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Water Body No. WA-55-1010
(Segment No. 24-54-01)

TECHNICAL MEMORANDUM

March 26, 1990

TO: Mike Blum

THROUGH: Bill Yake

FROM: Art Johnson and Dale Davis

SUBJECT: Follow-up Survey for Volatiles in the Little Spokane River

Detection of trace amounts (approximately 2 ug/L) of 1,1,1-trichloroethane in the Little Spokane River below Colbert Landfill during a baseline survey on September 12-13, 1989 (Johnson, 1989) was the impetus for a follow-up survey on December 12, 1989. Objectives of the second survey were to 1) determine where the solvent-contaminated ground water plume from the landfill was entering the Little Spokane, 2) better quantify 1,1,1-trichloroethane concentrations in the river, and 3) determine if other solvents known to be present in the Colbert plume could be detected. An ancillary objective was to identify the source of elevated nitrate+nitrite found in the river during the initial survey.

Figure 1 shows where water samples were collected. A 10-station transect was sampled along a five mile reach of the Little Spokane between Woolard Road bridge (site of previous trichloroethane detection) and Chattaroy. Samples were also collected from Sterling Spring and Dragoon Creek which enters the Little Spokane on the right bank approximately one mile above the spring. (Appendix A has detailed descriptions of each sampling site.) River flow during the survey was 118 cfs based on gage height at Chattaroy; flows during the September survey were 77 - 80 cfs (flow data provided by Greg Baca, Spokane Community College). Golder Associates (1987) report mean and drought flows in the Little Spokane of 236 cfs and 75 cfs, respectively.

At each of the transect stations, replicate grab samples were collected for volatiles, and single grabs were taken for specific conductivity, chloride, and nitrate+nitrite nitrogen. Single grab samples were collected for volatiles and other variables at Sterling Spring. Analyses for Dragoon Creek were limited to conductivity, chloride, and nitrate+nitrite nitrogen.

Sample containers for volatiles were standard 40 mL screw cap vials with teflon septa. Conductivity and chloride samples were in one-liter polyethylene bottles. Nitrate+nitrite samples were in 125 mL clear

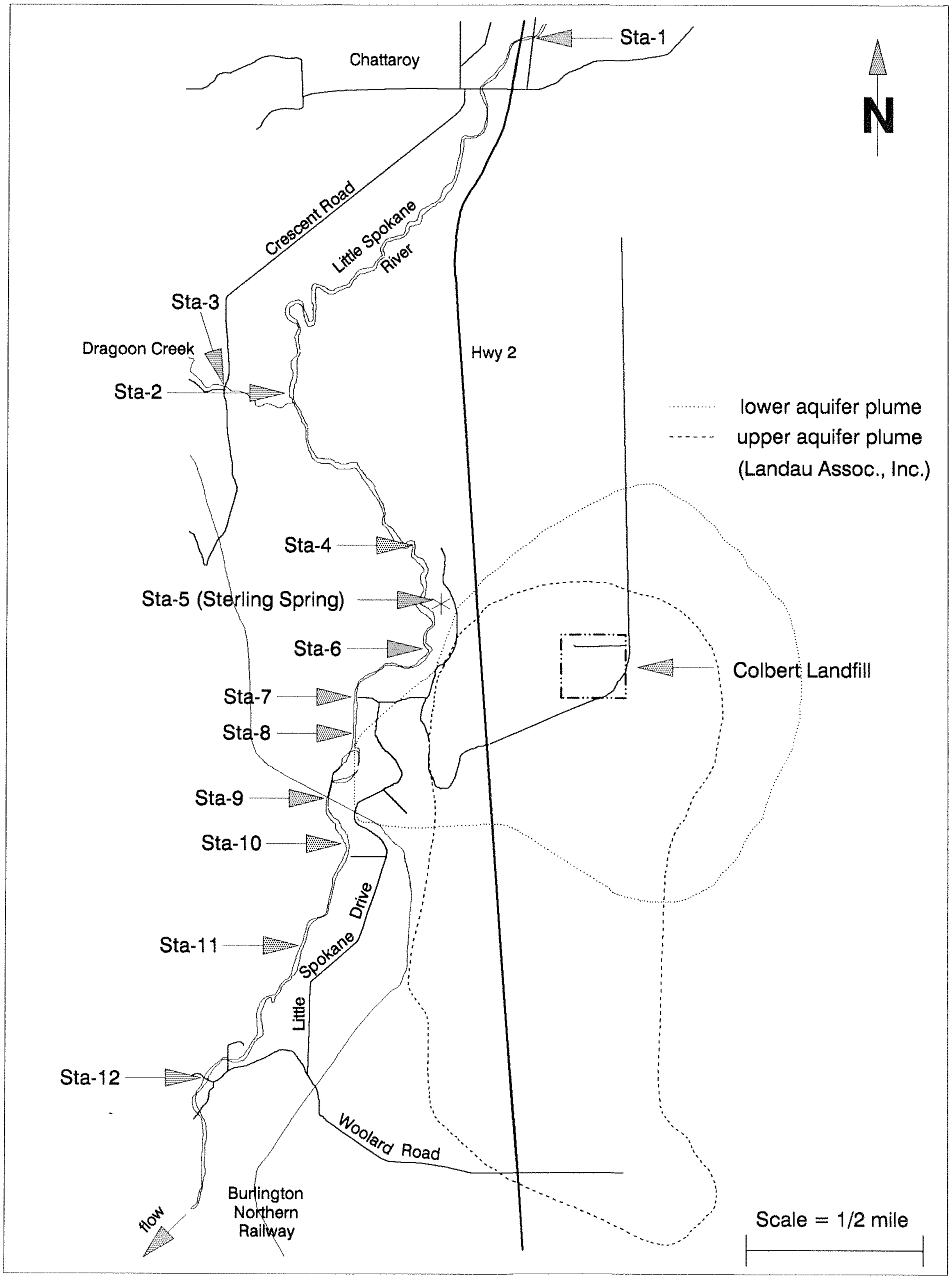

Figure 1. Map of study area showing sampling sites.

polyethylene bottles with H_2SO_4 preservative. All samples were placed on ice immediately on collection and transported to the Ecology Manchester Laboratory the following day.

Volatiles analysis was done at Laucks Testing Laboratories, Seattle, by purge and trap/GC/Hall detector (EPA method no. 601). Five samples were confirmed by GC/MS. A Hall detection method was used in place of the more commonly employed GC/MS method 624 in an effort to obtain lower detection limits than achieved in the first survey. A list of the compounds analyzed is in Appendix B. The remaining analyses were done at the Manchester Laboratory. Specific conductance was analyzed by conductivity meter (EPA method no. 120.1), chloride by ion chromatography (EPA method no. 300.0), and nitrate+nitrite nitrogen by calorimetric, automated, cadmium reduction (EPA method no. 353.2).

Stuart Magoon of the Manchester Laboratory reviewed the volatiles data for qualitative and quantitative accuracy and concluded the data were acceptable. Holding times, surrogate and matrix spike recoveries, and method blanks were within EPA CLP limits. Methylene chloride, a common laboratory contaminant, was detected in both blanks and field samples.

The results are summarized in Table 1. 1,1,1-Trichloroethane was the only compound detected. Detection limits for trichloroethane and other volatiles were 0.2 ug/L.

Figure 2 shows the distribution of trichloroethane in the river. The furthest upstream point at which trichloroethane was detected was due west of the landfill at station 6 below Sterling Spring. The average concentration at this site was 3.0 ug/L. With one exception, concentrations decreased by approximately 0.3 - 0.6 ug/L at each successive downstream sampling site, reaching an average concentration of 1.1 ug/L at Woolard Road bridge. A relatively high trichloroethane concentration of 6.8 ug/L was measured in Sterling Spring. Although this appears to be the region where the Colbert plume enters the Little Spokane, the spring's flow was small (estimated at 0.01 cfs) and could not, in and of itself, account for the trichloroethane concentrations observed in the river.

There was evidence of an increase in trichloroethane concentrations in the lower parts of the study reach at station 11 above the Woolard Road bridge. An average concentration of 2.3 ug/L was measured here, about 1 ug/L higher than in samples collected immediately upstream. Whereas samples at other sites were collected in mid-channel, station 11 samples were collected off the left bank due to deep water. This is a swampy area with several small left bank ditches draining into the river. These may be a source of trichloroethane, although detection of only 1.1 ug/L at Woolard Road bridge suggests a minor source and, furthermore, that the bank samples at station 11 may not be representative of average concentrations in the river.

Table 1. Water quality measurements in Little Spokane River in vicinity of Colbert Landfill, December 12, 1989.

Location	Time	Temp°C	Specific Conductance µmhos/cm	Chloride mg/L	1,1,1-Trichloroethane µg/L Sample #1	1,1,1-Trichloroethane µg/L Sample #2	Nitrate-Nitrite Nitrogen mg/L
Chattaroy	0835	0.5	198	1.49	0.2 U	0.2 U	0.40
Above Dragoon Creek	1220	1.4	191	2.09	0.2 U	0.2 U	0.57
Dragoon Creek	1210	0.1	321	3.85	-	-	2.83
Above Sterling Springs	1315	1.3	217	2.01	0.2 U	0.2 U	1.02
Sterling Springs	1300	8.9	437	1.52	6.8	-	0.04
Below Sterling Springs	1125	1.3	220	1.98	3.1	2.8	1.00
River Glenn Drive bridge	1100	1.3	224	1.97	2.4*	2.3	1.01
Above railroad trestle	1045	1.4	221	1.99	1.9	2.2	1.01
Burlington N. railroad trestle	1015	1.4	223	2.03	1.6**	2.0	1.04
Below railroad trestle	0955	1.2	225	2.04	1.4	1.4	1.00
Above Woolard Road bridge	0925	1.2	223	2.02	2.2	2.4	0.99
Woolard Road bridge	0905	1.1	223	2.04	1.1	1.1	1.00
Transfer blank	-	-	-	-	0.2 U	-	-
Transport blank	-	-	-	-	0.2 U	-	-

U - not detected at detection limit shown
* - average of duplicate analyses (2.0 µg/L and 2.7 µg/L)
** - average of duplicate analyses (1.4 µg/L and 1.8 µg/L)

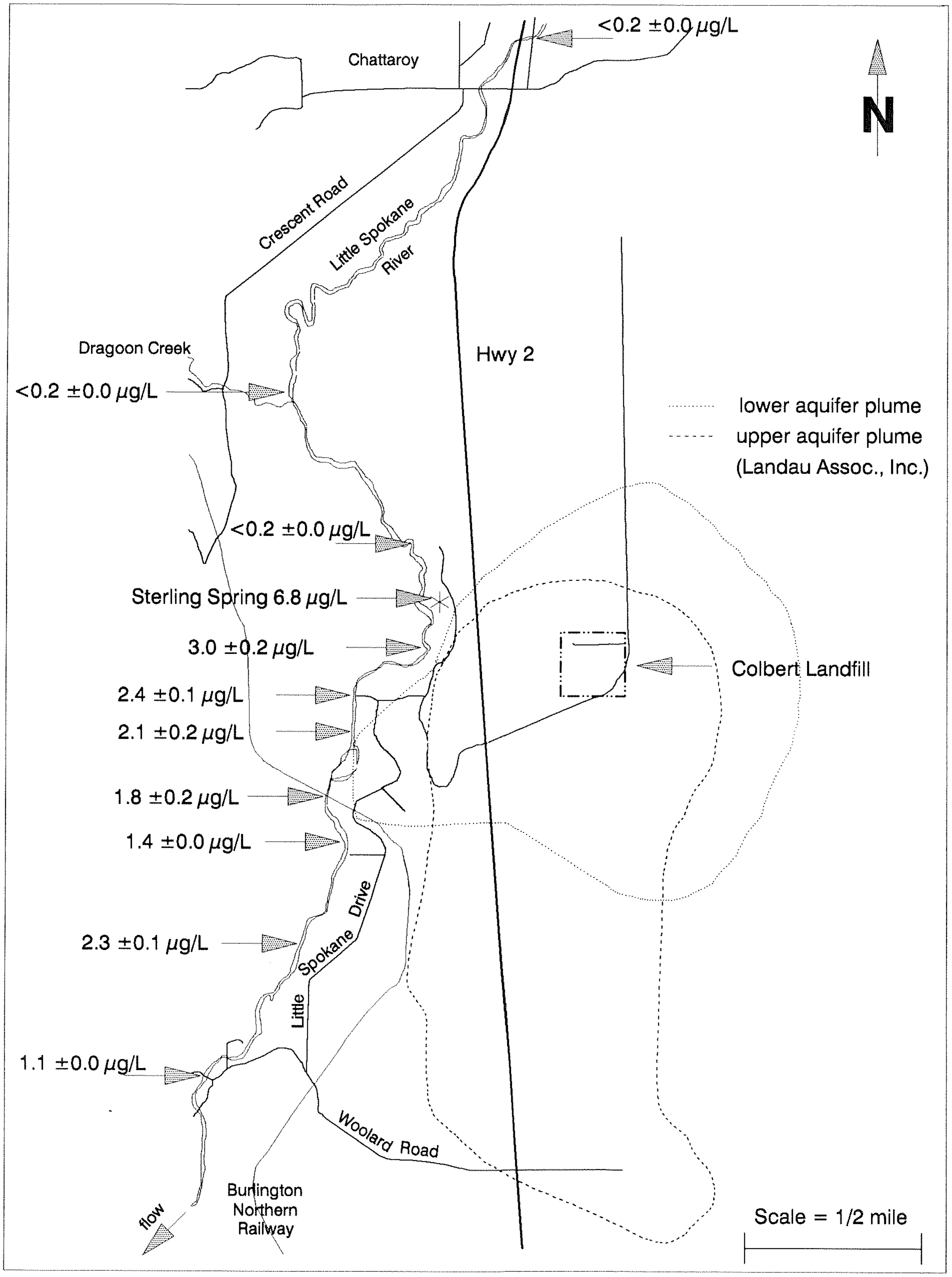

Figure 2. Map of study area showing mean 1,1,1-trichloroethane concentrations ± data range at each sampling site.

Results for nitrate+nitrite (Table 1) show Dragoon Creek is the major source of nitrogen to this reach of the river. A nitrate+nitrite concentration of 2.83 mg/L was measured in the tributary. Concentrations in the Little Spokane increased from 0.57 mg/L above the tributary to 1.02 mg/L below the tributary confluence. Given the existing river flow, a tributary flow of 20 cfs would be required to cause a nitrogen increase of this magnitude, which is a reasonable upper limit approximation of the flow observed during the survey. According to Carl Nuechterlein of the Ecology Eastern Regional Office non-point agricultural sources are a recognized water quality problem in Dragoon Creek. Because nitrate+nitrite concentrations did not increase at or below the point trichloroethane was detected in the river, the Colbert plume does not appear to be a significant nitrogen source.

We recommend collecting a few additional samples for volatiles analysis during low flow conditions later this year to track the progress of the plume. Sampling sites should include stations 4, 6, 9 and 12; Sterling Spring and the left bank drainage at station 11 should also be sampled.

References:

Golder Associates. 1987. Remedial Investigation: Colbert Landfill, Spokane, Washington. Vol. 1. Redmond, WA.

Johnson, A. 1990. Survey for Volatiles in the Little Spokane River. Wash. Dept. Ecology memorandum to M. Blum. Olympia, WA.

cc: Carl Nuechterlein
Claude Sappington
Dave Jansen
Leslie Romer
Steve Hunter
Dick Cunningham
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Appendix - A

Description of sample collection sites

Station Number	Name	Approximate River Mile	Description
1	Chattaroy	23.4	At Spokane Community College gaging station near Chattaroy, above Highway 2 bridge
2	Above Dragoon Creek	21.3	From bridge at 23902 Crescent Road
3	Dragoon Creek	21.2*	Immediately above bridge on Crescent Road
4	Above Sterling Springs	20.4	At sharp bend in river below Sterling barn, 22711 N. Glenn Dr.
5	Sterling Springs	20.1	Below Sterling residence at 22711 N. Glenn Dr.
6	Below Sterling Springs	19.9	Between 22319 N. Glenn Dr. and next house upstream
7	River Glenn Drive bridge	19.6	Immediately below River Glenn Dr. bridge
8	Above railroad trestle	19.4	At 22009 Meadow View Dr.
9	Burlington N. railroad trestle	19.2	Immediately below Burlington Northern railroad trestle
10	Below railroad trestle	19.0	Immediately below foot bridge at 21415 Little Spokane River Dr.
11	Above Woolard Road bridge	18.6	At 20901 Little Spokane River Dr.
12	Woolard Road bridge	18.0	Immediately above Woolard Road bridge

* - River mile at Little Spokane confluence

Appendix - B

Parameter	STORET No.	CAS No.
Bromodichloromethane	32101	75–27–4
Bromoform	32104	75–25–2
Bromomethane	34413	74–83–9
Carbon tetrachloride	32102	56–23–5
Chlorobenzene	34301	108–90–7
Chloroethane	34311	75–00–3
2-Chloroethylvinyl ether	34576	100–75–8
Chloroform	32106	67–66–3
Chloromethane	34418	74–87–3
Dibromochloromethane	32105	124–48–1
1,2-Dichlorobenzene	34536	95–50–1
1,3-Dichlorobenzene	34566	541–73–1
1,4-Dichlorobenzene	34571	106–46–7
Dichlorodifluoromethane	34668	75–71–8
1,1-Dichloroethane	34496	75–34–3
1,2-Dichloroethane	34531	107–06–2
1,1-Dichloroethane	34501	75–35–4
trans-1,2-Dichloroethene	34546	156–60–5
1,2-Dichloropropane	34541	78–87–5
cis-1,3-Dichloropropene	34704	10061–01–5
trans-1,3-Dichloropropene	34699	10061–02–6
Methylene chloride	34423	75–09–2
1,1,2,2-Tetrachloroethane	34516	79–34–5
Tetrachloroethene	34475	127–18–4
1,1,1-Trichloroethane	34506	71–55–6
1,1,2-Trichloroethane	34511	79–00–5
Tetrachloroethene	39180	79–01–6
Terichlorofluoromethane	34488	75–69–4
Vinyl chloride	39715	75–01–4