

D-1689 City of Yelm
groundwater
Monitoring project

98207601

City of Yelm
Groundwater Monitoring Project
Centennial Clean Water Fund
Grant Number G0100206, FY 2001 Funding Cycle
December 28, 2004
FINAL

City of Yelm
Groundwater Monitoring Project
Centennial Clean Water Fund
Grant Number G0100206, FY 2001 Funding Cycle
December 28, 2004
FINAL

Prepared for:

City of Yelm
105 Yelm Avenue West
Yelm, WA 98597



RECEIVED
U.S. DEPARTMENT OF ECONOMY

'04 DEC 29 P 4 :27

U.S. DEPARTMENT OF ECONOMY
WASHINGTON, D.C. 20540

This Report has been prepared by Patrick Skillings under the direction of Thomas E. Skillings, P.E. The work is in conformance with the Washington State Department of Ecology approved Quality Assurance Project Plan (QAPP). The testing results for this project have been reported to the Washington State Department of Ecology Environmental Information Management (EIM) database. This project has been completed under Grant Number G0100206 as part of the Centennial Clean Water Fund for the Fiscal Year 2001 Funding Cycle.



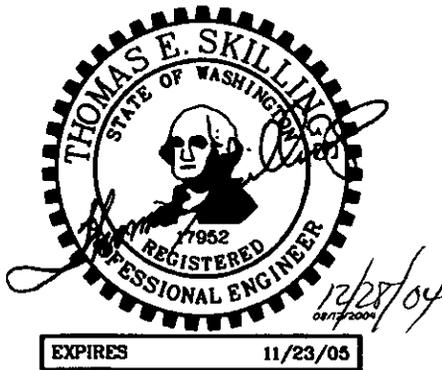
Prepared by: **Patrick Skillings**

Date: December 28, 2004



Reviewed by: **Thomas E. Skillings P.E.**

Date: December 28, 2004



Abbreviations and Acronyms.....	5
Executive Summary.....	6
1.0 Introduction.....	7
2.0 Study Area Hydrogeology.....	12
2.1 Recessional Outwash Aquifer.....	12
2.2 Upper Aquitard.....	12
2.3 Advance Outwash Aquifer.....	14
2.4 Lower Aquitard.....	14
3.0 Groundwater Monitoring.....	17
3.1 Yelm Groundwater Baseline Comparison.....	17
3.1.1 Nitrate+Nitrite-N.....	18
3.1.2 Total Dissolved Solids (TDS).....	18
3.1.3 Chloride.....	19
3.1.4 Fecal Coliform Bacteria.....	19
3.1.5 Ammonia-N.....	19
4.0 Constructed Treatment Wetlands.....	20
4.1 Constructed Treatment Wetlands.....	21
4.1.1 Nickel.....	22
4.1.2 Temperature.....	22
4.1.3 Chromium.....	22
4.1.4 Manganese.....	22
4.1.5 Dissolved Organic Carbon.....	22
5.0 Summary Discussion.....	23
5.1 Baseline Comparison.....	23
5.1.1 Nitrate+Nitrite-N.....	24
5.1.2 Total Dissolved Solids (TDS).....	24
5.1.3 Chloride.....	25
5.1.4 Fecal Coliform Bacteria.....	25
5.1.5 Ammonia-N.....	25
5.2 Constructed Treatment Wetlands.....	25
5.2.1 Chromium.....	27
5.2.2 Iron.....	27
5.2.3 Manganese.....	27
5.2.4 Nickel.....	28
5.2.5 Fecal Coliform Bacteria.....	28
5.2.6 Temperature.....	29
5.2.7 pH.....	29
5.2.8 Dissolved Oxygen.....	29
5.2.9 Non-Detectable Analytes.....	29
5.3 Seasonal Variation in Field Parameters.....	29
5.4 Reverse Osmosis Treatment.....	30
6.0 Conclusion.....	32
6.1 Baseline Conclusion.....	32
6.2 Constructed Treatment Wetland Conclusion.....	32

6.3 Reverse Osmosis Conclusion	33
7.0 References	34

List of Tables

Table 1.1: Primary and Secondary MCLs	11
Table 3.1: Groundwater Monitoring Project - Baseline Comparison	17
Table 4.1: Groundwater Monitoring Project Testing Results	21
Table 5.1: Groundwater Water Quality	24
Table 5.2: Constructed Treatment Wetlands Water Quality	26
Table 5.3: Seasonal Variations in Field Parameters	30
Table 5.4: Treatment Capacity of Reverse Osmosis Unit	31
Table C.1: Sampling Point Locations	Appendix C
Table C.2: Seasonal Variations on Select Parameters	Appendix C
Table D.1: Quality Assurance	Appendix D

List of Figures

Figure 1.1: Vicinity Map	8
Figure 1.2: Sampling Locations	9
Figure 2.1: Monitoring Well Hydrographs	13
Figure 2.2: December Potentiometric Map	15
Figure 2.3: March Potentiometric Map	16

Appendices

- Appendix A: Yelm Groundwater Baseline Sampling
- Appendix B: Quality Assurance Project Plan
- Appendix C: Yelm Groundwater Monitoring Project Sampling Results
- Appendix D: Quality Assurance
- Appendix E: Well Logs and As-Builts
- Appendix F: Hydrogeologic Cross-Sections

Abbreviations and Acronyms

BOD₅ – Five Day Biochemical Oxygen Demand
CFU/100mL – Colony Forming Unit per 100 milliliters
CTW – Constructed Treatment Wetland
DOC – Dissolved Organic Carbon
DOE – Washington State Department of Ecology
DOH – Washington State Department of Health
EPA – United States Environmental Protection Agency
FP – Fish Pond
GMP – Groundwater Monitoring Project
gpd – gallons per day
IS – Inflow Structure
NDMA – n-Nitrosodimethylamine
MBAS – Methylene Blue Active Substances method, used to test for anionic surfactants
MCL – Maximum Contaminant Level
mg/L – milligrams per liter (1 mg/L= 1 ppm)
ppm – parts per million
QAPP – Quality Assurance Project Plan
RIB – Rapid Infiltration Basin
RO – Reverse Osmosis
RW – Reclaimed Water
SSF – Subsurface Flow wetland
TDS – Total Dissolved Solids
TKN – Total Kjeldahl Nitrogen
TTHM – Total Trihalomethane
ug/L – micrograms per liter
umhos/cm – micromhos per centimeter
WAC – Washington Administrative Code

Executive Summary

The City of Yelm, Washington, as part of the City's water reclamation project, recharges a local aquifer with Class A reclaimed water after conveyance through Constructed Treatment Wetlands (CTWs) at Cochrane Park. The City also withdraws its drinking water from a local aquifer and, therefore, has a vested interest in assuring their drinking water source is protected. The aquifer being recharged with Class A reclaimed water is the Recessional Outwash Aquifer. The City withdraws its drinking water from the deeper Advanced Outwash Aquifer. These two aquifers are separated by an aquitard, which restricts direct movement of water between the two aquifers.

The City of Yelm has completed this Groundwater Monitoring Project (GMP) to determine if recharging the Recessional Outwash Aquifer with Class A reclaimed water is identifiable in the water quality of the aquifer used by the City and to determine if the constructed wetlands and infiltration basins are providing additional "polishing" of the reclaimed water before it is applied to groundwater for aquifer recharge.

The results from this project have been compared to a previous baseline report completed by the Washington State Department of Ecology (DOE 1998). A qualitative analysis between this Groundwater Monitoring Project and the baseline, indicates that nitrate+nitrite-N levels have not changed since the City has begun the discharge of Class A reclaimed water into the aquifer, maintaining a mean concentration level of 3.2 mg/L. Other analytes sampled have increased slightly; however, except for chloride, the increases in concentration levels of the baseline analytes can be attributed to the natural background levels of the constructed treatment wetlands. In addition, the changes from the baseline analytes are minimal and well below Drinking Water Standards.

This project also analyzed the impacts on water quality from the use of CTWs for secondary polishing of the Class A reclaimed water. Water quality levels for twenty-nine (29) analytes and four (4) parameters were analyzed at different locations within the treatment chain in an effort to identify any potential trends in treatment capability of CTWs. Many of the analytes sampled showed an improvement in water quality between the inflow structure and the rapid infiltration basins (RIBs). There were other analytes that showed a degradation in water quality moving through the wetland treatment chain. Overall, more of the analytes sampled experienced an improvement, rather than a degradation, in water quality. Changes in parameters sampled for did not indicate either an improvement or degradation in water quality.

Testing of the Constructed Treatment Wetlands indicated that the water flowing out of the fish pond is of lower quality than that of other sampling points in the wetlands. Contamination due to use by waterfowl and fish, including the use of fish food within part of the CTWs, is believed to be a large contributor to water quality degradation. However, the sub-surface flow wetland plays a significant role in improving the water quality after the fish pond.

A pilot Reverse Osmosis (RO) system was also sampled as part of this project. Class A reclaimed water was treated through the use of the RO unit and the results were compared to analyte levels in the Class A reclaimed water and drinking water Maximum Contaminant Level (MCL) thresholds. Testing of the treated water from the RO unit indicates an increased water quality through the use of the reverse osmosis treatment system. RO treatment will produce concentrations well below State Drinking Water Standards MCL levels.

1.0 Introduction

The City of Yelm completed a water reclamation project in 1999, which utilizes groundwater recharge as one of the final components of its municipal reuse facility. Currently, 50,000 gallons per day (35 gallons per minute) of Class A reclaimed water is used to recharge the same aquifer from which the City withdraws its drinking water supplies. The City wants to be assured their water supply continues to meet the State's Drinking Water Standards. To that end, the City has undertaken a Groundwater Monitoring Project to measure the impacts, if any, that recharging the groundwater with reclaimed water may be having on the aquifer, as well as to determine the effect on water quality within CTWs.

Class A reclaimed water is produced at the City's Reclamation Facility. Reclaimed water is defined as "*effluent derived in any part from sewage from a wastewater treatment system that has been adequately and reliably treated, so that as a result of that treatment, it is suitable for beneficial use or a controlled use that would not otherwise occur, and is no longer considered wastewater*" (Chapter 246-290-010 WAC). Prior to recharge, the reclaimed water undergoes additional polishing in a constructed treatment wetland composed of several wetland cells. The constructed treatment wetlands are located at the Cochrane Park facility in the City of Yelm (Figure 1.1).

In 1998, the Washington State Department of Ecology (DOE) Water Quality Program requested that the Environmental Investigations and Laboratory Services Program conduct sampling of the Advance Outwash Aquifer in order to define the extent of nitrate contamination in the aquifer. The request was based on previously identified nitrate contamination in the groundwater east of the City of Yelm (DOE 1998). The findings of the sampling were detailed in the report titled *Yelm Groundwater Baseline Sampling* (DOE 1998), herein after referred to as the Baseline, which is included in Appendix A.

The City of Yelm has completed this GMP, which consisted of quarterly testing over a two-year period, to determine if recharging the aquifer with Class A reclaimed water can be traced to the water quality of the aquifer used by the City. Quarters 1 through 4 were completed during the first year, while quarters 5 through 8 were completed during the second year. The results of the GMP were also used to evaluate if the constructed wetlands and infiltration basins are providing additional "polishing" of the reclaimed water before it is applied to groundwater / aquifer recharge. This project has been completed under Grant Number G0100206 as part of the Centennial Clean Water Fund for the Fiscal Year 2001 Funding Cycle.

Testing procedures for this project followed the *Quality Assurance Project Plan for the City of Yelm* (Skillings-Connolly 2001) (QAPP) that was approved by the Washington State Department of Ecology (Appendix B). The QAPP outlined testing procedures as well as Quality Control/Quality Assurance measures.

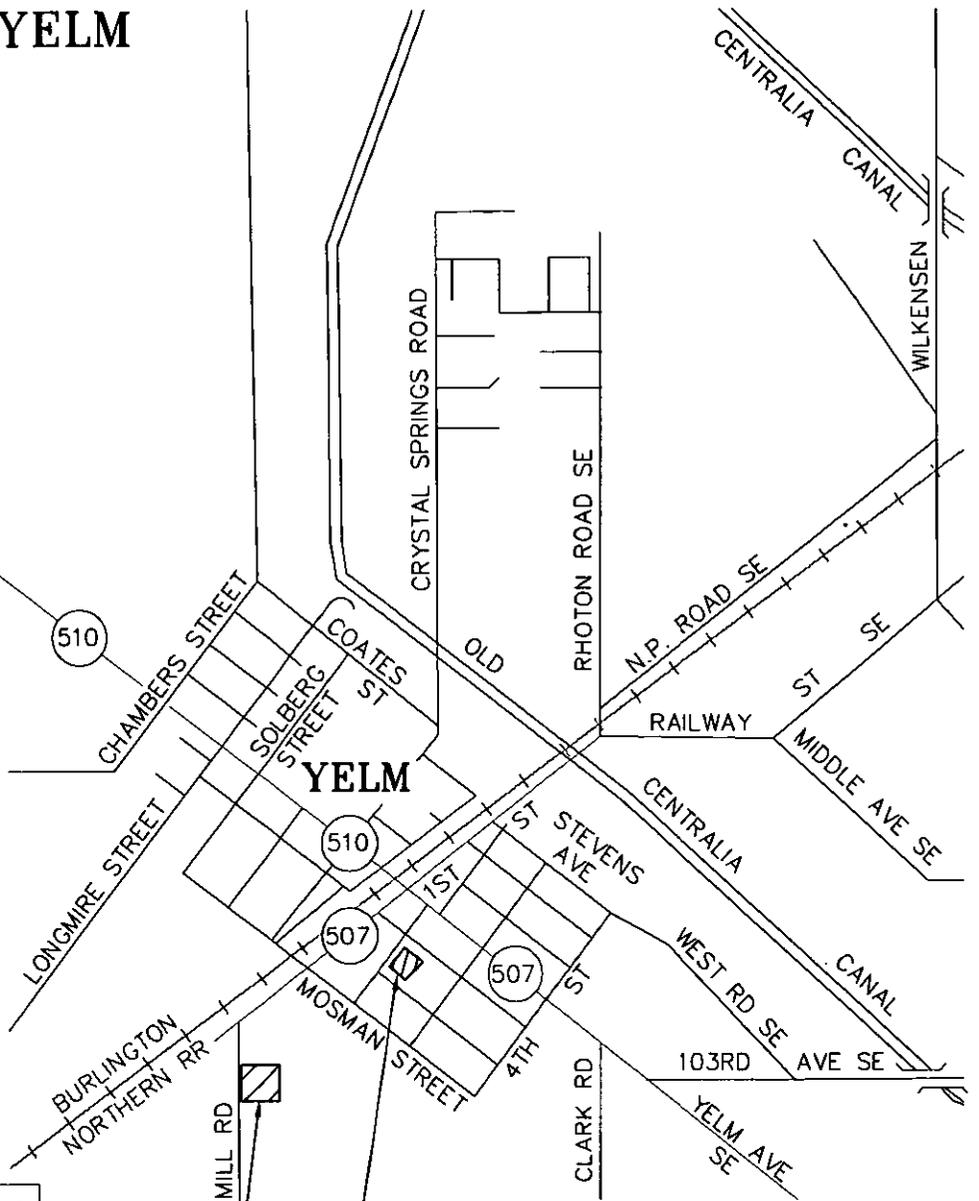
Groundwater testing occurred at six monitoring wells located at Cochrane Park as well as the City of Yelm City well. Testing of the Constructed Treatment Wetlands (treatment chain) was done by collecting samples at the inflow structure into the wetland system, as well as at control structures between treatment chain components (Figure 1.2). The wetland treatment chain consisted of two surface flow CTWs, a sub-surface flow

CITY OF YELM



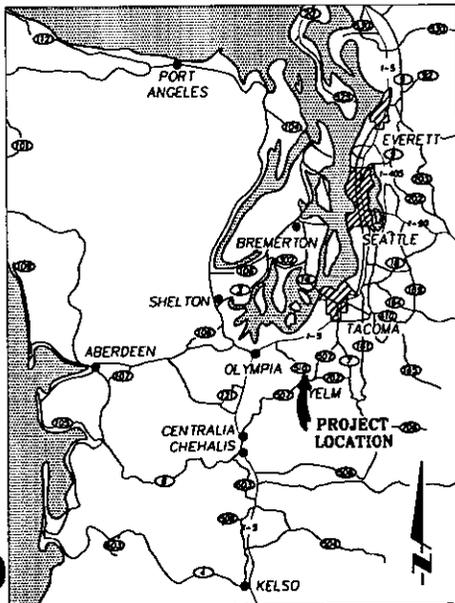
93rd AVE

MTN. VIEW RD.



CITY WELLS

COCHRANE PARK
WETLAND SITE

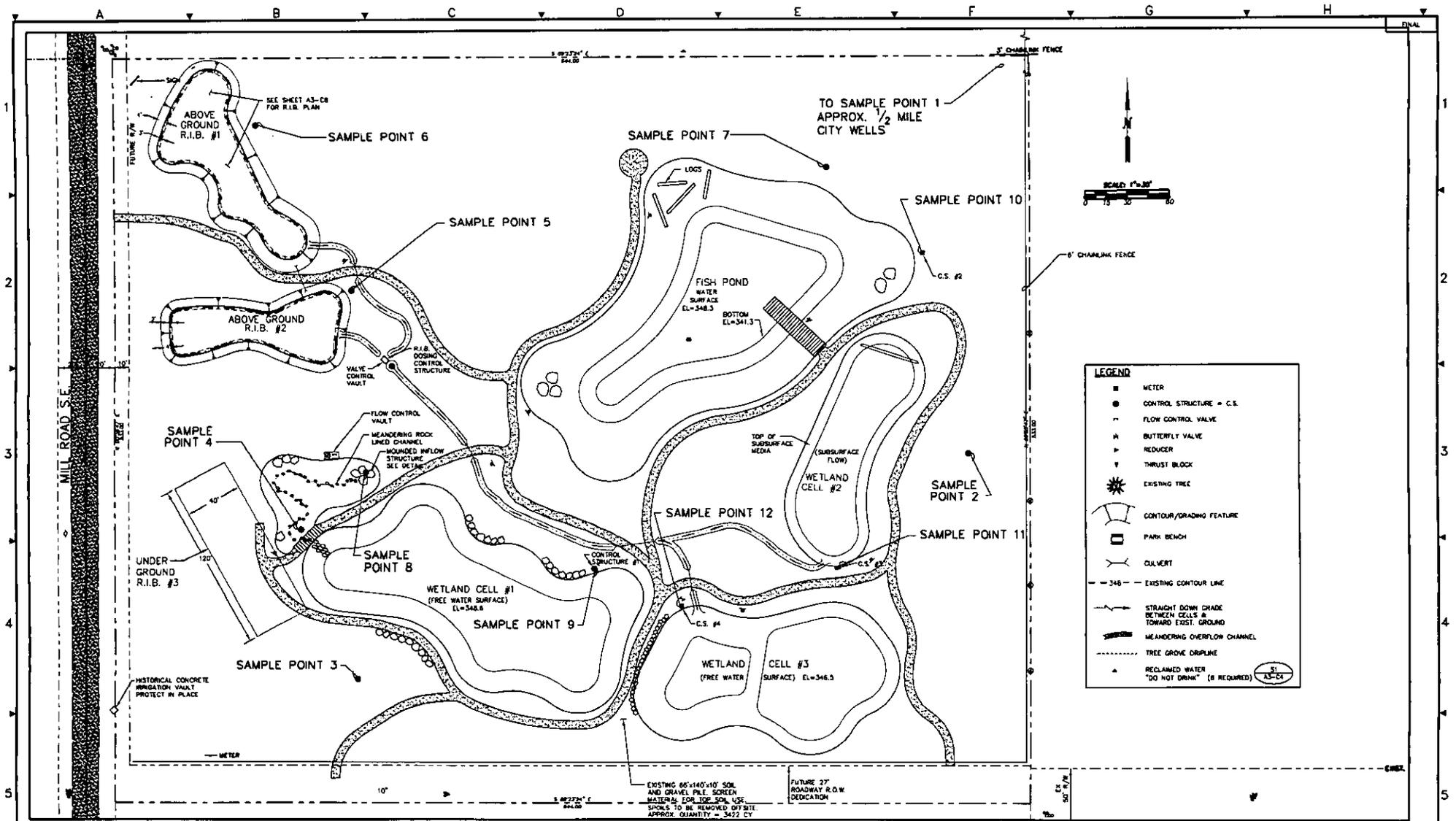


PUGET SOUND

**SKILLINGS
CONNOLLY**

5016 Lacey Boulevard SE, Lacey, Washington 98503
(360) 491-3399 (800) 454-7545 Fax (360) 491-3857

**FIGURE 1.1
VICINITY MAP**



2/25/18	ADDENDUM #3	BY	T. SATER
2/24/18	ADDENDUM #2	BY	T. SATER
DATE	REVISION	BY	CHECKED BY
			T.S.

DESIGNED BY
B. CONNOLLY
ENTERED BY
T. SATER
CHECKED BY
T.S.



SKILLINGS CONNOLLY

5016 Lacey Boulevard SE, Lacey, Washington 98503
(360) 491-3399 (800) 454-7545 Fax (360) 491-3857

PROJECT NAME
CITY OF YELM WATER REUSE PROJECT

JOB NO. 95055

DRAWING TITLE
FIGURE 1.2 COCHRANE PARK SAMPLING LOCATIONS

A ALT-3
DRAWING NO. H5055-30

SHEET NO.
A3-C2

CTW, an open water fish pond, and three rapid infiltration basins. This provided testing results for each separate component of the treatment chain.

It should be noted that the sample locations for the Baseline report are not the same as the sample locations for the GMP.

This report is separated into two sections. The first section compares the results of the 1998 *Yelm Groundwater Baseline Sampling* (Baseline) with the results of this *Yelm Groundwater Monitoring Project*. The Baseline details sampling results for the following five analytes: nitrate+nitrite-N, total dissolved solids (TDS), chloride, fecal coliform bacteria, and ammonium-N. In the first section of this report, a comparison is made between the Baseline results and the levels for the same five analytes in the Class A reclaimed water and in the groundwater. Groundwater was sampled at the City well #2 and the six monitoring wells at Cochrane Park.

The second section of this report details the results from additional analytes sampled for in the reclaimed water, the treatment chain, and the groundwater. Reclaimed water was sampled at the City's reclamation facility.

In addition to the sampling completed as part of the GMP, testing of a pilot reverse osmosis unit was completed in an effort to evaluate the treatment capability of reverse osmosis on Class A reclaimed water.

The Washington State Department of Health (DOH) and the United States Environmental Protection Agency (EPA) have established standards for water quality within the State of Washington. Water quality standards are measured based on a maximum contaminant level (MCL) which is a "trigger" level at which if water quality exceeds the MCL, the purveyor must take corrective action in accordance with WAC 246-290-310. DOH has created three levels of water quality standards: primary MCLs, secondary MCLs, and "action levels". A primary MCL is a water quality standard that is based on chronic, non-acute, or acute human health effects of a specific analyte. A secondary MCL is a water quality standard that is based on factors other than health effects (aesthetics, color, smell, etc.) of a specific analyte. An "action level" is a water quality threshold value. If an "action level" is exceeded by the results of sampling within the water distribution system, corrosion control must be considered. The only analytes sampled for as part of this GMP that have an "action level" were copper and lead.

Historically, the water withdrawn from the aquifer has met the water quality standards of the state and has not exhibited any poor water quality characteristics. However, because the aquifer is shallow, and may be influenced by surface water, the City does chlorinate its drinking water supply. The flow direction of the City's aquifer is to the northeast, passing by Cochrane Park as it flows toward the City's potable wells. The site of Cochrane Park, where the reclaimed water is polished and infiltrated, was previously undeveloped with light, native vegetation.

Table 1.1 details primary and secondary MCLs as listed in WAC 246-290-310 for all of the analytes sampled as part of the GMP. This table does not reflect results of the GMP sampling.

Table 1.1: Primary and Secondary MCLs

Analyte	Primary MCL ^a	Secondary MCL ^a
Nitrate-N	10.0 mg/L	
Total Dissolved Solids		500 mg/L
Chloride		250 mg/L
Ammonia-N ^b		
Fecal coliform bacteria	1 CFU/100mL	
Biochemical Oxygen Demand ^b		
Dissolved Organic Carbon ^b		
Nitrite-N	1.0 mg/L	
Surfactants ^b		
Sulfate		250 mg/L
Boron ^b		
Chromium	0.1 mg/L	
Copper ^c	1.3 mg/L	
Iron		0.3 mg/L
Manganese		0.05 mg/L (50 µg/L)
Nickel	0.1 mg/L	
Zinc		5.0 mg/L
Total Trihalomethanes (TTHM)	0.1 mg/L	
Fecal Streptococcus	1 per 100 mls	
Total Kjeldahl Nitrogen (TKN) ^b		
Temperature ^d		
pH ^d		
Conductivity ^d	700 µmhos/cm	
Dissolved Oxygen ^d		
Bromide ^b		
Silver		0.1 mg/L
Arsenic	0.05 mg/L (50 µg/L)	
Cadmium	0.005 mg/L (5 µg/L)	
Fluoride	4.0 mg/L	2.0 mg/L
Lead ^c	0.015 mg/L (15 µg/L)	
Mercury	0.002 mg/L (2 µg/L)	

a) WAC 246-290-310

b) Presently, no MCL has been established for these analytes.

c) "Action level"

d) Parameter; of the four parameters measured, only conductivity has an established MCL.

2.0 Study Area Hydrogeology

Four hydrogeologic units, two aquifers and two aquitards, are identified beneath the area sampled as part of the GMP. The aquifers consist of gravel and sandy gravel which readily transmit water and are designated as the Recessional Outwash Aquifer and the Advance Outwash Aquifer.

Aquitards generally have a substantial silt or clay component and do not transmit water as well as an aquifer, acting as an impervious or semi-impervious layer between aquifers. In most instances, the aquitard is only semi-impervious, allowing partial flow between water bearing zones (DOE 1998). In the Baseline report, the two aquitards are designated as the Upper and Lower Aquitards; therefore, for consistency, they will be referred to as such in this report. The subsurface relationships of the hydrogeologic units are shown in hydrogeologic profiles contained in Appendix F (Robinson-Noble 2001). The location and properties of the hydrogeologic units are described below.

2.1 Recessional Outwash Aquifer

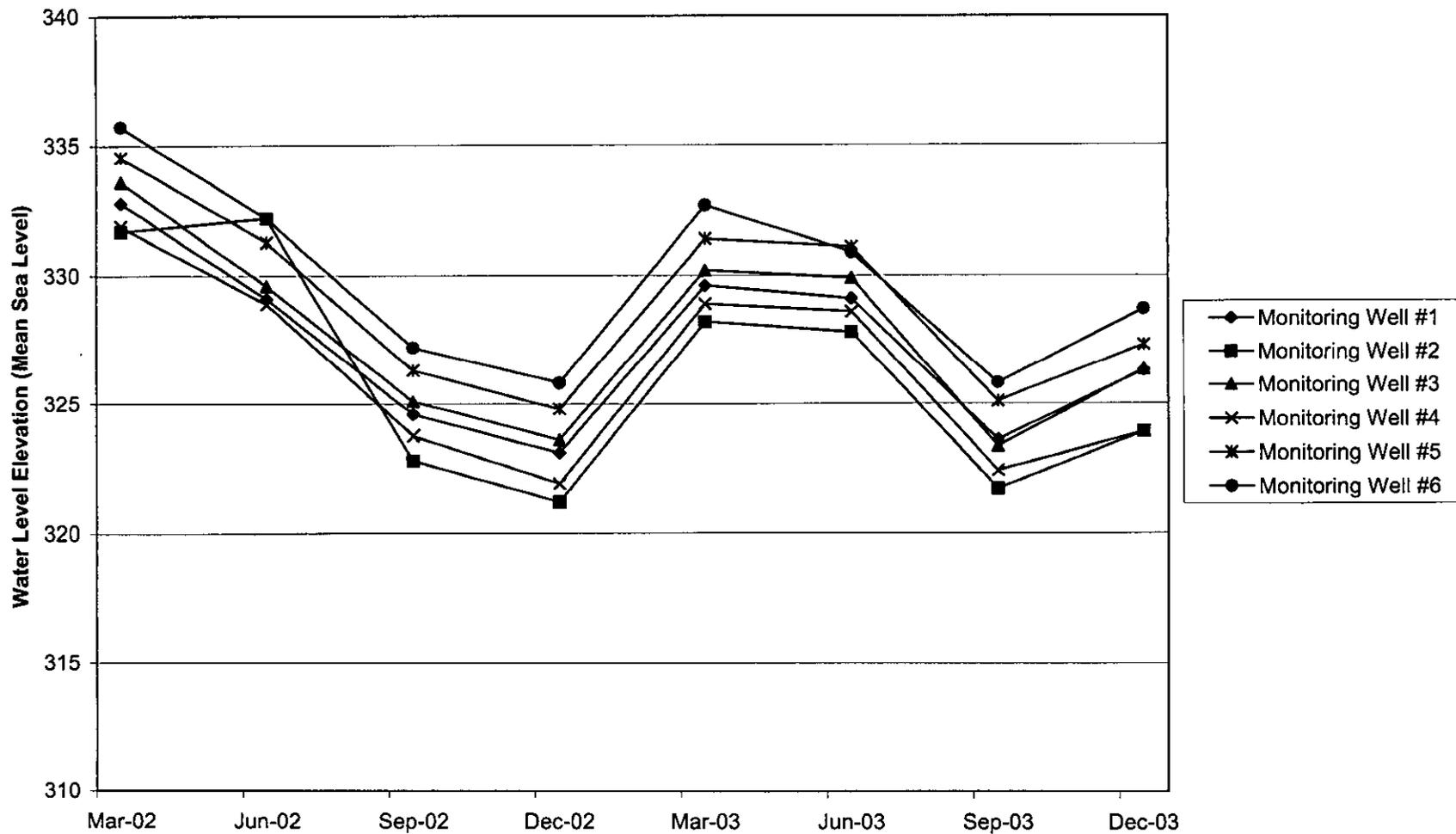
The Recessional Outwash Aquifer is the uppermost aquifer in the sampling area. It represents the saturated portion of the Vashon Recessional Outwash deposits mapped by Drost, Turney, Dion, and Jones (1998). Recessional Outwash was deposited by glacier meltwater as the Vashon Glacier retreated and consists of loose mixtures of sand and gravel. The deposits are nearly continuous beneath the sampling area and range up to 38 feet thick. All six of the monitoring wells extend into the Recessional Outwash Aquifer. The aquifer is recharged primarily by infiltrated precipitation (DOE 1998). Generally, the groundwater flow direction is in an easterly direction, however localized flow patterns will develop as a result in variations in infiltration and recharge. Figure 2.1 (Monitoring Well Hydrographs) shows water level fluctuations in the six monitoring wells during sampling for the GMP. Water levels were highest in the spring (March) and lowest during winter (December).

Figure 2.2 (December Potentiometric Map) shows the groundwater-flow pattern for the Recessional Outwash Aquifer. The map was constructed from water-level elevations measured in the six monitoring wells in December 2002. Figure 2.3 (March Potentiometric Map) also shows the groundwater-flow pattern for the Recessional Outwash Aquifer; however, the map was constructed from water-level elevations measured in the six monitoring wells in March 2003. It should be noted that the potentiometric maps were created to show the approximate groundwater contours in the sampling area, but were not part of a formal hydrogeological survey.

2.2 Upper Aquitard

The Upper Aquitard acts as a partial hydraulic barrier between the Recessional Outwash Aquifer and the underlying Advance Outwash Aquifer. Drillers refer to this unit as "clay and gravel", "hardpan", or "cemented gravel". The Upper Aquifer is mapped as Vashon Till by Robinson-Noble (2001). Vashon Till was deposited directly and overridden by

Figure 2.1: Monitoring Well Hydrographs



advancing glacial ice. Typically, Vashon Till consists of a compacted, concrete-like mixture of clay, silt, sand, and gravel that transmits water poorly (DOE 1998). The unit ranges in thickness from 10 to 30 feet and likely underlies much of the sampling area. None of the monitoring wells tapped into the Upper Aquitard.

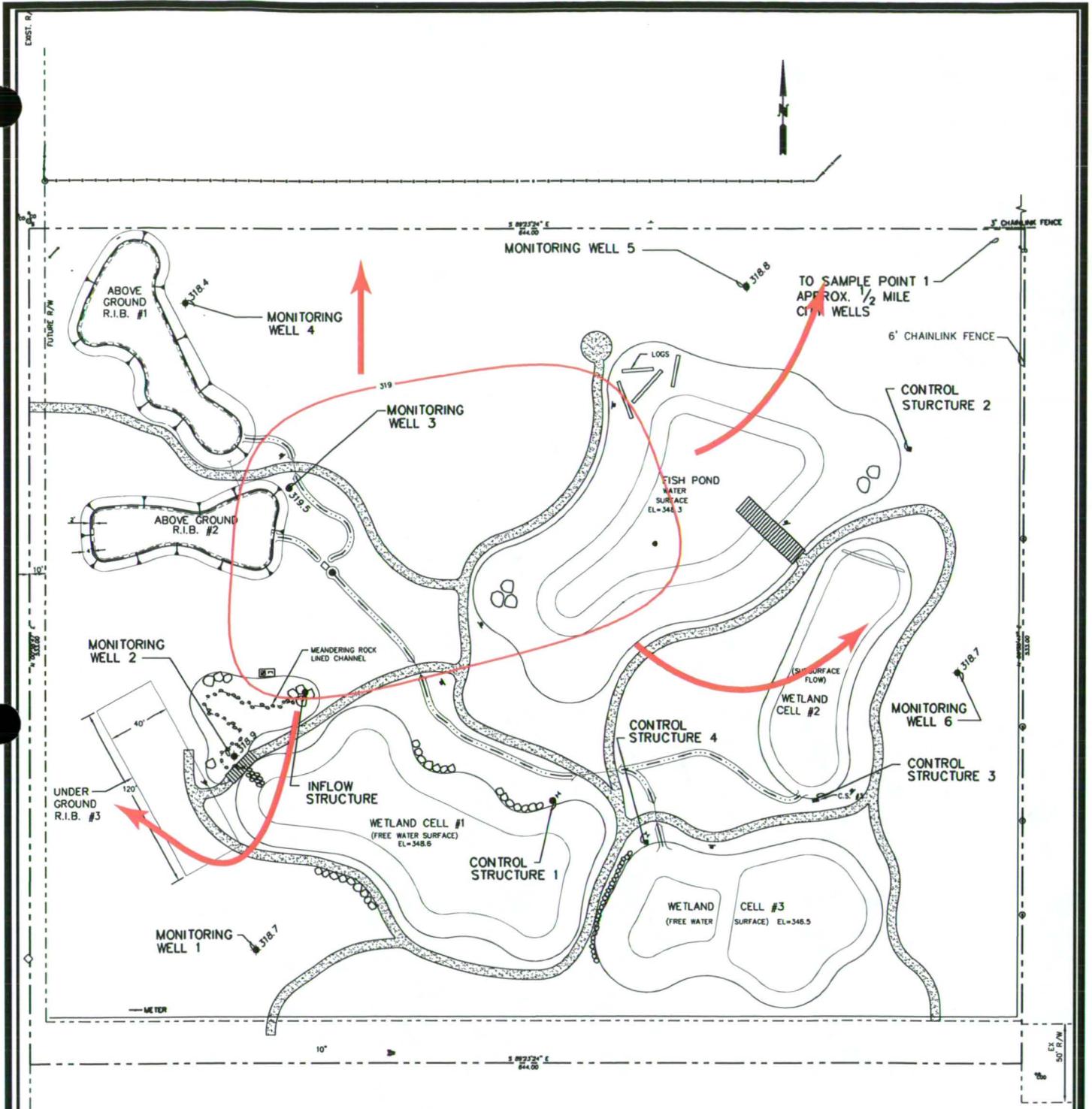
2.3 Advance Outwash Aquifer

The Advance Outwash Aquifer is the principal aquifer used in the Yelm area. The only well sampled for the GMP that tapped the Advance Outwash Aquifer was City well #2. This aquifer underlies the sampling area and consists of sand and gravel deposited by glacial meltwater, ahead to of the advancing glacier. The top of the aquifer occurs approximately at a depth 50 feet below the ground surface. None of the monitoring wells tested tap into the Advance Outwash Aquifer.

The aquifer is recharged primarily from infiltrated precipitation and leakage from the overlying Recessional Outwash Aquifer.

2.4 Lower Aquitard

The Lower Aquitard separates the Advance Outwash Aquifer from an even deeper aquifer. None of the wells sampled for the GMP tapped into the Lower Aquitard or the deeper aquifer. Information on the Lower Aquitard was gained from mapping completed for the City of Yelm Wellhead Protection Plan (Robinson-Noble 2001) and the Baseline report. The aquitard consists of hardpacked silty or clayey sandy gravel and is composed of the Kitsap Formation. Due to the fact that none of the wells sampled tapped this aquitard, the depth, location, or existence of this aquitard below the sampling area is not confirmed.



→ APPROXIMATE DIRECTION OF FLOW

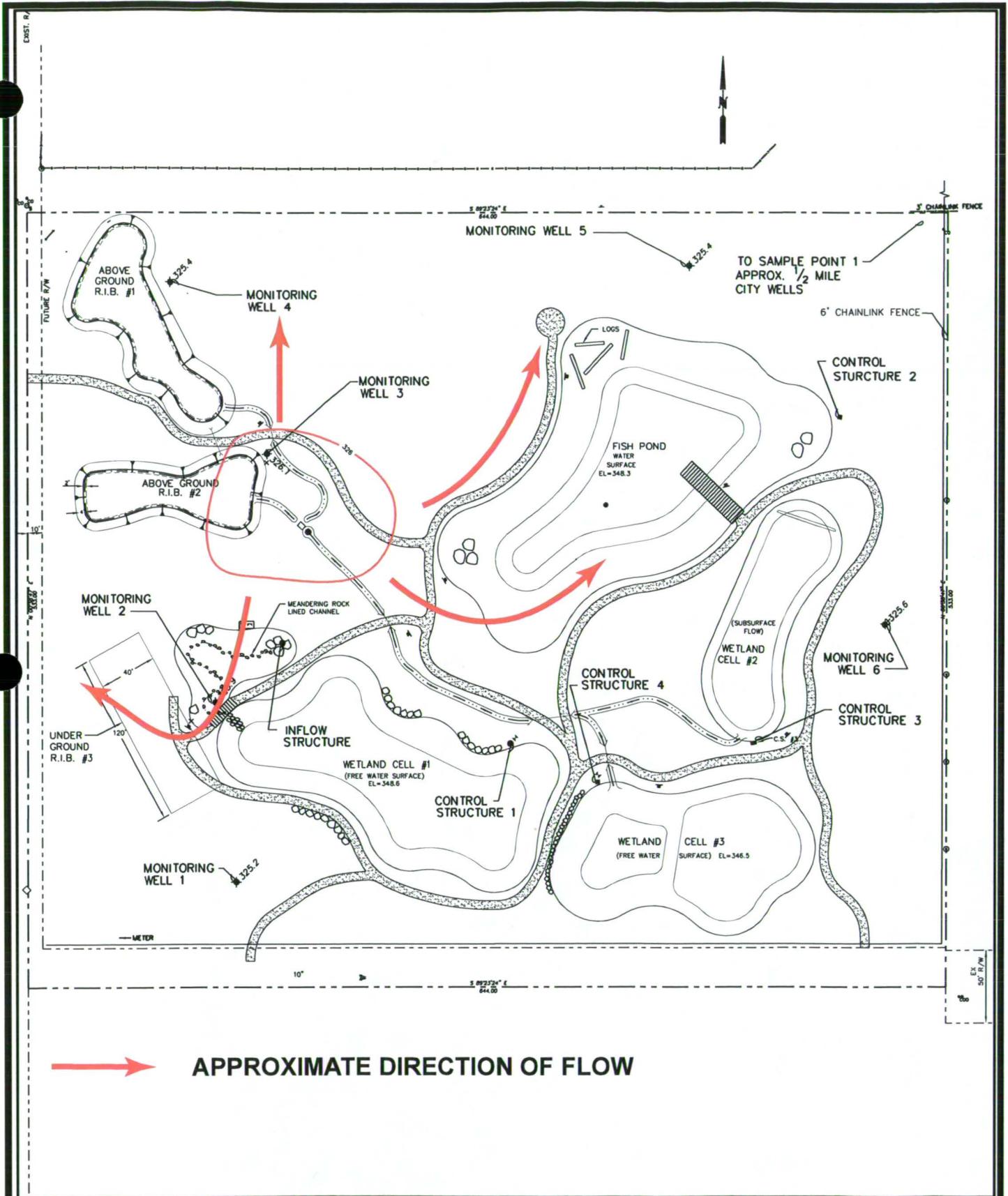
DESIGNED BY:	CH
ENTERED BY:	PS
	11/24/04



5016 Lacey Boulevard SE, Lacey, Washington 98503
 (360) 491-3399 (800) 454-7545 Fax (360) 491-3857

**COCHRANE PARK
 DECEMBER POTENTIOMETRIC MAP
 FIGURE 2.2**

JOB NUMBER	01090
SHEET	1
OF	1
SHEETS	



→ APPROXIMATE DIRECTION OF FLOW

DESIGNED BY:	CH
ENTERED BY:	PS
	11/24/04

**SKILLINGS
CONNOLLY**

5016 Lacey Boulevard SE, Lacey, Washington 98503
 (360) 491-3399 (800) 454-7545 Fax (360) 491-3857

**COCHRANE PARK
MARCH POTENTIOMETRIC MAP
FIGURE 2.3**

JOB NUMBER	01090
SHEET	1
OF	1
SHEETS	

3.0 Groundwater Monitoring

As discussed previously, the GMP was completed in an effort to identify potential impacts of discharging Class A reclaimed water into the aquifer. The majority of wells tested for the Baseline report (DOE 1998) were located in the northeast quadrant, approximately 1-mile to the northeast of Cochrane Park. Sampling locations for the Baseline were down-gradient from GMP sample sites. The Baseline report details sampling results for five analytes (nitrate-nitrite-N, total dissolved solids, chloride, fecal coliform bacteria, and ammonium-N). The GMP sampled concentration levels for the same five analytes in both the reclaimed water and in the groundwater. The GMP sampled for ammonia-N, instead of ammonium-N. Comparisons of these three sampling areas (reclaimed water, Baseline, and GMP groundwater sampling sites) can potentially show what effect recharge with reclaimed water is having on the aquifer.

Table 3.1 details the results from the Baseline report and the Yelm Groundwater Monitoring Project, comparing the Baseline report to the Class A reclaimed water and to the current groundwater from City well #2 and the six monitoring wells located at Cochrane Park.

Table 3.1: Groundwater Monitoring Project - Baseline Comparison

<i>Analyte</i>	<i>Baseline (DOE 1998)</i>			<i>Reclaimed Water</i>	<i>Groundwater Monitoring Project</i>		
	<i>Min</i>	<i>Max</i>	<i>Mean</i>		<i>Min</i>	<i>Max</i>	<i>Mean</i>
Nitrate-Nitrite-N (mg/L)	0.13	10.1	3.2	3.37	1.0	7.4	3.23
Total Dissolve Solids (mg/L)	67	158	110	302	54	315	125
Chloride (mg/L)	1.2	17.3	4.9	59.8	3	62	19.3
Fecal coliform bacteria (CFU/100mL)	ND ^a	ND	ND	ND	1	34	6
Ammonia-N (mg/L) ^b	0.014	0.015	NA	ND	0.03	0.56	0.13

a) ND = analyte non-detectable

b) Ammonium-N was only detected twice during sampling for the Baseline report, therefore, no mean has been calculated. See Section 3.1.5 for discussion.

3.1 Yelm Groundwater Baseline Comparison

The *Yelm Groundwater Baseline Sampling* report was completed in order to define the extent of nitrate contamination in the aquifer. For the Baseline, twenty-three private water-supply wells were sampled bi-monthly for one year to define nitrate concentrations in groundwater in a seven square mile area east of the City of Yelm. Twenty-two of the sampled wells tapped the principal aquifer, the Advance Outwash Aquifer that occurs at a depth of 70 to 100 feet below the ground surface. One sampled well tapped the uppermost aquifer that is rarely used for drinking water due to the high risk of contamination from surface water. Well samples were tested for nitrate+ nitrite-N, total dissolved solids, chloride, fecal coliform bacteria, and ammonium-N.

The City of Yelm produces Class A reclaimed water at the City's water reclamation facility. The City consistently and reliably produces Class A reclaimed water consistent with their National Pollutant Discharge Elimination System (NPDES) Permit (No. WA0040762). Results from sampling of the reclaimed water are beneficial when comparing results from the Baseline report to results from groundwater sampling to see if there is any correlation between recharge of the aquifer with reclaimed water and analyte levels within the groundwater.

Class A reclaimed water was sampled at the reclamation facility. Table 3.1 compares concentration levels for the Baseline report with analytes levels in the reclaimed water. Testing results for analyte levels within the groundwater, sampled as part of the GMP, are also detailed in Table 3.1. Comparison of concentration levels at these three areas gives a good representation as to what the quality of the aquifer was like prior to recharge, the quality of the water being used for recharge (Class A reclaimed water), and the quality of the aquifer after recharge with Class A reclaimed water.

To determine analyte concentration levels in the groundwater, a total of seven test wells were sampled quarterly for a period of two years as part of the GMP. The test points include six monitoring wells situated in close proximity to the CTWs at Cochrane Park and a final well (City well #2), which is used by the City of Yelm to withdraw drinking water from the aquifer. Please refer to Table C.1, Appendix C for the precise locations of these sampling points. Results from the GMP are detailed in Table 3.1. These results can be compared to results in the Baseline report and to analyte concentration levels in the reclaimed water.

3.1.1 Nitrate+Nitrite-N

In general, for the Baseline, up-gradient concentrations were less than 1 mg/L with concentrations increasing down-gradient. The observed elevated nitrate concentrations in the down-gradient direction confirm that nitrogen loading occurred between the up-gradient and down-gradient test wells. According to the Baseline report approximately half of the Advance Outwash Aquifer within the baseline sampling area has nitrate+nitrite-N concentrations exceeding 3 mg/L and approximately 10% of the aquifer has concentrations exceeding 5 mg/L (DOE 1998).

Nitrate-N and nitrite-N were tested for separately for the Groundwater Monitoring Project. Due to the fact that the groundwater baseline report listed nitrogen levels as nitrate+nitrite-N, nitrate-N and nitrite-N results from the GMP have been combined for a more accurate comparison between the GMP and the Baseline. The mean concentration of nitrate+nitrite-N in the reclaimed water sampled for the GMP was 3.37 mg/L. The mean concentration of nitrate+nitrite-N in groundwater (City well #2 and six monitoring wells) sampled for the GMP was 3.23 mg/L.

3.1.2 Total Dissolved Solids (TDS)

Baseline levels represent relatively low concentrations for groundwater and are probably a function of rapid groundwater movement in the Yelm area and the proximity to recharge sources (DOE 1998). The mean concentration for the Baseline report was 110 mg/L.

The mean concentration level for TDS in the reclaimed water was 302 mg/L, which is higher than that in the groundwater. The mean concentration level of TDS in the groundwater was 125 mg/L.

3.1.3 Chloride

Chloride is considered a good tracer in groundwater because it is readily soluble in water and does not absorb to soil particles. It is naturally occurring, but is also present in human and animal wastes. The mean concentration in the Baseline report was 4.9 mg/L.

Sampling of the reclaimed water for chloride resulted in a mean concentration level of 59.8 mg/L. Sampling of the groundwater, as part of the GMP, resulted in a mean concentration level of 19.3 mg/L.

3.1.4 Fecal Coliform Bacteria

Fecal coliform bacteria were not detected in any of the Baseline samples during the study period. The presence of fecal coliform bacteria in groundwater usually indicates proximity to a potential contaminant source area (DOE 1998). The presence of fecal coliform bacteria can also indicate the presence of groundwater under the influence of surface water.

While no fecal coliform bacteria were detected in the City's reclaimed water, fecal coliform bacteria were detected in all seven wells during at least one sampling event. Fecal coliform bacteria were detected during two sampling events in Monitoring Well #1. Fecal coliform bacteria counts ranged from 1 CFU/100mL to 34 CFU/100mL with the majority of fecal coliform bacteria detection occurring during the 7th quarter of testing (10/22/2003). A large storm event occurred during this quarter of testing. Fecal coliform bacteria were not present at any of the wells during repeat testing (subsequent quarter).

3.1.5 Ammonia-N

The test methods (EPA 350.3) for ammonia-N for the Baseline study and the GMP convert all NH_4^+ to $\text{NH}_{3(\text{aq})}$ and report the results as $\text{NH}_3\text{-N}$. Based on chemical equilibrium equations for the conditions in groundwater at Yelm, the predominate form of ammonia in aqueous solution is NH_4^+ . This means that the number of NH_4^+ ions in solution in the groundwater outnumber the $\text{NH}_{3(\text{aq})}$ molecules by orders of magnitude. Therefore, the results in the Baseline study were reported as NH_4^+ (ammonium-N) concentrations. The ammonia results for the GMP are also dominated by NH_4^+ even though the results were reported by the laboratory as $\text{NH}_3\text{-N}$ (ammonia-N) (Erickson 2004a). Therefore, the results from both studies can be directly compared (Erickson, per. comm. 2004b).

Ammonium-N was detected in two wells for one sampling event per well in the Baseline report. Both detections, 0.014 and 0.015 mg/L, were only slightly above the method detection limit (0.010 mg/L). Ammonium is an indicator of animal and human waste loading. Ammonium-N does not readily move through groundwater, so its presence in groundwater usually indicates proximity to a source area (DOE 1998).

Ammonia-N is the most common form of nitrogen in effluent from biological treatment. It is toxic to fish at relatively low concentrations and can exert a significant oxygen demand.

Ammonia-N was not detected during sampling of the reclaimed water. Sampling of the groundwater for ammonia-N, as part of the GMP, resulted in a mean concentration level of 0.13 mg/L.

4.0 Constructed Treatment Wetlands

In addition to the five (5) analytes sampled for comparison to the Baseline, twenty-four (24) other analytes and four (4) parameters were sampled for as part of the GMP. Table 4.1 lists all of the analytes and parameters sampled for as part of the GMP. Results from sampling of reclaimed water can be compared to the results from sampling of the constructed treatment wetlands and to the groundwater.

Sampling results of reclaimed water did not vary significantly from quarter to quarter. This is due to the consistent reliable treatment capability of the Reclamation Facility. Results from sampling of the reclaimed water serve as a concentration level baseline for analytes sampled for within the GMP. By comparing concentration levels within the reclaimed water to concentration levels within the CTWs and the surrounding groundwater, the ability of CTWs to provide effective additional treatment to the reclaimed water prior to recharge to the aquifer can be determined.

The intent of the CTW treatment chain is to provide additional polishing of the Class A reclaimed water prior to discharge to the City's aquifer. Reclaimed water, which is produced at the reclamation facility, enters the treatment chain via the inflow structure (at an average rate of 50,000 gallons per day), where it is conveyed into Wetland Cell #1, which is a surface flow wetland. From Wetland Cell #1, the water flows into a fish pond, then into Wetland Cell #2. Wetland Cell #2 is a subsurface flow wetland. The water is then conveyed into Wetland Cell #3, which is a surface flow wetland, prior to being discharged into the aquifer via RIBs (Figure 1.2).

Table 4.1 also details the results of testing for the GMP. For each analyte sampled for, and each parameter measured, the minimum level detected, the maximum level detected, and the sample mean is listed. Results are listed for sampling of the reclaimed water, CTWs, and for the groundwater, showing the water quality trend as reclaimed water goes from the reclamation facility, through the CTW treatment chain, and finally into the aquifer.

Analysis of the seasonal variation of analyte concentration levels may provide insight into the processes occurring within the CTW chain. Table C.2 (Appendix C) details concentration levels for nitrate-nitrite-N, ammonia-N, total dissolved solids, dissolved organic carbon, iron, manganese, fecal coliform bacteria, and chloride.

Water within the CTWs is not regulated under state drinking water standards and is not required to meet primary and secondary MCLs. Please refer to *Section 5.0 Summary Discussion* for a discussion on where water is required to meet the primary and secondary MCLs.

Table 4.1: Groundwater Monitoring Project Testing Results

Analyte	Class A Reclaimed Water	Constructed Treatment Wetlands			Groundwater		
		Min	Max	Mean	Min	Max	Mean
Chloride (mg/L)	59.8	5	111	67.1	3	62	19.3
Ammonia-N (mg/L)	ND ^a	0.08	5.4	0.82	0.03	0.56	0.13
Nitrate-N	3.37	0.4	12.8	3.5	1.0	7.4	3.23
Nitrite-N	ND	0.01	0.07	0.028	0.01	0.02	0.013
Total Dissolved Solids (mg/L)	302	220	392	300	54	315	125
Biochemical Oxygen Demand 5-day (mg/L)	ND	2	9	4.5	2	5	3.5
Bromide (mg/L)	0.2	0.1 ^b	0.1	0.1	0.1	0.2	0.15
Dissolve Organic Carbon (mg/L)	7.7	7	25	12.4	2	25 ^c	7.62
Fluoride (mg/L)	ND	0.02	0.19	0.052	0.01	0.06	0.034
Sulfate (mg/L)	27.3	0.01	36	24.4	1.0	26.0	8.64
Surfactants (mg/L)	0.09	0.028	0.35	0.159	0.03	0.07	0.047
Boron (µg/L)	210	0.4	550	314	0.02	280	81.7
Chromium (µg/L)	ND	8	12	9.67	8	13	10.5
Copper (µg/L)	23.0	6	36	18.3	0.007	60	21.99
Iron (µg/L)	48.0	29	600	171	0.16	5400	442.7
Silver (µg/L)	ND	7.0	10.0	7.78	9 ^b	9	9
Manganese (µg/L)	70	2	280	70.6	0.023	7900	297.3
Lead (µg/L)	ND	ND	ND	ND	1	2	1.67
Zinc (µg/L)	46	6	64	30.5	0.28	47	12.75
Total Trihalomethanes (TTHM) (µg/L)	32.0	1	85	13.02	1 ^b	1	1
Fecal coliform bacteria	ND	2	2000	249	1	34	5
Fecal Streptococci	4	6	4000	436	1	1400	122
Total Kjeldahl Nitrogen (TKN) (mg/L)	0.95	1.1	10	3.3	1.1	2.8	1.7
NDMA	ND	ND	ND	ND	ND	ND	ND
Caffeine	ND	ND	ND	ND	ND	ND	ND
Mercury (µg/L)	ND	ND	ND	ND	ND	ND	ND
Cadmium (µg/L)	ND	ND	ND	ND	ND	ND	ND
Arsenic (µg/L)	ND	ND	ND	ND	ND	ND	ND
Nickel (µg/L)	ND	16	19	17.5	ND	ND	ND
Temperature ^d (°C)	13.05	5.2	22.7	16.7	8.8	18.9	12.68
pH ^d	7.4	6.87	9.46	6.57	6.05	7.38	6.54
Conductivity ^d (µmhos/cm)	533.5	416	605	533	112	467	212
Dissolved Oxygen ^d (mg/L)	11.18	0.32	14.45	6.63	3.66	10.62	7.41

a) ND = analyte non-detectable.

b) Single occurrence.

c) Outlier value of 913 mg/L removed from data range (sample occurred during fifth quarter at Monitoring Well #1).

d) Parameters; these four parameters were measured during analyte sampling. Parameters are measurable factors that help define the sampled medium, in this case water, and are useful when comparing analyte levels.

4.1 Constructed Treatment Wetlands

Some of the analytes detected during the eight quarters of testing are not easily described in the same format as the rest of the analytes. Some analytes (nickel, chromium, manganese, and dissolved organic carbon) were detected only once or twice during sampling, while one parameter (temperature) exhibited temporal trends that were

not apparent in Table 4.1. Below is a discussion of those analytes and parameters that do not follow the normal data trends.

4.1.1 Nickel

Nickel was detected two times in the CTWs during the sampling rounds. During the 2nd quarter, nickel was recorded at 16 µg/L at Wetland Cell #1. Nickel was also detected at Wetland Cell #3 with a level of 19 µg/L.

4.1.2 Temperature

Temperature levels within the CTWs varied depending on the ambient air temperature. Temperature levels during the cooler months (November through April) averaged 6.62 °C (43.9 °F) while during the warmer months (May through October), temperature levels averaged 19.4 °C (66.9 °F).

On average, temperature levels within the groundwater were lower during the cooler winter months and higher during the warmer summer months. The mean temperature during the cooler months was 10.49 °C (50.9 °F), while the mean temperature during the warmer months was 14.61 °C (58.3 °F).

4.1.3 Chromium

A detectable level of Chromium was measured in three CTW samples over the course of two sampling events with a mean of 9.67 mg/L. Chromium was detected once during the third quarter at Wetland Cell #2 (subsurface flow wetland) with a level of 8 µg/L. Chromium was also detected at two different locations during the fourth quarter; once with a level of 12 µg/L at the Inflow Structure and once with a level of 9 µg/L at the Fish Pond.

Chromium was detected in the groundwater during two separate quarterly sampling events at two different locations. Chromium was detected at Monitoring Well #1 during the 2nd quarter with a value of 8 µg/L. Chromium was also detected during the 4th quarter at City well #2 with a concentration of 13 µg/L.

4.1.4 Manganese

The mean concentration level of manganese in the reclaimed water was 70 µg/L. The mean concentration level in the CTWs was 70.6 µg/L, with a maximum concentration level of 280 µg/L recorded at the fish pond. Manganese levels were greatest during the 3rd quarter and 6th quarter of testing in the fish pond. Manganese levels remained elevated in subsequent portions of the treatment chain.

Manganese concentration levels in the groundwater varied greatly among the wells tested. Monitoring Well #6 experienced the highest detection levels with a mean concentration of 1937 µg/L, while Monitoring Well #1 had the second highest detection levels with a mean of 71.62 µg/L. The remaining wells sampled had a mean of 14.4 µg/L. Please refer to *Section 5.2.3* for a discussion on potential reasons for these elevated levels.

4.1.5 Dissolved Organic Carbon

A single sample level of 913 mg/L was detected in the groundwater during the 5th quarter at Monitoring Well #1. The next highest level detected was 25 mg/L. The sample level

of 913 mg/L is being considered a statistical outlier and has been excluded from data range.

5.0 Summary Discussion

Analyte levels in the Baseline, reclaimed water, and groundwater for nitrate-nitrite-N, TDS, chloride, fecal coliform bacteria, and ammonia-N are detailed in Section 3.0 of this report. The effects of using Class A reclaimed water for aquifer recharge are summarized in *Section 5.1, Baseline Comparison*.

Analyte and parameter levels in the reclaimed water, when compared to levels in the CTWs and within the groundwater (sampled at City well #2 and the six monitoring wells) demonstrate the affect of using CTWs to provide Class A reclaimed water secondary polishing. In addition, comparison of analyte and parameter levels from the CTWs inflow to levels from the CTW prior to discharge to the RIBs demonstrates the treatment capacity of the CTW treatment chain. These comparisons are summarized in *Section 5.2, Constructed Treatment Wetlands*.

A pilot reverse osmosis unit was also tested, to demonstrate the treatment capacity of reverse osmosis on Class A reclaimed water (*Section 5.4, Reverse Osmosis Treatment*).

Primary and secondary MCLs were discussed within the Introduction (*Section 1.0*) of this report. These MCLs only apply to water regulated under state drinking water standards. Due to the fact that the City of Yelm currently utilizes a treatment system for its potable water, drinking water quality standards apply to the water withdrawn from the aquifer after receiving the required treatment. Therefore, none of the groundwater samples are regulated under state drinking water standards. In addition, water sampled within the CTWs is not required to meet state drinking water standards. However, comparison of sampling results to the state drinking water standards has been included to show, based on these results, that the recharge of the aquifer with Class A reclaimed water is not affecting the water quality of the aquifer, which is the City's only current source of drinking water. However, it should be noted that groundwater, tested within the monitoring wells, is required to meet the water quality standards detailed in the City of Yelm's NPDES permit for the reclamation facility.

5.1 Baseline Comparison

In the report titled *Yelm Groundwater Baseline Sampling*, sampling for five analytes was conducted to determine the extent of nitrate contamination to the aquifer and to establish a "baseline" to compare future water quality tests. Testing results for nitrate+nitrite-N, TDS, chloride, fecal coliform bacteria, and ammonium-N are detailed in that report. The City of Yelm Groundwater Monitoring Project included sampling these same analytes in the reclaimed water and in the localized aquifer at Cochrane Park. The groundwater sampling was also conducted at the City of Yelm's drinking water well (City well), down-gradient from the infiltration basins.

The analyte concentration levels in the GMP were compared to the Baseline report in an effort to determine if any impacts resulting from groundwater recharge using reclaimed water could be detected. The results of the current testing and the Baseline test results are captured in Table 5.1.

Table 5.1: Groundwater Water Quality

Analyte	Baseline	Reclaimed Water	Groundwater Monitoring Project	Increase/degradation of Water Quality
Nitrate-Nitrite-N (mg/L)	3.2	3.37	3.23	No change
Total Dissolved Solids (mg/L)	110	302	125	Degradation
Chloride (mg/L)	4.9	59.8	19.3	Degradation
Fecal coliform bacteria	ND	ND	6 per 100mls	Degradation
Ammonia (mg/L)	0.0145	ND ^a	0.13	Degradation

a) ND = analyte non-detectable

It can also be assumed that if an analyte was non-detectable in the reclaimed water, that any increases in the concentration level between the Baseline and the groundwater are probably not attributable to the reclaimed water.

Due to the easterly direction of flow within the aquifer below the sampling site for the GMP, the location of monitoring wells can be considered either up-gradient or down-gradient of the discharge location (RIBs). For the purposes of the GMP, Monitoring Well #1 is considered up-gradient of the discharge site, while Monitoring Wells #2 through #6 are considered down-gradient. Mounding from the RIBs may, however, be affecting water quality in Monitoring Well #1. Not enough information was collected for the GMP to conclusively determine if mounding is occurring and/or if there is any effect on the water quality of Monitoring Well #1. A supplemental analysis approach, if Monitoring Well #1 is determined to provide representative samples of up-gradient water quality, would be to compare samples from Monitoring Well #1 (up-gradient) to down-gradient samples. This approach is not being considered for the GMP because of the fact that it is not known whether mounding is occurring or if Monitoring Well #1 represents up-gradient water quality. The sampling protocol for this report follows the QAPP, which indicates that results from sampling for the GMP be compared to the Baseline Report.

5.1.1 Nitrate+Nitrite-N

Nitrate+nitrite-N levels in the groundwater remained unchanged between the Baseline report and the GMP. It appears the concentration levels of nitrate+nitrite-N in the reclaimed water do not have any detectable impact on the groundwater.

The Drinking Water Standard (MCL) for nitrate is 10 mg/L for public water-supply systems (Chapter 246-290,-291 WAC). Only one well had a concentration exceeding the MCL in the Baseline report. This occurred only once during the sampling of the specific well, which had a mean concentration of 8.6 mg/L (DOE 1998). None of the wells sampled as part of the GMP exceeded the primary MCL.

5.1.2 Total Dissolved Solids (TDS)

The TDS levels measured in the reclaimed water are higher than that measured in the Baseline report. TDS levels did not change as the reclaimed water passed through the CTWs. TDS, as with chlorides, are not readily treated by wetland processes and cannot be effectively reduced. While there has been an increase in the concentration levels of TDS within the groundwater (as a sampling average at all of the monitoring locations), levels are significantly below the secondary MCL of 500 mg/L.

It was also observed that TDS levels were higher at the monitoring wells that are adjacent to the RIBs. TDS concentration levels for the City well had a mean of 85 mg/L, which is below the Baseline, indicating that the small increase in TDS levels is occurring only in the vicinity of the RIBs and that TDS is not migrating from the Recessional Outwash Aquifer to the Advance Outwash Aquifer. This is expected due to the aquitard which separates the two aquifers, restricting the direct movement of water between the two.

5.1.3 Chloride

Chlorine plays a large role in the disinfection of wastewater. A large portion of chlorine remains in solution as chloride and chloramines, while the rest is lost to the atmosphere as chlorine gas. Because of the low biological demand for chloride, chloride levels do not change through the treatment chain. Chlorides are not a by-product of wetland processes; however, increases in chloride concentration levels can occur due to evapotranspiration. Groundwater sampling in the GMP indicates that chloride levels have increased in comparison to the Baseline report. Due to the fact that chloride levels are higher within the reclaimed water, it is possible that this increase is related to recharge of the aquifer with reclaimed water. It should be noted that although chloride levels have increased in the groundwater, the concentration level of 19.3 mg/L is still significantly lower than the secondary MCL (250 mg/L).

5.1.4 Fecal Coliform Bacteria

Sampling of the reclaimed water did not indicate the presence of fecal coliform bacteria; therefore, it is reasonable to assume that changes in water quality between the Baseline and the GMP are not due to concentration levels in the reclaimed water. Fecal coliform bacteria levels did increase though the constructed treatment wetlands. It is assumed the increased levels of fecal coliform bacteria in the groundwater have resulted from the degradation through the CTW process. The current primary MCL for fecal coliform bacteria is 1 CFU/100mL.

5.1.5 Ammonia-N

The level of ammonia-N in the reclaimed water was non-detectable. Therefore, an increase in ammonia-N in the groundwater does not indicate that the discharge of reclaimed water is causing a degradation of water quality within the aquifer, but is most likely caused by the CTW process. Currently, no MCL has been established for ammonia-N.

5.2 Constructed Treatment Wetlands

In the QAPP, it is stated that if sampling results show that water quality decreases as the water travels through the treatment chain from the inflow structure to the RIBs, then the constructed treatment wetlands can be considered to be degrading the water quality of the reclaimed water before it is discharged into the aquifer. Comparison of analyte concentration levels in the reclaimed water with concentration levels in the CTW and in the groundwater will indicate the ability of CTWs to provide secondary polishing to Class A reclaimed water. While reclaimed water enters the CTW treatment chain at the inflow structure, concentration levels at the inflow structure will vary from those in the reclaimed water. This can be attributed to the fact that 40% of the water coming into the CTWs is being re-circulated from Cell #1 of the CTWs. Table 5.2 details analyte concentration levels for the reclaimed water and within the CTW Treatment Chain. Changes to parameter levels (temperature, pH, DO, and conductivity) are expected within the CTWs due to the natural biological processes that occur in wetlands.

Table 5.2: Constructed Treatment Wetlands Water Quality

Analyte	Reclaimed Water	Inflow Structure	RIB ^a	Ground water	Primary MCL	Secondary MCL
Chloride (mg/L)	59.8	61.58	66.22	19.3	-	250
Ammonia (mg/L)	ND ^b	1.8	0.18	0.13	-	-
Biochemical Oxygen Demand 5-day (mg/L)	ND	ND	5.17	3.5	-	-
Dissolved Organic Carbon (mg/L)	7.7	11.88	11.38	7.62	-	-
Fluoride (mg/L)	ND	0.05	0.04	0.034	4.0	2.0
Nitrate-N (mg/L)	3.37	5.79	2.06	3.23	10.0	-
Nitrite-N (mg/L)	ND	0.02	0.04	0.013	1.0	-
Surfactants (mg/L)	0.09	0.19	0.14	0.047	-	-
Sulfate (mg/L)	27.3	28.5	22.0	8.64	-	250
Total Dissolved Solids (mg/L)	302	300	297	125	-	500
Boron (µg/L)	210.1	322	295	81.7	-	-
Chromium (µg/L)	ND	12	ND	10.5	100	-
Copper (µg/L)	23.0	17.2	16.7	21.99	1300	-
Iron (µg/L)	48	126	177	442.7	-	300
Manganese (µg/L)	70	20.25	100	297.3	-	50
Nickel ^c (µg/L)	ND	16	19	ND	100	-
Zinc (µg/L)	46	39.75	19.83	12.75	-	5000
Total Trihalomethanes (µg/L)	32	41.54	1.33	1	100	-
Fecal coliform bacteria (CFU/100mL)	ND	ND	291	5	1	-
Fecal streptococcus (per 100mls)	4	3	570	122	-	-
Total Kjeldahl Nitrogen (mg/L)	0.95	4.45	1.85	1.7	-	-
Bromide ^d (mg/L)	0.2	0.1	ND	0.15	-	-
Silver (µg/L)	ND	8.33	ND	9	-	10
NDMA	ND	ND	ND	ND	-	-
Caffeine	ND	ND	ND	ND	-	-
Mercury (µg/L)	ND	ND	ND	ND	2	-
Lead (µg/L)	ND	ND	ND	1.67	15	-
Cadmium (µg/L)	ND	ND	ND	ND	5	-
Arsenic (µg/L)	ND	ND	ND	ND	50	-
Dissolved oxygen ^e (mg/L)	11.18	8.32	6.80	7.41	-	-
pH ^e	7.4	7.47	7.57	6.54	-	-
Conductivity ^e (µmhos/cm)	533.5	546	523	212	-	-
Temperature ^e ° C	13.05	13.85	13.5	12.68	-	-

a) Rapid Infiltration Basin.

b) ND = analyte non-detectable.

c) Nickel was only detected twice within the CTWs, once at the inflow structure (2nd quarter) and once prior to RIBs (3rd quarter).

d) A single detection during sampling occurred once at Inflow Structure.

e) Parameter.

While primary and secondary MCLs have been included for comparison, as stated above, water within the CTWs is not regulated under state drinking water standards. It should also be noted that CTWs, while an engineered form of treatment, are still utilizing biological systems. Treatment capacities of CTWs are attributed to the biological process occurring within the wetland system, including: nutrient uptake, photosynthesis, respiration, and the nitrogen cycle. Due to these varied biological processes, analyte

concentrations within the CTWs can also fluctuate greatly and elevated analyte levels are not uncommon.

Some of the analytes, which include: chromium, iron, manganese, nickel, and fecal coliform bacteria, were either not consistently detected during sampling or exhibited unexpected detection level. These analytes are discussed further below. In addition, some of the parameters sampled for, including: temperature, pH, and dissolved oxygen are also discussed in further detail below.

5.2.1 Chromium

Detectable levels of chromium were measured in three sampling instances within the CTWs. Chromium was detected once during the 3rd quarter at wetland cell #2 (subsurface flow wetland) with a level of 8 µg/L. Chromium was also detected at two different locations during the fourth quarter; once with a level of 12 µg/L at the inflow structure and once with a level of 9 µg/L at the fish pond. Chromium was non-detectable prior to the RIBs during all of the sampling quarters, indicating a possible increase in water quality. The primary MCL for chromium is 100 µg/L (0.1 mg/L), significantly higher than detected levels.

5.2.2 Iron

Sampling of the reclaimed water for iron resulted in a mean concentration level of 48 µg/L. The mean concentration level for iron at the inflow structure of the CTWs was 126 µg/L, rising to 177 µg/L prior to the RIBs. Sampling of the groundwater for iron resulted in a mean concentration level of 442.7 µg/L. The secondary MCL for iron is 300 µg/L. Additional testing is necessary to determine possible reasons for this elevated concentration level of iron within the local groundwater. It should be noted that the mean concentration level at the City well was 84.5 mg/L, significantly below the secondary MCL, indicating that any elevated iron levels are occurring only in close proximity to the CTWs.

5.2.3 Manganese

Manganese concentration levels in Monitoring Well #6 are extremely high. The average concentration of manganese in Class A reclaimed water was 70 ug/L, while the average concentration at the inflow structure was 20.25 ug/L. This shows that the increased levels of manganese must be occurring within the wetlands treatment chain.

Manganese is an essential element that is vital to photosynthesis. Manganese is used for respiration and nitrogen metabolism by plants and animals (Kadlec and Knight 1996). Wetland reduction of manganese concentrations has been studied at a variety of natural and constructed treatment wetlands. Manganese removal efficiency is 68 percent at inflow concentrations up to 100 ug/L, indicating that the CTWs should be reducing manganese levels rather than increasing them. Removal efficiency is reduced to 40 percent at inflow concentrations between 210 and 5250 ug/L. Inflow concentrations for the sampled treatment chain averaged 20.25 ug/L with a range between 3 ug/L and 40 ug/L.

Given the relative removal efficiencies of constructed treatment wetlands and the basic biological processes of wetland vegetation, it can be deduced that manganese is being either concentrated within the treatment chain or is being introduced by a source other than the inflow of Class A reclaimed water.

The highest concentrations of manganese were detected in Monitoring Well #6 which is the farthest monitoring well from the rapid infiltration basins. If manganese concentrations in the groundwater were being caused by discharge from the treatment chain into the groundwater, high manganese concentrations would be expected in those monitoring wells adjacent to the discharge basins (Monitoring Wells #2, #3, and #4). These three wells combined had an average manganese concentration of 17.17 ug/L. There is the possibility that one of the treatment cells has a leak in its impervious liner, causing localized manganese concentrations in Monitoring Well #6. If this was the case, elevated levels of other analytes would be expected in the same well. This has not been observed however. Therefore it is possible that manganese is being introduced to the groundwater via another source.

Discussion with City of Yelm staff has indicated that the feed used in the fish pond (for the fish) contains manganese. Manganese is a common ingredient in commercial fish food. It has also been observed that a large population of waterfowl, mostly mallards, use the constructed treatment wetlands as habitat. The local waterfowl population has been observed feeding on the fish food, prior to moving into the surrounding areas of the treatment cells. It is likely that the elevated levels of manganese are being caused by the waste product of waterfowl in the vicinity of both Monitoring Well #6 and #1. Due to the shallow aquifer in this area, it is possible that manganese is being introduced to the localized groundwater due to influence by surface water. This would also explain why manganese levels are lowest during the summer months, as this is when fish are most active and consuming a larger percentage of feed. In the colder months, fish are less active, leaving more feed for consumption by waterfowl populations.

Another possible reason for elevated manganese levels may be due to naturally occurring manganese present in glacial sediment. Elevated manganese levels could occur if manganese is being mobilized within the groundwater due to a change in redox (reduction-oxidation) potential. The low dissolved oxygen levels in the vicinity of Monitoring Well #2 suggest that this may be occurring (Erickson 2004c).

It should be noted that the mean concentration level of manganese at the City well was 8.5 µg/L, significantly below the secondary MCL (50 µg/L), indicating that any elevated manganese levels are occurring only in close proximity to the CTWs.

5.2.4 Nickel

Nickel was detected two times during testing. During the 2nd quarter, nickel was recorded at 16 µg/L at Wetland Cell #1. Nickel was also detected at Wetland Cell #3 with a level of 19 µg/L. The fact that nickel occurred at only two sample locations indicates that further testing over a longer duration will need to be conducted to achieve more conclusive results. While the primary MCL for nickel is 100 µg/L (0.1 mg/L), and water within the CTW is not regulated under state drinking water standards, concentration levels were significantly lower than the MCL.

5.2.5 Fecal Coliform Bacteria

Fecal coliform bacteria levels at the inflow structure were zero or non-detectable. Fecal coliform bacteria levels increased to a mean of 276 CFU/100mL at the fish pond and 291 CFU/100mL prior to the RIBs. It should be observed that the fecal coliform bacteria levels dropped at the sub-surface flow wetland to 56 CFU/100mL. Overall, the CTW treatment chain results in higher concentrations of fecal coliform bacteria as the water flows through the wetland cells. This is most likely due to the presence of water fowl and other birds as well as the fish pond. However, it appears that the sub-surface flow

(SSF) wetland is effective in reducing fecal coliform bacteria counts and does improve the water quality. While the primary MCL is 1 CFU/100mL, water within the CTWs is not regulated under state drinking water standards.

5.2.6 Temperature

Temperature levels ranged from 5.2 °C (42 °F) to 22.7 °C (73 °F) with a mean of 16.7 °C (62.06 °F). Temperature levels varied depending on the ambient air temperature. Temperature levels did not fluctuate significantly through the treatment chain, indicating neither an increase nor degradation of water quality. Currently, there is no MCL set for temperature.

5.2.7 pH

Acidity levels ranged from a pH of 6.87 to 9.46 with a mean pH of 7.66. Changes in pH through the treatment chain were fairly consistent from quarter to quarter with a few exceptions. The pH levels fluctuated from 7.47 at the Inflow Structure to 7.57 prior to the RIBs. pH levels were the highest in the fish pond. This pH is higher than in the groundwater. Currently, there is no MCL set for pH.

5.2.8 Dissolved Oxygen

Dissolved oxygen (DO) levels ranged from 0.32 mg/L to 14.45 mg/L with a mean of 6.63 mg/L. The mean concentration of DO at the inflow structure was 8.3 mg/L, dropping to 6.6 mg/L at wetland cell #1, increasing to 7.9 mg/L at the fish pond, decreasing to 3.45 at wetland cell #2 (subsurface flow), and finally increasing to 6.8 mg/L prior to the RIB's. This fluctuation has not been interpreted as an increase or degradation of water quality. Currently, there is no MCL set for dissolved oxygen.

5.2.9 Non-Detectable Analytes

A number of analytes that were tested for during monitoring did not register at or above detectable levels. This indicates that the treatment chain is not causing a degradation of water quality for these analytes. However, there is insufficient data to determine if the CTW treatment chain would provide additional treatment. The following analytes were not detected during any of the sampling events:

- NDMA (n-nitrosodimethylamine)
- Caffeine
- Mercury
- Lead
- Cadmium
- Arsenic

5.3 Seasonal Variation in Field Parameters

As discussed previously, four field parameters were measured and analyzed at all of the sampling locations. While changes in field parameters do not always indicate a degradation or improvement in water quality, they should be considered when analyzing other analytes sampled. In depth analysis of measured field parameters was not completed as part of the GMP; however, analysis of the seasonal variation in the measured field parameters may provide insight into dissolution and mobility of other analytes sampled for the GMP. Table 5.3 details variations in measured field parameters at each sampling location over the course of sampling for the GMP. As discussed previously, additional analytes are included in Table C.2, Appendix C, which details seasonal variations in these selected analytes.

Table 5.3: Seasonal Variations in Field Parameters

Sample Quarter	CW ^a	MW6 ^b	MW1	MW2	MW3	MW4	MW5	IS ^c	CS1 ^d	CS2	CS3	CS4
pH												
1 st Quarter	6.38	6.22	6.37	6.47	6.05	6.64	6.34	7.5	8.69	7.78	7.48	8.2
2 nd Quarter	6.46	6.37	6.52	6.51	6.17	6.67	6.38	7.53	7.55	7.91	7.28	7.96
3 rd Quarter	6.38	7.38	6.64	6.29	6.43	6.58	6.26	7.25	6.87	7.7	7.09	7.08
4 th Quarter	6.67	7.33	6.94	6.29	6.56	6.9	6.52	7.43	7.56	8.15	7.49	7.45
5 th Quarter	6.5	6.35	6.67	6.33	6.22	6.85	6.49	7.39	7.44	9.4	7.21	7.93
6 th Quarter	6.46	6.14	6.5	6.53	6.14	6.64	6.37	7.39	7.09	7.74	7.04	7.27
7 th Quarter	6.53	7.31	6.65	6.48	6.5	6.87	6.5	7.64	7.2	7.83	7.2	7.24
8 th Quarter	6.62	6.18	6.91	6.6	6.35	6.88	6.41	7.59	7.67	8.02	7.62	7.72
Temperature (°C)												
1 st Quarter	10.8	10.5	10.6	11.0	11.0	9.1	10.5	6.1	6.2	6.0	5.8	6.0
2 nd Quarter	12.8	14.7	12.9	12.9	13.7	14.5	15.6	20.8	22.2	22.2	22.7	22.3
3 rd Quarter	11.2	12.3	12.3	12.5	17.4	12.4	15.9	20.1	17.5	20.4	18.2	17.5
4 th Quarter	10.5	10.1	10.4	10.4	11.9	12.1	10.6	9.0	7.9	6.9	7.1	7.2
5 th Quarter	9.7	8.8	8.9	9.4	11.2	10.1	10.0	7.9	8.1	7.3	6.2	6.2
6 th Quarter	16.7	15.2	16.8	16.0	16.7	18.9	18.7	19.0	20.5	21.3	22.0	21.5
7 th Quarter	13.7	15.1	12.7	15.1	15.6	16.7	15.1	18.7	18.8	19.4	18.9	19.0
8 th Quarter	9.4	10.5	9.1	10.6	12.2	12.5	11.7	6.8	5.4	5.2	5.6	5.4
Dissolved Oxygen (mg/L)												
1 st Quarter	7.59	5.94	7.43	8.23	4.97	7.17	8.02	7.78	11.37	9.03	4.45	7.78
2 nd Quarter	4.86	5.37	6.39	6.95	5.39	4.65	5.99	6.43	6.94	5.23	1.77	7.7
3 rd Quarter	4.2	3.66	7.83	6.47	5.33	5.44	6.96	7.81	0.91	5.33	7.09	7.08
4 th Quarter	8.28	4.76	8.26	8.61	7.24	7.36	8.9	10.58	10.43	10.67	4.52	6.02
5 th Quarter	9.61	9.26	10.52	9.86	9.08	8.82	9.43	10.66	11.13	14.45	3.08	11.87
6 th Quarter	9.02	7.12	8.26	7.76	9.0	7.52	9.47	7.11	5.24	6.13	1.7	9.88
7 th Quarter	9.64	5.0	8.41	7.27	6.25	7.06	7.86	7.28	2.6	4.71	0.32	4.15
8 th Quarter	4.48	7.1	9.46	9.6	10.62	10.44	10.38	9.82	8.65	9.82	5.72	4.38
Conductivity (µmhos/cm)												
1 st Quarter	136	167	134	113	336	357	163	604	529	595	521	501
2 nd Quarter	113	157	120	115	287	323	161	529	513	529	530	517
3 rd Quarter	112	122	134	152	368	332	156	560	585	597	593	601
4 th Quarter	133	128	143	195	360	467	177	546	546	526	533	525
5 th Quarter	137	186	129	228	398	286	156	549	537	461	451	427
6 th Quarter	137	163	127	288	306	247	187	531	539	526	515	576
7 th Quarter	137	134	137	265	425	254	208	552	571	591	594	605
8 th Quarter	145	172	136	340	404	249	250	539	534	495	416	472

- a) CW = City well
- b) MWx = Monitoring Well #x
- c) IS = Inflow Structure
- d) CSx = Control Structure #x

5.4 Reverse Osmosis Treatment

A pilot reverse osmosis (RO) unit was installed as part of the original construction of the City of Yelm Water Reclamation Facility. The RO unit, an EPRO-250, is made by Environmental Products USA Inc. and can treat up to 250 gallons per day (gpd) of water. An RO system uses a semi-permeable membrane to separate a high percentage of

dissolved molecules. Only certain molecules, such as water, can pass through the membrane. The RO unit uses pressure to force water through the membrane (against natural equilibrium, hence "reverse" osmosis) filtering out dissolved solids, organic matter, bacterium and other analytes from the flow, producing a stream of treated water. The pilot RO unit was tested and the results were compared to analyte levels in the Class A reclaimed water (Table 5.4).

Table 5.4: Treatment Capacity of Reverse Osmosis Unit

<i>Analyte (avg.)</i>	<i>Reclaimed Water</i>	<i>Reverse Osmosis</i>	<i>Primary MCL</i>	<i>Secondary MCL</i>
Chloride (mg/L)	59.8	3.5	-	250
Dissolved Organic Carbon (mg/L)	7.7	4	-	-
Nitrate+Nitrite-N (mg/L)	3.37	0.1	-	-
Total Dissolved Solids (mg/L)	302	57	-	500
Copper (µg/L)	23.0	18.5	1300	-
Iron (µg/L)	48	ND ^a	-	300
Manganese (µg/L)	70	18	-	50
Zinc (mg/L)	46	9	-	5.0
Total Trihalomethanes (µg/L)	32.0	9.3	100	-
Temperature ^b (°C)	13.05	16.7	-	-
pH ^b	7.4	6.6	-	-
Conductivity ^b (µmhos/cm)	533.5	14.2	-	700
Dissolved Oxygen ^b (mg/L)	11.18	8.64	-	-
Boron (mg/L)	210.1	104.7	-	-
Bromide (mg/L)	0.2	ND	-	-
Fecal Streptococcus	4	ND	1	-
Total Kjeldahl Nitrogen (TKN) (mg/L)	0.95	ND	-	-
Ammonia	ND	ND	-	-
Biochemical Oxygen Demand 5-day (mg/L)	ND	ND	-	-
Fluoride (mg/L)	ND	ND	4.0	2.0
Nitrite (mg/L)	ND	ND	1.0	-
Arsenic (mg/L)	ND	ND	0.05	-
Cadmium (mg/L)	ND	ND	0.005	-
Chromium (mg/L)	ND	ND	0.1	-
Lead (mg/L)	ND	ND	0.015	-
Mercury (mg/L)	ND	ND	0.002	-
Nickel (mg/L)	ND	ND	0.1	-
Silver (mg/L)	ND	ND	-	0.1
NDMA (µg/L)	ND	ND	-	-
Caffeine (µg/L)	ND	ND	-	-
Fecal coliform bacteria (CFU/100mL)	ND	ND	1	-

a) ND =analyte non-detectable.

b) Parameter.

Testing of the treated water from the RO unit indicates an increased water quality through the use of the reverse osmosis treatment system. RO treatment will produce concentrations well below State Drinking Water Standards MCL levels.

6.0 Conclusion

6.1 Baseline Conclusion

When looking at the comparison between the Baseline report and the GMP (Table 5.1), it is seen that the increase in chloride and TDS concentration levels can potentially be attributed to the discharge of Class A reclaimed water in the City of Yelm's aquifer; however, chloride and TDS levels are still significantly lower than the secondary MCLs. This conclusion is based on the fact that while four of the five Baseline analytes sampled during the GMP actually increased, only chloride and TDS showed a higher concentration level within the reclaimed water. Increases in both ammonia-N and in fecal coliform bacteria can be attributed to the CTWs. For both of these analytes, concentration levels increased prior to discharge to the RIBs.

The recharge with Class A reclaimed water has had no effect on nitrate levels within the aquifer, having remained the same at 3.2 mg/L in both the Baseline report and in the results from the sampling for the GMP. The Baseline report was completed in an effort to define the extent of nitrate contamination within the aquifer before the water reuse project started. Because nitrate contamination had been previously identified in groundwater east of Yelm (Tayne, 1996) the City wanted to ensure that the use of Class A reclaimed water to recharge the aquifer would not cause additional nitrate contamination within the aquifer. Sampling of groundwater at City well #2 and the six monitoring wells has shown that nitrate levels within the groundwater have not changed, indicating that recharge of the aquifer with Class A reclaimed water is not causing an increase in nitrate contamination.

As discussed in *Section 2.0 Study Area Hydrogeology*, there are two aquifers within the study area, the shallow Recessional Outwash Aquifer and the deeper Advanced Outwash Aquifer. These two aquifers are separated by an aquitard composed of Vashon Till, which restrict the direct movement of water between these two aquifers (Appendix F). The presence of the aquitard also limits the movement of analytes within the Recessional Outwash Aquifer into the Advance Outwash Aquifer. Therefore, it can be concluded that this is why the water quality of City well #2 is not being effected by the recharge of groundwater with Class A reclaimed water.

6.2 Constructed Treatment Wetland Conclusion

Secondary polishing of Class A reclaimed water with constructed treatment wetlands in some cases improves the water quality, while in other cases, contributes to the degradation of the water quality prior to discharge to the aquifer. Of the tested analytes (excluding temperature, pH, DO, and conductivity), seven (7) showed increased concentration levels from the inflow structure to the RIBs, indicating an overall degradation in water quality caused by the treatment chain. Of the tested analytes, sixteen (16) showed decreased concentration levels from the inflow structure to the RIBs, indicating an overall increase in water quality caused by the treatment chain.

Seven (7) of the tested analytes did not show any changes in concentration levels (including non-detected analytes), indicating either the tests are inconclusive or the CTWs are ineffective in treating those constituents.

It can be concluded that the CTWs, rather than the reclaimed water, are contributing to changes in the aquifer related to analytes other than TDS and chloride. As discussed previously, this can be attributed to the elevated analyte concentration levels that occur with CTWs due to wetland biological processes. Many of analytes sampled for can have concentration levels that fluctuate widely within the natural system. Because of these fluctuations, elevated analyte levels can be expected.

One trend that was observed is that different parts of the treatment chain provided better treatment for certain analytes, while other portions of the treatment chain caused degradation to water quality. Specifically, the sub-surface flow component of the CTW treatment chain appears to be providing the highest level of treatment. The fish pond component of the CTW treatment chain appears to be causing the highest levels of increased analyte concentrations. These trends should be further evaluated to help determine future treatment chain design for better overall reclaimed water quality polishing.

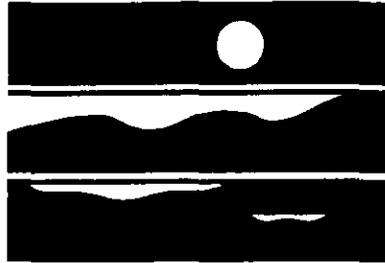
Analysis of data collected for this GMP has shown the affects of using Constructed Treatment Wetlands on Class A reclaimed water. While the sub-surface flow component of the CWT treatment chain has been shown to be providing treatment, the majority of analytes have higher levels coming out of the CTWs than were detected within the reclaimed water. This indicates that further analysis of the existing data, collected as part of this GMP, should support the feasibility of using RIBs for direct recharge of the aquifer with Class A reclaimed water.

6.3 Reverse Osmosis Conclusion

Testing of the treated water from the RO unit indicates an increase in water quality through the use of the reverse osmosis treatment system. It can also be concluded that the RO unit was effective at reducing chloride and TDS levels within the reclaimed water. RO treatment will produce concentrations significantly below State Drinking Water Standards MCL levels.

7.0 References

- Driscoll, F.G. 1986. *Groundwater and Well, second edition*. Johnson Division, St. Paul, Minnesota.
- Drost, B.W., G.L. Turney, N.P. Dion, and M.A. Jones. 1998. *Hydrology and Quality of Groundwater in Northern Thurston County, Washington*. US Geological Survey, Water Resource Investigations Report 92-4109 [Revised]. Prepared in cooperation with Thurston County Department of Health.
- Erickson, Dennis 1998. *Yelm Groundwater Baseline Sampling*. Washington State Department of Ecology Publication # 98-30.
- Erickson, Dennis September 28, 2004a. Technical Memorandum to Cindy James, Grant Administrator. Washington State Department of Ecology.
- Erickson, Dennis October 5, 2004b. Personal communication with Patrick Skillings, Staff Scientist, Skillings-Connolly.
- Erickson, Dennis December 15, 2004c. Technical Memorandum to Cindy James, Grant Administrator. Washington State Department of Ecology.
- Kadlec, R.H., R. Knight. 1996. *Treatment Wetlands*. Lewis Publishers, CRC Press, Inc.
- Moshiri, G.A. 1993. *Constructed Wetlands for Water Quality Improvement*. Lewis Publishers, CRC Press, Inc.
- Robinson-Noble. 2001. *draft City of Yelm Wellhead Protection Plan*. Prepared by Krista Hitz and Burt Clothier.
- Skillings-Connolly, Inc. 1995. *City of Yelm Water Reuse Facilities Plan. Volumes I and II*.
- Skillings-Connolly, Inc, 2001. *Quality Assurance Project Plan for the City of Yelm Groundwater Monitoring Project*.
- Tayne, T., 1996. Letter to Denis Erickson, Washington State Department of Ecology, March 13, 1996, and accompanying well logs and data sheets.
- Washington State Administrative Code, Chapters 246-290 and 291. Washington State Department of Health, 1994. Group A and B Public Water Systems, July 1994.
- Washington State Department of Ecology, 1999. *National Pollutant Discharge Elimination System and State Reclaimed Water Discharge Permit No. WA0040762*. NPDES permit for the City of Yelm Reclamation Facility.



WASHINGTON STATE
DEPARTMENT OF
E C O L O G Y

Yelm Groundwater Baseline Sampling

by
Denis Erickson

Environmental Investigations and Laboratory Services Program
Olympia, Washington 98504-7710

January 1998

Water Body No. WA-11-1010GW

Publication No. 98-301
printed on recycled paper

Table of Contents

	<u>Page</u>
List of Figures and Tables.....	ii
Summary.....	iii
Recommendations.....	iv
Acknowledgments.....	v
Introduction.....	1
Site Description.....	3
Location.....	3
Regional Geology and Hydrogeology.....	3
Methods.....	5
Monitoring Network.....	5
Hydrogeologic Characterization.....	5
Results I. Study Area Hydrogeology.....	7
General.....	7
Recessional Outwash Aquifer.....	7
Upper Aquitard.....	7
Advance Outwash Aquifer.....	10
Lower Aquitard.....	10
Deep Aquifer.....	11
Groundwater Velocity.....	14
Results II. Water Quality.....	17
Quality Assurance.....	17
Nitrate+Nitrite-N.....	17
Total Dissolved Solids (TDS).....	21
Chloride.....	21
Ammonium-N.....	21
Fecal Coliform Bacteria.....	21
References.....	25
Appendices	

List of Figures and Tables

	<u>Page</u>
Figures	
Figure 1. Well Locations.....	4
Figure 2. South-North Hydrogeologic Profile	8
Figure 3. East-West Hydrogeologic Profile.....	9
Figure 4. Selected Well Hydrographs, Advance Outwash Aquifer, April 1996.....	12
Figure 5. Potentiometric Map, Advance Outwash Aquifer, April 1996	13
Figure 6. Areas with Elevated Nitrate+Nitrite-N Concentrations.....	19
Figure 7. Nitrate+Nitrite-N Concentrations for Selected Wells.....	20
Tables	
Table 1. Summary of Hydraulic Conductivity Results.....	14
Table 2. Nitrate+Nitrite-N Results, April 1996 through February 1997	18

Summary

Twenty-three private water-supply wells were sampled bimonthly for one year to define nitrate concentrations in groundwater in a seven square mile area east of the city of Yelm. Twenty-two of the sampled wells tapped the principal aquifer, the Advance Outwash Aquifer that occurs at a depth of 70 to 100 feet below the ground surface. One sampled well tapped the uppermost aquifer that is little used for drinking water because it is considered susceptible to contamination from surface activities. Well samples were tested for nitrate+nitrite-N, chloride, total dissolved solids, ammonium and fecal coliform. Nitrate has migrated to the Advance Outwash Aquifer. Areas where mean nitrate+nitrite-N concentrations exceed 3 mg/L and 5 mg/L are identified. Concentrations are not at alarming levels but are high enough that additional nitrogen loading should be prevented. Potential nitrate sources upgradient of the study area are identified. Wells should be resampled in a few years to ensure that conditions have not deteriorated. Long-term monitoring is recommended at Crystal Springs, a natural spring located one mile north of Yelm. Water quality samples at Crystal Springs could be a useful indicator for changes in groundwater quality for a portion of the area north of Yelm.

Recommendations

1. Ecology should resample the same wells for nitrate in four to five years. Wells should be sampled bimonthly or more frequently for one year. The data should be evaluated relative to the baseline results of this study to determine if there is a trend in nitrate concentrations.
2. A sampling program should be designed and implemented at Crystal Springs as part of the monitoring for the wastewater reuse project. The discharge at Crystal Springs appears to be a convenient sampling point that could indicate changes in groundwater quality for a portion of the groundwater between the city of Yelm and Crystal Springs.
3. Potential sources of nitrate upgradient of the areas of elevated nitrate concentrations include:
 - onsite sewage systems
 - the poultry farm south of Bald Hill Road and west of the intersection of Bald Hill Road and Harris Road
 - the poultry farm north of Bald Hill Road and north of the intersection of Bald Hill Road and 110th Avenue
 - the abandoned poultry farm on Bald Hill Road and southeast of the intersection of Bald Hill Road and Harris Road
 - the livestock auction yard north of Highway 507

The Ecology Southwest Regional Office (SWRO) should follow up with site inspections and provide technical assistance to the poultry farms.

4. If better resolution of the nitrogen source locations is desired by the SWRO, Ecology should establish a water-level monitoring program to define the groundwater flow direction more accurately including seasonal variability. This program would require identifying additional wells for water level measurements, surveying wellhead elevations to 0.1 feet, and monitoring water levels monthly for at least one year.

Acknowledgments

I thank the many people who helped with this project.

- ◇ Dave Garland, Water Quality Program hydrogeologist, conceived the need for the project and reviewed the Quality Assurance Project Plan and the draft report.
- ◇ Kathy Cupps, Water Quality Program SWRO, reviewed the Quality Assurance Project Plan and draft report.
- ◇ Melanie Kimsey and Bob Duffy, Water Quality Program SWRO, reviewed the draft report.
- ◇ Pam Covey, Manchester Environmental Laboratory, monitored sample flow and testing.
- ◇ Manchester Environmental Laboratory chemists Becky Bogaczyk, Nancy Jensen, Debbie Lacroix and Casey Maggart conducted testing and provided quality assurance reviews.
- ◇ Ken Garmann, City of Yelm, provided well information and reviewed the draft report.
- ◇ Joan LeTourneau formatted and edited the report.
- ◇ The well owners allowed us to sample their wells; without their help this project would not have been possible.

Introduction

The City of Yelm is proposing to treat its wastewater to a high level and "reuse" the water for irrigation at schools, parks and a proposed golf course; for recharge to groundwater via infiltration ponds; and for constructed wetlands. The susceptibility of groundwater in the Yelm vicinity to contamination is well established. In 1994, in response to elevated nitrate concentrations in groundwater, the City of Yelm constructed a Septic Tank Effluent Pump system, which pumps the primary treated effluent from septic systems in the city to a central treatment plant (Skillings and Lewis, 1995). Because nitrate contamination had been previously identified in groundwater east of Yelm (Tayne, 1996), the Ecology Water Quality Program requested that the Environmental Investigations and Laboratory Services Program conduct sampling to help define the extent of nitrate contamination before the water reuse project starts. This report describes the methods and findings of this baseline assessment.

Site Description

Location

Yelm is located in southwestern Thurston County, Washington about 20 miles southeast of Olympia. The city is situated on a northwest-southeast trending, flat-lying, glacial outwash plain called the Yelm Prairie. The study area is located east of Yelm and occupies about seven square miles (Figure 1). Within the study area, the City of Yelm proposes to reuse treated wastewater on fields at two elementary schools, a park, and a constructed wetland (Skillings-Connolly, 1995). However, most of the treated wastewater will be applied to a future golf course, a part of the Thurston Highland development in the upland about 2.5 miles southwest of Yelm, which is not in the study area.

Regional Geology and Hydrogeology

Geology provides the framework within which groundwater moves. The vicinity geology is characterized by a thick sequence of unconsolidated glacial deposits overlying sedimentary bedrock (Mundorff, Weigle and Holmberg, 1955). Multiple glacial advances and retreats laid down the unconsolidated deposits. Most of the deposits in the Yelm vicinity are a product of the most recent glaciation, the Vashon. Regionally Dion, Turney, and Jones (1994) identified eight principal geologic units in northern Thurston County (listed in order of increasing age): alluvium, Vashon recessional outwash and end moraine, Vashon Till, Vashon advance outwash, Kitsap Formation, "penultimate" glacial deposits, undifferentiated unconsolidated deposits, and bedrock.

The principal aquifers in the region occur as saturated layers of sand and sandy gravel in unconsolidated deposits. These layers readily transmit water and are sandwiched between silty layers of relatively low permeability. As a result, the study area hydrogeology is characterized by multiple water-bearing zones with depth. Dion, Turney and Jones (1994) identified the following three principal regional aquifers:

- alluvial and recessional outwash deposits
- advance outwash deposits
- "penultimate" glaciation deposits

The study area geology and hydrogeology are discussed in Results I.

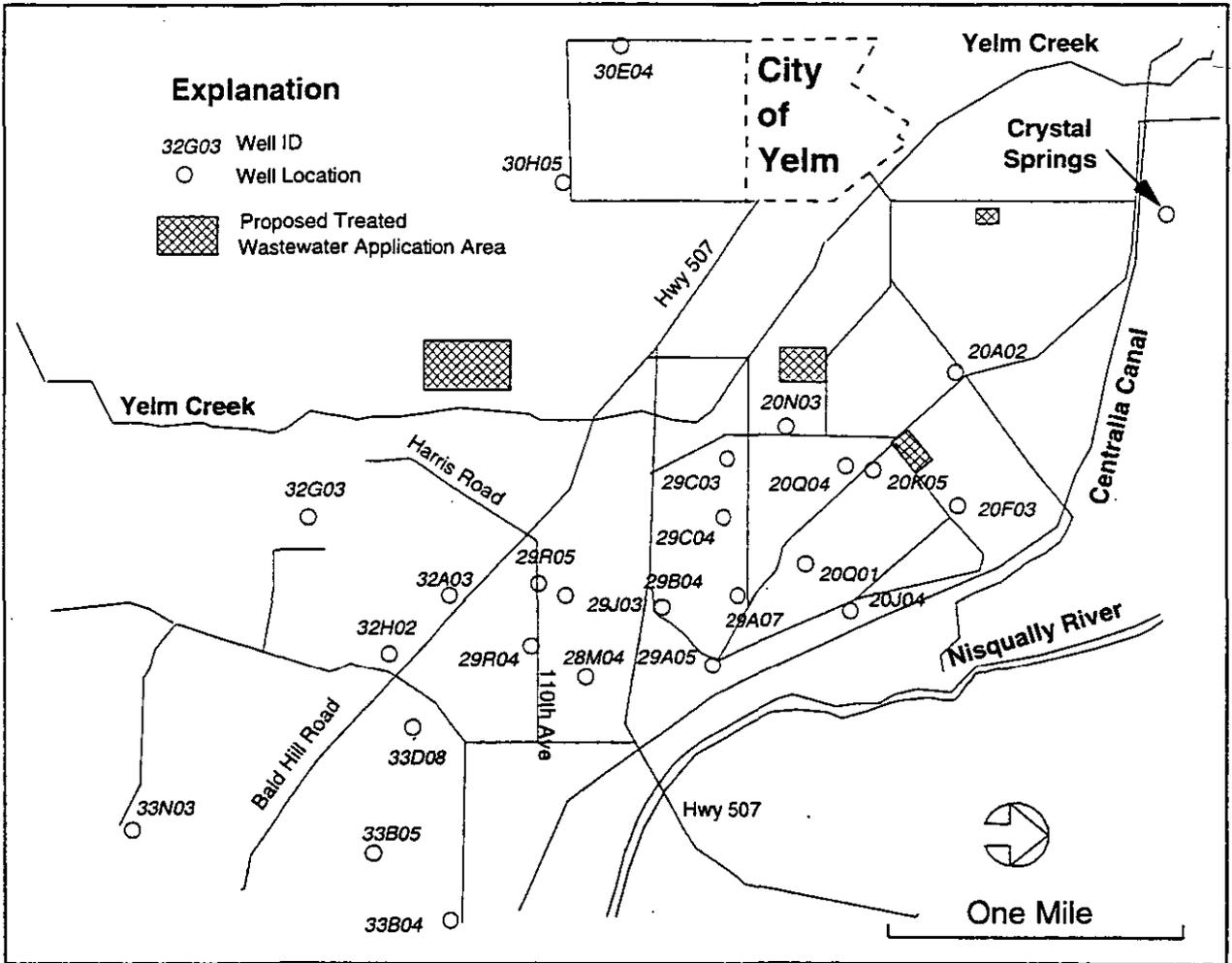


Figure 1. Yelm Groundwater Baseline Sampling Well Locations.

Methods

Monitoring Network

A groundwater-monitoring network was established using existing private water-supply wells. Wells were inventoried from the following sources: US Geological Survey Groundwater Information System, US Geological Survey Water Resource Division files, well logs on file at the Ecology Southwest Regional Office, and Thurston County Environmental Health well information.

Twenty-three wells were identified and selected for sampling. The locations of sampled wells are shown in Figure 1. Well construction data for each of the sampled wells are listed in Appendix A, Table A-1. The depth of sampled wells ranged from 21 to 119 feet with a mean depth of about 90 feet. Wells were sampled for nitrate+nitrite-N, ammonium, chloride, total dissolved solids, and fecal coliform bacteria. Sampling procedures are described in Appendix B. Wells were sampled bimonthly (every other month) for one year from April 1996 through February 1997. Static water levels were measured at 16 wells. The wellhead elevations were estimated from 1:24,000 topographic maps with 20-foot contour intervals.

Hydrogeologic Characterization

The stratigraphy of the study area was defined using drillers' logs for 55 wells with verified locations. Elevations of the tops and bottoms of hydrogeologic units were determined based on lithologies described on the drill logs and are shown in Appendix A, Table A-2. Because conditions are inferred by extrapolating between well locations, actual conditions may vary from those portrayed. Also, the density of wells varies spatially and drillers' logs vary in quality, therefore the hydrogeology of some areas is better defined than others. Lithology data were managed and hydrogeologic profiles were prepared using ROCKWARE UTILITIES™ software.

Results I. Study Area Hydrogeology

General

The hydrogeology of the study area is complex. Five hydrogeologic units, three aquifers and two aquitards, are identified beneath the study area to a depth of 150 feet. The aquifers consist of sand and sandy gravel which readily transmit water and are designated as the Recessional Outwash Aquifer, Advance Outwash Aquifer and the Deep Aquifer.

Aquitards generally have a substantial silt or clay component or are "cemented" and do not transmit water as readily as the aquifers. They act to hydraulically separate aquifers, although in most cases the aquitards provide only a partial barrier to flow between water-bearing zones. For this report the aquitards are designated the Upper and Lower Aquitards. The subsurface relationships of the hydrogeologic units are shown in hydrogeologic profiles Figures 2 and 3. The occurrence and properties of the hydrogeologic units are described below in order of increasing depth.

Recessional Outwash Aquifer

The Recessional Outwash Aquifer is the uppermost aquifer in the study area. It represents the saturated portion of the Vashon recessional outwash deposits mapped by Dion, Turney, and Jones (1994). Recessional outwash was deposited by glacier meltwater as the Vashon glacier retreated and consists of loose mixtures of sand and gravel. The deposits are nearly continuous beneath the study area and range up to 25 feet thick. One well (T17N/R2E-20N03) that tapped the Recessional Outwash Aquifer was sampled for this project. The aquifer is recharged primarily by infiltrated precipitation. Generally, the groundwater flow direction is probably northward toward the Nisqually River, however localized flow patterns will develop as a result of variations in infiltration and recharge.

Upper Aquitard

The Upper Aquitard acts as a partial hydraulic barrier between the Recessional Outwash Aquifer and the underlying Advance Outwash Aquifer. Drillers refer to this unit as "clay and gravel", "hardpan", or "cemented gravel". The Upper Aquitard is probably the same as the Vashon till as defined by Mundorff, Weigle, and Holmberg (1955) and Dion, Turney, and Jones (1994). Vashon till was deposited directly and overridden by the advancing glacial ice. Typically Vashon till consists of a compacted, concrete-like mixture of clay, silt, sand and gravel that transmits water poorly. The unit ranges in thickness from 20 to 30 feet and underlies much of the study area but may be absent locally.

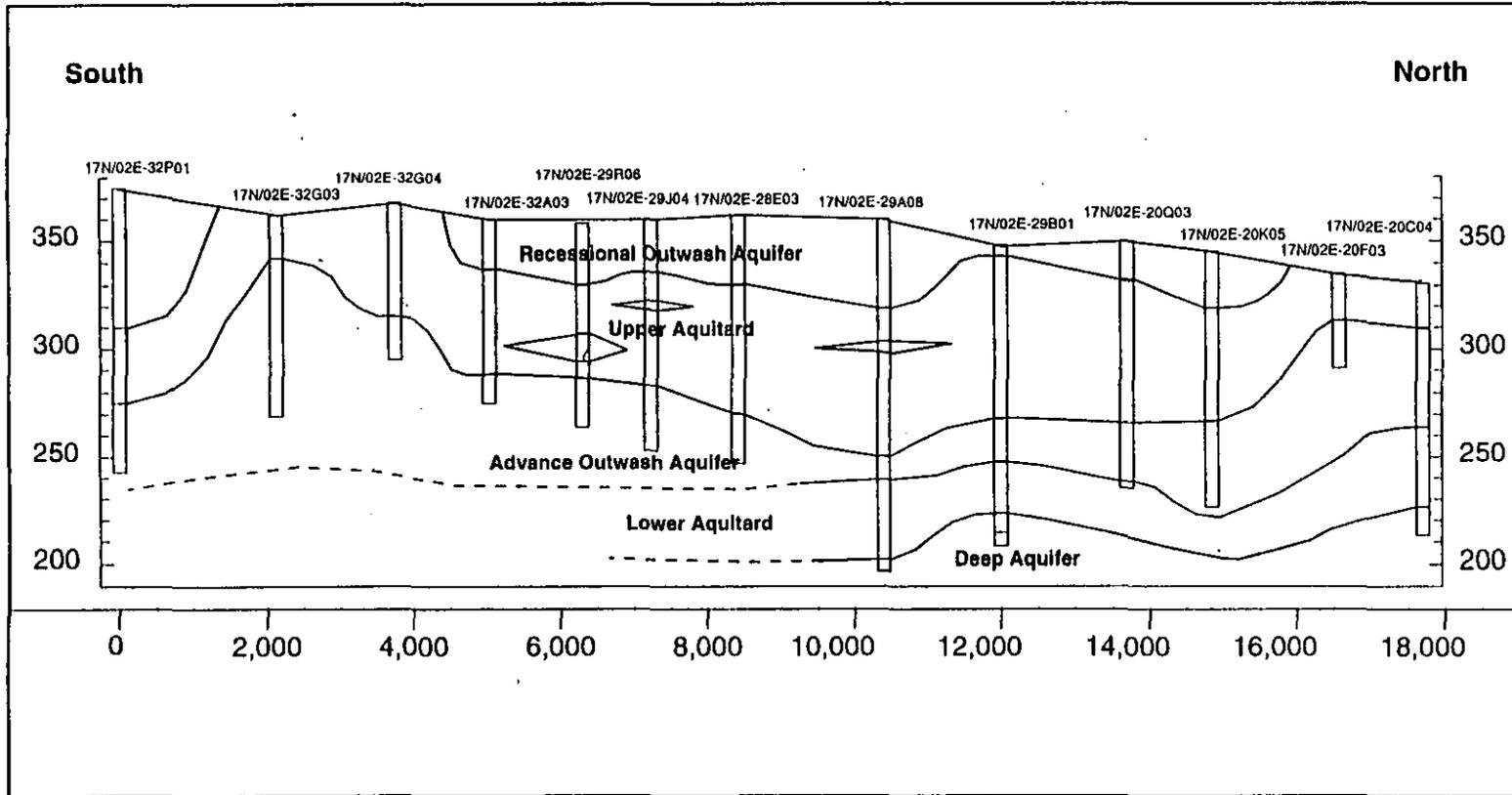


Figure 2. South-North Hydrogeologic Profile in the Vicinity of Yelm, Washington.

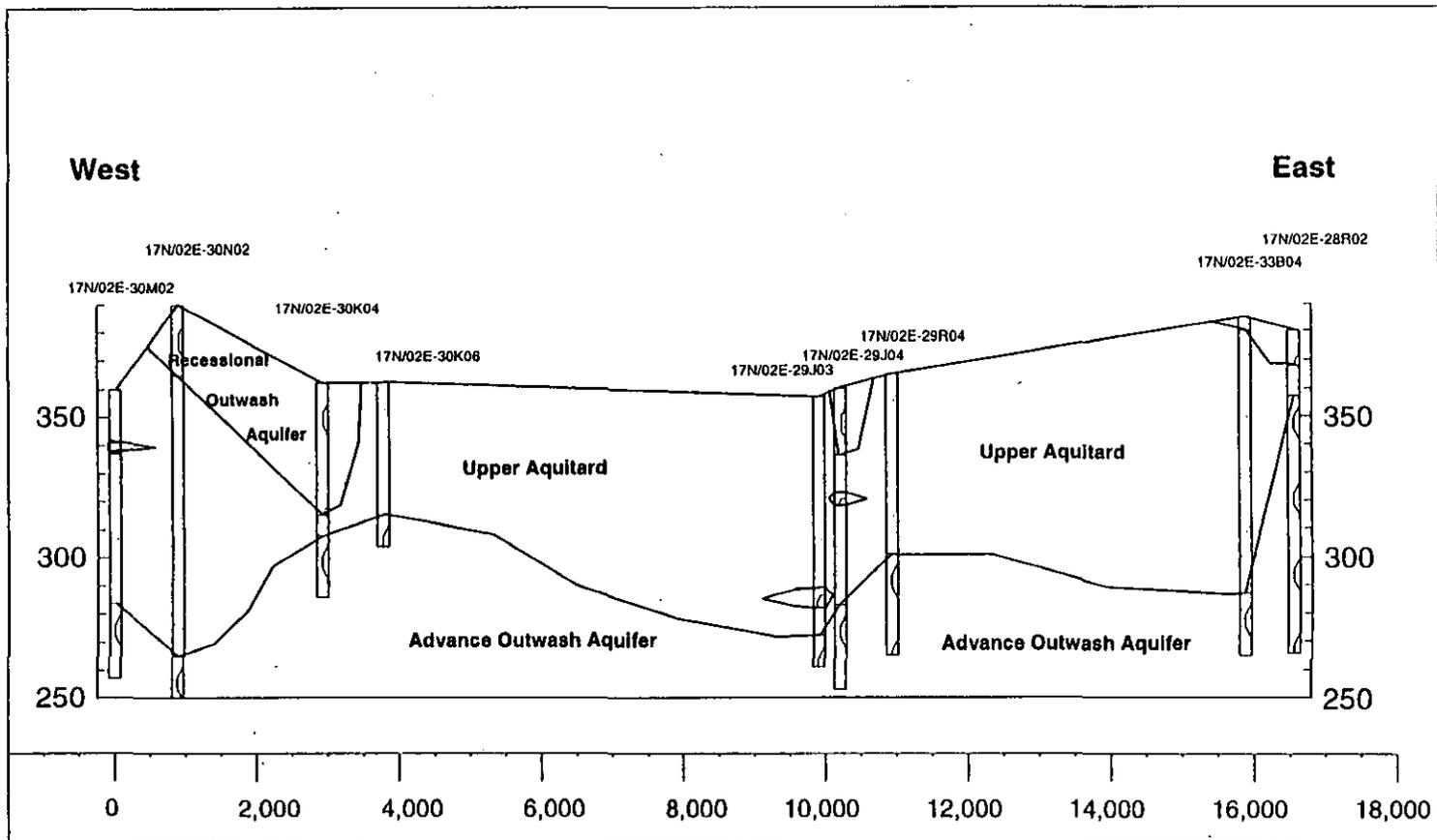


Figure 3. West-East Hydrogeologic Profile in the Vicinity of Yelm.

Discontinuous, water-bearing lenses of sand and sandy gravel occur within the till which can provide enough water for a domestic well. These lenses have limited lateral extent and typically are less than five feet thick. No wells sampled for this project were completed in these discontinuous lenses.

Advance Outwash Aquifer

The Advance Outwash Aquifer is the principal aquifer in terms of use in the Yelm area. Twenty-two of the 23 wells sampled for this project obtain water from this aquifer. This aquifer continuously underlies the study area and consists of sand and gravel deposited by glacial meltwater ahead of the advancing glacier. The deposits typically range from 10 to 50 feet thick. The top of the aquifer usually occurs at depth of about 70 to 100 feet below the ground surface.

The aquifer is recharged primarily from infiltrated precipitation and leakage from the overlying Recessional Outwash Aquifer. Figure 4 shows water level fluctuations in five wells completed in the Advance Outwash Aquifer over the study period. The seasonal water-level fluctuation ranged from about six to 13 feet. Water levels were highest in the late winter and spring and lowest in late summer and fall.

Figure 5 shows the groundwater-flow pattern for the Advance Outwash Aquifer. The map was constructed from water-level elevations measured in 16 wells in April 1996. The groundwater-flow pattern is strongly influenced by the Nisqually River. In the southern portion of the study area groundwater flows northwestward but swings westerly as it approaches the river.

Lower Aquitard

The properties and the distribution of the Lower Aquitard are not well defined. Only five of the wells used to define stratigraphy penetrate the entire thickness of the Lower Aquitard. The Lower Aquitard separates the Advance Outwash Aquifer from the Deep Aquifer. The Lower Aquitard was identified only in the north-central portion of the study area. Its thickness is variable ranging from less than 5 feet to greater than 60 feet. The aquitard consists of hardpacked silty or clayey sandy gravel and may be equivalent to the Kitsap Formation. However, there is disagreement about the presence and distribution of the Kitsap Formation in the Yelm area. Noble and Wallace (1966) did not identify the Kitsap Formation in well logs near Yelm but Dion, Turney and Jones (1994) indicate that the unit continuously underlies the study area. Also, because the Kitsap Formation represents lake, swamp and floodplain deposits it should consist predominately of silt and clay.

Deep Aquifer

Little is known about the occurrence and distribution of the Deep Aquifer in the study area; only five of the 55 well logs used for stratigraphy reached the Deep Aquifer. The Deep Aquifer consists mostly of sand and gravel. The Deep Aquifer may be equivalent to the outwash deposits of an older glacial advance, called the "penultimate" glaciation (Dion, Turney and Jones, 1994). No wells tapping the Deep Aquifer were sampled for this project.

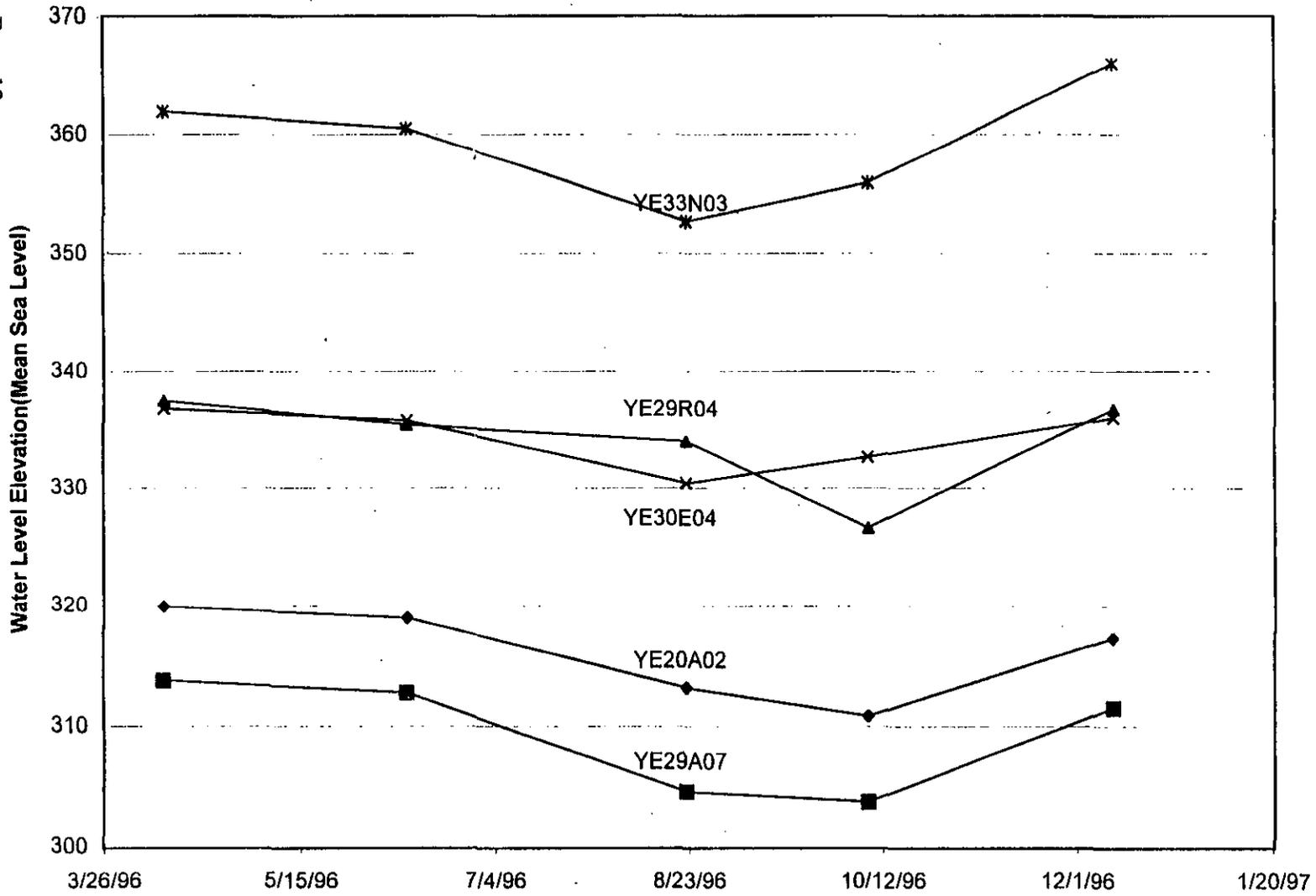


Figure 4. Selected Well Hydrographs, Yelm Groundwater Baseline Sampling.

Hydraulic Conductivity

Hydraulic conductivity is a measure of the ease that water moves through an aquifer. Under most circumstances, it is one of the most important factors that affects the rate that groundwater moves. Typical hydraulic conductivities for coarse glacial sediments such as the deposits that occur in Yelm range from 2.8 to 2,800 feet/day (Fetter, 1980).

For this study we estimated hydraulic conductivity from 76 well-yield tests using the method described by Bradbury and Rothschild (1985). This method is an iterative solution to the Theis equation with modifications for partial penetration and well loss. Well construction information and test data for the hydraulic conductivity estimates are listed in Appendix A, Table A-3. The hydraulic conductivity results are summarized in Table 1. The results show that hydraulic conductivity varies substantially vertically and horizontally. For each aquifer the geometric mean is considered the best estimate of central tendency for hydraulic conductivity results (Freeze, 1975). The geometric means for each aquifer are listed in Table 1.

Table 1. Summary of Hydraulic Conductivity Results.
(Units = feet/day)

<u>Aquifer Name</u>	<u>Minimum</u>	<u>Maximum</u>	<u>Geometric Mean</u>	<u>Number of Tests/Wells</u>
Recessional Outwash	4,800	66,000	18,000	2/1
Lenses in Vashon Till	47	6,800	370	16/15
Advance Outwash	10	12,000	87	42/42
Deep	22	380	72	16/11

Groundwater Velocity

Groundwater velocity can be estimated using Darcy's Law:

$$v = -K (dh/dL)/n_e$$

where,

v = the average linear groundwater velocity (feet/day)

K = hydraulic conductivity (feet/day)

dh/dL = hydraulic gradient (dimensionless)

n_e = effective porosity (dimensionless)

From Darcy's Law the average groundwater velocity for the Advance Outwash Aquifer is expected to range between 0.2 and 200 feet/day. This is based on:

- a hydraulic gradient of 0.004 (from Figure 4, 50 feet/12,300feet)
- an effective porosity of 0.25, and
- the hydraulic conductivities listed in Table 5.

The best estimate for the average groundwater velocity of the Advance Outwash Aquifer is about one to two feet/day using the geometric mean of the hydraulic conductivity (87 feet/day).

Wert (1989) reported a dye test conducted in the 1960s by Milt Johnson, retired water master for the City of Yelm, that had some remarkable results. Two gallons of dye were placed in a city well and dye was observed in Crystal Springs, about 6600 feet north of the well location, less than 12 hours later. This corresponds to a groundwater flow velocity of 13,200 feet/day. This velocity is substantially greater than the average velocity of one to two feet/day estimated using Darcy's Law.

Assuming that results of the dye test are described accurately, a possible explanation for the difference in the velocities obtained from the dye test and from the Darcy's Law calculation is that there is a preferred groundwater flowpath that connects the city well to Crystal Springs. Considering the meltwater origin of the deposits in Yelm, this pathway could be a buried stream channel that might consist of coarse gravel with little or no sandy matrix material. Such a deposit would have very high hydraulic conductivity. The lateral extent of this zone is not known but based on the hydraulic conductivity results from well-yield tests, it appears to have limited extent.

Results II. Water Quality

Quality Assurance

Quality assurance results are shown and summarized in Appendix C. Accuracy and precision of laboratory results were estimated using matrix spikes, laboratory duplicates and calibration standards. Blind field duplicates were used to estimate overall sampling and laboratory precision. Based on the quality assurance sample, all water quality data are considered acceptable for use.

Nitrate + Nitrite-N

All water quality results for this project are listed in Appendix D, Table D-1. Nitrite+nitrate-N results are summarized in Table 2. Nitrite+nitrate-N concentrations for all wells over the study period ranged from a minimum of 0.13 mg/L to a maximum of 10.1 mg/L. The mean concentration for all wells was 3.2 mg/L.

The Drinking Water Standard (Maximum Contaminant Level, MCL) for nitrate is 10 mg/L for public water-supply systems (Chapter 246-290,-291 WAC). Only one well (YE28R04) had a concentration exceeding 10 mg/L (10.1 mg/L) and this occurred for one sampling event. The mean concentration over the study period for well YE28R04 was 8.6 mg/L.

The distribution of mean nitrate+nitrite-N concentrations is shown in Figure 6. In general, upgradient concentrations are less than about one mg/L and concentrations increase downgradient. The observed elevated nitrate concentrations in the downgradient direction confirm that nitrogen loading is occurring between the upgradient and downgradient wells. Hachured areas on Figure 6 approximate where mean concentrations exceed 3 mg/L and 5 mg/L. Nearly half of the Advance Outwash Aquifer within the study area has nitrate+nitrite-N concentrations exceeding 3 mg/L and about 10% of the aquifer concentrations exceed 5 mg/L.

Figure 7 shows nitrate+nitrite-N concentrations for six wells over the study period. With the exception of well YE20R04 the data show little seasonal variability. At well YE20R04 the concentrations were highest in late winter/early spring (at the beginning and end of the study) and lowest in the fall.

Table 2. Nitrate+Nitrite-N Results Summary, April 1996 through February 1997.

Site ID	Mean	Minimum	Maximum	Difference	Depth Top	Depth Bottom	Aquifer
YE20A02	4.73	3.49	6.30	2.81	55	55	RO/AO
YE20F03	2.97	2.76	3.16	0.40	115.3	115.3	AO
YE20K05	5.34	5.00	6.44	1.44	119	119	AO
YE20N03	3.5	2.56	4.48	1.92	21	21	RO
YE20Q01	5.98	4.24	8.15	3.91	70	90	AO
YE20Q04	5.95	4.89	7.65	2.76	58	58	AO
YE28M04	0.47	0.43	0.50	0.07	96	96	AO
YE29A05	0.37	0.28	0.70	0.41	106	106	AO
YE29A07	6.22	4.94	7.34	2.40	101	101	AO
YE29B04	2.86	1.74	4.47	2.73	85	85	AO
YE29C04	6.16	4.57	9.79	5.22	100	100	RO/AO
YE29J03	0.76	0.69	0.86	0.17	96	96	AO
YE29R04	8.63	6.77	10.10	3.33	100	100	AO
YE29R05	3.41	3.14	3.61	0.47	85	85	AO
YE30E04	0.47	0.41	0.54	0.13	97	97	AO
YE30H05	2.00	1.10	2.58	1.48	42	49	AO
YE32A03	0.53	0.50	0.57	0.08	80	80	AO
YE32G03	0.15	0.13	0.19	0.05	83	93	AO
YE32H02	1.02	0.94	1.20	0.26	80	80	AO
YE33B04	5.21	4.11	6.14	2.03	118	118	AO
YE33B05	2.50	2.30	2.63	0.33	118	118	AO
YE33D08	3.24	2.44	3.95	1.51	105	105	AO
YE33N03	0.62	0.49	0.70	0.22	109	109	AO
Mean=	3.18			1.48	89	90	
Minimum=		0.13					
Maximum=			10.10				
RO=	Recessional Outwash Aquifer						
AO=	Advance Outwash Aquifer						

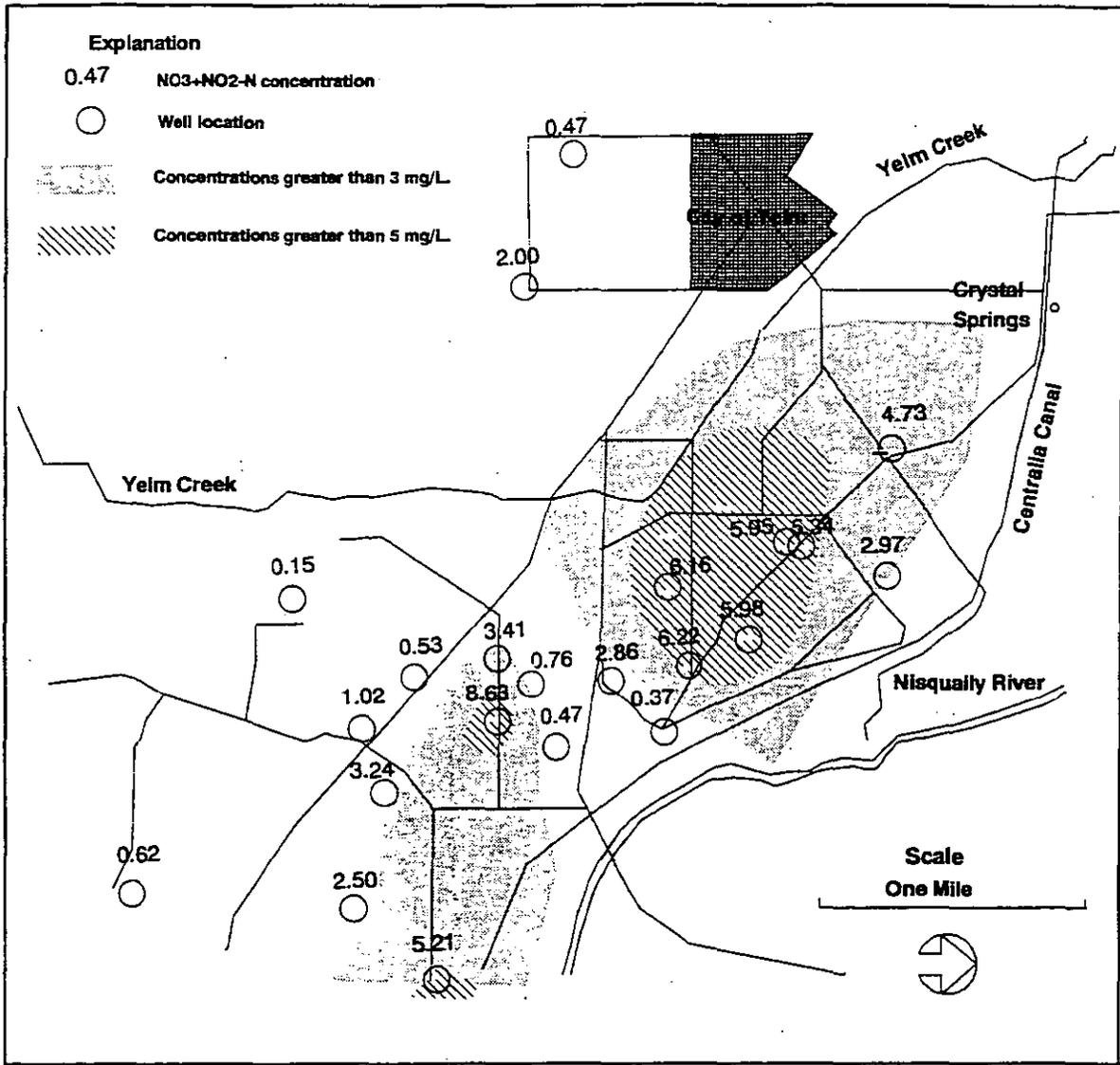


Figure 6. Mean Nitrate+Nitrite-N Concentrations for the Advance Outwash Aquifer.

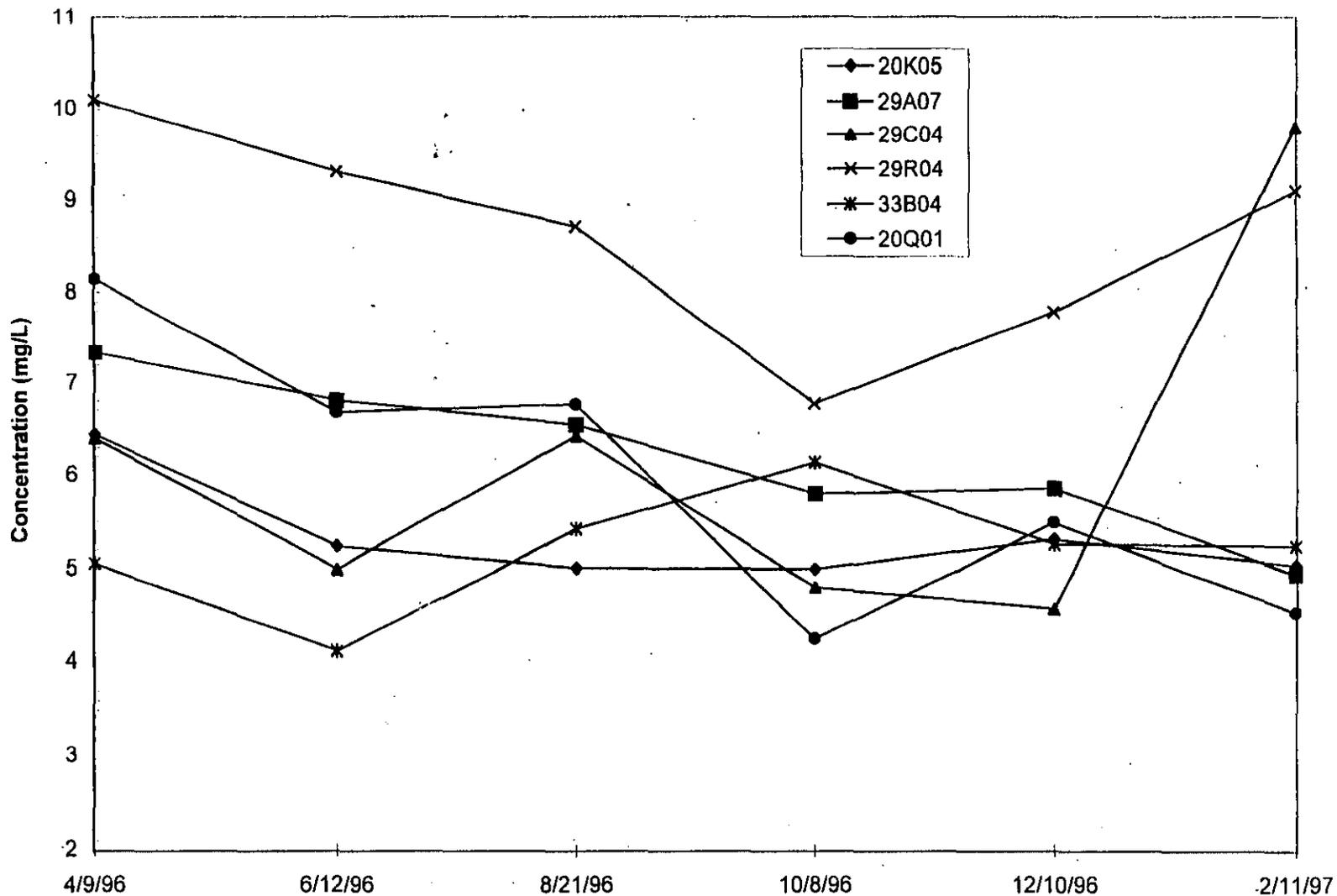


Figure 7. Nitrate+Nitrite-N at Selected Wells, Yelm Groundwater Baseline Sampling.

Total Dissolved Solids (TDS)

Total dissolved solids (TDS) concentrations ranged from 67 to 158 mg/L with a mean of 110 mg/L. For groundwater these represent fairly low concentrations and are probably a function of rapid groundwater movement in the Yelm area and the proximity to recharge sources. The Drinking Water Standard for TDS is a Secondary MCL and is 500 mg/L (Chapter 246-290 and -291WAC). A Secondary MCL is not health based but instead is based on aesthetics such as taste, odor or staining.

Chloride

Chloride concentrations ranged from 1.2 to 17.3 mg/L with a mean of 4.9 mg/L. Chloride is considered a good tracer in groundwater because it is readily soluble in water and does not adsorb to soil particles. It is naturally occurring but is also present in human and animal wastes. The Secondary Drinking Water Standard for chloride is 250 mg/L (Chapter 246-290 and -291WAC).

Ammonium-N

Ammonium-N was detected in two wells for one sampling event for each well. Both detections, 0.014 and 0.015 mg/L, were only slightly above the method detection limit, 0.01 mg/L. Ammonium is an indicator of animal and human waste loading. Because ammonium does not readily move through groundwater, its presence in groundwater usually indicates proximity to a source area.

Fecal Coliform Bacteria

Fecal coliform bacteria were not detected in any samples during the study period. The presence of fecal coliform bacteria in groundwater usually indicates proximity to the source area.

Discussion

Groundwater quality in the study area is generally good. The susceptibility of the Recessional Outwash Aquifer to contamination is widely recognized by local well drillers and the public. Only one active well was found that obtained water from this aquifer. This well was used for irrigation and not drinking water. Most new wells in the area are completed in the Advance Outwash Aquifer or deeper aquifers. The nitrate concentrations in the Recessional Outwash Aquifer are largely unknown but because the aquifer is so shallow they are probably high locally. The one well sampled for this study that tapped the Recessional Outwash Aquifer had a mean nitrate+nitrite-N concentration of 3.5 mg/L.

Nitrate has migrated to the Advance Outwash Aquifer that occurs at a depth of 70 to 100 feet below the ground surface. Areas where nitrate+nitrite-N concentrations exceed 3 mg/L and 5 mg/L in the Advance Outwash Aquifer are shown in Figure 6. Using the potentiometric map (Figure 5) to define flow direction it is possible to identify the general area, upgradient of the elevated nitrate, where the nitrogen sources are located. Potential nitrogen sources within this area include:

- onsite sewage systems
- the poultry farm south of Bald Hill Road and west of the intersection of Bald Hill Road and Harris Road
- the poultry farm north of Bald Hill Road and north of the intersection of Bald Hill Road and 110th Avenue
- the abandoned poultry farm on Bald Hill Road and southeast of the intersection of Bald Hill Road and Harris Road,
- the livestock auction yard north of Highway 507

The presence of a preferred groundwater flowpath in the area north of Yelm is significant from a water quality perspective. A zone of hydraulically connected groundwater flows toward the preferred flowpath and eventually discharges at Crystal Springs. Water quality samples at Crystal Springs could be a convenient and cost-effective means to indicate changes in groundwater quality from this zone. However, because the areal extent drained by the preferred flow zone is not known, possible correlations of changes in groundwater quality with source activities are limited.

References

- Bradbury, K.R. and E.R. Rothschild, 1985. A Computerized Technique for Estimating the Hydraulic Conductivity of Aquifers from Specific Capacity Data. Groundwater, Vol. 23, No. 2, pp. 240-246.
- Chapter 246-290 and -291WAC. Washington State Department of Health, 1994. Group A and B Public Water Systems, July 1994. 127p.
- Dion, N.P., G.L. Turney, and M.A. Jones, 1994. Hydrology and Quality of Groundwater in Northern Thurston County, Washington, US Geological Survey Water-Resources Investigations Report 92-4109. 188p.
- Fetter, C.W., 1980. Applied Hydrogeology. Merrill Publishing Company. 592p.
- Freeze, R.A., 1975. A stochastic-conceptual analysis of one-dimensional groundwater flow in nonuniform homogeneous media. Water Resources Research, Vol. 11, No. 5, pp.725-741.
- Manchester Environmental Laboratory, 1988. Quality Assurance Manual, Manchester Environmental Laboratory. Washington State Department of Ecology.
- Mundorff, M.J., J.W. Weigle, and G.D. Holmberg, 1955. Groundwater in the Yelm Area, Thurston and Pierce Counties Washington. US Geological Survey Circular 356. 58p.
- Noble and Wallace, 1966. Geology and Groundwater Resources of Thurston County, Washington, Volume 2. Washington State Division of Water Resources Water Supply Bulletin No. 10. 141p.
- Skillings-Connolly, Inc., 1995. City of Yelm Water Reuse Project Facilities Plan. Volumes I and II.
- Tayne, T., 1996. Letter to Denis Erickson, Washington State Department of Ecology, March 13, 1996, and accompanying well logs and data sheets.
- Wallace, E.F. and D. Molenaar, 1961. Geology and Groundwater Resources of Thurston County, Washington, Volume 1. Washington State Division of Water Resources Water Supply Bulletin No. 10. 254p.
- Wert, S. 1989. Untitled letter to Mike Olivant, Parametrix Inc., May 16, 1989. 8p.

Appendices

APPENDIX A

Table A-1. Well Construction Data for Sampled Wells.

Table A-2. Elevation of the Top of Hydrogeologic Units.

Table A-3. Yelm Wells Specific Capacity Tests and Hydraulic Conductivity Results.

Table A-4. Water-Level Elevations, April 1996.

WELLDATA.XLS

Table A-1. Well Construction Data for Sampled Yelm Wells.								
Local ID	State Plane	State Plane	Altitude	Date	Open	Static	Water-	Remarks
	X	Y	MSL (Feet)	Drilled	Interval	Water Level	Bearing Zone	
T17N/R2E-20A02	1478588	596152	340	12/23/92	55	30	AO	Unconfined
T17N/R2E-20F03	1480866	595967	335	04/24/89	115.3	32	AO	Unconfined
T17N/R2E-20J02	1482642	593977	340	10/1/89	53-58	36	TILL	Water level only.
T17N/R2E-20K05	1480245	594357	345	03/10/83	119	44	AO	
T17N/R2E-20N03	1479470	592765	343	1960's	21	13	RO	Unconfined
T17N/R2E-20Q01	1481838	593172	340	11/25/78	90	40	AO	
T17N/R2E-20Q04	1480202	593991	350	09/25/73	58	39	AO	
T17N/R2E-28M04	1483648	589043	360	07/06/93	96	59	AO	
T17N/R2E-29A05	1483465	591308	350	06/30/95	106	56	AO	
T17N/R2E-29A07	1482347	591980	350	04/23/85	101	40	AO	
T17N/R2E-29B04	1482532	590351	350	6/1/05	85	---	AO	Depth reported.
T17N/R2E-29C03	1479974	591704	348	07/19/84	40-80	31	AO	Sampled once.
T17N/R2E-29C04	1480929	591605	348	9/17/79	100	38	AO	
T17N/R2E-29J03	1482502	588640	357	08/06/86	96	36	AO	
T17N/R2E-29R04	1483135	587912	365	04/23/94	100	38	AO	
T17N/R2E-29R05	1482006	587996	362	01/11/95	85	25.8	AO	
T17N/R2E-30E04	1472870	589934	362	04/15/92	97	29	AO	
T17N/R2E-30H05	1475196	588855	362	06/22/87	49	27	AO	
T17N/R2E-32A03	1482263	586412	360	3/28/75	80	42	AO	
T17N/R2E-32G03	1480739	583955	362	09/02/92	93	32	AO	
T17N/R2E-32H02	1483167	585260	360	04/20/84	80	28	AO	
T17N/R2E-33B04	1487842	586405	385	10/04/94	118	59	AO	
T17N/R2E-33B05	1486512	584862	390	06/10/86	118	48	AO	
T17N/R2E-33D08	1484463	585684	370	12/14/88	105	43	AO	
T17N/R2E-33N03	1486079	580520	430	05/19/92	109	75	AO	
RO= Recessional Outwash Aquifer								
AO= Advance Outwash Aquifer								

WELLZONE

Table A-2. Elevation of the Top of Hydrogeologic Units.												
Well ID	Aquifer	X	Y	RO	TILL	Inter-TILL	TILL	AO	L.AQTRD	DEEP	D.AQTRD	BOTTOM
17N/02E-19N01	AO	1473978	593307.8	345	334	-	-	310	283	-	-	282
17N/02E-20A02	AO	1478588	596151.6	-	-	-	-	340	-	-	-	285
17N/02E-20C04	DEEP	1480660	597072.3		331	-	-	310	264	226	-	213
17N/02E-20F03	AO	1480866	595966.6		335	-	-	313	-	-	-	291
17N/02E-20J02	TILL	1482642	593977.4	340	301	289	-	-	-	-	-	282
17N/02E-20J04	DEEP	1482642	593977.4	340	300	289	282	246	190	173	-	145
17N/02E-20J05	AO	1482792	593611.3	340	324	263	259	254	-	-	-	223
17N/02E-20K05	AO	1480245	594357.3	345	319	-	-	267	-	-	-	226
17N/02E-20L05	AO	1482565	593433.1		355	315	295	264	-	-	-	
17N/02E-20N03	RO	1479470	592765.1	343	-	-	-	-	-	-	-	322
17N/02E-20P03	AO	1479471	592271.4	345	332	-	-	304	-	-	-	247
17N/02E-20Q01	AO	1481838	593172.4	340	333	298	295	248	-	-	-	237
17N/02E-20Q03	AO	1480693	593295.1	350	332	-	-	266	238	-	-	235
17N/02E-20Q04	AO	1480202	593990.9	-	350	-	-	294	-	-	-	288
17N/02E-28E03	AO	1483620	589389.1	362	330	-	-	270	-	-	-	247
17N/02E-28M04	AO	1483648	589043.4	360	341	-	-	282	-	-	-	264
17N/02E-28R02	AO	1488184	586996.3	380	-	-	368	357	-	-	-	266
17N/02E-29A05	AO	1483465	591308.5	350	316	-	-	278	242	-	-	230
17N/02E-29A06	AO	1482806	590831.8	-	360	-	-	265	-	-	-	252
17N/02E-29A07	AO	1482347	591980.5	-	350	-	-	260	-	-	-	249
17N/02E-29A08	DEEP	1483185	591328	360	319	303	298	250	239	202	-	197
17N/02E-29B01	DEEP	1481718	591938.6	348	343	-	-	268	248	223	214	208
17N/02E-29B02	DEEP	1482450	590467.4	350	336	315	245	235	-	-	-	212
17N/02E-29B05	AO	1481178	591967.2	348	334	-	-	318	295	-	-	288
17N/02E-29C04	AO	1480929	591604.9	-	-	-	-	348	-	-	-	248
17N/02E-29C02	AO	1479788	592048.6	348	339	-	-	272	-	-	-	265
17N/02E-29C03	AO	1479974	591703.8	-	348	-	-	308	-	-	-	260
17N/02E-29HO1D1	DEEP	1483714	590870.2	360	330	-	-	270	266	-	-	202
17N/02E-29J03	AO	1482502	588640.4	-	357	289	282	272	-	-	-	261
17N/02E-29J04	AO	1482785	588548.6	360	336	323	318	283	-	-	-	253
17N/02E-29R04	AO	1483135	587911.6	-	365	-	-	301	-	-	-	265
17N/02E-29R05	AO	1482006	587995.9	362	362	-	-	284	277	-	-	278
17N/02E-29R06	AO	1482495	587659.3	358	330	307	294	286	-	-	-	264

Table A-2. Elevation of the Top of Hydrogeologic Units.												
Well ID	Aquifer	X	Y	RO	TILL	Inter-TILL	TILL	AO	L.AQTRD	DEEP	D.AQTRD	BOTTOM
17N/02E-30E04	AO	1472870	589934.2	-	362	307	298	272	265	-	-	262
17N/02E-30H05	AO	1475196	588855.3	-	362	-	-	325	-	-	-	313
17N/02E-30K04	AO	1475593	588323.8	362	315	-	-	308	-	-	-	286
17N/02E-30K06	AO	1476373	588665.8	-	362	-	-	315	-	-	-	304
17N/02E-30N02	AO	1473567	588228.9	390	365	-	-	265	-	-	-	250
17N/02E-30M02	AO	1472977	588892.6	-	360	341	337	284	-	-	-	257
17N/02E-31G03	DEEP	1475312	586188.2	-	455	-	-	420	325	317	-	275
17N/02E-32A03	AO	1482263	586411.6	360	337	-	-	288	-	-	-	275
17N/02E-32G02	AO	1480374	584000.4	-	360	-	-	337	-	-	-	288
17N/02E-32G03	AO	1480739	583955.1	-	362	-	-	342	-	-	-	269
17N/02E-32G04	AO	1481673	585267.3	-	368	-	-	315	-	-	-	295
17N/02E-32H02	AO	1483167	585260.2	-	360	-	-	292	-	-	-	280
17N/02E-32J01D1	AO	1483545	583446.8	374	358	346	329	314	-	-	-	274
17N/02E-32P01	AO	1479373	582330.3	375	310	-	-	275	-	-	-	243
17N/02E-33B04	AO	1487842	586405	385	380	-	-	287	-	-	-	265
17N/02E-33B05	AO	1486512	584861.8	390	383	333	327	280	-	-	-	272
17N/02E-33D08	AO	1484463	585684.4	370	364	319	308	292	265	-	-	262
17N/02E-33G01	AO	1486479	584966.8	390	378	311	304	280	270	-	-	267
17N/02E-33K05	AO	1487453	583414.6	371	343	-	-	316	301	-	-	291
17N/02E-33L03	AO	1485566	583276.9	-	368	-	-	323	-	-	-	308
17N/02E-33N03	AO	1486079	580519.8	-	430	-	-	343	321	-	-	313
17N/02E-33N06	AO	1486294	580316.9	-	440	-	-	362	348	-	-	344
RO= Recessional Outwash Aquifer												
AO= Advanced Outwash Aquifer												
DEEP=Deep Aquifer												
L.AQTRD= Lower Aquitard.												

Appendix A-3. Well-Yield Tests and Hydraulic Conductivity Results.												
	Well	Static	Test	Test		Aquifer	Open			Hydraulic	Open	
	Dia.	DTW	DTW	Duration	Q	Thickness	Interval	Storage	Well	Conductivity	Interval	
Well ID	(In.)	(Feet)	(Feet)	(Hours)	(GPM)	(Feet)	(Feet)	Coeff.	Loss	(ft/day)	Depth	Zone
17N/2E-19	8	22	30	18	30	14	0.67	0.001	1	255	93	AO
17N/2E-19C	8	20	40	1	58	10	10	0.001	1	58.2	48-58	TILL
17N/2E-19C	6	30	40	4	20	5	0.5	0.001	1	169	60	TILL
17N/2E-19H	6	60	100	1	60	6	0.5	0.001	1	118	140	DEEP
17N/2E-19H05	6	19	20	2	37	11	5	0.25	1	886	29-34	TILL
17N/2E-19J01	6	19	32	1	40	41	0.5	0.25	1	431	60	TILL
17N/2E-19J02	6	23	31	1	12	22	0.5	0.001	1	168	45	TILL
17N/2E-19J07	12	18	168	7	240	15	15	0.001	1	22.4	233-243	DEEP
17N/2E-19N01	12	25.5	25.62	1	540	27	10	0.25	1	DNC	50-60	AO
17N/2E-19N01	12	25.5	25.62	4	540	27	10	0.25	1	DNC		AO
17N/2E-19N01	12	27.2	27.36	4	550	27	10	0.25	1	DNC	50-60	AO
17N/2E-19N02	12	25.02	30.22	1	1250	31	10.65	0.25	1	DNC	52-61	AO
17N/2E-19N02	12	25.02	30.22	4	1250	31	10.65	0.25	1	DNC	52-61	AO
17N/2E-19Q01	6	6	11	24	15	5	0.5	0.25	1	222	33	TILL
17N/2E-19Q01	6	6	14	1	24	5	0.5	0.25	1	191	33	TILL
17N/2E-20B	6	40	90	1	60	19	0.5	0.001	1	127	114	AO
17N/2E-20B	6	58	86	1	20	10	0.5	0.001	1	59.9	120	AO
17N/2E-20C	6	26	56	1.5	10	1.5	0.5	0.001	1	43.2	70.5	AO
17N/2E-20C	6	26	26.5	1	20	11.5	0.5	0.001	1	3740	53.5	TILL
17N/2E-20C04	6	60	63	1	3	13	0.5	0.001	1	91.7	118	AO
17N/2E-20D	6	18	35	1	15	10	0.5	0.001	1	74.3	64	AO
17N/2E-20D	6	96	107	1	4	13	0.5	0.001	1	32.9	114	AO
17N/2E-20G	6	60	85	1	15	56	0.5	0.001	1	94.7	116	AO
17N/2E-20G	8	20	46	1	12	37	0.67	0.001	1	41.9	65	AO
17N/2E-20G	6	52	81	1	15	12	0.5	0.001	1	45.7	103	AO
17N/2E-20G	6	35	70	1	10	57	0.5	0.001	1	45.3	104	AO
17N/2E-20J02	6	36	41	1	12	7	5	0.001	1	77.8	53-58	TILL
17N/2E-20J04	6	43	53	1	20	28	5	0.001	1	43.4	190-195	DEEP
17N/2E-20J05	6	51	69	1	15	31	0.5	0.001	1	106	117	AO
17N/2E-20K05	6	44	56	1	20	41	0.5	0.001	1	236	119	AO
17N/2E-20L05	6	22	80	1	7	31	0.5	0.001	1	15.3	91	AO

Appendix A-3. Well-Yield Tests and Hydraulic Conductivity Results.												
	Well	Static	Test	Test		Aquifer	Open			Hydraulic	Open	
	Dia.	DTW	DTW	Duration	Q	Thickness	Interval	Storage	Well	Conductivity	Interval	
Well ID	(In.)	(Feet)	(Feet)	(Hours)	(GPM)	(Feet)	(Feet)	Coeff.	Loss	(ft/day)	Depth	Zone
17N/2E-20N	6	23	25	1	30	10	0.5	0.001	1	1330	40	TILL
17N/2E-20N03	8	13	15	24	110	3	0.67	0.25	1	4800	21	RO
17N/2E-20N03	8	13	13.17	24	110	8	0.67	0.25	1	65900	21	RO
17N/2E-20Q01	6	40	65	1	15	11	11	0.001	1	10	70-90	AO
17N/2E-20Q04	6	39	47	1	20	4	0.5	0.001	1	212	58	AO
17N/2E-21L01	6	0	68	1	10	7	0.5	0.001	1	10.9	79	AO
17N/2E-28D	6	41	56	1	30	97	0.5	0.25	1	376	138	DEEP
17N/2E-28D	6	40	49	1	8	7	0.5	0.25	1	58.3	63	TILL
17N/2E-28E02	6	80	110	1	40	25	0.5	0.001	1	157	161	DEEP
17N/2E-28E03	6	65	110	1	10	23	0.5	0.001	1	25	115	AO
17N/2E-28E04	6	30	65	1	20	17	5	0.001	1	12.9	67-72	AO
17N/2E-28F	6	0	15	2	40	20	0.5	0.001	1	291	110	AO
17N/2E-28J	8	13	73	1	450	24	14.5	0.001	1	86.7	154.5-16	DEEP
17N/2E-28J	8	13	77	3	450	24	14.5	0.001	1	86.2	154.5-16	DEEP
17N/2E-28J	8	13	80	24	450	24	14.5	0.001	1	91.6	154.5-16	DEEP
17N/2E-28M02	6	45	57	1	15	14	0.5	0.001	1	118	77	AO
17N/2E-28M04	6	59	75	1	12	18	0.5	0.001	1	77.4	96	AO
17N/2E-28M05	6	27	51	1	50	15	5	0.001	1	51	148-153	DEEP
17N/2E-28M05	6	27	53	2	50	15	5	0.001	1	48.3	148-153	DEEP
17N/2E-28M05	6	27	53.5	3	50	15	5	0.001	1	48.2	148-153	DEEP
17N/2E-28M05	6	27	53.55	4	50	15	5	0.001	1	48.7	148-153	DEEP
17N/2E-28M06	6	43	80	1	15	27	0.5	0.001	1	48.8	118	AO
17N/2E-28N	6	35	60	3	40	4	0.5	0.001	1	140	160	DEEP
17N/2E-28Q	8	52	104	4	105	9	5	0.001	1	58.9	133	AO
17N/2E-28R01	8	49	49.5	1	60	11	5	0.001	1	3830	76-81	AO
17N/2E-28R01	8	49	49.5	1	60	11	0.67	0.001	1	8250	76	AO
17N/2E-29A06	6	59	74	1	10	13	0.5	0.001	1	60.8	108	AO
17N/2E-29B02	6	37	97	1	15	23	0.5	0.001	1	28.2	138	DEEP
17N/2E-29B05	6	15	40	1	11	23	0.5	0.001	1	49.8	50	AO
17N/2E-29C02	6	28	70	1	10	7	0.5	0.001	1	17.9	80	AO
17N/2E-29C03	8	31	45	1	30	48	40	0.001	1	9.6	40-80	AO

Appendix A-3. Well-Yield Tests and Hydraulic Conductivity Results.												
Well ID	Well Dia. (In.)	Static DTW (Feet)	Test DTW (Feet)	Test Duration (Hours)	Q (GPM)	Aquifer Thickness (Feet)	Open Interval (Feet)	Storage Coeff.	Well Loss	Hydraulic Conductivity (ft/day)	Open Interval Depth	Zone
17N/2E-29C04	6	38	71	1	15	62	0.5	0.25	1	73.6	100	AO
17N/2E-29H01	8	26	33	3	40	4	0.67	0.001	1	438	94	AO
17N/2E-29J	6	55	85	1	20	7	0.5	0.001	1	51.6	100	AO
17N/2E-29J01	6	30	60	1	20	6	0.5	0.001	1	50.9	96	AO
17N/2E-29J04	6	26	69	1	30	41	0.5	0.001	1	98.6	107	AO
17N/2E-29Q	6	17	45	1	15	12	0.5	0.001	1	47.4	58	TILL
17N/2E-29R01	6	12	67	2	8	12	0.5	0.001	1	12.8	76	AO
17N/2E-30F03	6	80	101	1	40	6	0.5	0.001	1	151	138	DEEP
17N/2E-30H02	8	40	96	2	30	8	0.67	0.001	1	30.5	136	DEEP
17N/2E-30R01	6	98	104	1	15	2	0.5	0.001	1	300	118	AO
17N/2E-31H03	6	55	75	1	20	6	0.5	0.001	1	77.4	99	AO
17N/2E-31H04	6	36	36.5	1	20	5	0.5	0.001	1	3600	60	TILL
17N/2E-32K01	6	90	90.5	1	60	5	0.5	0.001	1	11600	105	AO
17N/2E-33A02	6	55	65	1	30	4	0.5	0.001	1	256	127	AO
17N/2E-33N01	6	54	70	1	8	12	0.5	0.001	1	44.2	80	AO
17N/2E-34F02	6	43	48	1	20	4	0.5	0.25	1	257	58	TILL
17N/2E-34G02	6	30	30.5	1	30	3	0.5	0.001	1	6770	50	TILL
17N/2E-34H02	6	28	30	1	16	5	0.5	0.001	1	676	40	TILL
17N/2E-34N01	8	43	59	1	45	11	0.67	0.001	1	171	97	AO

DNC= Did not converge, no solution.

Table A-4. Water-Level Elevations, April 1996					
Well ID	State Plane X	State Plane Y	Measuring	Depth to	Water-Level
			Point	Water	Elevation
			Elevation (MSL, Feet)	(Feet)	(MSL, Feet)
YE20A02	1478588	596152	340	20.07	319.95
YE20F03	1480866	595967	335	28.83	306.17
YE20K05	1480245	594357	345	26.63	318.37
YE20N03	1479470	592765	343	7.48	335.52
YE20Q04	1480202	593991	350	26.03	323.97
YE28M04	1483648	589043	360	22.44	337.56
YE29A07	1482347	591980	350	36.27	313.73
YE29R05	1482006	587996	362	16.87	345.13
YE29R04	1483135	587912	365	27.5	337.5
YE30E04	1472870	589934	362	25.18	336.82
YE30H05	1475196	588855	362	24.42	337.58
YE32A03	1482263	586412	360	14.79	345.21
YE33B04	1487842	586405	385	27.37	357.63
YE33N03	1486079	580520	430	68.1	361.9
YE20J02	1482642	593977	340	33.88	306.12

APPENDIX B

Sampling and Testing Procedures

Samples were obtained using standard groundwater sampling procedures for the parameters to be tested.

Water levels were measured in each accessible well prior to sampling using a commercial electric probe. Measurements were recorded to 0.01 feet and were accurate to 0.03 feet. Well volumes were calculated using the height of water in the well casing above the bottom of the well.

Wells were purged a minimum of three well volumes and until specific conductance, pH, temperature measurements stabilized (changes of 10% or less between well volumes). Meters and precision for field parameters are listed in Table B-1. Samples were placed in bottles obtained from Manchester Environmental Laboratory. Bottle materials and preservatives for the target analytes are listed in Table B-2.

Table B-1. Field parameters, meters, and measurement precision.

Parameters	Meter	Precision
Specific Conductance	Beckman Conductivity Bridge	10 micromhos/cm
pH	Orion Model 9107	0.1 Std Unit
Temperature	Orion Model 9107	0.1 °C

Table B-2. Bottles, holding times and preservatives for Yelm target analytes.

Parameter	Bottle	Holding Time	Preservative
Nitrate+Nitrite-N	125 mL clear, w/m polyethylene	28 days	Sulfuric acid to pH<2, Cool to 4°C
Chloride	1000 mL polyethylene	28 days	Cool to 4°C
Fecal Coliform	250 mL sterile glass	30 hours	Cool to 4°C
Total Dissolved Solids	1000 mL polyethylene	28 days	Cool to 4°C

All samples were immediately placed in coolers with ice and transported to the Ecology Headquarters building in Lacey at the end of each day of sampling. Samples were left in the walk-in cooler until picked up by the laboratory courier to Ecology/EPA Manchester Environmental Laboratory in Manchester, Washington.

Samples were tested for the target parameters at the Ecology/EPA Manchester Environmental Laboratory. The target parameters, test methods and method detection limits are listed in Table B-3.

Table B-3. Target parameters, test methods and method detection limits.

Target Parameter	Test Method EPA Method/Standard Methods	Method Detection Limit (mg/L)
Nitrate+Nitrite-N	EPA 353.2/4500 NO3 F	0.01
Chloride	EPA 330.0/4110B	0.1
Fecal Coliform Bacteria	Membrane Filter 9222D	1CFU/100mL
Total Dissolved Solids	EPA 160.1/2540C	1

CFU= Colony forming unit.

APPENDIX C

Quality Assurance

Field

Field quality assurance samples consisted of one duplicate sample per ten well samples. Duplicate samples for this project are defined as two sequential samples obtained from the same well using identical sampling procedures. The duplicate sample results are used to estimate combined sampling and analytical precision. The relative percent difference (RPD) of the mean, the ratio of the difference and mean of duplicate results expressed as a percentage, is used to describe the precision of duplicate results. Low RPD's indicate high precision and high RPD's indicate poor precision. RPDs for nitrite+nitrate-N, total dissolved solids, and chloride calculated for each of the duplicate samples are shown in Table C-1. The precision for field duplicates was very good with RPDs ranging from 0 to 8% for nitrate+nitrite-N, 0 to 3% for total dissolved solids, and 0.1 to 1.7% for chloride

Laboratory

Copies of quality assurance reviews by Manchester Laboratory for each sampling event are shown in Appendix C. All analyses were performed within established EPA holding times. All initial and continuing calibration verification standards and blanks were within USEPA Contract Laboratory Program control limits. Laboratory quality control tests are done on each set of 20 or fewer samples and consisted of duplicate blanks, duplicate samples, a spiked sample, and a check (control) standard. Manchester Laboratory's quality control samples and procedures are discussed in Quality Assurance Manual, Manchester Environmental Laboratory (1988). All spike recoveries were within the acceptance limit of $\pm 25\%$. Laboratory duplicate results were within the $\pm 20\%$ acceptance window. Procedural blanks showed no analytical significant levels of analytes. Laboratory control sample analyses were within their acceptance windows of $\pm 20\%$.

Washington State Department of Ecology
Manchester Laboratory

April 30, 1996

TO: Denis Erickson
FROM: Becky Bogaczyk, Chemist *Bz*
SUBJECT: General Chemistry Quality Assurance memo for Yelm Groundwater,
week 16

SUMMARY

The data generated by the analysis of these samples can be used noting the qualifications discussed in this memo. All analyses requested were evaluated by established regulatory quality assurance guidelines

SAMPLE INFORMATION

Samples for Yelm Groundwater week 16 project were received by Manchester Laboratory on 04/17/96 in good condition.

HOLDING TIMES

All analyses were performed within established EPA holding times.

ANALYSIS PERFORMANCE

Instrument Calibration

Where applicable, instrument calibration was performed before each analytical run and checked by initial calibration verification standards and blanks. All initial and continuing calibration verification standards were within USEPA Contract Laboratory Program (CLP) control limits. A correlation coefficient of 0.995 or greater was met as stated in CLP calibration requirements.

Procedural Blanks

The procedural blanks associated with these samples showed no analytical significant levels of analytes.

Spiked Sample Analysis

Spike samples were performed where applicable with all spike recoveries within acceptance limits of $\pm 25\%$.

Precision Data

Spike sample results, where applicable, and duplicate sample results were used to evaluate precision on this sample set. Relative Percent Difference (RPD) for all parameters was within the 20% acceptance window for all duplicate analysis. Laboratory duplication is performed at a frequency of at least 10%.

Laboratory Control Sample (LCS) Analyses

LCS analyses were within the windows established for each parameter.

Other Quality Assurance Measures and Issues

Please call Becky Bogaczyk at SCAN (360) 871-8830 to further discuss this project.

cc: Bill Kammin
Project File

Washington State Department of Ecology
Manchester Laboratory

*Data
in
Access*

July 18, 1996

TO: Denis Erickson

FROM: Nancy Jensen, Microbiologist *NJ*

SUBJECT: General Chemistry Quality Assurance memo for Yelm Groundwater-24..

SUMMARY

The data generated by the analysis of these samples can be used noting the data qualifications discussed in this memo.

SAMPLE INFORMATION

These samples were received by the Manchester Laboratory on 06/11/96 in good condition.

HOLDING TIMES

Analysis of all parameters was performed within all applicable EPA holding times.

ANALYSIS PERFORMANCE

Instrument Calibration

Where applicable, instrument calibration was performed before each analytical run and checked by initial calibration verification standards and blanks. All initial and continuing calibration verification standards were within the relevant USEPA (CLP) control limits. A correlation coefficient of 0.995 or greater was met as stated in CLP calibration requirements.

Spiked Sample Analysis

All spiked samples were within acceptable limits.

Procedural Blanks

All procedural blanks were within acceptable limits.

Precision Data

Spike sample results and duplicate sample results were used to evaluate precision on this sample set. Relative Percent Difference (RPD) for all analytes were within the 20% acceptance window for duplicate analysis. Fecal coliforms RPD acceptance window is 40%. Laboratory duplication is done at a frequency of at least 10%.

Laboratory Control Sample (LCS) Analyses

LCS analyses were within the established windows.

Other Quality Assurance Measures and Issues

Please call Becky Bogaczyk at SCAN (360) 871-8830 to further discuss this project.

cc: Project File

Data in
Access

**Washington State Department of Ecology
Manchester Laboratory**

September 18, 1996

TO: Denis Erickson

FROM: Becky Bogaczyk, Chemist ^B

SUBJECT: General Chemistry Quality Assurance memo for Yelm Groundwater, week 34

SUMMARY

The data generated by the analysis of these samples can be used noting the qualifications discussed in this memo. All analyses requested were evaluated by established regulatory quality assurance guidelines.

SAMPLE INFORMATION

Samples for Yelm Groundwater week 34 project were received at Manchester Laboratory on 08/21-23/96 in good condition.

HOLDING TIMES

All analyses were performed within established EPA holding times.

ANALYSIS PERFORMANCE

Instrument Calibration

Instrument calibration was performed before each analytical run and checked by initial calibration verification standards and blanks. All initial and continuing calibration verification standards were within USEPA Contract Laboratory Program (CLP) control limits. A correlation coefficient of 0.995 or greater was met as stated in CLP calibration requirements.

Procedural Blanks

The procedural blanks associated with these samples showed no analytical significant levels of analytes.

Spiked Sample Analysis

Spike samples were performed with all spike recoveries within acceptance limits of $\pm 25\%$.

Precision Data

Results from duplicate analysis were used to evaluate precision. Duplicate analyses of all parameters were within acceptable limits.

Laboratory Control Sample (LCS) Analysis

All laboratory controls were within acceptance windows.

Other Quality Assurance Measures and Issues

All nutrient samples with a "U" qualifier have a result less than the detection limit of 0.01 mg/L.

All fecal samples with a "U" qualifier have a result less than the detection limit of 1/100 mL.

Call Nancy Jensen at (360) 871-8810 if you have any questions.

cc: Bill Kammin
Project File.

Washington State Department of Ecology
Manchester Laboratory

Access Data
in
Database

November 5, 1996

TO: Denis Erickson

FROM: Debbie Lacroix, Chemist *DL*

SUBJECT: General Chemistry Quality Assurance memo for the Yelm Groundwater Project

SUMMARY

The data generated by the analysis of these samples can be used without qualifications.

SAMPLE INFORMATION

Samples 96418070-95 from the Yelm Groundwater Project were received by the Manchester Laboratory on 10/8 and 10/9-96 in good condition.

HOLDING TIMES

All analyses were performed within applicable EPA holding times.

ANALYSIS PERFORMANCE

Instrument Calibration

Where applicable, instrument calibration was performed before each analysis and verified by initial and verification standards and blanks. All initial and continuing calibration verification standards were within the relevant EPA control limits. A correlation of 0.995 or greater was met as stated in CLP calibration requirements. All balances are calibrated yearly with calibration verification performed monthly.

Procedural Blanks

All procedural blanks were within acceptable limits.

Spiked Sample Analysis

All spikes were within the acceptance windows of $\pm 25\%$.

Precision Data

The results of the duplicate analysis of samples were used to evaluate the precision on this sample set. The Relative Percent Differences (RPD) were within their acceptance windows of +/- 20 %.

Laboratory Control Sample (LCS) Analyses

LCS analyses were within their acceptance windows of +/- 20 %.

Please call Debbie Lacroix at SCAN 871-8812 with any questions or concerns about this project.

cc: Project File

*Data in
Data Base*

Washington State Department of Ecology
Manchester Laboratory

January 16, 1997

TO: Denis Erickson

FROM: Casey Maggart, Chemist *CM*

SUBJECT: General Chemistry Quality Assurance memo for Yelm Groundwater

SUMMARY

The data generated by the analysis of these samples can be used noting the data qualifications discussed in this memo. All analyses requested were evaluated using USEPA Contract Laboratory Program (CLP) quality assurance requirements.

Sample Information

These samples from the Yelm Groundwater project were received by the Manchester Laboratory on 12/10/96 through 12/12/96 in good condition.

Holding Times

Analysis of all parameters was performed within USEPA established holding times.

ANALYSIS PERFORMANCE

Instrument Calibration

Where applicable, instrument calibration was performed before each analytical run and checked by initial calibration verification standards and blanks. All initial and continuing calibration verification standards were within the relevant USEPA (CLP) control limits. A correlation coefficient of 0.995 or greater was met as stated in CLP calibration requirements. The turbidimeter is calibrated bi-annually as stated in the manufacturer's recommendations. All balances are calibrated yearly with calibration verification occurring monthly. Oven temperatures are recorded before and after analyses to insure control.

Procedural Blanks

The procedural blanks associated with these samples showed no analytically significant levels of analytes.

Spiked Sample Analysis

Spike sample analyses were performed on the nutrients on this data set. All spike recoveries were within the CLP acceptance limits of +/- 25%.

Precision Data

The Relative Percent Difference (RPD) for all parameters were within their acceptance windows except for TDS sample 508230 which was qualified with a "J". The sample is qualified as an estimate because the replicate falls outside of the acceptance windows.

Laboratory Control Sample Analyses

LCS analyses were within the windows established for each parameter.

Other Quality Assurance Measures and Issues

All nutrient samples with a "U" qualifier have a result less than the detection limit of 0.01 mg/L.

All Fecal samples with a "U" qualifier have a result less than the detection limit of 1.0/100mL.

Please call Casey Maggart at SCAN 871-8824 to further discuss this project.

cc: Bill Kammin

Entered in
Database

Washington State Department of Ecology
Manchester Laboratory

March 12, 1997

TO: Denis Erickson
FROM: Becky Bogaczyk, Chemist
SUBJECT: General Chemistry Quality Assurance memo for Yelm Groundwater, week 07

SUMMARY

The data generated by the analysis of these samples can be used noting the qualifications discussed in this memo. All analyses requested were evaluated by established regulatory quality assurance guidelines

SAMPLE INFORMATION

Samples for Yelm Groundwater week 07 project were received by Manchester Laboratory on 02/11/97 in good condition.

HOLDING TIMES

All analyses were performed within established EPA holding times.

ANALYSIS PERFORMANCE

Instrument Calibration

Where applicable, instrument calibration was performed before each analytical run and checked by initial calibration verification standards and blanks. All initial and continuing calibration verification standards were within control limits. A correlation coefficient of 0.995 or greater was met.

Procedural Blanks

The procedural blanks associated with these samples showed no significant analytical levels of analytes.

Spiked Sample Analysis

Spike samples were performed where applicable with all spike recoveries within acceptance limits of $\pm 25\%$.

Precision Data

Spike sample results, where applicable, and duplicate sample results were used to evaluate precision on this sample set. Relative Percent Difference (RPD) for all parameters was within the 20% acceptance window for all duplicate analysis. Laboratory duplication is performed at a frequency of at least 10%.

Laboratory Control Sample (LCS) Analyses

LCS analyses were within the windows established for each parameter.

Other Quality Assurance Measures and Issues

The "U" qualification indicates the analyte was not detected at or above the reported result.

Please call Becky Bogaczyk at (360) 871-8830 to further discuss this project.

cc: Project File

APPENDIX D

Table D-1. Yelm Groundwater Quality Results, April 1996 through February 1997.

=====
=====
=====

Table D-1. Yelm Groundwater Quality Results, April 1996 through February 1997.

Site ID	Date	Nitrate+ Nitrite-N (mg/L)	Total Dissolved Solids (mg/L)	Chloride (mg/L)	Ammonium-N (mg/L)	Fecal Coliforms (CFU/100mL)
YE20A02	4/10/96	6.3	111	5.68	0.01 U	1 U
YE20A02	6/11/96	4.75	104	5.15	0.01 U	1 U
YE20A02	8/22/96	4.23	104	5.03	0.01 U	1 U
YE20A02	10/8/96	3.49	103	5.01	0.01 U	1 U
YE20A02	12/10/96	5.02	98	5.75	0.01 U	1 U
YE20A02	2/11/97	4.5	108.5	5.38	0.01 U	1 U
YE20F03	4/10/96	3.16	101	4.12	0.01 U	1 U
YE20F03	6/11/96	3.04	105	4.27	0.01 U	1 U
YE20F03	8/22/96	3.04	106.5	4.36	0.01 U	1 U
YE20F03	10/8/96	2.76	113	4.46	0.01 U	1 U
YE20F03	12/11/96	2.91	104.5	4.46	0.01 U	1 U
YE20F03	2/11/97	2.88	121	4.58	0.01 U	1 U
YE20K05	4/9/96	6.44	129	6.33	0.01 U	1 U
YE20K05	6/12/96	5.24	103	6.05	0.01 U	1 U
YE20K05	8/21/96	5.01	126	6.18	0.01 U	1 U
YE20K05	10/8/96	5	124	7.0	0.01 U	1 U
YE20K05	12/10/96	5.31	111	7.63	0.01 U	1 U
YE20K05	2/11/97	5.04	118	6.52	0.01 U	1 U
YE20N03	4/9/96	3.19	93	4.59	0.01 U	1 U
YE20N03	6/11/96	2.56	78	4.52	0.01 U	1 U
YE20N03	8/22/96	4.34	104	6.11	0.01 U	1 U
YE20N03	10/8/96	3.89	111	6.06	0.01 U	1 U
YE20N03	12/19/96	2.72	98	4.71	0.01 U	1 U
YE20N03	2/11/97	4.48	112	5.58	0.01 U	1 U
YE20Q01	4/9/96	8.15	142	7.11	0.01 U	1 U
YE20Q01	6/11/96	6.68	117	6.75	0.01 U	1 U
YE20Q01	8/21/96	6.76	126	7.0	0.01 U	1 U
YE20Q01	10/8/96	4.24	131	7.18	0.01 U	1 U
YE20Q01	12/10/96	5.49	107	5.96	0.01 U	1 U
YE20Q01	2/11/97	4.53	123	6.11	0.01 U	1 U
YE20Q04	4/9/96	7.65	144	6.82	0.01 U	1 U
YE20Q04	6/12/96	5.95	116	6.31	0.01 U	1 U
YE20Q04	8/21/96	5.07	121	6.2	0.01 U	1 U
YE20Q04	10/8/96	4.89	121.5	6.92	0.01 U	1 U
YE20Q04	12/10/96	5.86	112	6.9	0.01 U	1 U
YE20Q04	2/11/97	6.27	127	6.82	0.01 U	1 U
YE28M04	4/10/96	0.427	86	1.25	0.01 U	1 U
YE28M04	6/11/96	0.477	70	1.44	0.01 U	1 U
YE28M04	8/21/96	0.463	78	1.41	0.01 U	1 U
YE28M04	10/7/96	0.437	96.5	1.3	0.01 U	1 U
YE28M04	12/10/96	0.498	78	1.4	0.01 U	1 U
YE28M04	2/10/97	0.494	72	1.37	0.01 U	1 U
YE29A05	4/9/96	0.301	90	1.36	0.01 U	1 U
YE29A05	6/11/96	0.353	70	1.49	0.01 U	1 U
YE29A05	8/21/96	0.332	81	1.61	0.01 U	1 U
YE29A05	10/8/96	0.281	87	1.65	0.01 U	1 U
YE29A05	12/10/96	0.695	73	1.85	0.01 U	1 U
YE29A05	2/11/97	0.281	84	1.51	0.01 U	1 U
YE29A07	4/9/96	7.34	136	8.01	0.01 U	1 U
YE29A07	6/11/96	6.81	120	7.45	0.01 U	1 U
YE29A07	8/21/96	6.54	128	7.59	0.01 U	1 U
YE29A07	10/8/96	5.805	130	8.015	0.01 U	1 U
YE29A07	12/10/96	5.86	107	6.46	0.01 U	1 U
YE29A07	2/11/97	4.935	118.5	6.24	0.01 U	1 U

Table D-1. Yelm Groundwater Quality Results, April 1996 through February 1997.

Site ID	Date	Nitrate+ Nitrite-N (mg/L)	Total Dissolved Solids (mg/L)	Chloride (mg/L)	Ammonium-N (mg/L)	Fecal Coliforms (CFU/100mL)
YE29B04	4/10/96	4.47	100	5.3	0.01 U	1 U
YE29B04	6/11/96	2.44	78	3.19	0.01 U	1 U
YE29B04	8/21/96	2.7	79	3.1	0.01 U	1 U
YE29B04	10/8/96	2.43	97	2.91	0.01 U	1 U
YE29B04	12/10/96	1.74	69	2.35	0.01 U	1 U
YE29B04	2/11/97	3.37	102	4.07	0.01 U	1 U
YE29C03	4/16/96	4.34	106.5	5.435	0.01 U	1 U
YE29C04	4/9/96	6.4	122	6.95	0.01 U	1 U
YE29C04	6/11/96	5	98	6.54	0.01 U	1 U
YE29C04	8/21/96	6.415	116.5	7.345	0.01 U	1 U
YE29C04	10/8/96	4.8	129	10.2	0.01 U	1 U
YE29C04	12/10/96	4.57	110	7.32	0.01 U	1 U
YE29C04	2/11/97	9.79	157	8.61	0.01 U	1 U
YE29J03	4/10/96	0.811	87	1.54	0.01 U	1 U
YE29J03	6/11/96	0.752	77	1.64	0.01 U	1 U
YE29J03	8/20/96	0.687	95	1.61	0.01 U	1 U
YE29J03	10/7/96	0.692	97	1.55	0.01 U	1 U
YE29J03	12/9/96	0.765	80	1.66	0.01 U	1 U
YE29J03	2/10/97	0.858	82	1.64	0.01 U	1 U
YE29R04	4/10/96	10.1	148	12.1	0.01 U	1 U
YE29R04	6/11/96	9.31	132	11.7	0.01 U	1 U
YE29R04	8/20/96	8.72	158	9.53	0.01 U	1 U
YE29R04	10/7/96	6.77	146	8.99	0.01 U	1 U
YE29R04	12/9/96	7.79	142	12.7	0.01 U	1 U
YE29R04	2/10/97	9.1	134	10.8	0.01 U	1 U
YE29R05	4/8/96	3.61	105	3.8	0.01 U	1 U
YE29R05	6/10/96	3.61	108	3.99	0.01 U	1 U
YE29R05	8/20/96	3.175	115.5	3.7	0.01 U	1 U
YE29R05	10/7/96	3.145	123.5	3.865	0.01 U	1 U
YE29R05	12/9/96	3.42	106	3.94	0.01 U	1 U
YE29R05	2/10/97	3.51	103	4.22	0.01 U	1 U
YE30E04	4/10/96	0.527	114	3.15	0.01 U	1 U
YE30E04	6/10/96	0.476	114	3.32	0.01 U	1 U
YE30E04	8/21/96	0.418	114	3.28	0.01 U	1 U
YE30E04	10/8/96	0.412	114	3.24	0.01 U	1 U
YE30E04	12/11/96	0.478	116	3.32	0.01 U	1 U
YE30E04	2/11/97	0.538	130	3.44	0.01 U	1 U
YE30H05	4/10/96	1.37	67	4.14	0.01 U	1 U
YE30H05	6/10/96	1.1	69	3.55	0.01 U	1 U
YE30H05	8/21/96	2.4	94	6.11	0.01 U	1 U
YE30H05	10/8/96	2.17	98.5	6.39	0.01 U	1 U
YE30H05	12/10/96	2.58	82	5.58	0.01 U	1 U
YE30H05	2/11/97	2.37	99	6.03	0.01 U	1 U
YE32A03	4/8/96	0.529	80	1.61	0.01 U	1 U
YE32A03	6/10/96	0.53	81	1.76	0.01 U	1 U
YE32A03	8/20/96	0.524	89	1.72	0.01 U	1 U
YE32A03	10/7/96	0.495	92	1.64	0.01 U	1 U
YE32A03	12/9/96	0.533	80	1.75	0.01 U	1 U
YE32A03	2/10/97	0.57	77	1.725	0.01 U	1 U
YE32G03	4/8/96	0.134	118	3.05	0.01 U	1 U
YE32G03	6/10/96	0.15	115	3.22	0.01 U	1 U
YE32G03	8/20/96	0.132	122	3.7	0.01 U	1 U
YE32G03	10/7/96	0.139	143	3.1	0.01 U	1 U
YE32G03	12/9/96	0.131	118	3.24	0.01 U	1 U

Table D-1. Yelm Groundwater Quality Results, April 1996 through February 1997.

Site ID	Date	Nitrate+ Nitrite-N (mg/L)	Total Dissolved Solids (mg/L)	Chloride (mg/L)	Ammonium-N (mg/L)	Fecal Coliforms (CFU/100mL)
YE32G03	2/10/97	0.185	118	3.26	0.01 U	1 U
YE32H02	4/8/96	1.205	94	3.12	0.01 U	1 U
YE32H02	6/10/96	0.9745	101	3.4	0.01 U	1 U
YE32H02	8/20/96	0.962	104	3.07	0.01 U	1 U
YE32H02	10/7/96	0.936	107	3.09	0.01 U	1 U
YE32H02	12/9/96	1.105	98	3.15	0.01 U	1 U
YE32H02	2/10/97	0.937	89	3.03	0.01 U	1 U
YE33B04	4/8/96	5.06	99	6.99	0.01 U	1 U
YE33B04	6/10/96	4.11	101	5.38	0.01 U	1 U
YE33B04	8/20/96	5.42	142	17.3	0.01 U	1 U
YE33B04	10/7/96	6.14	157.5	16.2	0.01 U	1 U
YE33B04	12/9/96	5.26	102	5.71	0.014	1 U
YE33B04	2/10/97	5.24	99	6.72	0.01 U	1 U
YE33B05	4/8/96	2.58	119	3.79	0.01 U	1 U
YE33B05	6/10/96	2.55	120	3.98	0.01 U	1 U
YE33B05	8/20/96	2.41	126	3.97	0.01 U	1 U
YE33B05	10/7/96	2.3	131	3.98	0.01 U	1 U
YE33B05	12/9/96	2.52	123	4.12	0.01 U	1 U
YE33B05	2/10/97	2.63	122	4.23	0.01 U	1 U
YE33D08	4/8/96	3.25	111	4.92	0.01 U	1 U
YE33D08	6/11/96	3.95	107	6.87	0.01 U	1 U
YE33D08	8/20/96	3.41	121	6.2	0.01 U	1 U
YE33D08	10/7/96	2.84	123	5.64	0.015	1 U
YE33D08	12/9/96	2.44	120	4.9	0.01 U	1 U
YE33D08	2/10/97	3.55	105	6.36	0.01 U	1 U
YE33N03	4/8/96	0.678	142	3.6	0.01 U	1 U
YE33N03	6/10/96	0.647	141	3.74	0.01 U	1 U
YE33N03	8/20/96	0.662	149	3.77	0.01 U	1 U
YE33N03	10/7/96	0.519	154	3.81	0.01 U	1 U
YE33N03	12/9/96	0.486	150	3.88	0.01 U	1 U
YE33N03	2/10/97	0.701	138	3.89	0.01 U	1 U
	Mean=	3.19	110	4.92		1 U
	Min=	0.13	67	1.25	0.01 U	1 U
	Max=	10.1	158	17.3	0.015	1 U

U= Analyte not detected above listed value.

RECEIVED

FEB 17 2002

Skillings-Connolly, Inc.
Consulting Engineers

Title

Quality Assurance Project Plan For the City of Yelm Groundwater Quality Monitoring Project

Prepared by

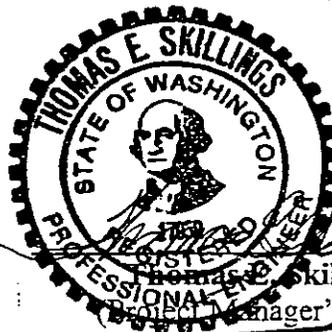
Skillings-Connolly, Inc.

Revised on

December 31, 2001

Project Information

**Centennial Clean Water Fund
Grant No. G0100206, FY 2001 Funding Cycle**



Shelly Badger

Shelly Badger
(Yelm City Administrator)

Cindy M. James

(D.O.E. Grant \ Contract Administrator)

Brian K. Matthews

Brian K. Matthews, P.E.
(Project Manager)

Melanie B. Kunsy

(D.O.E. Quality Assurance Officer)

Kenney Lillquist

Kenney Lillquist, E.I.T.
(Design Engineer)

Steve Hibbs

Steve Hibbs
(Laboratory Representative)

Table of Contents

DISTRIBUTION LIST	1
ORGANIZATION AND SCHEDULE	2
PROJECT ORGANIZATION	2
<i>Project Team</i>	2
<i>Decision Makers</i>	2
<i>Stakeholders</i>	2
<i>Participant Communication</i>	3
PROJECT SCHEDULE	4
<i>Project Start Date</i>	4
<i>Reconnaissance Visits</i>	4
<i>Field Activities</i>	4
<i>Delivery of Samples to the Laboratory</i>	4
<i>Reporting Laboratory Results</i>	4
<i>Data Entry to the EIM Database</i>	4
<i>Progress, Draft and Final Reports</i>	4
<i>Disposal of Samples</i>	4
<i>Schedule Limitations</i>	4
PROJECT BUDGET AND FINANCIAL SUPPORT CREDIT.....	6
KEY CONTACT INFORMATION.....	6
BACKGROUND AND PROBLEM STATEMENT	8
PROJECT BACKGROUND	8
<i>Site Description and Use</i>	8
<i>Project Map</i>	8
<i>Site History</i>	8
<i>Previous Water Quality Information</i>	8
<i>Applicable Regulatory Requirements and Criteria</i>	8
<i>Anticipated Site Logistical Problems</i>	8
PROBLEM STATEMENT	9
PROJECT DESCRIPTION	10
GOALS AND DECISION STATEMENT.....	10
OBJECTIVES	10
<i>Information needed to meet objective</i>	10
<i>Information Source(s)</i>	10
<i>Target Population Identification</i>	10
<i>Study Boundaries in time and space</i>	10
<i>Decision Rule</i>	10
<i>Anticipated Study Constraints</i>	11
DATA QUALITY OBJECTIVES	12
SAMPLING DESIGN	13
FIELD PROCEDURES	16
<i>City Wells 1 and 2</i>	16
<i>Monitoring Wells</i>	16
<i>Control Structures</i>	17
LABORATORY PROCEDURES	19

QUALITY CONTROL 20
FIELD QC20
LABORATORY QC21

DATA MANAGEMENT PROCEDURES 22
FIELD22
LABORATORY22
DATA BASE.....22
EXISTING DATA22

AUDITS AND REPORTS..... 23

DATA REVIEW, VERIFICATION AND VALIDATION 24
DATA REVIEW.....24
DATA VERIFICATION.....24
DATA VALIDATION24

DATA QUALITY ASSESSMENT 24

BIBLIOGRAPHY 25

SAMPLE FORMS AND EQUIPMENT SPECIFICATIONS 27

Distribution List

Copies of the Quality Assurance Project Plan will be distributed to the following parties:

Washington State Department of Ecology
Water Quality Program
Southwest Regional Office
c/o Christine Hempleman
PO Box 47775
Olympia, WA 98504-7775
Tel. (360) 407-6329

City of Yelm
c/o Shelly Badger
PO Box 479
Yelm, WA 98597
Tel. (360) 458-8405

Skillings-Connolly, Inc.
c/o Brian Matthews, PE
P.O. Box 5080
Lacey, WA 98509-5080
Tel. (360) 491-3399

Washington State Department of Health
Division of Drinking Water
SOUTHWEST DRINKING WATER OPERATIONS
c/o Mark Toy
PO Box 47823
Olympia, WA 98504-7823
Tel. (360) 586-5209

Spectra Laboratories
c/o Steve Hibbs
2221 Ross Way
Tacoma, WA 98421
Tel. (253) 272-4850

Organization and Schedule

Project Organization

Project Team

The City proposes using the same management structure that successfully implemented the recently completed water reclamation project. The project team has been working together on the Yelm reuse project over the last 12 years. They each understand the project and have been responsible for this successful implementation of the reuse project. This team includes:

Mayor Adam Rivas, chief elected official for the City. Mr. Rivas along with the aid of the City Council will make decisions for the project pertaining to the City's involvement.

Shelly Badger, City Administrator and the reuse project program manager for the City was responsible for the fiscal management of the reuse project and will serve in that capacity for the water quality monitoring project. Shelly works directly under the Mayor and reports to the Mayor and Council who are ultimately responsible for the quality of the drinking water supplied to their customers;

Thomas Skillings, PE, principal of Skillings-Connolly, Inc. will supervise the management of the project. He has worked on the City's reuse project from its conception in 1993, and was responsible for the planning, design and construction of all of the City's reuse facilities. He also has been the project manager for all of the City's potable drinking water treatment, storage and supply, planning and design services for the last 15 years. He is very familiar with the City's system needs and what this water quality monitoring effort is trying to accomplish.

Brian Matthews, PE will manage the project for Skillings-Connolly, Inc.. He is very familiar with the needs and dynamics of the City of Yelm stemming from his management of the construction of the reclamation facility at the City as well as working on various infrastructure improvements within the City.

This team, along with staff engineers and operators will work together to successfully complete this project on time and within the budget as they did with the \$9.6m water reuse construction project in 1999.

A new and invaluable member has been added to this team. Steve Hibbs, the Laboratory Manager for Spectra Laboratories will manage the water quality testing of the water samples taken for the project. Spectra Laboratories is located in Tacoma, Washington and specializes in water quality analysis.

A list of key personnel, their responsibilities and contact information is included at the end of this section.

Decision Makers

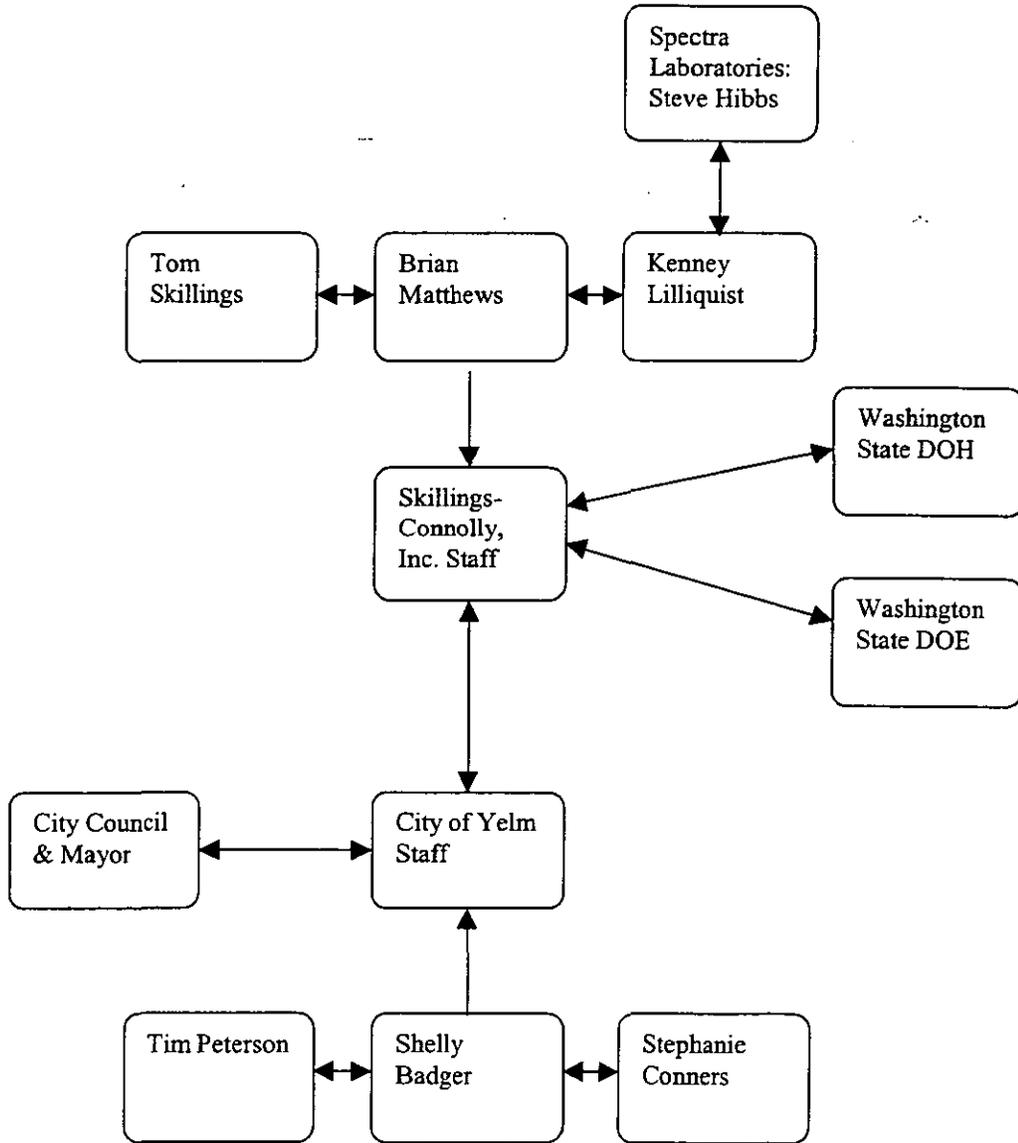
At the agency level, the Mayor and City Council will make decisions regarding the project based on the information provided to them by Shelly Badger and Skillings-Connolly. At the consultant level, Brian Matthews under the supervision of Thomas Skillings will make decisions pertaining to the portions of the project that directly involve the activities of Skillings-Connolly, Inc..

Stakeholders

The intent of this project is to examine the water quality impacts, if any, of recharging Yelm's aquifer with Class A reclaimed water. The construction of the reclamation facility was a pilot project for the State of Washington and the first of its kind in the state to recharge its own aquifer with Class A reclaimed water. The key stakeholders and those directly affected by the outcome of this project include the following: The State Department of Ecology who helped to fund portions of the project and has an interest in the standards of reclaimed water use as well as the use of constructed wetlands for additional polishing of reclaimed water. The State Department of Health regulates the water quality standards for water systems

within the state and will be faced with additional proposals for the use and implementation of water reclamation facilities in the future. The City of Yelm is directly responsible for providing their customers with water of the highest quality. All of the parties mentioned above will benefit from the results of the this project which will provide insight to the impacts on groundwater quality of aquifers that are recharged with Class A reclaimed water.

Participant Communication



The staff of Skillings-Connolly, Inc. will communicate with the DOH and DOE as necessary to meet the requirement of both departments and produce a product that will be beneficial to all. The staff of Skillings-Connolly, Inc. will keep in close communication with Shelly Badger and the City staff to complete the project with the utmost efficiency. Together the staffs of the City and Skillings-Connolly, Inc. will communicate closely with Yelm's Mayor and City Council to provide them with information that will

allow them to make citywide decisions and provide the necessary feedback for the City and Skillings-Connolly, Inc. staff to proceed successfully with the project.

Project Schedule

Project Start Date

This project will consist of taking water samples from monitoring wells and control structures located throughout Cochrane Park. Constructed in 1999, Cochrane Park is a public access facility that uses constructed wetlands to "polish" Class A reclaimed water (generated by Yelm's water reclamation facility) before it is discharged into the groundwater aquifer via rapid infiltration basins located at the park. Samples from the park and aquifer will be taken quarterly over a two-year period. It is anticipated that monitoring will start in February, 2002 following approval of final Quality Assurance Project Plan that is to be submitted to the DOE by December 31, 2001.

Reconnaissance Visits

Two reconnaissance visits to the site are expected. These visits will be to verify the condition of the wells and determine which monitoring wells will provide the most comprehensive and reliable results.

Field Activities

Monitoring and sampling of the wells is expected to take place once every three months beginning in February, 2002.

Delivery of Samples to the Laboratory

The samples taken from the wells will be submitted to the testing laboratory within the time frames specified for each constituent.

Reporting Laboratory Results

Laboratory results will be returned to Skillings-Connolly, Inc., for review and filing. The results will then be integrated into the project report.

Data Entry to the EIM Database

Data will be entered into the EIM database shortly after the results of the water quality testing are received from the testing laboratory.

Progress, Draft and Final Reports

A short progress report will be made quarterly following the receipt of the results from the lab. It is anticipated that the report will be a living document for the two-year life of the project with a draft report becoming available at the end of the two-year project life. The final report will be submitted shortly after all parties have reviewed the draft report.

Disposal of Samples

Unless otherwise specified by the City or state departments, the testing laboratory will dispose of the samples accordingly.

Schedule Limitations

At this time, primary limitations of the schedule are limited to the turn around time of the testing laboratory and their procedures. Depending on the constituents being tested for, results can take anywhere from couple days to several months to return. A second possible schedule limitation for the project is review of the documents by any agencies for an extended period of time. If results should take several months to obtain or if any review should take exceptional time, then the project will be delayed accordingly.

CITY OF YELM GROUNDWATER MONITORING SCHEDULE

Task Name	Duration	Start	Finish	Qtr 1, 2001	Qtr 3, 2001	Qtr 1, 2002	Qtr 3, 2002	Qtr 1, 2003	Qtr 3, 2003	Qtr 1, 2004	Qtr 3, 2004
Project Management	701 days	Tue 10/16/01	Tue 6/22/04								
Develop Draft QAPP	16 days	Mon 10/8/01	Mon 10/29/01								
Draft QAPP due to DOE	0 days	Wed 10/31/01	Wed 10/31/01								
DOE Review of Draft QAPP	20 days	Wed 10/31/01	Tue 11/27/01								
Develop Final QAPP	40 days	Tue 11/6/01	Mon 12/31/01								
Final QAPP due to DOE	0 days	Mon 12/31/01	Mon 12/31/01								
DOE Review of Final QAPP	20 days	Tue 1/1/02	Mon 1/28/02								
Sampling and Analysis	470 days	Tue 1/29/02	Mon 11/17/03								
Draft Report Development	100 days	Tue 11/11/03	Mon 3/29/04								
Draft Report Due to DOE	0 days	Wed 3/31/04	Wed 3/31/04								
DOE Review of Draft Report	20 days	Wed 3/31/04	Tue 4/27/04								
Final Report Development	38 days	Wed 5/5/04	Fri 6/25/04								
Final Report due to DOE	0 days	Wed 6/30/04	Wed 6/30/04								

Project Budget and Financial Support Credit

Yelm Groundwater Quality Monitoring Project Budget	
Elements	Total Eligible Cost (TEC)
Task 1-Project Management	\$15,000
Task 2 – Quality Assurance Project Plan (QAPP)	\$10,000
Task 3 – Data Collection & Laboratory Testing	\$131,000
Task 4 – Report Preparation	<u>\$19,000</u>
TOTAL	\$175,000
<i>The DOE's Fiscal Office will track to the Total Eligible Project Cost.</i>	
Matching Requirements	
Wash. DOE share FY 01 (75% of TEC)	\$131,250
City of Yelm share (25% of TEC)	\$43,750

Key Contact Information

City of Yelm Billing Contact: Shelly Badger
 City Administrator
 City of Yelm
 PO Box 479
 Yelm, WA 98597

Telephone Number: (360) 458-8405
 Fax Number: (360) 458-4348
 E-Mail Address: shelly@yelmtel.com

Engineering Consultant Project Supervisor: Thomas E. Skillings, PE
 Skillings-Connolly, Inc.
 P.O. Box 5080
 Lacey, WA 98509-5080

Telephone Number: (360) 491-3399
 Fax Number: (360) 491-3857
 E-Mail Address: tskillings@skillings.com

Engineering Consultant Project Manager: Brian Matthews, PE
 Skillings-Connolly, Inc.
 P.O. Box 5080
 Lacey, WA 98509-5080

Telephone Number: (360) 491-3399
 Fax Number: (360) 491-3857
 E-Mail Address: bmatthews@skillings.com

Engineering Consultant Design Engineer: Kenney Lilliquist, EIT
 Skillings-Connolly, Inc.
 P.O. Box 5080
 Lacey, WA 98509-5080

Telephone Number: (360) 491-3399
 Fax Number: (360) 491-3857
 E-Mail Address: klilliquist@skillings.com

Washington State DOH Contact: Mark Toy
 Washington State Department of Health
 Division of Drinking Water
 SOUTHWEST DRINKING WATER OPERATIONS

2411 Pacific Avenue
PO Box 47823, Olympia, WA 98504-7823
Telephone Number: (360) 586-5209
Fax Number: (360) 664-8058
E-Mail Address: Mark.Toy@DOH.WA.GOV

Washington State DOE Financial Manager: Dan Filip
Financial Manager
Water Quality Program
Washington State Department of Ecology
PO Box 47600
Olympia, WA 98504-7600
Telephone Number: (360) 407-6509
Fax Number: (360) 407-6574
E-Mail Address: dfil461@ecy.wa.gov

Washington State DOE Project Manager: Christine Hempleman
Project Manager
Water Quality Program
Southwest Regional Office
Washington State Department of Ecology
PO Box 47775
Olympia, WA 98504-7775
Telephone Number: (360) 407-6329
Fax Number: (360) 407-6305
E-Mail Address: chem461@ecy.wa.gov

Spectra Laboratories Laboratory Manager: Steve Hibbs
Laboratory Manager
Spectra Laboratories
2221 Ross Way
Tacoma, WA 98421
Telephone Number: (253) 272-4850
Fax Number: (253) 572-9838
E-Mail Address: info@spectra-lab.com

Background and Problem Statement

Project Background

Site Description and Use

"The City's water reclamation project, completed in 1999, utilizes groundwater recharge as one of the final components of the municipal reuse facility. Reclaimed water is used to recharge the same aquifer from which the City pumps its drinking water supplies. While no contamination has been detected to date, the new water reuse infiltration basins have the potential to pose a threat to the water supply. The City is undertaking a groundwater monitoring study to assure the groundwater is not adversely impacted by the recharge component.

Constructed wetlands at the Cochrane Park facility are designed to provide additional polishing of reclaimed water. The project will also determine the ability of constructed wetlands and specially designed rapid infiltration basins to provide effective additional treatment of reclaimed water prior to groundwater recharge.

The City will undertake this monitoring project by comparing the groundwater quality for the next two years to the baseline monitoring results completed in 1998 by the Department of Ecology (WSDOE publication 98-301). These monitoring efforts will test for pollutants as well as indicator parameters in the constructed wetlands, groundwater under the infiltration basins and the drinking water supplies."

The above description was taken from the Centennial Clean Water Fund Grant Agreement between the DOE and the City of Yelm.

Project Map

A layout of the area from which the samples will be taken is included on page 17. The diagram also indicates the approximate location from which several of the samples will be taken. The samples will be taken at locations along the treatment chain as water flows through the park and on to the City's potable wells. Sample point 1 is located approximately ½ mile away from Cochrane Park at the City's wells 1 and 2. The last sampling point, point number 12, is located at the control structure between the last treatment cell and the rapid infiltration basins.

Site History

Historically, the water withdrawn from the aquifer has met the water quality standards of the state and has not exhibited any poor water quality characteristics. The site of Cochrane Park, where the water is polished and infiltrated was previously undeveloped with light, native vegetation. The subsurface flow of the City's aquifer is to the northeast passing by Cochrane Park as it flows toward the City's potable wells.

Previous Water Quality Information

Previous sampling results of groundwater baseline sampling in Yelm will be used for comparison of results from this monitoring project. Results of the baseline testing are available in the Washington State Department of Ecology's publication 98-301.

Applicable Regulatory Requirements and Criteria

Anticipated Site Logistical Problems

There are no anticipated site logistical problems.

Problem Statement

Determine if recharging the aquifer with Class A reclaimed water is degrading the water quality of the aquifer used by the City. Determine if the constructed wetlands and infiltration basins are providing additional “polishing” of the reclaimed water before it is applied to groundwater / aquifer recharge.

Project Description

Goals and Decision Statement

Yelm withdraws their potable water from a shallow aquifer. This project will determine whether the water within the aquifer is being degraded as a result of recharging the aquifer with Class A reclaimed water. The project will also examine the polishing effects of constructed wetlands and rapid infiltration basins on Class A reclaimed water.

Objectives

The objectives of this project are to determine the extent of polishing accomplished with constructed wetlands and verify that recharging the aquifer with Class A reclaimed water is not degrading the groundwater quality of the aquifer.

Information needed to meet objective

Because of the seasonal variations in water use, sewer production, rainfall and groundwater levels, sampling for a prolonged period of time will have to be implemented to determine the overall affects on the water quality over time. The monitoring will span a period of 2 years to account for these variations. Also, by examining the groundwater quality over a two-year period, constituents that may have entered the aquifer by a means other than reclaimed water will be less likely to significantly alter the comprehensive results. The samples will be taken along the travel path of the reclaimed water. Essentially this will include sample points when it leaves the reclamation plant, as it travels through the wetland treatment cells of Cochrane Park and is finally withdrawn by the City's wells for use in the potable water system. The results of these water quality samples will be compared to the results of background samples of the aquifer taken before Cochrane Park and the reclamation facility were built.

Information Source(s)

The source of information will be the result of the water quality tests taken over the next two years and the background test results published in the Washington State Department of Health's publication 98-301.

Target Population Identification

To identify what aspects this monitoring project will focus on, target populations need to be established and defined. For this document, we have considered a "target population" to be the focus point of the study. There are two target populations for this project. The first target population is the Class A reclaimed water that is being treated at Cochrane Park. The amount of polishing this population receives, as a result of passing through the wetland park will be determined by this project. The second target population for this project is the ground water of the aquifer into which the reclaimed water is discharged. This project will determine if the groundwater quality of the aquifer is being degraded as a result of the infiltration of reclaimed water.

Study Boundaries in time and space

Effectively the study will begin at the inflow structure located at Cochrane Park and end at the City's potable wells located approximately ½ mile down gradient from the park. Samples will be taken at the control structures between the wetland cells, the fishpond and the rapid infiltration basins at the park. Samples will also be taken from sampling wells located at the park, the inflow structure of the park and City water supply wells.

Decision Rule

This project examines the water quality of two populations: the water along the treatment chain of the constructed wetlands and water of the aquifer being recharged with Class A reclaimed water. The locations selected as sampling sites are representative stages of the target populations travel paths. The two-year

project will provide repeated water quality results for each of the sample sites. These results will be compared with the downstream sites to determine if a trend in water quality exists.

Constructed Wetlands

If sampling results show that water quality decreases* as the water travels through the treatment chain from the inflow structure to the rapid infiltration basins, then the constructed wetlands can be considered to be degrading the water quality of the Class A reclaimed water before it is discharged into the aquifer.

If sampling results show that water quality increases* as the water travels through the treatment chain from the inflow structure to the rapid infiltration basins, then the constructed wetlands can be considered to be polishing the Class A reclaimed water before it is discharged into the aquifer.

Groundwater Aquifer

If samples taken along the groundwater flow path indicate an increasing* or neutral trend in water quality; aquifer recharge with Class A reclaimed water may not be adversely affecting the water quality of the aquifer.

If samples taken along the groundwater flow path indicate a decreasing* trend in water quality, aquifer recharge with Class A reclaimed water may be degrading the water quality of the aquifer.

In addition if the concentration of any constituents at the groundwater sampling sites are in excess of the state trigger level, it is recommended that more rigorous tests be performed including immediate testing of City wells 1 and 2.

Anticipated Study Constraints

At this time there are no anticipated constraints associated with this project.

* Lower concentrations of analytes are considered to indicate an increase in water quality. Higher concentrations of analytes are considered to indicate a decrease in water quality.

Data Quality Objectives

Spectra Laboratories, located in Tacoma Washington, have been contacted as the testing laboratory for this project. The laboratory has prepared the following table of Measurement Quality Objectives for the project:

Measurement Quality Objectives Yelm Groundwater Monitoring Project

ANALYTE	ACCURACY (bias+2xRSD)	PRECISION (RSD= sdev*100/avg)	BIAS ((avg-T)/T)x100	LABORATORY REPORTING LIMIT
Ammonia	11.03	5.46	0.10	0.2 mg/L
BOD (5-day)	27.80	8.72	10.37	2 mg/L
Bromide	N/A	N/A	N/A	0.1 mg/L
Chloride	4.51	2.18	0.15	0.5 mg/L
Dissolved Organic Carbon	31.99	14.29	3.41	5 mg/L
Fluoride	12.57	5.05	2.46	0.5 mg/L
Surfactants (MBAS)	19.60	9.10	1.40	0.02 mg/L
Nitrate	10.04	4.69	0.65	0.5 mg/L
Nitrite	30.48	6.80	16.89	0.1 mg/L
Sulfate	32.08	12.94	6.19	5 mg/L
Total Dissolved Solids	N/A	N/A	N/A	1 mg/L
Arsenic	27.61	13.03	1.54	0.005 mg/L
Boron	1.95	0.62	0.71	0.008 mg/L
Cadmium	7.09	2.86	1.37	0.003 mg/L
Chromium	5.72	2.63	0.46	0.007 mg/L
Copper	8.14	2.86	2.41	0.006 mg/L
Iron	17.60	5.56	6.47	0.015 mg/L
Lead	29.11	9.24	10.64	0.001 mg/L
Manganese	6.73	2.80	1.14	0.002 mg/L
Mercury	9.12	3.85	1.41	0.0005 mg/L
Nickel	5.87	2.58	0.71	0.015 mg/L
Silver	11.35	4.80	1.74	0.007 mg/L
Zinc	4.15	1.92	0.31	0.006 mg/L
Caffeine	68.71	18.54	31.64	10 ug/L
Total Trihalomethanes	25.52	8.29	8.94	2 ug/L
Fecal Coliform	N/A	N/A	N/A	N/A
Fecal Strep.	N/A	N/A	N/A	N/A
TKN	25.14	8.95	7.25	1.0 mg/L

Notes:

Precision and accuracy data for caffeine, bromide, and surfactants (MBAS) not available at this time.

Caffeine data based upon recoveries of nitrobenzene d5.

Surfactant (MBAS) data based on published values (Standard Methods).

Sampling Design

The intent of this groundwater monitoring project is to determine two things. First the project will determine how the quality of the Class A reclaimed water produced by the City of Yelm is affected by its flow through the constructed wetland of Cochrane Park. This will be accomplished by analyzing the quality of water samples taken along the constructed wetland treatment chain. The second goal of the program is to determine if recharge of the Class A reclaimed water is degrading the water quality of the aquifer from which the City of Yelm relies. The results of this project will be compared to the water quality results of the Department of Ecology's January 1998 publication Yelm Groundwater Baseline Sampling. (Publication no. 98-301) to help determine if degradation of the aquifer is resulting from recharge of the aquifer with Class A reclaimed water.

The frequency of sampling and water quality analysis for this monitoring project will be quarterly with samples being taken at the locations shown on the attached site plan. The following diagram shows the locations and identification numbers for sampling sites of the groundwater monitoring plan. The locations are numbered in order of sampling sequence, Sample point 1 acting as the first point from which a sample is to be taken. Sampling procedures are designed to minimize contamination with thorough cleaning of the sampling equipment between sample sites, however, the possibility of cross contamination with tainted equipment still exists. Sampling points have been sequenced so those sites with the highest expected quality will be obtained first. This ordering will reduce the chance of samples being contaminated from previous sites with poor water quality.

Wells 1 and 2 are located approximately ½ mile northeast of the sampling sites. Ideally the water being withdrawn from these wells will have the highest quality and this site was selected as the first sampling point.

The subsurface flow of the aquifer serving the City of Yelm flows in a northeast direction passing by Cochrane Park and the recharge basins as it travels in the direction of the City's potable wells. It is assumed that groundwater entering the study boundary will have higher water quality than that which is being recharged to the basin. Therefore sampling sites 2 and 3 are expected to have the next highest quality and were prioritized accordingly. As groundwater passes under the park, polished Class A reclaimed water will be added to the aquifer's flow. Because the reclaimed water is assumed to have lower quality, sampling points 4 through 7 are expected to exhibit lower water quality than sections of the aquifer up gradient from these wells.

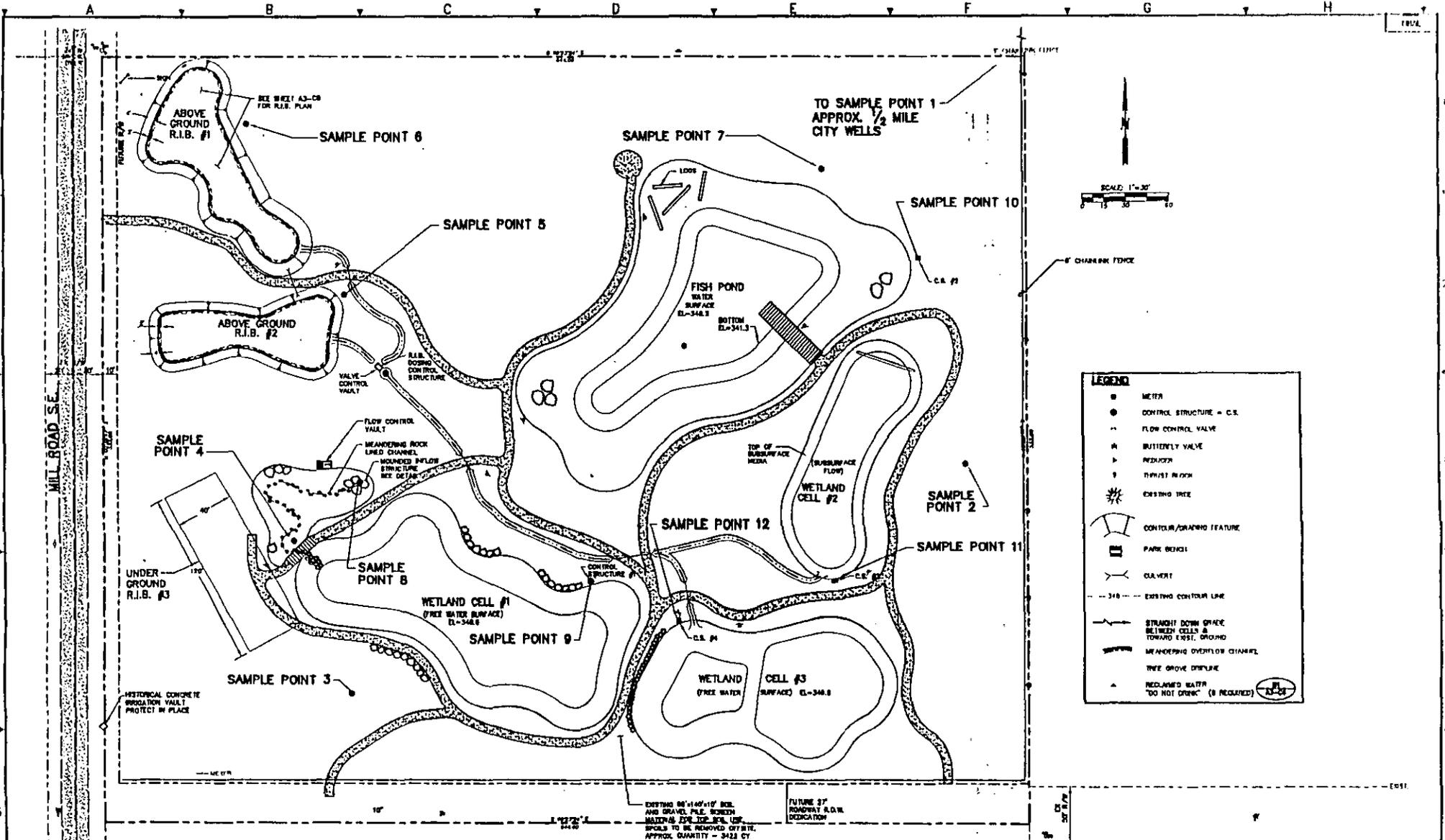
It is expected that the quality of reclaimed water introduced into the constructed wetlands will degrade as it travels from the beginning of the wetland cycle to the recharge basins¹. For this reason the inflow structure has been selected as sampling point 8 because it is expected to have the highest quality of water within the wetland cycle. The point at which water will be released in to the recharge basins has been selected as the last sampling point, sampling point 12. The water quality of sample point 12 and it is expected to have degraded as a result of traveling through the wetland treatment chain and having the lowest expected water quality was selected as the last sampling point.

Before sampling begins a reconnaissance visit will be performed to ensure that appropriate sampling sites have been selected. The monitoring project has been designed to span a period of 2 years with testing to occur quarterly (every three months). It is expected that this combination of frequency and duration will result in a comprehensive account of any seasonal variability affecting outcomes of the project.

¹ When the water reclamation project was developed, the community suggested that a catch and release fish pond would demonstrated the benign characteristics of Class A reclaimed water and that constructed wetlands would provide a transitional area around the pond as well as a natural way to "polish" the reclaimed water before it is discharged into the aquifer. However, it is suspected that the quality of the reclaimed water will actually decrease as a result of passing through the treatment chain of the constructed wetlands.

Constituents that will be analyzed by the testing laboratory are listed in the Data Quality Objectives section. In addition to these constituents, the following parameters will be measured in the field during sampling procedures with a Thermo Orion dissolved oxygen meter.

- PH
- Temperature
- Dissolved Oxygen
- Conductivity



LEGEND	
●	METER
○	CONTROL STRUCTURE - C.S.
⊕	FLOW CONTROL VALVE
⊞	BUTTERFLY VALVE
⊟	REDUCER
⊠	TURNST IN BOX
⊡	EXISTING TREE
⊢	CONTOUR/DRAINAGE FEATURE
⊣	PARK BENCH
⊤	CLAVERT
---	EXISTING CONTOUR LINE
—	STRAIGHT DOWN GRADE BETWEEN CELLS & TOWARD EXIST. GROUND
⊥	MEANDERING OVERFLOW CHANNEL
⊦	TREE GROVE DRIFLUE
⊧	RECLAIMED WATER "DO NOT DRINK" (IF REQUIRED)

DESIGNED BY B. CONNOLLY	ENTERED BY T. SATER
3/24/94 ADDENDUM #3	9/24/94 ADDENDUM #2
DATE REVISION	CHECKED BY T.S.

EXISTING 27' ROADWAY S.D.M. DEDICATION

6018 Lacey Boulevard SE, Lacey, Washington 98503
(360) 481-3399 (800) 454-7545 Fax (360) 481-3857

PROJECT NAME
**CITY OF LACEY
WATER REUSE PROJECT**

JOB NO. 85055

DRAWING TITLE
**CONSTRUCTED WETLANDS
COCHRANE PARK
SITE PLAN**

A ALT-3
DRAWING NO. H5055-30

SHEET NO.	A3-C2
-----------	-------

Field Procedures

The following information will be determined and recorded at each sample site. The information and measurements will be recorded in a notebook resistant to adverse weather conditions and dedicated for use on this project.

- Date and time
- Sample location and identification
- Identity of field personnel
- Sequence of Events
- Changes to the plan
- Site and atmospheric conditions
- Number of samples collected
- Location, identification and description for each sample
- Field measurements
- Identity of Quality Control samples
- Unusual circumstances that may affect data interpolation
- For Monitoring wells: static water level

Temperature, pH, conductivity and dissolved oxygen will be determined in the field with a Thermo Orion Dissolved Oxygen Meter model No. 123003 and then recorded in the dedicated notebook. A copy of the technical specifications for this multi-parameter meter, (obtained from Thermo Orion's website) is included at the end of this plan.

For all sample sites, the procedures outlined in Recommended Protocols for Measuring Conventional Water Quality Variables and Metals in Fresh Water of the Puget Sound Region, February 1990. (Obtained from the Puget Sound Water Quality Action Team's web site at http://www.wa.gov/puget_sound/) should be used as general guidelines. For constituents not identified in the document, use the recommended methods for metals as general guidelines.

There are three different types of sampling sites. Slightly different procedures will be followed for the different types of sample sites. *Clean rubber gloves shall be used while obtaining all samples.

City Wells1 and 2

Samples from these wells will be taken at faucets located inside the pumphouse of well #1. The City staff currently uses these faucets to take water samples from the wells as part of their water system operation. The faucets are dedicated for sampling purposes and draw from the City's dedicated supply line to their storage tanks. The samples will be taken after the City pumps have operated for a minimum of 2 minutes to ensure that a sample representative of water within the aquifer is obtained. Staff will coordinate with the City Water System Operator to determine when the pumps will be in operation and determine the static water level of the well according to the standard operation procedures of the City.

1. Remove aerator (if attached) and place rubber hose on faucet.
2. Slowly fill, from bottom, the sample containers provided by laboratory.
3. Fill dissolved oxygen sample slowly from the bottom of the container and allowed it to overflow in order to prevent any introduction of additional dissolved oxygen.
4. For samples that do not require preservatives, allow container to overflow a minimum of one bottle volume.
5. When sampling is complete, pack the labeled samples in coolers with Blue Ice for transport to the testing laboratory.

Monitoring Wells

To obtain samples that are representative of water within the aquifer and not within the monitoring well bore, the monitoring wells must be purged prior to sampling.

Sampling Equipment

The purge pump that will be used is the same type of pump that is currently used by the City's sewer department for sampling of the monitoring wells. The pump is a purge pump by Enviro-Tech model No. ES-40. A copy of the technical specifications is included at the end of this plan.

Static water level measurements will be made with an Olympic Electronic Well probe Model 500. The probe has color-coded markers every five feet to aid in water level determination.

Decontamination Procedures

Between sample sites, clean pump and multi-parameter meter with diluted hydrochloric acid and flush with de-ionized water.

Sampling Procedures

1. Place a drop cloth around the well to prevent introduction of any foreign material.
2. Lower electronic well probe into well until static water level is indicated, record measurement and repeat.
3. Lower purge pump into well and submerge approximately 6 inches below water surface.
4. Use a clamp to secure the hose to side of well casing taking care not to block discharge line.
5. Activate pump and discharge purge water away from well. Do not allow purged water to re-enter the well.
6. Purge well of between 1 and 5 bore volumes. Monitor and record temperature, pH and dissolved oxygen periodically. Well is considered to be adequately purged of stale water temperature, pH and dissolved oxygen measurements are within 5%.
7. Label sample containers to be filled.
8. Use a clean sample bottle to measure and record conductivity of discharged water per manufacturer's instructions.
9. Fill sample containers provided by laboratory directly from pump discharge line.
10. Fill dissolve oxygen sample slowly from the bottom of the container and allowed it to overflow in order to prevent any introduction of additional dissolved oxygen.
11. For samples that do not require preservatives, allow container to overflow a minimum of one bottle volume.
12. Pack samples in cooler with Blue Ice for transport to the testing laboratory.

Control Structures

The control structures at the park regulate flows from one treatment cell to the next. The structures are watertight basins with volumes of approximately 10 cubic feet. The inlet and outlet pipes have different elevations to regulate flow. Samples taken from these shallow basins will consist of water from the preceding treatment cell (or fishpond).

Decontamination Procedures

Between sample sites, clean multi-parameter meter with diluted hydrochloric acid and flush with de-ionized water. (Or as recommended by manufacturer if diluted hydrochloric acid is determined to be detrimental to the meter.)

Sampling Procedures

1. Clean all foreign debris from cover and sweep sides of ground clear of material that may enter the control structure. Use screwdriver or pliers, if needed, to remove debris from crevice surrounding lid before detaching lid
2. Place a drop cloth around the control structure to prevent introduction of any foreign material.
3. Detach and remove the lid
4. Label sample containers to be filled.
5. Record conductivity, temperature, pH and dissolved oxygen per meter manufacturer instructions.
6. To fill containers, submerge them upside down, remove lid and slowly rotate bottle until full.

7. Fill dissolve oxygen sample by **slowly** rotating the bottle so that individual air bubbles being displaced can be counted. (They don't need to actually be counted just rotate bottle upright slow enough that they could be counted.)
8. Pack samples in cooler with Blue Ice for transport to the testing laboratory.
9. Clean control structure rim of any debris. Replace and secure lid.

Sample identification

- SC1 CW
 - SC2 MW6
 - SC3 MW1
 - SC4 MW2
 - SC5 MW3
 - SC6 MW4
 - SC7 MW5
 - SC8 IS
 - SC9 CS1
 - SC10 CS2
 - SC11 CS3
 - SC12 CS4
 - SC 13 FD
- The first number of the sample identification indicates the sample point number on the site plan included in the sample design section. The second numbers indicate if the sample point is a City Well, a Monitoring Well (and the City's ID number of the well), a Control Structure (and the number of the control structure), the Inflow Structure or a Field Duplicate.

Tools Needed

The following is a list of tools needed to access the monitoring well and control structures and aid in sampling. The list is not all-inclusive but does include those items essential to access and sample acquisition.

- Screw driver (flat head)
- 9/16" socket
- 1/2" allen key
- 3/8" square wrench ("T" wrench)
- Nylon brush (large and small)
- Pliers (needle nose)
- Crow bar
- Man-hole lever
- Drop cloths
- Rubber gloves
- Clean 5-gallon bucket

Sample Transport

The testing laboratory will provide the sample containers along with "Blue Ice" cooling products and coolers to transport the samples in. The samples will be kept on "ice" as recommended by the testing laboratory and if possible, transported to the laboratory on the same day as sampling. If unforeseen delays prevent the samples from being delivered the same day as being sampled, than the samples will be delivered to the laboratory, the following morning, within 24 hours. A "Chain of Custody" form will be completed and accompany the samples to the lab. A sample of this form has been included at the end of this plan.

Laboratory Procedures

Spectra Laboratories have prepared the following table of laboratory procedures:

Laboratory & Field Procedures Skillings/Connolly Yelm Groundwater Monitoring

ANALYTE	MATRIX	PREPARATION METHOD	ANALYTICAL METHOD	SAMPLE SIZE	CONTAINER	PRES.	HOLD. TIME
Ammonia	Water	N/A	EPA 350.3 ISE	250ml	600ml HDPE	H2SO4	28 days
BOD (5-day)	Water	N/A	EPA 405.1 D.O. Probe	1L	1L HDPE	none	48 hours
Bromide	Water	N/A	SM 4500-Br B Color.	100ml	500ml HDPE	none	28 days
Chloride	Water	N/A	SM 4500-Cl D Titration	100ml	500ml HDPE	none	28 days
Dissolved Organic Carbon	Water	0.45um Filtration	EPA 415.1 Comb/IR	50ml	500ml HDPE	H2SO4	28 days
Fluoride	Water	N/A	EPA 340.2 ISE	250ml	500ml HDPE	none	28 days
Surfactants (MBAS)	Water	3510C Sep. Funnel Ext.	EPA 5540-C Color.	500ml	500ml HDPE	none	48 hours
Nitrate	Water	N/A	SM 4500-NO3 D ISE	250ml	500ml HDPE	none	48 hours
Nitrite	Water	N/A	SM 4500-NO2 B	250ml	500ml HDPE	none	48 hours
Sulfate	Water	N/A	EPA 375.4 Turbidimetric	250ml	500ml HDPE	none	28 days
Total Dissolved Solids	Water	N/A	EPA 160.1 Filtration	500ml	500ml HDPE	none	24 hours
Arsenic	Water	3015 Digestion	EPA 208.2 GFAA	250ml	250ml HDPE	HNO3	6 Mos.
Boron	Water	3015 Digestion	EPA 200.7 ICP	250ml	250ml HDPE	HNO3	6 Mos.
Cadmium	Water	3015 Digestion	EPA 200.7 ICP	250ml	250ml HDPE	HNO3	6 Mos.
Chromium	Water	3015 Digestion	EPA 200.7 ICP	250ml	250ml HDPE	HNO3	6 Mos.
Copper	Water	3015 Digestion	EPA 200.7 ICP	250ml	250ml HDPE	HNO3	6 Mos.
Iron	Water	3015 Digestion	EPA 200.7 ICP	250ml	250ml HDPE	HNO3	6 Mos.
Lead	Water	3015 Digestion	EPA 239.2 GFAA	250ml	250ml HDPE	HNO3	6 Mos.
Manganese	Water	3015 Digestion	EPA 200.7 ICP	250ml	250ml HDPE	HNO3	6 Mos.
Mercury	Water	N/A	EPA 245.1 Cold Vapor	250ml	250ml HDPE	HNO3	6 Mos.
Nickel	Water	3015 Digestion	EPA 200.7 ICP	250ml	250ml HDPE	HNO3	6 Mos.
Silver	Water	3015 Digestion	EPA 200.7 ICP	250ml	250ml HDPE	HNO3	6 Mos.
Zinc	Water	3015 Digestion	EPA 200.7 ICP	250ml	250ml HDPE	HNO3	6 Mos.
Caffeine	Water	3510C Sep. Funnel Ext.	EPA 625 GC/MS	2L	2x1L Glass	none	7ext./14 days
Total Trihalomethanes	Water	N/A	EPA 624 GC/MS	2x40ml	2x40ml VOA	HCl	14 days
Fecal Coliform	Water	N/A	SM 9222-D M/F	500ml	500ml HDPE*	Na2S2O3/EDTA	6 hours
Fecal Strep.	Water	N/A	SM 9230-C Membrane Filtration	500ml	500ml HDPE*	Na2S2O3/EDTA	6 hours

BOD = Biochemical Oxygen Demand

ISE = Ion Selective Electrode

Color. = Colorimetric Procedure (Spectrophotometric)

ICP = Inductively Coupled Plasma Emission

GFAA = Graphite Furnace Atomic Absorption

M/F = Membrane Filtration

*Sterilized Container

- Spectra Laboratories will be notified by phone of when sampling is anticipated to take place. After receiving notification, the laboratory will prepare the sample containers and schedule to accommodate the expected samples.

Quality Control

Field QC

Calibration

- The electronic water level probe will be checked with a steel tape for calibration before it is taken into the field for use.
- The multi-parameter meter will be calibrated per manufacturers recommendations; once before being taken into the field for use, once after half of the samples have been collected and once before the meter is brought back from the field.

Decontamination

Several measures will be used to reduce the possibility of contamination from external sources.

- Sample sites have been ordered so that sites expected to have the lowest concentrations of constituents will be sampled first and sites expected to have the highest concentrations of constituents will be sampled last.
- Clean rubber gloves will be used while collecting samples.
- Equipment will be cleaned with diluted hydrochloric acid and rinsed with de-ionized water between each sample site.

Precision

One duplicate field sample will be taken for every twelve sites that are sampled.

Laboratory QC

Spectra Laboratories have been contacted as the testing laboratory for this project. The following table describes the laboratory quality control measure for each analyte as identified by the laboratory.

Laboratory Quality Control Samples Skillings/Connolly Yelm Groundwater Monitoring

ANALYTE	CHECK STANDARDS	METHOD BLANKS	MATRIX SPIKES	MATRIX SPIKE DUPLICATES	SAMPLE DUPLICATES
Ammonia	1/Batch	1/Batch	1/Batch	1/Batch	None
BOD (5-day)	1 set/Batch	1/Batch	N/A	N/A	dilutions in triplicate
Bromide	1/Batch	1/Batch	1/Batch	1/Batch	None
Chloride	1/Batch	1/Batch	1/Batch	1/Batch	None
Dissolved Organic Carbon	2/Batch	1/Batch	1/Batch	1/Batch	None
Fluoride	1/Batch	1/Batch	1/Batch	1/Batch	None
Surfactants (MBAS)	1/Batch	1/Batch	1/Batch	1/Batch	None
Nitrate	1/Batch	1/Batch	1/Batch	1/Batch	None
Nitrite	1/Batch	1/Batch	1/Batch	1/Batch	None
Sulfate	1/Batch	1/Batch	1/Batch	1/Batch	None
Total Dissolved Solids	N/A	1/Batch	N/A	N/A	1/Batch
Arsenic	1/10 Samples	1/Batch	1/Batch	1/Batch	None
Boron	1/10 Samples	1/Batch	1/Batch	1/Batch	None
Cadmium	1/10 Samples	1/Batch	1/Batch	1/Batch	None
Chromium	1/10 Samples	1/Batch	1/Batch	1/Batch	None
Copper	1/10 Samples	1/Batch	1/Batch	1/Batch	None
Iron	1/10 Samples	1/Batch	1/Batch	1/Batch	None
Lead	1/10 Samples	1/Batch	1/Batch	1/Batch	None
Manganese	1/10 Samples	1/Batch	1/Batch	1/Batch	None
Mercury	1/10 Samples	1/Batch	1/Batch	1/Batch	None
Nickel	1/10 Samples	1/Batch	1/Batch	1/Batch	None
Silver	1/10 Samples	1/Batch	1/Batch	1/Batch	None
Zinc	1/10 Samples	1/Batch	1/Batch	1/Batch	None
Caffeine	1/day	1/Batch	1/Batch	1/Batch	None
Total Trihalomethanes	1/day	1/Batch	1/Batch	1/Batch	None
Fecal Coliform	N/A	1/Batch	N/A	N/A	N/A
Fecal Strep.	N/A	1/Batch	N/A	N/A	N/A

*A "batch" is a cycle of sampling. As part of this project the laboratory will be presented with 13 samples for analysis. Analysis of these 13 samples is considered a "batch". **Check Standards** are a second source standard, of a known value that is run at the end of a batch to check that the equipment was calibrated throughout the duration the analysis.

Data Management Procedures

Field

Data from field measurements will be recorded at the time of measurement in an all weather field notebook dedicated for use on the project. Before proceeding to the next sampling point the data will be compared to the historical data of the sampling point to identify any gross discrepancies. The field data obtained during sampling will be entered into the data spreadsheets upon returning from the field.

Laboratory

The data package provided by the lab shall include a case narrative discussing any problems with the analysis, corrective actions taken, changes to the referenced method, an explanation of data qualifiers and all quality control results associated with the data including: method blanks, check standards, analytical duplicates and matrix spikes.

Data Base

Results from the laboratory will be entered into Microsoft Excel spreadsheets formatted by the Department of Ecology. The spreadsheets will be submitted to the Department of Ecology for entry into Ecology's Environmental Information Management (EIM) system on a quarterly basis once all of the results have been obtained from the lab and entered into the spreadsheets for that testing period. Submission of data to the department on a quarterly basis will reduce the chances for data rejection by the departments system and allow data acquisition and recording methods to adjust smoothly and efficiently if needed. The data will be entered into the spreadsheets following the EIM Data Submittal Guide obtained from the web site: <http://www.ecy.wa.gov/services/as/iip/eim/eimdsg.html>

Existing Data

Management of existing data will not be necessary for this project. The results of this monitoring project will be compared to the water quality results of the Department of Ecology's January 1998 publication Yelm Groundwater Baseline Sampling. (Publication no. 98-301) as part of the final report.

Audits and Reports

A Technical Systems Audit (TSA) will be performed shortly after the sampling and testing has begun. Personnel from both Skillings-Connolly, Inc. and Spectra Laboratories will perform the audit together. The audit will examine how the project team is adhering to the intentions and guidelines established by this Project Plan. Coordination of the audit will serve to economize the work effort and quickly implement comprehensive corrective measures if needed. The successful audit will identify deviations from the quality assurance plan and will result in project team working together to address the findings of the audit. Findings of the audit and any corrective measures will be documented and summarized in the final project report. In addition the testing lab will be subject to national standards of quality and performance for testing laboratories.

Sampling, cleaning and maintenance procedures of field equipment and use will be evaluated on a quarterly basis for the first four quarters of the testing and sampling period. This frequency of field procedure evaluation will ensure that field procedures are acceptable and minimize the potential for obtaining filed data and samples of questionable quality. Following the first four quarters of the sampling and testing period, the use and care of field equipment will be evaluated every second quarter. The field equipment will be maintained as recommended by the manufacturer or more frequently if required.

A quarterly report will be prepared by the staff of Skillings-Connolly and submitted to the manager of the project for Skillings-Connolly. The report will be prepared with input from the testing laboratory and serve to assess the accuracy and completeness of data, review the results of system audits and identify any significant quality assurance problems and corrective actions taken.

Data Review, Verification and Validation

Data Review

Data obtained in the field will be examined thoroughly for completeness. The Data obtained will be reviewed for consistency, correctness and completeness to ensure that no errors or omissions were made. The person collecting the samples will ensure that the intent of the sampling design was met and review the data collection procedures before leaving the site.

Data Verification

The testing laboratory staff will review submitted samples for completeness and proper collection protocols. The testing laboratory shall provide a case narrative along with the testing results. The case narrative will include review and verification of the quality control results by the laboratory staff for compliance with acceptable criteria.

Data Validation

The complete data package obtained from the testing laboratory will be examined in detail by the Skillings-Connolly, Project Manager. The methods, standard operating procedures and results will be examined to determine if the Quality Assurance Project Plan has been followed.

Following validation of the data, the testing laboratory will be consulted to determine if the measurement quality objectives for the project have been met.

Data Quality Assessment

If contaminants are not found in the samples taken and the testing lab is confident with their testing results, then the data will be considered suitable for archiving in the EIM data base for comparison with future data. The testing methods and sampling procedures that will be followed by this monitoring project will not deviate significantly from acceptable standard practices. It is reasonable to assume that future data, obtain in a similar manner, can be reliably compared with the results of this project if the samples are examined by a qualified testing laboratory.

An electronic file of this document is located at the Skillings-Connolly, Inc. office under the following:
G:\project\2001\01090 Yelm Groundwater Monitoring\Work Product\Quality Assurance Project Plan (QAPP).doc

BIBLIOGRAPHY

Carey, Barbera, *Quality Assurance Interim Guidelines for Water Quality Sampling Analysis: Ground Water Management Areas*, December 1986.

Environmental Information Management (EIM) Data Submittal Guide, Washington State Department of Ecology, Online, Internet, October 23, 2001. Available:
<http://www.ecy.wa.gov/services/as/iip/eim/eimdsg.html>

Erickson, Denis, *Yelm Groundwater Baseline Sampling, D.O.E Publication No. 98-30*, Washington State Department of Ecology, January 1998.

Lombard, Stewart.M., Kirchner, Cliff.J., *Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies D.O.E. Publication.No. 01-03-003*, Washington State Department of Ecology, February 2001.

Recommended Protocols for Measuring Conventional Water Quality Variables and Metals in Fresh Water of the Puget Sound Region, Prepared for the U.S. Environmental Protection Agency and the Puget Sound Water Quality Authority, February 1990.

SAMPLE FORMS AND EQUIPMENT SPECIFICATIONS

PRODUCTS

► Model 1230 Waterproof Dissolved Oxygen Meter

- Simultaneous Monitoring of Dissolved Oxygen and pH
- Fully Waterproof to IP67 and NEMA 6
- 120 Point Datalogging, RS232 and GLPdoc™

Thermo Orion's Model 1230 allows monitoring of pH and DO or pH and Conductivity simultaneously with temperature date and time. The Model 1230 offers Auto-Buffer-Recognition, DirectCal™ and AUTO-CAL™ to make calibration and accurate measurements of multiple parameters simple. The datalogging and printing options make data collection easy. The GLPdoc "Good Laboratory Practices" feature ensures proper documentation of calibrations and results. Meter warranty is three (3) years.

Field Kit includes 9107WP electrode, 013010 conductivity cell, 083010 DO Probe, field case, armored meter case, and solutions.

Starter Kit includes field case and armored meter case.



Contact Sales

Specifications:

Range, % Saturation	0 to 199.9%, 0 to 600%
Resolution, % Saturation	0.01
Temperature Range	-5 to 50° C
Temperature Accuracy	0.1 ± 1 digit
Auto Barometric Pressure Measurement	Yes
Outputs	RS232
Datalogging (points)	120
Battery Power	Rechargeable NiCd, AC Line, 110/220
Range, mg/L (ppm)	0.00 to 19.99 mg/L, 0.0 to 90.0 mg/L
Resolution, mg/L (ppm)	0.01
Relative Accuracy	± 0.5%, ± 1 digit
Temperature Resolution	0.1
Salinity Correction	0.0 to 70.0 ppt
Other Modes	pH, mV, ORP, Temperature, Conductivity
Display	LCD
Inputs	8 pin WP DIN, DIN (with BNC Adapter), Single Banana
Printing Capability	Yes
Agency Approvals	UL/CSA/CE/IEC801, TUV
Waterproof Rating	IP67

All prices shown are in US dollars

Product #	Package	Probe
123000	110V with pH Probe	9107WP and buffers
123001	220V with pH Probe	9107WP and buffers
123002	Meter and Manual only	NA

REC-225-1430



Kenny

▲ Quality Environmental Products ▲

DIRECTIONS AND SPECIFICATIONS FOR MODELS ES-60 AND ES-40 DC PUMPS

- USES:
- 1) Purging wells to 60 feet
 - 2) Dedicated Pump
 - 3) Draw down and recharge tests
 - 4) Disposable pump for retrieving submerged product
 - 5) Disposable well development pump

AKW Kenny

DIRECTIONS: The purge pump is very easy to use. Simply connect the required length of tubing to the pump and completely submerge the pump in water. There is no control box or on-off switch. The pump will begin pumping when the connection is made to the 12 volt battery. The pump has an outlet to take a 3/8" hose, but can quickly be adapted to take a 1/2" hose by pushing on the 1/2" adaptor supplied with the pump. Recommended tubing is 1/2" nylon reinforced PVC.

MAINTENANCE: Both the ES-40 and ES-60 are fitted with a slotted cap to filter large particles of sand and rock. If particles are visible in the slots they should be removed. Other than that no maintenance is required. No attempt should be made to open the pumps. They are not rebuildable.

ES-60 MODEL: This model will pump up to 60 feet of head using 1/2" ID hose. The length of the lead line supplied with this pump is 62 feet. On one end of the lead line are the battery clips, on the other end is the pump.

ES-40 MODEL: This unit will pump up to 40 feet of head. 50 feet on lead line is supplied.

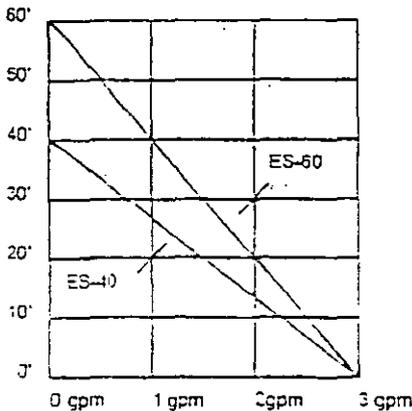
HELPFUL HINTS:

- 1) Use a fully charged battery. Do not operate the pump from a battery that is connected to an operating vehicle engine.
- 2) Do not run the pump dry.
- 3) Use the tubing to support the weight of the pump in the well rather than the lead line. This protects the waterproof connection where the lead line goes into the top of the pump.
- 4) To prevent air cavitation in the pump, start up in the following manner: On for 4 seconds, off for 4, on for 4, off for 4, one more time and the air should be out of the pump and up the tubing;
- 5) Do not pump from silt trap.
- 6) Do not dismantle the pump.
- 7) After each use pump clean water through the pump.

on sale now just call 109 00

159 00

ES-60 and ES-40 Pump Curve



ES-60 SPECIFICATIONS

- VOLTAGE.....12 VOLT DC
- DIAMETER.....1.5 INCHES
- LENGTH.....13 INCHES
- OUTPUT.....2.8 GPM
- FUSE RATING.....10 AMPS
- DISCHARGE.....1/2 OR 3/8
- IMPELLER.....STAINLESS
- CASING.....ABS PLASTIC
- SEALS.....SYN RUBBER

ES-40 SPECIFICATIONS

- VOLTAGE.....12 VOLT DC
- DIAMETER.....1.5 INCHES
- LENGTH.....6 INCHES
- OUTPUT.....3 GPM
- FUSE RATING.....5 AMPS
- DISCHARGE.....1/2 OR 3/8
- IMPELLER.....STAINLESS
- CASING.....ABS PLASTIC
- SEALS.....SYN RUBBER

Table C.1 Sampling Point Locations

Sampling Locations	Latitude	Longitude
SC1 CW	46°56'24.73"	122°36'23.06"
SC2 MW6	46°56'14.48"	122°36'32.64"
SC3 MW1	46°56'12.66"	122°36'39.20"
SC4 MW2	46°56'13.75"	122°36'39.67"
SC5 MW3	46°56'15.51"	122°36'38.94"
SC6 MW4	46°56'16.73"	122°36'39.92"
SC7 MW5	46°56'16.87"	122°36'34.69"
SC8 IS	46°56'14.18"	122°36'38.98"
SC9 CS1	46°56'13.47"	122°36'36.71"
SC10 CS2	46°56'15.69"	122°36'33.38"
SC11 CS3	46°56'13.47"	122°36'34.24"
SC12 CS4	46°56'13.21"	122°36'35.82"

Table C.2 Seasonal Variation on Select Parameters

Sample Quarter	CW ^a	MW6 ^b	MW1	MW2	MW3	MW4	MW5
Nitrate+Nitrite-N (mg/L)							
1st Quarter	3.46	5.05	2.12	2.25	6.05	1.81	4.88
2nd Quarter	2.4	5.5	3.1	3.2	5.4	2.2	4.8
3rd Quarter	2.54	2.34	4.33	4.29	3.38	3.13	4.22
4th Quarter	3.2	2.3	3.8	4.4	2.8	1	3.4
5th Quarter	3.1	3.5	2.4	4.02	7.4	3	3.4
6th Quarter	3.8	4.6	2.3	2.3	4	2.4	3.6
7th Quarter	2.5	1.11	3	1.28	2.91	3.28	1.64
8th Quarter	2.4	4	2.4	1.5	3.6	1.6	2.4
Ammonia-N (mg/L)							
1st quarter	0.08	0.04	0.04	0.03	0.03	0.03	0.56
2nd quarter	0.11	0.11	0.1	0.08	0.08	0.08	0.08
3rd quarter	0.21	0.21	0.2	0.18	0.18	0.18	0.15
4th quarter	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
5th quarter	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
6th quarter	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
7th quarter	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
8th quarter	<0.2	<0.2	<0.2	<0.2	<0.1	<0.1	<0.1
Total Dissolved Solids (mg/L)							
1st quarter	89	100	75	61	240	100	140
2nd quarter	64	96	73	62	180	170	100
3rd quarter	86	86	90	100	230	180	110
4th quarter	68	80	71	114	195	242	99
5th quarter	95	128	101	164	315	175	114
6th quarter	85	110	76	147	218	138	119
7th quarter	82	54	62	106	81	149	255
8th quarter	113	119	87	169	184	114	114
Dissolved Organic Carbon (mg/L)							
1st quarter	<6	7	7	7	7	10	10
2nd quarter	2	<2	<2	<2	<2	2	<2
3rd quarter	4	25	9	7	9	8	7
4th quarter	7	11	9	9	9	12	9
5th quarter	6	9	913	11	9	11	10
6th quarter	<2	4	7	<2	8	10	2
7th quarter	5	4	4	7	<2	8	10
8th quarter	2	5	8	4	<2	<2	<2

a) CW = City well

b) MW = Monitoring Well #x

Table C.2 Seasonal Variation on Select Parameters

Sample Quarter	CW^c	MW6^b	MW1	MW2	MW3	MW4	MW5
Iron (µg/L)							
1st quarter	140	550	720	430	300	500	270
2nd quarter	<10	64	280	130	280	110	99
3rd quarter	<10	1900	380	26	260	130	270
4th quarter	<15	3100	1300	95	380	450	380
5th quarter	<15	57	87	170	110	69	74
6th quarter	<15	190	69	25	57	63	40
7th quarter	29	720	290	115	270	85	130
8th quarter	<15	840	2000	5400	1.6	0.44	0.16
Manganese (µg/L)							
1st quarter	4	150	76	6	5	4	5
2nd quarter	<2	40	20	2	7	2	<2
3rd quarter	<2	5100	100	<2	18	7	14
4th quarter	<2	7900	170	<2	16	15	13
5th quarter	6	48	10	11	9	5	5
6th quarter	21	400	31	23	25	25	23
7th quarter	<2	860	56	2	5	7	12
8th quarter	3	1000	110	110	0.023	<0.002	<0.002
Fecal Coliform Bacteria (CFU)							
1st quarter	<2	<2	<2	<2	<2	<2	<2
2nd quarter	0	1	1	0	0	0	<2
3rd quarter	<2	<2	<2	<2	<2	<2	<2
4th quarter	<2	<2	34	<2	<2	<2	<2
5th quarter	<2	<2	<2	<2	<2	<2	<2
6th quarter	<2	<2	<2	<2	<2	<2	<2
7th quarter	15	5	0	12	2	2	10
8th quarter	<2	<2	<2	<2	<2	<2	<2
Chloride (mg/L)							
1st quarter	4.5	4.7	6.5	3.5	37	40	5
2nd quarter	5.2	8.2	6.7	6.2	40	49	9
3rd quarter	5.5	6.5	7	9	58	52	14
4th quarter	8	8	7	14	43	62	14
5th quarter	8.5	10.7	7.7	26.9	56	37.6	9.4
6th quarter	6	7.5	5	32.5	34.5	24.5	16
7th quarter	3.5	3	5	10	19.5	61.5	21.5
8th quarter	7	4.5	6	40	35	24	24

c) CW = City well

d) MW = Monitoring Well #x

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

04/08/2002

P.O.#: 1-186164-01090

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Kenney Lilliquist

Client ID: SC1 CW
Sample Matrix: Water
Date Sampled: 03/07/2002
Date Received: 03/08/2002
Spectra Project: 2002030066
Spectra Number: 1

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 5	ug/L	EPA 206.2	Bromide	<0.50	ug/L	SM4500-Br-B
Boron	84	ug/L	EPA 200.7	Chloride	4.5	mg/L	SM4500CL-C
Cadmium	< 3	ug/L	EPA 200.7	Dissolved Organic Carbon	< 6	mg/L	EPA 415.1
Chromium	< 7	ug/L	EPA 200.7	Fluoride	0.03	mg/L	EPA 340.2
Copper	16	ug/L	EPA 200.7	Nitrate	3.46	mg/L-N	SM4500NO3D
Iron	140	ug/L	EPA 200.7	Nitrite	<0.01	mg/L-N	SM4500NO2B
Lead	< 1	ug/L	EPA 239.2	Sulfate	< 1	mg/L	EPA 375.4
Manganese	4	ug/L	EPA 200.7	Total Dissolved Solids	89	mg/L	EPA 160.1
Mercury	<0.5	ug/L	EPA 245.1				
Nickel	< 15	ug/L	EPA 200.7				
Silver	< 7	ug/L	EPA 200.7				
Zinc	13	ug/L	EPA 200.7				
Bromodichloromethane	<1	ug/L	SW846 8260B				
Bromoform	<1	ug/L	SW846 8260B				
Caffeine	<10	ug/L	EPA 625				
Chlorodibromomethane	<1	ug/L	SW846 8260B				
Chloroform	<1	ug/L	SW846 8260B				
N-Nitrosodimethylamine	<10	ug/L	EPA 625				
TKN	1.1	mg/L	SM 4500-N-B				
Ammonia	0.08	mg/L-N	EPA 350.3				
Anionic Surfactants in BOD	<0.05	mg/L	SM5540C				
	4	mg/L	SM 5210				

Surrogate	Recovery	Method
2-Fluorophenol	140	SW846 8270C
Phenol-d6	111	SW846 8270C
Nitrobenzene-d5	52	SW846 8270C
2-Fluorobiphenyl	53	SW846 8270C

Surrogate	Recovery	Method
2,4,6-Tribromophenol	98	SW846 8270C
p-Terphenyl-d14	72	SW846 8270C
Dibromofluoromethane	94	SW846 8260B
Toluene-d8	101	SW846 8260B

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager

al4/sgh

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

04/08/2002

P.O.#: 1-186164-01090

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Kenney Lilliquist

Client ID: SC2 MW6
Sample Matrix: Water
Date Sampled: 03/07/2002
Date Received: 03/08/2002
Spectra Project: 2002030066
Spectra Number: 2

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 5	ug/L	EPA 206.2	Bromide	<0.50	ug/L	SM4500-Br-B
Boron	87	ug/L	EPA 200.7	Chloride	4.7	mg/L	SM4500CL-C
Cadmium	< 3	ug/L	EPA 200.7	Dissolved Organic Carbon	7	mg/L	EPA 415.1
Chromium	< 7	ug/L	EPA 200.7	Fluoride	0.05	mg/L	EPA 340.2
Copper	8	ug/L	EPA 200.7	Nitrate	5.05	mg/L-N	SM4500NO3D
Iron	550	ug/L	EPA 200.7	Nitrite	<0.01	mg/L-N	SM4500NO2B
Lead	< 1	ug/L	EPA 239.2	Sulfate	< 1	mg/L	EPA 375.4
Manganese	150	ug/L	EPA 200.7	Total Dissolved Solids	100	mg/L	EPA 160.1
Mercury	<0.5	ug/L	EPA 245.1				
Nickel	< 15	ug/L	EPA 200.7				
Silver	9	ug/L	EPA 200.7				
Zinc	33	ug/L	EPA 200.7				
Bromodichloromethane	<1	ug/L	SW846 8260B				
Bromoform	<1	ug/L	SW846 8260B				
Caffeine	<10	ug/L	EPA 625				
Chlorodibromomethane	<1	ug/L	SW846 8260B				
Chloroform	<1	ug/L	SW846 8260B				
N-Nitrosodimethylamine	<10	ug/L	EPA 625				
TKN	1.7	mg/L	SM 4500-N-B				
Ammonia	0.04	mg/L-N	EPA 350.3				
Anionic Surfactants in BOD	<0.05	mg/L	SM5540C				
	2	mg/L	SM 5210				

Surrogate	Recovery	Method
2-Fluorophenol	132	SW846 8270C
Phenol-d6	102	SW846 8270C
Nitrobenzene-d5	50	SW846 8270C
2-Fluorobiphenyl	58	SW846 8270C

Surrogate	Recovery	Method
2,4,6-Tribromophenol	74	SW846 8270C
p-Terphenyl-d14	76	SW846 8270C
Dibromofluoromethane	92	SW846 8260B
Toluene-d8	100	SW846 8260B

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager

a14/sgb

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

04/08/2002

P.O.#: 1-186164-01090

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Kenney Lilliquist

Client ID: SC3 MW1
Sample Matrix: Water
Date Sampled: 03/07/2002
Date Received: 03/08/2002
Spectra Project: 2002030066
Spectra Number: 3

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 5	ug/L	EPA 206.2	Bromide	<0.50	ug/L	SM4500-Br-B
Boron	70	ug/L	EPA 200.7	Chloride	6.5	mg/L	SM4500CL-C
Cadmium	< 3	ug/L	EPA 200.7	Dissolved Organic Carbon	7	mg/L	EPA 415.1
Chromium	< 7	ug/L	EPA 200.7	Fluoride	0.03	mg/L	EPA 340.2
Copper	9	ug/L	EPA 200.7	Nitrate	2.12	mg/L-N	SM4500NO3D
Iron	720	ug/L	EPA 200.7	Nitrite	<0.01	mg/L-N	SM4500NO2B
Lead	< 1	ug/L	EPA 239.2	Sulfate	< 1	mg/L	EPA 375.4
Manganese	76	ug/L	EPA 200.7	Total Dissolved Solids	75	mg/L	EPA 160.1
Mercury	<0.5	ug/L	EPA 245.1				
Nickel	< 15	ug/L	EPA 200.7				
Silver	< 7	ug/L	EPA 200.7				
Zinc	< 6	ug/L	EPA 200.7				
Bromodichloromethane	< 1	ug/L	SW846 8260B				
Bromoform	< 1	ug/L	SW846 8260B				
Caffeine	< 10	ug/L	EPA 625				
Chlorodibromomethane	< 1	ug/L	SW846 8260B				
Chloroform	< 1	ug/L	SW846 8260B				
N-Nitrosodimethylamine	< 10	ug/L	EPA 625				
TKN	2.8	mg/L	SM 4500-N-B				
Ammonia	0.04	mg/L-N	EPA 350.3				
Anionic Surfactants in	<0.05	mg/L	SM5540C				
BOD	4	mg/L	SM 5210				

Surrogate	Recovery	Method
2-Fluorophenol	176	SW846 8270C
Phenol-d6	133	SW846 8270C
Nitrobenzene-d5	66	SW846 8270C
2-Fluorobiphenyl	67	SW846 8270C

Surrogate	Recovery	Method
2,4,6-Tribromophenol	96	SW846 8270C
p-Terphenyl-d14	70	SW846 8270C
Dibromofluoromethane	92	SW846 8260B
Toluene-d8	99	SW846 8260B

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager

a14/sgb



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

04/08/2002

P.O.#: 1-186164-01090

Skillings-Connolly, Inc.
 PO Box 5080
 Lacey, WA 98509
 Attn: Kenney Lilliquist

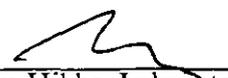
Client ID: SC4 MW2
 Sample Matrix: Water
 Date Sampled: 03/07/2002
 Date Received: 03/08/2002
 Spectra Project: 2002030066
 Spectra Number: 4

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 5	ug/L	EPA 206.2	Bromide	<0.50	ug/L	SM4500-Br-B
Boron	91	ug/L	EPA 200.7	Chloride	3.5	mg/L	SM4500CL-C
Cadmium	< 3	ug/L	EPA 200.7	Dissolved Organic Carbon	7	mg/L	EPA 415.1
Chromium	< 7	ug/L	EPA 200.7	Fluoride	0.03	mg/L	EPA 340.2
Copper	< 6	ug/L	EPA 200.7	Nitrate	2.25	mg/L-N	SM4500NO3D
Iron	430	ug/L	EPA 200.7	Nitrite	<0.01	mg/L-N	SM4500NO2B
Lead	< 1	ug/L	EPA 239.2	Sulfate	< 1	mg/L	EPA 375.4
Manganese	6	ug/L	EPA 200.7	Total Dissolved Solids	61	mg/L	EPA 160.1
Mercury	<0.5	ug/L	EPA 245.1				
Nickel	< 15	ug/L	EPA 200.7				
Silver	< 7	ug/L	EPA 200.7				
Zinc	10	ug/L	EPA 200.7				
Bromodichloromethane	<1	ug/L	SW846 8260B				
Bromoform	<1	ug/L	SW846 8260B				
Caffeine	<10	ug/L	EPA 625				
Chlorodibromomethane	<1	ug/L	SW846 8260B				
Chloroform	<1	ug/L	SW846 8260B				
N-Nitrosodimethylamine	<10	ug/L	EPA 625				
TKN	<1.0	mg/L	SM 4500-N-B				
Ammonia	0.03	mg/L-N	EPA 350.3				
Anionic Surfactants in	<0.05	mg/L	SM5540C				
BOD	4	mg/L	SM 5210				

Surrogate	Recovery	Method
2-Fluorophenol	196	SW846 8270C
Phenol-d6	154	SW846 8270C
Nitrobenzene-d5	73	SW846 8270C
2-Fluorobiphenyl	75	SW846 8270C

Surrogate	Recovery	Method
2,4,6-Tribromophenol	116	SW846 8270C
p-Terphenyl-d14	82	SW846 8270C
Dibromofluoromethane	92	SW846 8260B
Toluene-d8	100	SW846 8260B

SPECTRA LABORATORIES


 Steve Hibbs, Laboratory Manager
 a14/sgh

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

P.O.#: 1-186164-01090

04/08/2002

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Kenney Lilliquist

Client ID: SC5 MW3
Sample Matrix: Water
Date Sampled: 03/07/2002
Date Received: 03/08/2002
Spectra Project: 2002030066
Spectra Number: 5

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 5	ug/L	EPA 206.2	Bromide	<0.50	ug/L	SM4500-Br-B
Boron	59	ug/L	EPA 200.7	Chloride	37	mg/L	SM4500CL-C
Cadmium	< 3	ug/L	EPA 200.7	Dissolved Organic Carbon	7	mg/L	EPA 415.1
Chromium	< 7	ug/L	EPA 200.7	Fluoride	0.03	mg/L	EPA 340.2
Copper	< 6	ug/L	EPA 200.7	Nitrate	6.05	mg/L-N	SM4500NO3D
Iron	300	ug/L	EPA 200.7	Nitrite	<0.01	mg/L-N	SM4500NO2B
Lead	< 1	ug/L	EPA 239.2	Sulfate	14	mg/L	EPA 375.4
Manganese	5	ug/L	EPA 200.7	Total Dissolved Solids	240	mg/L	EPA 160.1
Mercury	<0.5	ug/L	EPA 245.1				
Nickel	< 15	ug/L	EPA 200.7				
Silver	< 7	ug/L	EPA 200.7				
Zinc	8	ug/L	EPA 200.7				
Bromodichloromethane	<1	ug/L	SW846 8260B				
Bromoform	<1	ug/L	SW846 8260B				
Caffeine	<10	ug/L	EPA 625				
Chlorodibromomethane	<1	ug/L	SW846 8260B				
Chloroform	<1	ug/L	SW846 8260B				
N-Nitrosodimethylamine	<10	ug/L	EPA 625				
TKN	<1.0	mg/L	SM 4500-N-B				
Ammonia	0.03	mg/L-N	EPA 350.3				
Anionic Surfactants in	<0.05	mg/L	SM5540C				
BOD	4	mg/L	SM 5210				

Surrogate	Recovery	Method
2-Fluorophenol	220	SW846 8270C
Phenol-d6	175	SW846 8270C
Nitrobenzene-d5	79	SW846 8270C
2-Fluorobiphenyl	84	SW846 8270C

Surrogate	Recovery	Method
2,4,6-Tribromophenol	122	SW846 8270C
p-Terphenyl-d14	80	SW846 8270C
Dibromofluoromethane	93	SW846 8260B
Toluene-d8	100	SW846 8260B

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager

al4/sgh

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

04/08/2002

P.O.#: 1-186164-01090

Skillings-Connolly, Inc.
 PO Box 5080
 Lacey, WA 98509
 Attn: Kenney Lilliquist

Client ID: SC6 MW4
 Sample Matrix: Water
 Date Sampled: 03/07/2002
 Date Received: 03/08/2002
 Spectra Project: 2002030066
 Spectra Number: 6

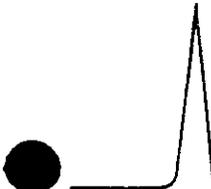
Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 5	ug/L	EPA 206.2	Bromide	<0.50	ug/L	SM4500-Br-B
Boron	240	ug/L	EPA 200.7	Chloride	40	mg/L	SM4500CL-C
Cadmium	< 3	ug/L	EPA 200.7	Dissolved Organic Carbon	10	mg/L	EPA 415.1
Chromium	< 7	ug/L	EPA 200.7	Fluoride	0.04	mg/L	EPA 340.2
Copper	13	ug/L	EPA 200.7	Nitrate	1.81	mg/L-N	SM4500NO3D
Iron	500	ug/L	EPA 200.7	Nitrite	<0.01	mg/L-N	SM4500NO2B
Lead	< 1	ug/L	EPA 239.2	Sulfate	21	mg/L	EPA 375.4
Manganese	4	ug/L	EPA 200.7	Total Dissolved Solids	100	mg/L	EPA 160.1
Mercury	<0.5	ug/L	EPA 245.1				
Nickel	< 15	ug/L	EPA 200.7				
Silver	< 7	ug/L	EPA 200.7				
Zinc	< 6	ug/L	EPA 200.7				
Bromodichloromethane	<1	ug/L	SW846 8260B				
Bromoform	<1	ug/L	SW846 8260B				
Caffeine	<10	ug/L	EPA 625				
Chlorodibromomethane	<1	ug/L	SW846 8260B				
Chloroform	<1	ug/L	SW846 8260B				
N-Nitrosodimethylamine	<10	ug/L	EPA 625				
TKN	1.4	mg/L	SM 4500-N-B				
Ammonia	0.03	mg/L-N	EPA 350.3				
Anionic Surfactants in	<0.05	mg/L	SM5540C				
BOD	3	mg/L	SM 5210				

Surrogate	Recovery	Method
2-Fluorophenol	164	SW846 8270C
Phenol-d6	130	SW846 8270C
Nitrobenzene-d5	60	SW846 8270C
2-Fluorobiphenyl	63	SW846 8270C

Surrogate	Recovery	Method
2,4,6-Tribromophenol	102	SW846 8270C
p-Terphenyl-d14	65	SW846 8270C
Dibromofluoromethane	94	SW846 8260B
Toluene-d8	98	SW846 8260B

SPECTRA LABORATORIES


 Steve Hibbs, Laboratory Manager
 al4/sgb



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

04/08/2002

P.O.#: 1-186164-01090

Skilling-Connolly, Inc.
 PO Box 5080
 Lacey, WA 98509
 Attn: Kenney Lilliquist

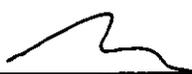
Client ID: SC7 MW5
 Sample Matrix: Water
 Date Sampled: 03/07/2002
 Date Received: 03/08/2002
 Spectra Project: 2002030066
 Spectra Number: 7

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 5	ug/L	EPA 206.2	Bromide	<0.50	ug/L	SM4500-Br-B
Boron	100	ug/L	EPA 200.7	Chloride	5.0	mg/L	SM4500CL-C
Cadmium	< 3	ug/L	EPA 200.7	Dissolved Organic Carbon	10	mg/L	EPA 415.1
Chromium	< 7	ug/L	EPA 200.7	Fluoride	0.06	mg/L	EPA 340.2
Copper	< 6	ug/L	EPA 200.7	Nitrate	4.88	mg/L-N	SM4500NO3D
Iron	270	ug/L	EPA 200.7	Nitrite	<0.01	mg/L-N	SM4500NO2B
Lead	< 1	ug/L	EPA 239.2	Sulfate	8	mg/L	EPA 375.4
Manganese	5	ug/L	EPA 200.7	Total Dissolved Solids	140	mg/L	EPA 160.1
Mercury	<0.5	ug/L	EPA 245.1				
Nickel	< 15	ug/L	EPA 200.7				
Silver	< 7	ug/L	EPA 200.7				
Zinc	47	ug/L	EPA 200.7				
Bromodichloromethane	<1	ug/L	SW846 8260B				
Bromoform	<1	ug/L	SW846 8260B				
Caffeine	<10	ug/L	EPA 625				
Chlorodibromomethane	<1	ug/L	SW846 8260B				
Chloroform	<1	ug/L	SW846 8260B				
N-Nitrosodimethylamine	<10	ug/L	EPA 625				
TKN	<1.0	mg/L	SM 4500-N-B				
Ammonia	0.56	mg/L-N	EPA 350.3				
Anionic Surfactants in	<0.05	mg/L	SM5540C				
BOD	5	mg/L	SM 5210				

Surrogate	Recovery	Method
2-Fluorophenol	194	SW846 8270C
Phenol-d6	144	SW846 8270C
Nitrobenzene-d5	69	SW846 8270C
2-Fluorobiphenyl	70	SW846 8270C

Surrogate	Recovery	Method
2,4,6-Tribromophenol	90	SW846 8270C
p-Terphenyl-d14	62	SW846 8270C
Dibromofluoromethane	93	SW846 8260B
Toluene-d8	100	SW846 8260B

SPECTRA LABORATORIES



Steve Hibbs, Laboratory Manager
 a14/sgh



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

04/08/2002

P.O.#: 1-186164-01090

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Kenney Lilliquist

Client ID: SC8 1S
Sample Matrix: Water
Date Sampled: 03/07/2002
Date Received: 03/08/2002
Spectra Project: 2002030066
Spectra Number: 8

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 5	ug/L	EPA 206.2	Bromide	<0.50	ug/L	SM4500-Br-B
Boron	450	ug/L	EPA 200.7	Chloride	57	mg/L	SM4500CL-C
Cadmium	< 3	ug/L	EPA 200.7	Dissolved Organic Carbon	13	mg/L	EPA 415.1
Chromium	< 7	ug/L	EPA 200.7	Fluoride	0.07	mg/L	EPA 340.2
Copper	8	ug/L	EPA 200.7	Nitrate	7.96	mg/L-N	SM4500NO3D
Iron	600	ug/L	EPA 200.7	Nitrite	0.02	mg/L-N	SM4500NO2B
Lead	< 1	ug/L	EPA 239.2	Sulfate	29	mg/L	EPA 375.4
Manganese	28	ug/L	EPA 200.7	Total Dissolved Solids	340	mg/L	EPA 160.1
Mercury	<0.5	ug/L	EPA 245.1				
Nickel	< 15	ug/L	EPA 200.7				
Silver	10	ug/L	EPA 200.7				
Zinc	50	ug/L	EPA 200.7				
Bromodichloromethane	1	ug/L	SW846 8260B				
Bromoform	<1	ug/L	SW846 8260B				
Caffeine	<10	ug/L	EPA 625				
Chlorodibromomethane	<1	ug/L	SW846 8260B				
Chloroform	6	ug/L	SW846 8260B				
N-Nitrosodimethylamine	<10	ug/L	EPA 625				
TKN	7.7	mg/L	SM 4500-N-B				
Ammonia	5.30	mg/L-N	EPA 350.3				
Anionic Surfactants in	0.30	mg/L	SM5540C				
BOD	< 2	mg/L	SM 5210				

Surrogate	Recovery	Method
2-Fluorophenol	249	SW846 8270C
Phenol-d6	187	SW846 8270C
Nitrobenzene-d5	94	SW846 8270C
2-Fluorobiphenyl	84	SW846 8270C

Surrogate	Recovery	Method
2,4,6-Tribromophenol	138	SW846 8270C
p-Terphenyl-d14	77	SW846 8270C
Dibromofluoromethane	95	SW846 8260B
Toluene-d8	103	SW846 8260B

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager

a14/sgh

Page 8 of 13

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

04/08/2002

P.O.#: 1-186164-01090

Skills-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Kenney Lilliquist

Client ID: SC9 CS1
Sample Matrix: Water
Date Sampled: 03/08/2002
Date Received: 03/08/2002
Spectra Project: 2002030066
Spectra Number: 9

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 5	ug/L	EPA 206.2	Bromide	<0.50	ug/L	SM4500-Br-B
Boron	430	ug/L	EPA 200.7	Chloride	57	mg/L	SM4500CL-C
Cadmium	< 3	ug/L	EPA 200.7	Dissolved Organic Carbon	13	mg/L	EPA 415.1
Chromium	< 7	ug/L	EPA 200.7	Fluoride	0.07	mg/L	EPA 340.2
Copper	10	ug/L	EPA 200.7	Nitrate	8.03	mg/L-N	SM4500NO3D
Iron	160	ug/L	EPA 200.7	Nitrite	0.01	mg/L-N	SM4500NO2B
Lead	< 1	ug/L	EPA 239.2	Sulfate	33	mg/L	EPA 375.4
Manganese	29	ug/L	EPA 200.7	Total Dissolved Solids	220	mg/L	EPA 160.1
Mercury	<0.5	ug/L	EPA 245.1				
Nickel	< 15	ug/L	EPA 200.7				
Silver	< 7	ug/L	EPA 200.7				
Zinc	43	ug/L	EPA 200.7				
Bromodichloromethane	1	ug/L	SW846 8260B				
Bromoform	<1	ug/L	SW846 8260B				
Caffeine	<10	ug/L	EPA 625				
Chlorodibromomethane	<1	ug/L	SW846 8260B				
Chloroform	4	ug/L	SW846 8260B				
N-Nitrosodimethylamine	<10	ug/L	EPA 625				
TKN	5.9	mg/L	SM 4500-N-B				
Ammonia	5.40	mg/L-N	EPA 350.3				
Anionic Surfactants in	0.28	mg/L	SM5540C				
BOD	3	mg/L	SM 5210				

Surrogate	Recovery	Method
2-Fluorophenol	229	SW846 8270C
Phenol-d6	177	SW846 8270C
Nitrobenzene-d5	86	SW846 8270C
2-Fluorobiphenyl	84	SW846 8270C

Surrogate	Recovery	Method
2,4,6-Tribromophenol	127	SW846 8270C
p-Terphenyl-d14	78	SW846 8270C
Dibromofluoromethane	86	SW846 8260B
Toluene-d8	103	SW846 8260B

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager
al4/sgh

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

04/08/2002

P.O.#: 1-186164-01090

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Kenney Lilliquist

Client ID: SC10 CS2
Sample Matrix: Water
Date Sampled: 03/08/2002
Date Received: 03/08/2002
Spectra Project: 2002030066
Spectra Number: 10

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 5	ug/L	EPA 206.2	Bromide	<0.50	ug/L	SM4500-Br-B
Boron	400	ug/L	EPA 200.7	Chloride	55	mg/L	SM4500CL-C
Cadmium	< 3	ug/L	EPA 200.7	Dissolved Organic Carbon	12	mg/L	EPA 415.1
Chromium	< 7	ug/L	EPA 200.7	Fluoride	0.07	mg/L	EPA 340.2
Copper	11	ug/L	EPA 200.7	Nitrate	5.46	mg/L-N	SM4500NO3D
Iron	140	ug/L	EPA 200.7	Nitrite	0.03	mg/L-N	SM4500NO2B
Lead	< 1	ug/L	EPA 239.2	Sulfate	30	mg/L	EPA 375.4
Manganese	29	ug/L	EPA 200.7	Total Dissolved Solids	340	mg/L	EPA 160.1
Mercury	<0.5	ug/L	EPA 245.1				
Nickel	< 15	ug/L	EPA 200.7				
Silver	8	ug/L	EPA 200.7				
Zinc	44	ug/L	EPA 200.7				
Bromodichloromethane	<1	ug/L	SW846 8260B				
Bromoform	<1	ug/L	SW846 8260B				
Caffeine	<10	ug/L	EPA 625				
Chlorodibromomethane	<1	ug/L	SW846 8260B				
Chloroform	1	ug/L	SW846 8260B				
N-Nitrosodimethylamine	<10	ug/L	EPA 625				
TKN	1.6	mg/L	SM 4500-N-B				
Ammonia	0.91	mg/L-N	EPA 350.3				
Anionic Surfactants in	0.28	mg/L	SM5540C				
BOD	9	mg/L	SM 5210				

Surrogate	Recovery	Method
2-Fluorophenol	176	SW846 8270C
Phenol-d6	144	SW846 8270C
Nitrobenzene-d5	67	SW846 8270C
2-Fluorobiphenyl	68	SW846 8270C

Surrogate	Recovery	Method
2,4,6-Tribromophenol	114	SW846 8270C
p-Terphenyl-d14	70	SW846 8270C
Dibromofluoromethane	86	SW846 8260B
Toluene-d8	102	SW846 8260B

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager

a14/sgh

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

04/08/2002

P.O.#: 1-186164-01090

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Kenney Lilliquist

Client ID: SC11 CS3
Sample Matrix: Water
Date Sampled: 03/08/2002
Date Received: 03/08/2002
Spectra Project: 2002030066
Spectra Number: 11

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 5	ug/L	EPA 206.2	Bromide	<0.50	ug/L	SM4500-Br-B
Boron	450	ug/L	EPA 200.7	Chloride	55	mg/L	SM4500CL-C
Cadmium	< 3	ug/L	EPA 200.7	Dissolved Organic Carbon	10	mg/L	EPA 415.1
Chromium	8	ug/L	EPA 200.7	Fluoride	0.19	mg/L	EPA 340.2
Copper	10	ug/L	EPA 200.7	Nitrate	5.55	mg/L-N	SM4500NO3D
Iron	100	ug/L	EPA 200.7	Nitrite	<0.01	mg/L-N	SM4500NO2B
Lead	< 1	ug/L	EPA 239.2	Sulfate	27	mg/L	EPA 375.4
Manganese	4	ug/L	EPA 200.7	Total Dissolved Solids	320	mg/L	EPA 160.1
Mercury	<0.5	ug/L	EPA 245.1				
Nickel	< 15	ug/L	EPA 200.7				
Silver	< 7	ug/L	EPA 200.7				
Zinc	28	ug/L	EPA 200.7				
Bromodichloromethane	<1	ug/L	SW846 8260B				
Bromoform	<1	ug/L	SW846 8260B				
Caffeine	<10	ug/L	EPA 625				
Chlorodibromomethane	<1	ug/L	SW846 8260B				
Chloroform	<1	ug/L	SW846 8260B				
N-Nitrosodimethylamine	<10	ug/L	EPA 625				
TKN	<1.0	mg/L	SM 4500-N-B				
Ammonia	0.24	mg/L-N	EPA 350.3				
Anionic Surfactants in	0.27	mg/L	SM5540C				
BOD	3	mg/L	SM 5210				

Surrogate	Recovery	Method
2-Fluorophenol	216	SW846 8270C
Phenol-d6	172	SW846 8270C
Nitrobenzene-d5	79	SW846 8270C
2-Fluorobiphenyl	79	SW846 8270C

Surrogate	Recovery	Method
2,4,6-Tribromophenol	124	SW846 8270C
p-Terphenyl-d14	75	SW846 8270C
Dibromofluoromethane	88	SW846 8260B
Toluene-d8	100	SW846 8260B

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager

a14/sgb

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

04/08/2002

P.O.#: 1-186164-01090

Skillings-Connolly, Inc.
 PO Box 5080
 Lacey, WA 98509
 Attn: Kenney Lilliquist

Client ID: SC12 CS4
 Sample Matrix: Water
 Date Sampled: 03/08/2002
 Date Received: 03/08/2002
 Spectra Project: 2002030066
 Spectra Number: 12

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 5	ug/L	EPA 206.2	Bromide	<0.50	ug/L	SM4500-Br-B
Boron	400	ug/L	EPA 200.7	Chloride	53	mg/L	SM4500CL-C
Cadmium	< 3	ug/L	EPA 200.7	Dissolved Organic Carbon	11	mg/L	EPA 415.1
Chromium	< 7	ug/L	EPA 200.7	Fluoride	0.05	mg/L	EPA 340.2
Copper	< 6	ug/L	EPA 200.7	Nitrate	2.99	mg/L-N	SM4500NO3D
Iron	130	ug/L	EPA 200.7	Nitrite	0.01	mg/L-N	SM4500NO2B
Lead	< 1	ug/L	EPA 239.2	Sulfate	27	mg/L	EPA 375.4
Manganese	15	ug/L	EPA 200.7	Total Dissolved Solids	320	mg/L	EPA 160.1
Mercury	<0.5	ug/L	EPA 245.1				
Nickel	< 15	ug/L	EPA 200.7				
Silver	< 7	ug/L	EPA 200.7				
Zinc	25	ug/L	EPA 200.7				
Bromodichloromethane	<1	ug/L	SW846 8260B				
Bromoform	<1	ug/L	SW846 8260B				
Caffeine	<10	ug/L	EPA 625				
Chlorodibromomethane	<1	ug/L	SW846 8260B				
Chloroform	<1	ug/L	SW846 8260B				
N-Nitrosodimethylamine	<10	ug/L	EPA 625				
TKN	<1.0	mg/L	SM 4500-N-B				
Ammonia	0.21	mg/L-N	EPA 350.3				
Anionic Surfactants in BOD	0.18	mg/L	SM5540C				
	10	mg/L	SM 5210				

Surrogate	Recovery	Method
2-Fluorophenol	256	SW846 8270C
Phenol-d6	196	SW846 8270C
Nitrobenzene-d5	94	SW846 8270C
2-Fluorobiphenyl	82	SW846 8270C

Surrogate	Recovery	Method
2,4,6-Tribromophenol	139	SW846 8270C
p-Terphenyl-d14	77	SW846 8270C
Dibromofluoromethane	93	SW846 8260B
Toluene-d8	101	SW846 8260B

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager

a14/sgh

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

04/08/2002

P.O.#: 1-186164-01090

Skillings-Connolly, Inc.
 PO Box 5080
 Lacey, WA 98509
 Attn: Kenney Lilliquist

Client ID: SC13 FD
 Sample Matrix: Water
 Date Sampled: 03/08/2002
 Date Received: 03/08/2002
 Spectra Project: 2002030066
 Spectra Number: 13

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 5	ug/L	EPA 206.2	Bromide	<0.50	ug/L	SM4500-Br-B
Boron	520	ug/L	EPA 200.7	Chloride	55	mg/L	SM4500CL-C
Cadmium	< 3	ug/L	EPA 200.7	Dissolved Organic Carbon	10	mg/L	EPA 415.1
Chromium	< 7	ug/L	EPA 200.7	Fluoride	0.05	mg/L	EPA 340.2
Copper	13	ug/L	EPA 200.7	Nitrate	5.53	mg/L-N	SM4500NO3D
Iron	47	ug/L	EPA 200.7	Nitrite	<0.01	mg/L-N	SM4500NO2B
Lead	< 1	ug/L	EPA 239.2	Sulfate	27	mg/L	EPA 375.4
Manganese	3	ug/L	EPA 200.7	Total Dissolved Solids	320	mg/L	EPA 160.1
Molybdenum	<0.5	ug/L	EPA 245.1				
Nickel	< 15	ug/L	EPA 200.7				
Silver	< 7	ug/L	EPA 200.7				
Zinc	19	ug/L	EPA 200.7				
Bromodichloromethane	<1	ug/L	SW846 8260B				
Bromoform	<1	ug/L	SW846 8260B				
Caffeine	<10	ug/L	EPA 625				
Chlorodibromomethane	<1	ug/L	SW846 8260B				
Chloroform	<1	ug/L	SW846 8260B				
N-Nitrosodimethylamine	<10	ug/L	EPA 625				
TKN	<1.0	mg/L	SM 4500-N-B				
Ammonia	0.20	mg/L-N	EPA 350.3				
Anionic Surfactants in BOD	0.16	mg/L	SM5540C				
	3	mg/L	SM 5210				

Surrogate	Recovery	Method
2-Fluorophenol	228	SW846 8270C
Phenol-d6	173	SW846 8270C
Nitrobenzene-d5	83	SW846 8270C
2-Fluorobiphenyl	77	SW846 8270C

Surrogate	Recovery	Method
2,4,6-Tribromophenol	127	SW846 8270C
p-Terphenyl-d14	73	SW846 8270C
Dibromofluoromethane	92	SW846 8260B
Toluene-d8	102	SW846 8260B

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager

a14/sgb



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

03/29/2002

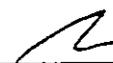
Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Kenney Lilliquist

Project: Yelm Groundwater
Sample Matrix: Water
Date Sampled: 03/20/2002
Date Received: 03/20/2002
Spectra Project: 2002030185

<u>Spectra #</u>	<u>Client ID</u>	<u>Analyte</u>	<u>Result</u>	<u>Units</u>	<u>Method</u>
1	SC1 CW	Fecal Coliform	<2	per 100mls	Membrane Filtration
1	SC1 CW	Fecal Strep.	<2	per 100mls	Membrane Filtration
2	SC2 MW6	Fecal Coliform	<2	per 100mls	Membrane Filtration
2	SC2 MW6	Fecal Strep.	<2	per 100mls	Membrane Filtration
3	SC3 MW1	Fecal Coliform	<2	per 100mls	Membrane Filtration
3	SC3 MW1	Fecal Strep.	<2	per 100mls	Membrane Filtration
4	SC4 MW2	Fecal Coliform	<2	per 100mls	Membrane Filtration
4	SC4 MW2	Fecal Strep.	<2	per 100mls	Membrane Filtration
5	SC5 MW3	Fecal Coliform	<2	per 100mls	Membrane Filtration
5	SC5 MW3	Fecal Strep.	<2	per 100mls	Membrane Filtration
6	SC6 MW4	Fecal Coliform	<2	per 100mls	Membrane Filtration
6	SC6 MW4	Fecal Strep.	<2	per 100mls	Membrane Filtration
7	SC7 MW5	Fecal Coliform	<2	per 100mls	Membrane Filtration
7	SC7 MW5	Fecal Strep.	6	per 100mls	Membrane Filtration
8	SC8 IS	Fecal Coliform	<2	per 100mls	Membrane Filtration
8	SC8 IS	Fecal Strep.	4	per 100mls	Membrane Filtration
9	SC9 CS1	Fecal Coliform	<2	per 100mls	Membrane Filtration
9	SC9 CS1	Fecal Strep.	<2	per 100mls	Membrane Filtration
10	SC10 CS2	Fecal Coliform	2	per 100mls	Membrane Filtration
10	SC10 CS2	Fecal Strep.	8	per 100mls	Membrane Filtration
11	SC11 CS3	Fecal Coliform	<2	per 100mls	Membrane Filtration
11	SC11 CS3	Fecal Strep.	<2	per 100mls	Membrane Filtration
12	SC12 CS4	Fecal Coliform	<2	per 100mls	Membrane Filtration

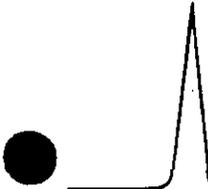
Fecal Coliform and Fecal Streptococcus were subcontracted to Water Management Laboratories, Inc.

SPECTRA LABORATORIES



Steve Hibbs, Laboratory Manager

a7/mh



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

03/29/2002

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Kenney Lilliquist

Project: Yelm Groundwater
Sample Matrix: Water
Date Sampled: 03/20/2002
Date Received: 03/20/2002
Spectra Project: 2002030185

<u>Spectra #</u>	<u>Client ID</u>	<u>Analyte</u>	<u>Result</u>	<u>Units</u>	<u>Method</u>
12	SC12 CS4	Fecal Strep.	6	per 100mls	Membrane Filtration
13	SC13 FD	Fecal Coliform	2	per 100mls	Membrane Filtration
13	SC13 FD	Fecal Strep.	<2	per 100mls	Membrane Filtration
14	Split Sample (SC7 MW5) Spectra #7	Fecal Coliform	<2	per 100mls	Membrane Filtration
14	Split Sample (SC7 MW5) Spectra #7	Fecal Strep.	10	per 100mls	Membrane Filtration

Fecal Coliform and Fecal Streptococcus were subcontracted to Water Management Laboratories, Inc.

SPECTRA LABORATORIES


Steve Hibbs, Laboratory Manager

a7/mlh

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

07/10/2002

Skillings-Connolly, Inc.
 PO Box 5080
 Lacey, WA 98509
 Attn: Patrick Skillings

Project: Yelm Groundwater Monitoring
 Client ID: SC1 CW
 Sample Matrix: Water
 Date Sampled: 06/12/2002
 Date Received: 06/12/2002
 Spectra Project: 2002060156
 Spectra Number: 1

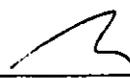
112D

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 5	ug/L	EPA 206.2	Bromide	< 0.1	mg/L	SM4500-Br-B
Boron	22	ug/L	EPA 200.7	Chloride	5.2	mg/L	SM4500CL-C
Cadmium	< 3	ug/L	EPA 200.7	Dissolved Organic Carbon	2	mg/L	EPA 415.1
Chromium	< 7	ug/L	EPA 200.7	Fluoride	0.01	mg/L	EPA 340.2
Copper	< 6	ug/L	EPA 200.7	Nitrate	2.4	mg/L-N	SM4500NO3D
Iron	< 10	ug/L	EPA 200.7	Nitrite	<0.01	mg/L-N	SM4500NO2B
Lead	< 1	ug/L	EPA 239.2	Sulfate	< 1	mg/L	EPA 375.4
Manganese	< 2	ug/L	EPA 200.7	Total Dissolved Solids	64	mg/L	EPA 160.1
Mercury	<0.5	ug/L	EPA 245.1				
Nickel	< 15	ug/L	EPA 200.7				
Silver	< 7	ug/L	EPA 200.7				
Zinc	10	ug/L	EPA 200.7				
Bromodichloromethane	<1	ug/L	SW846 8260B				
Bromoform	<1	ug/L	SW846 8260B				
Caffeine	<10	ug/L	EPA 625				
Chlorodibromomethane	<1	ug/L	SW846 8260B				
Chloroform	<1	ug/L	SW846 8260B				
N-Nitrosodimethylamine	<10	ug/L	EPA 625				
TKN	< 1.0	mg/L	SM 4500-N-B				
Ammonia	0.11	mg/L-N	EPA 350.3				
Anionic Surfactants in	<0.05	mg/L	SM5540C				
BOD	< 2	mg/L	SM 5210				

Surrogate	Recovery	Method
Nitrobenzene-d5	77	SW846 8270C
2-Fluorobiphenyl	90	SW846 8270C
p-Terphenyl-d14	102	SW846 8270C
Dibromofluoromethane	101	SW846 8260B

Surrogate	Recovery	Method
Toluene-d8	104	SW846 8260B
4-Bromofluorobenzene	101	SW846 8260B

SPECTRA LABORATORIES


 Steve Hibbs, Laboratory Manager

a14/scj

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

07/10/2002

Skillings-Connolly, Inc.
 PO Box 5080
 Lacey, WA 98509
 Attn: Patrick Skillings

Project: Yelm Groundwater Monitoring
 Client ID: SC2 MW6
 Sample Matrix: Water
 Date Sampled: 06/12/2002
 Date Received: 06/12/2002
 Spectra Project: 2002060156
 Spectra Number: 2

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 5	ug/L	EPA 206.2	Bromide	< 0.1	mg/L	SM4500-Br-B
Boron	13	ug/L	EPA 200.7	Chloride	8.2	mg/L	SM4500CL-C
Cadmium	< 3	ug/L	EPA 200.7	Dissolved Organic Carbon	< 2	mg/L	EPA 415.1
Chromium	< 7	ug/L	EPA 200.7	Fluoride	0.04	mg/L	EPA 340.2
Copper	< 6	ug/L	EPA 200.7	Nitrate	5.5	mg/L-N	SM4500NO3D
Iron	64	ug/L	EPA 200.7	Nitrite	<0.01	mg/L-N	SM4500NO2B
Lead	< 1	ug/L	EPA 239.2	Sulfate	< 1	mg/L	EPA 375.4
Manganese	40	ug/L	EPA 200.7	Total Dissolved Solids	96	mg/L	EPA 160.1
Mercury	<0.5	ug/L	EPA 245.1				
Nickel	< 15	ug/L	EPA 200.7				
Silver	< 7	ug/L	EPA 200.7				
Zinc	8	ug/L	EPA 200.7				
Bromodichloromethane	<1	ug/L	SW846 8260B				
Bromoform	<1	ug/L	SW846 8260B				
Caffeine	<10	ug/L	EPA 625				
Chlorodibromomethane	<1	ug/L	SW846 8260B				
Chloroform	<1	ug/L	SW846 8260B				
N-Nitrosodimethylamine	<10	ug/L	EPA 625				
TKN	< 1.0	mg/L	SM 4500-N-B				
Ammonia	0.11	mg/L-N	EPA 350.3				
Anionic Surfactants in	<0.05	mg/L	SM5540C				
BOD	< 2	mg/L	SM 5210				

Surrogate	Recovery	Method
Nitrobenzene-d5	68	SW846 8270C
2-Fluorobiphenyl	80	SW846 8270C
p-Terphenyl-d14	92	SW846 8270C
Dibromofluoromethane	106	SW846 8260B

Surrogate	Recovery	Method
Toluene-d8	104	SW846 8260B
4-Bromofluorobenzene	99	SW846 8260B

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager
 a14/scj



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

07/10/2002

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

Project: Yelm Groundwater Monitoring
Client ID: SC3 MW1
Sample Matrix: Water
Date Sampled: 06/12/2002
Date Received: 06/12/2002
Spectra Project: 2002060156
Spectra Number: 3

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 5	ug/L	EPA 206.2	Bromide	0.1	mg/L	SM4500-Br-B
Boron	19	ug/L	EPA 200.7	Chloride	6.7	mg/L	SM4500CL-C
Cadmium	< 3	ug/L	EPA 200.7	Dissolved Organic Carbon	< 2	mg/L	EPA 415.1
Chromium	8	ug/L	EPA 200.7	Fluoride	0.06	mg/L	EPA 340.2
Copper	< 6	ug/L	EPA 200.7	Nitrate	3.1	mg/L-N	SM4500NO3D
Iron	280	ug/L	EPA 200.7	Nitrite	<0.01	mg/L-N	SM4500NO2B
Lead	< 1	ug/L	EPA 239.2	Sulfate	< 1	mg/L	EPA 375.4
Manganese	20	ug/L	EPA 200.7	Total Dissolved Solids	73	mg/L	EPA 160.1
Mercury	<0.5	ug/L	EPA 245.1				
Nickel	< 15	ug/L	EPA 200.7				
Silver	< 7	ug/L	EPA 200.7				
Zinc	9	ug/L	EPA 200.7				
Bromodichloromethane	<1	ug/L	SW846 8260B				
Bromoform	<1	ug/L	SW846 8260B				
Caffeine	<10	ug/L	EPA 625				
Chlorodibromomethane	<1	ug/L	SW846 8260B				
Chloroform	<1	ug/L	SW846 8260B				
N-Nitrosodimethylamine	<10	ug/L	EPA 625				
TKN	< 1.0	mg/L	SM 4500-N-B				
Ammonia	0.10	mg/L-N	EPA 350.3				
Anionic Surfactants in	<0.05	mg/L	SM5540C				
BOD	< 2	mg/L	SM 5210				

Surrogate	Recovery	Method
Nitrobenzene-d5	55	SW846 8270C
2-Fluorobiphenyl	69	SW846 8270C
p-Terphenyl-d14	79	SW846 8270C
Dibromofluoromethane	106	SW846 8260B

Surrogate	Recovery	Method
Toluene-d8	105	SW846 8260B
4-Bromofluorobenzene	102	SW846 8260B

SPECTRA LABORATORIES



Steve Hibbs, Laboratory Manager

Page 3 of 13

a14/scj

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

07/10/2002

Skillings-Connolly, Inc.
 PO Box 5080
 Lacey, WA 98509
 Attn: Patrick Skillings

Project: Yelm Groundwater Monitoring
 Client ID: SC4 MW2
 Sample Matrix: Water
 Date Sampled: 06/12/2002
 Date Received: 06/12/2002
 Spectra Project: 2002060156
 Spectra Number: 4

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 5	ug/L	EPA 206.2	Bromide	< 0.1	mg/L	SM4500-Br-B
Boron	16	ug/L	EPA 200.7	Chloride	6.2	mg/L	SM4500CL-C
Cadmium	< 3	ug/L	EPA 200.7	Dissolved Organic Carbon	< 2	mg/L	EPA 415.1
Chromium	< 7	ug/L	EPA 200.7	Fluoride	0.04	mg/L	EPA 340.2
Copper	< 6	ug/L	EPA 200.7	Nitrate	3.2	mg/L-N	SM4500NO3D
Iron	130	ug/L	EPA 200.7	Nitrite	< 0.01	mg/L-N	SM4500NO2B
Lead	< 1	ug/L	EPA 239.2	Sulfate	< 1	mg/L	EPA 375.4
Manganese	2	ug/L	EPA 200.7	Total Dissolved Solids	62	mg/L	EPA 160.1
Mercury	< 0.5	ug/L	EPA 245.1				
Nickel	< 15	ug/L	EPA 200.7				
Silver	< 7	ug/L	EPA 200.7				
Zinc	< 6	ug/L	EPA 200.7				
Bromodichloromethane	< 1	ug/L	SW846 8260B				
Bromoform	< 1	ug/L	SW846 8260B				
Caffeine	< 10	ug/L	EPA 625				
Chlorodibromomethane	< 1	ug/L	SW846 8260B				
Chloroform	< 1	ug/L	SW846 8260B				
N-Nitrosodimethylamine	< 10	ug/L	EPA 625				
TKN	< 1.0	mg/L	SM 4500-N-B				
Ammonia	0.08	mg/L-N	EPA 350.3				
Anionic Surfactants in	< 0.05	mg/L	SM5540C				
BOD	< 2	mg/L	SM 5210				

Surrogate	Recovery	Method
Nitrobenzene-d5	64	SW846 8270C
2-Fluorobiphenyl	74	SW846 8270C
p-Terphenyl-d14	85	SW846 8270C
Dibromofluoromethane	108	SW846 8260B

Surrogate	Recovery	Method
Toluene-d8	105	SW846 8260B
4-Bromofluorobenzene	100	SW846 8260B

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager

a14/scj



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

07/10/2002

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

Project: Yelm Groundwater Monitoring
Client ID: SC5 MW3
Sample Matrix: Water
Date Sampled: 06/12/2002
Date Received: 06/12/2002
Spectra Project: 2002060156
Spectra Number: 5

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 5	ug/L	EPA 206.2	Bromide	0.2	mg/L	SM4500-Br-B
Boron	10	ug/L	EPA 200.7	Chloride	40	mg/L	SM4500CL-C
Cadmium	< 3	ug/L	EPA 200.7	Dissolved Organic Carbon	< 2	mg/L	EPA 415.1
Chromium	< 7	ug/L	EPA 200.7	Fluoride	0.04	mg/L	EPA 340.2
Copper	< 6	ug/L	EPA 200.7	Nitrate	5.4	mg/L-N	SM4500NO3D
Iron	280	ug/L	EPA 200.7	Nitrite	<0.01	mg/L-N	SM4500NO2B
Lead	< 1	ug/L	EPA 239.2	Sulfate	14	mg/L	EPA 375.4
Manganese	7	ug/L	EPA 200.7	Total Dissolved Solids	180	mg/L	EPA 160.1
Mercury	<0.5	ug/L	EPA 245.1				
Nickel	< 15	ug/L	EPA 200.7				
Silver	< 7	ug/L	EPA 200.7				
Zinc	< 6	ug/L	EPA 200.7				
Bromodichloromethane	<1	ug/L	SW846 8260B				
Bromoform	<1	ug/L	SW846 8260B				
Caffeine	<10	ug/L	EPA 625				
Chlorodibromomethane	<1	ug/L	SW846 8260B				
Chloroform	<1	ug/L	SW846 8260B				
N-Nitrosodimethylamine	<10	ug/L	EPA 625				
TKN	< 1.0	mg/L	SM 4500-N-B				
Ammonia	0.08	mg/L-N	EPA 350.3				
Anionic Surfactants in	<0.05	mg/L	SM5540C				
BOD	< 2	mg/L	SM 5210				

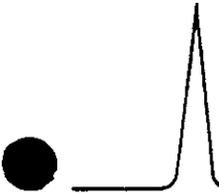
Surrogate	Recovery	Method
Nitrobenzene-d5	52	SW846 8270C
2-Fluorobiphenyl	67	SW846 8270C
p-Terphenyl-d14	82	SW846 8270C
Dibromofluoromethane	101	SW846 8260B

Surrogate	Recovery	Method
Toluene-d8	103	SW846 8260B
4-Bromofluorobenzene	101	SW846 8260B

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager

a14/scj



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

07/10/2002

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

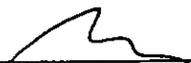
Project: Yelm Groundwater Monitoring
Client ID: SC6 MW4
Sample Matrix: Water
Date Sampled: 06/12/2002
Date Received: 06/12/2002
Spectra Project: 2002060156
Spectra Number: 6

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 5	ug/L	EPA 206.2	Bromide	0.1	mg/L	SM4500-Br-B
Boron	180	ug/L	EPA 200.7	Chloride	49	mg/L	SM4500CL-C
Cadmium	< 3	ug/L	EPA 200.7	Dissolved Organic Carbon	2	mg/L	EPA 415.1
Chromium	< 7	ug/L	EPA 200.7	Fluoride	0.03	mg/L	EPA 340.2
Copper	< 6	ug/L	EPA 200.7	Nitrate	2.2	mg/L-N	SM4500NO3D
Iron	110	ug/L	EPA 200.7	Nitrite	<0.01	mg/L-N	SM4500NO2B
Lead	< 1	ug/L	EPA 239.2	Sulfate	12	mg/L	EPA 375.4
Manganese	2	ug/L	EPA 200.7	Total Dissolved Solids	170	mg/L	EPA 160.1
Mercury	<0.5	ug/L	EPA 245.1				
Nickel	< 15	ug/L	EPA 200.7				
Silver	< 7	ug/L	EPA 200.7				
Zinc	< 6	ug/L	EPA 200.7				
Bromodichloromethane	<1	ug/L	SW846 8260B				
Bromoform	<1	ug/L	SW846 8260B				
Caffeine	<10	ug/L	EPA 625				
Chlorodibromomethane	<1	ug/L	SW846 8260B				
Chloroform	<1	ug/L	SW846 8260B				
N-Nitrosodimethylamine	<10	ug/L	EPA 625				
TKN	< 1.0	mg/L	SM 4500-N-B				
Ammonia	0.08	mg/L-N	EPA 350.3				
Anionic Surfactants in	<0.05	mg/L	SM5540C				
BOD	< 2	mg/L	SM 5210				

Surrogate	Recovery	Method
Nitrobenzene-d5	60	SW846 8270C
2-Fluorobiphenyl	68	SW846 8270C
p-Terphenyl-d14	79	SW846 8270C
Dibromofluoromethane	106	SW846 8260B

Surrogate	Recovery	Method
Toluene-d8	105	SW846 8260B
4-Bromofluorobenzene	100	SW846 8260B

SPECTRA LABORATORIES


Steve Hibbs, Laboratory Manager

a14/scj

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

07/10/2002

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

Project: Yelm Groundwater Monitoring
Client ID: SC7 MW5
Sample Matrix: Water
Date Sampled: 06/12/2002
Date Received: 06/12/2002
Spectra Project: 2002060156
Spectra Number: 7

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 5	ug/L	EPA 206.2	Bromide	0.1	mg/L	SM4500-Br-B
Boron	23	ug/L	EPA 200.7	Chloride	9.0	mg/L	SM4500CL-C
Cadmium	< 3	ug/L	EPA 200.7	Dissolved Organic Carbon	< 2	mg/L	EPA 415.1
Chromium	< 7	ug/L	EPA 200.7	Fluoride	< 0.01	mg/L	EPA 340.2
Copper	< 6	ug/L	EPA 200.7	Nitrate	4.8	mg/L-N	SM4500NO3D
Iron	99	ug/L	EPA 200.7	Nitrite	< 0.01	mg/L-N	SM4500NO2B
Lead	< 1	ug/L	EPA 239.2	Sulfate	< 1	mg/L	EPA 375.4
Manganese	< 2	ug/L	EPA 200.7	Total Dissolved Solids	100	mg/L	EPA 160.1
Mercury	< 0.5	ug/L	EPA 245.1				
Nickel	< 7	ug/L	EPA 200.7				
Silver	< 7	ug/L	EPA 200.7				
Zinc	< 6	ug/L	EPA 200.7				
Bromodichloromethane	< 1	ug/L	SW846 8260B				
Bromoform	< 1	ug/L	SW846 8260B				
Caffeine	< 10	ug/L	EPA 625				
Chlorodibromomethane	< 1	ug/L	SW846 8260B				
Chloroform	< 1	ug/L	SW846 8260B				
N-Nitrosodimethylamine	< 10	ug/L	EPA 625				
TKN	< 1.0	mg/L	SM 4500-N-B				
Ammonia	0.08	mg/L-N	EPA 350.3				
Anionic Surfactants in	< 0.05	mg/L	SM5540C				
BOD	< 2	mg/L	SM 5210				

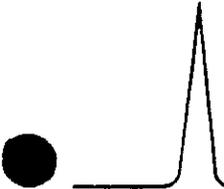
Surrogate	Recovery	Method
Nitrobenzene-d5	53	SW846 8270C
2-Fluorobiphenyl	67	SW846 8270C
p-Terphenyl-d14	79	SW846 8270C
Dibromofluoromethane	105	SW846 8260B

Surrogate	Recovery	Method
Toluene-d8	105	SW846 8260B
4-Bromofluorobenzene	99	SW846 8260B

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager

a14/scj



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

07/10/2002

Skillings-Connolly, Inc.
 PO Box 5080
 Lacey, WA 98509
 Attn: Patrick Skillings

Project: Yelm Groundwater Monitoring
 Client ID: SC8 IS
 Sample Matrix: Water
 Date Sampled: 06/12/2002
 Date Received: 06/12/2002
 Spectra Project: 2002060156
 Spectra Number: 8

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 5	ug/L	EPA 206.2	Bromide	< 0.1	mg/L	SM4500-Br-B
Boron	360	ug/L	EPA 200.7	Chloride	77	mg/L	SM4500CL-C
Cadmium	< 3	ug/L	EPA 200.7	Dissolved Organic Carbon	7	mg/L	EPA 415.1
Chromium	< 7	ug/L	EPA 200.7	Fluoride	<0.01	mg/L	EPA 340.2
Copper	< 6	ug/L	EPA 200.7	Nitrate	5.1	mg/L-N	SM4500NO3D
Iron	120	ug/L	EPA 200.7	Nitrite	<0.01	mg/L-N	SM4500NO2B
Lead	< 1	ug/L	EPA 239.2	Sulfate	36	mg/L	EPA 375.4
Manganese	32	ug/L	EPA 200.7	Total Dissolved Solids	280	mg/L	EPA 160.1
Mercury	<0.5	ug/L	EPA 245.1				
Nickel	< 15	ug/L	EPA 200.7				
Silver	< 7	ug/L	EPA 200.7				
Zinc	13	ug/L	EPA 200.7				
Bromodichloromethane	9.72	ug/L	SW846 8260B				
Bromoform	<1	ug/L	SW846 8260B				
Caffeine	<10	ug/L	EPA 625				
Chlorodibromomethane	1.2	ug/L	SW846 8260B				
Chloroform	37.4	ug/L	SW846 8260B				
N-Nitrosodimethylamine	<10	ug/L	EPA 625				
TKN	< 1.0	mg/L	SM 4500-N-B				
Ammonia	0.08	mg/L-N	EPA 350.3				
Anionic Surfactants in	0.26	mg/L	SM5540C				
BOD	< 2	mg/L	SM 5210				

Surrogate	Recovery	Method
Nitrobenzene-d5	31	SW846 8270C
2-Fluorobiphenyl	36	SW846 8270C
p-Terphenyl-d14	60	SW846 8270C
Dibromofluoromethane	107	SW846 8260B

Surrogate	Recovery	Method
Toluene-d8	105	SW846 8260B
4-Bromofluorobenzene	100	SW846 8260B

SPECTRA LABORATORIES


 Steve Hibbs, Laboratory Manager

a14/scj

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

07/10/2002

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

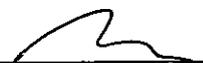
Project: Yelm Groundwater Monitoring
Client ID: SC9 CS1
Sample Matrix: Water
Date Sampled: 06/12/2002
Date Received: 06/12/2002
Spectra Project: 2002060156
Spectra Number: 9

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 5	ug/L	EPA 206.2	Bromide	< 0.1	mg/L	SM4500-Br-B
Boron	360	ug/L	EPA 200.7	Chloride	82	mg/L	SM4500CL-C
Cadmium	< 3	ug/L	EPA 200.7	Dissolved Organic Carbon	8	mg/L	EPA 415.1
Chromium	< 7	ug/L	EPA 200.7	Fluoride	0.02	mg/L	EPA 340.2
Copper	< 6	ug/L	EPA 200.7	Nitrate	1.1	mg/L-N	SM4500NO3D
Iron	250	ug/L	EPA 200.7	Nitrite	0.02	mg/L-N	SM4500NO2B
Lead	< 1	ug/L	EPA 239.2	Sulfate	31	mg/L	EPA 375.4
Manganese	80	ug/L	EPA 200.7	Total Dissolved Solids	270	mg/L	EPA 160.1
Mercury	<0.5	ug/L	EPA 245.1				
Nickel	16	ug/L	EPA 200.7				
Silver	< 7	ug/L	EPA 200.7				
Zinc	8	ug/L	EPA 200.7				
Bromodichloromethane	1.3	ug/L	SW846 8260B				
Bromoform	<1	ug/L	SW846 8260B				
Caffeine	<10	ug/L	EPA 625				
Chlorodibromomethane	<1	ug/L	SW846 8260B				
Chloroform	8.8	ug/L	SW846 8260B				
N-Nitrosodimethylamine	<10	ug/L	EPA 625				
TKN	< 1.0	mg/L	SM 4500-N-B				
Ammonia	0.11	mg/L-N	EPA 350.3				
Anionic Surfactants in	0.22	mg/L	SM5540C				
BOD	4	mg/L	SM 5210				

Surrogate	Recovery	Method
Nitrobenzene-d5	47	SW846 8270C
2-Fluorobiphenyl	53	SW846 8270C
p-Terphenyl-d14	85	SW846 8270C
Dibromofluoromethane	107	SW846 8260B

Surrogate	Recovery	Method
Toluene-d8	105	SW846 8260B
4-Bromofluorobenzene	101	SW846 8260B

SPECTRA LABORATORIES


Steve Hibbs, Laboratory Manager

a14/scj

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

07/10/2002

Skillings-Connolly, Inc.
 PO Box 5080
 Lacey, WA 98509
 Attn: Patrick Skillings

Project: Yelm Groundwater Monitoring
 Client ID: SC10 CS2
 Sample Matrix: Water
 Date Sampled: 06/12/2002
 Date Received: 06/12/2002
 Spectra Project: 2002060156
 Spectra Number: 10

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 5	ug/L	EPA 206.2	Bromide	< 0.1	mg/L	SM4500-Br-B
Boron	370	ug/L	EPA 200.7	Chloride	83	mg/L	SM4500CL-C
Cadmium	< 3	ug/L	EPA 200.7	Dissolved Organic Carbon	9	mg/L	EPA 415.1
Chromium	< 7	ug/L	EPA 200.7	Fluoride	0.02	mg/L	EPA 340.2
Copper	< 6	ug/L	EPA 200.7	Nitrate	1.0	mg/L-N	SM4500NO3D
Iron	200	ug/L	EPA 200.7	Nitrite	0.02	mg/L-N	SM4500NO2B
Lead	< 1	ug/L	EPA 239.2	Sulfate	26	mg/L	EPA 375.4
Manganese	180	ug/L	EPA 200.7	Total Dissolved Solids	290	mg/L	EPA 160.1
Mercury	<0.5	ug/L	EPA 245.1				
Nickel	< 15	ug/L	EPA 200.7				
Silver	< 7	ug/L	EPA 200.7				
Zinc	< 6	ug/L	EPA 200.7				
Bromodichloromethane	<1	ug/L	SW846 8260B				
Bromoform	<1	ug/L	SW846 8260B				
Caffeine	<10	ug/L	EPA 625				
Chlorodibromomethane	<1	ug/L	SW846 8260B				
Chloroform	1.4	ug/L	SW846 8260B				
N-Nitrosodimethylamine	<10	ug/L	EPA 625				
TKN	< 1.0	mg/L	SM 4500-N-B				
Ammonia	0.29	mg/L-N	EPA 350.3				
Anionic Surfactants in	0.18	mg/L	SM5540C				
BOD	3	mg/L	SM 5210				

Surrogate	Recovery	Method
Nitrobenzene-d5	45	SW846 8270C
2-Fluorobiphenyl	56	SW846 8270C
p-Terphenyl-d14	86	SW846 8270C
Dibromofluoromethane	105	SW846 8260B

Surrogate	Recovery	Method
Toluene-d8	104	SW846 8260B
4-Bromofluorobenzene	102	SW846 8260B

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager

a14/scj



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

07/10/2002

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

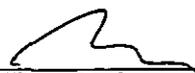
Project: Yelm Groundwater Monitoring
Client ID: SC11 CS3
Sample Matrix: Water
Date Sampled: 06/12/2002
Date Received: 06/12/2002
Spectra Project: 2002060156
Spectra Number: 11

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 5	ug/L	EPA 200.7	Bromide	< 0.1	mg/L	SM4500-Br-B
Boron	360	ug/L	EPA 200.7	Chloride	81	mg/L	SM4500CL-C
Cadmium	< 3	ug/L	EPA 200.7	Dissolved Organic Carbon	7	mg/L	EPA 415.1
Chromium	< 7	ug/L	EPA 200.7	Fluoride	0.03	mg/L	EPA 340.2
Copper	< 6	ug/L	EPA 200.7	Nitrate	1.0	mg/L-N	SM4500NO3D
Iron	250	ug/L	EPA 200.7	Nitrite	<0.01	mg/L-N	SM4500NO2B
Lead	< 1	ug/L	EPA 239.2	Sulfate	21	mg/L	EPA 375.4
Manganese	76	ug/L	EPA 200.7	Total Dissolved Solids	280	mg/L	EPA 160.1
Mercury	<0.5	ug/L	EPA 245.1				
Nickel	< 15	ug/L	EPA 200.7				
Silver	< 7	ug/L	EPA 200.7				
Zinc	< 6	ug/L	EPA 200.7				
Bromodichloromethane	<1	ug/L	SW846 8260B				
Bromoform	<1	ug/L	SW846 8260B				
Caffeine	<10	ug/L	EPA 625				
Chlorodibromomethane	<1	ug/L	SW846 8260B				
Chloroform	<1	ug/L	SW846 8260B				
N-Nitrosodimethylamine	<10	ug/L	EPA 625				
TKN	< 1.0	mg/L	SM 4500-N-B				
Ammonia	0.11	mg/L-N	EPA 350.3				
Anionic Surfactants in	0.10	mg/L	SM5540C				
BOD	2	mg/L	SM 5210				

Surrogate	Recovery	Method
Nitrobenzene-d5	52	SW846 8270C
2-Fluorobiphenyl	60	SW846 8270C
p-Terphenyl-d14	85	SW846 8270C
Dibromofluoromethane	102	SW846 8260B

Surrogate	Recovery	Method
Toluene-d8	104	SW846 8260B
4-Bromofluorobenzene	101	SW846 8260B

SPECTRA LABORATORIES



Steve Hibbs, Laboratory Manager

a14/scj

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

07/10/2002

Skillings-Connolly, Inc.
 PO Box 5080
 Lacey, WA 98509
 Attn: Patrick Skillings

Project: Yelm Groundwater Monitoring
 Client ID: SC12 CS4
 Sample Matrix: Water
 Date Sampled: 06/12/2002
 Date Received: 06/12/2002
 Spectra Project: 2002060156
 Spectra Number: 12

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 5	ug/L	EPA 206.2	Bromide	< 0.1	mg/L	SM4500-Br-B
Boron	350	ug/L	EPA 200.7	Chloride	68	mg/L	SM4500CL-C
Cadmium	< 3	ug/L	EPA 200.7	Dissolved Organic Carbon	8	mg/L	EPA 415.1
Chromium	< 7	ug/L	EPA 200.7	Fluoride	0.03	mg/L	EPA 340.2
Copper	< 6	ug/L	EPA 200.7	Nitrate	0.9	mg/L-N	SM4500NO3D
Iron	300	ug/L	EPA 200.7	Nitrite	<0.01	mg/L-N	SM4500NO2B
Lead	< 1	ug/L	EPA 239.2	Sulfate	20	mg/L	EPA 375.4
Manganese	55	ug/L	EPA 200.7	Total Dissolved Solids	260	mg/L	EPA 160.1
Mercury	<0.5	ug/L	EPA 245.1				
Nickel	< 15	ug/L	EPA 200.7				
Silver	< 7	ug/L	EPA 200.7				
Zinc	6	ug/L	EPA 200.7				
Bromodichloromethane	<1	ug/L	SW846 8260B				
Bromoform	<1	ug/L	SW846 8260B				
Caffeine	<20	ug/L	EPA 625				
Chlorodibromomethane	<1	ug/L	SW846 8260B				
Chloroform	<1	ug/L	SW846 8260B				
N-Nitrosodimethylamine	<20	ug/L	EPA 625				
TKN	< 1.0	mg/L	SM 4500-N-B				
Ammonia	0.08	mg/L-N	EPA 350.3				
Anionic Surfactants in	0.16	mg/L	SM5540C				
BOD	3	mg/L	SM 5210				

Surrogate	Recovery	Method
Nitrobenzene-d5	69	SW846 8270C
2-Fluorobiphenyl	79	SW846 8270C
p-Terphenyl-d14	79	SW846 8270C
Dibromofluoromethane	103	SW846 8260B

Surrogate	Recovery	Method
Toluene-d8	102	SW846 8260B
4-Bromofluorobenzene	100	SW846 8260B

SPECTRA LABORATORIES


 Steve Hibbs, Laboratory Manager

a14/scj

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

07/10/2002

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

Project: Yelm Groundwater Monitoring
Client ID: SC13 FD
Sample Matrix: Water
Date Sampled: 06/12/2002
Date Received: 06/12/2002
Spectra Project: 2002060156
Spectra Number: 13

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 5	ug/L	EPA 206.2	Bromide	0.1	mg/L	SM4500-Br-B
Boron	350	ug/L	EPA 200.7	Chloride	76	mg/L	SM4500CL-C
Cadmium	< 3	ug/L	EPA 200.7	Dissolved Organic Carbon	8	mg/L	EPA 415.1
Chromium	< 7	ug/L	EPA 200.7	Fluoride	0.03	mg/L	EPA 340.2
Copper	< 6	ug/L	EPA 200.7	Nitrate	1.4	mg/L-N	SM4500NO3D
Iron	250	ug/L	EPA 200.7	Nitrite	0.02	mg/L-N	SM4500NO2B
Lead	< 1	ug/L	EPA 239.2	Sulfate	30	mg/L	EPA 375.4
Manganese	80	ug/L	EPA 200.7	Total Dissolved Solids	280	mg/L	EPA 160.1
Mercury	<0.5	ug/L	EPA 245.1				
Nickel	< 15	ug/L	EPA 200.7				
Silver	< 7	ug/L	EPA 200.7				
Zinc	9	ug/L	EPA 200.7				
Bromodichloromethane	1.3	ug/L	SW846 8260B				
Bromoform	<1	ug/L	SW846 8260B				
Caffeine	<10	ug/L	EPA 625				
Chlorodibromomethane	<1	ug/L	SW846 8260B				
Chloroform	8.8	ug/L	SW846 8260B				
N-Nitrosodimethylamine	<10	ug/L	EPA 625				
TKN	< 1.0	mg/L	SM 4500-N-B				
Ammonia	0.08	mg/L-N	EPA 350.3				
Anionic Surfactants in	0.23	mg/L	SM5540C				
BOD	3	mg/L	SM 5210				

Surrogate	Recovery	Method
Nitrobenzene-d5	55	SW846 8270C
2-Fluorobiphenyl	64	SW846 8270C
p-Terphenyl-d14	83	SW846 8270C
Dibromofluoromethane	108	SW846 8260B

Surrogate	Recovery	Method
Toluene-d8	103	SW846 8260B
4-Bromofluorobenzene	100	SW846 8260B

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager

a14/scj

June 14, 2002

Spectra Laboratories, Inc.
2221 Ross Way
Tacoma, WA 98421
Attn: Steve Hibbs

Dear Sir:

Results of analysis of thirteen environmental water samples taken on 06-12-02 and received on 06-12-02 at 4:15 p.m. are as follows:

Project: 2002060156 - Skillings - Connolly

<u>Sample Identification</u>	<u>Fecal Coliform (per 100 mls)</u>	<u>Fecal Streptococcus (per 100 mls)</u>
01 - SC1 CW 10:30 split sample	0	< 2*
02 - SC2 MW6 08:00	1	0
03 - SC3 MW1 09:00	1	1
04 - SC4 MW2 09:30	0	1
05 - SC5 MW3 10:00	0	0
06 - SC6 MW4 11:10	0	0
07 - SC7 MW5 12:00 split sample	< 2*	< 2*
08 - SC8 1S 11:05	0	0

<u>Sample Identification</u>	<u>Fecal Coliform (per 100 mls)</u>	<u>Fecal Streptococcus (per 100 mls)</u>
09 - SC9 CS1 12:30	2,000	54
10 - SC10 CS2 13:00	50	6
11 - SC11 CS3 13:55	11	10
12 - SC12 CS4 14:05	100	43
13 - SC13 FD 12:30	1,800	44
split sample	2,000	---

* < is less than

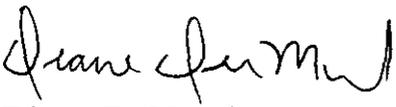
Lab Number: 08967389 through 08967401

Please note sample volume was insufficient to split for both tests on sample #13.

Samples were analyzed by membrane filtration procedure according to Standard Methods for the Examination of Water and Wastewater, 19th Edition and EPA Microbiological Methods for Monitoring the Environment.

Chain of custody record is enclosed.

Sincerely,


Diane DuMond
Microbiologist

DD:lcc
enclosure

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

10/01/2002

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509

Project: Yelm Groundwater Monitoring
Client ID: SC1 CW
Sample Matrix: Water
Date Sampled: 09/05/2002
Date Received: 09/05/2002
Spectra Project: 2002090031
Spectra Number: 1

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 5	ug/L	EPA 206.2	Bromide	< 0.1	mg/L	SM4500-Br-B
Boron	< 8	ug/L	EPA 200.7	Chloride	5.5	mg/L	SM4500CL-C
Cadmium	< 3	ug/L	EPA 200.7	Dissolved Organic Carbon	4	mg/L	EPA 415.1
Chromium	< 7	ug/L	EPA 200.7	Fluoride	0.03	mg/L	EPA 340.2
Copper	< 6	ug/L	EPA 200.7	Nitrate	2.54	mg/L-N	SM4500NO3D
Iron	< 10	ug/L	EPA 200.7	Nitrite	< 0.01	mg/L-N	SM4500NO2B
Lead	< 1	ug/L	EPA 239.2	Sulfate	< 1	mg/L	EPA 375.4
Manganese	< 2	ug/L	EPA 200.7	Total Dissolved Solids	86	mg/L	EPA 160.1
Mercury	< 0.5	ug/L	EPA 245.1				
Nickel	< 15	ug/L	EPA 200.7				
Silver	< 7	ug/L	EPA 200.7				
Zinc	< 6	ug/L	EPA 200.7				
Bromodichloromethane	< 1	ug/L	SW846 8260B				
Bromoform	< 1	ug/L	SW846 8260B				
Caffeine	< 10	ug/L	EPA 625				
Chlorodibromomethane	< 1	ug/L	SW846 8260B				
Chloroform	< 1	ug/L	SW846 8260B				
N-Nitrosodimethylamine	< 10	ug/L	EPA 625				
TKN	1.1	mg/L	SM 4500-N-B				
Ammonia	0.21	mg/L-N	EPA 350.3				
Anionic Surfactants as	< 0.05	mg/L	SM5540C				
BOD	< 2	mg/L	SM 5210				

Surrogate	Recovery	Method
Dibromofluoromethane	103	SW846 8260B
Toluene-d8	99	SW846 8260B
4-Bromofluorobenzene	99	EPA 624
Nitrobenzene-d5	75	SW846 8270C

Surrogate	Recovery	Method
2-Fluorobiphenyl	96	SW846 8270C
p-Terphenyl-d14	102	SW846 8270C

SPECTRA LABORATORIES


Steve Hibbs, Laboratory Manager

a14/sg



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

10/01/2002

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509

Project: Yelm Groundwater Monitoring
Client ID: SC2 MW6
Sample Matrix: Water
Date Sampled: 09/05/2002
Date Received: 09/05/2002
Spectra Project: 2002090031
Spectra Number: 2

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 5	ug/L	EPA 206.2	Bromide	0.1	mg/L	SM4500-Br-B
Boron	< 8	ug/L	EPA 200.7	Chloride	6.5	mg/L	SM4500CL-C
Cadmium	< 3	ug/L	EPA 200.7	Dissolved Organic Carbon	25	mg/L	EPA 415.1
Chromium	< 7	ug/L	EPA 200.7	Fluoride	0.05	mg/L	EPA 340.2
Copper	< 6	ug/L	EPA 200.7	Nitrate	2.34	mg/L-N	SM4500NO3D
Iron	1900	ug/L	EPA 200.7	Nitrite	< 0.01	mg/L-N	SM4500NO2B
Lead	< 1	ug/L	EPA 239.2	Sulfate	< 1	mg/L	EPA 375.4
Manganese	5100	ug/L	EPA 200.7	Total Dissolved Solids	86	mg/L	EPA 160.1
Mercury	< 0.5	ug/L	EPA 245.1				
Nickel	< 15	ug/L	EPA 200.7				
Silver	< 7	ug/L	EPA 200.7				
Zinc	9	ug/L	EPA 200.7				
Bromodichloromethane	< 1	ug/L	SW846 8260B				
Bromoform	< 1	ug/L	SW846 8260B				
Caffeine	< 10	ug/L	EPA 625				
Chlorodibromomethane	< 1	ug/L	SW846 8260B				
Chloroform	< 1	ug/L	SW846 8260B				
N-Nitrosodimethylamine	< 10	ug/L	EPA 625				
TKN	< 1	mg/L	SM 4500-N-B				
Ammonia	0.21	mg/L-N	EPA 350.3				
Anionic Surfactants as	< 0.05	mg/L	SM5540C				
BOD	< 2	mg/L	SM 5210				

Surrogate	Recovery	Method
Dibromofluoromethane	102	SW846 8260B
Toluene-d8	100	SW846 8260B
4-Bromofluorobenzene	101	EPA 624
Nitrobenzene-d5	62	SW846 8270C

Surrogate	Recovery	Method
2-Fluorobiphenyl	79	SW846 8270C
p-Terphenyl-d14	98	SW846 8270C

SPECTRA LABORATORIES


Steve Hibbs, Laboratory Manager
a14/sgh

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

10/01/2002

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509

Project: Yelm Groundwater Monitoring
Client ID: SC3 MW1
Sample Matrix: Water
Date Sampled: 09/05/2002
Date Received: 09/05/2002
Spectra Project: 2002090031
Spectra Number: 3

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 5	ug/L	EPA 206.2	Bromide	0.2	mg/L	SM4500-Br-B
Boron	< 8	ug/L	EPA 200.7	Chloride	7.0	mg/L	SM4500CL-C
Cadmium	< 3	ug/L	EPA 200.7	Dissolved Organic Carbon	9	mg/L	EPA 415.1
Chromium	< 7	ug/L	EPA 200.7	Fluoride	0.03	mg/L	EPA 340.2
Copper	< 6	ug/L	EPA 200.7	Nitrate	4.33	mg/L-N	SM4500NO3D
Iron	380	ug/L	EPA 200.7	Nitrite	< 0.01	mg/L-N	SM4500NO2B
Lead	< 1	ug/L	EPA 239.2	Sulfate	< 1	mg/L	EPA 375.4
Manganese	100	ug/L	EPA 200.7	Total Dissolved Solids	90	mg/L	EPA 160.1
Mercury	< 0.5	ug/L	EPA 245.1				
Nickel	< 15	ug/L	EPA 200.7				
Silver	< 7	ug/L	EPA 200.7				
Zinc	< 6	ug/L	EPA 200.7				
Bromodichloromethane	<1	ug/L	SW846 8260B				
Bromoform	<1	ug/L	SW846 8260B				
Caffeine	<10	ug/L	EPA 625				
Chlorodibromomethane	<1	ug/L	SW846 8260B				
Chloroform	<1	ug/L	SW846 8260B				
N-Nitrosodimethylamine	<10	ug/L	EPA 625				
TKN	<1	mg/L	SM 4500-N-B				
Ammonia	0.20	mg/L-N	EPA 350.3				
Anionic Surfactants as	<0.05	mg/L	SM5540C				
BOD	< 2	mg/L	SM 5210				

Surrogate	Recovery	Method
Dibromofluoromethane	104	SW846 8260B
Toluene-d8	100	SW846 8260B
4-Bromofluorobenzene	100	EPA 624
Nitrobenzene-d5	68	SW846 8270C

Surrogate	Recovery	Method
2-Fluorobiphenyl	87	SW846 8270C
p-Terphenyl-d14	88	SW846 8270C

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager

a14/sgh



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

10/01/2002

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509

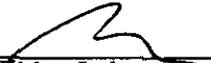
Project: Yelm Groundwater Monitoring
Client ID: SC4 MW2
Sample Matrix: Water
Date Sampled: 09/05/2002
Date Received: 09/05/2002
Spectra Project: 2002090031
Spectra Number: 4

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 5	ug/L	EPA 206.2	Bromide	< 0.1	mg/L	SM4500-Br-B
Boron	< 8	ug/L	EPA 200.7	Chloride	9.0	mg/L	SM4500CL-C
Cadmium	< 3	ug/L	EPA 200.7	Dissolved Organic Carbon	7	mg/L	EPA 415.1
Chromium	< 7	ug/L	EPA 200.7	Fluoride	0.02	mg/L	EPA 340.2
Copper	< 6	ug/L	EPA 200.7	Nitrate	4.29	mg/L-N	SM4500NO3D
Iron	26	ug/L	EPA 200.7	Nitrite	< 0.01	mg/L-N	SM4500NO2B
Lead	< 1	ug/L	EPA 239.2	Sulfate	< 1	mg/L	EPA 375.4
Manganese	< 2	ug/L	EPA 200.7	Total Dissolved Solids	100	mg/L	EPA 160.1
Mercury	< 0.5	ug/L	EPA 245.1				
Nickel	< 15	ug/L	EPA 200.7				
Silver	< 7	ug/L	EPA 200.7				
Zinc	< 6	ug/L	EPA 200.7				
Bromodichloromethane	< 1	ug/L	SW846 8260B				
Bromoform	< 1	ug/L	SW846 8260B				
Caffeine	< 10	ug/L	EPA 625				
Chlorodibromomethane	< 1	ug/L	SW846 8260B				
Chloroform	< 1	ug/L	SW846 8260B				
N-Nitrosodimethylamine	< 10	ug/L	EPA 625				
TKN	< 1	mg/L	SM 4500-N-B				
Ammonia	0.18	mg/L-N	EPA 350.3				
Anionic Surfactants as	< 0.05	mg/L	SM5540C				
BOD	< 2	mg/L	SM 5210				

Surrogate	Recovery	Method
Dibromofluoromethane	106	SW846 8260B
Toluene-d8	99	SW846 8260B
4-Bromofluorobenzene	101	EPA 624
Nitrobenzene-d5	71	SW846 8270C

Surrogate	Recovery	Method
2-Fluorobiphenyl	90	SW846 8270C
p-Terphenyl-d14	95	SW846 8270C

SPECTRA LABORATORIES



Steve Hibbs, Laboratory Manager
al4/sgh

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

10/01/2002

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509

Project: Yelm Groundwater Monitoring
Client ID: SC5 MW3
Sample Matrix: Water
Date Sampled: 09/05/2002
Date Received: 09/05/2002
Spectra Project: 2002090031
Spectra Number: 5

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 5	ug/L	EPA 206.2	Bromide	0.2	mg/L	SM4500-Br-B
Boron	120	ug/L	EPA 200.7	Chloride	58	mg/L	SM4500CL-C
Cadmium	< 3	ug/L	EPA 200.7	Dissolved Organic Carbon	9	mg/L	EPA 415.1
Chromium	< 7	ug/L	EPA 200.7	Fluoride	0.02	mg/L	EPA 340.2
Copper	< 6	ug/L	EPA 200.7	Nitrate	3.38	mg/L-N	SM4500NO3D
Iron	260	ug/L	EPA 200.7	Nitrite	< 0.01	mg/L-N	SM4500NO2B
Lead	< 1	ug/L	EPA 239.2	Sulfate	5	mg/L	EPA 375.4
Manganese	18	ug/L	EPA 200.7	Total Dissolved Solids	230	mg/L	EPA 160.1
Mercury	< 0.5	ug/L	EPA 245.1				
Nickel	< 15	ug/L	EPA 200.7				
Silver	< 7	ug/L	EPA 200.7				
Zinc	13	ug/L	EPA 200.7				
Bromodichloromethane	<1	ug/L	SW846 8260B				
Bromoform	<1	ug/L	SW846 8260B				
Caffeine	<10	ug/L	EPA 625				
Chlorodibromomethane	<1	ug/L	SW846 8260B				
Chloroform	<1	ug/L	SW846 8260B				
N-Nitrosodimethylamine	<10	ug/L	EPA 625				
TKN	<1	mg/L	SM 4500-N-B				
Ammonia	0.18	mg/L-N	EPA 350.3				
Anionic Surfactants as	<0.05	mg/L	SM5540C				
BOD	< 2	mg/L	SM 5210				

Surrogate	Recovery	Method
Dibromofluoromethane	107	SW846 8260B
Toluene-d8	98	SW846 8260B
4-Bromofluorobenzene	100	EPA 624
Nitrobenzene-d5	66	SW846 8270C

Surrogate	Recovery	Method
2-Fluorobiphenyl	82	SW846 8270C
p-Terphenyl-d14	95	SW846 8270C

SPECTRA LABORATORIES


Steve Hibbs, Laboratory Manager
a14/sgh

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

10/01/2002

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509

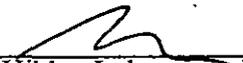
Project: Yelm Groundwater Monitoring
Client ID: SC6 MW4
Sample Matrix: Water
Date Sampled: 09/05/2002
Date Received: 09/05/2002
Spectra Project: 2002090031
Spectra Number: 6

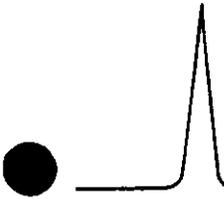
Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 5	ug/L	EPA 206.2	Bromide	0.2	mg/L	SM4500-Br-B
Boron	160	ug/L	EPA 200.7	Chloride	52	mg/L	SM4500CL-C
Cadmium	< 3	ug/L	EPA 200.7	Dissolved Organic Carbon	8	mg/L	EPA 415.1
Chromium	< 7	ug/L	EPA 200.7	Fluoride	0.02	mg/L	EPA 340.2
Copper	< 6	ug/L	EPA 200.7	Nitrate	3.13	mg/L-N	SM4500NO3D
Iron	130	ug/L	EPA 200.7	Nitrite	< 0.01	mg/L-N	SM4500NO2B
Lead	< 1	ug/L	EPA 239.2	Sulfate	5	mg/L	EPA 375.4
Manganese	7	ug/L	EPA 200.7	Total Dissolved Solids	180	mg/L	EPA 160.1
Mercury	< 0.5	ug/L	EPA 245.1				
Nickel	< 15	ug/L	EPA 200.7				
Silver	< 7	ug/L	EPA 200.7				
Zinc	16	ug/L	EPA 200.7				
Bromodichloromethane	< 1	ug/L	SW846 8260B				
Bromoform	< 1	ug/L	SW846 8260B				
Caffeine	< 10	ug/L	EPA 625				
Chlorodibromomethane	< 1	ug/L	SW846 8260B				
Chloroform	< 1	ug/L	SW846 8260B				
N-Nitrosodimethylamine	< 10	ug/L	EPA 625				
TKN	< 1	mg/L	SM 4500-N-B				
Ammonia	0.18	mg/L-N	EPA 350.3				
Anionic Surfactants as	< 0.05	mg/L	SM5540C				
BOD	< 2	mg/L	SM 5210				

Surrogate	Recovery	Method
Dibromofluoromethane	108	SW846 8260B
Toluene-d8	99	SW846 8260B
4-Bromofluorobenzene	101	EPA 624
Nitrobenzene-d5	42	SW846 8270C

Surrogate	Recovery	Method
2-Fluorobiphenyl	54	SW846 8270C
p-Terphenyl-d14	71	SW846 8270C

SPECTRA LABORATORIES


Steve Hibbs, Laboratory Manager
a14/sgb



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

10/01/2002

Skillsing-Connolly, Inc.
PO Box 5080
Lacey, WA 98509

Project: Yelm Groundwater Monitoring
Client ID: SC7 MW5
Sample Matrix: Water
Date Sampled: 09/05/2002
Date Received: 09/05/2002
Spectra Project: 2002090031
Spectra Number: 7

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 5	ug/L	EPA 206.2	Bromide	< 0.1	mg/L	SM4500-Br-B
Boron	< 8	ug/L	EPA 200.7	Chloride	14	mg/L	SM4500CL-C
Cadmium	< 3	ug/L	EPA 200.7	Dissolved Organic Carbon	7	mg/L	EPA 415.1
Chromium	< 7	ug/L	EPA 200.7	Fluoride	0.02	mg/L	EPA 340.2
Copper	< 6	ug/L	EPA 200.7	Nitrate	4.22	mg/L-N	SM4500NO3D
Iron	270	ug/L	EPA 200.7	Nitrite	< 0.01	mg/L-N	SM4500NO2B
Lead	< 1	ug/L	EPA 239.2	Sulfate	< 1	mg/L	EPA 375.4
Manganese	14	ug/L	EPA 200.7	Total Dissolved Solids	110	mg/L	EPA 160.1
Mercury	< 0.5	ug/L	EPA 245.1				
Nickel	< 15	ug/L	EPA 200.7				
Silver	< 7	ug/L	EPA 200.7				
Zinc	< 6	ug/L	EPA 200.7				
Bromodichloromethane	< 1	ug/L	SW846 8260B				
Bromoform	< 1	ug/L	SW846 8260B				
Caffeine	< 10	ug/L	EPA 625				
Chlorodibromomethane	< 1	ug/L	SW846 8260B				
Chloroform	< 1	ug/L	SW846 8260B				
N-Nitrosodimethylamine	< 10	ug/L	EPA 625				
TKN	< 1	mg/L	SM 4500-N-B				
Ammonia	0.15	mg/L-N	EPA 350.3				
Anionic Surfactants as	< 0.05	mg/L	SM5540C				
BOD	< 2	mg/L	SM 5210				

Surrogate	Recovery	Method
Dibromofluoromethane	103	SW846 8260B
Toluene-d8	99	SW846 8260B
4-Bromofluorobenzene	99	EPA 624
Nitrobenzene-d5	78	SW846 8270C

Surrogate	Recovery	Method
2-Fluorobiphenyl	95	SW846 8270C
p-Terphenyl-d14	98	SW846 8270C

SPECTRA LABORATORIES



Steve Hibbs, Laboratory Manager

a14/sgh



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

10/01/2002

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509

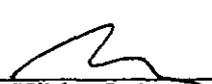
Project: Yelm Groundwater Monitoring
Client ID: SC8 IS
Sample Matrix: Water
Date Sampled: 09/05/2002
Date Received: 09/05/2002
Spectra Project: 2002090031
Spectra Number: 8

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 5	ug/L	EPA 206.2	Bromide	< 0.1	mg/L	SM4500-Br-B
Boron	320	ug/L	EPA 200.7	Chloride	100	mg/L	SM4500CL-C
Cadmium	< 3	ug/L	EPA 200.7	Dissolved Organic Carbon	14	mg/L	EPA 415.1
Chromium	< 7	ug/L	EPA 200.7	Fluoride	0.03	mg/L	EPA 340.2
Copper	< 6	ug/L	EPA 200.7	Nitrate	6.98	mg/L-N	SM4500NO3D
Iron	54	ug/L	EPA 200.7	Nitrite	< 0.01	mg/L-N	SM4500NO2B
Lead	< 1	ug/L	EPA 239.2	Sulfate	25	mg/L	EPA 375.4
Manganese	5	ug/L	EPA 200.7	Total Dissolved Solids	320	mg/L	EPA 160.1
Mercury	< 0.5	ug/L	EPA 245.1				
Nickel	< 15	ug/L	EPA 200.7				
Silver	8	ug/L	EPA 200.7				
Zinc	41	ug/L	EPA 200.7				
Bromodichloromethane	13	ug/L	SW846 8260B				
Bromoform	< 1	ug/L	SW846 8260B				
Caffeine	< 10	ug/L	EPA 625				
Chlorodibromomethane	1	ug/L	SW846 8260B				
Chloroform	71	ug/L	SW846 8260B				
N-Nitrosodimethylamine	< 10	ug/L	EPA 625				
TKN	< 1	mg/L	SM 4500-N-B				
Ammonia	0.10	mg/L-N	EPA 350.3				
Anionic Surfactants as	0.35	mg/L	SM5540C				
BOD	< 2	mg/L	SM 5210				

Surrogate	Recovery	Method
Dibromofluoromethane	110	SW846 8260B
Toluene-d8	98	SW846 8260B
4-Bromofluorobenzene	104	EPA 624
Nitrobenzene-d5	74	SW846 8270C

Surrogate	Recovery	Method
2-Fluorobiphenyl	90	SW846 8270C
p-Terphenyl-d14	89	SW846 8270C

SPECTRA LABORATORIES


Steve Hibbs, Laboratory Manager

a14/sgh

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

10/01/2002

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509

Project: Yelm Groundwater Monitoring
Client ID: SC9 CS1
Sample Matrix: Water
Date Sampled: 09/05/2002
Date Received: 09/05/2002
Spectra Project: 2002090031
Spectra Number: 9

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 5	ug/L	EPA 206.2	Bromide	< 0.1	mg/L	SM4500-Br-B
Boron	280	ug/L	EPA 200.7	Chloride	100	mg/L	SM4500CL-C
Cadmium	< 3	ug/L	EPA 200.7	Dissolved Organic Carbon	14	mg/L	EPA 415.1
Chromium	< 7	ug/L	EPA 200.7	Fluoride	0.03	mg/L	EPA 340.2
Copper	< 6	ug/L	EPA 200.7	Nitrate	1.29	mg/L-N	SM4500NO3D
Iron	100	ug/L	EPA 200.7	Nitrite	0.03	mg/L-N	SM4500NO2B
Lead	< 1	ug/L	EPA 239.2	Sulfate	29	mg/L	EPA 375.4
Manganese	42	ug/L	EPA 200.7	Total Dissolved Solids	330	mg/L	EPA 160.1
Mercury	< 0.5	ug/L	EPA 245.1				
Nickel	< 15	ug/L	EPA 200.7				
Silver	< 7	ug/L	EPA 200.7				
Zinc	17	ug/L	EPA 200.7				
Bromodichloromethane	1	ug/L	SW846 8260B				
Bromoform	<1	ug/L	SW846 8260B				
Caffeine	<10	ug/L	EPA 625				
Chlorodibromomethane	<1	ug/L	SW846 8260B				
Chloroform	11	ug/L	SW846 8260B				
N-Nitrosodimethylamine	<10	ug/L	EPA 625				
TKN	<1	mg/L	SM 4500-N-B				
Ammonia	0.12	mg/L-N	EPA 350.3				
Anionic Surfactants as	0.31	mg/L	SM5540C				
BOD	3	mg/L	SM 5210				

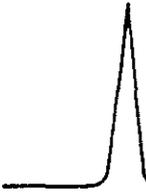
Surrogate	Recovery	Method
Dibromofluoromethane	105	SW846 8260B
Toluene-d8	99	SW846 8260B
4-Bromofluorobenzene	102	EPA 624
Nitrobenzene-d5	64	SW846 8270C

Surrogate	Recovery	Method
2-Fluorobiphenyl	87	SW846 8270C
p-Terphenyl-d14	81	SW846 8270C

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager

a14/sgh



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

10/01/2002

Skills-Connolly, Inc.
PO Box 5080
Lacey, WA 98509

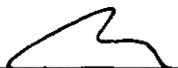
Project: Yelm Groundwater Monitoring
Client ID: SC10 CS2
Sample Matrix: Water
Date Sampled: 09/05/2002
Date Received: 09/05/2002
Spectra Project: 2002090031
Spectra Number: 10

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 5	ug/L	EPA 206.2	Bromide	< 0.1	mg/L	SM4500-Br-B
Boron	310	ug/L	EPA 200.7	Chloride	110	mg/L	SM4500CL-C
Cadmium	< 3	ug/L	EPA 200.7	Dissolved Organic Carbon	20	mg/L	EPA 415.1
Chromium	< 7	ug/L	EPA 200.7	Fluoride	0.04	mg/L	EPA 340.2
Copper	< 6	ug/L	EPA 200.7	Nitrate	0.96	mg/L-N	SM4500NO3D
Iron	150	ug/L	EPA 200.7	Nitrite	< 0.01	mg/L-N	SM4500NO2B
Lead	< 1	ug/L	EPA 239.2	Sulfate	16	mg/L	EPA 375.4
Manganese	280	ug/L	EPA 200.7	Total Dissolved Solids	320	mg/L	EPA 160.1
Mercury	< 0.5	ug/L	EPA 245.1				
Nickel	< 15	ug/L	EPA 200.7				
Silver	< 7	ug/L	EPA 200.7				
Zinc	< 6	ug/L	EPA 200.7				
Bromodichloromethane	<1	ug/L	SW846 8260B				
Bromoform	<1	ug/L	SW846 8260B				
Caffeine	<10	ug/L	EPA 625				
Chlorodibromomethane	<1	ug/L	SW846 8260B				
Chloroform	<1	ug/L	SW846 8260B				
N-Nitrosodimethylamine	<10	ug/L	EPA 625				
TKN	1.7	mg/L	SM 4500-N-B				
Ammonia	0.13	mg/L-N	EPA 350.3				
Anionic Surfactants as	0.30	mg/L	SM5540C				
BOD	8	mg/L	SM 5210				

Surrogate	Recovery	Method
Dibromofluoromethane	109	SW846 8260B
Toluene-d8	99	SW846 8260B
4-Bromofluorobenzene	101	EPA 624
Nitrobenzene-d5	70	SW846 8270C

Surrogate	Recovery	Method
2-Fluorobiphenyl	87	SW846 8270C
p-Terphenyl-d14	81	SW846 8270C

SPECTRA LABORATORIES



Steve Hibbs, Laboratory Manager
al4/sgh

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

10/01/2002

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509

Project: Yelm Groundwater Monitoring
Client ID: SC11 CS3
Sample Matrix: Water
Date Sampled: 09/05/2002
Date Received: 09/05/2002
Spectra Project: 2002090031
Spectra Number: 11

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 5	ug/L	EPA 206.2	Bromide	< 0.1	mg/L	SM4500-Br-B
Boron	290	ug/L	EPA 200.7	Chloride	111	mg/L	SM4500CL-C
Cadmium	< 3	ug/L	EPA 200.7	Dissolved Organic Carbon	11	mg/L	EPA 415.1
Chromium	< 7	ug/L	EPA 200.7	Fluoride	0.04	mg/L	EPA 340.2
Copper	17	ug/L	EPA 200.7	Nitrate	1.36	mg/L-N	SM4500NO3D
Iron	290	ug/L	EPA 200.7	Nitrite	< 0.01	mg/L-N	SM4500NO2B
Lead	< 1	ug/L	EPA 239.2	Sulfate	< 1	mg/L	EPA 375.4
Manganese	160	ug/L	EPA 200.7	Total Dissolved Solids	320	mg/L	EPA 160.1
Mercury	< 0.5	ug/L	EPA 245.1				
Nickel	< 15	ug/L	EPA 200.7				
Silver	< 7	ug/L	EPA 200.7				
Zinc	< 6	ug/L	EPA 200.7				
Bromodichloromethane	< 1	ug/L	SW846 8260B				
Bromoform	< 1	ug/L	SW846 8260B				
Caffeine	< 10	ug/L	EPA 625				
Chlorodibromomethane	< 1	ug/L	SW846 8260B				
Chloroform	< 1	ug/L	SW846 8260B				
N-Nitrosodimethylamine	< 10	ug/L	EPA 625				
TKN	1.7	mg/L	SM 4500-N-B				
Ammonia	0.12	mg/L-N	EPA 350.3				
Anionic Surfactants as	0.14	mg/L	SM5540C				
BOD	5	mg/L	SM 5210				

Surrogate	Recovery	Method
Dibromofluoromethane	109	SW846 8260B
Toluene-d8	102	SW846 8260B
4-Bromofluorobenzene	102	EPA 624
Nitrobenzene-d5	73	SW846 8270C

Surrogate	Recovery	Method
2-Fluorobiphenyl	92	SW846 8270C
p-Terphenyl-d14	85	SW846 8270C

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager

a14/sgh



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

10/01/2002

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509

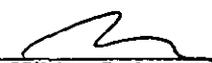
Project: Yelm Groundwater Monitoring
Client ID: SC12 CS4
Sample Matrix: Water
Date Sampled: 09/05/2002
Date Received: 09/05/2002
Spectra Project: 2002090031
Spectra Number: 12

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 5	ug/L	EPA 206.2	Bromide	< 0.1	mg/L	SM4500-Br-B
Boron	320	ug/L	EPA 200.7	Chloride	111	mg/L	SM4500CL-C
Cadmium	< 3	ug/L	EPA 200.7	Dissolved Organic Carbon	14	mg/L	EPA 415.1
Chromium	< 7	ug/L	EPA 200.7	Fluoride	0.04	mg/L	EPA 340.2
Copper	< 6	ug/L	EPA 200.7	Nitrate	1.03	mg/L-N	SM4500NO3D
Iron	200	ug/L	EPA 200.7	Nitrite	< 0.01	mg/L-N	SM4500NO2B
Lead	< 1	ug/L	EPA 239.2	Sulfate	< 1	mg/L	EPA 375.4
Manganese	100	ug/L	EPA 200.7	Total Dissolved Solids	335	mg/L	EPA 160.1
Mercury	< 0.5	ug/L	EPA 245.1				
Nickel	19	ug/L	EPA 200.7				
Silver	< 7	ug/L	EPA 200.7				
Zinc	< 6	ug/L	EPA 200.7				
Bromodichloromethane	<1	ug/L	SW846 8260B				
Bromoform	<1	ug/L	SW846 8260B				
Caffeine	<10	ug/L	EPA 625				
Chlorodibromomethane	<1	ug/L	SW846 8260B				
Chloroform	<1	ug/L	SW846 8260B				
N-Nitrosodimethylamine	<10	ug/L	EPA 625				
TKN	<1	mg/L	SM 4500-N-B				
Ammonia	0.13	mg/L-N	EPA 350.3				
Anionic Surfactants as	0.15	mg/L	SM5540C				
BOD	4	mg/L	SM 5210				

Surrogate	Recovery	Method
Dibromofluoromethane	112	SW846 8260B
Toluene-d8	100	SW846 8260B
4-Bromofluorobenzene	103	EPA 624
Nitrobenzene-d5	79	SW846 8270C

Surrogate	Recovery	Method
2-Fluorobiphenyl	96	SW846 8270C
p-Terphenyl-d14	88	SW846 8270C

SPECTRA LABORATORIES


Steve Hibbs, Laboratory Manager
a14/sgh

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

10/01/2002

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509

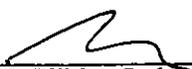
Project: Yelm Groundwater Monitoring
Client ID: SC13 FD
Sample Matrix: Water
Date Sampled: 09/05/2002
Date Received: 09/05/2002
Spectra Project: 2002090031
Spectra Number: 13

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 5	ug/L	EPA 206.2	Bromide	< 0.1	mg/L	SM4500-Br-B
Boron	160	ug/L	EPA 200.7	Chloride	49	mg/L	SM4500CL-C
Cadmium	< 3	ug/L	EPA 200.7	Dissolved Organic Carbon	10	mg/L	EPA 415.1
Chromium	< 7	ug/L	EPA 200.7	Fluoride	0.02	mg/L	EPA 340.2
Copper	< 6	ug/L	EPA 200.7	Nitrate	3.17	mg/L-N	SM4500NO3D
Iron	100	ug/L	EPA 200.7	Nitrite	< 0.01	mg/L-N	SM4500NO2B
Lead	< 1	ug/L	EPA 239.2	Sulfate	6	mg/L	EPA 375.4
Manganese	3	ug/L	EPA 200.7	Total Dissolved Solids	180	mg/L	EPA 160.1
Mercury	< 0.5	ug/L	EPA 245.1				
Nickel	< 15	ug/L	EPA 200.7				
Silver	< 7	ug/L	EPA 200.7				
Zinc	< 6	ug/L	EPA 200.7				
Bromodichloromethane	< 1	ug/L	SW846 8260B				
Bromoform	< 1	ug/L	SW846 8260B				
Caffeine	< 10	ug/L	EPA 625				
Chlorodibromomethane	< 1	ug/L	SW846 8260B				
Chloroform	< 1	ug/L	SW846 8260B				
N-Nitrosodimethylamine	< 10	ug/L	EPA 625				
TKN	< 1	mg/L	SM 4500-N-B				
Ammonia	0.11	mg/L-N	EPA 350.3				
Anionic Surfactants as	< 0.05	mg/L	SM5540C				
BOD	< 2	mg/L	SM 5210				

Surrogate	Recovery	Method
Dibromofluoromethane	105	SW846 8260B
Toluene-d8	101	SW846 8260B
4-Bromofluorobenzene	100	EPA 624
Nitrobenzene-d5	75	SW846 8270C

Surrogate	Recovery	Method
2-Fluorobiphenyl	97	SW846 8270C
p-Terphenyl-d14	96	SW846 8270C

SPECTRA LABORATORIES


Steve Hibbs, Laboratory Manager
a14/sgh

September 9, 2002

Spectra Laboratories, Inc.
2221 Ross Way
Tacoma, WA 98421
Attn: Steve Hibbs

Dear Sir:

Results of analysis of thirteen environmental water samples taken on 09-05-02 and received on 09-05-02 at 4:15 p.m. are as follows:

Project: 2002090031 - Skillings - Connolly

<u>Sample Identification</u>	<u>Fecal Coliform (per 100 mls)</u>	<u>Fecal Streptococcus (per 100 mls)</u>
01, 10:20	< 2*	2
02, 08:30	< 2*	140
03, 09:15	< 2*	< 2*
04, 09:45	< 2*	< 2*
05, 11:00	< 2*	< 2*
06, 11:30	< 2*	< 2*
07, 12:15	< 2*	< 2*
08, 10:50	< 2*	< 2*
09, 13:00	40	310
10, 13:15	40	32

<u>Sample Identification</u>	<u>Fecal Coliform (per 100 mls)</u>	<u>Fecal Streptococcus (per 100 mls)</u>
11, 13:30	< 2*	< 2*
12, 13:45	18	12
13, 09:15	< 2*	< 2*

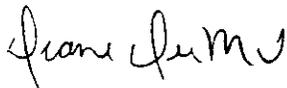
* < is less than

Lab Number: 08974806 through 08974818

Samples were analyzed by membrane filtration procedure according to Standard Methods for the Examination of Water and Wastewater, 19th Edition and EPA Microbiological Methods for Monitoring the Environment.

Chain of custody record is enclosed.

Sincerely,



Diane DuMond
Microbiologist

DD:lcc
enclosure

R:\COMM\SPECTRALABS9-5

SPECTRA Laboratories, Inc.

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

01/15/2003

Skillings-Connolly, Inc.
 PO Box 5080
 Lacey, WA 98509
 Attn: Patrick Skillings

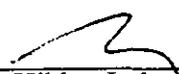
Project: Yelm Groundwater Monitoring
 Client ID: SC1 CW
 Sample Matrix: Water
 Date Sampled: 12/05/2002
 Date Received: 12/05/2002
 Spectra Project: 2002120056
 Spectra Number: 1

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 5	ug/L	EPA 206.2	Anionic Surf. as MBAS	<0.05	mg/L	SM5540C
Boron	200	ug/L	EPA 200.7	BOD	< 2	mg/L	EPA 405.1
Cadmium	< 3	ug/L	EPA 200.7	Bromide	< 0.1	mg/L	SM4500-Br-B
Chromium	13	ug/L	EPA 200.7	Chloride	8	mg/L	SM4500CL-C
Copper	8	ug/L	EPA 200.7	Dissolved Organic Carbon	7	mg/L	EPA 415.1
Iron	< 15	ug/L	EPA 200.7	Fluoride	< 0.2	mg/L	EPA 340.2
Lead	< 1	ug/L	EPA 239.2	Nitrate	3.2	mg/L-N	SM4500NO3D
Manganese	< 2	ug/L	EPA 200.7	Nitrite	< 0.01	mg/L-N	SM4500NO2B
Mercury	<0.0005	ug/L	EPA 245.1	Sulfate	4	mg/L	EPA 375.4
Nickel	< 15	ug/L	EPA 200.7	Total Dissolved Solids	68	mg/L	EPA 160.1
Silver	< 7	ug/L	EPA 200.7				
Zinc	15	ug/L	EPA 200.7				
Bromodichloromethane	<1	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	<1	ug/L	EPA 624				
N-Nitrosodimethylamine	<10	ug/L	EPA 625				
Fecal Coliform	<2	/100	Membrane				
Fecal Streptococcus	<2	/100	Membrane				
TKN	<1.0	mg/L	SM 4500-N-B				
Ammonia	< 0.1	mg/L-N	EPA 350.3				

Surrogate	Recovery	Method
Dibromofluoromethane	101	EPA 624
4-Bromofluorobenzene	103	EPA 624
Nitrobenzene-d5	73	EPA 625
p-Terphenyl-d14	91	EPA 625

Surrogate	Recovery	Method
Toluene-d8	97	EPA 624
2-Fluorobiphenyl	69	EPA 625

SPECTRA LABORATORIES


 Steve Hibbs, Laboratory Manager

a14/scj

SPECTRA Laboratories, Inc.

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

01/15/2003

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

Project: Yelm Groundwater Monitoring
Client ID: SC2 MW6
Sample Matrix: Water
Date Sampled: 12/05/2002
Date Received: 12/05/2002
Spectra Project: 2002120056
Spectra Number: 2

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 5	ug/L	EPA 206.2	Anionic Surf. as MBAS	<0.05	mg/L	SM5540C
Boron	120	ug/L	EPA 200.7	BOD	< 2	mg/L	EPA 405.1
Cadmium	< 3	ug/L	EPA 200.7	Bromide	< 0.1	mg/L	SM4500-Br-B
Chromium	< 7	ug/L	EPA 200.7	Chloride	8	mg/L	SM4500CL-C
Copper	11	ug/L	EPA 200.7	Dissolved Organic Carbon	11	mg/L	EPA 415.1
Iron	3100	ug/L	EPA 200.7	Fluoride	< 0.2	mg/L	EPA 340.2
Lead	1	ug/L	EPA 239.2	Nitrate	2.3	mg/L-N	SM4500NO3D
Manganese	7900	ug/L	EPA 200.7	Nitrite	< 0.01	mg/L-N	SM4500NO2B
Mercury	<0.0005	ug/L	EPA 245.1	Sulfate	3	mg/L	EPA 375.4
Nickel	< 15	ug/L	EPA 200.7	Total Dissolved Solids	80	mg/L	EPA 160.1
Silver	< 7	ug/L	EPA 200.7				
Zinc	25	ug/L	EPA 200.7				
Bromodichloromethane	<1	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	<1	ug/L	EPA 624				
N-Nitrosodimethylamine	<10	ug/L	EPA 625				
Fecal Coliform	<2	/100	Membrane				
Fecal Streptococcus	<2	/100	Membrane				
TKN	<1.0	mg/L	SM 4500-N-B				
Ammonia	< 0.1	mg/L-N	EPA 350.3				

Surrogate	Recovery	Method
Dibromofluoromethane	106	EPA 624
4-Bromofluorobenzene	103	EPA 624
Nitrobenzene-d5	97	EPA 625
p-Terphenyl-d14	91	EPA 625

Surrogate	Recovery	Method
Toluene-d8	92	EPA 624
2-Fluorobiphenyl	94	EPA 625

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager

a14/scj



SPECTRA Laboratories, Inc.

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

01/15/2003

Skillings-Connolly, Inc.
 PO Box 5080
 Lacey, WA 98509
 Attn: Patrick Skillings

Project: Yelm Groundwater Monitoring
 Client ID: SC3 MW1
 Sample Matrix: Water
 Date Sampled: 12/05/2002
 Date Received: 12/05/2002
 Spectra Project: 2002120056
 Spectra Number: 3

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 5	ug/L	EPA 206.2	Anionic Surf. as MBAS	<0.05	mg/L	SM5540C
Boron	95	ug/L	EPA 200.7	BOD	< 2	mg/L	EPA 405.1
Cadmium	< 3	ug/L	EPA 200.7	Bromide	< 0.1	mg/L	SM4500-Br-B
Chromium	< 7	ug/L	EPA 200.7	Chloride	7	mg/L	SM4500CL-C
Copper	< 6	ug/L	EPA 200.7	Dissolved Organic Carbon	9	mg/L	EPA 415.1
Iron	1300	ug/L	EPA 200.7	Fluoride	< 0.2	mg/L	EPA 340.2
Lead	< 1	ug/L	EPA 239.2	Nitrate	3.8	mg/L-N	SM4500NO3D
Manganese	170	ug/L	EPA 200.7	Nitrite	< 0.01	mg/L-N	SM4500NO2B
Mercury	<0.0005	ug/L	EPA 245.1	Sulfate	2	mg/L	EPA 375.4
Nickel	< 15	ug/L	EPA 200.7	Total Dissolved Solids	71	mg/L	EPA 160.1
Silver	< 7	ug/L	EPA 200.7				
Zinc	15	ug/L	EPA 200.7				
Bromodichloromethane	<1	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	<1	ug/L	EPA 624				
N-Nitrosodimethylamine	<10	ug/L	EPA 625				
Fecal Coliform	34	/100	Membrane				
Fecal Streptococcus	6	/100	Membrane				
TKN	<1.0	mg/L	SM 4500-N-B				
Ammonia	< 0.1	mg/L-N	EPA 350.3				

Surrogate	Recovery	Method
Dibromofluoromethane	104	EPA 624
4-Bromofluorobenzene	104	EPA 624
Nitrobenzene-d5	81	EPA 625
p-Terphenyl-d14	101	EPA 625

Surrogate	Recovery	Method
Toluene-d8	92	EPA 624
2-Fluorobiphenyl	86	EPA 625

SPECTRA LABORATORIES


 Steve Hibbs, Laboratory Manager

a14/scj

SPECTRA Laboratories, Inc.

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

01/15/2003

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

Project: Yelm Groundwater Monitoring
Client ID: SC4 MW2
Sample Matrix: Water
Date Sampled: 12/05/2002
Date Received: 12/05/2002
Spectra Project: 2002120056
Spectra Number: 4

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 5	ug/L	EPA 206.2	Anionic Surf. as MBAS	<0.05	mg/L	SM5540C
Boron	55	ug/L	EPA 200.7	BOD	< 2	mg/L	EPA 405.1
Cadmium	< 3	ug/L	EPA 200.7	Bromide	< 0.1	mg/L	SM4500-Br-B
Chromium	< 7	ug/L	EPA 200.7	Chloride	14	mg/L	SM4500CL-C
Copper	< 6	ug/L	EPA 200.7	Dissolved Organic Carbon	9	mg/L	EPA 415.1
Iron	95	ug/L	EPA 200.7	Fluoride	< 0.2	mg/L	EPA 340.2
Lead	< 1	ug/L	EPA 239.2	Nitrate	4.4	mg/L-N	SM4500NO3D
Manganese	< 2	ug/L	EPA 200.7	Nitrite	< 0.01	mg/L-N	SM4500NO2B
Mercury	< 0.0005	ug/L	EPA 245.1	Sulfate	9	mg/L	EPA 375.4
Nickel	< 15	ug/L	EPA 200.7	Total Dissolved Solids	114	mg/L	EPA 160.1
Silver	< 7	ug/L	EPA 200.7				
Zinc	19	ug/L	EPA 200.7				
Bromodichloromethane	< 1	ug/L	EPA 624				
Bromoform	< 1	ug/L	EPA 624				
Caffeine	< 10	ug/L	EPA 625				
Chlorodibromomethane	< 1	ug/L	EPA 624				
Chloroform	< 1	ug/L	EPA 624				
N-Nitrosodimethylamine	< 10	ug/L	EPA 625				
Fecal Coliform	< 2	/100	Membrane				
Fecal Streptococcus	4	/100	Membrane				
TKN	< 1.0	mg/L	SM 4500-N-B				
Ammonia	< 0.1	mg/L-N	EPA 350.3				

Surrogate	Recovery	Method
Dibromofluoromethane	107	EPA 624
4-Bromofluorobenzene	102	EPA 624
Nitrobenzene-d5	86	EPA 625
p-Terphenyl-d14	97	EPA 625

Surrogate	Recovery	Method
Toluene-d8	95	EPA 624
2-Fluorobiphenyl	85	EPA 625

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager

a14/scj

SPECTRA Laboratories, Inc.

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

01/15/2003

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

Project: Yelm Groundwater Monitoring
Client ID: SC5 MW3
Sample Matrix: Water
Date Sampled: 12/05/2002
Date Received: 12/05/2002
Spectra Project: 2002120056
Spectra Number: 5

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 5	ug/L	EPA 206.2	Anionic Surf. as MBAS	<0.05	mg/L	SM5540C
Boron	210	ug/L	EPA 200.7	BOD	< 2	mg/L	EPA 405.1
Cadmium	< 3	ug/L	EPA 200.7	Bromide	0.2	mg/L	SM4500-Br-B
Chromium	< 7	ug/L	EPA 200.7	Chloride	43	mg/L	SM4500CL-C
Copper	< 6	ug/L	EPA 200.7	Dissolved Organic Carbon	9	mg/L	EPA 415.1
Iron	380	ug/L	EPA 200.7	Fluoride	< 0.2	mg/L	EPA 340.2
Lead	< 1	ug/L	EPA 239.2	Nitrate	2.8	mg/L-N	SM4500NO3D
Manganese	16	ug/L	EPA 200.7	Nitrite	< 0.01	mg/L-N	SM4500NO2B
Mercury	<0.0005	ug/L	EPA 245.1	Sulfate	9	mg/L	EPA 375.4
Nickel	< 15	ug/L	EPA 200.7	Total Dissolved Solids	195	mg/L	EPA 160.1
Silver	< 7	ug/L	EPA 200.7				
Zinc	15	ug/L	EPA 200.7				
Bromodichloromethane	<1	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	<1	ug/L	EPA 624				
N-Nitrosodimethylamine	<10	ug/L	EPA 625				
Fecal Coliform	<2	/100	Membrane				
Fecal Streptococcus	2	/100	Membrane				
TKN	<1.0	mg/L	SM 4500-N-B				
Ammonia	< 0.1	mg/L-N	EPA 350.3				

Surrogate	Recovery	Method
Dibromofluoromethane	106	EPA 624
4-Bromofluorobenzene	103	EPA 624
Nitrobenzene-d5	87	EPA 625
p-Terphenyl-d14	95	EPA 625

Surrogate	Recovery	Method
Toluene-d8	94	EPA 624
2-Fluorobiphenyl	85	EPA 625

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager

a14/scj

SPECTRA Laboratories, Inc.

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

01/15/2003

Skillings-Connolly, Inc.
 PO Box 5080
 Lacey, WA 98509
 Attn: Patrick Skillings

Project: Yelm Groundwater Monitoring
 Client ID: SC6 MW4
 Sample Matrix: Water
 Date Sampled: 12/05/2002
 Date Received: 12/05/2002
 Spectra Project: 2002120056
 Spectra Number: 6

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 0.005	ug/L	EPA 206.2	Anionic Surf. as MBAS	<0.05	mg/L	SM5540C
Boron	280	ug/L	EPA 200.7	BOD	< 2	mg/L	EPA 405.1
Cadmium	< 3	ug/L	EPA 200.7	Bromide	< 0.1	mg/L	SM4500-Br-B
Chromium	< 7	ug/L	EPA 200.7	Chloride	62	mg/L	SM4500CL-C
Copper	< 6	ug/L	EPA 200.7	Dissolved Organic Carbon	12	mg/L	EPA 415.1
Iron	450	ug/L	EPA 200.7	Fluoride	< 0.2	mg/L	EPA 340.2
Lead	< 1	ug/L	EPA 239.2	Nitrate	1.0	mg/L-N	SM4500NO3D
Manganese	15	ug/L	EPA 200.7	Nitrite	< 0.01	mg/L-N	SM4500NO2B
Mercury	<0.0005	ug/L	EPA 245.1	Sulfate	20	mg/L	EPA 375.4
Nickel	< 15	ug/L	EPA 200.7	Total Dissolved Solids	242	mg/L	EPA 160.1
Silver	< 7	ug/L	EPA 200.7				
Zinc	18	ug/L	EPA 200.7				
Bromodichloromethane	<1	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	1	ug/L	EPA 624				
N-Nitrosodimethylamine	<10	ug/L	EPA 625				
Fecal Coliform	<2	/100	Membrane				
Fecal Streptococcus	8	/100	Membrane				
TKN	<1.0	mg/L	SM 4500-N-B				
Ammonia	< 0.1	mg/L-N	EPA 350.3				

Surrogate	Recovery	Method
Dibromofluoromethane	93	EPA 624
4-Bromofluorobenzene	104	EPA 624
Nitrobenzene-d5	65	EPA 625
p-Terphenyl-d14	101	EPA 625

Surrogate	Recovery	Method
Toluene-d8	94	EPA 624
2-Fluorobiphenyl	71	EPA 625

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager

a14/scj



SPECTRA Laboratories, Inc.

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

01/15/2003

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

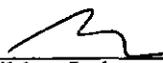
Project: Yelm Groundwater Monitoring
Client ID: SC7 MW5
Sample Matrix: Water
Date Sampled: 12/05/2002
Date Received: 12/05/2002
Spectra Project: 2002120056
Spectra Number: 7

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 5	ug/L	EPA 206.2	Anionic Surf. as MBAS	<0.05	mg/L	SM5540C
Boron	100	ug/L	EPA 200.7	BOD	2	mg/L	EPA 405.1
Cadmium	< 3	ug/L	EPA 200.7	Bromide	< 0.1	mg/L	SM4500-Br-B
Chromium	< 7	ug/L	EPA 200.7	Chloride	14	mg/L	SM4500CL-C
Copper	< 6	ug/L	EPA 200.7	Dissolved Organic Carbon	9	mg/L	EPA 415.1
Iron	380	ug/L	EPA 200.7	Fluoride	< 0.2	mg/L	EPA 340.2
Lead	< 1	ug/L	EPA 239.2	Nitrate	3.4	mg/L-N	SM4500NO3D
Manganese	13	ug/L	EPA 200.7	Nitrite	< 0.01	mg/L-N	SM4500NO2B
Mercury	<0.0005	ug/L	EPA 245.1	Sulfate	5	mg/L	EPA 375.1
Nickel	< 15	ug/L	EPA 200.7	Total Dissolved Solids	99	mg/L	EPA 160.1
Silver	< 7	ug/L	EPA 200.7				
Zinc	18	ug/L	EPA 200.7				
Bromodichloromethane	<1	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	<1	ug/L	EPA 624				
N-Nitrosodimethylamine	<10	ug/L	EPA 625				
Fecal Coliform	<2	/100	Membrane				
Fecal Streptococcus	2	/100	Membrane				
TKN	<1.0	mg/L	SM 4500-N-B				
Ammonia	< 0.1	mg/L-N	EPA 350.3				

Surrogate	Recovery	Method
Dibromofluoromethane	92	EPA 624
4-Bromofluorobenzene	105	EPA 624
Nitrobenzene-d5	90	EPA 625
p-Terphenyl-d14	98	EPA 625

Surrogate	Recovery	Method
Toluene-d8	94	EPA 624
2-Fluorobiphenyl	91	EPA 625

SPECTRA LABORATORIES


Steve Hibbs, Laboratory Manager
a14/scj

SPECTRA Laboratories, Inc.

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

01/15/2003

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

Project: Yelm Groundwater Monitoring
Client ID: SC8 IS
Sample Matrix: Water
Date Sampled: 12/05/2002
Date Received: 12/05/2002
Spectra Project: 2002120056
Spectra Number: 8

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 5	ug/L	EPA 206.2	Anionic Surf. as MBAS	0.33	mg/L	SM5540C
Boron	380	ug/L	EPA 200.7	BOD	< 2	mg/L	EPA 405.1
Cadmium	< 3	ug/L	EPA 200.7	Bromide	< 0.1	mg/L	SM4500-Br-B
Chromium	8	ug/L	EPA 200.7	Chloride	57	mg/L	SM4500CL-C
Copper	6	ug/L	EPA 200.7	Dissolved Organic Carbon	15	mg/L	EPA 415.1
Iron	29	ug/L	EPA 200.7	Fluoride	< 0.2	mg/L	EPA 340.2
Lead	< 1	ug/L	EPA 239.2	Nitrate	12.8	mg/L-N	SM4500NO3D
Manganese	14	ug/L	EPA 200.7	Nitrite	< 0.01	mg/L-N	SM4500NO2B
Mercury	<0.0005	ug/L	EPA 245.1	Sulfate	25	mg/L	EPA 375.4
Nickel	< 15	ug/L	EPA 200.7	Total Dissolved Solids	305	mg/L	EPA 160.1
Silver	< 7	ug/L	EPA 200.7				
Zinc	64	ug/L	EPA 200.7				
Bromodichloromethane	6	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	24	ug/L	EPA 624				
N-Nitrosodimethylamine	<10	ug/L	EPA 625				
Fecal Coliform	<2	/100	Membrane				
Fecal Streptococcus	<2	/100	Membrane				
TKN	<1.0	mg/L	SM 4500-N-B				
Ammonia	< 0.1	mg/L-N	EPA 350.3				

Surrogate	Recovery	Method
Dibromofluoromethane	88	EPA 624
4-Bromofluorobenzene	102	EPA 624
Nitrobenzene-d5	79	EPA 625
p-Terphenyl-d14	99	EPA 625

Surrogate	Recovery	Method
Toluene-d8	91	EPA 624
2-Fluorobiphenyl	84	EPA 625

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager

a14/scj

SPECTRA Laboratories, Inc.

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

01/15/2003

Skillings-Connolly, Inc.
 PO Box 5080
 Lacey, WA 98509
 Attn: Patrick Skillings

Project: Yelm Groundwater Monitoring
 Client ID: SC9 CS1
 Sample Matrix: Water
 Date Sampled: 12/05/2002
 Date Received: 12/05/2002
 Spectra Project: 2002120056
 Spectra Number: 9

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 5	ug/L	EPA 206.2	Anionic Surf. as MBAS	0.25	mg/L	SM5540C
Boron	350	ug/L	EPA 200.7	BOD	< 2	mg/L	EPA 405.1
Cadmium	< 3	ug/L	EPA 200.7	Bromide	< 0.1	mg/L	SM4500-Br-B
Chromium	< 7	ug/L	EPA 200.7	Chloride	59	mg/L	SM4500CL-C
Copper	< 6	ug/L	EPA 200.7	Dissolved Organic Carbon	19	mg/L	EPA 415.1
Iron	77	ug/L	EPA 200.7	Fluoride	< 0.2	mg/L	EPA 340.2
Lead	< 1	ug/L	EPA 239.2	Nitrate	10.8	mg/L-N	SM4500NO3D
Manganese	21	ug/L	EPA 200.7	Nitrite	0.01	mg/L-N	SM4500NO2B
Mercury	<0.0005	ug/L	EPA 245.1	Sulfate	27	mg/L	EPA 375.4
Nickel	< 15	ug/L	EPA 200.7	Total Dissolved Solids	305	mg/L	EPA 160.1
Silver	< 7	ug/L	EPA 200.7				
Zinc	59	ug/L	EPA 200.7				
Bromodichloromethane	5	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	21	ug/L	EPA 624				
N-Nitrosodimethylamine	<10	ug/L	EPA 625				
Fecal Coliform	24	/100	Membrane				
Fecal Streptococcus	30	/100	Membrane				
TKN	<1.0	mg/L	SM 4500-N-B				
Ammonia	0.1	mg/L-N	EPA 350.3				

Surrogate	Recovery	Method
Dibromofluoromethane	84	EPA 624
4-Bromofluorobenzene	104	EPA 624
Nitrobenzene-d5	56	EPA 625
p-Terphenyl-d14	63	EPA 625

Surrogate	Recovery	Method
Toluene-d8	96	EPA 624
2-Fluorobiphenyl	59	EPA 625

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager

a14/scj

SPECTRA Laboratories, Inc.

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

01/15/2003

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

Project: Yelm Groundwater Monitoring
Client ID: SC10 CS2
Sample Matrix: Water
Date Sampled: 12/05/2002
Date Received: 12/05/2002
Spectra Project: 2002120056
Spectra Number: 10

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 5	ug/L	EPA 206.2	Anionic Surf. as MBAS	0.29	mg/L	SM5540C
Boron	400	ug/L	EPA 200.7	BOD	3	mg/L	EPA 405.1
Cadmium	< 3	ug/L	EPA 200.7	Bromide	< 0.1	mg/L	SM4500-Br-B
Chromium	12	ug/L	EPA 200.7	Chloride	60	mg/L	SM4500CL-C
Copper	< 6	ug/L	EPA 200.7	Dissolved Organic Carbon	16	mg/L	EPA 415.1
Iron	100	ug/L	EPA 200.7	Fluoride	< 0.2	mg/L	EPA 340.2
Lead	< 1	ug/L	EPA 239.2	Nitrate	6.0	mg/L-N	SM4500NO3D
Manganese	29	ug/L	EPA 200.7	Nitrite	0.01	mg/L-N	SM4500NO2B
Mercury	<0.0005	ug/L	EPA 245.1	Sulfate	0.01	mg/L	EPA 375.4
Nickel	< 15	ug/L	EPA 200.7	Total Dissolved Solids	292	mg/L	EPA 160.1
Silver	< 7	ug/L	EPA 200.7				
Zinc	51	ug/L	EPA 200.7				
Bromodichloromethane	1	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	5	ug/L	EPA 624				
N-Nitrosodimethylamine	<10	ug/L	EPA 625				
Fecal Coliform	12	/100	Membrane				
Fecal Streptococcus	50	/100	Membrane				
TKN	<1.0	mg/L	SM 4500-N-B				
Ammonia	0.2	mg/L-N	EPA 350.3				

Surrogate	Recovery	Method
Dibromofluoromethane	86	EPA 624
4-Bromofluorobenzene	102	EPA 624
Nitrobenzene-d5	72	EPA 625
p-Terphenyl-d14	77	EPA 625

Surrogate	Recovery	Method
Toluene-d8	94	EPA 624
2-Fluorobiphenyl	72	EPA 625

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager

a14/scj

SPECTRA Laboratories, Inc.

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

01/15/2003

Skillings-Connolly, Inc.
 PO Box 5080
 Lacey, WA 98509
 Attn: Patrick Skillings

Project: Yelm Groundwater Monitoring
 Client ID: SC11 CS3
 Sample Matrix: Water
 Date Sampled: 12/05/2002
 Date Received: 12/05/2002
 Spectra Project: 2002120056
 Spectra Number: 11

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 5	ug/L	EPA 206.2	Anionic Surf. as MBAS	0.18	mg/L	SM5540C
Boron	460	ug/L	EPA 200.7	BOD	< 2	mg/L	EPA 405.1
Cadmium	< 3	ug/L	EPA 200.7	Bromide	< 0.1	mg/L	SM4500-Br-B
Chromium	< 7	ug/L	EPA 200.7	Chloride	61	mg/L	SM4500CL-C
Copper	< 6	ug/L	EPA 200.7	Dissolved Organic Carbon	20	mg/L	EPA 415.1
Iron	< 15	ug/L	EPA 200.7	Fluoride	< 0.2	mg/L	EPA 340.2
Lead	< 1	ug/L	EPA 239.2	Nitrate	5.3	mg/L-N	SM4500NO3D
Manganese	2	ug/L	EPA 200.7	Nitrite	< 0.01	mg/L-N	SM4500NO2P
Mercury	0.0006	ug/L	EPA 245.1	Sulfate	35	mg/L	EPA 375.4
Nickel	< 15	ug/L	EPA 200.7	Total Dissolved Solids	274	mg/L	EPA 160.1
Silver	< 7	ug/L	EPA 200.7				
Zinc	27	ug/L	EPA 200.7				
Bromodichloromethane	<1	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	3	ug/L	EPA 624				
N-Nitrosodimethylamine	<10	ug/L	EPA 625				
Fecal Coliform	<2	/100	Membrane				
Fecal Streptococcus	<2	/100	Membrane				
TKN	<1.0	mg/L	SM 4500-N-B				
Ammonia	< 0.1	mg/L-N	EPA 350.3				

Surrogate	Recovery	Method
Dibromofluoromethane	89	EPA 624
4-Bromofluorobenzene	108	EPA 624
Nitrobenzene-d5	50	EPA 625
p-Terphenyl-d14	69	EPA 625

Surrogate	Recovery	Method
Toluene-d8	97	EPA 624
2-Fluorobiphenyl	53	EPA 625

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager

a14/scj

SPECTRA Laboratories, Inc.

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

01/15/2003

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

Project: Yelm Groundwater Monitoring
Client ID: SC12 CS4
Sample Matrix: Water
Date Sampled: 12/05/2002
Date Received: 12/05/2002
Spectra Project: 2002120056
Spectra Number: 12

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 5	ug/L	EPA 206.2	Anionic Surf. as MBAS	0.20	mg/L	SM5540C
Boron	360	ug/L	EPA 200.7	BOD	< 2	mg/L	EPA 405.1
Cadmium	< 3	ug/L	EPA 200.7	Bromide	< 0.1	mg/L	SM4500-Br-B
Chromium	< 7	ug/L	EPA 200.7	Chloride	62	mg/L	SM4500CL-C
Copper	< 6	ug/L	EPA 200.7	Dissolved Organic Carbon	14	mg/L	EPA 415.1
Iron	75	ug/L	EPA 200.7	Fluoride	< 0.2	mg/L	EPA 340.2
Lead	< 1	ug/L	EPA 239.2	Nitrate	3.8	mg/L-N	SM4500NO3D
Manganese	49	ug/L	EPA 200.7	Nitrite	< 0.01	mg/L-N	SM4500NO2B
Mercury	< 0.0005	ug/L	EPA 245.1	Sulfate	34	mg/L	EPA 375.4
Nickel	< 15	ug/L	EPA 200.7	Total Dissolved Solids	286	mg/L	EPA 160.1
Silver	< 7	ug/L	EPA 200.7				
Zinc	26	ug/L	EPA 200.7				
Bromodichloromethane	< 1	ug/L	EPA 624				
Bromoform	< 1	ug/L	EPA 624				
Caffeine	< 10	ug/L	EPA 625				
Chlorodibromomethane	< 1	ug/L	EPA 624				
Chloroform	2	ug/L	EPA 624				
N-Nitrosodimethylamine	< 10	ug/L	EPA 625				
Fecal Coliform	200	/100	Membrane				
Fecal Streptococcus	550	/100	Membrane				
TKN	< 1.0	mg/L	SM 4500-N-B				
Ammonia	0.2	mg/L-N	EPA 350.3				

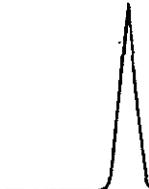
Surrogate	Recovery	Method
Dibromofluoromethane	91	EPA 624
4-Bromofluorobenzene	106	EPA 624
Nitrobenzene-d5	72	EPA 625
p-Terphenyl-d14	74	EPA 625

Surrogate	Recovery	Method
Toluene-d8	96	EPA 624
2-Fluorobiphenyl	74	EPA 625

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager

a14/scj



SPECTRA Laboratories, Inc.

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

01/15/2003

Skillings-Connolly, Inc.
 PO Box 5080
 Lacey, WA 98509
 Attn: Patrick Skillings

Project: Yelm Groundwater Monitoring
 Client ID: SC13 FD
 Sample Matrix: Water
 Date Sampled: 12/05/2002
 Date Received: 12/05/2002
 Spectra Project: 2002120056
 Spectra Number: 13

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Arsenic	< 5	ug/L	EPA 206.2	Anionic Surf. as MBAS	<0.05	mg/L	SM5540C
Boron	240	ug/L	EPA 200.7	BOD	< 2	mg/L	EPA 405.1
Cadmium	< 3	ug/L	EPA 200.7	Bromide	< 0.1	mg/L	SM4500-Br-B
Chromium	9	ug/L	EPA 200.7	Chloride	8	mg/L	SM4500CL-C
Copper	7	ug/L	EPA 200.7	Dissolved Organic Carbon	6	mg/L	EPA 415.1
Iron	< 15	ug/L	EPA 200.7	Fluoride	< 0.2	mg/L	EPA 340.2
Lead	< 1	ug/L	EPA 239.2	Nitrate	3.2	mg/L-N	SM4500NO3D
Manganese	< 2	ug/L	EPA 200.7	Nitrite	< 0.01	mg/L-N	SM4500NO2B
Mercury	<0.0005	ug/L	EPA 245.1	Sulfate	5	mg/L	EPA 375.
Nickel	< 15	ug/L	EPA 200.7	Total Dissolved Solids	75	mg/L	EPA 160.1
Silver	< 7	ug/L	EPA 200.7				
Zinc	19	ug/L	EPA 200.7				
Bromodichloromethane	<1	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	<1	ug/L	EPA 624				
N-Nitrosodimethylamine	<10	ug/L	EPA 625				
Fecal Coliform	<2	/100	Membrane				
Fecal Streptococcus	<2	/100	Membrane				
TKN	<1.0	mg/L	SM 4500-N-B				
Ammonia	< 0.1	mg/L-N	EPA 350.3				

Surrogate	Recovery	Method
Dibromofluoromethane	95	EPA 624
4-Bromofluorobenzene	100	EPA 624
Nitrobenzene-d5	83	EPA 625
p-Terphenyl-d14	78	EPA 625

Surrogate	Recovery	Method
Toluene-d8	95	EPA 624
2-Fluorobiphenyl	77	EPA 625

SPECTRA LABORATORIES



Steve Hibbs, Laboratory Manager

a14/scj

December 13, 2002

Spectra Laboratories, Inc.
2221 Ross Way
Tacoma, WA 98421
Attn: Steve Hibbs

Dear Sir:

Results of analysis of thirteen environmental water samples taken on 12-05-02 and received on 12-05-02 at 1:15 p.m. are as follows:

Project: 2002120056 - Skillings - Connolly

<u>Sample Identification</u>	<u>Fecal Coliform (per 100 mls)</u>	<u>Fecal Streptococcus (per 100 mls)</u>
01, 10:10	< 2*	< 2*
split sample	< 2*	< 2*
02, 08:00	< 2*	< 2*
03, 08:35	34	6
04, 09:05	< 2*	4
05, 09:30	< 2*	2
06, 09:55	< 2*	8
07, 10:45	< 2*	2
split sample	< 2*	2
08, 10:40	< 2*	< 2*
09, 11:15	24	30
split sample	20	34
10, 11:30	12	50

<u>Sample Identification</u>	<u>Fecal Coliform (per 100 mls)</u>	<u>Fecal Streptococcus (per 100 mls)</u>
11, 11:50	< 2*	< 2*
12, 12:05	200	550
13, 10:10	< 2*	< 2*

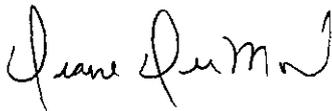
* < is less than

Lab Number: 08983078 through 08983090

Samples were analyzed by membrane filtration procedure according to Standard Methods for the Examination of Water and Wastewater, 19th Edition and EPA Microbiological Methods for Monitoring the Environment.

Chain of custody record is enclosed.

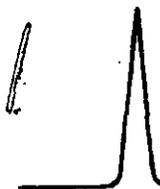
Sincerely,



Diane DuMond
Microbiologist

DD:lcc
enclosure

R:\COMM\SPECTRALABS12-5



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

04/08/2003

Skillings-Connolly, Inc.
 PO Box 5080
 Lacey, WA 98509
 Attn: Patrick Skillings

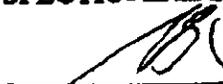
Project: Yelm GW Monitoring
 Client ID: SC1 CW
 Sample Matrix: Water
 Date Sampled: 03/06/2003
 Date Received: 03/06/2003
 Spectra Project: 2003030069
 Spectra Number: 1

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Total Dissolved Solids	95	mg/L	EPA 160.1	N-Nitrosodimethylamine	<10	ug/L	EPA 625
Boron	45	ug/L	EPA 200.7	Fecal Coliform	<2	/100	Membrane
Cadmium	<3	ug/L	EPA 200.7	Fecal Streptococcus	<2	/100	Membrane
Chromium	<7	ug/L	EPA 200.7	TKN	1.4	mg/L	SM 4500-N-B
Copper	10	ug/L	EPA 200.7	BOD	<2	mg/L	SM 5210
Iron	<15	ug/L	EPA 200.7	Bromide	<0.1	mg/L	SM4500-Br-B
Manganese	6	ug/L	EPA 200.7	Chloride	8.5	mg/L	SM4500CL-C
Nickel	<15	ug/L	EPA 200.7	Nitrite	<0.01	mg/L-N	SM4500NO2E
Silver	<7	ug/L	EPA 200.7	Nitrate	3.1	mg/L-N	SM4500NO3E
Zinc	<6	ug/L	EPA 200.7	Anionic Surf. as MBAS	0.04	mg/L	SM5540C
Arsenic	<5	ug/L	EPA 206.2				
Lead	<1	ug/L	EPA 239.2				
Mercury	<0.5	ug/L	EPA 245.1				
Fluoride	<0.2	mg/L	EPA 340.2				
Ammonia	<0.1	mg/L-N	EPA 350.3				
Sulfate	3	mg/L	EPA 375.4				
Dissolved Organic Carbon	6	mg/L	EPA 415.1				
Bromodichloromethane	<1	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	<1	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				

Surrogate	Recovery	Method
Dibromofluoromethane	128	EPA 624
4-Bromodifluoromethane	105	EPA 624
Nitrobenzene-d5	50	EPA 625
p-Tolylbenzyl-d14	80	EPA 625

Surrogate	Recovery	Method
Toluene-d8	102	EPA 624
2-Fluorobiphenyl	50	EPA 625

SPECTRA LABORATORIES


 Steve Hibbs, Laboratory Manager

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

04/08/2003

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

Project: Yelm GW Monitoring
Client ID: SC2 MW6
Sample Matrix: Water
Date Sampled: 03/06/2003
Date Received: 03/06/2003
Spectra Project: 2003030069
Spectra Number: 2

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Total Dissolved Solids	128	mg/L	EPA 160.1	N-Nitrosodimethylamine	<10	ug/L	EPA 625
Boron	23	ug/L	EPA 200.7	Fecal Coliform	<2	/100	Membrane
Cadmium	<3	ug/L	EPA 200.7	Fecal Streptococcus	44	/100	Membrane
Chromium	<7	ug/L	EPA 200.7	TKN	<1.0	mg/L	SM 4500-N-B
Copper	9	ug/L	EPA 200.7	BOD	<2	mg/L	SM 5210
Iron	57	ug/L	EPA 200.7	Bromide	<0.1	mg/L	SM4500-Br-B
Manganese	48	ug/L	EPA 200.7	Chloride	10.7	mg/L	SM4500CL
Nickel	<15	ug/L	EPA 200.7	Nitrite	<0.01	mg/L-N	SM4500NO2B
Silver	<7	ug/L	EPA 200.7	Nitrate	3.5	mg/L-N	SM4500NO3D
Zinc	<6	ug/L	EPA 200.7	Anionic Surf. as MBAS	<0.02	mg/L	SM5540C
Arsenic	<5	ug/L	EPA 206.2				
Lead	<1	ug/L	EPA 239.2				
Mercury	<0.5	ug/L	EPA 245.1				
Fluoride	<0.2	mg/L	EPA 340.2				
Ammonia	<0.1	mg/L-N	EPA 350.3				
Sulfate	3	mg/L	EPA 375.4				
Dissolved Organic Carbon	0.9	mg/L	EPA 415.1				
Bromodichloromethane	<1	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	<1	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				

Surrogate	Recovery	Method
Dibromofluoromethane	112	EPA 624
4-Bromodifluorobenzene	103	EPA 624
Nitrobenzene-d5	73	EPA 625
p-Tolylstyryl-d14	77	EPA 625

Surrogate	Recovery	Method
Toluene-d8	101	EPA 624
2-Fluorobiphenyl	67	EPA 625

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager

Page 2 of 13

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

04/08/2003

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

Project: Yelm GW Monitoring
Client ID: SC3 MW1
Sample Matrix: Water
Date Sampled: 03/06/2003
Date Received: 03/06/2003
Spectra Project: 2003030069
Spectra Number: 3

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Total Dissolved Solids	101	mg/L	EPA 160.1	N-Nitrosodimethylamine	<10	ug/L	EPA 625
Boron	22	ug/L	EPA 200.7	Fecal Coliform	<2	/100	Membrane
Cadmium	<3	ug/L	EPA 200.7	Fecal Streptococcus	660	/100	Membrane
Chromium	<7	ug/L	EPA 200.7	TKN	<1.0	mg/L	SM 4500-N-B
Copper	<6	ug/L	EPA 200.7	BOD	<2	mg/L	SM 5210
Iron	87	ug/L	EPA 200.7	Bromide	<0.1	mg/L	SM4500-Br-B
Manganese	10	ug/L	EPA 200.7	Chloride	7.7	mg/L	SM4500CL-C
Nickel	<15	ug/L	EPA 200.7	Nitrite	<0.01	mg/L-N	SM4500NO2B
Silver	<7	ug/L	EPA 200.7	Nitrate	2.4	mg/L-N	SM4500NO3D
Zinc	<6	ug/L	EPA 200.7	Anionic Surf. as MBAS	<0.02	mg/L	SM5540C
Arsenic	<5	ug/L	EPA 206.2				
Lead	<1	ug/L	EPA 239.2				
Mercury	<0.5	ug/L	EPA 245.1				
Fluoride	<0.2	mg/L	EPA 340.2				
Ammonia	<0.1	mg/L-N	EPA 350.3				
Sulfate	3	mg/L	EPA 375.4				
Dissolved Organic Carbon	913	mg/L	EPA 415.1				
Bromodichloromethane	<1	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	<1	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				

Surrogate	Recovery	Method
Dibromofluoromethane	113	EPA 624
4-Bromofluorobenzene	102	EPA 624
Nitrobenzene-d5	70	EPA 625
p-Terphenyl-d14	85	EPA 625

Surrogate	Recovery	Method
Toluene-d8	100	EPA 624
2-Fluorobiphenyl	73	EPA 625

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager

Page 3 of 13

5th

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

04/08/2003

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

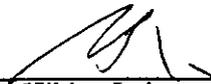
Project: Yelm GW Monitoring
Client ID: SC4 MW2
Sample Matrix: Water
Date Sampled: 03/06/2003
Date Received: 03/06/2003
Spectra Project: 2003030069
Spectra Number: 4

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Total Dissolved Solids	164	mg/L	EPA 160.1	N-Nitrosodimethylamine	<10	ug/L	EPA 625
Boron	89	ug/L	EPA 200.7	Fecal Coliform	<2	/100	Membrane
Cadmium	<3	ug/L	EPA 200.7	Fecal Streptococcus	1400	/100	Membrane
Chromium	<7	ug/L	EPA 200.7	TKN	<1.0	mg/L	SM 4500-N-B
Copper	6	ug/L	EPA 200.7	BOD	<2	mg/L	SM 5210
Iron	170	ug/L	EPA 200.7	Bromide	<0.1	mg/L	SM4500-Br-B
Manganese	11	ug/L	EPA 200.7	Chloride	26.9	mg/L	SM4500CL-C
Nickel	<15	ug/L	EPA 200.7	Nitrite	0.02	mg/L-N	SM4500NO2B
Silver	<7	ug/L	EPA 200.7	Nitrate	4.0	mg/L-N	SM4500NO3
Zinc	<6	ug/L	EPA 200.7	Anionic Surf. as MBAS	<0.02	mg/L	SM5540C
Arsenic	<5	ug/L	EPA 206.2				
Lead	<1	ug/L	EPA 239.2				
Mercury	<0.5	ug/L	EPA 245.1				
Fluoride	<0.2	mg/L	EPA 340.2				
Ammonia	<0.1	mg/L-N	EPA 350.3				
Sulfate	12	mg/L	EPA 375.4				
Dissolved Organic Carbon	11	mg/L	EPA 415.1				
Bromodichloromethane	<1	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	<1	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				

Surrogate	Recovery	Method
Dibromofluoromethane	114	EPA 624
4-Bromofluorobenzene	102	EPA 624
Nitrobenzene-d5	46	EPA 625
p-Terphenyl-d14	77	EPA 625

Surrogate	Recovery	Method
Toluene-d8	100	EPA 624
2-Fluorobiphenyl	45	EPA 625

SPECTRA LABORATORIES


Steve Hibbs, Laboratory Manager

a14/scj

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

04/08/2003

Skillsing-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

Project: Yelm GW Monitoring
Client ID: SC5 MW3
Sample Matrix: Water
Date Sampled: 03/06/2003
Date Received: 03/06/2003
Spectra Project: 2003030069
Spectra Number: 5

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Total Dissolved Solids	315	mg/L	EPA 160.1	N-Nitrosodimethylamine	<10	ug/L	EPA 625
Boron	25	ug/L	EPA 200.7	Fecal Coliform	<2	/100	Membrane
Cadmium	< 3	ug/L	EPA 200.7	Fecal Streptococcus	148	/100	Membrane
Chromium	< 7	ug/L	EPA 200.7	TKN	1.1	mg/L	SM 4500-N-B
Copper	< 6	ug/L	EPA 200.7	BOD	< 2	mg/L	SM 5210
Iron	110	ug/L	EPA 200.7	Bromide	< 0.1	mg/L	SM4500-Br-B
Manganese	9	ug/L	EPA 200.7	Chloride	56.0	mg/L	SM4500CL-C
Nickel	< 15	ug/L	EPA 200.7	Nitrite	< 0.01	mg/L-N	SM4500NO2B
Sulfur	< 7	ug/L	EPA 200.7	Nitrate	7.4	mg/L-N	SM4500NO3D
Zinc	< 6	ug/L	EPA 200.7	Anionic Surf. as MBAS	<0.02	mg/L	SM5540C
Arsenic	< 5	ug/L	EPA 206.2				
Lead	< 1	ug/L	EPA 239.2				
Mercury	<0.5	ug/L	EPA 245.1				
Fluoride	< 0.2	mg/L	EPA 340.2				
Ammonia	< 0.1	mg/L-N	EPA 350.3				
Sulfate	26	mg/L	EPA 375.4				
Dissolved Organic Carbon	9	mg/L	EPA 415.1				
Bromodichloromethane	<1	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	<1	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				

Surrogate	Recovery	Method
Dibromofluoromethane	114	EPA 624
4-Bromofluorobenzene	103	EPA 624
Nitrobenzene-d5	72	EPA 625
p-Terphenyl-d14	80	EPA 625

Surrogate	Recovery	Method
Toluene-d8	101	EPA 624
2-Fluorobiphenyl	65	EPA 625

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager

a14/scj



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

04/08/2003

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

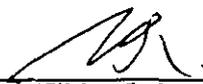
Project: Yelm GW Monitoring
Client ID: SC6 MW4
Sample Matrix: Water
Date Sampled: 03/06/2003
Date Received: 03/06/2003
Spectra Project: 2003030069
Spectra Number: 6

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Total Dissolved Solids	175	mg/L	EPA 160.1	N-Nitrosodimethylamine	<10	ug/L	EPA 625
Boron	220	ug/L	EPA 200.7	Fecal Coliform	<2	/100	Membrane
Cadmium	< 3	ug/L	EPA 200.7	Fecal Streptococcus	6	/100	Membrane
Chromium	< 7	ug/L	EPA 200.7	TKN	2.3	mg/L	SM 4500-N-B
Copper	10	ug/L	EPA 200.7	BOD	< 2	mg/L	SM 5210
Iron	69	ug/L	EPA 200.7	Bromide	< 0.1	mg/L	SM4500-Br-B
Manganese	5	ug/L	EPA 200.7	Chloride	37.6	mg/L	SM4500CL-C
Nickel	< 15	ug/L	EPA 200.7	Nitrite	< 0.01	mg/L-N	SM4500NO2B
Silver	< 7	ug/L	EPA 200.7	Nitrate	3.0	mg/L-N	SM4500N
Zinc	< 6	ug/L	EPA 200.7	Anionic Surf. as MBAS	<0.02	mg/L	SM5540C
Arsenic	< 5	ug/L	EPA 206.2				
Lead	< 1	ug/L	EPA 239.2				
Mercury	<0.5	ug/L	EPA 245.1				
Fluoride	< 0.2	mg/L	EPA 340.2				
Ammonia	< 0.1	mg/L-N	EPA 350.3				
Sulfate	13	mg/L	EPA 375.4				
Dissolved Organic Carbon	11	mg/L	EPA 415.1				
Bromodichloromethane	<1	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	<1	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				

Surrogate	Recovery	Method
Dibromofluoromethane	111	EPA 624
4-Bromofluorobenzene	101	EPA 624
Nitrobenzene-d5	62	EPA 625
p-Terphenyl-d14	87	EPA 625

Surrogate	Recovery	Method
Toluene-d8	100	EPA 624
2-Fluorobiphenyl	61	EPA 625

SPECTRA LABORATORIES



Steve Hibbs, Laboratory Manager

a14/scj

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

04/08/2003

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

Project: Yelm GW Monitoring
Client ID: SC7 MW5
Sample Matrix: Water
Date Sampled: 03/06/2003
Date Received: 03/06/2003
Spectra Project: 2003030069
Spectra Number: 7

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Total Dissolved Solids	114	mg/L	EPA 160.1	N-Nitrosodimethylamine	<10	ug/L	EPA 625
Boron	43	ug/L	EPA 200.7	Fecal Coliform	<2	/100	Membrane
Cadmium	<3	ug/L	EPA 200.7	Fecal Streptococcus	440	/100	Membrane
Chromium	<7	ug/L	EPA 200.7	TKN	<1.0	mg/L	SM 4500-N-B
Copper	<6	ug/L	EPA 200.7	BOD	<2	mg/L	SM 5210
Iron	74	ug/L	EPA 200.7	Bromide	<0.1	mg/L	SM4500-Br-B
Manganese	5	ug/L	EPA 200.7	Chloride	9.4	mg/L	SM4500CL-C
Nickel	<15	ug/L	EPA 200.7	Nitrite	<0.01	mg/L-N	SM4500NO2B
Sulfate	<7	ug/L	EPA 200.7	Nitrate	3.4	mg/L-N	SM4500NO3D
Zinc	<6	ug/L	EPA 200.7	Anionic Surf. as MBAS	<0.02	mg/L	SM5540C
Arsenic	<5	ug/L	EPA 206.2				
Lead	<1	ug/L	EPA 239.2				
Mercury	<0.5	ug/L	EPA 245.1				
Fluoride	<0.2	mg/L	EPA 340.2				
Ammonia	<0.1	mg/L-N	EPA 350.3				
Sulfate	6	mg/L	EPA 375.4				
Dissolved Organic Carbon	10	mg/L	EPA 415.1				
Bromodichloromethane	<1	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	<1	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				

Surrogate	Recovery	Method
Dibromofluoromethane	118	EPA 624
4-Bromofluorobenzene	102	EPA 624
Nitrobenzene-d5	72	EPA 625
p-Terphenyl-d14	90	EPA 625

Surrogate	Recovery	Method
Toluene-d8	100	EPA 624
2-Fluorobiphenyl	72	EPA 625

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager

a14/scj

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

04/08/2003

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

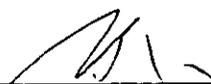
Project: Yelm GW Monitoring
Client ID: SC8 IS
Sample Matrix: Water
Date Sampled: 03/06/2003
Date Received: 03/06/2003
Spectra Project: 2003030069
Spectra Number: 8

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Total Dissolved Solids	318	mg/L	EPA 160.1	N-Nitrosodimethylamine	<10	ug/L	EPA 625
Boron	450	ug/L	EPA 200.7	Fecal Coliform	<2	/100	Membrane
Cadmium	<3	ug/L	EPA 200.7	Fecal Streptococcus	<2	/100	Membrane
Chromium	<7	ug/L	EPA 200.7	TKN	<1.0	mg/L	SM 4500-N-B
Copper	17	ug/L	EPA 200.7	BOD	<2	mg/L	SM 5210
Iron	30	ug/L	EPA 200.7	Bromide	<0.1	mg/L	SM4500-Br-B
Manganese	26	ug/L	EPA 200.7	Chloride	72.6	mg/L	SM4500CL-C
Nickel	<15	ug/L	EPA 200.7	Nitrite	<0.01	mg/L-N	SM4500NO ₂ -D
Silver	7	ug/L	EPA 200.7	Nitrate	4.5	mg/L-N	SM4500NO ₃ -D
Zinc	37	ug/L	EPA 200.7	Anionic Surf. as MBAS	0.12	mg/L	SM5540C
Arsenic	<5	ug/L	EPA 206.2				
Lead	<1	ug/L	EPA 239.2				
Mercury	<0.5	ug/L	EPA 245.1				
Fluoride	<0.2	mg/L	EPA 340.2				
Ammonia	<0.1	mg/L-N	EPA 350.3				
Sulfate	27	mg/L	EPA 375.4				
Dissolved Organic Carbon	17	mg/L	EPA 415.1				
Bromodichloromethane	7	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Chlorodibromomethane	1	ug/L	EPA 624				
Chloroform	32	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				

Surrogate	Recovery	Method
Dibromofluoromethane	109	EPA 624
4-Bromofluorobenzene	102	EPA 624
Nitrobenzene-d5	74	EPA 625
p-Terphenyl-d14	83	EPA 625

Surrogate	Recovery	Method
Toluene-d8	98	EPA 624
2-Fluorobiphenyl	80	EPA 625

SPECTRA LABORATORIES


Steve Hibbs, Laboratory Manager
a14/scj

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

04/08/2003

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

Project: Yelm GW Monitoring
Client ID: SC9 CS1
Sample Matrix: Water
Date Sampled: 03/06/2003
Date Received: 03/06/2003
Spectra Project: 2003030069
Spectra Number: 9

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Total Dissolved Solids	308	mg/L	EPA 160.1	N-Nitrosodimethylamine	<10	ug/L	EPA 625
Boron	460	ug/L	EPA 200.7	Fecal Coliform	<2	/100	Membrane
Cadmium	< 3	ug/L	EPA 200.7	Fecal Streptococcus	32	/100	Membrane
Chromium	< 7	ug/L	EPA 200.7	TKN	<1.0	mg/L	SM 4500-N-B
Copper	16	ug/L	EPA 200.7	BOD	< 2	mg/L	SM 5210
Iron	52	ug/L	EPA 200.7	Bromide	< 0.1	mg/L	SM4500-Br-B
Manganese	23	ug/L	EPA 200.7	Chloride	71.8	mg/L	SM4500CL-C
Nickel	< 15	ug/L	EPA 200.7	Nitrite	0.02	mg/L-N	SM4500NO2B
Silver	7	ug/L	EPA 200.7	Nitrate	4.5	mg/L-N	SM4500NO3D
Zinc	37	ug/L	EPA 200.7	Anionic Surf. as MBAS	0.16	mg/L	SM5540C
Arsenic	< 5	ug/L	EPA 206.2				
Lead	< 1	ug/L	EPA 239.2				
Mercury	<0.5	ug/L	EPA 245.1				
Fluoride	< 0.2	mg/L	EPA 340.2				
Ammonia	< 0.1	mg/L-N	EPA 350.3				
Sulfate	26	mg/L	EPA 375.4				
Dissolved Organic Carbon	19	mg/L	EPA 415.1				
Bromodichloromethane	5	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	23	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				

Surrogate	Recovery	Method
Dibromofluoromethane	97	EPA 624
4-Bromofluorobenzene	100	EPA 624
Nitrobenzene-d5	73	EPA 625
p-Terphenyl-d14	84	EPA 625

Surrogate	Recovery	Method
Toluene-d8	99	EPA 624
2-Fluorobiphenyl	73	EPA 625

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager

a14/scj



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

04/08/2003

Skillings-Connolly, Inc.
 PO Box 5080
 Lacey, WA 98509
 Attn: Patrick Skillings

Project: Yelm GW Monitoring
 Client ID: SC10 CS2
 Sample Matrix: Water
 Date Sampled: 03/06/2003
 Date Received: 03/06/2003
 Spectra Project: 2003030069
 Spectra Number: 10

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Total Dissolved Solids	270	mg/L	EPA 160.1	N-Nitrosodimethylamine	<10	ug/L	EPA 625
Boron	400	ug/L	EPA 200.7	Fecal Coliform	30	/100	Membrane
Cadmium	< 3	ug/L	EPA 200.7	Fecal Streptococcus	1300	/100	Membrane
Chromium	< 7	ug/L	EPA 200.7	TKN	3.1	mg/L	SM 4500-N-B
Copper	10	ug/L	EPA 200.7	BOD	8	mg/L	SM 5210
Iron	120	ug/L	EPA 200.7	Bromide	< 0.1	mg/L	SM4500-Br-B
Manganese	43	ug/L	EPA 200.7	Chloride	58.9	mg/L	SM4500CL-C
Nickel	< 15	ug/L	EPA 200.7	Nitrite	0.16	mg/L-N	SM4500NO2B
Silver	< 7	ug/L	EPA 200.7	Nitrate	3.1	mg/L-N	SM4500NO3
Zinc	22	ug/L	EPA 200.7	Anionic Surf. as MBAS	0.15	mg/L	SM5540C
Arsenic	< 5	ug/L	EPA 206.2				
Lead	< 1	ug/L	EPA 239.2				
Mercury	<0.5	ug/L	EPA 245.1				
Fluoride	< 0.2	mg/L	EPA 340.2				
Ammonia	1.0	mg/L-N	EPA 350.3				
Sulfate	22	mg/L	EPA 375.4				
Dissolved Organic Carbon	14	mg/L	EPA 415.1				
Bromodichloromethane	<1	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	6	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				

Surrogate	Recovery	Method
Dibromofluoromethane	108	EPA 624
4-Bromofluorobenzene	102	EPA 624
Nitrobenzene-d5	69	EPA 625
p-Terphenyl-d14	77	EPA 625

Surrogate	Recovery	Method
Toluene-d8	100	EPA 624
2-Fluorobiphenyl	65	EPA 625

SPECTRA LABORATORIES



Steve Hibbs, Laboratory Manager
 a14/scj

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

04/08/2003

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

Project: Yelm GW Monitoring
Client ID: SC11 CS3
Sample Matrix: Water
Date Sampled: 03/06/2003
Date Received: 03/06/2003
Spectra Project: 2003030069
Spectra Number: 11

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Total Dissolved Solids	258	mg/L	EPA 160.1	N-Nitrosodimethylamine	<10	ug/L	EPA 625
Boron	390	ug/L	EPA 200.7	Fecal Coliform	40	/100	Membrane
Cadmium	< 3	ug/L	EPA 200.7	Fecal Streptococcus	390	/100	Membrane
Chromium	< 7	ug/L	EPA 200.7	TKN	1.4	mg/L	SM 4500-N-B
Copper	10	ug/L	EPA 200.7	BOD	9	mg/L	SM 5210
Iron	69	ug/L	EPA 200.7	Bromide	< 0.1	mg/L	SM4500-Br-B
Manganese	47	ug/L	EPA 200.7	Chloride	57.7	mg/L	SM4500CL-C
Nickel	< 15	ug/L	EPA 200.7	Nitrite	0.02	mg/L-N	SM4500NO2B
Silver	< 7	ug/L	EPA 200.7	Nitrate	5.3	mg/L-N	SM4500NO3D
Zinc	19	ug/L	EPA 200.7	Anionic Surf. as MBAS	0.07	mg/L	SM5540C
Arsenic	< 5	ug/L	EPA 206.2				
Lead	< 1	ug/L	EPA 239.2				
Mercury	<0.5	ug/L	EPA 245.1				
Fluoride	< 0.2	mg/L	EPA 340.2				
Ammonia	0.5	mg/L-N	EPA 350.3				
Sulfate	21	mg/L	EPA 375.4				
Dissolved Organic Carbon	25	mg/L	EPA 415.1				
Bromodichloromethane	<1	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	2	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				

Surrogate	Recovery	Method
Dibromofluoromethane	111	EPA 624
4-Bromofluorobenzene	102	EPA 624
Nitrobenzene-d5	67	EPA 625
p-Terphenyl-d14	82	EPA 625

Surrogate	Recovery	Method
Toluene-d8	99	EPA 624
2-Fluorobiphenyl	66	EPA 625

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager

a14/scj

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

04/08/2003

Skillings-Connolly, Inc.
 PO Box 5080
 Lacey, WA 98509
 Attn: Patrick Skillings

Project: Yelm GW Monitoring
 Client ID: SC12 CS4
 Sample Matrix: Water
 Date Sampled: 03/06/2003
 Date Received: 03/06/2003
 Spectra Project: 2003030069
 Spectra Number: 12

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Total Dissolved Solids	251	mg/L	EPA 160.1	N-Nitrosodimethylamine	<10	ug/L	EPA 625
Boron	< 8	ug/L	EPA 200.7	Fecal Coliform	60	/100	Membrane
Cadmium	< 3	ug/L	EPA 200.7	Fecal Streptococcus	2500	/100	Membrane
Chromium	< 7	ug/L	EPA 200.7	TKN	2.6	mg/L	SM 4500-N-B
Copper	8	ug/L	EPA 200.7	BOD	7	mg/L	SM 5210
Iron	120	ug/L	EPA 200.7	Bromide	< 0.1	mg/L	SM4500-Br-B
Manganese	61	ug/L	EPA 200.7	Chloride	54.2	mg/L	SM4500CL-C
Nickel	< 15	ug/L	EPA 200.7	Nitrite	0.07	mg/L-N	SM4500NO2
Silver	< 7	ug/L	EPA 200.7	Nitrate	4.7	mg/L-N	SM4500NO3D
Zinc	20	ug/L	EPA 200.7	Anionic Surf. as MBAS	0.09	mg/L	SM5540C
Arsenic	< 5	ug/L	EPA 206.2				
Lead	< 1	ug/L	EPA 239.2				
Mercury	<0.5	ug/L	EPA 245.1				
Fluoride	< 0.2	mg/L	EPA 340.2				
Ammonia	0.3	mg/L-N	EPA 350.3				
Sulfate	23	mg/L	EPA 375.4				
Dissolved Organic Carbon	..20	mg/L	EPA 415.1				
Bromodichloromethane	<1	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	1	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				

Surrogate	Recovery	Method
Dibromofluoromethane	105	EPA 624
4-Bromofluorobenzene	99	EPA 624
Nitrobenzene-d5	81	EPA 625
p-Terphenyl-d14	88	EPA 625

Surrogate	Recovery	Method
Toluene-d8	101	EPA 624
2-Fluorobiphenyl	78	EPA 625

SPECTRA LABORATORIES



Steve Hibbs, Laboratory Manager

a14/scj

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

04/08/2003

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

Project: Yelm GW Monitoring
Client ID: SC13 FD
Sample Matrix: Water
Date Sampled: 03/06/2003
Date Received: 03/06/2003
Spectra Project: 2003030069
Spectra Number: 13

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Total Dissolved Solids	139	mg/L	EPA 160.1	N-Nitrosodimethylamine	<10	ug/L	EPA 625
Boron	< 8	ug/L	EPA 200.7	Fecal Coliform	<2	/100	Membrane
Cadmium	< 3	ug/L	EPA 200.7	Fecal Streptococcus	32	/100	Membrane
Chromium	< 7	ug/L	EPA 200.7	TKN	<1.0	mg/L	SM 4500-N-B
Copper	< 6	ug/L	EPA 200.7	BOD	< 2	mg/L	SM 5210
Iron	77	ug/L	EPA 200.7	Bromide	< 0.1	mg/L	SM4500-Br-B
Manganese	55	ug/L	EPA 200.7	Chloride	16.6	mg/L	SM4500CL-C
Nickel	< 15	ug/L	EPA 200.7	Nitrite	< 0.01	mg/L-N	SM4500NO2B
Mercury	< 7	ug/L	EPA 200.7	Nitrate	5.4	mg/L-N	SM4500NO3D
Zinc	< 6	ug/L	EPA 200.7	Anionic Surf. as MBAS	<0.02	mg/L	SM5540C
Arsenic	< 5	ug/L	EPA 206.2				
Lead	< 1	ug/L	EPA 239.2				
Mercury	<0.5	ug/L	EPA 245.1				
Fluoride	< 0.2	mg/L	EPA 340.2				
Ammonia	< 0.1	mg/L-N	EPA 350.3				
Sulfate	6	mg/L	EPA 375.4				
Dissolved Organic Carbon	12	mg/L	EPA 415.1				
Bromodichloromethane	<1	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	<1	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				

Surrogate	Recovery	Method
Dibromofluoromethane	98	EPA 624
4-Bromofluorobenzene	102	EPA 624
Nitrobenzene-d5	77	EPA 625
p-Terphenyl-d14	87	EPA 625

Surrogate	Recovery	Method
Toluene-d8	98	EPA 624
2-Fluorobiphenyl	70	EPA 625

SPECTRA LABORATORIES


Steve Hibbs, Laboratory Manager

al4/scj

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

04/23/2003

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

Project: Yelm Groundwater Monitoring
Client ID: R/O
Sample Matrix: Water
Date Sampled: 03/31/2003
Date Received: 03/31/2003
Spectra Project: 2003030396
Spectra Number: 1

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Conductivity	8.8	umhos/	EPA 120.1	Ammonia	< 0.1	mg/L-N	EPA 350.3
Total Dissolved Solids	3	mg/L	EPA 160.1	Sulfate	< 1	mg/L	EPA 375.4
✓ Barium	< 2	ug/L	EPA 200.7	Dissolved Organic Carbon	< 5	mg/L	EPA 415.1
✓ Beryllium	< 1	ug/L	EPA 200.7	Caffeine	< 10	ug/L	EPA 625
Boron	17	ug/L	EPA 200.7	N-Nitrosodimethylamine	< 10	ug/L	EPA 625
Cadmium	< 3	ug/L	EPA 200.7	Fecal Coliform	0	/100	Membrane
Chromium	< 7	ug/L	EPA 200.7	Fecal Streptococcus	0	/100	Membrane
Copper	< 6	ug/L	EPA 200.7	✓ Color	< 1	Color	SM 2120
Iron	< 15	ug/L	EPA 200.7	✓ Turbidity	< 0.1	ntu	SM 2130B
Manganese	15	ug/L	EPA 200.7	TKN	< 1.0	mg/L	SM 4500-N-B
Nickel	< 15	ug/L	EPA 200.7	BOD	< 2	mg/L	SM 5210
Silver	< 7	ug/L	EPA 200.7	Bromide	< 0.1	mg/L	SM4500-Br-B
✓ Sodium	3900	ug/L	EPA 200.7	✓ Chloride	< 5.0	mg/L	SM4500CL-C
✓ Total Hardness	460	ug/L	EPA 200.7	✓ Total Cyanide	< 0.02	mg/L	SM4500CN-E
Zinc	< 6	ug/L	EPA 200.7	Nitrite	< 0.5	mg/L-N	SM4500NO2B
✓ Thallium	< 1	ug/L	EPA 200.9	Nitrate	< 0.5	mg/L-N	SM4500NO3D
✓ Antimony	< 5	ug/L	EPA 204.2	✓ Total Organic Carbon	< 5	mg/L	SM5310 B
✓ Arsenic	< 5	ug/L	EPA 206.2	Anionic Surfactants as	< 0.02	mg/L	SM5540C
Lead	< 1	ug/L	EPA 239.2	Bromodichloromethane	< 1	ug/L	SW846 8260B
Mercury	< 0.5	ug/L	EPA 245.1	Bromoform	< 1	ug/L	SW846 8260B
✓ Selenium	< 5	ug/L	EPA 270.2	Chlorodibromomethane	< 1	ug/L	SW846 8260B
Fluoride	< 0.2	mg/L	EPA 340.2	Chloroform	5	ug/L	SW846 8260B

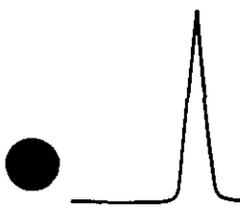
Surrogate	Recovery	Method
Dibromofluoromethane	111	SW846 8260B
4-Bromofluorobenzene	100	EPA 624
Nitrobenzene-d5	55	SW846 8270C
p-Terphenyl-d14	59	SW846 8270C

Surrogate	Recovery	Method
Toluene-d8	89	SW846 8260B
2-Fluorobiphenyl	67	SW846 8270C

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager

a14/scj



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

04/23/2003

Skills-Connolly, Inc.
 PO Box 5080
 Lacey, WA 98509
 Attn: Patrick Skillings

Project: Yelm Groundwater Monitoring
 Client ID: R/O
 Sample Matrix: Water
 Date Sampled: 03/31/2003
 Date Received: 03/31/2003
 Spectra Project: 2003030396
 Spectra Number: 1

<u>Analyte</u>	<u>Result</u>	<u>Units</u>	<u>Method</u>	<u>Analyte</u>	<u>Result</u>	<u>Units</u>	<u>Method</u>
Nitrate/Nitrite	< 0.5	mg/L-N	Summation				

Surrogate	Recovery	Method
Dibromofluoromethane	111	SW846 8260B
4-Bromofluorobenzene	100	EPA 624
Nitrobenzene-d5	55	SW846 8270C
p-Terphenyl-d14	59	SW846 8270C

Surrogate	Recovery	Method
Toluene-d8	89	SW846 8260B
2-Fluorobiphenyl	67	SW846 8270C

SPECTRA LABORATORIES



Steve Hibbs, Laboratory Manager
 a14/scj

March 10, 2003

Spectra Laboratories, Inc.
2221 Ross Way
Tacoma, WA 98421
Attn: Kerrie Nason

Dear Ms. Nason:

Results of analysis of thirteen environmental water samples taken on 03-06-03 and received on 03-06-03 at 3:15 p.m. are as follows:

Project: 2003030069 - Skillings and Connolly

<u>Sample Identification</u>	<u>Fecal Coliform (per 100 mls)</u>	<u>Fecal Streptococcus (per 100 mls)</u>
01, 1010	< 2*	< 2*
02, 0820	< 2*	44
03, 0900	< 2*	660
04, 0930	< 2*	1,400
05, 0955	< 2*	148
06, 1045	< 2*	6
07, 1115	< 2*	440
08, 1040 split sample	< 2* < 2*	< 2* < 2*
09, 1140	< 2*	32
10, 1155	30	1,300

* < is less than

<u>Sample Identification</u>	<u>Fecal Coliform (per 100 mls)</u>	<u>Fecal Streptococcus (per 100 mls)</u>
11, 1210	40	390
12, 1230 split sample	60 100	2,500 2,800
13, 0820	< 2*	32

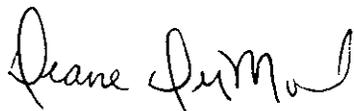
* < is less than

Lab Number: 08990936 through 08990948

Samples were analyzed by membrane filtration procedure according to Standard Methods for the Examination of Water and Wastewater, 19th Edition and EPA Microbiological Methods for Monitoring the Environment.

Chain of custody record is enclosed.

Sincerely,



Diane DuMond
Microbiologist

DD:klm
enclosure



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

07/10/2003

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

Project: Yelm Groundwater Monitoring
Client ID: SC1 CW
Sample Matrix: Water
Date Sampled: 06/05/2003
Date Received: 06/05/2003
Spectra Project: 2003060069
Spectra Number: 1

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Total Dissolved Solids	85.0	mg/L	EPA 160.1	N-Nitrosodimethylamine	<10	ug/L	EPA 625
Boron	28	ug/L	EPA 200.7	Fecal Coliform	<2	/100	Membrane
Cadmium	<3	ug/L	EPA 200.7	Fecal Streptococcus	<2	/100	Membrane
Chromium	<7	ug/L	EPA 200.7	TKN	ND	mg/L	SM 4500-N-B
Copper	34	ug/L	EPA 200.7	BOD	<2	mg/L	SM 5210
Iron	<15	ug/L	EPA 200.7	Bromide	<0.1	mg/L	SM4500-Br-B
Manganese	21	ug/L	EPA 200.7	Chloride	6.0	mg/L	SM4500CL-C
Nickel	<15	ug/L	EPA 200.7	Nitrite	<0.01	mg/L-N	SM4500NO ₂ -B
Silver	<7	ug/L	EPA 200.7	Nitrate	3.8	mg/L-N	SM4500NO ₃ -B
Zinc	12	ug/L	EPA 200.7	Anionic Surf. as MBAS	<0.02	mg/L	SM5540C
Arsenic	<5	ug/L	EPA 206.2				
Lead	<1	ug/L	EPA 239.2				
Mercury	<0.5	ug/L	EPA 245.1				
Fluoride	<0.2	mg/L	EPA 340.2				
Ammonia	<0.1	mg/L-N	EPA 350.3				
Sulfate	9	mg/L	EPA 375.4				
Dissolved Organic Carbon	<2	mg/L	EPA 415.1				
Bromodichloromethane	<1	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	<1	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				

Surrogate	Recovery	Method
2-Fluorobiphenyl	66	EPA 625
Dibromofluoromethane	94	EPA 624
4-Bromofluorobenzene	101	EPA 624
Nitrobenzene-d5	47	EPA 625

Surrogate	Recovery	Method
p-Terphenyl-d14	57	EPA 625
Toluene-d8	100	EPA 624

SPECTRA LABORATORIES


Steve Hibbs, Laboratory Manager
a14/sgh

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

07/10/2003

Skillings-Connolly, Inc.
 PO Box 5080
 Lacey, WA 98509
 Attn: Patrick Skillings

Project: Yelm Groundwater Monitoring
 Client ID: SC2 MW6
 Sample Matrix: Water
 Date Sampled: 06/05/2003
 Date Received: 06/05/2003
 Spectra Project: 2003060069
 Spectra Number: 2

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Total Dissolved Solids	110	mg/L	EPA 160.1	N-Nitrosodimethylamine	<10	ug/L	EPA 625
Boron	13	ug/L	EPA 200.7	Fecal Coliform	<2	/100	Membrane
Cadmium	<3	ug/L	EPA 200.7	Fecal Streptococcus	<2	/100	Membrane
Chromium	<7	ug/L	EPA 200.7	TKN	ND	mg/L	SM 4500-N-B
Copper	33	ug/L	EPA 200.7	BOD	<2	mg/L	SM 5210
Iron	190	ug/L	EPA 200.7	Bromide	<0.1	mg/L	SM4500-Br-B
Manganese	400	ug/L	EPA 200.7	Chloride	7.5	mg/L	SM4500CL-C
Nickel	<15	ug/L	EPA 200.7	Nitrite	<0.01	mg/L-N	SM4500NO2B
Cobalt	<7	ug/L	EPA 200.7	Nitrate	4.6	mg/L-N	SM4500NO3D
Zinc	12	ug/L	EPA 200.7	Anionic Surf. as MBAS	0.03	mg/L	SM5540C
Arsenic	<5	ug/L	EPA 206.2				
Lead	<1	ug/L	EPA 239.2				
Mercury	<0.5	ug/L	EPA 245.1				
Fluoride	<0.2	mg/L	EPA 340.2				
Ammonia	<0.1	mg/L-N	EPA 350.3				
Sulfate	8	mg/L	EPA 375.4				
Dissolved Organic Carbon	4	mg/L	EPA 415.1				
Bromodichloromethane	<1	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	<1	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				

Surrogate	Recovery	Method
2-Fluorobiphenyl	64	EPA 625
Dibromofluoromethane	107	EPA 624
4-Bromofluorobenzene	105	EPA 624
Nitrobenzene-d5	53	EPA 625

Surrogate	Recovery	Method
p-Terphenyl-d14	54	EPA 625
Toluene-d8	96	EPA 624

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager

a14/sgH



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

07/10/2003

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

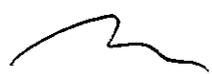
Project: Yelm Groundwater Monitoring
Client ID: SC3 MW1
Sample Matrix: Water
Date Sampled: 06/05/2003
Date Received: 06/05/2003
Spectra Project: 2003060069
Spectra Number: 3

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Total Dissolved Solids	76.0	mg/L	EPA 160.1	N-Nitrosodimethylamine	<10	ug/L	EPA 625
Boron	16	ug/L	EPA 200.7	Fecal Coliform	<2	/100	Membrane
Cadmium	< 3	ug/L	EPA 200.7	Fecal Streptococcus	<2	/100	Membrane
Chromium	< 7	ug/L	EPA 200.7	TKN	ND	mg/L	SM 4500-N-B
Copper	28	ug/L	EPA 200.7	BOD	< 2	mg/L	SM 5210
Iron	69	ug/L	EPA 200.7	Bromide	< 0.1	mg/L	SM4500-Br-B
Manganese	31	ug/L	EPA 200.7	Chloride	5.0	mg/L	SM4500CL-C
Nickel	< 15	ug/L	EPA 200.7	Nitrite	< 0.01	mg/L-N	SM4500NO2B
Silver	< 7	ug/L	EPA 200.7	Nitrate	2.3	mg/L-N	SM4500NO3
Zinc	9	ug/L	EPA 200.7	Anionic Surf. as MBAS	<0.02	mg/L	SM5540C
Arsenic	< 5	ug/L	EPA 206.2				
Lead	< 1	ug/L	EPA 239.2				
Mercury	<0.5	ug/L	EPA 245.1				
Fluoride	< 0.2	mg/L	EPA 340.2				
Ammonia	< 0.1	mg/L-N	EPA 350.3				
Sulfate	< 1	mg/L	EPA 375.4				
Dissolved Organic Carbon	7	mg/L	EPA 415.1				
Bromodichloromethane	<1	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	<1	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				

Surrogate	Recovery	Method
2-Fluorobiphenyl	78	EPA 625
Dibromofluoromethane	102	EPA 624
4-Bromofluorobenzene	103	EPA 624
Nitrobenzene-d5	48	EPA 625

Surrogate	Recovery	Method
p-Terphenyl-d14	59	EPA 625
Toluene-d8	96	EPA 624

SPECTRA LABORATORIES



Steve Hibbs, Laboratory Manager

a14/sgh

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

07/10/2003

Skillsings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillsings

Project: Yelm Groundwater Monitoring
Client ID: SC4 MW2
Sample Matrix: Water
Date Sampled: 06/05/2003
Date Received: 06/05/2003
Spectra Project: 2003060069
Spectra Number: 4

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Total Dissolved Solids	147	mg/L	EPA 160.1	N-Nitrosodimethylamine	<10	ug/L	EPA 625
Boron	220	ug/L	EPA 200.7	Fecal Coliform	<2	/100	Membrane
Cadmium	< 3	ug/L	EPA 200.7	Fecal Streptococcus	<2	/100	Membrane
Chromium	< 7	ug/L	EPA 200.7	TKN	ND	mg/L	SM 4500-N-B
Copper	31	ug/L	EPA 200.7	BOD	< 2	mg/L	SM 5210
Iron	25	ug/L	EPA 200.7	Bromide	< 0.1	mg/L	SM4500-Br-B
Manganese	23	ug/L	EPA 200.7	Chloride	32.5	mg/L	SM4500CL-C
Nickel	< 15	ug/L	EPA 200.7	Nitrite	< 0.01	mg/L-N	SM4500NO2B
Sulfate	< 7	ug/L	EPA 200.7	Nitrate	2.3	mg/L-N	SM4500NO3D
Zinc	8	ug/L	EPA 200.7	Anionic Surf. as MBAS	<0.02	mg/L	SM5540C
Arsenic	< 5	ug/L	EPA 206.2				
Lead	< 1	ug/L	EPA 239.2				
Mercury	<0.5	ug/L	EPA 245.1				
Fluoride	< 0.2	mg/L	EPA 340.2				
Ammonia	< 0.1	mg/L-N	EPA 350.3				
Sulfate	9	mg/L	EPA 375.4				
Dissolved Organic Carbon	< 2	mg/L	EPA 415.1				
Bromodichloromethane	<1	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	<1	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				

Surrogate	Recovery	Method
2-Fluorobiphenyl	76	EPA 625
Dibromofluoromethane	103	EPA 624
4-Bromofluorobenzene	104	EPA 624
Nitrobenzene-d5	53	EPA 625

Surrogate	Recovery	Method
p-Terphenyl-d14	61	EPA 625
Toluene-d8	98	EPA 624

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager

a14/sgh

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

07/10/2003

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

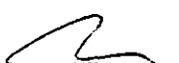
Project: Yelm Groundwater Monitoring
Client ID: SC5 MW3
Sample Matrix: Water
Date Sampled: 06/05/2003
Date Received: 06/05/2003
Spectra Project: 2003060069
Spectra Number: 5

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Total Dissolved Solids	218	mg/L	EPA 160.1	N-Nitrosodimethylamine	<10	ug/L	EPA 625
Boron	23	ug/L	EPA 200.7	Fecal Coliform	<2	/100	Membrane
Cadmium	<3	ug/L	EPA 200.7	Fecal Streptococcus	<2	/100	Membrane
Chromium	<7	ug/L	EPA 200.7	TKN	ND	mg/L	SM 4500-N-B
Copper	27	ug/L	EPA 200.7	BOD	<2	mg/L	SM 5210
Iron	57	ug/L	EPA 200.7	Bromide	<0.1	mg/L	SM4500-Br-B
Manganese	25	ug/L	EPA 200.7	Chloride	34.5	mg/L	SM4500CL-C
Nickel	<15	ug/L	EPA 200.7	Nitrite	<0.01	mg/L-N	SM4500NO ₂ -B
Silver	<7	ug/L	EPA 200.7	Nitrate	4.0	mg/L-N	SM4500NO ₃ -B
Zinc	<6	ug/L	EPA 200.7	Anionic Surf. as MBAS	<0.02	mg/L	SM5540C
Arsenic	<5	ug/L	EPA 206.2				
Lead	<1	ug/L	EPA 239.2				
Mercury	<0.5	ug/L	EPA 245.1				
Fluoride	<0.2	mg/L	EPA 340.2				
Ammonia	<0.1	mg/L-N	EPA 350.3				
Sulfate	15	mg/L	EPA 375.4				
Dissolved Organic Carbon	8	mg/L	EPA 415.1				
Bromodichloromethane	<1	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	<1	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				

Surrogate	Recovery	Method
2-Fluorobiphenyl	56	EPA 625
Dibromofluoromethane	105	EPA 624
+Bromofluorobenzene	104	EPA 624
Nitrobenzene-d5	45	EPA 625

Surrogate	Recovery	Method
p-Terphenyl-d14	55	EPA 625
Toluene-d8	98	EPA 624

SPECTRA LABORATORIES


Steve Hibbs, Laboratory Manager
a14/sgb

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

07/10/2003

Skills-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

Project: Yelm Groundwater Monitoring
Client ID: SC6 MW4
Sample Matrix: Water
Date Sampled: 06/05/2003
Date Received: 06/05/2003
Spectra Project: 2003060069
Spectra Number: 6

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Total Dissolved Solids	138	mg/L	EPA 160.1	N-Nitrosodimethylamine	<10	ug/L	EPA 625
Boron	170	ug/L	EPA 200.7	Fecal Coliform	<2	/100	Membrane
Cadmium	< 3	ug/L	EPA 200.7	Fecal Streptococcus	2	/100	Membrane
Chromium	< 7	ug/L	EPA 200.7	TKN	ND	mg/L	SM 4500-N-B
Copper	31	ug/L	EPA 200.7	BOD	< 2	mg/L	SM 5210
Iron	63	ug/L	EPA 200.7	Bromide	< 0.1	mg/L	SM4500-Br-B
Manganese	25	ug/L	EPA 200.7	Chloride	24.5	mg/L	SM4500CL-C
Nickel	< 15	ug/L	EPA 200.7	Nitrite	< 0.01	mg/L-N	SM4500NO2B
Silver	< 7	ug/L	EPA 200.7	Nitrate	2.4	mg/L-N	SM4500NO3D
Zinc	9	ug/L	EPA 200.7	Anionic Surf. as MBAS	0.07	mg/L	SM5540C
Arsenic	< 5	ug/L	EPA 206.2				
Lead	< 1	ug/L	EPA 239.2				
Mercury	<0.5	ug/L	EPA 245.1				
Fluoride	< 0.2	mg/L	EPA 340.2				
Ammonia	< 0.1	mg/L-N	EPA 350.3				
Sulfate	9	mg/L	EPA 375.4				
Dissoived Organic Carbon	10	mg/L	EPA 415.1				
Bromodichloromethane	<1	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	<1	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				

Surrogate	Recovery	Method
2-Fluorobiphenyl	46	EPA 625
Dibromofluoromethane	106	EPA 624
4-Bromofluorobenzene	103	EPA 624
Nitrobenzene-d5	44	EPA 625

Surrogate	Recovery	Method
p-Terphenyl-d14	52	EPA 625
Toluene-d8	99	EPA 624

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager

a14/sgh

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

07/10/2003

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

Project: Yelm Groundwater Monitoring
Client ID: SC7 MW5
Sample Matrix: Water
Date Sampled: 06/05/2003
Date Received: 06/05/2003
Spectra Project: 2003060069
Spectra Number: 7

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Total Dissolved Solids	119	mg/L	EPA 160.1	N-Nitrosodimethylamine	<10	ug/L	EPA 625
Boron	55	ug/L	EPA 200.7	Fecal Coliform	<2	/100	Membrane
Cadmium	<3	ug/L	EPA 200.7	Fecal Streptococcus	<2	/100	Membrane
Chromium	<7	ug/L	EPA 200.7	TKN	ND	mg/L	SM 4500-N-B
Copper	28	ug/L	EPA 200.7	BOD	<2	mg/L	SM 5210
Iron	40	ug/L	EPA 200.7	Bromide	0.1	mg/L	SM4500-Br-B
Manganese	23	ug/L	EPA 200.7	Chloride	16.0	mg/L	SM4500CL-C
Nickel	<15	ug/L	EPA 200.7	Nitrite	<0.01	mg/L-N	SM4500NO2B
Silver	<7	ug/L	EPA 200.7	Nitrate	3.6	mg/L-N	SM4500NO3B
Zinc	11	ug/L	EPA 200.7	Anionic Surf. as MBAS	<0.02	mg/L	SM5540C
Arsenic	<5	ug/L	EPA 206.2				
Lead	<1	ug/L	EPA 239.2				
Mercury	<0.5	ug/L	EPA 245.1				
Fluoride	<0.2	mg/L	EPA 340.2				
Ammonia	<0.1	mg/L-N	EPA 350.3				
Sulfate	9	mg/L	EPA 375.4				
Dissolved Organic Carbon	2	mg/L	EPA 415.1				
Bromodichloromethane	<1	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	<1	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				

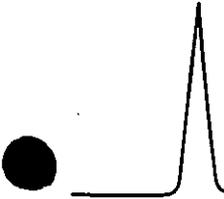
Surrogate	Recovery	Method
2-Fluorobiphenyl	65	EPA 625
Dibromofluoromethane	104	EPA 624
4-Bromofluorobenzene	106	EPA 624
Nitrobenzene-d5	55	EPA 625

Surrogate	Recovery	Method
p-Terphenyl-d14	58	EPA 625
Toluene-d8	98	EPA 624

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager

a14/sgh



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

07/10/2003

Skillings-Connolly, Inc.
 PO Box 5080
 Lacey, WA 98509
 Attn: Patrick Skillings

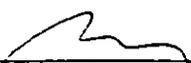
Project: Yelm Groundwater Monitoring
 Client ID: SC8 IS
 Sample Matrix: Water
 Date Sampled: 06/05/2003
 Date Received: 06/05/2003
 Spectra Project: 2003060069
 Spectra Number: 8

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Total Dissolved Solids	298	mg/L	EPA 160.1	N-Nitrosodimethylamine	<10	ug/L	EPA 625
Boron	500	ug/L	EPA 200.7	Fecal Coliform	<2	/100	Membrane
Cadmium	< 3	ug/L	EPA 200.7	Fecal Streptococcus	<2	/100	Membrane
Chromium	< 7	ug/L	EPA 200.7	TKN	1.2	mg/L	SM 4500-N-B
Copper	35	ug/L	EPA 200.7	BOD	< 2	mg/L	SM 5210
Iron	54	ug/L	EPA 200.7	Bromide	0.1	mg/L	SM4500-Br-B
Manganese	40	ug/L	EPA 200.7	Chloride	67.0	mg/L	SM4500CL-C
Nickel	< 15	ug/L	EPA 200.7	Nitrite	< 0.01	mg/L-N	SM4500NO2B
Silver	< 7	ug/L	EPA 200.7	Nitrate	2.3	mg/L-N	SM4500NO3D
Zinc	45	ug/L	EPA 200.7	Anionic Surf. as MBAS	0.06	mg/L	SM5540C
Arsenic	< 5	ug/L	EPA 206.2				
Lead	< 1	ug/L	EPA 239.2				
Mercury	<0.5	ug/L	EPA 245.1				
Fluoride	< 0.2	mg/L	EPA 340.2				
Ammonia	< 0.1	mg/L-N	EPA 350.3				
Sulfate	31	mg/L	EPA 375.4				
Dissolved Organic Carbon	12	mg/L	EPA 415.1				
Bromodichloromethane	8	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Chlorodibromomethane	1	ug/L	EPA 624				
Chloroform	39	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				

Surrogate	Recovery	Method
2-Fluorobiphenyl	76	EPA 625
Dibromofluoromethane	111	EPA 624
4-Bromofluorobenzene	104	EPA 624
Nitrobenzene-d5	65	EPA 625

Surrogate	Recovery	Method
p-Terphenyl-d14	58	EPA 625
Toluene-d8	97	EPA 624

SPECTRA LABORATORIES


 Steve Hibbs, Laboratory Manager
 a14/sgh

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

07/10/2003

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

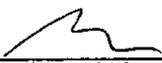
Project: Yelm Groundwater Monitoring
Client ID: SC9 CS1
Sample Matrix: Water
Date Sampled: 06/05/2003
Date Received: 06/05/2003
Spectra Project: 2003060069
Spectra Number: 9

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Total Dissolved Solids	392	mg/L	EPA 160.1	N-Nitrosodimethylamine	<10	ug/L	EPA 625
Boron	530	ug/L	EPA 200.7	Fecal Coliform	1030	/100	Membrane
Cadmium	<3	ug/L	EPA 200.7	Fecal Streptococcus	150	/100	Membrane
Chromium	<7	ug/L	EPA 200.7	TKN	1.0	mg/L	SM 4500-N-B
Copper	31	ug/L	EPA 200.7	BOD	2	mg/L	SM 5210
Iron	240	ug/L	EPA 200.7	Bromide	<0.1	mg/L	SM4500-Br-B
Manganese	77	ug/L	EPA 200.7	Chloride	66.5	mg/L	SM4500CL-C
Nickel	<15	ug/L	EPA 200.7	Nitrite	<0.01	mg/L-N	SM4500NO2P
Silver	<7	ug/L	EPA 200.7	Nitrate	<0.5	mg/L-N	SM4500NO3P
Zinc	30	ug/L	EPA 200.7	Anionic Surf. as MBAS	0.09	mg/L	SM5540C
Arsenic	<5	ug/L	EPA 206.2				
Lead	<1	ug/L	EPA 239.2				
Mercury	<0.5	ug/L	EPA 245.1				
Fluoride	<0.2	mg/L	EPA 340.2				
Ammonia	<0.1	mg/L-N	EPA 350.3				
Sulfate	21	mg/L	EPA 375.4				
Dissolved Organic Carbon	11	mg/L	EPA 415.1				
Bromodichloromethane	2	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	13	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				

Surrogate	Recovery	Method
2-Fluorobiphenyl	52	EPA 625
Dibromofluoromethane	107	EPA 624
4-Bromofluorobenzene	105	EPA 624
Nitrobenzene-d5	51	EPA 625

Surrogate	Recovery	Method
p-Terphenyl-d14	57	EPA 625
Toluene-d8	96	EPA 624

SPECTRA LABORATORIES


Steve Hibbs, Laboratory Manager
al4/sgh

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

07/10/2003

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

Project: Yelm Groundwater Monitoring
Client ID: SC10 CS2
Sample Matrix: Water
Date Sampled: 06/05/2003
Date Received: 06/05/2003
Spectra Project: 2003060069
Spectra Number: 10

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Total Dissolved Solids	361	mg/L	EPA 160.1	N-Nitrosodimethylamine	<10	ug/L	EPA 625
Boron	520	ug/L	EPA 200.7	Fecal Coliform	720	/100	Membrane
Cadmium	<3	ug/L	EPA 200.7	Fecal Streptococcus	26	/100	Membrane
Chromium	<7	ug/L	EPA 200.7	TKN	1.4	mg/L	SM 4500-N-B
Copper	31	ug/L	EPA 200.7	BOD	2	mg/L	SM 5210
Iron	450	ug/L	EPA 200.7	Bromide	<0.1	mg/L	SM4500-Br-B
Manganese	200	ug/L	EPA 200.7	Chloride	66.0	mg/L	SM4500CL-C
Nickel	<15	ug/L	EPA 200.7	Nitrite	<0.01	mg/L-N	SM4500NO2B
Silver	<7	ug/L	EPA 200.7	Nitrate	<0.5	mg/L-N	SM4500NO3D
Zinc	30	ug/L	EPA 200.7	Anionic Surf. as MBAS	0.08	mg/L	SM5540C
Arsenic	<5	ug/L	EPA 206.2				
Lead	<1	ug/L	EPA 239.2				
Mercury	<0.5	ug/L	EPA 245.1				
Fluoride	<0.2	mg/L	EPA 340.2				
Ammonia	<0.1	mg/L-N	EPA 350.3				
Sulfate	14	mg/L	EPA 375.4				
Dissolved Organic Carbon	13	mg/L	EPA 415.1				
Bromodichloromethane	<1	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	1	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				

Surrogate	Recovery	Method
2-Fluorobiphenyl	58	EPA 625
Dibromofluoromethane	113	EPA 624
4-Bromofluorobenzene	104	EPA 624
Nitrobenzene-d5	55	EPA 625

Surrogate	Recovery	Method
p-Terphenyl-d14	54	EPA 625
Toluene-d8	97	EPA 624

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager

a14/sgh



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

07/10/2003

Skillings-Connolly, Inc.
 PO Box 5080
 Lacey, WA 98509
 Attn: Patrick Skillings

Project: Yelm Groundwater Monitoring
 Client ID: SC11 CS3
 Sample Matrix: Water
 Date Sampled: 06/05/2003
 Date Received: 06/05/2003
 Spectra Project: 2003060069
 Spectra Number: 11

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Total Dissolved Solids	357	mg/L	EPA 160.1	N-Nitrosodimethylamine	<10	ug/L	EPA 625
Boron	550	ug/L	EPA 200.7	Fecal Coliform	170	/100	Membrane
Cadmium	< 3	ug/L	EPA 200.7	Fecal Streptococcus	20	/100	Membrane
Chromium	< 7	ug/L	EPA 200.7	TKN	1.3	mg/L	SM 4500-N-B
Copper	28	ug/L	EPA 200.7	BOD	< 2	mg/L	SM 5210
Iron	270	ug/L	EPA 200.7	Bromide	< 0.1	mg/L	SM4500-Br-B
Manganese	240	ug/L	EPA 200.7	Chloride	67.5	mg/L	SM4500CL-C
Nickel	< 15	ug/L	EPA 200.7	Nitrite	< 0.01	mg/L-N	SM4500NO2B
Silver	< 7	ug/L	EPA 200.7	Nitrate	< 0.5	mg/L-N	SM4500NO3B
Zinc	21	ug/L	EPA 200.7	Anionic Surf. as MBAS	0.16	mg/L	SM5540C
Arsenic	< 5	ug/L	EPA 206.2				
Lead	< 1	ug/L	EPA 239.2				
Mercury	<0.5	ug/L	EPA 245.1				
Fluoride	< 0.2	mg/L	EPA 340.2				
Ammonia	0.3	mg/L-N	EPA 350.3				
Sulfate	13	mg/L	EPA 375.4				
Dissolved Organic Carbon	14	mg/L	EPA 415.1				
Bromodichloromethane	<1	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	<1	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				

Surrogate	Recovery	Method
2-Fluorobiphenyl	62	EPA 625
Dibromofluoromethane	112	EPA 624
4-Bromofluorobenzene	104	EPA 624
Nitrobenzene-d5	62	EPA 625

Surrogate	Recovery	Method
p-Terphenyl-d14	52	EPA 625
Toluene-d8	96	EPA 624

SPECTRA LABORATORIES


 Steve Hibbs, Laboratory Manager
 at4/sgh

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

07/10/2003

Skillsing-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

Project: Yelm Groundwater Monitoring
Client ID: SC12 CS4
Sample Matrix: Water
Date Sampled: 06/05/2003
Date Received: 06/05/2003
Spectra Project: 2003060069
Spectra Number: 12

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Total Dissolved Solids	377	mg/L	EPA 160.1	N-Nitrosodimethylamine	<10	ug/L	EPA 625
Boron	540	ug/L	EPA 200.7	Fecal Coliform	130	/100	Membrane
Cadmium	< 3	ug/L	EPA 200.7	Fecal Streptococcus	23	/100	Membrane
Chromium	< 7	ug/L	EPA 200.7	TKN	1.1	mg/L	SM 4500-N-B
Copper	28	ug/L	EPA 200.7	BOD	2	mg/L	SM 5210
Iron	240	ug/L	EPA 200.7	Bromide	< 0.1	mg/L	SM4500-Br-B
Manganese	240	ug/L	EPA 200.7	Chloride	66.0	mg/L	SM4500CL-C
Nickel	< 15	ug/L	EPA 200.7	Nitrite	< 0.01	mg/L-N	SM4500NO2B
Sulfur	< 7	ug/L	EPA 200.7	Nitrate	< 0.5	mg/L-N	SM4500NO3D
Zinc	15	ug/L	EPA 200.7	Anionic Surf. as MBAS	0.18	mg/L	SM5540C
Arsenic	< 5	ug/L	EPA 206.2				
Lead	< 1	ug/L	EPA 239.2				
Mercury	<0.5	ug/L	EPA 245.1				
Fluoride	< 0.2	mg/L	EPA 340.2				
Ammonia	0.2	mg/L-N	EPA 350.3				
Sulfate	12	mg/L	EPA 375.4				
Dissolved Organic Carbon	8	mg/L	EPA 415.1				
Bromodichloromethane	<1	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	<1	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				

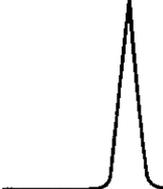
Surrogate	Recovery	Method
2-Fluorobiphenyl	57	EPA 625
Dibromofluoromethane	121	EPA 624
4-Bromofluorobenzene	105	EPA 624
Nitrobenzene-d5	35	EPA 625

Surrogate	Recovery	Method
p-Terphenyl-d14	56	EPA 625
Toluene-d8	97	EPA 624

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager

a14/sgb



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

07/10/2003

Skillings-Connolly, Inc.
 PO Box 5080
 Lacey, WA 98509
 Attn: Patrick Skillings

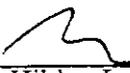
Project: Yelm Groundwater Monitoring
 Client ID: SC13 FD
 Sample Matrix: Water
 Date Sampled: 06/05/2003
 Date Received: 06/05/2003
 Spectra Project: 2003060069
 Spectra Number: 13

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Total Dissolved Solids	225	mg/L	EPA 160.1	N-Nitrosodimethylamine	<10	ug/L	EPA 625
Boron	240	ug/L	EPA 200.7	Fecal Coliform	<2	/100	Membrane
Cadmium	<3	ug/L	EPA 200.7	Fecal Streptococcus	<2	/100	Membrane
Chromium	<7	ug/L	EPA 200.7	TKN	ND	mg/L	SM 4500-N-B
Copper	32	ug/L	EPA 200.7	BOD	<2	mg/L	SM 5210
Iron	17	ug/L	EPA 200.7	Bromide	<0.1	mg/L	SM4500-Br-B
Manganese	22	ug/L	EPA 200.7	Chloride	34.0	mg/L	SM4500CL-C
Nickel	<15	ug/L	EPA 200.7	Nitrite	<0.01	mg/L-N	SM4500NO2B
Silver	<7	ug/L	EPA 200.7	Nitrate	1.8	mg/L-N	SM4500NO3
Zinc	15	ug/L	EPA 200.7	Anionic Surf. as MBAS	0.04	mg/L	SM5540C
Arsenic	<5	ug/L	EPA 206.2				
Lead	<1	ug/L	EPA 239.2				
Mercury	<0.5	ug/L	EPA 245.1				
Fluoride	<0.2	mg/L	EPA 340.2				
Ammonia	<0.1	mg/L-N	EPA 350.3				
Sulfate	9	mg/L	EPA 375.4				
Dissolved Organic Carbon	13	mg/L	EPA 415.1				
Bromodichloromethane	<1	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	<1	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				

Surrogate	Recovery	Method
2-Fluorobiphenyl	48	EPA 625
Dibromofluoromethane	120	EPA 624
4-Bromofluorobenzene	107	EPA 624
Nitrobenzene-d5	33	EPA 625

Surrogate	Recovery	Method
p-Terphenyl-d14	50	EPA 625
Toluene-d8	97	EPA 624

SPECTRA LABORATORIES



Steve Hibbs, Laboratory Manager
 a14/sgh

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

07/10/2003

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

Project: Yelm Groundwater Monitoring
Client ID: RO
Sample Matrix: Water
Date Sampled: 06/05/2003
Date Received: 06/05/2003
Spectra Project: 2003060069
Spectra Number: 14

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Thallium	< 1	ug/L	EPA 279.2	Ammonia	< 0.1	mg/L-N	EPA 350.3
Conductivity	15.8	umhos/	EPA 120.1	Sulfate	< 1	mg/L	EPA 375.4
Total Dissolved Solids	161	mg/L	EPA 160.1	Dissolved Organic Carbon	5	mg/L	EPA 415.1
Barium	< 2	ug/L	EPA 200.7	Bromodichloromethane	2	ug/L	EPA 624
Beryllium	< 1	ug/L	EPA 200.7	Bromoform	< 1	ug/L	EPA 624
Boron	290	ug/L	EPA 200.7	Chlorodibromomethane	< 1	ug/L	EPA 624
Cadmium	< 3	ug/L	EPA 200.7	Chloroform	16	ug/L	EPA 624
Chromium	< 7	ug/L	EPA 200.7	Caffeine	< 10	ug/L	EPA 625
Copper	28	ug/L	EPA 200.7	N-Nitrosodimethylamine	< 10	ug/L	EPA 625
Iron	< 15	ug/L	EPA 200.7	Fecal Coliform	< 2	/100	Membrane
Manganese	21	ug/L	EPA 200.7	Fecal Streptococcus	< 2	/100	Membrane
Nickel	< 15	ug/L	EPA 200.7	Color	< 1	Color	SM 2120B
Silver	< 7	ug/L	EPA 200.7	Turbidity	< 0.01	ntu	SM 2130B
Sodium	8400	ug/L	EPA 200.7	TKN	ND	mg/L	SM 4500-N-B
Total Hardness	4500	ug/L	EPA 200.7	BOD	< 2	mg/L	SM 5210
Zinc	11	ug/L	EPA 200.7	Bromide	< 0.1	mg/L	SM4500-Br-B
Antimony	< 5	ug/L	EPA 204.2	Chloride	3.5	mg/L	SM4500CL-C
Arsenic	< 5	ug/L	EPA 206.2	Total Cyanide	< 0.01	mg/L	SM4500CN-E
Lead	< 1	ug/L	EPA 239.2	Nitrite	< 0.01	mg/L-N	SM4500NO2B
Mercury	< 0.5	ug/L	EPA 245.1	Nitrate	< 0.5	mg/L-N	SM4500NO3D
Selenium	< 5	ug/L	EPA 270.2	Total Organic Carbon	10	mg/L	SM5310 B
Fluoride	< 0.2	mg/L	EPA 340.2	Anionic Surf. as MBAS	< 0.10	mg/L	SM5540C

Surrogate	Recovery	Method
2-Fluorobiphenyl	43	EPA 625
Dibromofluoromethane	118	EPA 624
4-Bromofluorobenzene	103	EPA 624
Nitrobenzene-d5	45	EPA 625

Surrogate	Recovery	Method
p-Terphenyl-d14	54	EPA 625
Toluene-d8	78	EPA 624

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager

a14/sgh

Page 14 of 15

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

07/10/2003

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

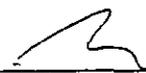
Project: Yelm Groundwater Monitoring
Client ID: RW
Sample Matrix: Water
Date Sampled: 06/05/2003
Date Received: 06/05/2003
Spectra Project: 2003060069
Spectra Number: 15

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Thallium	< 1	ug/L	EPA 279.2	Ammonia	< 0.1	mg/L-N	EPA 350.3
Conductivity	542	umhos/	EPA 120.1	Sulfate	29	mg/L	EPA 375.4
Total Dissolved Solids	345	mg/L	EPA 160.1	Dissolved Organic Carbon	11	mg/L	EPA 415.1
Barium	4	ug/L	EPA 200.7	Bromodichloromethane	8	ug/L	EPA 624
Beryllium	< 1	ug/L	EPA 200.7	Bromoform	< 1	ug/L	EPA 624
Boron	510	ug/L	EPA 200.7	Chlorodibromomethane	1	ug/L	EPA 624
Cadmium	< 3	ug/L	EPA 200.7	Chloroform	25	ug/L	EPA 624
Chromium	< 7	ug/L	EPA 200.7	Caffeine	< 10	ug/L	EPA 625
Copper	36	ug/L	EPA 200.7	N-Nitrosodimethylamine	< 10	ug/L	EPA 625
Iron	< 15	ug/L	EPA 200.7	Fecal Coliform	< 2	/100	Membrane
Manganese	43	ug/L	EPA 200.7	Fecal Streptococcus	< 2	/100	Membrane
Nickel	< 15	ug/L	EPA 200.7	Color	< 1	Color	SM 2120B
Silver	< 7	ug/L	EPA 200.7	Turbidity	0.16	ntu	SM 2130B
Sodium	83600	ug/L	EPA 200.7	TKN	0.9	mg/L	SM 4500-N-B
Total Hardness	68000	ug/L	EPA 200.7	BOD	< 2	mg/L	SM 5210
Zinc	54	ug/L	EPA 200.7	Bromide	0.2	mg/L	SM4500-Br-B
Antimony	< 5	ug/L	EPA 204.2	Chloride	66.5	mg/L	SM4500CL-C
Arsenic	< 5	ug/L	EPA 206.2	Total Cyanide	< 0.01	mg/L	SM4500CN-E
Lead	< 1	ug/L	EPA 239.2	Nitrite	< 0.01	mg/L-N	SM4500NO2B
Mercury	< 0.5	ug/L	EPA 245.1	Nitrate	3.5	mg/L-N	SM4500NO3D
Selenium	< 5	ug/L	EPA 270.2	Total Organic Carbon	12	mg/L	SM5310 B
Fluoride	< 0.2	mg/L	EPA 340.2	Anionic Surf. as MBAS	0.16	mg/L	SM5540C

Surrogate	Recovery	Method
2-Fluorobiphenyl	113	EPA 625
Dibromofluoromethane	118	EPA 624
4-Bromofluorobenzene	99	EPA 624
Nitrobenzene-d5	100	EPA 625

Surrogate	Recovery	Method
p-Terphenyl-d14	84	EPA 625
Toluene-d8	84	EPA 624

SPECTRA LABORATORIES


Steve Hibbs, Laboratory Manager

a14/sgb

7th

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

11/26/2003

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

Project: Yelm Groundwater Monitoring
Client ID: SC1 CW
Sample Matrix: Water
Date Sampled: 10/22/2003
Date Received: 10/22/2003
Spectra Project: 2003100258
Spectra Number: 1

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Total Dissolved Solids	82.0	mg/L	EPA 160.1	N-Nitrosodimethylamine	<10	ug/L	EPA 625
Boron	0.04	ug/L	EPA 200.7	Fecal Coliform	15*	/100	Membrane
Cadmium	< 3	ug/L	EPA 200.7	Fecal Streptococcus	0	/100	Membrane
Chromium	< 7	ug/L	EPA 200.7	TKN	<1	mg/L	SM 4500-N-B
Copper	16	ug/L	EPA 200.7	BOD	< 2	mg/L	SM 5210
Iron	29	ug/L	EPA 200.7	Bromide	< 0.1	mg/L	SM4500-Br-B
Manganese	< 2	ug/L	EPA 200.7	Chloride	3.5	mg/L	SM4500CL-C
Nickel	< 15	ug/L	EPA 200.7	Nitrite	< 0.01	mg/L-N	SM4500NO2B
Silver	< 7	ug/L	EPA 200.7	Nitrate	2.5	mg/L-N	SM4500NO3D
Zinc	< 6	ug/L	EPA 200.7	Anionic Surf. as MBAS	<0.02	mg/L	SM5540C
Arsenic	< 5	ug/L	EPA 206.2				
Lead	< 1	ug/L	EPA 239.2				
Mercury	<0.5	ug/L	EPA 245.1				
Fluoride	< 0.2	mg/L	EPA 340.2				
Ammonia	< 0.1	mg/L-N	EPA 350.3				
Sulfate	< 1	mg/L	EPA 375.4				
Dissolved Organic Carbon	5	mg/L	EPA 415.1				
Bromodichloromethane	<1	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	<1	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				

Surrogate	Recovery	Method
Dibromofluoromethane	80	EPA 624
Toluene-d8	106	EPA 624
4-Bromofluorobenzene	100	EPA 624
2-Fluorophenol	18	EPA 625

Surrogate	Recovery	Method
Phenol-d6	37	EPA 625
Nitrobenzene-d5	49	EPA 625
2-Fluorobiphenyl	44	EPA 625
2,4,6-Tribromophenol	54	EPA 625

SPECTRA LABORATORIES


Steve Hibbs, Laboratory Manager
a14/gma

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

11/26/2003

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

Project: Yelm Groundwater Monitoring
Client ID: SC2 MW6
Sample Matrix: Water
Date Sampled: 10/22/2003
Date Received: 10/22/2003
Spectra Project: 2003100258
Spectra Number: 2

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Total Dissolved Solids	54.0	mg/L	EPA 160.1	N-Nitrosodimethylamine	<10	ug/L	EPA 625
Boron	0.02	ug/L	EPA 200.7	Fecal Coliform	5	/100	Membrane
Cadmium	< 3	ug/L	EPA 200.7	Fecal Streptococcus	10	/100	Membrane
Chromium	< 7	ug/L	EPA 200.7	TKN	<1	mg/L	SM 4500-N-B
Copper	6	ug/L	EPA 200.7	BOD	< 2	mg/L	SM 5210
Iron	720	ug/L	EPA 200.7	Bromide	< 0.1	mg/L	SM4500-Br-B
Manganese	860	ug/L	EPA 200.7	Chloride	3.0	mg/L	SM4500CL-C
Nickel	< 15	ug/L	EPA 200.7	Nitrite	< 0.01	mg/L-N	SM4500NO
Silver	< 7	ug/L	EPA 200.7	Nitrate	1.1	mg/L-N	SM4500NO
Zinc	< 6	ug/L	EPA 200.7	Anionic Surf. as MBAS	<0.02	mg/L	SM5540C
Arsenic	< 5	ug/L	EPA 206.2				
Lead	< 1	ug/L	EPA 239.2				
Mercury	<0.5	ug/L	EPA 245.1				
Fluoride	< 0.2	mg/L	EPA 340.2				
Ammonia	< 0.1	mg/L-N	EPA 350.3				
Sulfate	1	mg/L	EPA 375.4				
Dissolved Organic Carbon	4	mg/L	EPA 415.1				
Bromodichloromethane	<1	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	<1	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				

Surrogate	Recovery	Method
Dibromofluoromethane	85	EPA 624
Toluene-d8	106	EPA 624
4-Bromofluorobenzene	101	EPA 624
2-Fluorophenol	6	EPA 625

Surrogate	Recovery	Method
Phenol-d6	12	EPA 625
Nitrobenzene-d5	59	EPA 625
2-Fluorobiphenyl	47	EPA 625
2,4,6-Tribromophenol	32	EPA 625

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager
a14/gma

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

11/26/2003

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

Project: Yelm Groundwater Monitoring
Client ID: SC3 MW1
Sample Matrix: Water
Date Sampled: 10/22/2003
Date Received: 10/22/2003
Spectra Project: 2003100258
Spectra Number: 3

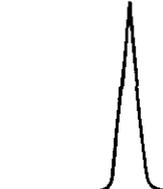
Analyte	Result	Units	Method	Analyte	Result	Units	Method
Total Dissolved Solids	62.0	mg/L	EPA 160.1	Fecal Coliform	0	/100	Membrane
Boron	0.02	ug/L	EPA 200.7	Fecal Streptococcus	990	/100	Membrane
Cadmium	< 3	ug/L	EPA 200.7	TKN	<1	mg/L	SM 4500-N-B
Chromium	< 7	ug/L	EPA 200.7	BOD	< 2	mg/L	SM 5210
Copper	< 6	ug/L	EPA 200.7	Bromide	< 0.1	mg/L	SM4500-Br-B
Iron	290	ug/L	EPA 200.7	Chloride	5.0	mg/L	SM4500CL-C
Manganese	56	ug/L	EPA 200.7	Nitrite	< 0.01	mg/L-N	SM4500NO2B
Nickel	< 15	ug/L	EPA 200.7	Nitrate	3.0	mg/L-N	SM4500NO3D
Silver	< 7	ug/L	EPA 200.7	Dissolved Organic Carbon	4	mg/L	SM5310B
Zinc	< 6	ug/L	EPA 200.7	Anionic Surf. as MBAS	<0.02	mg/L	SM5540C
Arsenic	< 5	ug/L	EPA 206.2				
Lead	< 1	ug/L	EPA 239.2				
Mercury	<0.5	ug/L	EPA 245.1				
Fluoride	< 0.2	mg/L	EPA 340.2				
Ammonia	< 0.1	mg/L-N	EPA 350.3				
Sulfate	< 1	mg/L	EPA 375.4				
Bromodichloromethane	<1	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	<1	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				
N-Nitrosodimethylamine	<10	ug/L	EPA 625				

Surrogate	Recovery	Method
Dibromofluoromethane	89	EPA 624
Toluene-d8	106	EPA 624
4-Bromofluorobenzene	102	EPA 624
2-Fluorophenol	47	EPA 625

Surrogate	Recovery	Method
Phenol-d6	81	EPA 625
Nitrobenzene-d5	100	EPA 625
2-Fluorobiphenyl	80	EPA 625
2,4,6-Tribromophenol	75	EPA 625

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager
a14/gma



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

10/06/2003

Skillings-Connolly, Inc.
 PO Box 5080
 Lacey, WA 98509
 Attn: Patrick Skillings

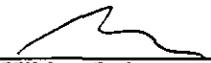
Project: Yelm Groundwater
 Client ID: SC3 MW1
 Sample Matrix: Water
 Date Sampled: 09/11/2003
 Date Received: 09/11/2003
 Spectra Project: 2003090138
 Spectra Number: 2

Analyte	Result	Units	Method
Total Dissolved Solids	81	mg/L	EPA 160.1
Bromodichloromethane	<1	ug/L	EPA 624
Bromoform	<1	ug/L	EPA 624
Chlorodibromomethane	<1	ug/L	EPA 624
Chloroform	<1	ug/L	EPA 624
Fecal Coliform	2*	/100 mls.	Membrane Filtration
Fecal Streptococcus	0	/100 mls.	Membrane Filtration
TKN	ND	mg/L	SM 4500-N-B
Chloride	4.0	mg/L	SM4500CL-C
Nitrite	< 0.01	mg/L	SM4500NO2B
Nitrate	2.91	mg/L-N	SM4500NO3D

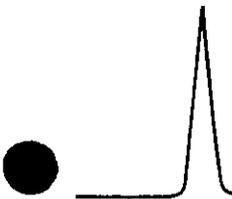
Fecal Coliform, Fecal Strep., and TKNs were analyzed by STL Seattle.

Surrogate	Recovery	Method
Dibromofluoromethane	93	EPA 624
Toluene-d8	99	EPA 624
4-Bromofluorobenzene	102	EPA 624

SPECTRA LABORATORIES



Steve Hibbs, Laboratory Manager
 as/sgh



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

10/06/2003

Skillings-Connolly, Inc.
 PO Box 5080
 Lacey, WA 98509
 Attn: Patrick Skillings

Project: Yelm Groundwater
 Client ID: SC4 MW2
 Sample Matrix: Water
 Date Sampled: 09/11/2003
 Date Received: 09/11/2003
 Spectra Project: 2003090138
 Spectra Number: 3

Analyte	Result	Units	Method
Total Dissolved Solids	149	mg/L	EPA 160.1
Bromodichloromethane	<1	ug/L	EPA 624
Bromoform	<1	ug/L	EPA 624
Chlorodibromomethane	<1	ug/L	EPA 624
Chloroform	<1	ug/L	EPA 624
Fecal Coliform	2	/100 mls.	Membrane Filtration
Fecal Streptococcus	4	/100 mls.	Membrane Filtration
TKN	ND	mg/L	SM 4500-N-B
Chloride	10.0	mg/L	SM4500CL-C
Nitrite	< 0.01	mg/L-N	SM4500NO2B
Nitrate	3.26	mg/L-N	SM4500NO3D

Surrogate	Recovery	Method
Dibromofluoromethane	96	EPA 624
Toluene-d8	98	EPA 624
4-Bromofluorobenzene	103	EPA 624

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager
 a5/sgb



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

10/06/2003

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

Project: Yelm Groundwater
Client ID: SC5 MW3
Sample Matrix: Water
Date Sampled: 09/11/2003
Date Received: 09/11/2003
Spectra Project: 2003090138
Spectra Number: 4

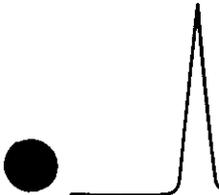
<u>Analyte</u>	<u>Result</u>	<u>Units</u>	<u>Method</u>
Total Dissolved Solids	255	mg/L	EPA 160.1
Bromodichloromethane	<1	ug/L	EPA 624
Bromoform	<1	ug/L	EPA 624
Chlorodibromomethane	<1	ug/L	EPA 624
Chloroform	<1	ug/L	EPA 624
Fecal Coliform	10	/100 mls.	Membrane Filtration
Fecal Streptococcus	0	/100 mls.	Membrane Filtration
TKN	ND	mg/L	SM 4500-N-B
Chloride	19.5	mg/L	SM4500CL-C
Nitrite	0.02	mg/L-N	SM4500NO2B
Nitrate	1.64	mg/L-N	SM4500NO3D

<u>Surrogate</u>	<u>Recovery</u>	<u>Method</u>
Dibromofluoromethane	96	EPA 624
Toluene-d8	98	EPA 624
4-Bromofluorobenzene	104	EPA 624

SPECTRA LABORATORIES



Steve Hibbs, Laboratory Manager
a5/sgb



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

10/06/2003

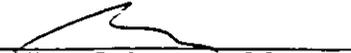
Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

Project: Yelm Groundwater
Client ID: SC6 MW4
Sample Matrix: Water
Date Sampled: 09/11/2003
Date Received: 09/11/2003
Spectra Project: 2003090138
Spectra Number: 5

Analyte	Result	Units	Method
Total Dissolved Solids	143	mg/L	EPA 160.1
Bromodichloromethane	<1	ug/L	EPA 624
Bromoform	<1	ug/L	EPA 624
Chlorodibromomethane	<1	ug/L	EPA 624
Chloroform	<1	ug/L	EPA 624
Fecal Coliform	2	/100 mls.	Membrane Filtration
Fecal Streptococcus	6	/100 mls.	Membrane Filtration
TKN	ND	mg/L	SM 4500-N-B
Chloride	61.5	mg/L	SM4500CL-C
Nitrite	< 0.01	mg/L-N	SM4500NO2B
Nitrate	3.02	mg/L-N	SM4500NO3D

Surrogate	Recovery	Method
Dibromofluoromethane	98	EPA 624
Toluene-d8	98	EPA 624
4-Bromofluorobenzene	103	EPA 624

SPECTRA LABORATORIES



Steve Hibbs, Laboratory Manager
a5/sgb



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

10/06/2003

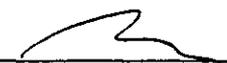
Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

Project: Yelm Groundwater
Client ID: SC7 MW5
Sample Matrix: Water
Date Sampled: 09/11/2003
Date Received: 09/11/2003
Spectra Project: 2003090138
Spectra Number: 6

<u>Analyte</u>	<u>Result</u>	<u>Units</u>	<u>Method</u>
Total Dissolved Solids	122	mg/L	EPA 160.1
Bromodichloromethane	<1	ug/L	EPA 624
Bromoform	<1	ug/L	EPA 624
Chlorodibromomethane	<1	ug/L	EPA 624
Chloroform	<1	ug/L	EPA 624
Fecal Coliform	8	/100 mls.	Membrane Filtration
Fecal Streptococcus	8	/100 mls.	Membrane Filtration
TKN	ND	mg/L	SM 4500-N-B
Chloride	21.5	mg/L	SM4500CL-C
Nitrite	0.01	mg/L-N	SM4500NO2B
Nitrate	2.76	mg/L-N	SM4500NO3D

<u>Surrogate</u>	<u>Recovery</u>	<u>Method</u>
Dibromofluoromethane	98	EPA 624
Toluene-d8	97	EPA 624
4-Bromofluorobenzene	103	EPA 624

SPECTRA LABORATORIES



Steve Hibbs, Laboratory Manager

a5/sgb

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

11/26/2003

Skillings-Connolly, Inc.
 PO Box 5080
 Lacey, WA 98509
 Attn: Patrick Skillings

Project: Yelm Groundwater Monitoring
 Client ID: SC8 IS
 Sample Matrix: Water
 Date Sampled: 10/22/2003
 Date Received: 10/22/2003
 Spectra Project: 2003100258
 Spectra Number: 4

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Total Dissolved Solids	249.0	mg/L	EPA 160.1	N-Nitrosodimethylamine	<10	ug/L	EPA 625
Boron	0.40	ug/L	EPA 200.7	Fecal Coliform	0	/100	Membrane
Cadmium	< 3	ug/L	EPA 200.7	Fecal Streptococcus	5	/100	Membrane
Chromium	< 7	ug/L	EPA 200.7	TKN	<1	mg/L	SM 4500-N-B
Copper	< 6	ug/L	EPA 200.7	BOD	< 2	mg/L	SM 5210
Iron	60	ug/L	EPA 200.7	Bromide	< 0.1	mg/L	SM4500-Br-B
Manganese	3	ug/L	EPA 200.7	Chloride	55.0	mg/L	SM4500CL-C
Nickel	< 15	ug/L	EPA 200.7	Nitrite	< 0.01	mg/L-N	SM4500NO2B
Silver	< 7	ug/L	EPA 200.7	Nitrate	3.9	mg/L-N	SM4500NO3D
Zinc	29	ug/L	EPA 200.7	Anionic Surf. as MBAS	0.060	mg/L	SM5540C
Arsenic	< 5	ug/L	EPA 206.2				
Lead	< 1	ug/L	EPA 239.2				
Mercury	<0.5	ug/L	EPA 245.1				
Fluoride	< 0.2	mg/L	EPA 340.2				
Ammonia	< 0.1	mg/L-N	EPA 350.3				
Sulfate	27	mg/L	EPA 375.4				
Dissolved Organic Carbon	9	mg/L	EPA 415.1				
Bromodichloromethane	11	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Chlorodibromomethane	1	ug/L	EPA 624				
Chloroform	35	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				

Surrogate	Recovery	Method
Dibromofluoromethane	92	EPA 624
Toluene-d8	109	EPA 624
4-Bromofluorobenzene	102	EPA 624
2-Fluorophenol	51	EPA 625

Surrogate	Recovery	Method
Phenol-d6	77	EPA 625
Nitrobenzene-d5	90	EPA 625
2-Fluorobiphenyl	76	EPA 625
2,4,6-Tribromophenol	73	EPA 625

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager

al4/gma



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

11/26/2003

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

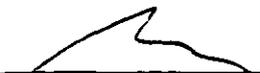
Project: Yelm Groundwater Monitoring
Client ID: SC9 CS1
Sample Matrix: Water
Date Sampled: 10/22/2003
Date Received: 10/22/2003
Spectra Project: 2003100258
Spectra Number: 5

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Total Dissolved Solids	241.0	mg/L	EPA 160.1	N-Nitrosodimethylamine	<10	ug/L	EPA 625
Boron	0.40	ug/L	EPA 200.7	Fecal Coliform	>1500	/100	Membrane
Cadmium	<3	ug/L	EPA 200.7	Fecal Streptococcus	>1500	/100	Membrane
Chromium	<7	ug/L	EPA 200.7	TKN	1.4	mg/L	SM 4500-N-B
Copper	<6	ug/L	EPA 200.7	BOD	3	mg/L	SM 5210
Iron	200	ug/L	EPA 200.7	Bromide	<0.1	mg/L	SM4500-Br-B
Manganese	60	ug/L	EPA 200.7	Chloride	55.0	mg/L	SM4500CL-C
Nickel	<15	ug/L	EPA 200.7	Nitrite	0.03	mg/L-N	SM4500NO ₂ -D
Silver	<7	ug/L	EPA 200.7	Nitrate	1.4	mg/L-N	SM4500NO ₃ -D
Zinc	14	ug/L	EPA 200.7	Anionic Surf. as MBAS	0.053	mg/L	SM5540C
Arsenic	<5	ug/L	EPA 206.2				
Lead	<1	ug/L	EPA 239.2				
Mercury	<0.5	ug/L	EPA 245.1				
Fluoride	<0.2	mg/L	EPA 340.2				
Ammonia	1.0	mg/L-N	EPA 350.3				
Sulfate	24	mg/L	EPA 375.4				
Dissolved Organic Carbon	10	mg/L	EPA 415.1				
Bromodichloromethane	3	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	14	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				

Surrogate	Recovery	Method
Dibromofluoromethane	96	EPA 624
Toluene-d8	107	EPA 624
4-Bromofluorobenzene	100	EPA 624
2-Fluorophenol	21	EPA 625

Surrogate	Recovery	Method
Phenol-d6	48	EPA 625
Nitrobenzene-d5	54	EPA 625
2-Fluorobiphenyl	53	EPA 625
2,4,6-Tribromophenol	72	EPA 625

SPECTRA LABORATORIES



Steve Hibbs, Laboratory Manager
a14/gma

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

11/26/2003

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

Project: Yelm Groundwater Monitoring
Client ID: SC10 CS2
Sample Matrix: Water
Date Sampled: 10/22/2003
Date Received: 10/22/2003
Spectra Project: 2003100258
Spectra Number: 6

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Total Dissolved Solids	336.0	mg/L	EPA 160.1	N-Nitrosodimethylamine	<10	ug/L	EPA 625
Boron	0.41	ug/L	EPA 200.7	Fecal Coliform	1080	/100	Membrane
Cadmium	< 3	ug/L	EPA 200.7	Fecal Streptococcus	>1500	/100	Membrane
Chromium	< 7	ug/L	EPA 200.7	TKN	1.8	mg/L	SM 4500-N-B
Copper	< 6	ug/L	EPA 200.7	BOD	8	mg/L	SM 5210
Iron	310	ug/L	EPA 200.7	Bromide	< 0.1	mg/L	SM4500-Br-B
Manganese	94	ug/L	EPA 200.7	Chloride	63.0	mg/L	SM4500CL-C
Nickel	< 15	ug/L	EPA 200.7	Nitrite	0.01	mg/L-N	SM4500NO2B
Silver	< 7	ug/L	EPA 200.7	Nitrate	0.6	mg/L-N	SM4500NO3D
Zinc	8	ug/L	EPA 200.7	Anionic Surf. as MBAS	0.025	mg/L	SM5540C
Arsenic	< 5	ug/L	EPA 206.2				
Lead	< 1	ug/L	EPA 239.2				
Mercury	<0.5	ug/L	EPA 245.1				
Fluoride	< 0.2	mg/L	EPA 340.2				
Ammonia	0.2	mg/L-N	EPA 350.3				
Sulfate	22	mg/L	EPA 375.4				
Dissolved Organic Carbon	12	mg/L	EPA 415.1				
Bromodichloromethane	<1	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	1	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				

Surrogate	Recovery	Method
Dibromofluoromethane	94	EPA 624
Toluene-d8	109	EPA 624
4-Bromofluorobenzene	102	EPA 624
2-Fluorophenol	34	EPA 625

Surrogate	Recovery	Method
Phenol-d6	59	EPA 625
Nitrobenzene-d5	79	EPA 625
2-Fluorobiphenyl	69	EPA 625
2,4,6-Tribromophenol	72	EPA 625

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager

a14/gma

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

1-1/26/2003

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

Project: Yelm Groundwater Monitoring
Client ID: SC11 CS3
Sample Matrix: Water
Date Sampled: 10/22/2003
Date Received: 10/22/2003
Spectra Project: 2003100258
Spectra Number: 7

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Total Dissolved Solids	360.0	mg/L	EPA 160.1	N-Nitrosodimethylamine	<10	ug/L	EPA 625
Boron	0.42	ug/L	EPA 200.7	Fecal Coliform	>1500	/100	Membrane
Cadmium	< 3	ug/L	EPA 200.7	Fecal Streptococcus	260	/100	Membrane
Chromium	< 7	ug/L	EPA 200.7	TKN	1.3	mg/L	SM 4500-N-B
Copper	< 6	ug/L	EPA 200.7	BOD	3	mg/L	SM 5210
Iron	190	ug/L	EPA 200.7	Bromide	< 0.1	mg/L	SM4500-Br-B
Manganese	66	ug/L	EPA 200.7	Chloride	61.5	mg/L	SM4500CL-C
Nickel	< 15	ug/L	EPA 200.7	Nitrite	< 0.01	mg/L-N	SM4500NO2B
Silver	< 7	ug/L	EPA 200.7	Nitrate	0.5	mg/L-N	SM4500N
Zinc	< 6	ug/L	EPA 200.7	Anionic Surf. as MBAS	<0.02	mg/L	SM5540C
Arsenic	< 5	ug/L	EPA 206.2				
Lead	< 1	ug/L	EPA 239.2				
Mercury	<0.5	ug/L	EPA 245.1				
Fluoride	< 0.2	mg/L	EPA 340.2				
Ammonia	0.3	mg/L-N	EPA 350.3				
Sulfate	22	mg/L	EPA 375.4				
Dissolved Organic Carbon	7	mg/L	EPA 415.1				
Bromodichloromethane	<1	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	<1	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				

*Microbiological tests were performed by STL-Seattle.

Surrogate	Recovery	Method
Dibromofluoromethane	93	EPA 624
Toluene-d8	109	EPA 624
4-Bromofluorobenzene	100	EPA 624
2-Fluorophenol	28	EPA 625

Surrogate	Recovery	Method
Phenol-d6	50	EPA 625
Nitrobenzene-d5	55	EPA 625
2-Fluorobiphenyl	52	EPA 625
2,4,6-Tribromophenol	67	EPA 625

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager
al4/gma

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

11/26/2003

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

Project: Yelm Groundwater Monitoring
Client ID: SC12 CS4
Sample Matrix: Water
Date Sampled: 10/22/2003
Date Received: 10/22/2003
Spectra Project: 2003100258
Spectra Number: 8

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Total Dissolved Solids	308.0	mg/L	EPA 160.1	N-Nitrosodimethylamine	<10	ug/L	EPA 625
Boron	0.39	ug/L	EPA 200.7	Fecal Coliform	930	/100	Membrane
Cadmium	< 3	ug/L	EPA 200.7	Fecal Streptococcus	860	/100	Membrane
Chromium	< 7	ug/L	EPA 200.7	TKN	<1	mg/L	SM 4500-N-B
Copper	< 6	ug/L	EPA 200.7	BOD	5	mg/L	SM 5210
Iron	160	ug/L	EPA 200.7	Bromide	< 0.1	mg/L	SM4500-Br-B
Manganese	170	ug/L	EPA 200.7	Chloride	61.0	mg/L	SM4500CL-C
Nickel	< 15	ug/L	EPA 200.7	Nitrite	< 0.01	mg/L-N	SM4500NO2B
Silver	< 7	ug/L	EPA 200.7	Nitrate	0.4	mg/L-N	SM4500NO3D
Zinc	< 6	ug/L	EPA 200.7	Anionic Surf. as MBAS	0.029	mg/L	SM5540C
Arsenic	< 5	ug/L	EPA 206.2				
Lead	< 1	ug/L	EPA 239.2				
Mercury	<0.5	ug/L	EPA 245.1				
Fluoride	< 0.2	mg/L	EPA 340.2				
Ammonia	< 0.1	mg/L-N	EPA 350.3				
Sulfate	18	mg/L	EPA 375.4				
Dissolved Organic Carbon	7	mg/L	EPA 415.1				
Bromodichloromethane	<1	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	<1	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				

Surrogate	Recovery	Method
Dibromofluoromethane	95	EPA 624
Toluene-d8	109	EPA 624
4-Bromofluorobenzene	100	EPA 624
2-Fluorophenol	28	EPA 625

Surrogate	Recovery	Method
Phenol-d6	46	EPA 625
Nitrobenzene-d5	49	EPA 625
2-Fluorobiphenyl	50	EPA 625
2,4,6-Tribromophenol	75	EPA 625

SPECTRA LABORATORIES


Steve Hibbs, Laboratory Manager
a14/gma



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

11/26/2003

Skillings-Connolly, Inc.
 PO Box 5080
 Lacey, WA 98509
 Attn: Patrick Skillings

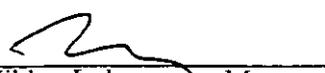
Project: Yelm Groundwater Monitoring
 Client ID: SC13 FD
 Sample Matrix: Water
 Date Sampled: 10/22/2003
 Date Received: 10/22/2003
 Spectra Project: 2003100258
 Spectra Number: 9

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Total Dissolved Solids	253.8	mg/L	EPA 160.1	N-Nitrosodimethylamine	<10	ug/L	EPA 625
Boron	0.42	ug/L	EPA 200.7	Fecal Coliform	240	/100	Membrane
Cadmium	< 3	ug/L	EPA 200.7	Fecal Streptococcus	220	/100	Membrane
Chromium	< 7	ug/L	EPA 200.7	TKN	<1	mg/L	SM 4500-N-B
Copper	< 6	ug/L	EPA 200.7	BOD	2	mg/L	SM 5210
Iron	220	ug/L	EPA 200.7	Bromide	< 0.1	mg/L	SM4500-Br-B
Manganese	70	ug/L	EPA 200.7	Chloride	62.5	mg/L	SM4500CL-C
Nickel	< 15	ug/L	EPA 200.7	Nitrite	< 0.01	mg/L-N	SM4500NO2P
Silver	< 7	ug/L	EPA 200.7	Nitrate	0.4	mg/L-N	SM4500NO3P
Zinc	< 6	ug/L	EPA 200.7	Anionic Surf. as MBAS	0.023	mg/L	SM5540C
Arsenic	< 5	ug/L	EPA 206.2				
Lead	< 1	ug/L	EPA 239.2				
Mercury	<0.5	ug/L	EPA 245.1				
Fluoride	< 0.2	mg/L	EPA 340.2				
Ammonia	0.3	mg/L-N	EPA 350.3				
Sulfate	7	mg/L	EPA 375.4				
Dissolved Organic Carbon	7	mg/L	EPA 415.1				
Bromodichloromethane	<1	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	<1	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				

Surrogate	Recovery	Method
Dibromofluoromethane	94	EPA 624
Toluene-d8	108	EPA 624
4-Bromofluorobenzene	101	EPA 624
2-Fluorophenol	0	EPA 625

Surrogate	Recovery	Method
Phenol-d6	14	EPA 625
Nitrobenzene-d5	10	EPA 625
2-Fluorobiphenyl	27	EPA 625
2,4,6-Tribromophenol	71	EPA 625

SPECTRA LABORATORIES


 Steve Hibbs, Laboratory Manager
 a14/gma

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

11/26/2003

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

Project: Yelm Groundwater Monitoring
Client ID: RW
Sample Matrix: Water
Date Sampled: 10/22/2003
Date Received: 10/22/2003
Spectra Project: 2003100258
Spectra Number: 10

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Total Dissolved Solids	268.8	mg/L	EPA 160.1	N-Nitrosodimethylamine	<10	ug/L	EPA 625
Boron	0.41	ug/L	EPA 200.7	Fecal Coliform	0	/100	Membrane
Cadmium	< 3	ug/L	EPA 200.7	Fecal Streptococcus	0	/100	Membrane
Chromium	< 7	ug/L	EPA 200.7	TKN	<1	mg/L	SM 4500-N-B
Copper	< 6	ug/L	EPA 200.7	BOD	< 2	mg/L	SM 5210
Iron	< 15	ug/L	EPA 200.7	Bromide	< 0.1	mg/L	SM4500-Br-B
Manganese	< 2	ug/L	EPA 200.7	Chloride	55.0	mg/L	SM4500CL-C
Nickel	< 15	ug/L	EPA 200.7	Nitrite	< 0.01	mg/L-N	SM4500NO2B
Sulfur	< 7	ug/L	EPA 200.7	Nitrate	3.7	mg/L-N	SM4500NO3D
Zinc	29	ug/L	EPA 200.7	Anionic Surf. as MBAS	0.021	mg/L	SM5540C
Arsenic	< 5	ug/L	EPA 206.2				
Lead	< 1	ug/L	EPA 239.2				
Mercury	<0.5	ug/L	EPA 245.1				
Fluoride	< 0.2	mg/L	EPA 340.2				
Ammonia	< 0.1	mg/L-N	EPA 350.3				
Sulfate	26	mg/L	EPA 375.4				
Dissolved Organic Carbon	4	mg/L	EPA 415.1				
Bromodichloromethane	12	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Chlorodibromomethane	2	ug/L	EPA 624				
Chloroform	30	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				

Surrogate	Recovery	Method
Dibromofluoromethane	96	EPA 624
Toluene-d8	109	EPA 624
4-Bromofluorobenzene	103	EPA 624
2-Fluorophenol	0	EPA 625

Surrogate	Recovery	Method
Phenol-d6	4	EPA 625
Nitrobenzene-d5	47	EPA 625
2-Fluorobiphenyl	48	EPA 625
2,4,6-Tribromophenol	51	EPA 625

SPECTRA LABORATORIES


Steve Hibbs, Laboratory Manager
a14/gma

STL Seattle

Client Name
Project Name
Date Received

Spectra Laboratories
2003090138
09-11-03

General Chemistry Parameters

Client Sample ID 2003090138-01
Lab ID 116053-01

Parameter	Method	Date Analyzed	Units	Result	PQL
Fecal Coliform, MF	SM 9222D	09-11-03	CFU/100 ml	0	2
Fecal Strep	SM 9230C	09-11-03	CFU/100 ml	0	2

Client Sample ID 2003090138-02
Lab ID 116053-02

Parameter	Method	Date Analyzed	Units	Result	PQL
Fecal Coliform, MF	SM 9222D	09-11-03	CFU/100 ml	12	2
Fecal Strep	SM 9230C	09-11-03	CFU/100 ml	6	2
Total Kjeldahl Nitrogen	EPA 351.2	09-22-03	mg/L	ND	0.5

Client Sample ID 2003090138-03
Lab ID 116053-03

Parameter	Method	Date Analyzed	Units	Result	PQL
Fecal Coliform, MF	SM 9222D	09-11-03	CFU/100 ml	2	2
Fecal Strep	SM 9230C	09-11-03	CFU/100 ml	0	2
Total Kjeldahl Nitrogen	EPA 351.2	09-22-03	mg/L	ND	0.5

Client Sample ID 2003090138-04
Lab ID 116053-04

Parameter	Method	Date Analyzed	Units	Result	PQL
Fecal Coliform, MF	SM 9222D	09-11-03	CFU/100 ml	2	2
Fecal Strep	SM 9230C	09-11-03	CFU/100 ml	4	2
Total Kjeldahl Nitrogen	EPA 351.2	09-22-03	mg/L	ND	0.5

Client Sample ID 2003090138-05
Lab ID 116053-05

Parameter	Method	Date Analyzed	Units	Result	PQL
Fecal Coliform, MF	SM 9222D	09-11-03	CFU/100 ml	10	2
Fecal Strep	SM 9230C	09-11-03	CFU/100 ml	0	2
Total Kjeldahl Nitrogen	EPA 351.2	09-22-03	mg/L	ND	0.5

STL Seattle

Client Sample ID 2003090138-06
Lab ID 116053-06

Parameter	Method	Date Analyzed	Units	Result	PQL
Fecal Coliform, MF	SM 9222D	09-11-03	CFU/100 ml	2	2
Fecal Strep	SM 9230C	09-11-03	CFU/100 ml	6	2
Total Kjeldahl Nitrogen	EPA 351.2	09-22-03	mg/L	ND	0.5

Client Sample ID 2003090138-07
Lab ID 116053-07

Parameter	Method	Date Analyzed	Units	Result	PQL
Fecal Coliform, MF	SM 9222D	09-11-03	CFU/100 ml	8	2
Fecal Strep	SM 9230C	09-11-03	CFU/100 ml	8	2
Total Kjeldahl Nitrogen	EPA 351.2	09-22-03	mg/L	ND	0.5

Client Sample ID 2003090138-08
Lab ID 116053-08

Parameter	Method	Date Analyzed	Units	Result	PQL
Fecal Coliform, MF	SM 9222D	09-11-03	CFU/100 ml	> 900	2
Fecal Strep	SM 9230C	09-11-03	CFU/100 ml	730	2

Client Sample ID 2003090138-09
Lab ID 116053-09

Parameter	Method	Date Analyzed	Units	Result	PQL
Fecal Coliform, MF	SM 9222D	09-11-03	CFU/100 ml	> 900	2
Fecal Strep	SM 9230C	09-11-03	CFU/100 ml	210	2

Client Sample ID 2003090138-10
Lab ID 116053-10

Parameter	Method	Date Analyzed	Units	Result	PQL
Fecal Coliform, MF	SM 9222D	09-11-03	CFU/100 ml	170	2
Fecal Strep	SM 9230C	09-11-03	CFU/100 ml	150	2

Client Sample ID 2003090138-11
Lab ID 116053-11

Parameter	Method	Date Analyzed	Units	Result	PQL
Fecal Coliform, MF	SM 9222D	09-11-03	CFU/100 ml	36	2
Fecal Strep	SM 9230C	09-11-03	CFU/100 ml	22	2

STL Seattle

Client Sample ID 2003090138-12
Lab ID 116053-12

Parameter	Method	Date Analyzed	Units	Result	PQL
Fecal Coliform, MF	SM 9222D	09-11-03	CFU/100 ml	74	2
Fecal Strep	SM 9230C	09-11-03	CFU/100 ml	32	2

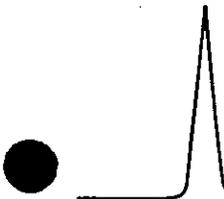
Client Sample ID 2003090138-13
Lab ID 116053-13

Parameter	Method	Date Analyzed	Units	Result	PQL
Fecal Coliform, MF	SM 9222D	09-11-03	CFU/100 ml	2	2
Fecal Strep	SM 9230C	09-11-03	CFU/100 ml	0	2

Client Sample ID 2003090138-14
Lab ID 116053-14

Parameter	Method	Date Analyzed	Units	Result	PQL
Fecal Coliform, MF	SM 9222D	09-11-03	CFU/100 ml	0	2
Fecal Strep	SM 9230C	09-11-03	CFU/100 ml	0	2

8th



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

03/18/2004

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

Project: Yelm Groundwater Monitoring
Client ID: SC1 CW
Sample Matrix: Water
Date Sampled: 12/10/2003
Date Received: 12/10/2003
Spectra Project: 2003120127
Spectra Number: 1

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Total Dissolved Solids	113	mg/L	EPA 160.1	N-Nitrosodimethylamine	<10	ug/L	EPA 625
Boron	< 30	ug/L	EPA 200.7	Fecal Coliform	<2**	/100	Membrane
Cadmium	< 3	ug/L	EPA 200.7	Fecal Streptococcus	<2	/100	Membrane
Chromium	< 7	ug/L	EPA 200.7	TKN	<1	mg/L	SM 4500-N-B
Copper	60	ug/L	EPA 200.7	BOD	< 2	mg/L	SM 5210
Iron	< 15	ug/L	EPA 200.7	Bromide	0.2	mg/L	SM4500-Br-B
Manganese	3	ug/L	EPA 200.7	Chloride	7.0	mg/L	SM4500CL-C
Nickel	< 15	ug/L	EPA 200.7	Nitrite	< 0.01	mg/L-N	SM4500NO2B
Silver	< 7	ug/L	EPA 200.7	Nitrate	2.4	mg/L-N	SM4500NO3D
Zinc	7	ug/L	EPA 200.7	Anionic Surf. as MBAS	<0.02	mg/L	SM5540C
Arsenic by GFAA	< 5	ug/L	EPA 206.2				
Lead by GFAA	2	ug/L	EPA 239.2				
Mercury	<0.5	ug/L	EPA 245.1				
Fluoride	< 0.2	mg/L	EPA 340.2				
Ammonia	< 0.2	mg/L-N	EPA 350.3				
Sulfate	6	mg/L	EPA 375.4				
Dissolved Organic Carbon	2	mg/L	EPA 415.1				
Bromodichloromethane	<1	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	<1	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				

** Analysis was performed by Water Management Laboratories, Inc

Surrogate	Recovery	Method
Dibromofluoromethane	87	EPA 624
Toluene-d8	99	EPA 624
4-Bromofluorobenzene	99	EPA 624
2-Fluorophenol	52	EPA 625

Surrogate	Recovery	Method
Phenol-d6	58	EPA 625
Nitrobenzene-d5	54	EPA 625
2-Fluorobiphenyl	63	EPA 625
2,4,6-Tribromophenol	80	EPA 625

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager
a14/mlh

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

03/18/2004

Skillings-Connolly, Inc.
 PO Box 5080
 Lacey, WA 98509
 Attn: Patrick Skillings

Project: Yelm Groundwater Monitoring
 Client ID: SC2 MW6
 Sample Matrix: Water
 Date Sampled: 12/10/2003
 Date Received: 12/10/2003
 Spectra Project: 2003120127
 Spectra Number: 2

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Total Dissolved Solids	119	mg/L	EPA 160.1	N-Nitrosodimethylamine	<10	ug/L	EPA 625
Boron	< 30	ug/L	EPA 200.7	Fecal Coliform	<2	/100	Membrane
Cadmium	< 3	ug/L	EPA 200.7	Fecal Streptococcus	46	/100	Membrane
Chromium	< 7	ug/L	EPA 200.7	TKN	<1	mg/L	SM 4500-N-B
Copper	31	ug/L	EPA 200.7	BOD	< 2	mg/L	SM 5210
Iron	840	ug/L	EPA 200.7	Bromide	< 0.1	mg/L	SM4500-Br-B
Manganese	1000	ug/L	EPA 200.7	Chloride	4.5	mg/L	SM4500CL-C
Nickel	< 15	ug/L	EPA 200.7	Nitrite	< 0.01	mg/L-N	SM4500NO2B
Silver	< 7	ug/L	EPA 200.7	Nitrate	4.0	mg/L-N	SM4500NO3
Zinc	< 6	ug/L	EPA 200.7	Anionic Surf. as MBAS	<0.02	mg/L	SM5540C
Arsenic by GFAA	< 5	ug/L	EPA 206.2				
Lead by GFAA	< 1	ug/L	EPA 239.2				
Mercury	<0.5	ug/L	EPA 245.1				
Fluoride	< 0.2	mg/L	EPA 340.2				
Ammonia	< 0.2	mg/L-N	EPA 350.3				
Sulfate	6	mg/L	EPA 375.4				
Dissolved Organic Carbon	5	mg/L	EPA 415.1				
Bromodichloromethane	<1	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	<1	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				

Surrogate	Recovery	Method
Dibromofluoromethane	87	EPA 624
Toluene-d8	99	EPA 624
4-Bromofluorobenzene	102	EPA 624
2-Fluorophenol	88	EPA 625

Surrogate	Recovery	Method
Phenol-d6	83	EPA 625
Nitrobenzene-d5	101	EPA 625
2-Fluorobiphenyl	104	EPA 625
2,4,6-Tribromophenol	112	EPA 625

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager
 a14/mlh

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

03/18/2004

Skillings-Connolly, Inc.
 PO Box 5080
 Lacey, WA 98509
 Attn: Patrick Skillings

Project: Yelm Groundwater Monitoring
 Client ID: SC3 MW1
 Sample Matrix: Water
 Date Sampled: 12/10/2003
 Date Received: 12/10/2003
 Spectra Project: 2003120127
 Spectra Number: 3

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Total Dissolved Solids	87.0	mg/L	EPA 160.1	N-Nitrosodimethylamine	<10	ug/L	EPA 625
Boron	< 30	ug/L	EPA 200.7	Fecal Coliform	<2	/100	Membrane
Cadmium	< 3	ug/L	EPA 200.7	Fecal Streptococcus	62	/100	Membrane
Chromium	< 7	ug/L	EPA 200.7	TKN	<1	mg/L	SM 4500-N-B
Copper	45	ug/L	EPA 200.7	BOD	< 2	mg/L	SM 5210
Iron	2000	ug/L	EPA 200.7	Bromide	0.1	mg/L	SM4500-Br-B
Manganese	110	ug/L	EPA 200.7	Chloride	6.0	mg/L	SM4500CL-C
Nickel	< 15	ug/L	EPA 200.7	Nitrite	< 0.01	mg/L-N	SM4500NO2B
Silver	< 7	ug/L	EPA 200.7	Nitrate	2.4	mg/L-N	SM4500NO3D
Zinc	20	ug/L	EPA 200.7	Anionic Surf. as MBAS	<0.02	mg/L	SM5540C
Arsenic by GFAA	< 5	ug/L	EPA 206.2				
Lead by GFAA	1	ug/L	EPA 239.2				
Mercury	<0.5	ug/L	EPA 245.1				
Fluoride	< 0.2	mg/L	EPA 340.2				
Ammonia	< 0.2	mg/L-N	EPA 350.3				
Sulfate	6	mg/L	EPA 375.4				
Dissolved Organic Carbon	3	mg/L	EPA 415.1				
Bromodichloromethane	<1	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	<1	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				

Surrogate	Recovery	Method
Dibromofluoromethane	86	EPA 624
Toluene-d8	97	EPA 624
4-Bromofluorobenzene	100	EPA 624
2-Fluorophenol	39	EPA 625

Surrogate	Recovery	Method
Phenol-d6	44	EPA 625
Nitrobenzene-d5	42	EPA 625
2-Fluorobiphenyl	49	EPA 625
2,4,6-Tribromophenol	53	EPA 625

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager
 a14/mih

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

03/18/2004

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

Project: Yelm Groundwater Monitoring
Client ID: SC4 MW2
Sample Matrix: Water
Date Sampled: 12/10/2003
Date Received: 12/10/2003
Spectra Project: 2003120127
Spectra Number: 4

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Total Dissolved Solids	169	mg/L	EPA 160.1	N-Nitrosodimethylamine	<10	ug/L	EPA 625
Boron	40	ug/L	EPA 200.7	Fecal Coliform	<2	/100	Membrane
Cadmium	<3	ug/L	EPA 200.7	Fecal Streptococcus	70	/100	Membrane
Chromium	<7	ug/L	EPA 200.7	TKN	<1	mg/L	SM 4500-N-B
Copper	43	ug/L	EPA 200.7	BOD	<2	mg/L	SM 5210
Iron	5400	ug/L	EPA 200.7	Bromide	<0.1	mg/L	SM4500-Br-B
Manganese	110	ug/L	EPA 200.7	Chloride	40	mg/L	SM4500CL-C
Nickel	<15	ug/L	EPA 200.7	Nitrite	<0.01	mg/L-N	SM4500NO ₂ -D
Silver	<7	ug/L	EPA 200.7	Nitrate	1.5	mg/L-N	SM4500NO ₃ -D
Zinc	16	ug/L	EPA 200.7	Anionic Surf. as MBAS	<0.02	mg/L	SM5540C
Arsenic by GFAA	<5	ug/L	EPA 206.2				
Lead by GFAA	2	ug/L	EPA 239.2				
Mercury	<0.5	ug/L	EPA 245.1				
Fluoride	<0.2	mg/L	EPA 340.2				
Ammonia	<0.2	mg/L-N	EPA 350.3				
Sulfate	15	mg/L	EPA 375.4				
Dissolved Organic Carbon	4	mg/L	EPA 415.1				
Bromodichloromethane	<1	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	<1	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				

Surrogate	Recovery	Method
Dibromofluoromethane	90	EPA 624
Toluene-d8	96	EPA 624
4-Bromofluorobenzene	100	EPA 624
2-Fluorophenol	68	EPA 625

Surrogate	Recovery	Method
Phenol-d6	74	EPA 625
Nitrobenzene-d5	70	EPA 625
2-Fluorobiphenyl	81	EPA 625
2,4,6-Tribromophenol	99	EPA 625

SPECTRA LABORATORIES


Steve Hibbs, Laboratory Manager
al4/mlh

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

01/22/2004

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

Project: Yelm Groundwater
Client ID: SC5 MW3
Sample Matrix: Water
Date Sampled: 12/18/2003
Date Received: 12/18/2003
Spectra Project: 2003120242
Spectra Number: 1

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Total Dissolved Solids	184	mg/L	EPA 160.1	N-Nitrosodimethylamine	<10	ug/L	EPA 625
Boron	130	ug/L	EPA 200.7	Fecal Coliform	<2	/100	Membrane
Cadmium	< 0.003	ug/L	EPA 200.7	Fecal Streptococcus	<2	/100	Membrane
Chromium	< 0.007	ug/L	EPA 200.7	TKN	<1	mg/L	SM 4500-N-B
Copper	0.007	ug/L	EPA 200.7	BOD	< 2	mg/L	SM 5210
Iron	1.6	ug/L	EPA 200.7	Bromide	< 0.1	mg/L	SM4500-Br-B
Manganese	0.023	ug/L	EPA 200.7	Chloride	35	mg/L	SM4500CL-C
Nickel	< 0.015	ug/L	EPA 200.7	Nitrite	< 0.01	mg/L-N	SM4500NO2B
Silver	< 0.007	ug/L	EPA 200.7	Nitrate	3.6	mg/L-N	SM4500NO3D
Zinc	0.056	ug/L	EPA 200.7	Anionic Surf. as MBAS	<0.02	mg/L	SM5540C
Arsenic by GFAA	< 5	ug/L	EPA 206.2				
Lead by GFAA	< 1	ug/L	EPA 239.2				
Mercury	<0.5	ug/L	EPA 245.1				
Fluoride	< 0.2	mg/L	EPA 340.2				
Ammonia	<0.1	mg/L-N	EPA 350.3				
Sulfate	25	mg/L	EPA 375.4				
Dissolved Organic Carbon	< 2	mg/L	EPA 415.1				
Bromodichloromethane	<1	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	<1	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				

*Microbiological samples were analyzed by Water management Laboratories, Inc

Surrogate	Recovery	Method
Dibromofluoromethane	87	EPA 624
Toluene-d8	96	EPA 624
4-Bromofluorobenzene	99	EPA 624
2-Fluorophenol	36	EPA 625

Surrogate	Recovery	Method
Phenol-d6	48	EPA 625
Nitrobenzene-d5	41	EPA 625
2-Fluorobiphenyl	53	EPA 625
2,4,6-Tribromophenol	64	EPA 625

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager

sl4/gma



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

01/22/2004

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

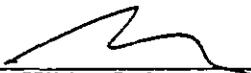
Project: Yelm Groundwater
Client ID: SC6 MW4
Sample Matrix: Water
Date Sampled: 12/18/2003
Date Received: 12/18/2003
Spectra Project: 2003120242
Spectra Number: 2

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Total Dissolved Solids	114	mg/L	EPA 160.1	N-Nitrosodimethylamine	<10	ug/L	EPA 625
Boron	110	ug/L	EPA 200.7	Fecal Coliform	<2	/100	Membrane
Cadmium	< 0.003	ug/L	EPA 200.7	Fecal Streptococcus	<2	/100	Membrane
Chromium	< 0.007	ug/L	EPA 200.7	TKN	<1	mg/L	SM 4500-N-B
Copper	< 0.006	ug/L	EPA 200.7	BOD	< 2	mg/L	SM 5210
Iron	0.44	ug/L	EPA 200.7	Bromide	< 0.1	mg/L	SM4500-Br-B
Manganese	< 0.002	ug/L	EPA 200.7	Chloride	24	mg/L	SM4500CL-C
Nickel	< 0.015	ug/L	EPA 200.7	Nitrite	< 0.01	mg/L-N	SM4500NO ₂ -B
Silver	< 0.007	ug/L	EPA 200.7	Nitrate	1.6	mg/L-N	SM4500NO ₃ -B
Zinc	0.036	ug/L	EPA 200.7	Anionic Surf. as MBAS	<0.02	mg/L	SM5540C
Arsenic by GFAA	< 5	ug/L	EPA 206.2				
Lead by GFAA	< 1	ug/L	EPA 239.2				
Mercury	<0.5	ug/L	EPA 245.1				
Fluoride	< 0.2	mg/L	EPA 340.2				
Ammonia	<0.1	mg/L-N	EPA 350.3				
Sulfate	10	mg/L	EPA 375.4				
Dissolved Organic Carbon	< 2	mg/L	EPA 415.1				
Bromodichloromethane	<1	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	<1	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				

Surrogate	Recovery	Method
Dibromofluoromethane	89	EPA 624
Toluene-d8	96	EPA 624
4-Bromofluorobenzene	97	EPA 624
2-Fluorophenol	39	EPA 625

Surrogate	Recovery	Method
Phenol-d6	49	EPA 625
Nitrobenzene-d5	41	EPA 625
2-Fluorobiphenyl	50	EPA 625
2,4,6-Tribromophenol	58	EPA 625

SPECTRA LABORATORIES



Steve Hibbs, Laboratory Manager

a14/gma

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

01/22/2004

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

Project: Yelm Groundwater
Client ID: SC7 MW5
Sample Matrix: Water
Date Sampled: 12/18/2003
Date Received: 12/18/2003
Spectra Project: 2003120242
Spectra Number: 3

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Total Dissolved Solids	114	mg/L	EPA 160.1	N-Nitrosodimethylamine	<10	ug/L	EPA 625
Boron	80	ug/L	EPA 200.7	Fecal Coliform	<2	/100	Membrane
Cadmium	<0.003	ug/L	EPA 200.7	Fecal Streptococcus	<2	/100	Membrane
Chromium	<0.007	ug/L	EPA 200.7	TKN	<1	mg/L	SM 4500-N-B
Copper	<0.006	ug/L	EPA 200.7	BOD	<2	mg/L	SM 5210
Iron	0.16	ug/L	EPA 200.7	Bromide	<0.1	mg/L	SM4500-Br-B
Manganese	<0.002	ug/L	EPA 200.7	Chloride	24	mg/L	SM4500CL-C
Nickel	<0.015	ug/L	EPA 200.7	Nitrite	<0.01	mg/L-N	SM4500NO2B
Silver	<0.007	ug/L	EPA 200.7	Nitrate	2.4	mg/L-N	SM4500NO3D
Zinc	0.028	ug/L	EPA 200.7	Anionic Surf. as MBAS	<0.02	mg/L	SM5540C
Arsenic by GFAA	<5	ug/L	EPA 206.2				
Lead by GFAA	<1	ug/L	EPA 239.2				
Mercury	<0.5	ug/L	EPA 245.1				
Fluoride	<0.2	mg/L	EPA 340.2				
Ammonia	<0.1	mg/L-N	EPA 350.3				
Sulfate	10	mg/L	EPA 375.4				
Dissolved Organic Carbon	<2	mg/L	EPA 415.1				
Bromodichloromethane	<1	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	<1	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				

Surrogate	Recovery	Method
Dibromofluoromethane	89	EPA 624
Toluene-d8	97	EPA 624
4-Bromofluorobenzene	97	EPA 624
2-Fluorophenol	52	EPA 625

Surrogate	Recovery	Method
Phenol-d6	63	EPA 625
Nitrobenzene-d5	57	EPA 625
2-Fluorobiphenyl	68	EPA 625
2,4,6-Tribromophenol	70	EPA 625

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager
a14/gma

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

03/18/2004

Skillings-Connolly, Inc.
 PO Box 5080
 Lacey, WA 98509
 Attn: Patrick Skillings

Project: Yelm Groundwater Monitoring
 Client ID: SC8 1S
 Sample Matrix: Water
 Date Sampled: 12/10/2003
 Date Received: 12/10/2003
 Spectra Project: 2003120127
 Spectra Number: 5

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Total Dissolved Solids	296	mg/L	EPA 160.1	N-Nitrosodimethylamine	<10	ug/L	EPA 625
Boron	120	ug/L	EPA 200.7	Fecal Coliform	<2	/100	Membrane
Cadmium	<3	ug/L	EPA 200.7	Fecal Streptococcus	<2	/100	Membrane
Chromium	<7	ug/L	EPA 200.7	TKN	<1	mg/L	SM 4500-N-B
Copper	20	ug/L	EPA 200.7	BOD	<2	mg/L	SM 5210
Iron	58	ug/L	EPA 200.7	Bromide	<0.1	mg/L	SM4500-Br-B
Manganese	14	ug/L	EPA 200.7	Chloride	57	mg/L	SM4500CL-C
Nickel	<15	ug/L	EPA 200.7	Nitrite	<0.01	mg/L-N	SM4500NO2B
Silver	<7	ug/L	EPA 200.7	Nitrate	2.8	mg/L-N	SM4500NO3
Zinc	39	ug/L	EPA 200.7	Anionic Surf. as MBAS	0.032	mg/L	SM5540C
Arsenic by GFAA	<5	ug/L	EPA 206.2				
Lead by GFAA	<1	ug/L	EPA 239.2				
Mercury	<0.5	ug/L	EPA 245.1				
Fluoride	<0.2	mg/L	EPA 340.2				
Ammonia	<0.2	mg/L-N	EPA 350.3				
Sulfate	28	mg/L	EPA 375.4				
Dissolved Organic Carbon	8	mg/L	EPA 415.1				
Bromodichloromethane	6	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	21	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				

Surrogate	Recovery	Method
Dibromofluoromethane	83	EPA 624
Toluene-d8	97	EPA 624
4-Bromofluorobenzene	100	EPA 624
2-Fluorophenol	60	EPA 625

Surrogate	Recovery	Method
Phenol-d6	59	EPA 625
Nitrobenzene-d5	67	EPA 625
2-Fluorobiphenyl	84	EPA 625
2,4,6-Tribromophenol	93	EPA 625

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager

a14/mlh

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

03/18/2004

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

Project: Yelm Groundwater Monitoring
Client ID: SC9 CS1
Sample Matrix: Water
Date Sampled: 12/10/2003
Date Received: 12/10/2003
Spectra Project: 2003120127
Spectra Number: 6

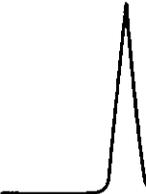
Analyte	Result	Units	Method	Analyte	Result	Units	Method
Total Dissolved Solids	271	mg/L	EPA 160.1	N-Nitrosodimethylamine	<10	ug/L	EPA 625
Boron	100	ug/L	EPA 200.7	Fecal Coliform	10	/100	Membrane
Cadmium	< 3	ug/L	EPA 200.7	Fecal Streptococcus	4000	/100	Membrane
Chromium	< 7	ug/L	EPA 200.7	TKN	<1	mg/L	SM 4500-N-B
Copper	15	ug/L	EPA 200.7	BOD	< 2	mg/L	SM 5210
Iron	140	ug/L	EPA 200.7	Bromide	< 0.1	mg/L	SM4500-Br-B
Manganese	20	ug/L	EPA 200.7	Chloride	61	mg/L	SM4500CL-C
Nickel	< 15	ug/L	EPA 200.7	Nitrite	0.01	mg/L-N	SM4500NO2B
Silver	< 7	ug/L	EPA 200.7	Nitrate	2.2	mg/L-N	SM4500NO3D
Zinc	36	ug/L	EPA 200.7	Anionic Surf. as MBAS	0.034	mg/L	SM5540C
Arsenic by GFAA	< 5	ug/L	EPA 206.2				
Lead by GFAA	< 1	ug/L	EPA 239.2				
Mercury	<0.5	ug/L	EPA 245.1				
Fluoride	< 0.2	mg/L	EPA 340.2				
Ammonia	< 0.2	mg/L-N	EPA 350.3				
Sulfate	33	mg/L	EPA 375.4				
Dissolved Organic Carbon	8	mg/L	EPA 415.1				
Bromodichloromethane	4	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	17	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				

Surrogate	Recovery	Method
Dibromofluoromethane	88	EPA 624
Toluene-d8	96	EPA 624
4-Bromofluorobenzene	98	EPA 624
2-Fluorophenol	68	EPA 625

Surrogate	Recovery	Method
Phenol-d6	76	EPA 625
Nitrobenzene-d5	69	EPA 625
2-Fluorobiphenyl	72	EPA 625
2,4,6-Tribromophenol	104	EPA 625

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager
al4/mlh



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

03/18/2004

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

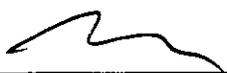
Project: Yelm Groundwater Monitoring
Client ID: SC10 CS2
Sample Matrix: Water
Date Sampled: 12/10/2003
Date Received: 12/10/2003
Spectra Project: 2003120127
Spectra Number: 7

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Total Dissolved Solids	249	mg/L	EPA 160.1	N-Nitrosodimethylamine	<10	ug/L	EPA 625
Boron	96	ug/L	EPA 200.7	Fecal Coliform	<2	/100	Membrane
Cadmium	< 3	ug/L	EPA 200.7	Fecal Streptococcus	440	/100	Membrane
Chromium	< 7	ug/L	EPA 200.7	TKN	2	mg/L	SM 4500-N-B
Copper	36	ug/L	EPA 200.7	BOD	4	mg/L	SM 5210
Iron	260	ug/L	EPA 200.7	Bromide	< 0.1	mg/L	SM4500-Br-B
Manganese	41	ug/L	EPA 200.7	Chloride	58	mg/L	SM4500CL-C
Nickel	< 15	ug/L	EPA 200.7	Nitrite	0.02	mg/L-N	SM4500NO ₂ -D
Silver	< 7	ug/L	EPA 200.7	Nitrate	0.9	mg/L-N	SM4500NO ₃ -D
Zinc	36	ug/L	EPA 200.7	Anionic Surf. as MBAS	0.023	mg/L	SM5540C
Arsenic by GFAA	< 5	ug/L	EPA 206.2				
Lead by GFAA	< 1	ug/L	EPA 239.2				
Mercury	<0.5	ug/L	EPA 245.1				
Fluoride	< 0.2	mg/L	EPA 340.2				
Ammonia	< 0.2	mg/L-N	EPA 350.3				
Sulfate	26	mg/L	EPA 375.4				
Dissolved Organic Carbon	9	mg/L	EPA 415.1				
Bromodichloromethane	<1	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	2	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				

Surrogate	Recovery	Method
Dibromofluoromethane	87	EPA 624
Toluene-d8	97	EPA 624
4-Bromofluorobenzene	98	EPA 624
2-Fluorophenol	50	EPA 625

Surrogate	Recovery	Method
Phenol-d6	59	EPA 625
Nitrobenzene-d5	50	EPA 625
2-Fluorobiphenyl	60	EPA 625
2,4,6-Tribromophenol	90	EPA 625

SPECTRA LABORATORIES



Steve Hibbs, Laboratory Manager
a14/mlh

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

03/18/2004

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

Project: Yelm Groundwater Monitoring
Client ID: SC11 CS3
Sample Matrix: Water
Date Sampled: 12/10/2003
Date Received: 12/10/2003
Spectra Project: 2003120127
Spectra Number: 8

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Total Dissolved Solids	249	mg/L	EPA 160.1	N-Nitrosodimethylamine	<10	ug/L	EPA 625
Boron	120	ug/L	EPA 200.7	Fecal Coliform	2	/100	Membrane
Cadmium	< 3	ug/L	EPA 200.7	Fecal Streptococcus	2200	/100	Membrane
Chromium	< 7	ug/L	EPA 200.7	TKN	7	mg/L	SM 4500-N-B
Copper	24	ug/L	EPA 200.7	BOD	< 2	mg/L	SM 5210
Iron	130	ug/L	EPA 200.7	Bromide	< 0.1	mg/L	SM4500-Br-B
Manganese	19	ug/L	EPA 200.7	Chloride	54	mg/L	SM4500CL-C
Nickel	< 15	ug/L	EPA 200.7	Nitrite	< 0.01	mg/L-N	SM4500NO2B
Silver	< 7	ug/L	EPA 200.7	Nitrate	1.1	mg/L-N	SM4500NO3D
Zinc	59	ug/L	EPA 200.7	Anionic Surf. as MBAS	<0.02	mg/L	SM5540C
Arsenic by GFAA	< 5	ug/L	EPA 206.2				
Lead by GFAA	< 1	ug/L	EPA 239.2				
Mercury	<0.5	ug/L	EPA 245.1				
Fluoride	< 0.2	mg/L	EPA 340.2				
Ammonia	0.3	mg/L-N	EPA 350.3				
Sulfate	28	mg/L	EPA 375.4				
Dissolved Organic Carbon	9	mg/L	EPA 415.1				
Bromodichloromethane	<1	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	2	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				

Surrogate	Recovery	Method
Dibromofluoromethane	87	EPA 624
Toluene-d8	96	EPA 624
4-Bromofluorobenzene	100	EPA 624
2-Fluorophenol	55	EPA 625

Surrogate	Recovery	Method
Phenol-d6	66	EPA 625
Nitrobenzene-d5	63	EPA 625
2-Fluorobiphenyl	63	EPA 625
2,4,6-Tribromophenol	103	EPA 625

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager

a14/mih

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

03/18/2004

Skillsing-Connolly, Inc.
 PO Box 5080
 Lacey, WA 98509
 Attn: Patrick Skillings

Project: Yelm Groundwater Monitoring
 Client ID: SC12 CS4
 Sample Matrix: Water
 Date Sampled: 12/10/2003
 Date Received: 12/10/2003
 Spectra Project: 2003120127
 Spectra Number: 9

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Total Dissolved Solids	240	mg/L	EPA 160.1	N-Nitrosodimethylamine	<10	ug/L	EPA 625
Boron	98	ug/L	EPA 200.7	Fecal Coliform	600	/100	Membrane
Cadmium	< 3	ug/L	EPA 200.7	Fecal Streptococcus	570	/100	Membrane
Chromium	< 7	ug/L	EPA 200.7	TKN	<1	mg/L	SM 4500-N-B
Copper	14	ug/L	EPA 200.7	BOD	< 2	mg/L	SM 5210
Iron	190	ug/L	EPA 200.7	Bromide	< 0.1	mg/L	SM4500-Br-B
Manganese	110	ug/L	EPA 200.7	Chloride	54	mg/L	SM4500CL-C
Nickel	< 15	ug/L	EPA 200.7	Nitrite	< 0.01	mg/L-N	SM4500NO2P
Silver	< 7	ug/L	EPA 200.7	Nitrate	0.6	mg/L-N	SM4500NO3P
Zinc	27	ug/L	EPA 200.7	Anionic Surf. as MBAS	<0.02	mg/L	SM5540C
Arsenic by GFAA	< 5	ug/L	EPA 206.2				
Lead by GFAA	< 1	ug/L	EPA 239.2				
Mercury	<0.5	ug/L	EPA 245.1				
Fluoride	< 0.2	mg/L	EPA 340.2				
Ammonia	< 0.2	mg/L-N	EPA 350.3				
Sulfate	20	mg/L	EPA 375.4				
Dissolved Organic Carbon	9	mg/L	EPA 415.1				
Bromodichloromethane	<1	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	1	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				

Surrogate	Recovery	Method
Dibromofluoromethane	88	EPA 624
Toluene-d8	97	EPA 624
4-Bromofluorobenzene	99	EPA 624
2-Fluorophenol	56	EPA 625

Surrogate	Recovery	Method
Phenol-d6	66	EPA 625
Nitrobenzene-d5	57	EPA 625
2-Fluorobiphenyl	69	EPA 625
2,4,6-Tribromophenol	106	EPA 625

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager

a14/mlh

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

03/18/2004

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

Project: Yelm Groundwater Monitoring
Client ID: SC13 FD
Sample Matrix: Water
Date Sampled: 12/10/2003
Date Received: 12/10/2003
Spectra Project: 2003120127
Spectra Number: 12

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Total Dissolved Solids	250	mg/L	EPA 160.1	N-Nitrosodimethylamine	<10	ug/L	EPA 625
Boron	89	ug/L	EPA 200.7	Fecal Coliform	130	/100	Membrane
Cadmium	< 3	ug/L	EPA 200.7	Fecal Streptococcus	270	/100	Membrane
Chromium	< 7	ug/L	EPA 200.7	TKN	<1	mg/L	SM 4500-N-B
Copper	< 6	ug/L	EPA 200.7	BOD	2	mg/L	SM 5210
Iron	240	ug/L	EPA 200.7	Bromide	< 0.1	mg/L	SM4500-Br-B
Manganese	52	ug/L	EPA 200.7	Chloride	55	mg/L	SM4500CL-C
Nickel	< 15	ug/L	EPA 200.7	Nitrite	0.02	mg/L-N	SM4500NO2B
Silver	< 7	ug/L	EPA 200.7	Nitrate	0.8	mg/L-N	SM4500NO3D
Zinc	34	ug/L	EPA 200.7	Anionic Surf. as MBAS	<0.02	mg/L	SM5540C
Arsenic by GFAA	< 5	ug/L	EPA 206.2				
Lead by GFAA	< 1	ug/L	EPA 239.2				
Mercury	<0.5	ug/L	EPA 245.1				
Fluoride	< 0.2	mg/L	EPA 340.2				
Ammonia	< 0.2	mg/L-N	EPA 350.3				
Sulfate	27	mg/L	EPA 375.4				
Dissolved Organic Carbon	10	mg/L	EPA 415.1				
Bromodichloromethane	<1	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	3	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				

Surrogate	Recovery	Method
Dibromofluoromethane	88	EPA 624
Toluene-d8	96	EPA 624
4-Bromofluorobenzene	99	EPA 624
2-Fluorophenol	49	EPA 625

Surrogate	Recovery	Method
Phenol-d6	65	EPA 625
Nitrobenzene-d5	54	EPA 625
2-Fluorobiphenyl	68	EPA 625
2,4,6-Tribromophenol	100	EPA 625

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager
a14/mlh

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

03/18/2004

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

Project: Yelm Groundwater Monitoring
Client ID: RO
Sample Matrix: Water
Date Sampled: 12/10/2003
Date Received: 12/10/2003
Spectra Project: 2003120127
Spectra Number: 10

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Thallium by GFAA	< 1	ug/L	EPA 279.2	Sulfate	< 1	mg/L	EPA 375.4
Total Dissolved Solids	7.0	mg/L	EPA 160.1	Dissolved Organic Carbon	3	mg/L	EPA 415.1
Barium	< 2	ug/L	EPA 200.7	Bromodichloromethane	<1	ug/L	EPA 624
Beryllium	< 1	ug/L	EPA 200.7	Bromoform	<1	ug/L	EPA 624
Boron	< 30	ug/L	EPA 200.7	Chlorodibromomethane	<1	ug/L	EPA 624
Cadmium	< 3	ug/L	EPA 200.7	Chloroform	5	ug/L	EPA 624
Chromium	< 7	ug/L	EPA 200.7	Caffeine	<10	ug/L	EPA 625
Copper	9	ug/L	EPA 200.7	N-Nitrosodimethylamine	<10	ug/L	EPA 625
Iron	< 15	ug/L	EPA 200.7	Fecal Coliform	<2	/100	Membrane
Manganese	< 2	ug/L	EPA 200.7	Fecal Streptococcus	<2	/100	Membrane
Nickel	< 15	ug/L	EPA 200.7	Color	< 1	Color	SM 2120B
Silver	< 7	ug/L	EPA 200.7	Turbidity	0.25	ntu	SM 2130B
Sodium	1900	ug/L	EPA 200.7	TKN	<1	mg/L	SM 4500-N-B
Total Hardness	< 300	ug/L	EPA 200.7	BOD	< 2	mg/L	SM 5210
Zinc	7	ug/L	EPA 200.7	Conductivity	8.1	umhos/	SM2510B
Antimony by GFAA	< 5	ug/L	EPA 204.2	Bromide	< 0.1	mg/L	SM4500-Br-B
Arsenic by GFAA	< 5	ug/L	EPA 206.2	Chloride	<1.0	mg/L	SM4500CL-C
Lead by GFAA	< 1	ug/L	EPA 239.2	Total Cyanide	<0.01	mg/L	SM4500CN-E
Mercury	<0.5	ug/L	EPA 245.1	Nitrite	< 0.01	mg/L-N	SM4500NO2B
Selenium by GFAA	< 5	ug/L	EPA 270.2	Nitrate	0.1	mg/L-N	SM4500NO3D
Fluoride	< 0.2	mg/L	EPA 340.2	Total Organic Carbon	3	mg/L	SM5310 B
Ammonia	< 0.2	mg/L-N	EPA 350.3	Anionic Surf. as MBAS	<0.02	mg/L	SM5540C

Surrogate	Recovery	Method
Dibromofluoromethane	87	EPA 624
Toluene-d8	91	EPA 624
4-Bromofluorobenzene	94	EPA 624
2-Fluorophenol	50	EPA 625

Surrogate	Recovery	Method
Phenol-d6	35	EPA 625
Nitrobenzene-d5	60	EPA 625
2-Fluorobiphenyl	67	EPA 625
2,4,6-Tribromophenol	75	EPA 625

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager
al4/mlh

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

03/18/2004

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

Project: Yelm Groundwater Monitoring
Client ID: RW
Sample Matrix: Water
Date Sampled: 12/10/2003
Date Received: 12/10/2003
Spectra Project: 2003120127
Spectra Number: 11

Analyte	Result	Units	Method	Analyte	Result	Units	Method
Total Dissolved Solids	293	mg/L	EPA 160.1	N-Nitrosodimethylamine	<10	ug/L	EPA 625
Boron	120	ug/L	EPA 200.7	Fecal Coliform	<2	/100	Membrane
Cadmium	< 3	ug/L	EPA 200.7	Fecal Streptococcus	4	/100	Membrane
Chromium	< 7	ug/L	EPA 200.7	TKN	1	mg/L	SM 4500-N-B
Copper	10	ug/L	EPA 200.7	BOD	< 2	mg/L	SM 5210
Iron	48	ug/L	EPA 200.7	Bromide	< 0.1	mg/L	SM4500-Br-B
Manganese	97	ug/L	EPA 200.7	Chloride	58	mg/L	SM4500CL-C
Nickel	< 15	ug/L	EPA 200.7	Nitrite	< 0.01	mg/L-N	SM4500NO2B
Silver	< 7	ug/L	EPA 200.7	Nitrate	2.9	mg/L-N	SM4500NO3D
Zinc	54	ug/L	EPA 200.7	Anionic Surf. as MBAS	<0.02	mg/L	SM5540C
Arsenic by GFAA	< 5	ug/L	EPA 206.2				
Lead by GFAA	< 1	ug/L	EPA 239.2				
Mercury	<0.5	ug/L	EPA 245.1				
Fluoride	< 0.2	mg/L	EPA 340.2				
Ammonia	< 0.2	mg/L-N	EPA 350.3				
Sulfate	27	mg/L	EPA 375.4				
Dissolved Organic Carbon	8	mg/L	EPA 415.1				
Bromodichloromethane	4	ug/L	EPA 624				
Bromoform	<1	ug/L	EPA 624				
Chlorodibromomethane	<1	ug/L	EPA 624				
Chloroform	14	ug/L	EPA 624				
Caffeine	<10	ug/L	EPA 625				

Surrogate	Recovery	Method
Dibromofluoromethane	87	EPA 624
Toluene-d8	95	EPA 624
4-Bromofluorobenzene	100	EPA 624
2-Fluorophenol	59	EPA 625

Surrogate	Recovery	Method
Phenol-d6	71	EPA 625
Nitrobenzene-d5	68	EPA 625
2-Fluorobiphenyl	76	EPA 625
2,4,6-Tribromophenol	99	EPA 625

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager

a14/mlh

Quality Assurance

Field quality assurance samples consisted of one duplicate set per quarter. Field duplicates for the Groundwater Monitoring Project are defined as two sequential samples obtained from the same sampling site using identical sampling procedures. Duplicate sampling sites were chosen at random each quarter. The duplicate sample results are used to estimate combined sampling and analytical precision. The relative percent difference (RPD) of the mean, the ratio of the difference and the mean of duplicate results expressed as a percentage, can be used to describe the precision of duplicate results. RPD results are included in Table D-1 in Appendix D. While RPD can be used to describe the precision of duplicate results, it is limited by the precision of the data reporting level. RPD can be misleading when data levels are listed out to only one or two significant digits. In cases where testing results are rounded, RPD may not provide an accurate description of precision of duplicate results.

Copies of Quality Control Results from Spectra Laboratories for each sampling quarter are included in Appendix D. Laboratory quality control tests consisted of method blanks, duplicate samples, spiked samples, and check (control) standards.



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

Date: 3/11/02

Client: Skillings/Connolly

Sample Matrix: Water
Standard Methods: 5220B
Units: mg/L

SM 5210B/405.1 BOD ANALYSIS
QUALITY CONTROL RESULTS

Glucose-Glutamic Acid Check Standard

Date Analyzed: 3/11/02

	<u>Known Value</u>	<u>5 Day Measured Value</u>	<u>% Recovered</u>
G/GA	198	216	109
G/GA	198	195.5	99
G/GA	198	202	102

1	<u>030066-1</u>	11	<u>030066-11</u>
2	<u>030066-2</u>	12	<u>030066-12</u>
3	<u>030066-3</u>	13	<u>030066-13</u>
4	<u>030066-4</u>	14	<u> </u>
5	<u>030066-5</u>	15	<u> </u>
6	<u>030066-6</u>	16	<u> </u>
7	<u>030066-7</u>	17	<u> </u>
8	<u>030066-8</u>	18	<u> </u>
9	<u>030033-9</u>	19	<u> </u>
10	<u>030066-10</u>	20	<u> </u>

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

Date: 03/13/02

Client: Skillings/Connolly

Sample Matrix: Water
EPA Method: 415.1/9060
Units: mg/L

415.1/9060 DISSOLVED ORGANIC CARBON ANALYSIS QUALITY CONTROL RESULTS

Initial Calibration Verification

Date Analyzed: 03/13/02

<u>Known Value</u>	<u>Measured Value</u>	<u>% Recovered</u>
50.00	40.54	81.08

Method Blank Results

Date Analyzed: 03/13/02 RESULT
< 6

MATRIX SPIKE RESULTS

Spiked Sample: 030066-12
Date Analyzed: 03/13/02

<u>SAMPLE RESULT</u>	<u>SPIKE AMOUNT</u>	<u>SPIKE RESULT</u>	<u>% REC.</u>	<u>MSD RESULT</u>	<u>MSD % REC.</u>	<u>RPD</u>
11.30	25.00	32.62	85.28	32.73	85.72	0.51

SAMPLE DUPLICATE RESULTS

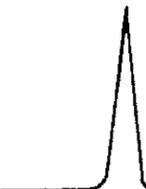
Duplicate Sample # 030066-12 SAMPLE RESULT DUPLICATE RESULT RPD
Date Analyzed: 03/13/02
11.30 11.16 1.25

Check Standard Results

Date Analyzed: 03/13/02

<u>Known Value</u>	<u>Measured Value</u>	<u>% Recovered</u>
50.00	55.05	110.10

<u>1 030066-1</u>	<u>11 030066-11</u>
<u>2 030066-2</u>	<u>12 030066-12</u>
<u>3 030066-3</u>	<u>13 030066-13</u>
<u>4 030066-4</u>	<u>14</u>
<u>5 030066-5</u>	<u>15</u>
<u>6 030066-6</u>	<u>16</u>
<u>7 030066-7</u>	<u>17</u>
<u>8 030066-8</u>	<u>18</u>
<u>9 030066-9</u>	<u>19</u>
<u>10 030066-10</u>	<u>20</u>



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

June 16, ~~2000~~
2002

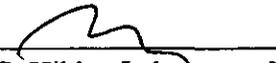
Skillings-Connolly, Inc.
Attn: Patrick Skillings
PO Box 5080
Lacey, WA 98509

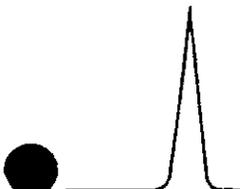
Sample Matrix: Water
EPA Method: 624/8260
Sample Spiked: Method Blank
Date Analyzed: 6-19-02
Units: ug/L
Spectra Project: 2002060156
Applies to Spectra #'s 1 - 13

GCMS VOLATILE ORGANIC ANALYSIS QUALITY CONTROL RESULTS

<u>Compound</u>	<u>Sample Result</u>	<u>Spike Amount Added</u>	<u>Spike Amount Found</u>	<u>% Recovery</u>	<u>Dup. Spike Amount Found</u>	<u>% Recovery</u>	<u>RPD</u>
1,1-Dichloroethene	<1	9.36	8.24	88	8.50	91	3
Trichloroethene	<1	10.00	8.52	85	9.40	94	10
Benzene	<1	10.00	8.85	89	9.71	97	9
Toluene	<1	10.00	9.31	93	10.15	102	9
Chlorobenzene	<1	10.00	9.44	94	10.15	102	7

SPECTRA LABORATORIES, INC.


Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

June 17, 2002

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

EPA Method: 6010
Spectra Project: 2002030066
Applies to Spectra #'s 1 - 13

Attn: Patrick Skillings

METALS QUALITY CONTROL RESULTS

MS/MSD

Spiked Sample: 2002030066-12
Units: ug/L

Date Prepared: 3-12-02
Date Analyzed: 3-12-02

<u>Compound</u>	<u>Sample Result</u>	<u>Spike Amount</u>	<u>Spike Result</u>	<u>% Recovery</u>	<u>Dup. Result</u>	<u>Dup. % Recovery</u>	<u>RPD</u>
Arsenic	ND	1000.00	961.20	96.1	1074.80	107.5	11.2
Boron	322.88	1000.00	1074.74	75.2	1081.58	75.9	0.9
Cadmium	ND	1000.00	1093.05	109.3	1073.92	107.4	1.8
Chromium	ND	1000.00	1140.39	114.0	1132.20	113.2	0.7
Mercury *	ND	2.0	195	97	1.95	97	0.0
Copper	ND	1000.00	1085.11	108.5	1077.72	107.8	0.7
Iron	115.75	1000.00	1141.63	102.6	1128.50	101.3	1.3
Lead	ND	1000.00	1170.40	117.0	1000.40	100.0	15.7
Manganese	14.69	1000.00	1110.92	109.6	1088.94	107.4	2.0
Nickel	13.24	1000.00	1094.90	108.2	1054.07	104.1	3.8
Silver	ND	1000.00	858.73	85.9	870.39	87.0	1.3
Zinc	22.41	1000.00	1097.25	107.5	1098.08	107.6	0.1

METHOD BLANK

Units: ug/L

Date Prepared: 3-12-02
Date Analyzed: 3-12-02

Arsenic	<5	Iron	
Boron	<30	Lead	<1
Cadmium	<3	Manganese	<2
Chromium	<7	Nickel	<15
Copper	<6	Silver	<7
Mercury	<0.5	Zinc	<5

* Mercury spiked in to sample #2002030066-9

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

June 17, 2002

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

Attn: Patrick Skillings

Sample Matrix: Water
EPA Method: 415.1/9060
Units: mg/L
Spectra Project: 2002030066
Applies to Spectra #'s 1 - 13

METHOD 415.1/9060 DISSOLVED ORGANIC CARBON ANALYSIS QUALITY CONTROL RESULTS

Initial Calibration Verification

<u>Date</u>	<u>Known Value</u>	<u>Measured Value</u>	<u>% Rec.</u>
3-13-02	50.0	40.54	81.08

Matrix Spike Results

<u>Date</u>	<u>Sample Result</u>	<u>Spike Amount</u>	<u>Spike Result</u>	<u>% Rec.</u>	<u>MSD Result</u>	<u>MSD % Rec.</u>	<u>RPD</u>
3-13-02	11.30	25.00	32.62	85.28	32.73	85.72	0.51

Sample Duplicate Results

Duplicate Sample #2002030066-12

<u>Date</u>	<u>Sample Result</u>	<u>Duplicate Result</u>	<u>RPD</u>
3-13-02	11.30	11.16	1.25

Check Standard Results

<u>Date</u>	<u>Known Value</u>	<u>Measured Value</u>	<u>% Rec.</u>
3-13-02	50.0	55.05	110.10

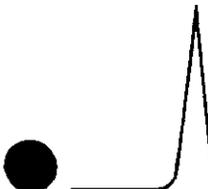
Method Blank Results

<u>Date</u>	<u>Result</u>
3-13-02	<6

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

June 17, 2002

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

Attn: Patrick Skillings

Sample Matrix: Water
EPA Method: SM 5210B/405.1
Units: mg/L
Spectra Project: 2002030066
Applies to Spectra #'s 1 - 13

SM 5210B/405.1 BOD ANALYSIS QUALITY CONTROL RESULTS

Glucose-Glutamic Acid Check Standard

<u>Date</u>	<u>Known Value</u>	<u>Measured Value</u>	<u>% Rec.</u>
3-11-02	198	216	109
	198	195.5	99
	198	202	102

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

June 17, 2002

Skillings-Connolly, Inc.
 P.O. Box 5080
 Lacey, WA 98509

Sample Matrix: Water
 EPA Method: 375.4/SM4500E
 Units: mg/L
 Spectra Project: 2002030066
 Applies to Spectra #'s 1 - 13

Attn: Patrick Skillings

METHOD 375.4/SM4500E SULFATE QUALITY CONTROL RESULTS

Initial Calibration Verification

<u>Date</u>	<u>Known Value</u>	<u>Measured Value</u>	<u>% Rec.</u>
3-11-02	257	277.2	108

Matrix Spike Results

<u>Date</u>	<u>Sample Result</u>	<u>Spike Amount</u>	<u>Spike Result</u>	<u>% Rec.</u>	<u>MSD Result</u>	<u>MSD % Rec.</u>	<u>RPD</u>
3-11-02	27.41	20.0	47.20	99.0	47.51	100.5	2

Sample Duplicate Results

Duplicate Sample #2002030066-8

<u>Date</u>	<u>Sample Result</u>	<u>Duplicate Result</u>	<u>RPD</u>
3-11-02	29.16	30.04	3

Check Standard Results

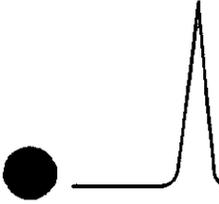
<u>Date</u>	<u>Known Value</u>	<u>Measured Value</u>	<u>% Rec.</u>
3-11-02	50	53.9	108

Method Blank Results

<u>Date</u>	<u>Result</u>
3-11-02	<1

SPECTRA LABORATORIES, INC.


 Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

July 11, 2002

Skillings-Connolly
Attn: Patrick Skillings
PO Box 5080
Lacey, WA 98509

Sample Matrix: Water
EPA Method: 415.1/9060
Spiked Sample: 060156-1
Units: mg/L
Spectra Project: 2002060156
Applies to Spectra #'s 1-13

415.1/9060 DISSOLVED ORGANIC CARBON ANALYSIS QUALITY CONTROL RESULTS

Initial Calibration Verification

<u>Date</u>	<u>Known Value</u>	<u>Measured Value</u>	<u>% Recovered</u>
6-17-02	100.00	82.64	82.64

Matrix Spike Results

<u>Date</u>	<u>Sample Result</u>	<u>Spike Amount</u>	<u>Spike Result</u>	<u>% Rec.</u>	<u>MSD Result</u>	<u>MSD %REC.</u>	<u>RPD</u>
6-17-02	2.04	25.00	22.36	81.30	21.54	78.02	4.12

Sample Duplicate Results

Duplicate Sample #060156-12

<u>Date</u>	<u>Sample Result</u>	<u>Duplicate Result</u>	<u>RPD</u>
6-17-02	7.993	7.575	5.37

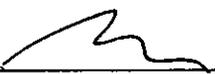
Check Standard Results

<u>Date</u>	<u>Known Value</u>	<u>Measured Value</u>	<u>% Rec.</u>
6-17-02	50.00	43.16	86.32

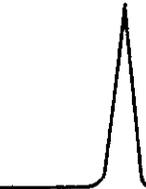
Method Blank Results

<u>Date</u>	<u>Result</u>
06-17-02	< 2

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

July 11, 2002

Skillings-Connolly
Attn: Patrick Skillings
PO Box 5080
Lacey, WA 98509

METHOD BLANK
Sample Matrix: Water
Spectra Project: 2002060156
Applies to Spectra #'s 1 - 13

Date Analyzed: 6-19-02
Dilution: 1
< = less than

VOLATILE ORGANIC COMPOUNDS

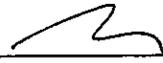
EPA METHOD 8260

Compound	CAS#	ug/L
Bromodichloromethane	75-27-4	< 1
Bromoform	75-25-2	< 1
Chlorodibromomethane	124-48-1	< 1
Chloroform	67-66-3	< 1

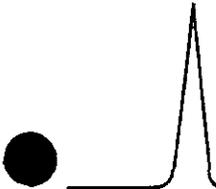
CAS# = Chemical Abstract Services Registry Number
VOA Surrogate Percent Recoveries

Dibromofluoromethane	101 %
Toluene-d8	104 %
4-Bromofluorobenzene	100 %

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

July 15, 2002

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

EPA Method: 6010
Spectra Project: 2002060156
Applies to Spectra #'s 1 - 13

Attn: Patrick Skillings

METALS QUALITY CONTROL RESULTS

MS/MSD

Spiked Sample: 2002060156-1
Units: mg/L

Date Prepared: 6-13-02
Date Analyzed: 6-13-02

<u>Compound</u>	<u>Sample Result</u>	<u>Spike Amount</u>	<u>Spike Result</u>	<u>% Recovery</u>	<u>Dup. Result</u>	<u>Dup. % Recovery</u>	<u>RPD</u>
Arsenic	ND	1.000	0.988	98.8	1.197	119.7	19.1
Boron	0.022	1.000	0.789	76.7	0.780	75.8	1.2
Cadmium	ND	1.000	1.051	105.1	1.064	106.4	1.2
Chromium	ND	1.000	1.027	102.7	1.044	104.4	1.6
Mercury *	ND	0.0020	0.00204	102	0.00212	106	3.9
Copper	ND	1.000	1.026	102.6	1.032	103.2	0.6
Iron	ND	1.000	1.038	103.8	1.037	103.7	0.1
Lead	ND	1.000	1.071	107.1	1.013	101.3	5.6
Manganese	ND	1.000	1.044	104.4	1.039	103.9	0.5
Nickel	ND	1.000	1.049	104.9	1.062	106.2	1.2
Silver	ND	1.000	0.913	91.3	0.969	96.9	6.0
Zinc	0.010	1.000	1.051	104.1	1.058	104.8	0.7

METHOD BLANK

Units: mg/L

Date Prepared: 6-13-02
Date Analyzed: 6-13-02

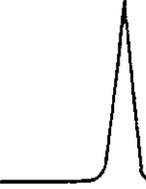
Arsenic	<0.005	Iron	<0.010
Boron	<0.008	Lead	<0.001
Cadmium	<0.003	Manganese	<0.002
Chromium	<0.007	Nickel	<0.015
Copper	<0.006	Silver	<0.007
Mercury	<0.0005	Zinc	<0.006

* Mercury spiked in to sample #2002060055-1

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

July 15, 2002

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

Sample Matrix: Water
EPA Method: 4500Br
Units: mg/L
Spectra Project: 2002060156
Applies to Spectra #'s 1 - 13

STANDARD METHOD 4500 BR BROMIDE ANALYSIS QUALITY CONTROL RESULTS

Initial Check Standard Results

<u>Date</u>	<u>Known Value</u>	<u>Measured Value</u>	<u>% Rec.</u>
6-10-02	0.5	0.555	111.0

Matrix Spike/Matrix Spike Duplicate Results

<u>Date</u>	<u>Sample Result</u>	<u>Spike Amount</u>	<u>Spike Result</u>	<u>% Rec.</u>	<u>MSD Result</u>	<u>MSD % Rec.</u>	<u>RPD</u>
6-10-02	0.202	0.5	0.738	107.2	1	107.8	1

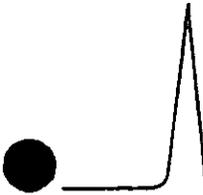
Sample Duplicate Results

Duplicate Sample #2002060156-6

<u>Date</u>	<u>Sample Result</u>	<u>Duplicate Result</u>	<u>RPD</u>
6-10-02	0.139	0.137	1.4

SPECTRA LABORATORIES, INC.


Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

July 15, 2002

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

Attn: Patrick Skillings

Sample Matrix: Water
EPA Method: SM 5210B/405.1
Units: mg/L
Spectra Project: 2002060156
Applies to Spectra #'s 1 - 13

SM 5210B/405.1 BOD ANALYSIS QUALITY CONTROL RESULTS

Glucose-Glutamic Acid Check Standard

<u>Date</u>	<u>Known Value</u>	<u>Measured Value</u>	<u>% Rec.</u>
6-19-02	198	175	88
	198	194.5	98
	198	183.3	93

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

October 1, 2002

Skillings-Connolly
Attn: Patrick Skillings
PO Box 5080
Lacey, WA 98509

Sample Matrix: Water
EPA Method: 375-4/SM4500E
Spiked Sample: 090031-13
Units: mg/L
Spectra Project: 2002090031
Applies to Spectra #'s 1-13

Method 375.4/SM4500E Sulfate QUALITY CONTROL RESULTS

Initial Calibration Verification

<u>Date</u>	<u>Known Value</u>	<u>Measured Value</u>	<u>% Recovered</u>
9-13-02	257	272.3	106

Matrix Spike Results

<u>Date</u>	<u>Sample Result</u>	<u>Spike Amount</u>	<u>Spike Result</u>	<u>% Rec.</u>	<u>MSD Result</u>	<u>MSD %REC.</u>	<u>RPD</u>
9-13-02	6.120	20.00	26.310	101.0	26.970	104.3	3

Sample Duplicate Results

Duplicate Sample #090031-8

<u>Date</u>	<u>Sample Result</u>	<u>Duplicate Result</u>	<u>RPD</u>
9-13-02	24.90	24.77	1

Check Standard Results

<u>Date</u>	<u>Known Value</u>	<u>Measured Value</u>	<u>% Rec.</u>
9-13-02	50	52.0	104

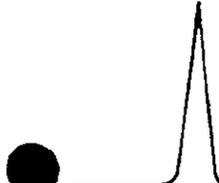
Method Blank Results

<u>Date</u>	<u>Result</u>
9-13-02	< 1

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

October 3, 2002

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

EPA Method: 6010
Spectra Project: 2002090031
Applies to Spectra #'s 1 - 13

Attn: Patrick Skillings

METALS QUALITY CONTROL RESULTS

MS/MSD

Spiked Sample: 2002090031-1
Units: mg/L

Date Prepared: 9-6-02
Date Analyzed: 9-11-02

<u>Compound</u>	<u>Sample Result</u>	<u>Spike Amount</u>	<u>Spike Result</u>	<u>% Recovery</u>	<u>Dup. Result</u>	<u>Dup. % Recovery</u>	<u>RPD</u>
Arsenic	ND	1.000	0.934	93.4	1.098	109.8	16.1
Boron	ND	1.000	0.996	99.6	1.003	100.3	0.7
Cadmium	ND	1.000	1.083	108.3	1.119	111.9	3.3
Chromium	ND	1.000	1.065	106.5	1.072	107.2	0.7
Mercury *	ND	0.0020	0.0021	104	0.0022	108	3.7
Copper	ND	1.000	1.088	108.8	1.101	110.1	1.2
Iron	ND	1.000	1.063	106.3	1.053	105.3	0.9
Lead	ND	1.000	0.907	90.7	0.913	91.3	0.7
Manganese	ND	1.000	1.053	105.3	1.075	107.5	2.1
Nickel	ND	1.000	1.076	107.6	1.074	107.4	0.2
Silver	ND	1.000	1.050	105.0	1.031	103.1	1.8
Zinc	ND	1.000	1.097	109.7	1.074	107.4	2.1

METHOD BLANK

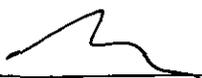
Units: mg/L

Date Prepared: 9-6-02
Date Analyzed: 9-11-02

Arsenic	<0.005	Iron	<0.010
Boron	<0.008	Lead	<0.001
Cadmium	<0.003	Manganese	<0.002
Chromium	<0.007	Nickel	<0.015
Copper	<0.006	Silver	<0.007
Mercury	<0.0005	Zinc	<0.006

* Mercury spiked in to sample #2002090031-13

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

October 3, 2002

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

Attn: Patrick Skillings

Sample Matrix: Water
EPA Method: 415.1/9060
Units: mg/L
Spectra Project: 2002090031
Applies to Spectra #'s 1 - 13

METHOD 415.1/9060 DISSOLVED ORGANIC CARBON ANALYSIS QUALITY CONTROL RESULTS

Initial Calibration Verification

<u>Date</u>	<u>Known Value</u>	<u>Measured Value</u>	<u>% Rec.</u>
9-9-02	50.00	50.71	101.42

Matrix Spike Results

<u>Date</u>	<u>Sample Result</u>	<u>Spike Amount</u>	<u>Spike Result</u>	<u>% Rec.</u>	<u>MSD Result</u>	<u>MSD % Rec.</u>	<u>RPD</u>
9-11-02	3.89	25.00	22.98	76.36	22.73	75.36	1.32

Sample Duplicate Results

Duplicate Sample #2002090031-13

<u>Date</u>	<u>Sample Result</u>	<u>Duplicate Result</u>	<u>RPD</u>
9-9-02	9.813	9.091	7.64

Check Standard Results

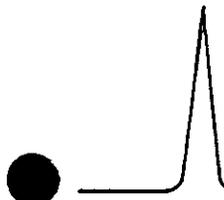
<u>Date</u>	<u>Known Value</u>	<u>Measured Value</u>	<u>% Rec.</u>
9-9-02	50.0	59.50	119.00

Method Blank Results

<u>Date</u>	<u>Result</u>
9-9-02	<2

SPECTRA LABORATORIES, INC.


Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

October 7, 2002

Skillings & Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

Attn: Patrick Skillings

Sample Matrix: Water
Sample Spiked: Method Blank
Date Extracted: 9-10-02
Date Analyzed: 9-16-02
Units: ug/L
Spectra Project: 2002090031
Applies to Spectra #'s 1 - 13

SOIL SEMIVOLATILE MATRIX SPIKE QUALITY CONTROL

	Sample Result	Spike Added	MS Conc.	MS % Rec.	MSD Conc.	MSD Rec.	RPD
Phenol	75	<10	56	74	64	85	14
2-Chlorophenol	75	<10	51	68	60	80	15
1,4-Dichlorobenzene	50	<10	33	66	36	71	8
N-Nitroso-Di-n-Propylamine	50	<10	57	113	61	122*	7
1,2,4-Trichlorobenzene	50	<10	39	77	41	82	6
4-Chloro-3-Methylphenol	75	<10	65	86	71	95	9
Acenaphthene	50	<10	43	85	47	94	9
4-Nitrophenol	75	<50	72	96*	77	103*	7
2,4-Dinitrotoluene	50	<10	38	77	43	87	12
Pentachlorophenol	75	<50	61	81	68	90	11
Pyrene	50	<10	52	104	56	111	7

* Out of limits

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

October 7, 2002

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

Attn: Patrick Skillings

Sample Matrix: Water
EPA Method: 4500Br
Units: mg/L
Spectra Project: 2002090031
Applies to Spectra #'s 1 - 13

STANDARD METHOD 4500 BR BROMIDE ANALYSIS QUALITY CONTROL RESULTS

Initial Check Standard Results

<u>Date</u>	<u>Known Value</u>	<u>Measured Value</u>	<u>% Rec.</u>
9-16-02	0.5	0.518	103.6

Matrix Spike/Matrix Spike Duplicate Results

<u>Date</u>	<u>Sample Result</u>	<u>Spike Amount</u>	<u>Spike Result</u>	<u>% Rec.</u>	<u>MSD Result</u>	<u>MSD % Rec.</u>	<u>RPD</u>
9-16-02	ND	0.5	0.462	92.4	0.405	81.0	13

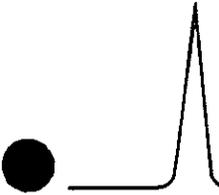
Sample Duplicate Results Duplicate Sample #2002090031-2

<u>Date</u>	<u>Sample Result</u>	<u>Duplicate Result</u>	<u>RPD</u>
9-16-02	0.132	0.108	20.0

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850

October 7, 2002

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

Attn: Patrick Skillings

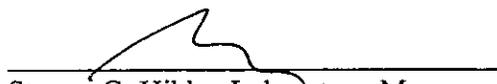
Sample Matrix: Water
EPA Method: SM 5210B/405.1
Units: mg/L
Spectra Project: 2002090031
Applies to Spectra #'s 1 - 13

SM 5210B/405.1 BOD ANALYSIS QUALITY CONTROL RESULTS

Glucose-Glutamic Acid Check Standard

<u>Date</u>	<u>Known Value</u>	<u>Measured Value</u>	<u>% Rec.</u>
9-11-02	198	160	81
	198	150.5	76
	198	163.3	82

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories, Inc.

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

January 16, 2003

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

Attn: Patrick Skillings

Sample Matrix: Water
EPA Method: 375.4/SM4500E
Units: mg/L
Spectra Project: 2002120056
Applies to Spectra #'s 1 - 13

METHOD 375.4/SM4500E SULFATE QUALITY CONTROL RESULTS

Matrix Spike Results

<u>Date</u>	<u>Sample Result</u>	<u>Spike Amount</u>	<u>Spike Result</u>	<u>% Rec.</u>	<u>MSD Result</u>	<u>MSD % Rec.</u>	<u>RPD</u>
12-10-02	4.44	20.00	22.85	92.05	21.88	87.20	5.41

Sample Duplicate Results

Duplicate Sample #2002120056-4

<u>Date</u>	<u>Sample Result</u>	<u>Duplicate Result</u>	<u>RPD</u>
12-10-02	8.79	8.34	5.25

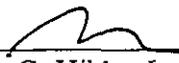
Check Standard Results

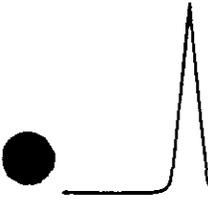
<u>Date</u>	<u>Known Value</u>	<u>Measured Value</u>	<u>% Rec.</u>
12-10-02	50.00	51.94	103.88

Method Blank Results

<u>Date</u>	<u>Result</u>
12-10-02	<1

SPECTRA LABORATORIES, INC.


Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories, Inc.

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

January 16, 2003

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

Sample Matrix: Water
EPA Method: 415.1/9060
Units: mg/L
Spectra Project: 2002120056
Applies to Spectra #'s 1 - 13

Attn: Patrick Skillings

METHOD 415.1/9060 DISSOLVED ORGANIC CARBON ANALYSIS QUALITY CONTROL RESULTS

Initial Calibration Verification

<u>Date</u>	<u>Known Value</u>	<u>Measured Value</u>	<u>% Rec.</u>
12-12-02	50.00	45.99	91.97

Matrix Spike Results

<u>Date</u>	<u>Sample Result</u>	<u>Spike Amount</u>	<u>Spike Result</u>	<u>% Rec.</u>	<u>MSD Result</u>	<u>MSD % Rec.</u>	<u>RPD</u>
12-12-02	8.62	25.00	28.62	80.01	28.49	79.49	0.65

Sample Duplicate Results

Duplicate Sample #2002120056-3

<u>Date</u>	<u>Sample Result</u>	<u>Duplicate Result</u>	<u>RPD</u>
12-12-02	8.747	8.156	6.99

Check Standard Results

<u>Date</u>	<u>Known Value</u>	<u>Measured Value</u>	<u>% Rec.</u>
12-12-02	50.00	43.35	86.70

Method Blank Results

<u>Date</u>	<u>Result</u>
12-12-02	<2

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories, Inc.

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

January 16, 2003

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

Attn: Patrick Skillings

Sample Matrix: Water
EPA Method: SM 5210B/405.1
Units: mg/L
Spectra Project: 2002120056
Applies to Spectra #'s 1 - 13

SM 5210B/405.1 BOD ANALYSIS QUALITY CONTROL RESULTS

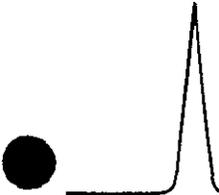
Glucose-Glutamic Acid Check Standard

<u>Date</u>	<u>Known Value</u>	<u>Measured Value</u>	<u>% Rec.</u>
12-12-02	198	177	89
	198	170.3	86
	198	204.3	103

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories, Inc.

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

January 20, 2003

Skillings & Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

Sample Matrix: Water
EPA Method: 624/8260
Sample Spiked: Method Blank
Date Analyzed: 12-13-02
Units: ug/L
Spectra Project: 2002120056
Applies to Spectra #'s 1 - 13

GCMS VOLATILE ORGANIC ANALYSIS QUALITY CONTROL RESULTS

<u>Compound</u>	<u>Sample Result</u>	<u>Spike Amount Added</u>	<u>Spike Amount Found</u>	<u>% Recovery</u>	<u>Dup. Spike Amount Found</u>	<u>% Recovery</u>	<u>RPD</u>
1,1-Dichloroethene	<1	9.36	6.06	65	6.47	69	7
Trichloroethene	<1	10.00	8.27	83	8.86	89	7
Benzene	<1	10.00	8.41	84	9.13	91	8
Toluene	<1	10.00	7.80	78	8.14	81	4
Chlorobenzene	<1	10.00	9.20	92	9.86	99	7

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories, Inc.

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

January 20, 2003

Skillings & Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

Attn: Patrick Skillings

Sample Matrix: Water
Sample Spiked: Method Blank
Date Extracted: 10-30-02
Date Analyzed: 10-31-02
Units: ug/L
Spectra Project: 2002120056
Applies to Spectra #'s 1 - 13

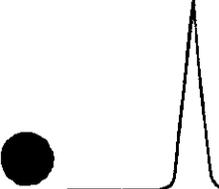
SOIL SEMIVOLATILE MATRIX SPIKE QUALITY CONTROL

	Sample Result	Spike Added	MS Conc.	MS % Rec.	MSD Conc.	MSD Rec.	RPD
Phenol	75	<10	36	48	35	46	5
2-Chlorophenol	75	<10	39	52	36	48	7
1,4-Dichlorobenzene	50	<10	20	39	19	38	4
N-Nitroso-Di-n-Propylamine	50	<10	27	54	26	52	5
1,2,4-Trichlorobenzene	50	<10	21	42	22	43	3
4-Chloro-3-Methylphenol	75	<10	38	51	36	48	5
Acenaphthene	50	<10	29	58	27	54	8
4-Nitrophenol	75	<50	17	23	15	20	14
2,4-Dinitrotoluene	50	<10	29	58	23	46	22
Pentachlorophenol	75	<50	34	45	29	39	15
Pyrene	50	<10	47	93	39	78	18

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories, Inc.

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

January 20, 2003

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

Sample Matrix: Water
EPA Method: 4500Br
Units: mg/L
Spectra Project: 2002120056
Applies to Spectra #'s 1 - 13

STANDARD METHOD 4500 BR BROMIDE ANALYSIS QUALITY CONTROL RESULTS

Initial Check Standard Results

<u>Date</u>	<u>Known Value</u>	<u>Measured Value</u>	<u>% Rec.</u>
1-13-03	.5	0.614	122.8

Matrix Spike/Matrix Spike Duplicate Results

<u>Date</u>	<u>Sample Result</u>	<u>Spike Amount</u>	<u>Spike Result</u>	<u>% Rec.</u>	<u>MSD Result</u>	<u>MSD % Rec.</u>	<u>RPD</u>
1-13-03	ND	0.5	0.401	80.2	0.386	77.2	4

Sample Duplicate Results Duplicate Sample #2002120056-5

<u>Date</u>	<u>Sample Result</u>	<u>Duplicate Result</u>	<u>RPD</u>
1-13-03	0.201	0.198	1.5

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories, Inc.

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

January 20, 2003

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

EPA Method: 6010
Spectra Project: 2002120056
Applies to Spectra #'s 1 - 13

Attn: Patrick Skillings

METALS QUALITY CONTROL RESULTS

MS/MSD

Spiked Sample: 2002120056-1
Units: mg/L

Date Prepared: 12-9-02
Date Analyzed: 12-9-02

<u>Compound</u>	<u>Sample Result</u>	<u>Spike Amount</u>	<u>Spike Result</u>	<u>% Recovery</u>	<u>Dup. Result</u>	<u>Dup. % Recovery</u>	<u>RPD</u>
Arsenic	ND	1.000	1.182	118.2	0.988	98.8	17.9
Boron	0.199	1.000	0.993	79.4	1.051	85.2	7.0
Cadmium	ND	1.000	1.067	106.7	1.033	103.3	3.2
Chromium	ND	1.000	1.110	111.0	1.065	106.5	4.1
Mercury *	ND	0.0020	0.0021	105	0.0020	100	4.8
Copper	0.008	1.000	1.057	104.9	1.036	102.8	2.0
Iron	ND	1.000	0.973	97.3	0.961	96.1	1.2
Lead	ND	1.000	1.188	118.8	1.168	116.8	1.7
Manganese	ND	1.000	1.027	102.7	1.041	104.1	1.4
Nickel	ND	1.000	1.030	103.0	0.897	89.7	13.8
Silver	ND	1.000	0.961	96.1	0.928	92.8	3.5
Zinc	0.015	1.000	1.029	101.4	1.043	102.8	1.4

METHOD BLANK

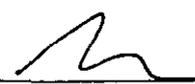
Units: mg/L

Date Prepared: 12-9-02
Date Analyzed: 12-9-02

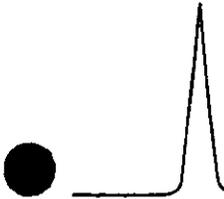
Arsenic	<0.005	Iron	<0.015
Boron	<0.01	Lead	<0.001
Cadmium	<0.003	Manganese	<0.002
Chromium	<0.007	Nickel	<0.015
Copper	<0.006	Silver	<0.007
Mercury	<0.0005	Zinc	<0.006

* Mercury spiked in to method blank.

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

April 10, 2003

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

Attn: Patrick Skillings

Sample Matrix: Water
EPA Method: 4500Br
Units: mg/L
Spectra Project: 2003030069
Applies to Spectra #'s 1 - 13

STANDARD METHOD 4500 BR BROMIDE ANALYSIS QUALITY CONTROL RESULTS

Initial Check Standard Results

<u>Date</u>	<u>Known Value</u>	<u>Measured Value</u>	<u>% Rec.</u>
4-3-03	0.5	0.48	96.0

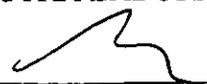
Matrix Spike/Matrix Spike Duplicate Results

<u>Date</u>	<u>Sample Result</u>	<u>Spike Amount</u>	<u>Spike Result</u>	<u>% Rec.</u>	<u>MSD Result</u>	<u>MSD % Rec.</u>	<u>RPD</u>
4-3-03	<0.1	0.5	0.586	117.2	0.566	113.2	3

Sample Duplicate Results Duplicate Sample #2003030069-13

<u>Date</u>	<u>Sample Result</u>	<u>Duplicate Result</u>	<u>RPD</u>
4-3-03	<0.1	<0.1	0.0

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

April 10, 2003

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

Attn: Patrick Skillings

Sample Matrix: Water
EPA Method: 415.1/9060
Units: mg/L
Spectra Project: 2003030069
Applies to Spectra #'s 1 - 13

METHOD 415.1/9060 DISSOLVED ORGANIC CARBON ANALYSIS QUALITY CONTROL RESULTS

Matrix Spike Results

<u>Date</u>	<u>Sample Result</u>	<u>Spike Amount</u>	<u>Spike Result</u>	<u>% Rec.</u>	<u>MSD Result</u>	<u>MSD % Rec.</u>	<u>RPD</u>
3-10-03	6.091	25	29.68	94.4	29	90.4	4

Sample Duplicate Results

Duplicate Sample #2003030069-2

<u>Date</u>	<u>Sample Result</u>	<u>Duplicate Result</u>	<u>RPD</u>
3-10-03	8.992	9.406	4.5

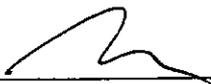
Check Standard Results

<u>Date</u>	<u>Known Value</u>	<u>Measured Value</u>	<u>% Rec.</u>
3-10-03	50	42.26	84.5

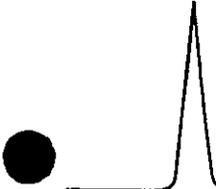
Method Blank Results

<u>Date</u>	<u>Result</u>
3-10-03	<5

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

April 10, 2003

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

METHOD BLANK
Sample Matrix: Water
Spectra Project:2003030069
Applies to Spectra #'s 1 - 13

Date Extracted: 3-11-03
Date Analyzed: 3-14-03
Dilution: 1
< = less than

SEMIVOLATILE ORGANIC ANALYSIS

METHOD 625/8270

Compound	ug/L
----------	------

N-Nitrosodimethylamine	<10
------------------------	-----

Caffeine	<10
----------	-----

SURROGATE RECOVERIES:

Nitrobenzene-d5	54%
2-Fluorobiphenyl	50%
p-Terphenyl-d14	83%

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838
April 10, 2003

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

METHOD BLANK
Sample Matrix: Water
Applies to Spectra #2003030069

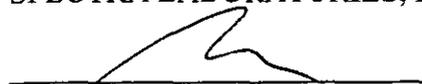
Date Analyzed: 3-11-03
Dilution: 1
< = less than

VOLATILE ORGANIC COMPOUNDS			EPA METHOD 8260
Compound	CAS#	ug/L	
Bromodichloromethane	75-27-4	<1	
Bromoform	75-25-2	<1	
Chlorodibromomethane	124-48-1	<1	
Chloroform	67-66-3	<1	

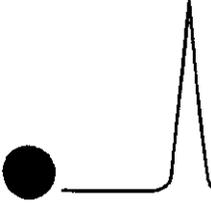
CAS# = Chemical Abstract Services Registry Number
VOA Surrogate Percent Recoveries

Dibromofluoromethane	105%
Toluene-d8	105%
4-Bromofluorobenzene	101%

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

April 10, 2003

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

Sample Matrix: Water
EPA Method: 375.4
Units: mg/L
Spectra Project: 2003030069
Applies to Spectra #'s 1 - 13

Attn: Patrick Skillings

METHOD 375.4/SM4500E SULFATE QUALITY CONTROL RESULTS

Matrix Spike Results

<u>Date</u>	<u>Sample Result</u>	<u>Spike Amount</u>	<u>Spike Result</u>	<u>% Rec.</u>	<u>MSD Result</u>	<u>MSD % Rec.</u>	<u>RPD</u>
4-2-03	2.55	20.00	24.15	108.00	23.63	105.40	2.44

Sample Duplicate Results

Duplicate Sample #2003030069-2

<u>Date</u>	<u>Sample Result</u>	<u>Duplicate Result</u>	<u>RPD</u>
4-2-03	2.70	3.15	15.38

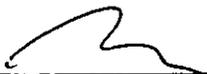
Check Standard Results

<u>Date</u>	<u>Known Value</u>	<u>Measured Value</u>	<u>% Rec.</u>
4-2-03	50.00	47.15	94.30

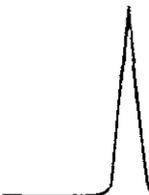
Method Blank Results

<u>Date</u>	<u>Result</u>
4-2-03	<1

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

April 10, 2003

Skillings & Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

Sample Matrix: Water
EPA Method: 624/8260
Sample Spiked: Method Blank
Date Analyzed: 3-11-03
Units: ug/L
Spectra Project: 2003030069
Applies to Spectra #'s 1 - 13

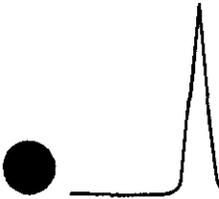
GCMS VOLATILE ORGANIC ANALYSIS QUALITY CONTROL RESULTS

<u>Compound</u>	<u>Sample Result</u>	<u>Spike Amount Added</u>	<u>Spike Amount Found</u>	<u>% Recovery</u>	<u>Dup. Spike Amount Found</u>	<u>% Recovery</u>	<u>RPD</u>
1,1-Dichloroethene	<1	10.00	9.61	96	9.91	99	3
Trichloroethene	<1	10.00	9.71	97	9.76	98	1
Benzene	<1	10.00	9.91	99	10.04	100	1
Toluene	<1	10.00	10.11	101	10.26	103	1
Chlorobenzene	<1	10.00	9.78	98	9.69	97	1

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

April 8, 2003

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

EPA Method: 6010
Spectra Project: 2003030069
Applies to Spectra #'s 1 - 13

Attn: Patrick Skillings

METALS QUALITY CONTROL RESULTS

MS/MSD

Spiked Sample: 2003030069-1
Units: mg/L

Date Prepared: 3-10-03
Date Analyzed: 3-10-03

<u>Compound</u>	<u>Sample Result</u>	<u>Spike Amount</u>	<u>Spike Result</u>	<u>% Recovery</u>	<u>Dup. Result</u>	<u>Dup. % Recovery</u>	<u>RPD</u>
Arsenic	ND	1.000	0.917	91.7	1.045	104.5	13.0
Boron	0.045	1.000	1.035	99.0	1.022	97.7	1.3
Cadmium	ND	1.000	0.998	99.8	1.017	101.7	1.9
Chromium	ND	1.000	0.975	97.5	1.020	102.0	4.5
Mercury *	ND	0.0040	0.0042	105	0.0042	105	0
Copper	0.010	1.000	1.018	100.8	1.028	101.8	1.0
Iron	0.012	1.000	0.992	98.0	0.985	97.3	0.7
Lead	ND	1.000	0.828	82.8	0.811	81.1	2.1
Manganese	0.006	1.000	0.971	96.5	0.996	99.0	2.6
Nickel	ND	1.000	0.990	99.0	1.012	101.2	2.2
Silver	ND	1.000	0.808	80.8	0.858	85.8	6.0
Zinc	ND	1.000	1.007	100.7	1.009	100.9	0.2

METHOD BLANK

Units: mg/L

Date Prepared: 3-10-03
Date Analyzed: 3-10-03

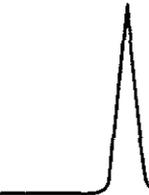
Arsenic	<0.005	Iron	<0.015
Boron	<0.01	Lead	<0.001
Cadmium	<0.003	Manganese	<0.002
Chromium	<0.007	Nickel	<0.015
Copper	<0.006	Silver	<0.007
Mercury	<0.0005	Zinc	<0.006

* Mercury spiked in to sample #20030005-1

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

April 10, 2003

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

Attn: Patrick Skillings

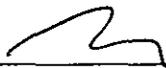
Sample Matrix: Water
EPA Method: SM 5210B/405.1
Units: mg/L
Spectra Project: 2003030069
Applies to Spectra #'s 1 - 13

SM 5210B/405.1 BOD ANALYSIS QUALITY CONTROL RESULTS

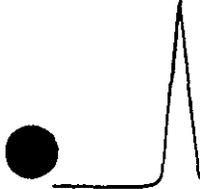
Glucose-Glutamic Acid Check Standard

<u>Date</u>	<u>Known Value</u>	<u>Measured Value</u>	<u>% Rec.</u>
3-12-03	198	182	92
	198	190	96
	198	196	99

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

April 24, 2003

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

EPA Method: 6010
Spectra Project: 2003030396
Applies to Spectra #1

Attn: Patrick Skillings

METALS QUALITY CONTROL RESULTS

MS/MSD							
Spiked Sample: 2003030069-1				Date Prepared: 3-10-03			
Units: mg/L				Date Analyzed: 3-10-03			
<u>Compound</u>	<u>Sample Result</u>	<u>Spike Amount</u>	<u>Spike Result</u>	<u>% Recovery</u>	<u>Dup. Result</u>	<u>Dup. % Recovery</u>	<u>RPD</u>
Arsenic	ND	1.000	0.917	91.7	1.045	104.5	13.0
Boron	0.045	1.000	1.035	99.0	1.022	97.7	1.3
Cadmium	ND	1.000	0.998	99.8	1.017	101.7	1.9
Chromium	ND	1.000	0.975	97.5	1.020	102.0	4.5
Mercury *	ND	0.0040	0.0042	105	0.0042	105	0
Copper	0.010	1.000	1.018	100.8	1.028	101.8	1.0
Iron	0.012	1.000	0.992	98.0	0.985	97.3	0.7
Lead	ND	1.000	0.828	82.8	0.811	81.1	2.1
Manganese	0.006	1.000	0.971	96.5	0.996	99.0	2.6
Nickel	ND	1.000	0.990	99.0	1.012	101.2	2.2
Silver	ND	1.000	0.808	80.8	0.858	85.8	6.0
Zinc	ND	1.000	1.007	100.7	1.009	100.9	0.2

METHOD BLANK

Units: mg/L

Date Prepared: 3-10-03

Date Analyzed: 3-10-03

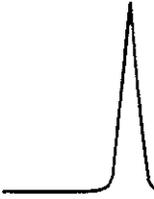
Arsenic	<0.005	Iron	<0.015
Boron	<0.01	Lead	<0.001
Cadmium	<0.003	Manganese	<0.002
Chromium	<0.007	Nickel	<0.015
Copper	<0.006	Silver	<0.007
Mercury	<0.0005	Zinc	<0.006

* Mercury spiked in to sample #20030005-1

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

April 24, 2003

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

Sample Matrix: Water
EPA Method: 375.4
Units: mg/L
Spectra Project: 2003030396
Applies to Spectra #1

Attn: Patrick Skillings

METHOD 375.4/SM4500E SULFATE QUALITY CONTROL RESULTS

Matrix Spike Results

<u>Date</u>	<u>Sample Result</u>	<u>Spike Amount</u>	<u>Spike Result</u>	<u>% Rec.</u>	<u>MSD Result</u>	<u>MSD % Rec.</u>	<u>RPD</u>
4-2-03	2.55	20.00	24.15	108.00	23.63	105.40	2

Sample Duplicate Results

Duplicate Sample #2003030069-2

<u>Date</u>	<u>Sample Result</u>	<u>Duplicate Result</u>	<u>RPD</u>
4-2-03	2.70	3.15	15

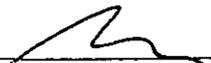
Check Standard Results

<u>Date</u>	<u>Known Value</u>	<u>Measured Value</u>	<u>% Rec.</u>
4-2-03	50.00	47.15	94

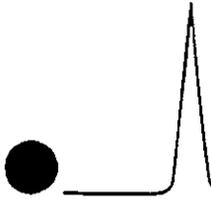
Method Blank Results

<u>Date</u>	<u>Result</u>
4-2-03	<1

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

April 24, 2003

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

Attn: Patrick Skillings

Sample Matrix: Water
EPA Method: 4500Br
Units: mg/L
Spectra Project: 2003030396
Applies to Spectra #1

STANDARD METHOD 4500 BR BROMIDE ANALYSIS QUALITY CONTROL RESULTS

Initial Check Standard Results

<u>Date</u>	<u>Known Value</u>	<u>Measured Value</u>	<u>% Rec.</u>
4-3-03	0.5	0.48	96.0

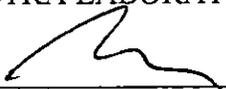
Matrix Spike/Matrix Spike Duplicate Results

<u>Date</u>	<u>Sample Result</u>	<u>Spike Amount</u>	<u>Spike Result</u>	<u>% Rec.</u>	<u>MSD Result</u>	<u>MSD % Rec.</u>	<u>RPD</u>
4-3-03	<0.1	0.5	0.586	117.2	0.566	113.2	3

Sample Duplicate Results Duplicate Sample #2003030069-13

<u>Date</u>	<u>Sample Result</u>	<u>Duplicate Result</u>	<u>RPD</u>
4-3-03	<0.1	<0.1	0.0

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

April 24, 2003

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

Attn: Patrick Skillings

Sample Matrix: Water
EPA Method: 415.1/9060
Units: mg/L
Spectra Project: 2003030396
Applies to Spectra #1

METHOD 415.1/9060 DISSOLVED ORGANIC CARBON ANALYSIS QUALITY CONTROL RESULTS

Matrix Spike Results

<u>Date</u>	<u>Sample Result</u>	<u>Spike Amount</u>	<u>Spike Result</u>	<u>% Rec.</u>	<u>MSD Result</u>	<u>MSD % Rec.</u>	<u>RPD</u>
3-10-03	6.091	25	29.68	94.4	29	90.4	4

Sample Duplicate Results

Duplicate Sample #2003030069-2

<u>Date</u>	<u>Sample Result</u>	<u>Duplicate Result</u>	<u>RPD</u>
3-10-03	8.992	9.406	4.5

Check Standard Results

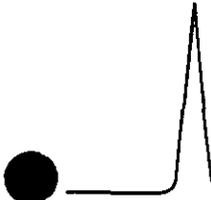
<u>Date</u>	<u>Known Value</u>	<u>Measured Value</u>	<u>% Rec.</u>
4-4-03	50	51.26	102.5

Method Blank Results

<u>Date</u>	<u>Result</u>
4-4-03	<5

SPECTRA LABORATORIES, INC.


Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

April 24, 2003

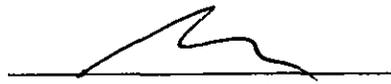
Skillings & Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

Sample Matrix: Water
EPA Method: 624/8260
Sample Spiked: Method Blank
Date Analyzed: 3-11-03
Units: ug/L
Spectra Project: 2003030396
Applies to Spectra #1

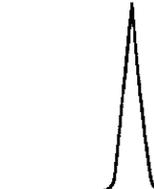
GCMS VOLATILE ORGANIC ANALYSIS QUALITY CONTROL RESULTS

<u>Compound</u>	<u>Sample Result</u>	<u>Spike Amount Added</u>	<u>Spike Amount Found</u>	<u>% Recovery</u>	<u>Dup. Spike Amount Found</u>	<u>% Recovery</u>	<u>RPD</u>
1,1-Dichloroethene	<1	10.00	9.61	96	9.91	99	3
Trichloroethene	<1	10.00	9.71	97	9.76	98	1
Benzene	<1	10.00	9.91	99	10.04	100	1
Toluene	<1	10.00	10.11	101	10.26	103	1
Chlorobenzene	<1	10.00	9.78	98	9.69	97	1

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

April 24, 2003

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

Attn: Patrick Skillings

Sample Matrix: Water
EPA Method: SM 5210B/405.1
Units: mg/L
Spectra Project: 2003030396
Applies to Spectra #1

SM 5210B/405.1 BOD ANALYSIS QUALITY CONTROL RESULTS

Glucose-Glutamic Acid Check Standard

<u>Date</u>	<u>Known Value</u>	<u>Measured Value</u>	<u>% Rec.</u>
3-12-03	198	182	92
	198	190	96
	198	196	99

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838
April 24, 2003

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

METHOD BLANK
Sample Matrix: Water
Applies to Spectra #2003030396

Date Analyzed: 4-2-03
Dilution: 1
< = less than

VOLATILE ORGANIC COMPOUNDS

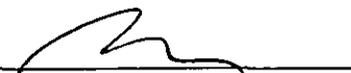
EPA METHOD 8260

Compound	CAS#	ug/L
Bromodichloromethane	75-27-4	<1
Bromoform	75-25-2	<1
Chlorodibromomethane	124-48-1	<1
Chloroform	67-66-3	<1

CAS# = Chemical Abstract Services Registry Number
VOA Surrogate Percent Recoveries

Dibromofluoromethane	107%
Toluene-d8	101%
4-Bromofluorobenzene	104%

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

April 24, 2003

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

METHOD BLANK
Sample Matrix: Water
Spectra Project: 2003030396
Applies to Spectra #1

Date Extracted: 4-3-03
Date Analyzed: 4-4-03
Dilution: 1
< = less than

SEMIVOLATILE ORGANIC ANALYSIS

METHOD 625/8270

Compound	ug/L
----------	------

N-Nitrosodimethylamine	<10
------------------------	-----

Caffeine	<10
----------	-----

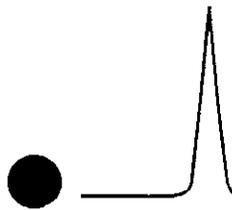
SURROGATE RECOVERIES:

Nitrobenzene-d5	79%
2-Fluorobiphenyl	82%
p-Terphenyl-d14	77%

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

July 10, 2003

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

Attn: Patrick Skillings

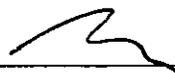
Sample Matrix: Water
EPA Method: SM 5210B/405.1
Units: mg/L
Spectra Project: 2003060069
Applies to Spectra #'s 1 - 15

SM 5210B/405.1 BOD ANALYSIS QUALITY CONTROL RESULTS

Glucose-Glutamic Acid Check Standard

<u>Date</u>	<u>Known Value</u>	<u>Measured Value</u>	<u>% Rec.</u>
6-12-03	198	215	109
	198	176	89
	198	172.3	87

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

July 10, 2003

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

EPA Method: 6010
Spectra Project: 2003060069
Applies to Spectra #'s 1 - 15

Attn: Patrick Skillings

METALS QUALITY CONTROL RESULTS

MS/MSD

Spiked Sample: 2003060069-10
Units: mg/L

Date Prepared: 6-16-03
Date Analyzed: 6-17-03

<u>Compound</u>	<u>Sample Result</u>	<u>Spike Amount</u>	<u>Spike Result</u>	<u>% Recovery</u>	<u>Dup. Result</u>	<u>Dup. % Recovery</u>	<u>RPD</u>
Arsenic	ND	1.000	1.074	107.4	0.955	95.5	11.7
Boron	0.525	1.000	1.690	116.5	1.701	117.6	0.9
Cadmium	ND	1.000	1.128	112.8	1.130	113.0	0.2
Chromium	ND	1.000	1.095	109.5	1.076	107.6	1.8
Mercury *	ND	0.0020	0.0021	107	0.0023	116	8.6
Mercury **	ND	0.0020	0.0019	96	0.0022	111	14.2
Copper	0.031	1.000	1.214	118.3	1.195	116.4	1.6
Iron	0.454	1.000	1.554	110.0	1.549	109.5	0.5
Lead	ND	1.000	0.965	96.5	0.986	98.6	2.2
Manganese	0.201	1.000	1.245	104.4	1.273	107.2	2.6
Nickel	ND	1.000	1.113	111.3	1.103	110.3	0.9
Silver	ND	1.000	1.050	105.0	1.051	105.1	0.1
Zinc	0.030	1.000	1.201	117.1	1.207	117.7	0.5

METHOD BLANK

Units: mg/L

Date Prepared: 6-16-03
Date Analyzed: 6-17-03

Arsenic	<0.005	Iron	<0.015
Boron	<0.01	Lead	<0.001
Cadmium	<0.003	Manganese	<0.002
Chromium	<0.007	Nickel	<0.015
Copper	<0.006	Silver	<0.007
Mercury	<0.0005	Zinc	<0.006

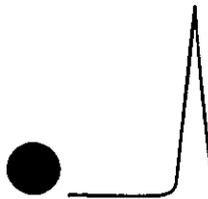
* Mercury spiked in to sample #2003050405-1, Applies to Spectra Sample #'s 2003060069 1 - 11.

* Mercury spiked in to sample #2003060122-1, Applies to Spectra Sample #'s 2003060069 12 - 15.

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

July 10, 2003

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

Sample Matrix: Water
EPA Method: 375.4/SM4500E
Units: mg/L
Spectra Project: 2003060069
Applies to Spectra #'s 1 - 15

Attn: Patrick Skillings

METHOD 375.4/SM4500E SULFATE QUALITY CONTROL RESULTS

Matrix Spike Results

<u>Date</u>	<u>Sample Result</u>	<u>Spike Amount</u>	<u>Spike Result</u>	<u>% Rec.</u>	<u>MSD Result</u>	<u>MSD % Rec.</u>	<u>RPD</u>
6-26-03	21.00	20.00	42.41	107.06	42.41	107.04	0.02

Sample Duplicate Results Duplicate Sample #2003060069-8

<u>Date</u>	<u>Sample Result</u>	<u>Duplicate Result</u>	<u>RPD</u>
6-26-03	30.66	25.36	18.92

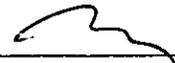
Check Standard Results

<u>Date</u>	<u>Known Value</u>	<u>Measured Value</u>	<u>% Rec.</u>
6-26-03	50.00	50.74	101.49

Method Blank Results

<u>Date</u>	<u>Result</u>
6-26-03	<1

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838
July 10, 2003

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

METHOD BLANK
Sample Matrix: Water
Applies to Spectra #2003060069

Date Analyzed: 6-9-03
Dilution: 1
< = less than

VOLATILE ORGANIC COMPOUNDS**EPA METHOD 8260**

Compound	CAS#	ug/L
Bromodichloromethane	75-27-4	<1
Bromoform	75-25-2	<1
Chlorodibromomethane	124-48-1	<1
Chloroform	67-66-3	<1

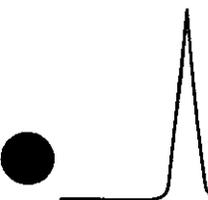
CAS# = Chemical Abstract Services Registry Number
VOA Surrogate Percent Recoveries

Dibromofluoromethane	84%
Toluene-d8	100%
4-Bromofluorobenzene	101%

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

July 10, 2003

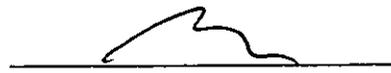
Skillings & Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

Sample Matrix: Water
EPA Method: 624/8260
Sample Spiked: Method Blank
Date Analyzed: 6-9-03
Units: ug/L
Spectra Project: 2003060069
Applies to Spectra #'s 1 - 15

GCMS VOLATILE ORGANIC ANALYSIS QUALITY CONTROL RESULTS

<u>Compound</u>	<u>Sample Result</u>	<u>Spike Amount Added</u>	<u>Spike Amount Found</u>	<u>% Recovery</u>	<u>Dup. Spike Amount Found</u>	<u>% Recovery</u>	<u>RPD</u>
1,1-Dichloroethene	<1	9.36	11.10	119	11.50	123	4
Trichloroethene	<1	10.00	9.32	93	9.33	93	0
Benzene	<1	10.00	9.45	95	9.55	96	1
Toluene	<1	10.00	9.44	94	9.46	95	0
Chlorobenzene	<1	10.00	9.39	94	9.27	93	1

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

July 10, 2003

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

Attn: Patrick Skillings

Sample Matrix: Water
EPA Method: 4500Br
Units: mg/L
Spectra Project: 2003060069
Applies to Spectra #'s 1 - .15

STANDARD METHOD 4500 BR BROMIDE ANALYSIS QUALITY CONTROL RESULTS

Initial Check Standard Results

<u>Date</u>	<u>Known Value</u>	<u>Measured Value</u>	<u>% Rec.</u>
6-26-03	0.5	0.433	86.6

Matrix Spike/Matrix Spike Duplicate Results

<u>Date</u>	<u>Sample Result</u>	<u>Spike Amount</u>	<u>Spike Result</u>	<u>% Rec.</u>	<u>MSD Result</u>	<u>MSD % Rec.</u>	<u>RPD</u>
6-26-03	ND	0.5	0.426	85.2	0.485	97.0	13

Sample Duplicate Results

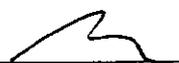
Duplicate Sample #2003060069-8

<u>Date</u>	<u>Sample Result</u>	<u>Duplicate Result</u>	<u>RPD</u>
6-26-03	0.139	0.159	13

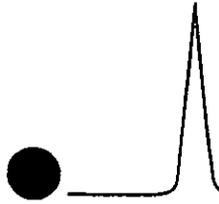
Method Blank

<u>Date</u>	<u>Result</u>
6-26-03	<0.1

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

July 10, 2003

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

Attn: Patrick Skillings

Sample Matrix: Water
EPA Method: 415.1
Units: mg/L
Spectra Project: 2003060069
Applies to Spectra #'s 1 - 15

METHOD 415.1/IR DISSOLVED ORGANIC CARBON ANALYSIS QUALITY CONTROL RESULTS

Matrix Spike Results

<u>Date</u>	<u>Sample Result</u>	<u>Spike Amount</u>	<u>Spike Result</u>	<u>% Rec.</u>	<u>MSD Result</u>	<u>MSD % Rec.</u>	<u>RPD</u>
7-2-03	1.4	25	22.4	84.0	22	83.6	0

Sample Duplicate Results

Duplicate Sample #2003060069-2

<u>Date</u>	<u>Sample Result</u>	<u>Duplicate Result</u>	<u>RPD</u>
7-2-03	4.080	5.630	31.9

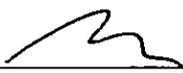
Check Standard Results

<u>Date</u>	<u>Known Value</u>	<u>Measured Value</u>	<u>% Rec.</u>
7-2-03	100	87.65	87.7

Method Blank Results

<u>Date</u>	<u>Result</u>
7-2-03	<5

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

July 10, 2003

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

METHOD BLANK
Sample Matrix: Water
Spectra Project: 2003060069
Applies to Spectra #'s 1 - 15

Date Extracted: 6-9-03
Date Analyzed: 6-13-03
Dilution: 1
< = less than

SEMIVOLATILE ORGANIC ANALYSIS

METHOD 625/8270

Compound	ug/L
----------	------

N-Nitrosodimethylamine	<10
------------------------	-----

Caffeine	<10
----------	-----

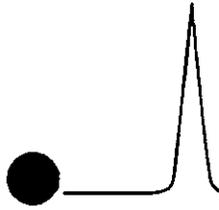
SURROGATE RECOVERIES:

Nitrobenzene-d5	59%
2-Fluorobiphenyl	66%
p-Terphenyl-d14	62%

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

July 10, 2003

Skillings & Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

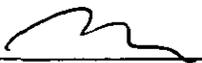
Attn: Patrick Skillings

Sample Matrix: Water
Sample Spiked: Method Blank
Date Extracted: 6-24-03
Date Analyzed: 6-25-03
Units: ug/L
Spectra Project: 2003060069
Applies to Spectra #'s 1 - 15

SOIL SEMIVOLATILE MATRIX SPIKE QUALITY CONTROL

	Sample Result	Spike Added	MS Conc.	MS % Rec.	MSD Conc.	MSD Rec.	RPD
Phenol	75	<10	49	65	41	54	18
2-Chlorophenol	75	<10	41	55	40	54	1
1,4-Dichlorobenzene	50	<10	25	49	27	54	9
N-Nitroso-Di-n-Propylamine	50	<10	42	84	45	90	6
1,2,4-Trichlorobenzene	50	<10	26	51	33	66	25
4-Chloro-3-Methylphenol	75	<10	50	67	72	96	36
Acenaphthene	50	<10	39	77	43	85	9
4-Nitrophenol	75	<50	45	59	48	63	7
2,4-Dinitrotoluene	50	<10	41	82	47	95	15
Pentachlorophenol	75	<50	49	66	58	77	16
Pyrene	50	<10	43	87	46	91	5

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager

RECEIVED

OCT 08 2003

Skillings-Connolly, Inc.
Consulting Engineers

SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

10/06/2003

Skillings-Connolly, Inc.
PO Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

Project: Yelm Groundwater
Client ID: SC2 MW6
Sample Matrix: Water
Date Sampled: 09/11/2003
Date Received: 09/11/2003
Spectra Project: 2003090138
Spectra Number: 1

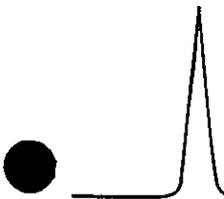
Analyte	Result	Units	Method
Total Dissolved Solids	106	mg/L	EPA 160.1
Bromodichloromethane	<1	ug/L	EPA 624
Bromoform	<1	ug/L	EPA 624
Chlorodibromomethane	<1	ug/L	EPA 624
Chloroform	<1	ug/L	EPA 624
Fecal Coliform	12	/100 mls.	Membrane Filtration
Fecal Streptococcus	6	/100 mls.	Membrane Filtration
TKN	ND	mg/L	SM 4500-N-B
Chloride	5.0	mg/L	SM4500CL-C
Nitrite	0.01	mg/L-N	SM4500NO2B
Nitrate	1.27	mg/L-N	SM4500NO3D

Surrogate	Recovery	Method
Dibromofluoromethane	96	EPA 624
Toluene-d8	101	EPA 624
4-Bromofluorobenzene	102	EPA 624

SPECTRA LABORATORIES

Steve Hibbs, Laboratory Manager

a5/sgb



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

October 7, 2003

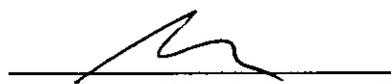
Skillings & Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

Sample Matrix: Water
EPA Method: 624/8260
Sample Spiked: Method Blank
Date Analyzed: 10-1-03
Units: ug/L
Spectra Project: 2003090138
Applies to Spectra #'s 1 - 14

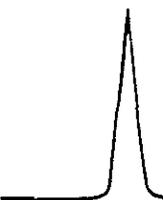
GCMS VOLATILE ORGANIC ANALYSIS QUALITY CONTROL RESULTS

<u>Compound</u>	<u>Sample Result</u>	<u>Spike Amount Added</u>	<u>Spike Amount Found</u>	<u>% Recovery</u>	<u>Dup. Spike Amount Found</u>	<u>% Recovery</u>	<u>RPD</u>
1,1-Dichloroethene	<1	9.36	10.73	115	10.44	112	3
Trichloroethene	<1	10.00	9.50	95	9.21	92	3
Benzene	<1	10.00	10.18	102	9.89	99	3
Toluene	<1	10.00	9.64	96	9.35	94	3
Chlorobenzene	<1	10.00	9.63	96	9.36	94	3

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838
October 7, 2003

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

METHOD BLANK
Sample Matrix: Water
Spectra Project: 2003090138
Applies to Spectra #'s 1 - 14

Date Analyzed: 10-2-03
Dilution: 1
< = less than

VOLATILE ORGANIC COMPOUNDS

EPA METHOD 8260

Compound	CAS#	ug/L
Bromodichloromethane	75-27-4	<1
Bromoform	75-25-2	<1
Chlorodibromomethane	124-48-1	<1
Chloroform	67-66-3	<1

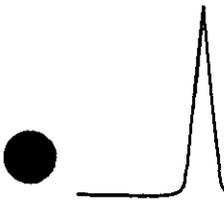
CAS# = Chemical Abstract Services Registry Number
VOA Surrogate Percent Recoveries

Dibromofluoromethane	93%
Toluene-d8	99%
4-Bromofluorobenzene	105%

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

December 2, 2003

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

Attn: Patrick Skillings

Sample Matrix: Water
EPA Method: 415.1/9060
Units: mg/L
Spectra Project: 2003100258
Applies to Spectra #'s 1 - 10

METHOD 415.1/9060 DISSOLVED ORGANIC CARBON ANALYSIS QUALITY CONTROL RESULTS

Matrix Spike/Matrix Spike Duplicate Results

<u>Date</u>	<u>Sample Result</u>	<u>Spike Amount</u>	<u>Spike Result</u>	<u>% Rec.</u>	<u>MSD Result</u>	<u>MSD % Rec.</u>	<u>RPD</u>
11-13-03	4.5	25	23.6	76.4	25	81.6	7

Sample Duplicate Results Duplicate Sample #2003100258-6

<u>Date</u>	<u>Sample Result</u>	<u>Duplicate Result</u>	<u>RPD</u>
11-13-03	12.2	13.4	9.4

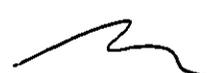
Check Standard Results

<u>Date</u>	<u>Known Value</u>	<u>Measured Value</u>	<u>% Rec.</u>
11-13-03	100	106.4	106.4

Method Blank Results

<u>Date</u>	<u>Result</u>
11-13-03	<5

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

December 2, 2003

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

Attn: Patrick Skillings

Sample Matrix: Water
EPA Method: 4500Br
Units: mg/L
Spectra Project: 2003100258
Applies to Spectra #'s 1 - 10

STANDARD METHOD 4500 BR BROMIDE ANALYSIS QUALITY CONTROL RESULTS

Initial Check Standard Results

<u>Date</u>	<u>Known Value</u>	<u>Measured Value</u>	<u>% Rec.</u>
11-10-03	0.5	0.397	79.4

Matrix Spike/Matrix Spike Duplicate Results

<u>Date</u>	<u>Sample Result</u>	<u>Spike Amount</u>	<u>Spike Result</u>	<u>% Rec.</u>	<u>MSD Result</u>	<u>MSD % Rec.</u>	<u>RPD</u>
11-10-03	0.048	0.5	0.451	80.6	0.444	79.2	2

Sample Duplicate Results

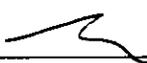
Duplicate Sample #200310258-6

<u>Date</u>	<u>Sample Result</u>	<u>Duplicate Result</u>	<u>RPD</u>
11-10-03	0.025	0.022	13

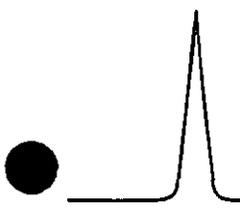
Method Blank Results

<u>Date</u>	<u>Result</u>
11-10-03	<0.1

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838
December 2, 2003

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

METHOD BLANK
Sample Matrix: Water
Applies to Spectra #2003100258

Date Analyzed: 11-10-03
Dilution: 1
< = less than

VOLATILE ORGANIC COMPOUNDS

EPA METHOD 8260

Compound	CAS#	ug/L
Bromodichloromethane	75-27-4	<1
Bromoform	75-25-2	<1
Chlorodibromomethane	124-48-1	<1
Chloroform	67-66-3	<1

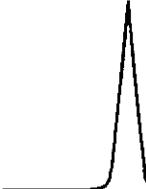
CAS# = Chemical Abstract Services Registry Number
VOA Surrogate Percent Recoveries

Dibromofluoromethane	87%
Toluene-d8	106%
4-Bromofluorobenzene	101%

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

December 2, 2003

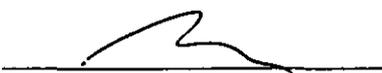
Skillings & Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

Sample Matrix: Water
EPA Method: 624/8260
Sample Spiked: Method Blank
Date Analyzed: 11-10-03
Units: ug/L
Spectra Project: 2003100258
Applies to Spectra #'s 1 - 10

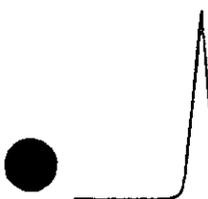
GCMS VOLATILE ORGANIC ANALYSIS QUALITY CONTROL RESULTS

<u>Compound</u>	<u>Sample Result</u>	<u>Spike Amount Added</u>	<u>Spike Amount Found</u>	<u>% Recovery</u>	<u>Dup. Spike Amount Found</u>	<u>% Recovery</u>	<u>RPD</u>
1,1-Dichloroethene	<1	9.36	10.04	107	9.90	106	1
Trichloroethene	<1	10.00	8.60	86	8.19	82	5
Benzene	<1	10.00	8.77	88	8.53	85	3
Toluene	<1	10.00	8.86	89	8.85	89	0
Chlorobenzene	<1	10.00	8.75	88	8.49	85	3

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

December 2, 2003

Skillings & Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

Attn: Patrick Skillings

Sample Matrix: Water
Sample Spiked: Method Blank
Date Extracted: 10-1-03
Date Analyzed: 10-2-03
Units: ug/L
Spectra Project: 2003100258
Applies to Spectra #'s 1 - 10

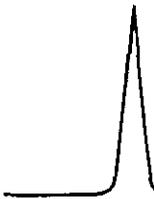
SOIL SEMIVOLATILE MATRIX SPIKE QUALITY CONTROL

	Sample Result	Spike Added	MS Conc.	MS % Rec.	MSD Conc.	MSD Rec.	RPD
Phenol	75	<10	52	69	58	77	11
2-Chlorophenol	75	<10	62	82	67	90	9
1,4-Dichlorobenzene	50	<10	33	65	35	70	7
N-Nitroso-Di-n-Propylamine	50	<10	45	91	48	97	6
1,2,4-Trichlorobenzene	50	<10	38	75	40	79	6
4-Chloro-3-Methylphenol	75	<10	60	80	66	87	9
Acenaphthene	50	<10	42	84	46	92	9
4-Nitrophenol	75	<50	40	54	40	54	0
2,4-Dinitrotoluene	50	<10	41	82	45	89	8
Pentachlorophenol	75	<50	13	17	17	23	28
Pyrene	50	<10	42	84	45	91	8

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

December 3, 2003

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

Sample Matrix: Water
EPA Method: 375.4/SM4500E
Units: mg/L
Spectra Project: 2003100258
Applies to Spectra #'s 1 - 10

Attn: Patrick Skillings

METHOD 375.4/SM4500E SULFATE QUALITY CONTROL RESULTS

Matrix Spike Results

<u>Date</u>	<u>Sample Result</u>	<u>Spike Amount</u>	<u>Spike Result</u>	<u>% Rec.</u>	<u>MSD Result</u>	<u>MSD % Rec.</u>	<u>RPD</u>
11-25-03	0.94	20.00	21.11	100.85	20.78	99.17	1.68

Sample Duplicate Results

Duplicate Sample #2003100258-8

<u>Date</u>	<u>Sample Result</u>	<u>Duplicate Result</u>	<u>RPD</u>
11-25-03	18.21	19.12	4.84

Check Standard Results

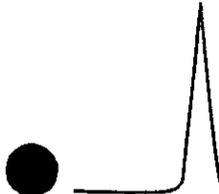
<u>Date</u>	<u>Known Value</u>	<u>Measured Value</u>	<u>% Rec.</u>
11-25-03	50.00	51.25	102.50

Method Blank Results

<u>Date</u>	<u>Result</u>
11-25-03	<1

SPECTRA LABORATORIES, INC.


Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

December 3, 2003

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

EPA Method: 6010
Spectra Project: 2003100258
Applies to Spectra #'s 1 - 10

Attn: Patrick Skillings

METALS QUALITY CONTROL RESULTS

MS/MSD

Spiked Sample: 2003100258-8
Units: mg/L

Date Prepared: 11-3-03
Date Analyzed: 11-3-03

<u>Compound</u>	<u>Sample Result</u>	<u>Spike Amount</u>	<u>Spike Result</u>	<u>% Recovery</u>	<u>Dup. Result</u>	<u>Dup. % Recovery</u>	<u>RPD</u>
Arsenic	ND	1.000	1.194	119.4	1.106	110.6	7.7
Boron	0.393	1.000	1.372	97.9	1.328	93.5	4.6
Cadmium	ND	1.000	0.988	98.8	0.984	98.4	0.4
Chromium	ND	1.000	0.987	98.7	0.997	99.7	1.0
Mercury *	ND	0.0200	0.0194	97	0.0209	104	7.2
Copper	0.009	1.000	1.066	105.7	1.061	105.2	0.5
Iron	0.155	1.000	1.248	109.3	1.205	105.0	4.0
Lead	ND	1.000	0.968	96.8	0.836	83.6	14.6
Manganese	0.173	1.000	1.276	110.3	1.287	111.4	1.0
Nickel	ND	1.000	0.971	97.1	0.986	98.6	1.5
Silver	ND	1.000	0.939	93.9	0.903	90.3	3.9
Zinc	ND	1.000	1.033	103.3	1.008	100.8	2.4

METHOD BLANK

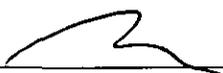
Units: mg/L

Date Prepared: 12-3-03
Date Analyzed: 12-3-03

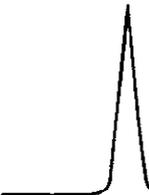
Arsenic	<0.005	Iron	<0.015
Boron	<0.01	Lead	<0.001
Cadmium	<0.003	Manganese	<0.002
Chromium	<0.007	Nickel	<0.015
Copper	<0.006	Silver	<0.007
Mercury	<0.0005	Zinc	<0.006

* Mercury spiked in to sample #2003100224-3

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

December 3, 2003

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

Attn: Patrick Skillings

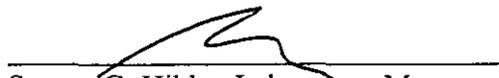
Sample Matrix: Water
EPA Method: SM 5210B/405.1
Units: mg/L
Spectra Project: 2003100258
Applies to Spectra #'s 1 - 10

SM 5210B/405.1 BOD ANALYSIS QUALITY CONTROL RESULTS

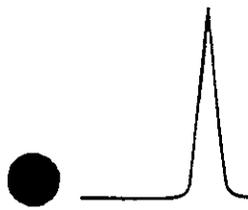
Glucose-Glutamic Acid Check Standard

<u>Date</u>	<u>Known Value</u>	<u>Measured Value</u>	<u>% Rec.</u>
10-29-03	198	214	108
	198	209.5	106
	198	202	102

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

December 3, 2003

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

METHOD BLANK
Sample Matrix: Water
Spectra Project: 2003100258
Applies to Spectra #'s 1 - 10

Date Extracted: 10-23-03
Date Analyzed: 11-4-03
Dilution: 1
< = less than

SEMIVOLATILE ORGANIC ANALYSIS

METHOD 625/8270

Compound	ug/L
----------	------

N-Nitrosodimethylamine	<10
------------------------	-----

Caffeine	<10
----------	-----

SURROGATE RECOVERIES:

Nitrobenzene-d5	53%
2-Fluorobiphenyl	51%
p-Terphenyl-d14	77%

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

December 3, 2003

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

METHOD BLANK
Sample Matrix: Water
Spectra Project: 2003100258
Applies to Spectra #'s 1 - 10

Date Extracted: 10-27-03
Date Analyzed: 11-4-03
Dilution: 1
< = less than

SEMIVOLATILE ORGANIC ANALYSIS

METHOD 625/8270

Compound	ug/L
----------	------

N-Nitrosodimethylamine	<10
------------------------	-----

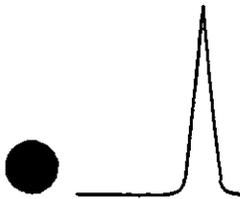
Caffeine	<10
----------	-----

SURROGATE RECOVERIES:

Nitrobenzene-d5	88%
2-Fluorobiphenyl	69%
p-Terphenyl-d14	88%

SPECTRA LABORATORIES, INC.

Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

March 17, 2004

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

EPA Method: 6010
Spectra Project: 2003120127
Applies to Spectra #'s 1 - 12

Attn: Patrick Skillings

METALS QUALITY CONTROL RESULTS

MS/MSD

Spiked Sample: 2003120127-2
Units: mg/L

Date Prepared: 12-18-03
Date Analyzed: 12-18-03

<u>Compound</u>	<u>Sample Result</u>	<u>Spike Amount</u>	<u>Spike Result</u>	<u>% Recovery</u>	<u>Dup. Result</u>	<u>Dup. % Recovery</u>	<u>RPD</u>
Arsenic	ND	1.000	1.083	108.3	1.042	104.2	3.9
Boron	ND	1.000	0.929	92.9	0.929	92.9	0
Cadmium	ND	1.000	0.988	98.8	0.984	98.4	0.4
Chromium	ND	1.000	0.987	98.7	0.997	99.7	1.0
Mercury *	ND	0.0020	0.0021	103	0.0021	106	3.4
Copper	0.009	1.000	1.066	105.7	1.061	105.2	0.5
Iron	0.155	1.00	1.248	109.3	1.205	105.0	4.0
Lead	ND	1.000	1.154	115.4	1.160	116.0	0.5
Manganese	0.173	1.000	1.273	110.3	1.287	111.4	1.0
Nickel	ND	1.000	0.971	97.1	0.986	98.6	1.5
Silver	ND	1.000	0.939	93.9	0.903	90.3	3.9
Zinc	ND	1.000	1.033	103.3	1.008	100.8	2.4

METHOD BLANK

Units: mg/L

Date Prepared: 12-18-03
Date Analyzed: 12-18-03

Arsenic	<0.005	Iron	<0.015
Boron	<0.03	Lead	<0.001
Cadmium	<0.003	Manganese	<0.002
Chromium	<0.007	Nickel	<0.015
Copper	<0.006	Silver	<0.007
Mercury	<0.0005	Zinc	<0.006

* Mercury spiked in to sample #120172-1

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

March 17, 2004

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

Attn: Patrick Skillings

Sample Matrix: Water
EPA Method: 375.4/SM4500E
Units: mg/L
Spectra Project: 2003120127
Applies to Spectra #'s 1 - 12

METHOD 375.4/SM4500E SULFATE QUALITY CONTROL RESULTS

Matrix Spike Results

<u>Date</u>	<u>Sample Result</u>	<u>Spike Amount</u>	<u>Spike Result</u>	<u>% Rec.</u>	<u>MSD Result</u>	<u>MSD % Rec.</u>	<u>RPD</u>
1-5-04	32.80	20.0	49.66	84.27	51.76	94.79	11.76

Sample Duplicate Results

Duplicate Sample #2003120127-12

<u>Date</u>	<u>Sample Result</u>	<u>Duplicate Result</u>	<u>RPD</u>
1-5-04	26.70	26.34	1.36

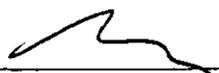
Check Standard Results

<u>Date</u>	<u>Known Value</u>	<u>Measured Value</u>	<u>% Rec.</u>
1-5-04	405.00	401.09	99.03

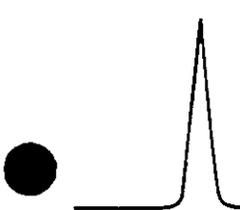
Method Blank Results

<u>Date</u>	<u>Result</u>
1-5-04	<1

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838
March 17, 2004

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509
Attn: Patrick Skillings

METHOD BLANK
Sample Matrix: Water
Applies to Spectra #2003120127
1 - 12

Date Analyzed: 12-26-03
Dilution: 1
< = less than

VOLATILE ORGANIC COMPOUNDS**EPA METHOD 8260**

Compound	CAS#	ug/L
Bromodichloromethane	75-27-4	<1
Bromoform	75-25-2	<1
Chlorodibromomethane	124-48-1	<1
Chloroform	67-66-3	<1

CAS# = Chemical Abstract Services Registry Number
VOA Surrogate Percent Recoveries

Dibromofluoromethane	87%
Toluene-d8	99%
4-Bromofluorobenzene	99%

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

March 17, 2004

Skillings & Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

Sample Matrix: Water
EPA Method: 624/8260
Sample Spiked: Method Blank
Date Analyzed: 12-8-03
Units: ug/L
Spectra Project: 2003120127
Applies to Spectra #'s 1 - 12

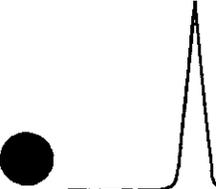
GCMS VOLATILE ORGANIC ANALYSIS QUALITY CONTROL RESULTS

<u>Compound</u>	<u>Sample Result</u>	<u>Spike Amount Added</u>	<u>Spike Amount Found</u>	<u>% Recovery</u>	<u>Dup. Spike Amount Found</u>	<u>% Recovery</u>	<u>RPD</u>
1,1-Dichloroethene	<1	10.00	10.26	103	11.14	111	8
Trichloroethene	<1	10.00	9.21	92	10.19	102	10
Benzene	<1	10.00	9.61	96	10.48	105	9
Toluene	<1	10.00	9.57	96	10.50	105	9
Chlorobenzene	<1	10.00	9.34	93	10.19	102	9

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

March 17, 2004

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

Attn: Patrick Skillings

Sample Matrix: Water
EPA Method: 4500Br
Units: mg/L
Spectra Project: 2003120127
Applies to Spectra #'s 1 - 12

STANDARD METHOD 4500 BR BROMIDE ANALYSIS QUALITY CONTROL RESULTS

Initial Check Standard Results

<u>Date</u>	<u>Known Value</u>	<u>Measured Value</u>	<u>% Rec.</u>
1-6-04	0.5	0.55	110.0

Matrix Spike/Matrix Spike Duplicate Results

<u>Date</u>	<u>Sample Result</u>	<u>Spike Amount</u>	<u>Spike Result</u>	<u>% Rec.</u>	<u>MSD Result</u>	<u>MSD % Rec.</u>	<u>RPD</u>
1-6-04	0.167	0.5	0.713	109.2	0.682	103.0	6

Sample Duplicate Results Duplicate Sample #2003120127-3

<u>Date</u>	<u>Sample Result</u>	<u>Duplicate Result</u>	<u>RPD</u>
1-6-04	0.117	0.115	2

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

March 17, 2004

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

Sample Matrix: Water
EPA Method: 415.1/9060
Units: mg/L
Spectra Project: 2003120127
Applies to Spectra #'s 1.- 12

Attn: Patrick Skillings

METHOD 415.1/9060 DISSOLVED ORGANIC CARBON ANALYSIS QUALITY CONTROL RESULTS

Matrix Spike Results

<u>Date</u>	<u>Sample Result</u>	<u>Spike Amount</u>	<u>Spike Result</u>	<u>% Rec.</u>	<u>MSD Result</u>	<u>MSD % Rec.</u>	<u>RPD</u>
12-18-03	4.945	25	30.69	103.0	30.80	103.4	0

Sample Duplicate Results

Duplicate Sample #2003120127-10

<u>Date</u>	<u>Sample Result</u>	<u>Duplicate Result</u>	<u>RPD</u>
12-18-03	2.55	2.05	21.6

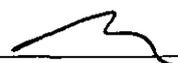
Check Standard Results

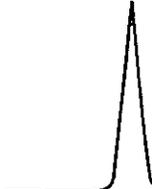
<u>Date</u>	<u>Known Value</u>	<u>Measured Value</u>	<u>% Rec.</u>
12-18-03	100	101.9	101.9

Method Blank Results

<u>Date</u>	<u>Result</u>
12-18-03	<5

SPECTRA LABORATORIES, INC.


Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

March 18, 2004

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

METHOD BLANK
Sample Matrix: Water
Spectra Project: 2003120127
Applies to Spectra #'s 1 - 12

Date Extracted: 12-22-03
Date Analyzed: 1-17-04
Dilution: 1
< = less than

SEMIVOLATILE ORGANIC ANALYSIS

METHOD 625/8270

Compound	ug/L
----------	------

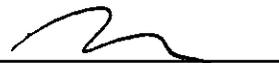
N-Nitrosodimethylamine	<10.0
------------------------	-------

Caffeine	<10.0
----------	-------

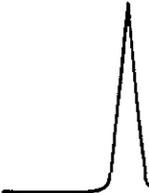
SURROGATE RECOVERIES:

Nitrobenzene-d5	50%
2-Fluorobiphenyl	56%
p-Terphenyl-d14	82%

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

March 18, 2004

Skillings & Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

Attn: Patrick Skillings

Sample Matrix: Water
Sample Spiked: Method Blank
Date Extracted: 1-20-04
Date Analyzed: 1-21-04
Units: ug/L
Spectra Project: 2003120127
Applies to Spectra #'s 1 - 12

SOIL SEMIVOLATILE MATRIX SPIKE QUALITY CONTROL

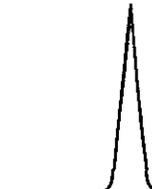
	Sample Result	Spike Added	MS Conc.	MS % Rec.	MSD Conc.	MSD Rec.	RPD
Phenol	75	<10	38	51	43	57	11
2-Chlorophenol	75	<10	37	50	43	57	14
1,4-Dichlorobenzene	50	<10	20	40	24	47	15
N-Nitroso-Di-n-Propylamine	50	<10	23	45	24	48	6
1,2,4-Trichlorobenzene	50	<10	25	51	30	61	18
4-Chloro-3-Methylphenol	75	<10	45	61	50	66	9
Acenaphthene	50	<10	29	58	33	65	12
4-Nitrophenol	75	<50	59	79	66	88	11
2,4-Dinitrotoluene	50	<10	30	59	37	74	22
Pentachlorophenol	75	<50	47	63	63	84	28
Pyrene	50	<10	36	72	41	82	13

* Out of limits

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager



SPECTRA Laboratories

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838

March 18, 2004

Skillings-Connolly, Inc.
P.O. Box 5080
Lacey, WA 98509

Attn: Patrick Skillings

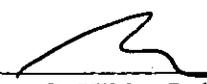
Sample Matrix: Water
EPA Method: SM 5210B/405.1
Units: mg/L
Spectra Project: 2003120127
Applies to Spectra #'s 1 - 12

SM 5210B/405.1 BOD ANALYSIS QUALITY CONTROL RESULTS

Glucose-Glutamic Acid Check Standard

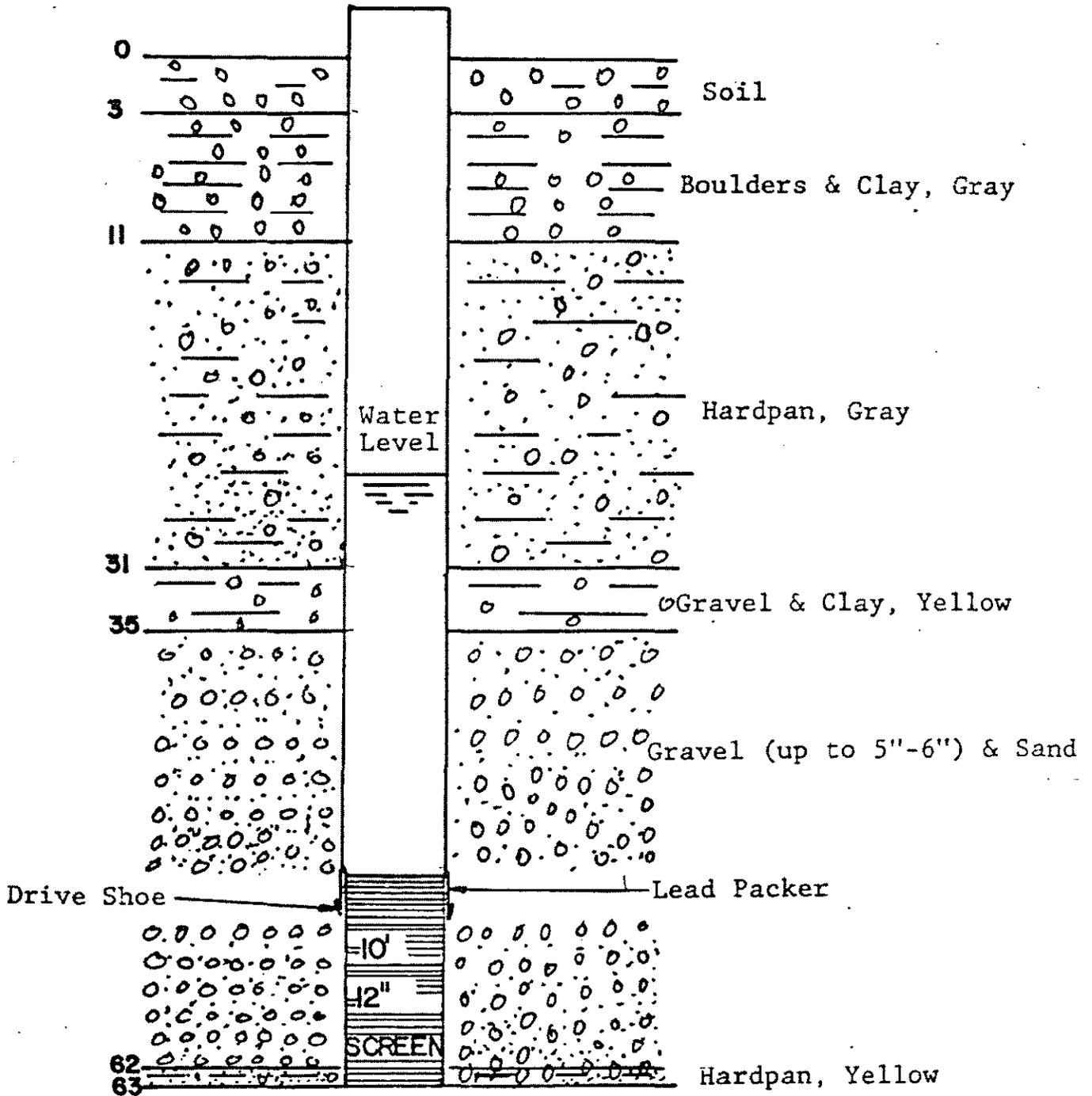
<u>Date</u>	<u>Known Value</u>	<u>Measured Value</u>	<u>% Rec.</u>
12-17-03	198	195	98
	198	178	90
	198	166	84

SPECTRA LABORATORIES, INC.



Steven G. Hibbs, Laboratory Manager

YELM WELL NO. 1

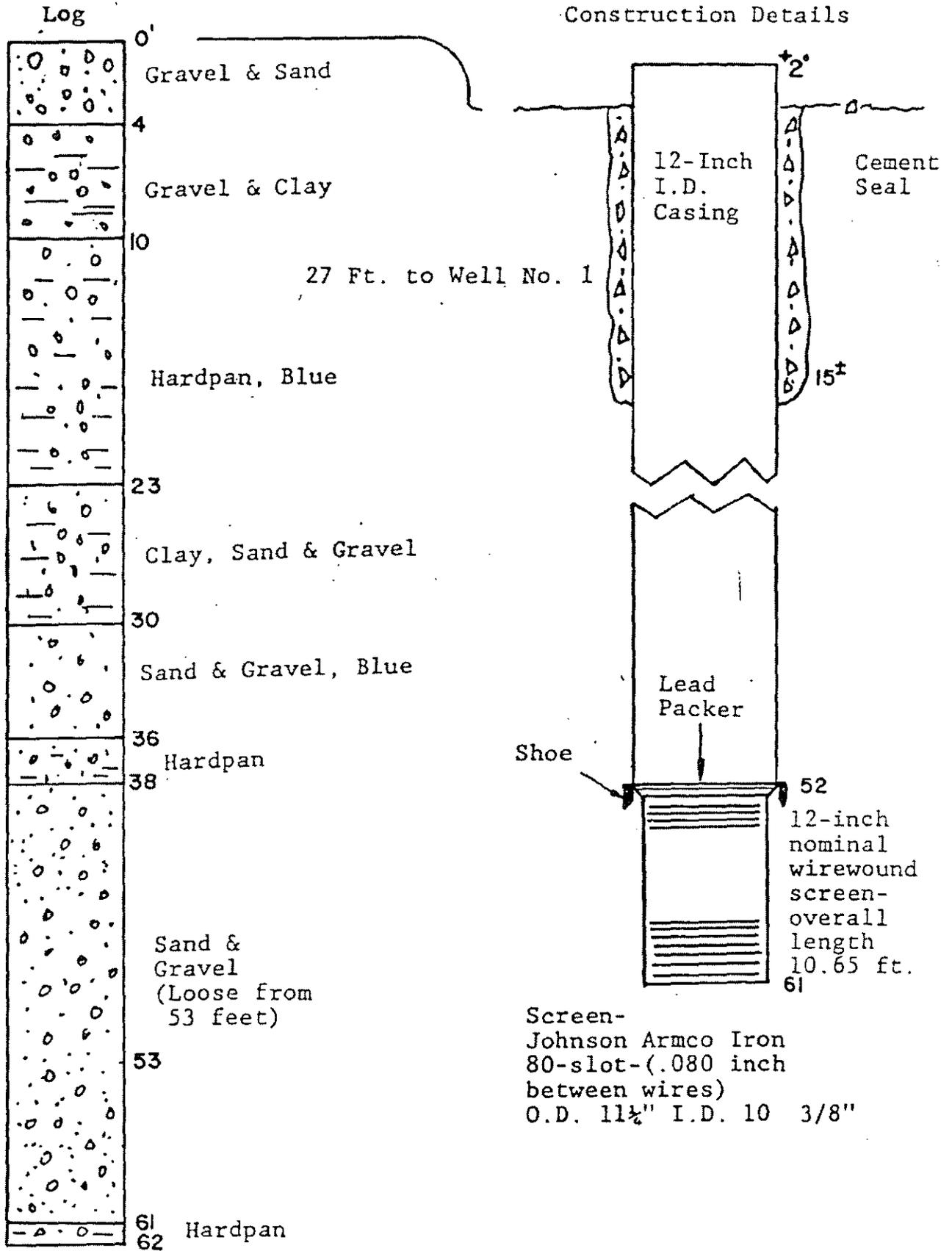


SCREEN DETAILS

TYPE: Wirewound Armco Iron
 SLOT: 0.06 Inch between Wires
 O.D. 11 $\frac{1}{2}$ "; I.D. 10 $\frac{9}{8}$ "

CASING: 12" I.D.
 STATIC WATER LEVELS FROM GROUND
 9-14-50 25.5'; 10-18-50 27.2
 DRAWDOWN 0.16 ft. 10-18-50 at 550 G.P.M.

YELM WELL NO. 2.

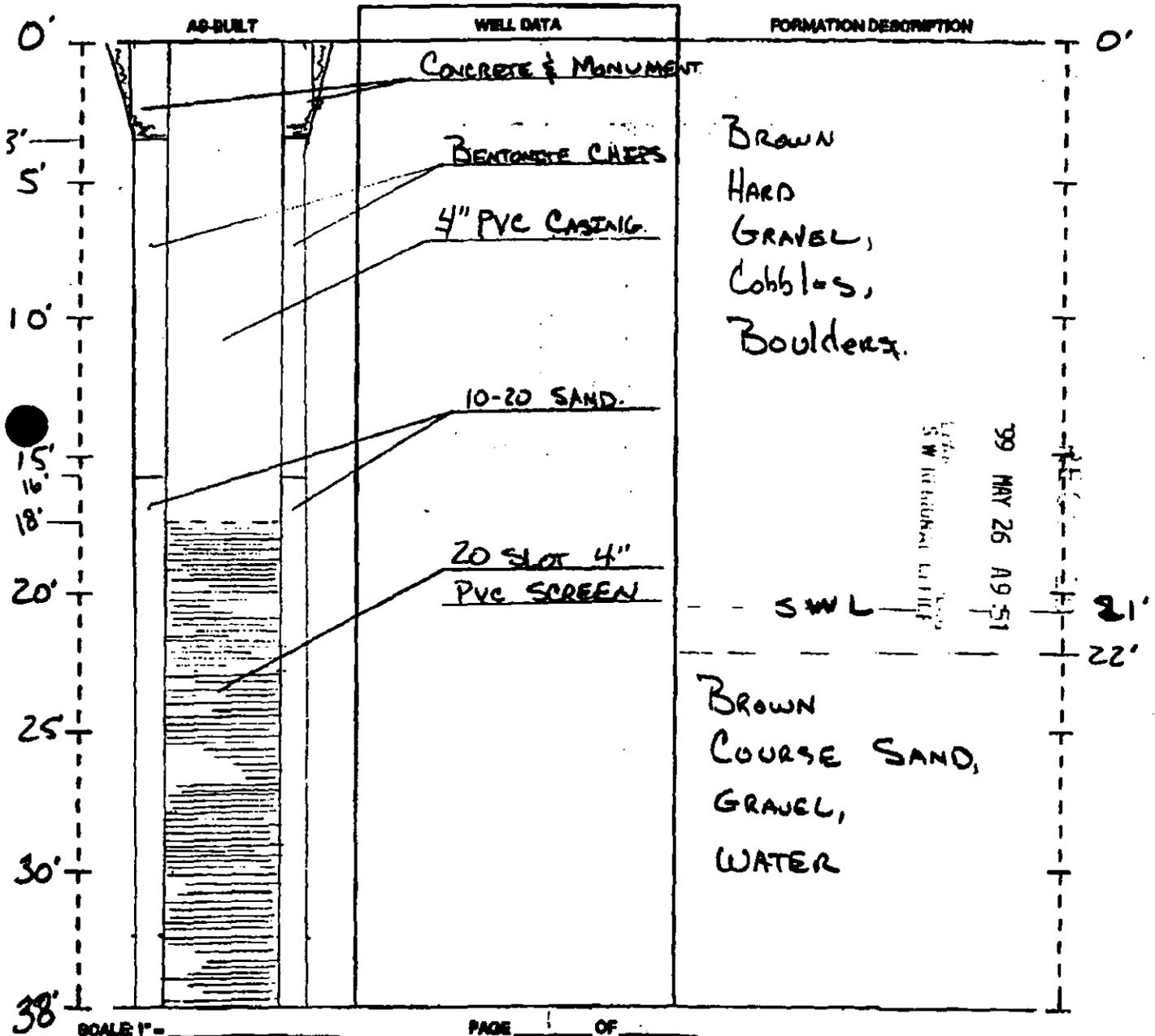


RESOURCE PROTECTION WELL REPORT

START CARD NO. R00645

PROJECT NAME: Cochrane Park
 WELL IDENTIFICATION NO. AES877
 DRILLING METHOD: Air Rotary
 DRILLER: Rogeray Phythian
 FIRM: Arcadia Drilling, Inc.
 SIGNATURE: [Signature] #2053
 CONSULTING FIRM: Skillings-Conolly, Inc.
 REPRESENTATIVE: R. Moeckel

COUNTY: Thurston
 LOCATION: NW 1/4 NW 1/4 Sec 30 Twp 17N R 2E
 STREET ADDRESS OF WELL: Mill Road
 WATER LEVEL ELEVATION: 21'
 GROUND SURFACE ELEVATION: 350'
 INSTALLED: 05/03/99
 DEVELOPED: 05/03/99



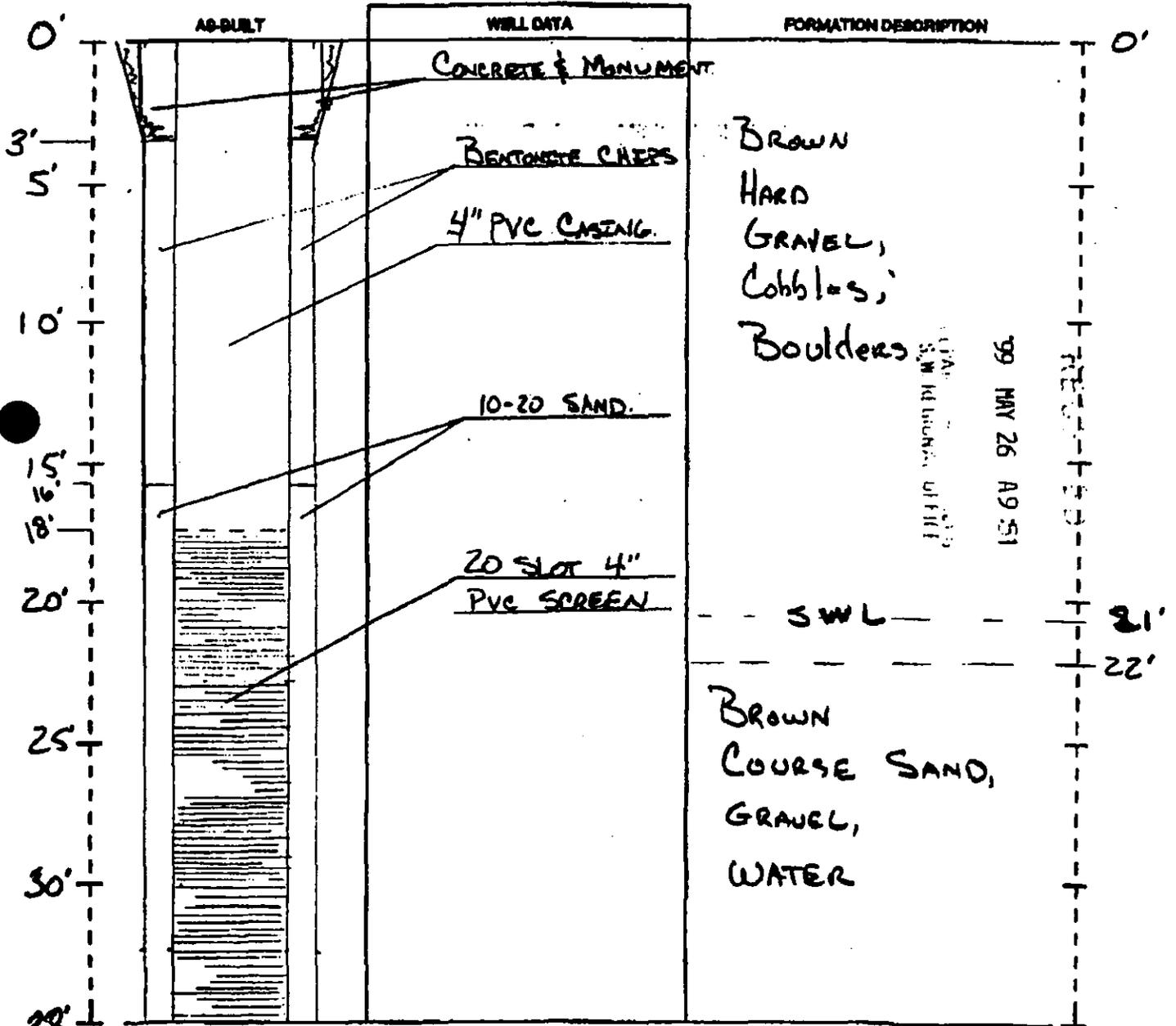
SCALE: 1" = _____ PAGE _____ OF _____

RESOURCE PROTECTION WELL REPORT

START CARD NO. R00645

PROJECT NAME Cochrane Park
 WELL IDENTIFICATION NO. AES878
 DRILLING METHOD: Air Rotary
 DRILLER: Rogeray Phythian
 FIRM: Arcadia Drilling, Inc.
 SIGNATURE: [Signature] #2052
 CONSULTING FIRM: Skilling-Conolly, Inc.
 REPRESENTATIVE: R. Moeckel

COUNTY: Thurston
 LOCATION: NW 1/4 NW 1/4 Sec 30 Twp 17N R 2E
 STREET ADDRESS OF WELL: Mill Road
 WATER LEVEL ELEVATION: 21'
 GROUND SURFACE ELEVATION: 350'
 INSTALLED: 05/03/99
 DEVELOPED: 05/03/99

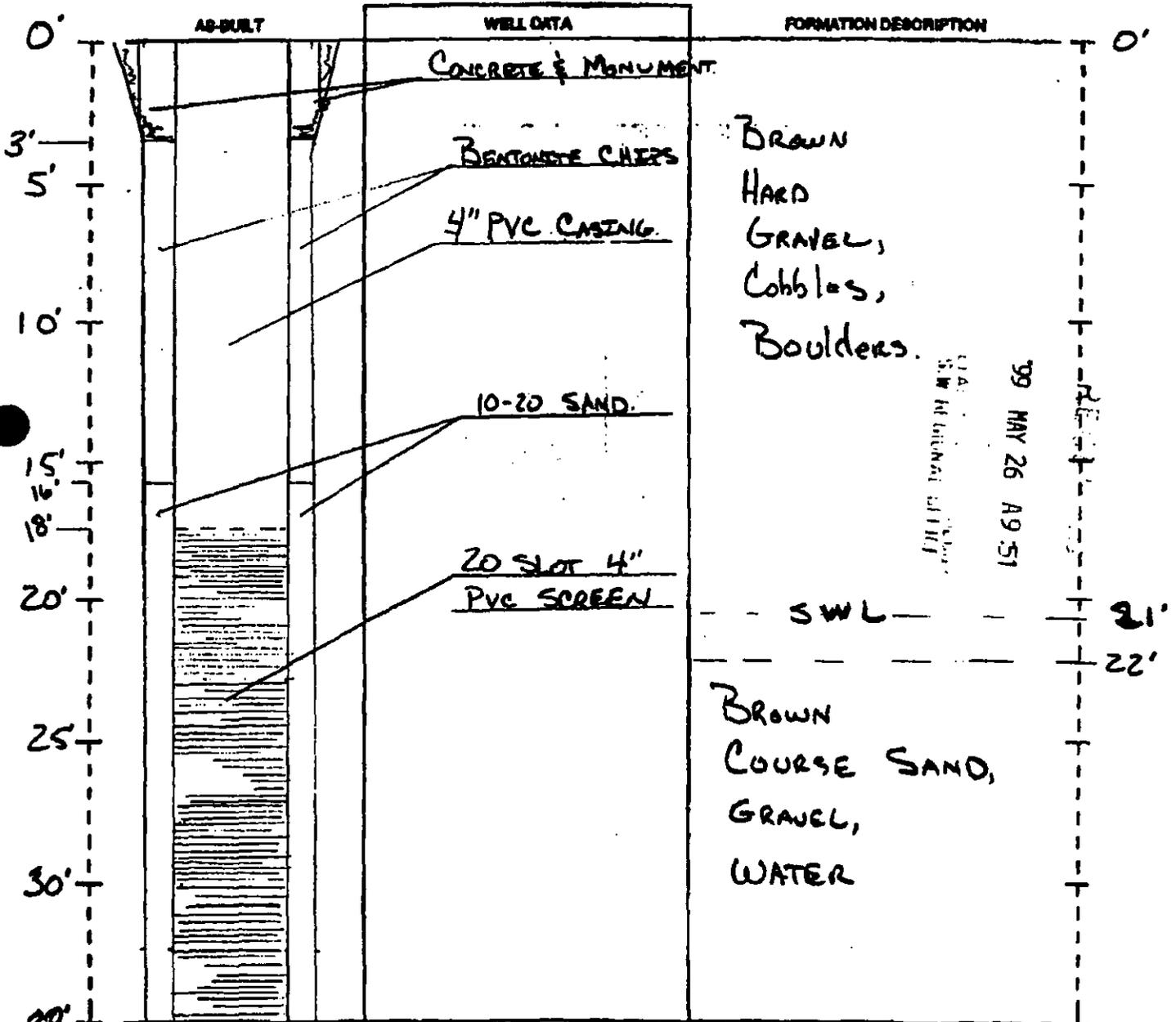


RESOURCE PROTECTION WELL REPORT

START CARD NO. R00645

PROJECT NAME: Cochrane Park
 WELL IDENTIFICATION NO.: AES881
 DRILLING METHOD: Air Rotary
 DRILLER: Rogeray Phythian
 FIRM: Arcadia Drilling, Inc.
 SIGNATURE: [Signature] #2053
 CONSULTING FIRM: Skilling-Conolly, Inc.
 REPRESENTATIVE: R. Moeckel

COUNTY: Thurston
 LOCATION: NW 1/4 NW 1/4 Sec 30 Twp 17N R 2E
 STREET ADDRESS OF WELL: Mill Road
 WATER LEVEL ELEVATION: 21'
 GROUND SURFACE ELEVATION: 350'
 INSTALLED: 05/03/99
 DEVELOPED: 05/03/99



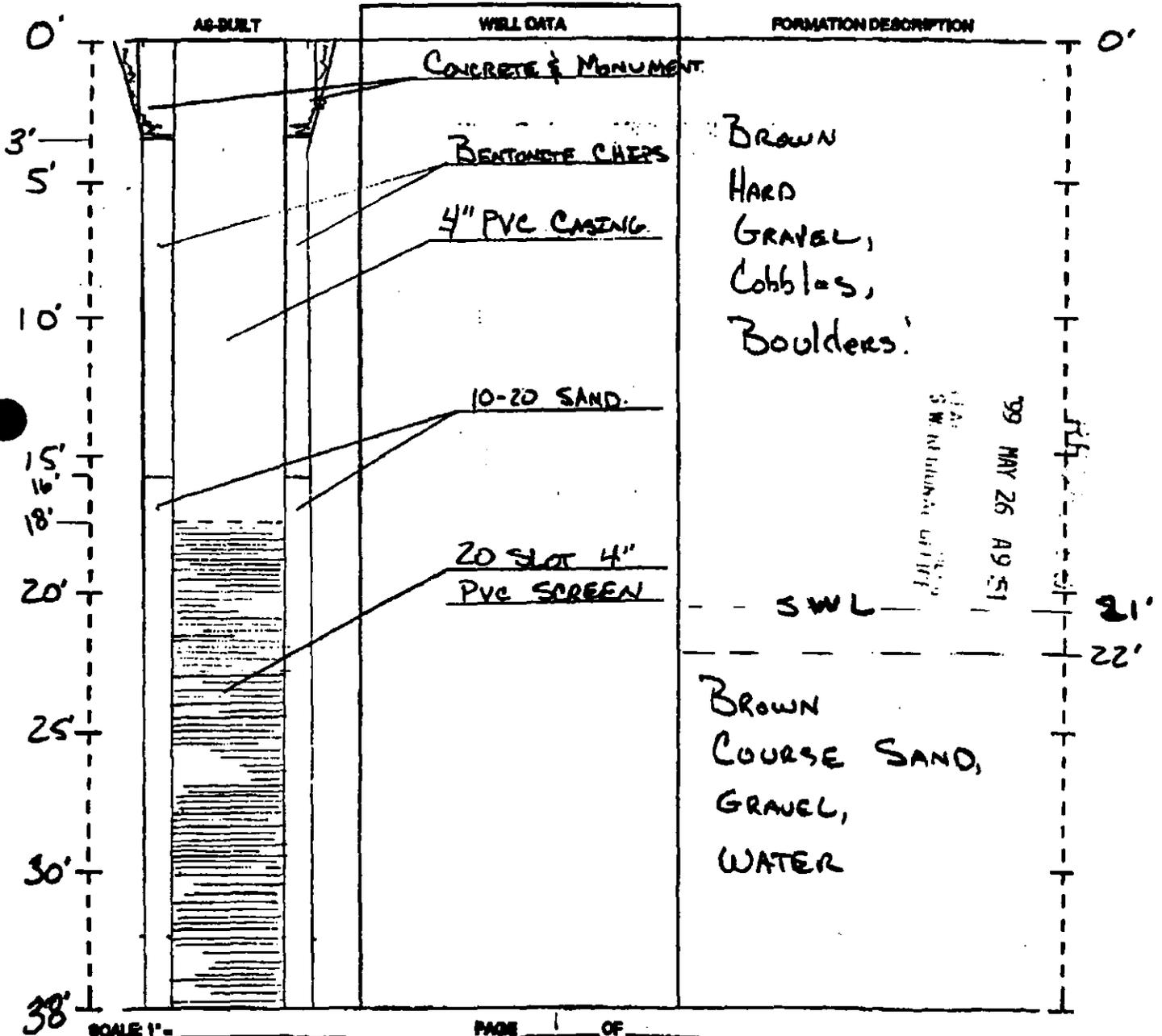
SCALE: 1" = _____ PAGE 1 OF _____

RESOURCE PROTECTION WELL REPORT

START CARD NO. R00645

PROJECT NAME: Cochrane Park
 WELL IDENTIFICATION NO.: AES880
 DRILLING METHOD: Air Rotary
 DRILLER: Rogeray Phythian
 FIRM: Arcadia Drilling, Inc.
 SIGNATURE: [Signature] #2053
 CONSULTING FIRM: Skillings-Conolly, Inc.
 REPRESENTATIVE: R. Moeckel

COUNTY: Thurston
 LOCATION: NW¹⁴ NW¹⁴ Sec 30 Twp 17N R 2E
 STREET ADDRESS OF WELL: Mill Road
 WATER LEVEL ELEVATION: 21'
 GROUND SURFACE ELEVATION: 350'
 INSTALLED: 05/03/99
 DEVELOPED: 05/03/99

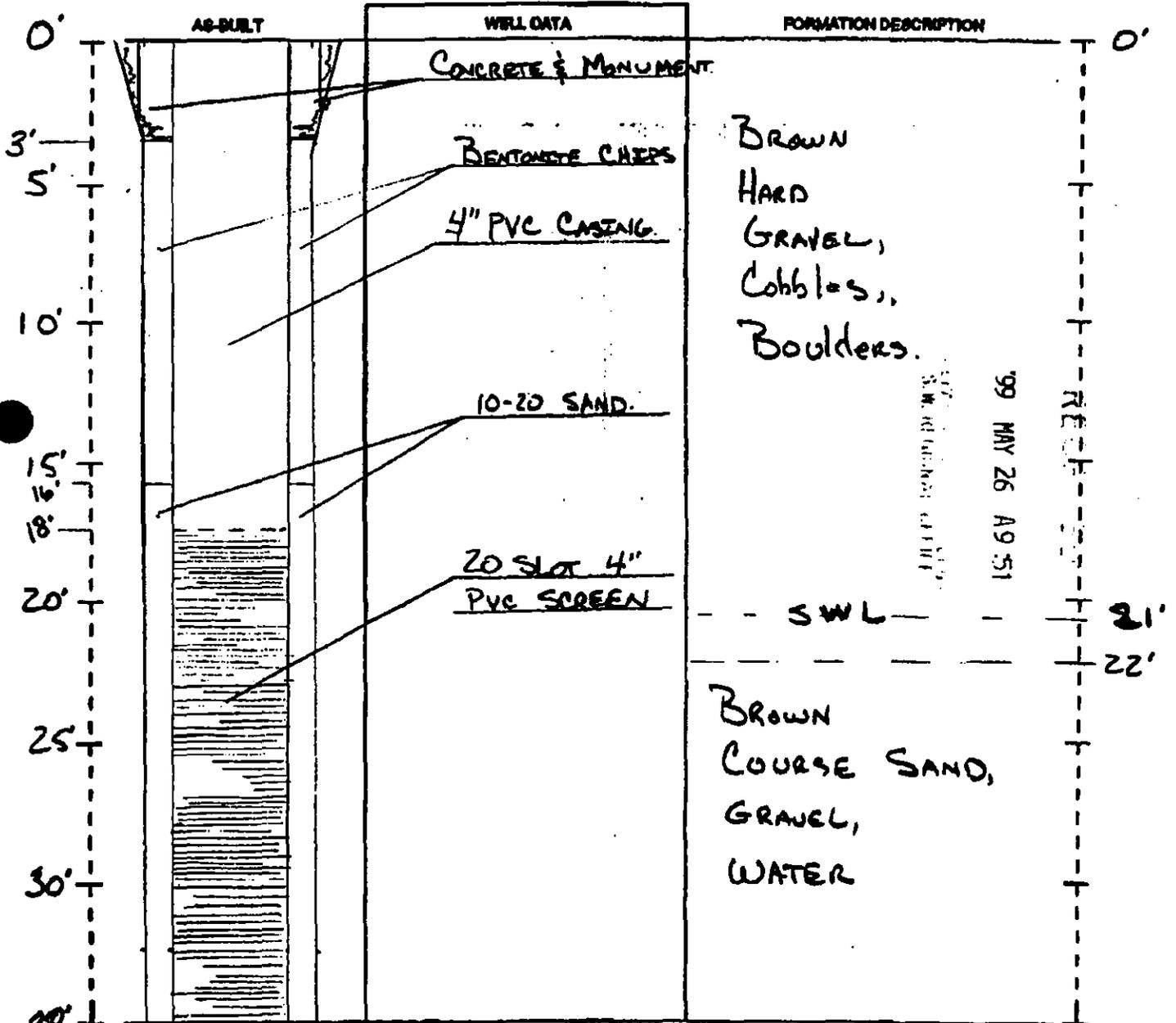


RESOURCE PROTECTION WELL REPORT

START CARD NO. R00645

PROJECT NAME: Cochrane Park
 WELL IDENTIFICATION NO. AES879
 DRILLING METHOD: Air Rotary
 DRILLER: Rogeray Phythian
 FIRM: Arcadia Drilling, Inc.
 SIGNATURE: [Signature] #2053
 CONSULTING FIRM: Skillings-Conolly, Inc.
 REPRESENTATIVE: R. Moeckel

COUNTY: Thurston
 LOCATION: NW 1/4 NW 1/4 Sec 30 Twp 17N R 2E
 STREET ADDRESS OF WELL: Mill Road
 WATER LEVEL ELEVATION: 21'
 GROUND SURFACE ELEVATION: 350'
 INSTALLED: 05/03/99
 DEVELOPED: 05/03/99

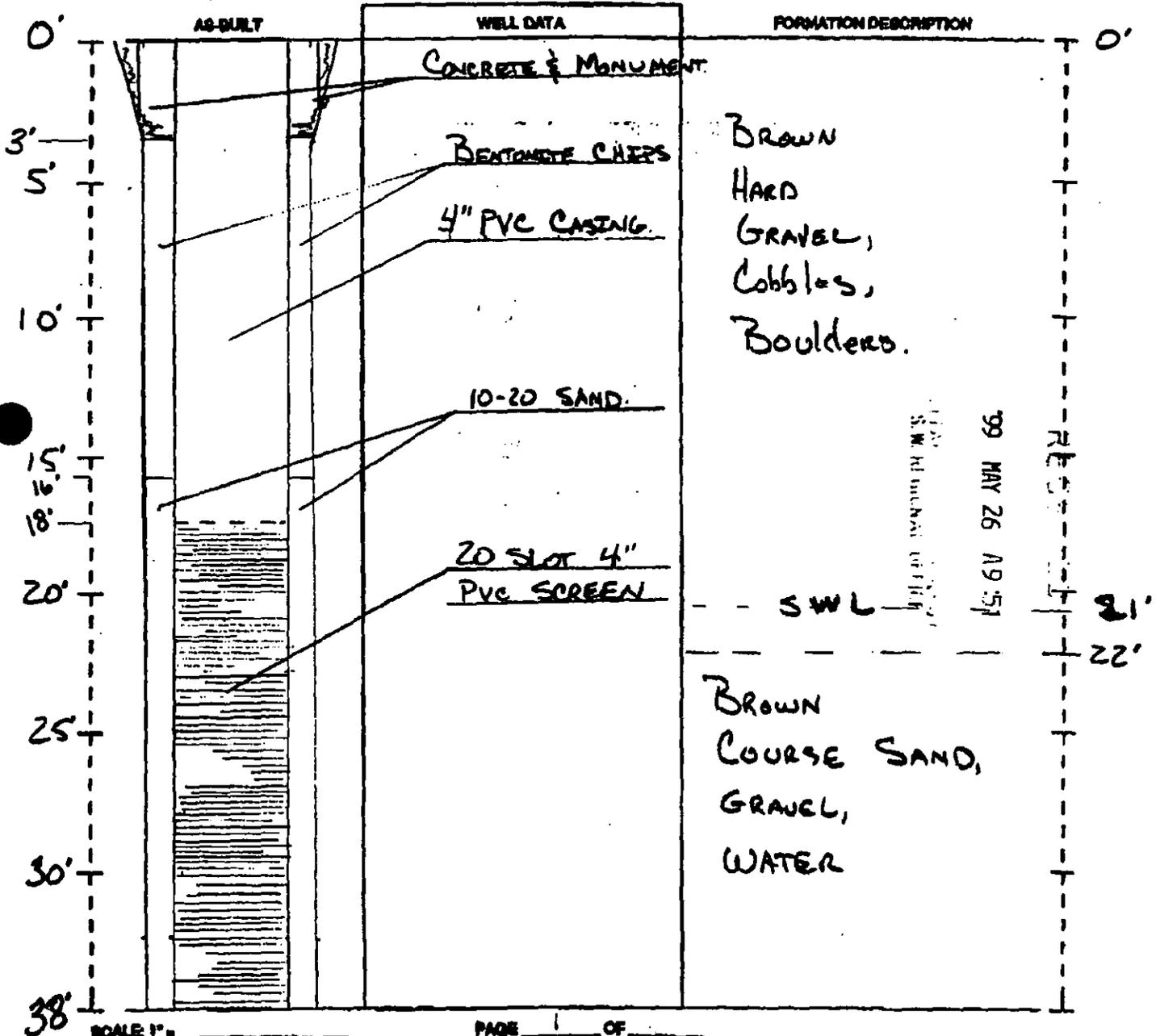


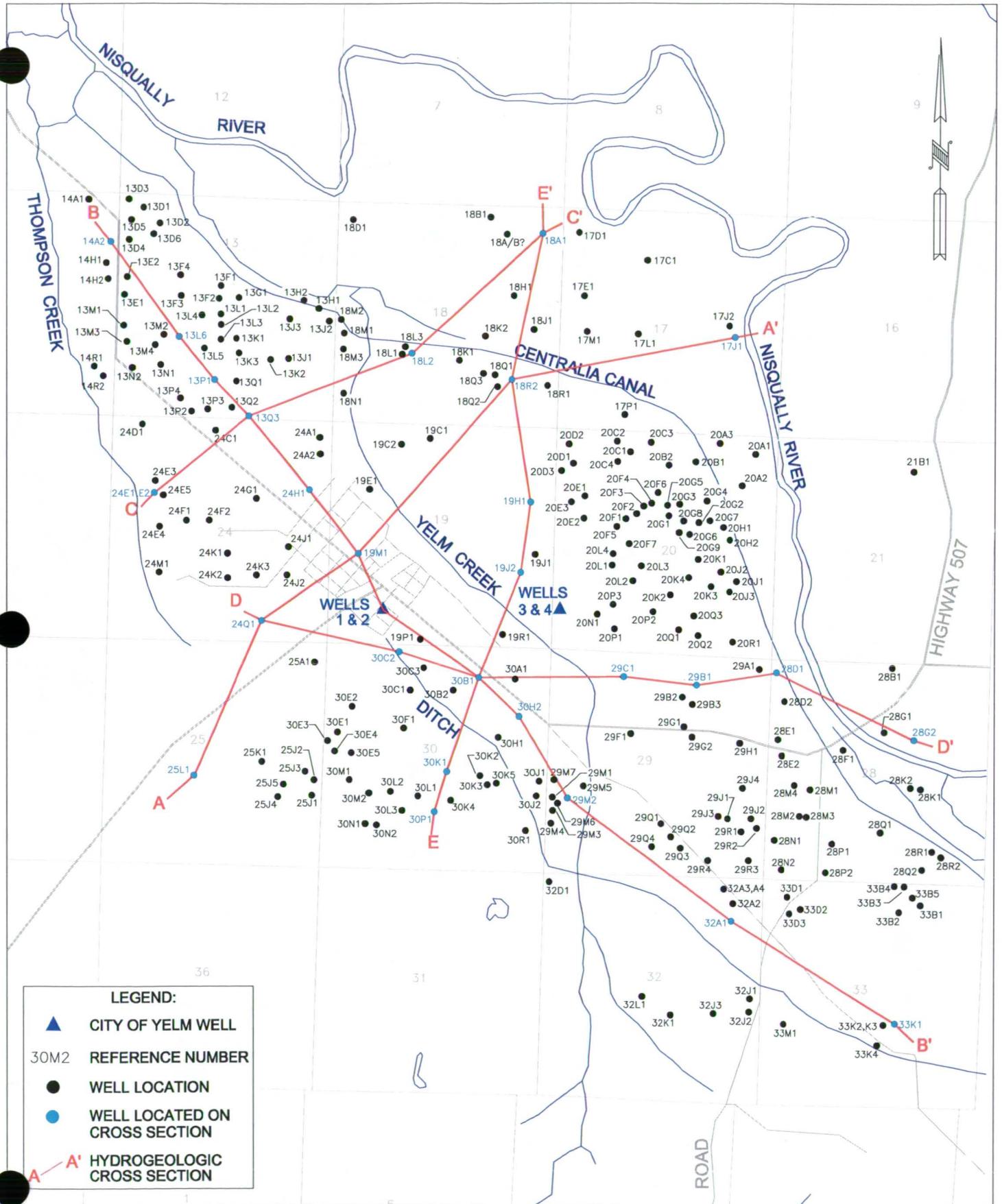
RESOURCE PROTECTION WELL REPORT

START CARD NO. R00645

PROJECT NAME: Cochrane Park
 WELL IDENTIFICATION NO. AES882
 DRILLING METHOD: Air Rotary
 DRILLER: Rogeray Phythian
 FIRM: Arcadia Drilling, Inc.
 SIGNATURE: [Signature] #2053
 CONSULTING FIRM: Skilling-Conolly, Inc.
 REPRESENTATIVE: R. Moeckel

COUNTY: Thurston
 LOCATION: NW 1/4 NW 1/4 Sec 30 Twp 17N R 2E
 STREET ADDRESS OF WELL: Mill Road
 WATER LEVEL ELEVATION: 21'
 GROUND SURFACE ELEVATION: 350'
 INSTALLED: 05/03/99
 DEVELOPED: 05/03/99





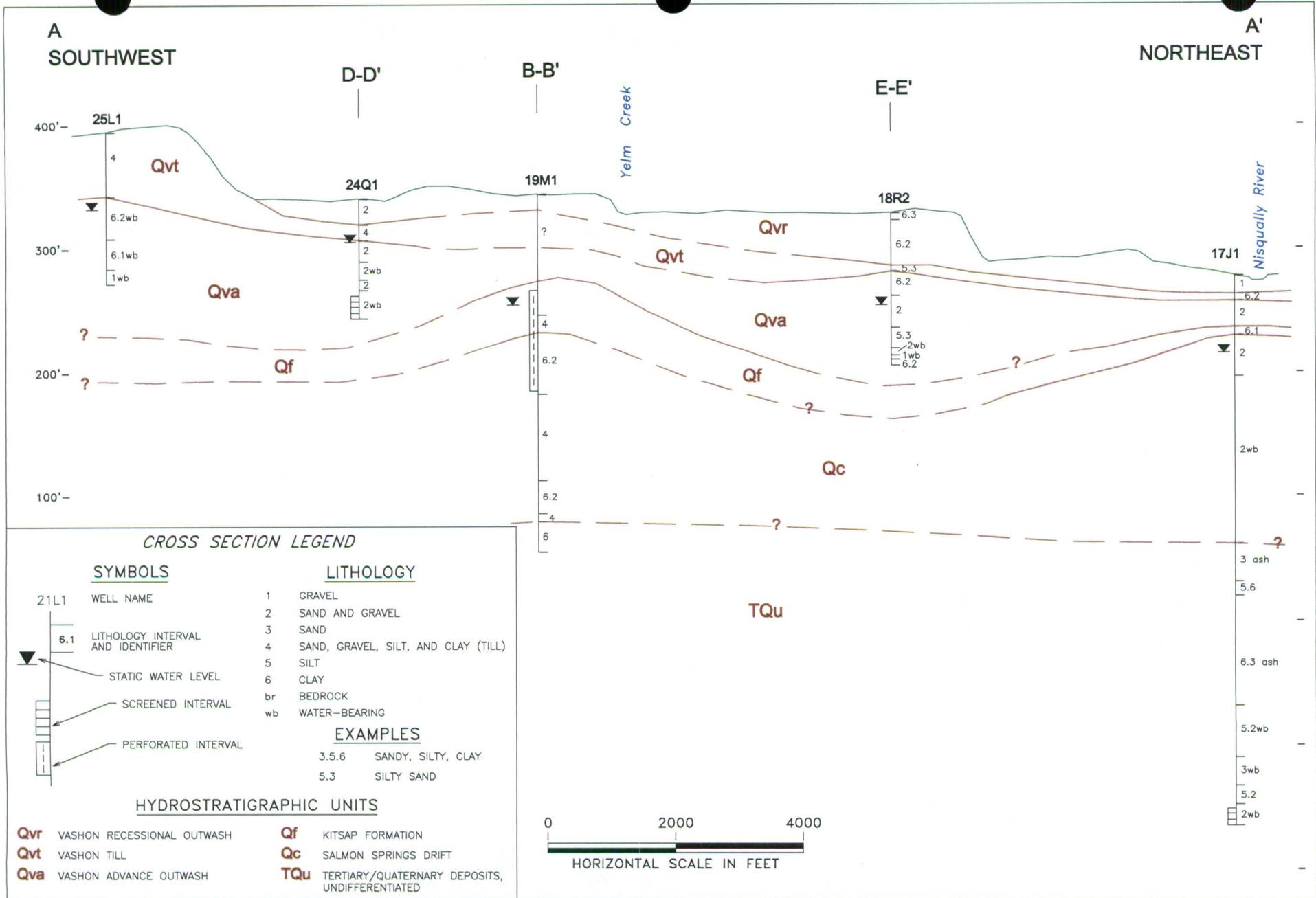
LEGEND:

- ▲ CITY OF YELM WELL
- 30M2 REFERENCE NUMBER
- WELL LOCATION
- WELL LOCATED ON CROSS SECTION
- A — A' HYDROGEOLOGIC CROSS SECTION



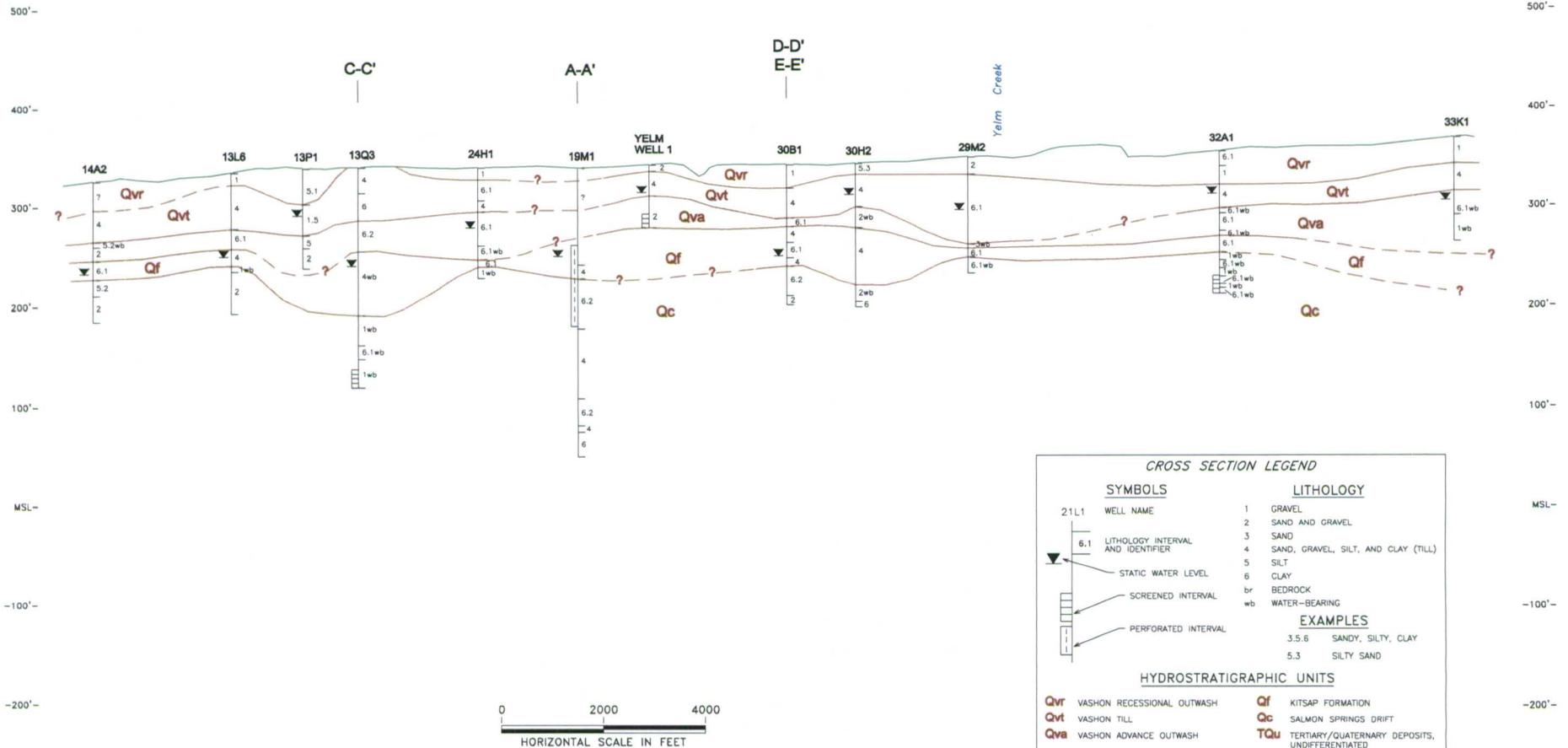
PM: BGC/KAH
 MAY 2001
 00-211WH SCALE 1"=3,000'

FIGURE 2
WELL AND CROSS SECTION LOCATION MAP
CITY OF YELM WELLHEAD PROTECTION PLAN



B
NORTH

B'
SOUTH



CROSS SECTION LEGEND

SYMBOLS		LITHOLOGY	
2.1L1	WELL NAME	1	GRAVEL
6.1	LITHOLOGY INTERVAL AND IDENTIFIER	2	SAND AND GRAVEL
▼	STATIC WATER LEVEL	3	SAND
▬	SCREENED INTERVAL	4	SAND, GRAVEL, SILT, AND CLAY (TILL)
▬	PERFORATED INTERVAL	5	SILT
		6	CLAY
		br	BEDROCK
		wb	WATER-BEARING

EXAMPLES

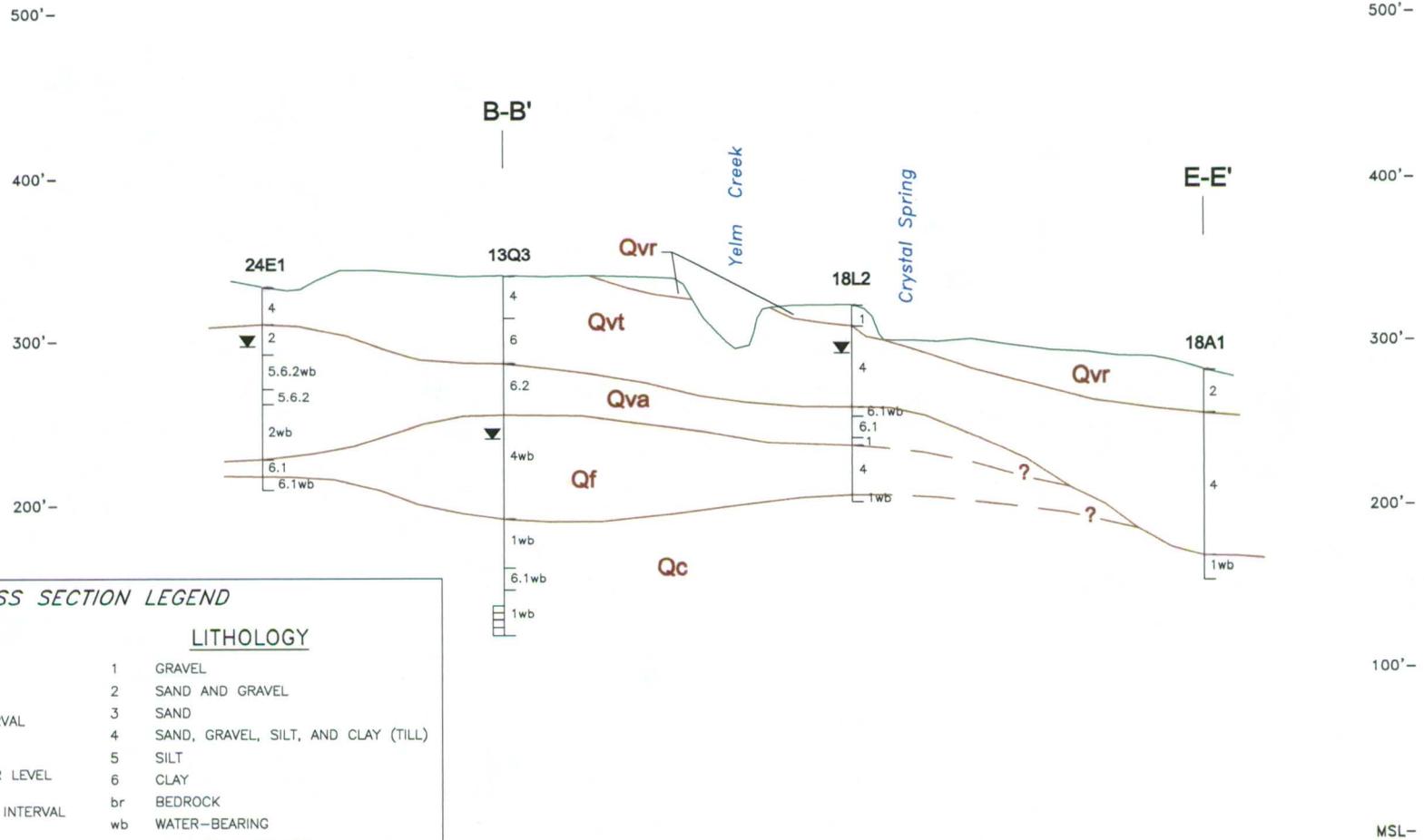
3.5.6	SANDY, SILTY, CLAY
5.3	SILTY SAND

HYDROSTRATIGRAPHIC UNITS

Qvr	VASHON RECESSONAL OUTWASH	Qf	KITSAP FORMATION
Qvt	VASHON TILL	Qc	SALMON SPRINGS DRIFT
Qva	VASHON ADVANCE OUTWASH	TQu	TERTIARY/QUATERNARY DEPOSITS, UNDIFFERENTIATED

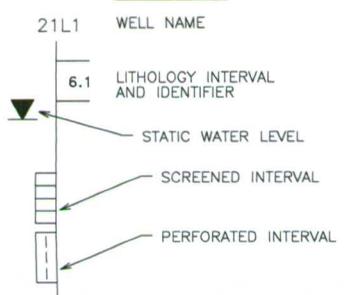
C
SOUTHWEST

C'
NORTHEAST



CROSS SECTION LEGEND

SYMBOLS



LITHOLOGY

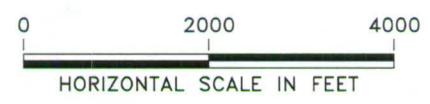
- 1 GRAVEL
- 2 SAND AND GRAVEL
- 3 SAND
- 4 SAND, GRAVEL, SILT, AND CLAY (TILL)
- 5 SILT
- 6 CLAY
- br BEDROCK
- wb WATER-BEARING

EXAMPLES

- 3.5.6 SANDY, SILTY, CLAY
- 5.3 SILTY SAND

HYDROSTRATIGRAPHIC UNITS

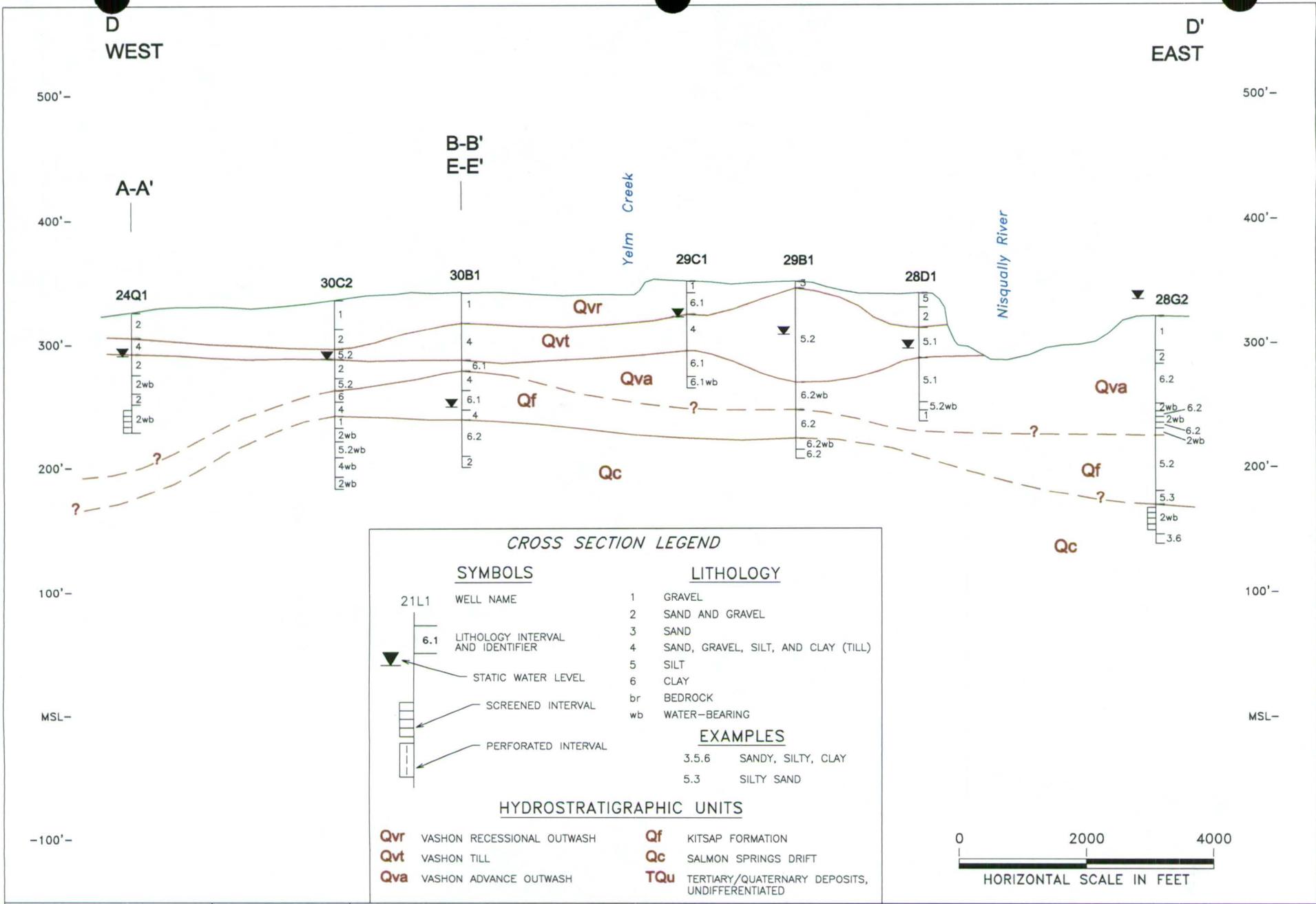
- Qvr** VASHON RECESSIONAL OUTWASH
- Qvt** VASHON TILL
- Qva** VASHON ADVANCE OUTWASH
- Qf** KITSAP FORMATION
- Qc** SALMON SPRINGS DRIFT
- TQu** TERTIARY/QUATERNARY DEPOSITS, UNDIFFERENTIATED

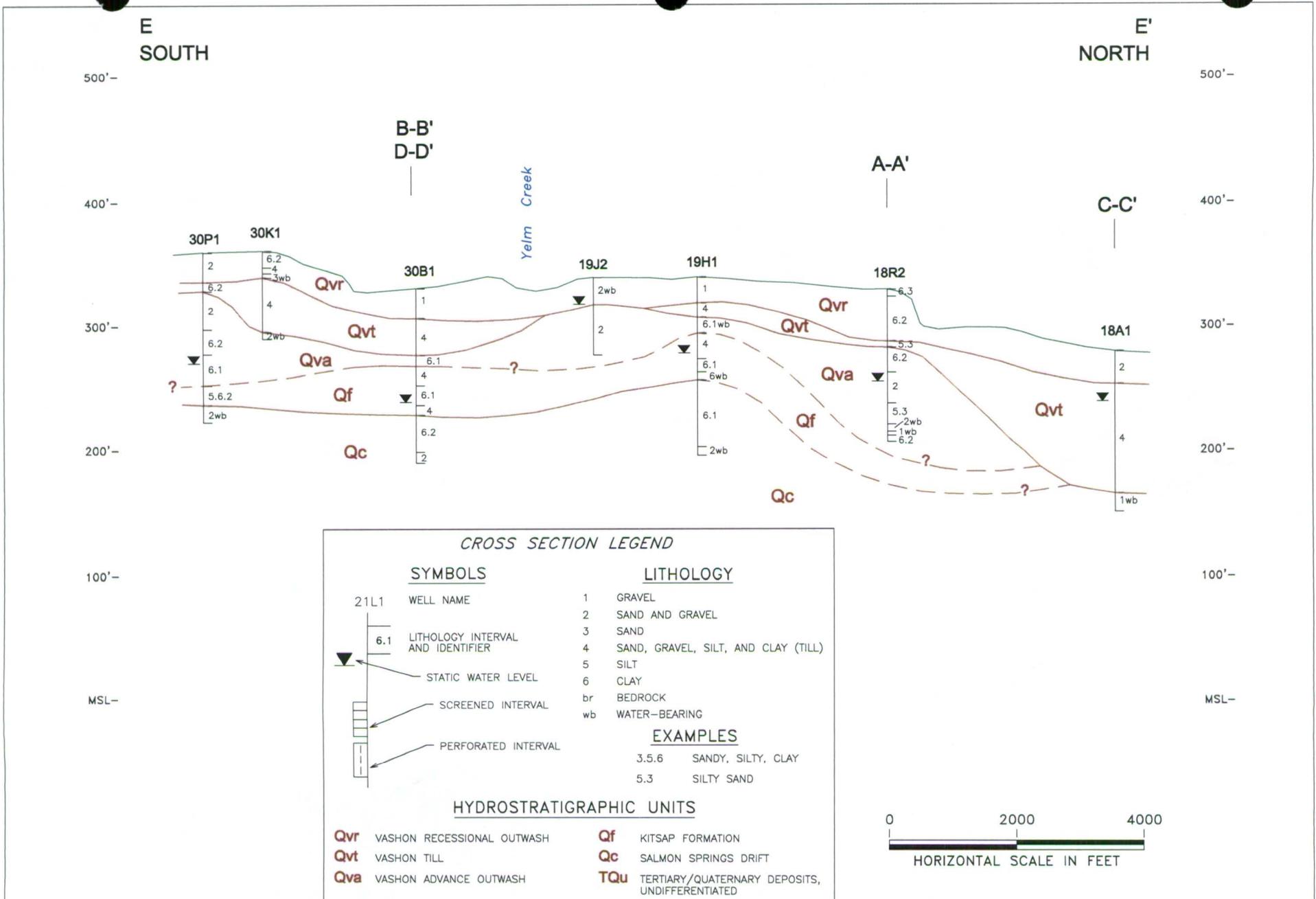


ROBINSON & NOBLE, INC.

PM: BGC/KAH
MAY 2001
00-211WH

FIGURE 7
HYDROGEOLOGIC CROSS SECTION C-C'
CITY OF YELM WELLHEAD PROTECTION PLAN





PM: BGC/KAH
 MAY 2001
 00-211WH

FIGURE 9
HYDROGEOLOGIC CROSS SECTION E-E'
CITY OF YELM WELLHEAD PROTECTION PLAN