91-e36

(Segment No. 13-28-GW)

CHRISTINE O. GREGOIRE
Director

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
7171 Cleanwater Lane, Building 8, LH-14 • Olympia, Washington 98504

April 4, 1991

TO: Mike Wilson

FROM: Pam Marti PM

SUBJECT: Toftdahl Drum Site Routine Monitoring Round III

## SUMMARY

The Toxics Investigations/Ground Water Monitoring Section collected samples from four domestic water supply wells located in the area surrounding the former Toftdahl Drum Site on October 23, 1990. This sampling was part of the routine ground water monitoring conducted at the site since 1987. Low concentrations of lead, chromium, copper, silver, and zinc were detected in some of the domestic wells. These concentrations were all well below state and federal drinking water criteria. Observed concentrations are consistent with previous sampling results, in that copper and zinc are the only analytes that are regularly detected in the private wells. These occurrences are probably related to well construction and plumbing materials.

## OBJECTIVES

The Toxics Investigations/Ground Water Monitoring Section was requested by the Toxics Cleanup Program (TCP) to monitor ground water at the Toftdahl Drum Site on a semi-annual basis as required by the federally mandated Record of Decision (ROD). Monitoring objectives are as follows:

1. Provide routine ground water monitoring data on a semi-annual basis for five years, ending in April 1991, then annually for ten years. (Annual sampling for priority pollutant metals only was completed in October 1990. Annual sampling for a full priority pollutant analyses will be completed in April 1991.)

2. Sample for full priority pollutant analyses on a semi-annual bases to provide TCP with data that would possibly explain past sporadic detection of polyaromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), volatile organic compounds (VOCs), and semi-volatile organic compounds (BNAs).

3. Determine future sampling needs at the completion of the semi-annual sampling.

## SITE BACKGROUND

In the early 1970s, drums containing unknown quantities and types of waste were cleaned for resale on the Toftdahl property. The drums allegedly contained industrial wastes from a plywood manufacturing facility. It is estimated that between 100 and 200 drums were cleaned on site. Approximately 50 drums contained residual wastes and could not be sold. These drums were buried on site (see Figure 1). In 1985, the buried drums and wastes were removed. A Remedial Investigation conducted after drum removal concluded that no significant soil or ground water contamination existed. Low concentrations of PAHs, PCBs, VOCs, and BNAs were detected sporadically in nearby domestic water supply wells. The ROD for the Toftdahl site requires ground water monitoring on a semi-annual basis for five years and annually for ten years. In 1989, the site was delisted from the National Priorities List.

Geology of the area was defined in the Final Remedial Investigation (1986) as consisting of a complex sequence of discontinuous sediments, sedimentary rocks, and volcanic layers. Extensive weathering and/or hydrothermal alteration has altered all but a few of the original deposits to clays and silts. The alteration has masked many of the original distinguishing features, making correlation uncertain. Generally, ground water occurs in coarser stratified sand, gravel and clayey gravel zones at various depths. Based on on-site well logs, two aquifer systems designated the shallow and deep aquifers and have been identified beneath the site. Both systems consist of several discontinuous water-bearing zones separated by layers of clay and silt. The shallow system ranges in depth from about 7 to 30 feet and the deep system ranges in depth from 69 to 98 feet. Water levels in some deep borings rose to approximately 50 feet below ground surface indicating confined conditions. The four private wells sampled during the compliance monitoring are all drilled to the deep zone and range in depth from 72 to 110 feet. Ground water in the deep system is generally thought to flow to the south. The Boone well is considered to be upgradient of the site and the Bedoff, Homala, and Kyle wells downgradient. Figure 2 shows the locations of the domestic wells sampled and the direction of ground water flow.

## METHODS

### Ground Water Sampling

Prior to sample collection, domestic wells were purged by allowing taps to run until stable pH, temperature, and specific conductance values were obtained. Samples were then collected from the tap nearest the well. Wells were sampled from upgradient to downgradient. All wells were sampled for total priority pollutant metals. The Kyle well was sampled for cyanide. During sample Round II an estimated concentration for cyanide that was slightly above the detection limit was reported for this well. Cyanide has not been detected in any other samples throughout the compliance monitoring. Metals samples were preserved with 1 mL of concentrated nitric acid to a $pH < 2$ and the cyanide with ascorbic acid. Chemical analyses, analytical methods, and detection limits are shown in Table 1.

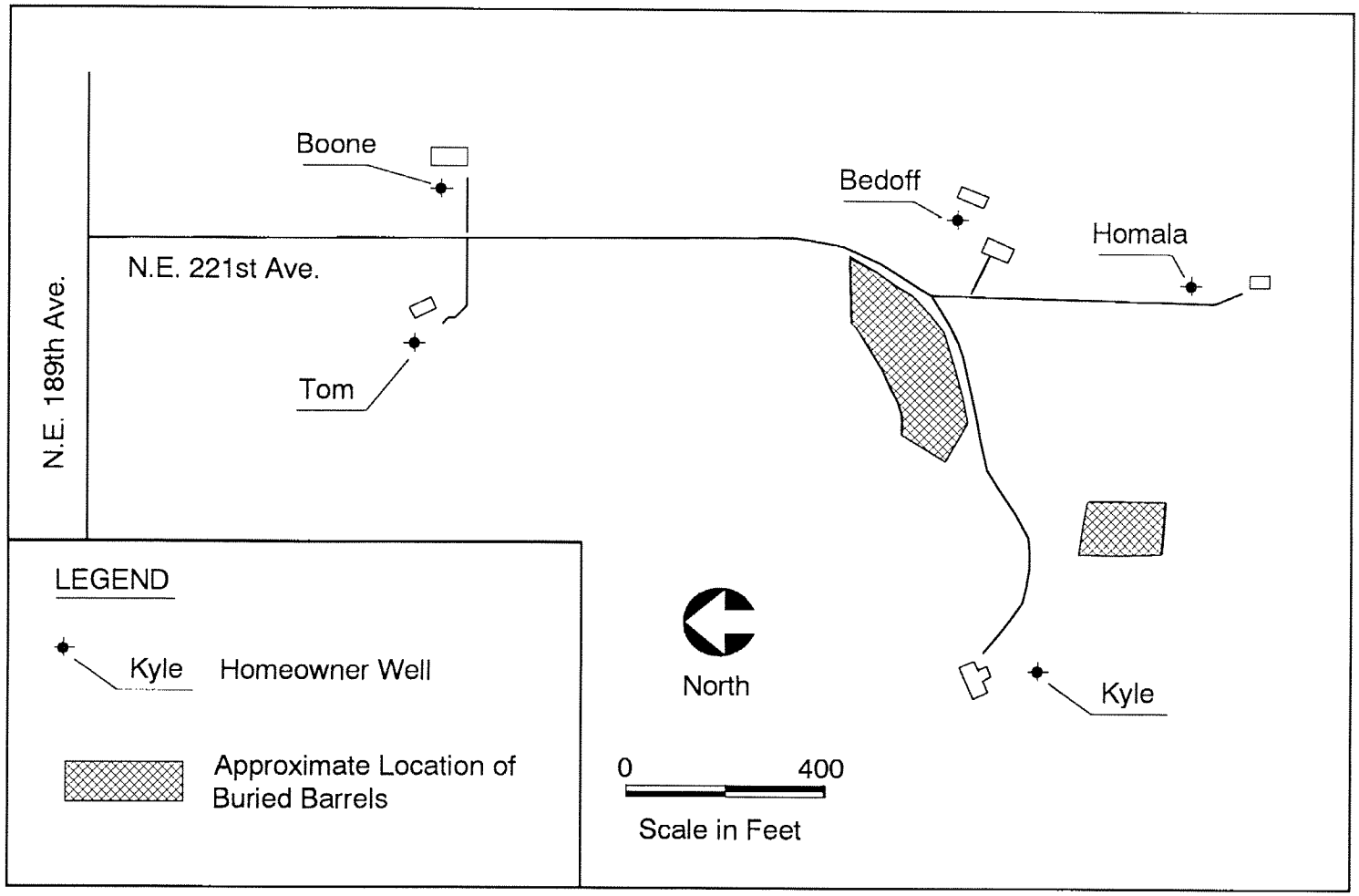


Figure 1: Location Map

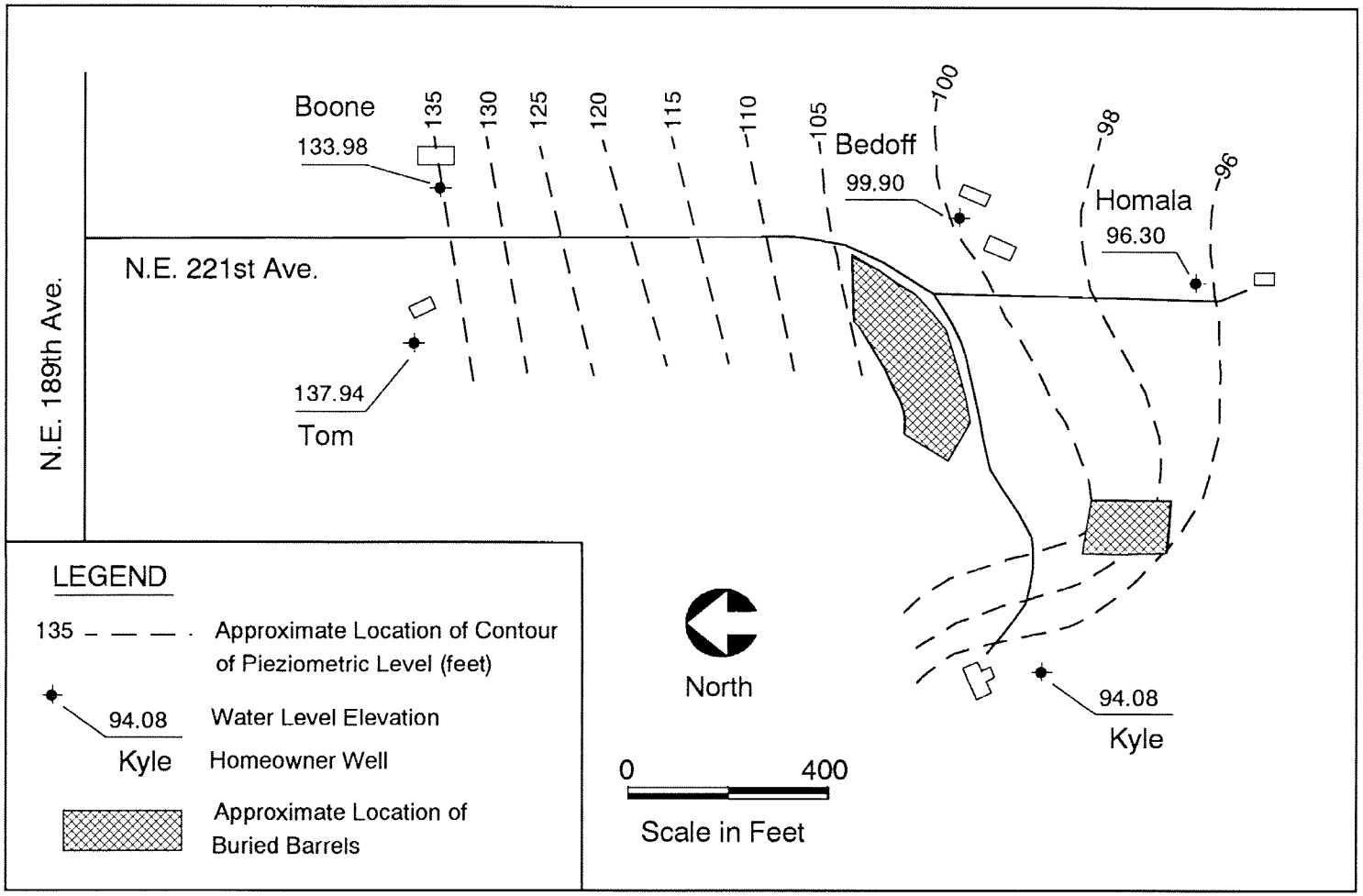


Figure 2: Potentiometric Surface Map for May 2, 1986 (Deep Aquifer)

Table 1: Parameters, Analytical Methods and Detection Limits

| Analytical Parameters | Method | Reference | Detection Limit |
|---|---|---|---|
| Field Parameters: | | | |
| pH | Beckman pH Meter | NA | 0.1 Std Units |
| Specific Conductance | Beckman RC-15C Conductivity Bridge | NA | 10 umhos/cm |
| Temperature | Precision Thermometer | NA | 0.1°C |
| Metals (Total Recoverable): | | | |
| Antimony | #204.2 | EPA 1983 | 1.0 μg/l |
| Arsenic | #206.2 | EPA 1983 | 1.5 μg/l |
| Beryllium | #200.7 | EPA 1983 | 1.0 μg/l |
| Cadmium | #200.7 | EPA 1983 | 2.0 μg/l |
| Chromium | #200.7 | EPA 1983 | 5.0 μg/l |
| Copper | #200.7 | EPA 1983 | 2.0 μg/l |
| Lead | #239.2 | EPA 1983 | 1.0 μg/l |
| Mercury | #245.1 | EPA 1983 | 0.04 μg/l |
| Nickel | #200.7 | EPA 1983 | 10.0 μg/l |
| Selenium | #270.2 | EPA 1983 | 2.0 μg/l |
| Silver | #200.7 | EPA 1983 | 2.0 μg/l |
| Thallium | #279.1 | EPA 1983 | 2.5 μg/l |
| Zinc | #200.7 | EPA 1983 | 2.0 μg/l |

NA = Not Applicable

U.S. EPA, 1983. Methods for the Chemical Analysis of Water and Wastes. Environmental Monitoring and Support Laboratory, March 1983.

**Quality Assurance Samples**

Quality control samples consisted of a duplicate sample and transport blank. A blind duplicate sample, labeled "Smith", was collected from the Kyle well. Matrix spikes, matrix spike duplicates, and method blanks were analyzed for all parameters. Quality assurance results are discussed in the memo from Steve Twiss attached as Appendix A, and are summarized below. Except as indicated, sample results for this project can be used without qualification. Trace amounts of copper, silver, and zinc were detected in the method blanks at 2.4, 2.4, and 2.1 ppb respectively. The method blank results for the other metals showed no detectable levels of analytes. Sample results for copper, silver, and zinc, which are less than ten times the amount detected in the blank, are flagged with a "B". Zinc was also detected in the transport blank and was reported as an estimated value of 7.8 ppb. All spike recoveries were within acceptable limits of $\pm 25\%$ for water sample analysis. The relative percent difference of the duplicate samples (Kyle and Smith) were well within $\pm 20\%$ for duplicate analysis.

## ANALYTICAL RESULTS

Analytical results are presented in Appendix A. Data were managed using the ENVIS database software package. Table 2 is a summary of field parameters and test results for sample Round III conducted on October 23, 1990. As in past sample events, copper and zinc were detected at low concentrations in both the up- and down-gradient wells. Lead, chromium, and silver were also detected in the upgradient Boone well and lead in the downgradient Homala well. However, these results were qualified because of method blank contamination or were estimated at levels at or near the detection limits. All detected concentrations were well below the maximum contaminant level (MCL) established for state and federal drinking water supplies. Cyanide was not detected in the Kyle well during this round of sampling.

Table 3 is a summary of results for all four sample rounds to date. Observed concentrations are consistent with previous sampling results, in that copper and zinc are the only analytes that are regularly detected in the private wells. This is probably related to the well construction and plumbing materials.

## DISCUSSION AND CONCLUSIONS

Priority pollutant metals analyses for sample Round III of the Toftdahl Drum site showed detectable concentrations of lead, chromium, copper, silver, and zinc. All analyses were well below established state and federal drinking water standards.

Table 2: Summary of Sampling Results from October 1990 (mg/L unless otherwise specified)

| Location | pH (s.u.) | Temperature (C) | Specific Conductance (umhos/cm) | Lead | Chromium | Copper | Silver | Zinc |
|---|---|---|---|---|---|---|---|---|
| Boone | 6.69 | 11.9 | 110 | 0.001J | 0.006J | 0.08 | 0.006J | 0.5 |
| Bedoff | 6.89 | 10.8 | 120 | ND | ND | 0.05 | ND | 0.006JB |
| Kyle | 6.67 | 10.8 | 83 | ND | ND | 0.03 | ND | 0.01JB |
| Smith (duplicate) | -- | -- | -- | ND | ND | 0.03 | 0.002JB | 0.02JB |
| Homala | 6.71 | 11.9 | 86 | 0.002J | ND | ND | ND | 0.03 |
| Transport | -- | -- | -- | ND | ND | ND | ND | 0.007JB |
| Detection Limits | -- | -- | -- | 0.001 | 0.005 | 0.002 | 0.002 | 0.002 |
| Maximum Contaminant Level (MCL) | -- | -- | -- | 0.05* | 0.05* | 1.0** | 0.05* | 5.0** |

B: Detected in method blank
J: Estimated concentration
ND: Not detected at limits shown
--: Not analyzed
*: Primary Maximum Contaminat Levels (MCLs) are based on chronic and acute health effects
**: Secondary Maximum Contaminant Levels (MCL) are based on factors other than health effects

Table 3: Summary of Sampling Results from September 1988 to October 1990

| | September 12, 1988 | | | October 17, 1989 | | | April 11, 1990 | | | October 23, 1990 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Copper (mg/L) | Zinc (mg/L) | Mercury (ug/L) | Copper (mg/L) | Zinc (mg/L) | Mercury (ug/L) | Copper (mg/L) | Zinc (mg/L) | Mercury (ug/L) | Copper (mg/L) | Zinc (mg/L) | Mercury (ug/L) |
| Boone | 0.08 | 0.39 | ND | 0.05 | 0.29 | ND | 0.08 | 0.16 | 0.05J | 0.08 | 0.5 | ND |
| Bedoff | 0.12 | ND | ND | 0.05 | ND | ND | 0.04 | ND | 0.08J | 0.05 | 0.006JB | ND |
| Kyle | 0.04 | 0.05 | ND | 0.03 | 0.02 | 0.10B | 0.05 | ND | 0.04J | 0.03 | 0.01JB | ND |
| Smith (duplicate) | -- | -- | -- | -- | -- | -- | 0.05 | ND | ND | 0.03 | 0.02JB | ND |
| Homala | -- | -- | -- | ND | 0.02 | 0.16B | ND | 0.08 | 0.04J | ND | 0.03 | ND |
| Tom | 0.03 | 0.03 | 0.1 | 0.01 | 0.01 | 0.01 | -- | -- | -- | -- | -- | -- |
| East (duplicate) | -- | -- | -- | ND | 0.02 | ND | -- | -- | -- | -- | -- | -- |
| Ginter | -- | -- | -- | ND | ND | ND | -- | -- | -- | -- | -- | -- |
| Detection Limits | 0.002 | 0.004 | 0.08 | 0.01 | 0.01 | 0.06 | 0.002 | 0.005 | 0.02 | 0.002 | 0.002 | 0.04 |
| Maximum Contaminant Level (MCL) | 1.0** | 5.0** | 2.0* | 1.0** | 5.0** | 2.0* | 1.0** | 5.0** | 2.0* | 1.0** | 5.0** | 2.0* |

ND: Not Detected at Limits Shown --: Not analyzed J: Estimated Value

B: Concentration Detected Less than that Detected in the Transport Blank

*: Primary Maximum Contaminant Level (MCL) are based on chronic and acute health effects

**: Secondary Maximum Contaminant Level (MCL) are based on factors other than health effects

## RECOMMENDATIONS

1. Samples should be collected for priority pollutants and priority pollutant metals during sample Round IV to meet the requirements of the ROD. After which the monitoring effort should be reevaluated and parameters established for the 10-year annual monitoring period.

2. Downgradient wells, Bedoff, Homala, and Kyle, and upgradient well Boone should continue to be sampled.

PM:blt

Attachment
cc: Bill Yake

WASHINGTON STATE DEPARTMENT OF ECOLOGY
ENVIRONMENTAL INVESTIGATIONS AND LABORATORY SERVICES
MANCHESTER LABORATORY

January 17, 1991

TO: Pam Marti

FROM: Steve Twiss

SUBJECT: QA memo, Toftdahl Drum Site project

**SAMPLE RECEIPT:**

Samples from the Toftdahl Drum Site project were received by the Manchester Laboratory on 10/24/90 in good condition. Analysis for priority pollutant metals was subsequently performed on the samples.

**HOLDING TIMES:**

All analyses were performed within the specified holding times for metals analysis (28 days for mercury, 180 days for all other metals).

**INSTRUMENT CALIBRATION:**

Instrument calibration was performed before each analytical run and checked by initial calibration verification standards and blanks. Continuing calibration standards and blanks were analyzed at a frequency of 10% during the run and again at the end of the analytical run. All initial and continuing calibration verification standards were within the control limits of +/- 10%. Atomic Absorption calibration gave correlation coefficients greater than the limiting criteria of 0.995. A correlation coefficient of 0.995 or higher means that the calibration is acceptable.

**PROCEDURAL BLANKS:**

Trace amounts of Copper, Silver and Zinc were detected in the procedural blanks at 2.4, 2.4 and 2.1 ppb respectively. The procedural blank results for the other metals showed no detectable levels of analytes. Sample results for Copper, Silver and Zinc which are less than ten times the amount detected in the blank should be flagged with a "B".

**SPIKED SAMPLE ANALYSIS:**

Spiked sample and duplicate spiked sample analysis were performed on sample number(s) 438030. All spike recoveries were within the acceptable limits of +/- 25% for water sample analysis.

**PRECISION DATA:**

The duplicate results of the spiked and duplicate spiked sample were used to calculate precision related to the analysis of these samples. The % RPD for all parameters was well within the +/- 20% window for duplicate analysis.

**STANDARD REFERENCE MATERIAL:**

Standard reference material or external verification standards were all within the windows established for each parameter.

**SUMMARY:**

Except as indicated for Copper, Silver and Zinc the sample results for this project can be used without qualification.

If you have any questions concerning the results or the methods used in the analysis please call me or Randy Knox at SCAN 744-4737.

cc Bill Kammin

Washington State Department of Ecology
Sample/Project Analysis Results



Project: DOE-008M TOFTDAHL DRUM SITE

Officer: PZM Account: D3P01

Laboratory: Ecology, Manchester

Sample No: 90 438030 Description: BOONE Source: Drinking Water (At tap)

Begin Date: 90/10/23 :

| Metals - PP | | Water-Total Result | Units |
|---|---|---|---|
| Arsenic | As-Total | 1.5U | ug/l |
| Cadmium | Cd-Total | 0.10U | ug/l |
| Lead | Pb-Total | 1.1J* | ug/l |
| Thallium | Tl-Total | 2.5U | ug/l |
| Antimony | Sb-Total | 2.5U | ug/l |
| Selenium | Se-Total | 2.0U | ug/l |
| Mercury | Hg-Total | 0.04U | ug/l |

| Metals - PP Matrix Spike #1 | | Water-Total Result | Units |
|---|---|---|---|
| Arsenic | As-Total | 92 | % Recov |
| Cadmium | Cd-Total | 106 | % Recov |
| Thallium | Tl-Total | 100 | % Recov |
| Antimony | Sb-Total | 102 | % Recov |
| Selenium | Se-Total | 106 | % Recov |

| Metals - PP Matrix Spike #2 | | Water-Total Result | Units |
|---|---|---|---|
| Arsenic | As-Total | 90 | % Recov |
| Cadmium | Cd-Total | 104 | % Recov |
| Thallium | Tl-Total | 99 | % Recov |
| Antimony | Sb-Total | 95 | % Recov |
| Selenium | Se-Total | 108 | % Recov |

| Metals - ICP Scan | | Water-Total Result | Units |
|---|---|---|---|
| Berylium | Be-Total | 1.0U | ug/l |
| Chromium | Cr-Total | 6.0J* | ug/l |
| Copper | Cu-Total | 83.9 * | ug/l |
| Nickel | Ni-Total | 10U | ug/l |
| Silver | Ag-Total | 6.0JB* | ug/l |
| Zinc | Zn-Total | 480 * | ug/l |

| Metals - ICP Scan Matrix Spike #1 | | Water-Total Result | Units |
|---|---|---|---|
| Berylium | Be-Total | 104 | % Recov |
| Chromium | Cr-Total | 102 | % Recov |
| Copper | Cu-Total | 107 | % Recov |
| Nickel | Ni-Total | 104 | % Recov |
| Silver | Ag-Total | 89 | % Recov |
| Zinc | Zn-Total | 106 | % Recov |

| Metals - ICP Scan Matrix Spike #2 | | Water-Total Result | Units |
|---|---|---|---|
| Berylium | Be-Total | 100 | % Recov |
| Chromium | Cr-Total | 101 | % Recov |
| Copper | Cu-Total | 102 | % Recov |
| Nickel | Ni-Total | 101 | % Recov |
| Silver | Ag-Total | 92 | % Recov |
| Zinc | Zn-Total | 100 | % Recov |

(Sample Complete)

12-MAR-91
07:49:18

Washington State Department of Ecology
Sample/Project Analysis Results

Project: DOE-008M TOFTDAHL DRUM SITE

Officer: PZM Account: D3P01

Laboratory: Ecology, Manchester

Sample No: 90 438031 Description: BEDOFF

Source: Drinking Water (At tap)

Begin Date: 90/10/23 :

| Metals - PP | | Water-Total Result | Water-Total Units |
|---|---|---|---|
| Arsenic | As-Total | 1.5U | ug/l |
| Cadmium | Cd-Total | 0.10U | ug/l |
| Lead | Pb-Total | 1.0U | ug/l |
| Thallium | Tl-Total | 2.5U | ug/l |
| Antimony | Sb-Total | 2.5U | ug/l |
| Selenium | Se-Total | 2.0U | ug/l |
| Mercury | Hg-Total | 0.04U | ug/l |

| Metals - ICP Scan | | Water-Total Result | Water-Total Units |
|---|---|---|---|
| Berylium | Be-Total | 1.0U | ug/l |
| Chromium | Cr-Total | 5.0U | ug/l |
| Copper | Cu-Total | 45.9 * | ug/l |
| Nickel | Ni-Total | 10U | ug/l |
| Silver | Ag-Total | 2.0U | ug/l |
| Zinc | Zn-Total | 6.2JB* | ug/l |

(Sample Complete)

Project: DOE-008M TOFTDAHL DRUM SITE

Officer: PZM Account: D3P01

Laboratory: Ecology, Manchester

Sample No: 90 438032 Description: KYLE

Source: Drinking Water (At tap)

Begin Date: 90/10/23 :

| Metals - PP | | Water-Total Result | Units |
|---|---|---|---|
| Arsenic | As-Total | 1.5U | ug/l |
| Cadmium | Cd-Total | 0.10U | ug/l |
| Lead | Pb-Total | 1.0U | ug/l |
| Thallium | Tl-Total | 2.5U | ug/l |
| Antimony | Sb-Total | 2.5U | ug/l |
| Selenium | Se-Total | 2.0U | ug/l |
| Mercury | Hg-Total | 0.04U | ug/l |

| Metals - PP Matrix Spike #1 | | Water-Total Result | Units |
|---|---|---|---|
| Lead | Pb-Total | 101 | % Recov |

| Metals - PP Matrix Spike #2 | | Water-Total Result | Units |
|---|---|---|---|
| Lead | Pb-Total | 102 | % Recov |

| Metals - ICP Scan | | Water-Total Result | Units |
|---|---|---|---|
| Berylium | Be-Total | 1.0U | ug/l |
| Chromium | Cr-Total | 5.0U | ug/l |
| Copper | Cu-Total | 25.8 * | ug/l |
| Nickel | Ni-Total | 10U | ug/l |
| Silver | Ag-Total | 2.0U | ug/l |
| Zinc | Zn-Total | 12JB* | ug/l |

| Analytical Resources, Inc Contract Lab Program | Water-Total Result | Units |
|---|---|---|
| Cyanide | ANALYZED | CLP |

(Sample Complete)

Washington State Department of Ecology
Sample/Project Analysis Results



Project: DOE-008M TOFTDAHL DRUM SITE

Officer: PZM Account: D3P01

Laboratory: Ecology, Manchester

Sample No: 90 438033 Description: SMITH

Source: Drinking Water (At tap)

Begin Date: 90/10/23 :

| Metals - PP | | Water-Total Result | Units |
|---|---|---|---|
| Arsenic | As-Total | 1.5U | ug/l |
| Cadmium | Cd-Total | 0.10U | ug/l |
| Lead | Pb-Total | 1.0U | ug/l |
| Thallium | Tl-Total | 2.5U | ug/l |
| Antimony | Sb-Total | 2.5U | ug/l |
| Selenium | Se-Total | 2.0U | ug/l |
| Mercury | Hg-Total | 0.04U | ug/l |

| Metals - ICP Scan | | Water-Total Result | Units |
|---|---|---|---|
| Berylium | Be-Total | 1.0U | ug/l |
| Chromium | Cr-Total | 5.0U | ug/l |
| Copper | Cu-Total | 28.4 * | ug/l |
| Nickel | Ni-Total | 10U | ug/l |
| Silver | Ag-Total | 2.0JB* | ug/l |
| Zinc | Zn-Total | 15JB* | ug/l |

(Sample Complete)

Washington State Department of Ecology
Sample/Project Analysis Results

Project: DOE-008M TOFTDAHL DRUM SITE

Officer: PZM Account: D3P01

Laboratory: Ecology, Manchester

Sample No: 90 438034 Description: HOMALA

Source: Drinking Water (At tap)

Begin Date: 90/10/23 :

| Metals - PP | | Water-Total Result | Units |
|---|---|---|---|
| Arsenic | As-Total | 1.5U | ug/l |
| Cadmium | Cd-Total | 0.10U | ug/l |
| Lead | Pb-Total | 1.5J* | ug/l |
| Thallium | Tl-Total | 2.5U | ug/l |
| Antimony | Sb-Total | 2.5U | ug/l |
| Selenium | Se-Total | 2.0U | ug/l |
| Mercury | Hg-Total | 0.04U | ug/l |

| Metals - ICP Scan | | Water-Total Result | Units |
|---|---|---|---|
| Berylium | Be-Total | 1.0U | ug/l |
| Chromium | Cr-Total | 5.0U | ug/l |
| Copper | Cu-Total | 2.0U | ug/l |
| Nickel | Ni-Total | 10U | ug/l |
| Silver | Ag-Total | 2.0U | ug/l |
| Zinc | Zn-Total | 34.0 * | ug/l |

(Sample Complete)

Project: DOE-008M TOFTDAHL DRUM SITE  Officer: PZM  Account: D3P01

Laboratory: Ecology, Manchester

Sample No: 90 438035  Description: TRANSPORT  Source: Water (General)

Begin Date: 90/10/23 :

| Metals - PP | | Water-Total Result | Units |
|---|---|---|---|
| Arsenic | As-Total | 1.5U | ug/l |
| Cadmium | Cd-Total | 0.10U | ug/l |
| Lead | Pb-Total | 1.0U | ug/l |
| Thallium | Tl-Total | 2.5U | ug/l |
| Antimony | Sb-Total | 2.5U | ug/l |
| Selenium | Se-Total | 2.0U | ug/l |
| Mercury | Hg-Total | 0.04U | ug/l |

| Metals - PP Matrix Spike #1 | | Water-Total Result | Units |
|---|---|---|---|
| Mercury | Hg-Total | 110 | % Recov |

| Metals - PP Matrix Spike #2 | | Water-Total Result | Units |
|---|---|---|---|
| Mercury | Hg-Total | 113 | % Recov |

| Metals - ICP Scan | | Water-Total Result | Units |
|---|---|---|---|
| Berylium | Be-Total | 1.0U | ug/l |
| Chromium | Cr-Total | 5.0U | ug/l |
| Copper | Cu-Total | 2.0U | ug/l |
| Nickel | Ni-Total | 10U | ug/l |
| Silver | Ag-Total | 2.0U | ug/l |
| Zinc | Zn-Total | 7.8JB* | ug/l |

(Sample Complete)

Project: DOE-008M TOFTDAHL DRUM SITE

Officer: PZM

Account: D3P01

Blank ID: PB 44.08

| Metals - PP Blank #1 | | Water-Total Result | Units |
|---|---|---|---|
| Arsenic | As-Total | 1.5U | ug/l |
| Cadmium | Cd-Total | 0.10U | ug/l |
| Antimony | Sb-Total | 2.5U | ug/l |
| Selenium | Se-Total | 2.0U | ug/l |

| Metals - ICP Scan Blank #1 | | Water-Total Result | Units |
|---|---|---|---|
| Berylium | Be-Total | 1.0U | ug/l |
| Chromium | Cr-Total | 5.0U | ug/l |
| Copper | Cu-Total | 2.4J* | ug/l |
| Nickel | Ni-Total | 10U | ug/l |
| Silver | Ag-Total | 2.4J* | ug/l |
| Zinc | Zn-Total | 2.1J* | ug/l |

(Sample Complete)

Project: DOE-008M TOFTDAHL DRUM SITE

Officer: PZM

Account: D3P01

Blank ID: PB 44.09

| Metals - PP Blank #2 | | Water-Total Result | Units |
|---|---|---|---|
| Arsenic | As-Total | 1.5U | ug/l |
| Cadmium | Cd-Total | 0.10U | ug/l |
| Antimony | Sb-Total | 2.5U | ug/l |
| Selenium | Se-Total | 2.0U | ug/l |

| Metals - ICP Scan Blank #2 | | Water-Total Result | Units |
|---|---|---|---|
| Berylium | Be-Total | 1.0U | ug/l |
| Chromium | Cr-Total | 5.0U | ug/l |
| Copper | Cu-Total | 2.0U | ug/l |
| Nickel | Ni-Total | 10U | ug/l |
| Silver | Ag-Total | 2.0U | ug/l |
| Zinc | Zn-Total | 2.0U | ug/l |

(Sample Complete)

Project: DOE-008M TOFTDAHL DRUM SITE

Officer: PZM

Account: D3P01

Blank ID: PB 48.34

| Metals - PP Blank #1 | | Water-Total Result | Units |
|---|---|---|---|
| Lead | Pb-Total | 1.0U | ug/l |
| Thallium | Tl-Total | 2.5U | ug/l |

(Sample Complete)

Project: DOE-008M TOFTDAHL DRUM SITE

Officer: PZM

Account: D3P01

Blank ID: PB 48.35

| Metals - PP Blank #2 | | Water-Total Result | Units |
|---|---|---|---|
| Lead | Pb-Total | 1.0U | ug/l |
| Thallium | Tl-Total | 2.5U | ug/l |

(Sample Complete)

**WASHINGTON STATE DEPARTMENT OF ECOLOGY**
**MANCHESTER ENVIRONMENTAL LABORATORY**
**Manchester, Washington 98353**

**DATA REVIEW**

**By:** Craig Smith, Chemist
**PROJECT:** Toftdahl Drum Site
**Lab Sample No:** 438032 **Report Date:** 1-10-91

| | Collected | To Manchester | Digested |
|---|---|---|---|
| **HOLDING TIME:** | 10/23/90 | 10/24/90 | 11/15/90 |
| | | **Analyzed:** | 12/07/90 |

The QA/QC checks are complete, all results within the accepted limits.

The sample result was below the reporting detection limit.

Call me if you have any questions at SCAN: 744 - 4737

**ANALYTICAL RESOURCES INCORPORATED**

Analytical
Chemists &
Consultants

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## Final Report
## Laboratory Analysis of Total Cyanide

Matrix: WATER

Data Release Authorized:
*Report Prepared : December 11, 1990*

Project No: TOFTDAHL
QC Report No: WSDOE-7218
Date Received: 10/24/90

***Sample Data:***

| Lab ID | Sample Number | DATE OF ANALYSIS 12/7/90 TOTAL (mg/L) |
|---|---|---|
| 7218 A | 438032 | < 0.010 |

***Method Blank Analysis:***

| Sample Number | TOTAL (mg/l) |
|---|---|
| *Method Blank 1* | < 0.010 |
| *Method Blank 2* | < 0.010 |
| *Detection Limit :* | 0.010 |

| ***Check Standard Analysis:*** | (mg/l) | QC #4257 |
|---|---|---|
| *Measured Value* | 0.062 | 0.697 |
| *"True" Value* | 0.062 | 0.759 |
| *% Recovery* | 100.00% | 91.77% |

| ***Duplicate Analysis:*** | (mg/l) |
|---|---|
| *Original* | < 0.010 |
| *Duplicate* | < 0.010 |
| *RPD* | - |

| ***Spike Analysis:*** | (mg/l) |
|---|---|
| *Original* | < 0.010 |
| *Spike* | 0.074 |
| *Spike Level* | 0.104 |
| *% Recovery* | 71.15% |

**Comments:**

*Sample distillation to NaOH on 11/15/90.*