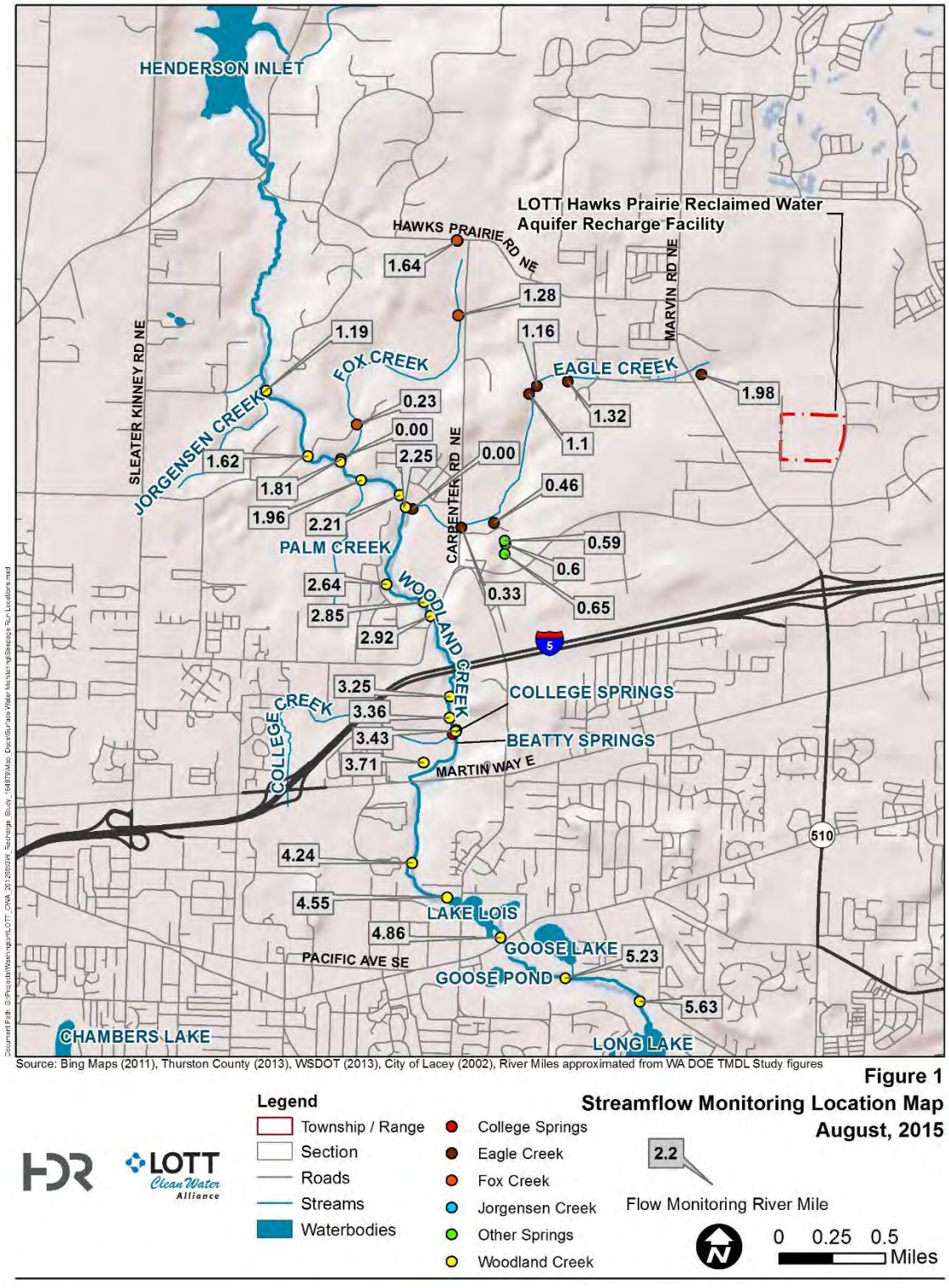

Figure G-1: Stream Flow Monitoring Location Map

1

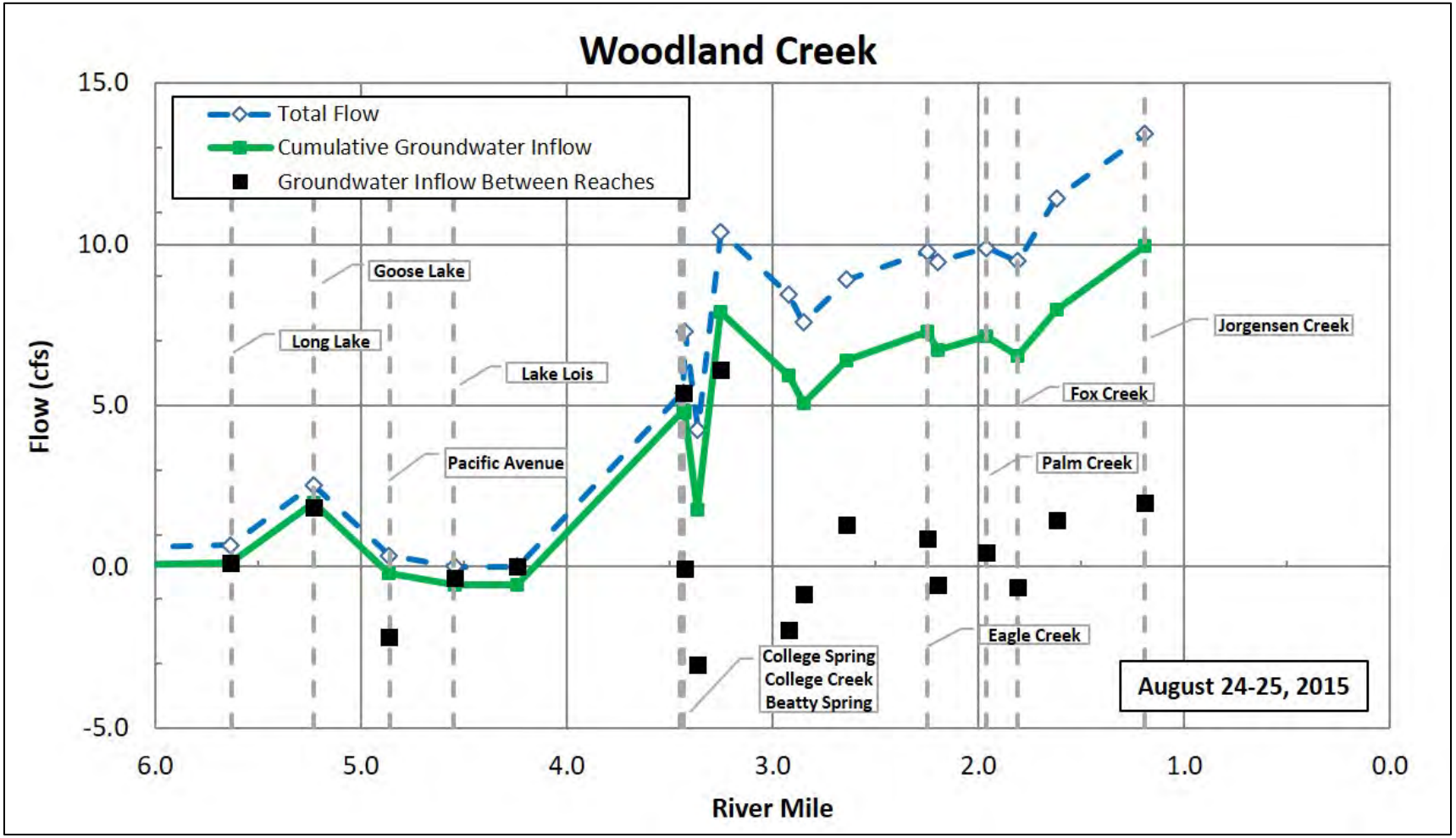

Figure G-2: Woodland Creek Groundwater Inflow

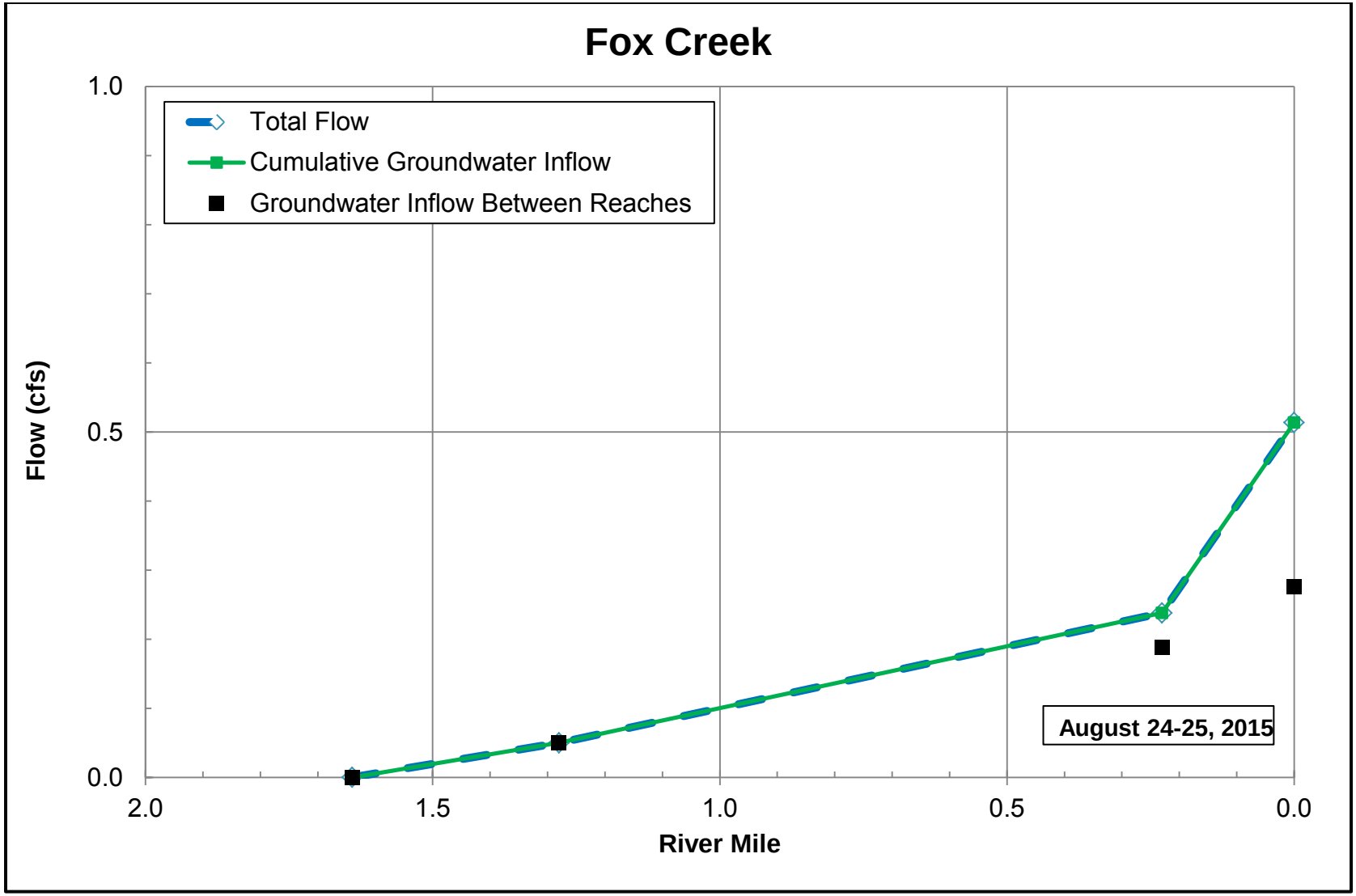

Figure G-3: Fox Creek Groundwater Inflow

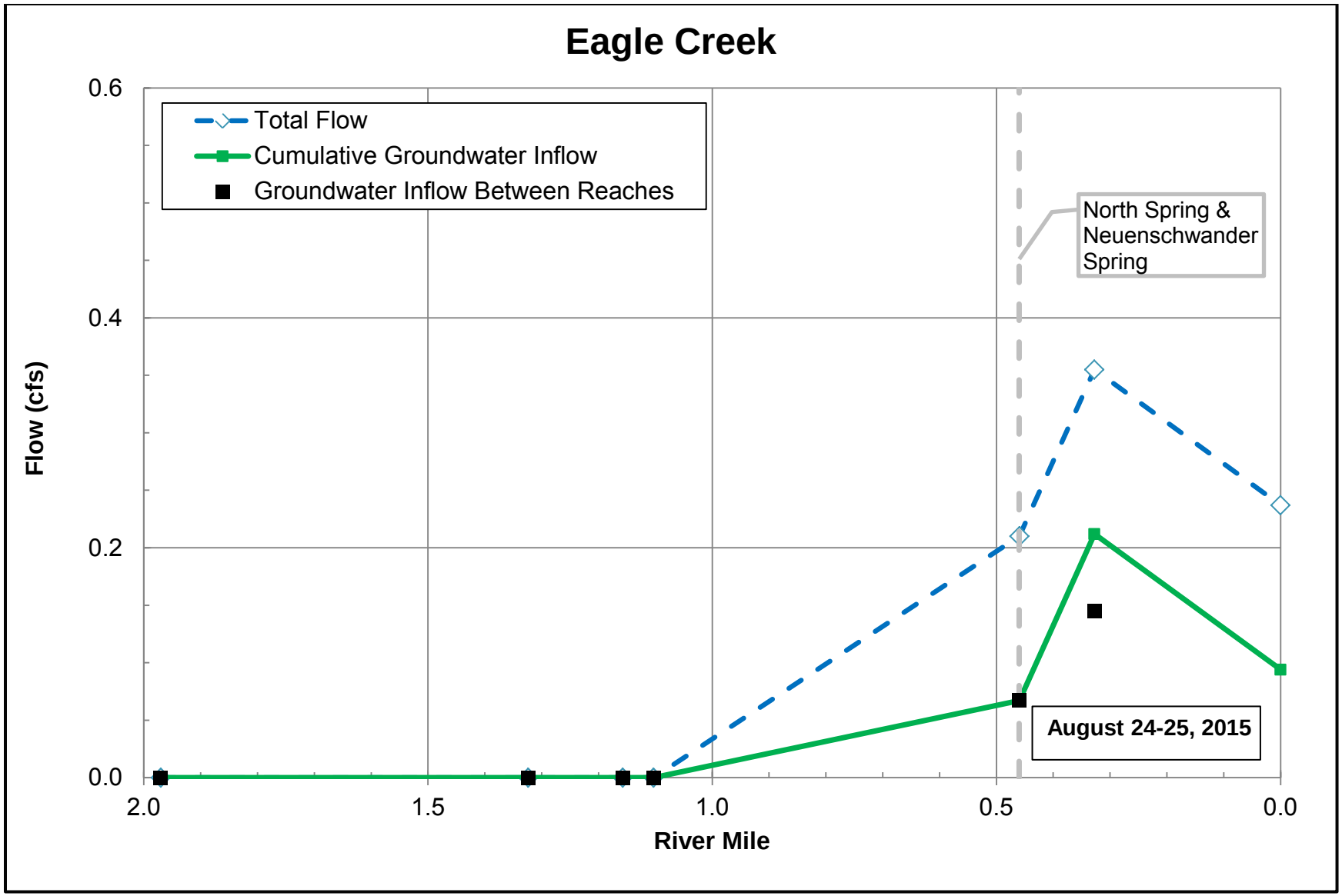

Figure G-4: Eagle Creek Groundwater Inflow

Appendix H
Laboratory Analytical Reports
(separate file)

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