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Clayton
ENVIRONMENTAL
CONSULTANTS

May 25, 1999

Mr. Derek Lee
California Regional Water Quality Control Board
San Francisco Bay Region
1515 Clay Street, Suite 1400
Oakland, California 94612

Clayton Project No. 70-97203.00.201

Subject: Additional Remedial Investigation 1999 at 5050, 5051, and 5200 Coliseum Way and 750-50th Avenue, Oakland, California.

Dear Mr. Chan:

Enclosed please find Clayton Group Services, Inc's (Clayton's) report for an Additional Remedial Investigation 1999 at 5050, 5051, and 5200 Coliseum Way and 750-50th Avenue, Oakland, California. This report presents the results of Clayton's remedial investigation from January through May, 1999 at the subject property. If you have any questions or comments, please call me at (925) 426-2686.

Sincerely,

Dwight R. Hoenig
Vice President, Western Regional Director
Environmental Risk Management and
Remediation
San Francisco Regional Office

DRW/daa

cc: Barney Chan, Alameda County Health Agency
Tim Colvig, Wulfsberg Reese Ferris & Sykes
Samuel Friedman, Millennium Holdings, Inc.

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Additional Remedial Investigation 1999
At
Coliseum Way Properties
5050, 5051 and 5200 Coliseum Way and
750-50th Avenue
Oakland, California

For
Millennium Holdings Inc.

Clayton Project No. 70-97203.00.201

May 25, 1999

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EXECUTIVE SUMMARY

Clayton has completed the following additional remedial investigation of the nature and extent of contamination associated with waste materials that exist for Properties at 750-50th Avenue and 5050, 5051, and 5200 Coliseum Way, Oakland, Alameda County. This investigation was in response to the Regional Water Quality Control Board's Adoption of Site Cleanup Requirements, dated March 9, 1999. Based on our analysis of the current data, we have drawn the following conclusions:

- The tracer study using Fluorescein and Rhodamine WT dyes has not indicated hydraulic conductivity between the wells adjacent to the subsurface culverts northwest of the 5050 Coliseum Way property (Wells LF-5 and CW-13) with wells CW-10 and CW-12. Clayton concludes that the backfill material surrounding the sides and bottoms of the Second Line G and Courtland Creek Culverts is not a preferential pathway for contaminated groundwater.

  Clayton sampled surface waters in the Second Line G and Courtland Creek Culverts for tracer dyes. Rhodamine WT was detected in a surface water sample (Sample W5) collected in the Courtland Creek Culvert at Coliseum Way after injection of the dye into well CW-13. Clayton also inspected the interior of the Courtland Creek Culvert in this area and observed some cracks and minor groundwater weeps along the base of the sidewalls along the concrete culvert.

  Fluorescein, which is a common dye used in radiator coolant, was detected in storm water samples. This detection likely originates from upgradient industrial businesses or vehicular use of the public streets at or upgradient of the subject property.

  not necessary
  Could indicate migration of GW

- Weep water samples from the storm water channel collected in the area of well MW-4 were found to contain detectable cadmium and zinc concentrations. Field observations indicate that the total groundwater influx to surface water in the open storm channel near MW-4 is one gallon or less per minute during low tide periods. The highest zinc concentration detected in the weep water samples was 9.4 mg/L, with an average concentrations of only 3.2 mg/L for the northwest boundary to the 5051 Coliseum Way property.

- Surface water samples collected along the Second Line G Culvert and the Courtland Creek Culvert northwest of the subject property between September 1998 and March 1999 (four sampling events) indicate that only cadmium and zinc were detected at significant concentrations. Zinc concentrations ranged from 0.05 to 0.55 mg/L. One upgradient surface water sample in the Second Line G Culvert near San Leandro Street had a zinc concentration of 1.4 mg/L. Clayton is unable to evaluate the total metal loading contribution attributable to the upper portion of the Courtland Creek channel due to the recent finding that the Courtland Creek Culvert, joins the Second Line G Culvert upstream of the subject property. Based on the results of the tracer study and limited impact of groundwater to the Second Line G Culvert, Clayton concludes that the metals loading to this culvert from the subject property is neglible

since no significant groundwater migration into the Second Line G Culvert has been identified.

- Metals mass loading calculations for surface waters have been made based on the available data and visual observations of surface flow in the studied storm water channels. Clayton estimates that approximately 7.6 pounds of zinc per year and 0.1 pounds of cadmium per year are impacting surface waters from the 5051 Coliseum Way property. Metals loading from the Courtland Creek Culvert attributed to groundwater migration to surface water from the subject property consists of only about 2.6 pounds of zinc per year, 0.5 pounds of barium per year, and 0.3 pounds of arsenic per year. Conversely, metals loading estimates from upstream sources that flow by the subject property likely exceed 2,000 pounds of zinc per year and possibly 1,000 pounds of barium per year from the Second Line G Culvert alone. Therefore, Clayton concludes that the metals loading from the subject property to the surface waters and ultimately the bay are insignificant compared to the general storm water metals loading rates that are occurring from other upgradient unidentified sources.

- Additional grab-groundwater samples collected southeast of the 54th Avenue Creek indicate that soluble metal concentrations exceed MCLs for nine metals. However, the concentrations appear to be decreasing with increasing distance from the subject property.

- Clayton calculated an area-weighted total dissolved solids (TDS) concentration for the subject property of 6,417.5 mg/L. The area-weighted TDS concentration significantly exceeds that 3,000 mg/L level established for potential underground sources of drinking water.

1 INTRODUCTION

Millennium Holdings Inc. retained Clayton Environmental Consultants, a division of Clayton Group Services, Inc. (Clayton) to perform a health risk assessment and conduct an additional remedial investigation at the Coliseum Way Properties, located at 750-50th Avenue, and 5050, 5051, and 5200 Coliseum Way, Oakland, California (Figure 1), the subject property. The investigation was designed to assist the California Regional Water Quality Control Board (Board) with its investigation of the subject property by addressing the tasks outlined in the Site Cleanup Requirements [SLIC No: 01S0422 (DCL)] adopted on March 9, 1999. Clayton provided the Board with a schedule of proposed investigation activities in a letter dated January 11, 1999.

The first task to be completed was the submittal of a Final Health Risk Assessment to the Board. Clayton has not yet received final comments from the Board for the Draft Human Health Risk Assessment submitted on February 24, 1999; however, once comments are received, the report will be finalized and submitted to the Board. The second task required the completion of a remedial investigation. This report details the findings of that investigation.

Clayton's investigation consisted of the following tasks.

- Evaluating the site for the installation of an additional groundwater monitoring well upgradient of well CW-13. Clayton concluded that due to numerous subsurface utilities and the existence of wells LF-12 and LF-5, such a well was not practical.
- Conducting a tracer study to evaluate the hydrologic conductivity between wells CW-13 and LF-12, and the assumed downgradient wells CW-10 and CW-12.
- Collecting and analyzing "weep water" along the concrete lined storm water channel in the vicinity of monitoring well MW-4.
- Collecting surface water (storm water) samples along the Second Line G Culvert at locations upstream and adjacent to the site. In addition, collecting surface water samples in the adjacent Courtland Creek Culvert.. These surface water samples were analyzed for metals of concern and tracer dyes.
- Calculating mass loading rates in surface water for select heavy metals using available data.
- Collecting four additional groundwater samples on the southeast bank of the 54th Avenue Creek that parallels the 5200 Coliseum Way property and analyze for total metals and TDS.
- Calculate an area-weighted total dissolved solids (TDS) concentration in the groundwater for the subject property to be used in determining cleanup standards.

This report presents the background of the site, scope of work, along with descriptions of the tracer study, weep water sampling for metals, storm water sampling for metals, metals mass loading estimates in surface waters, additional groundwater sampling, area-weighted TDS in groundwater, analytical results, conclusions, and limitations.

1.1 BACKGROUND

The 5050 and 5200 Coliseum Way properties encompass approximately 10 acres and the 5051 Coliseum property is approximately 4.4 acres. The properties are relatively flat with elevations ranging from approximately 8 to 15 feet above mean sea level (amsl). The subject property is located in an industrial area of Oakland. The sites are approximately one half-mile east of San Leandro Bay. Regionally, groundwater generally flows west towards San Leandro Bay. The Coliseum Way properties (Figure 1) are bounded to the northwest, southwest, and southeast by storm water drainage canals and culverts that flow to the San Leandro Bay. The canals drain a watershed area that encompasses a large industrial area in the City of Oakland. These canals are tidally influenced.

The subject property has a long history of industrial usage. From the middle to late 1800s to about 1900 the property was used for lead smelting, from 1900 to 1920 the 5050 Coliseum Way property was used for the retorting of pyrite ores for the production of sulfuric acid. The ore reduction process resulted in the deposition of approximately 15,000 cubic yards of pyrite slag and cinders onto the 5050 and 5200 Coliseum Way properties.

A lithopone (paint pigment) manufacturing facility occupied the properties at 750-50th Avenue and 5050 Coliseum Way from approximately 1926 to 1963. Lithopone consists of a chemically co-precipitated pigment of barium sulfate and zinc sulfide used in the production of paint pigment. Various metals were added to the lithopone to give it pigment. Processing residuals from lithopone production included various forms of insoluble sulfate residuals including barium sulfate and zinc sulfate. These residuals were deposited as both dry filter cake and slurry deposits on portions of the 5051 and 5200 Coliseum Way properties.

The presence of the sulfide rich slag and cinders has given rise to a localized condition of low pH shallow groundwater on the 5050 Coliseum Way property. The acidic groundwater has solublized a suite of acid soluble metals, primarily zinc, with associated metals of cadmium and barium. On the 5200 property, the primary metal constituents are arsenic and barium. The pH conditions of groundwater on 5200 property are neutral to slightly basic.

Millennium Holdings Inc. has undertaken the responsibility for the investigation and remediation of 750-50th Avenue, 5050 and 5051 Coliseum Way, and the 5200 Coliseum Way property.[1] Buildings associated with a former Volvo-GM truck maintenance facility

[1] On March 15, 1999, Millennium Holdings Inc. transferred ownership of the sites, consisting of 5050 Coliseum Way, 750 50th Avenue and 5051 Coliseum Way, to LeMean Property Holdings Corporation ("LeMean"). LeMean is the indirect subsidiary of Millennium Holdings Inc. Millennium Holdings Inc. has agreed to manage and perform the investigation and remedial action with respect to the discharge or release of hazardous substances at, on, in or under the sites and adjoining sites first occurring prior to the date of transfer. LeMean has granted Millennium Holdings Inc. access and easement rights for the purpose of performing its investigation and remedial action work. LeMean and Millennium Holdings Inc. shall have the exclusive right and responsibility to communicate with governmental authorities relating to the release or discharge of hazardous substances at the sites.

are located at 750-50th Avenue. A mini-storage facility currently occupies the 5200 Coliseum Way property.

The 5051 Coliseum Way site was also part of the former lithopone manufacturing process. The site is currently divided into a north area and south area by a cyclone fence. The area north is unpaved and previously was used by PG&E for temporary storage of construction materials and soil. Two electrical transmission towers are located on this north area. The area south is paved and used for weekend parking. PG&E Substation J is located across the drainage channel northwest from the 5051 Coliseum Way site. Southeast of the 5051 Coliseum Way site is a lot owned by the East Bay Municipal Utility District (EBMUD) and contains an EBMUD sewer pump station.

The tidally influenced storm water drainage channels bordering the subject property (Figure 1) include an open and unlined channel that parallels the southeast property boundary of the 5051 and 5200 Coliseum Way sites. Two subsurface culverts, the Courtland Creek Culvert and the Second Line G Culvert, parallel the northwest property boundaries of the 5050 Coliseum Way property and the 750 50th Avenue property. The two culverts merge into an open concrete-lined channel south of the intersection of Coliseum Way and 50th Avenue. The drainage channel is open and concrete-lined along the northwestern perimeter of the 5051 Coliseum Way site, and is open and unlined along the southwestern perimeter of the property, prior to flowing under Interstate 880.

1.2 SCOPE OF WORK

The scope of work performed for this investigation included:

- Prefield Activities
- Tracer Dye Injection and Sampling
- Surface Water Sampling for Metals
- Soil Borings and Grab-Groundwater Sampling for Metals and TDS
- Laboratory Analysis of Samples
- Analytical Results
- Calculations of Metals Mass Loading in Surface Waters
- Calculation of Area-Weighted TDS
- Report Preparation

Each of these activities is described in the following sections of this report.

1.3 TRACER STUDY

Clayton proposed conducting a tracer study using Fluorescent dyes in its January 11, 1999 letter to the Board. The study addressed concerns that contaminated groundwater from the subject property may migrate offsite along preferential pathways in permeable backfill materials under and along the culverts that parallel the northwest boundary of the 5050 Coliseum Way property. The tracer study was designed to evaluate the hydrologic conductivity between monitoring well CW-13 and the downgradient wells CW-10 and CW-12. The Board verbally approved the tracer study on March 5, 1999.

Clayton selected Ozark Underground Laboratory (OUL) of Protem, Missouri to provide fluorescent dyes, carbon samplers, and fluorometric laboratory services. Carbon samplers placed into water allowed sampling to be conducted over a pre-selected sample period, whereas, discrete water samples only sample the dyes present at the time of sample collection. Clayton conducted the fieldwork and modified its proposed dye test proeedure somewhat by selecting two different dyes, one each for injection into wells CW-13 and LF-12, (both wells are adjacent to the Second Line G Culvert and upgradient to wells CW-10 and CW-12). The two dyes selected were Fluorescein (more specifically 15174 Uranine C) and 16972 Rhodamine WT. Clayton has attached the Material Safety Data Sheets for these dyes in Appendix A.

Clayton selected the use of these distinctively colored dyes because they can be readily observed if a significant "breakout" occurs and the dyes migrate to the nearby surface waters or downgradient wells. The dyes are non-toxic, non-mutagenic, and inexpensive. The dyes can also be detected at low concentrations by laboratory fluorometric analysis due to their unique spectral emissions. Laboratory analysis can detect Fluorescein, potentially as low as 0.5 parts per billion (ppb) in water, and Rhodamine WT, potentially as low as 0.007 ppb in water.

Prior to injecting any dyes into the groundwater, Clayton first conducted background testing of groundwater for the presence of fluorescent dyes in wells CW-10, CW-12, CW-13, LF-5, and LF-12, and surface waters in the Second Line G Culvert and the Courtland Creek Culvert at Coliseum Way and 50th Avenue on March 10, 1999. The first set of carbon samplers (Sample Set C1) were pulled on March 12, 1999. The carbon samplers were replaced during each sampling event and a water sample was also collected in a plastic 50 milliliter (ml) sample vial. Clayton submitted the samples to OUL for analysis. Typically the carbon samplers were analyzed and the water samples were held for confirmation testing. Analytical results for Sample Set C1 found no background dye concentrations. Since no dyes were detected, Clayton proceeded with the injection of dyes into wells CW-13 and LF-12 on March 16, 1999. Clayton collected water samples twice a week for the first two weeks following dye injection and then weekly thereafter. Table 1 shows the sample dates that the carbon samplers were placed and pulled, and the sample results at each sample point. Table 2 show the water sample results of the select samples analyzed. The sample locations are shown in Figure 2 and the certified analytical results are in Appendix C.

Carbons in all wells?

Initially three pounds of the Rhodamine WT dye (a red dye solution) was injected into well CW-13 followed by 23 gallons of tap water to provide additional hydraulic head to move the dye into the permeable fill materials. An additional 12 gallons of tap water was injected into the well during each subsequent sampling event. One pound of Fluorescein dye powder (a yellow/green dye) was mixed with one gallon of tap water and injected into well LF-12. An additional 5 gallons of tap water was injected into the well, filling the well. Well LF-12, even though it appears to be within about 3 to 4 feet of the Second Line G Culvert, was observed to be in a fairly tight formation, as the additional head in the well did not readily dissipate. Clayton injected an additional 5 gallons of tap water during each subsequent sampling event. The last tap water addition was on May 6, 1999.

The total amount of tap water added to well CW-13 was approximately 130 gallons and approximately 50 gallons was added to well LF-12 during this sampling period.

Sampling events were conducted during low tide in order to access the culverts. Samples were individually labeled, placed into separate sealed plastic bags, put into a chilled cooler, and stored until shipment to Ozark Underground Laboratories (OUL). A sample chain-of-custody document was completed for each sampling event.

As of the May 12, 1999 sampling event, residual dyes still existed in each injection well though the coloration had attenuated somewhat. On May 12, 1999, Clayton also placed carbon samplers into each of the injection wells to determine the residual concentration of each dye and to attempt to determine if any cross-migration of the dyes has occurred between the two injection wells. Clayton will continue the sampling events through the month of June 1999. Clayton will continue to advise the Board of any significant findings should any occur during the proposed sampling period.

The background sample set C1 was found to be free of fluorescent dyes, therefore, background sample set C2 was not analyzed and placed on hold. The remainder of sample sets (C3- C11) were analyzed after dye injection. Carbon samplers were analyzed for all sample sets C3 through C11 for both fluorescent dyes.

Access to the culverts was limited, and the city design drawings did not accurately indicate the as-built condition of the culverts. On March 26, 1999, Clayton discovered an opening in the Second Line G Culvert on the north side of 50th Avenue at East 8th Street (See Figure 2). This location was added as an upstream sample point to evaluate possible upgradient releases of fluorescent dyes. The upstream carbon sample C7 was lost on April 8, 1999, due to movement of debris in the culvert. Carbon sample C9 in monitoring well LF-5 was not retrievable on April 22, 1999, due to a car parked on the well box. The sample was pulled the following week as sample C10 from monitoring well LF-5. No other carbon sample complications occurred.

Clayton observed the storm water flow in the Second Line G Culvert during each sampling event and the upgradient flow at East 8th Street was observed to be significantly less, approximately 10 percent of the downgradient flow at Coliseum Way. Flow in the Courtland Creek Culvert at Coliseum Way was usually near or at the observed base flow rate, estimated at about three-fourths of a gallon per minute (gpm). The only time the base flow was observed to change was during active rainfall. Such an event was observed on March 19, 1999, when the flow was estimated at about 10 to 12 gpm. As-Built maps of the culverts obtained from the City of Oakland Public Works Department indicated that the Courtland Creek Culvert and the Second Line G Culvert are separate culverts. Clayton explored the culverts on May 12, 1999 to investigate the source of the additional storm water observed in the Second Line G culvert. Clayton found that the Courtland Creek Culvert has an opening (3.5 feet by 3.5 feet) that connects to the Second Line G Culvert just north of the railroad tracks upgradient of the subject property where the Courtland Creek Culvert makes a 90 degree turn (See Figures 2 and 3). The old portion of the Courtland Creek Culvert (the portion between the 90 degree turn and Coliseum Way) is elevated at the turn and only receives storm water when the

runoff exceeds a depth of about 2.5 feet in the culvert. Therefore, unless the storm water runoff is high, for example during a significant rain event, the only source of water that the old portion of the Courtland Creek Culvert receives is from three curb drain inlets along the north side of 50th Avenue and from groundwater infiltration that was observed along the base of the box culvert sidewalls where horizontal cracks and groundwater weeps were observed.

Clayton also observed the interior of the Second Line-G Culvert between Coliseum Way and the Courtland Creek Culvert connection north of the subject property. The concrete walls and floor were observed to be in good condition with no obvious groundwater seeps, except for two areas. One area is where the parking lot storm drain discharge pipe enters the culvert sidewall about four feet above the culvert floor near monitoring well LF-5. The discharge pipe is about 10 inches in diameter and is not sealed at the sidewall. Groundwater, estimated at about 0.1 gpm or less, was observed to flow into the culvert below the discharge pipe. No visible dye coloration was noted. The second area is near monitoring well LFMW-3 where nine vertical hairline cracks in the sidewall were observed. Groundwater was observed oozing through these cracks, however, the groundwater just wetted the sidewall and did not amount to any significant inflow into the culvert. Clayton did not collect any discrete water samples in this area.

1.3.1 Analytical Results

All carbon and water dye samples were shipped to and analyzed by Ozark Underground Laboratories in Protem, Missouri. OUL's Certificates of Analysis and Procedures and Criteria of Fluorescein, Eosine, Rhodamine WT, Sulforhodamine B, and Pyranine Dyes in Water and Charcoal Samplers, dated February 18, 1998, are attached in Appendix B.

Fluorescein

The initial background sampling (Sampling C1) did not indicate the existence of Fluorescein dye in any of the carbon samplers. Fluorescein dye was injected into monitoring well LF-12 on March 16, 1999 during a period of light precipitation. Fluorescein dye was detected in the Second Line G Culvert at Coliseum Way in carbon samples C3 and C4, the first two sampling events following the dye injection. Clayton did not begin sampling upstream storm water until March 26, 1999; therefore, it is unknown if the detected dye is from releases related to the dye injection or from unknown upstream sources. However, later sample set results (C6 through C11) indicate that Fluorescein, when detected, was present in both upstream and downstream samples at the same time. Also, when Fluorescein was not detected, it was not detected in both upstream and downstream samples at the same time, suggesting that the Fluorescein findings are a result of upstream releases.

what about ~~Qty~~ Concentration?

Rhodamine WT

The initial background sample C1 did not find Rhodamine WT dye in any of the storm water or groundwater samples. Rhodamine WT was added to monitoring well CW-13 on March 16, 1999. Rhodamine was first detected in water sample W5 collected on March

26, 1999 in Courtland Creek at Coliseum Way. Rhodamine dye was also detected in the Courtland Creek Culvert carbon sampler sets C6-C10. Sample W11 also indicated the presence of Rhodamine. Rhodamine has not been detected in any other sample location except Courtland Creek at Coliseum Way.

1.4 WEEP WATER SAMPLING FOR METALS

In order to evaluate the potential metals loading from groundwater migrating to surface water in the storm water channel adjacent to the 5051 Coliseum Way property, Clayton collected six weep water samples on January 13, 1999, from weep holes at the base of the concrete sidewall of the open storm water channel near monitoring well MW-4 (See Figure 3 for sample locations and Table 3 for a summary of sample results). The weep water samples were collected from the weep holes at low tide when the tide level was below the floor of the channel and only a minimal base flow existed in the channel. Clayton assumes that the samples collected during low tide are representative of groundwater migration to surface water with the highest possible contaminant load. Although there are a number of weep holes along the base of the channel wall, only six had enough water flowing out of the weep holes to allow for the collection of a sample. Most holes were damp but did not have any appreciable flow. Clayton estimates that the average weep water flow from all holes in the area sampled was approximately one-gallon (or less) per minute. The highest zinc concentration detected was 9.4 milligrams per liter (mg/L) in sample WW-1. The average zinc concentration from the six weep water samples was 3.23 mg/L.

Surface water samples were collected in 500 milliliter plastic sample jars with sealing lids. The samples were labeled, stored in a chilled cooler, and accompanied with a chain-of-custody document to the laboratory the same day. The samples were preserved and filtered by the laboratory. Laboratory analytical results are in Appendix C.

1.5 STORM WATER SAMPLING FOR METALS

Clayton collected additional surface water samples from the Second Line G Culvert on January 13, 1999 (a non-storm sampling event) and on March 19, 1999 (a storm sampling event) during a period of light precipitation with surface sheet flow to storm drains in paved areas. Sample locations were selected upstream and downstream of the subject property. An additional surface water sample was collected from the storm water flowing from the Courtland Creek Culvert at Coliseum Way on March 19, 1999. The sample locations are shown in Figure 3 and the metal concentration results are shown in Table 4. The metal concentrations from these samples correlated well with metal concentrations from previous non-storm sampling events conducted in September 1999 (Reported in Clayton's Additional Remedial Investigation and Third Quarter 1998 Monitoring Report, dated November 5, 1998).

Clayton's sampling program assumed that the Second Line G Culvert was the primary culvert of concern since it borders the subject property along 50th Avenue. However, as discussed in Section 3.1 of this report, Clayton observed a disparity in upstream and downstream flow rates in the culvert and it was not until the interior of the culvert was

inspected that it was discovered that the majority of the storm water flow in the culvert originates from the Courtland Creek Culvert that drains the area northwest of the subject property and the railroad tracks (Figure 2). Therefore, the Second Line G Culvert appears to collect storm water from a very large industrial portion of Oakland immediately upgradient of the subject property. A few of the immediate upgradient businesses noted by Clayton included numerous automobile repair, metal grinding, metal recycling, and former plating businesses.

Surface water sample results collected on January 13, 1999 indicate that metal concentrations in the Second Line G storm water channel were slightly more concentrated in the upstream sample (SW-1) near San Leandro Street than they were near Coliseum Way (Sample SW-2). Clayton discovered an additional opening in the Second Line G Culvert at East 8th Street and collected an additional upstream sample and the downstream sample on March 19, 1999. Metals concentrations were slightly higher in the downstream sample (2G-DG-W3).

The sample collected in the Courtland Creek Culvert at Coliseum Way (Sample CLD-DG-W3) had elevated concentrations of barium at 0.11 mg/L and zinc at 0.52 mg/L. Flow in the Courtland Creek Culvert was the highest, approximately 10 to 12 gallons per minute, observed to date on March 19, 1999. The increased flow as apparently due to the rain event and surface sheet flow along 50th Avenue that was entering the culvert. Clayton does not believe that this flow was from the upstream portion of the Courtland Creek channel north of the railroad tracks (See Section 3.1).

1.6 METALS MASS LOADING ESTIMATION IN SURFACE WATERS ← Very unreliable

Clayton calculated metals mass loading in surface waters from the available metals data from surface water (storm water) samples collected adjacent to and upstream of the 5050 and 5051 Coliseum Way Properties as described in Sections 3.1 through 3.3 above. Flow rates were estimated at each sample location in the storm water channels and culverts from visual observations of channel flow widths, relative depths, and estimated rate of surface water movement over time. These flow estimates are believed to be conservative "over estimates" since there is no consideration for frictional loss along the base and sides of each channel. The estimates do not take into consideration the variations in flow rates that may occur during extremes in flow rates due to significant storm events and tidal influence. However, based on observations made over a period of more than a year, these flow estimates are believed to be close to "average" flow rates with the exception of significant storm events.

} Overstatable method

Clayton calculated the mass loading of metals in surface waters using the metals concentrations results obtained between October 13, 1998 and March 19, 1999 (See Table 5). Clayton has identified groundwater migration to surface waters in only two locations that are associated with the subject property. The first area is the older portion of the Courtland Creek Culvert where metals loading is estimated at approximately 2.6 pounds per year of zinc, 0.5 pounds per year of barium, and 0.3 pounds per year of arsenic. The second area identified is the weep hole area in the storm water channel on the northwest side of the 5051 Coliseum Way property. Clayton calculates that the zinc

loading to surface waters in this area is approximately 7.6 pounds per year and cadmium is approximately 0.1 pounds per year (See Table 5 for mass loading estimates and Figure 4 for the sampled area). A review of Table 5 indicates that the subject property contribution to metals loading is insignificant compared to the metals loading that is occurring from upstream sources. Zinc loading appears to potentially exceed 2,000 pounds per year in the Second Line G Culvert drainage system. This loading appears to be attributable to offsite upgradient discharges and other non-point sources.

1.7 ADDITIONAL GROUNDWATER SAMPLING

1.7.1 Pre-Field Activities

Prior to conducting the fieldwork, Clayton prepared a Site Safety and Health Plan (SSHP) for the work proposed at the subject property in accordance with the requirements of the State of California General Industry Safety Order (GISO) 5192 and Title 29 of the Code of Federal Regulations, Section 1910.120 (29 CFR 1910.120). A copy of the health and safety plan was kept onsite during field activities. The SSHP detailed the work to be performed, safety precautions, emergency response procedures, nearest hospital information, and onsite personnel responsible for managing emergency situations.

Underground Service Alert (USA), as required by law, was notified on February 10, 1999 and the utilities were identified (ticket number 372-070). In addition, Norcal Underground Locating was contracted and identified safe drilling locations and underground utilities in the vicinity of proposed boring locations. No borings were located within three feet of a detectable underground utility.

A drilling permit application was submitted to the Alameda County Public Works Agency prior to the commencement of the field activities. Permit number 99WR051 was issued for the installation of four temporary monitor wells (See Appendix D).

An existing flood encroachment permit with the Alameda County Flood Control and Water Conservation District (FCWCD) (permit # F12-LD0591, issued July 6, 1998) was utilized for the field activities. Mr. John Thornton with the FCWCD authorized access to drill on February 11, 1999, under the existing permit.

1.7.2 Field Investigation

On February 16, 1999 Environmental Control Associates, Inc. (ECA), under the supervision of Mark Williams, geologist for Clayton, advanced four boreholes (Borings CSB-10 through CSB-13) along the southeast bank of the 54th Avenue Creek, southeast of the 5200 Coliseum Way property. The boring locations are shown in Figure 4. The borings were advanced using hand-operated, pneumatic-powered, Geoprobe sampling equipment. The borings were advanced to a maximum depth of eight feet below ground surface (bgs) to collect groundwater samples.

The temporary well points were constructed in each borehole with a 5-foot length of one-inch outer diameter (o.d.) 0.010-inch slotted PVC screen and an appropriate length of one-inch o.d. blank PVC casing. The bottom of the screened section was capped with a

disposable well cap, and the temporary well point was inserted into the borehole. After allowing the groundwater to equalize for several minutes, the temporary well point was sampled using a new disposable PVC bailer to retrieve a grab groundwater sample. The groundwater samples were collected in appropriate laboratory supplied containers, sealed, labeled with identifying information, and stored in a chilled ice chest for transportation to the laboratory. The grab-groundwater samples were not filtered for solids in the field, nor were the temporary well points purged of water prior to sample collection. The pH of the groundwater was measured in the field using a Horiba portable pH instrument.

All Geoprobe push rods and downhole sampling equipment were steam cleaned or cleaned in a solution of non-phosphate detergent and double rinsed with tap water after each use. After the groundwater samples were collected, the temporary monitor well casings were removed and each boring was sealed to the surface with neat cement grout.

Dark brown silty clays were observed in the boreholes during the installation of the temporary monitor wells. The boreholes were inspected for physical characteristics indicative of adverse impacts, such as unusual odors, colors/hues, and chemical sheens. No soil samples were collected from the boreholes.

The collected samples were capped, labeled, and placed in pre-chilled ice chests. The samples were sent to Clayton's State of California-certified laboratory in Pleasanton, California under formal chain-of-custody documentation and analyzed for California Assessment Method metals (CAM-17) and total dissolved solids (TDS).

1.7.3 Analytical Results

Four groundwater samples, one each from borings CSB-10 through CSB-13, were submitted for analysis by USEPA Methods 6010A and 7471A for CAM-17 metals and by USEPA Method 160.1 for TDS. The analytical data sheets and chain of custody record are included in Appendix F. A summary of the additional grab-groundwater analytical results is presented in Table 6.

Metals detected in groundwater included arsenic, barium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, vanadium, and zinc. Antimony, beryllium, selenium, silver, and thallium were not detected in any of the groundwater samples. Metals detected above maximum contaminant levels (MCLs) established by State and Federal regulations in one or more of the groundwater samples include arsenic, barium, cadmium, chromium, copper, lead, mercury, nickel, and zinc. The metal concentrations exceeding the corresponding MCL are shown in bold type in Table 6.

TDS concentrations for all four samples ranged from 2,400 mg/L to 4,100 mg/L, with an average concentration of 3,175 mg/L for all four groundwater samples. Field pH levels ranged from 8.3 to 9.4 standard units (See Table 6).

1.8 AREA-WEIGHTED TDS IN GROUNDWATER

Clayton calculated an area-weighted TDS concentration for use by the Board in determining groundwater cleanup standards for the subject property. Clayton used the TDS historical data for five sampling events between March 1998 and February 1999

from 41 existing groundwater monitoring wells (all wells except well LF-F1) at the subject property. Only the data from three sampling events existed for monitoring wells CW-8 and CW-9.

The area-weighted value was calculated by first determining the relative area of the total subject property plus the offsite areas where wells CW-6 through CW-10 and CW-12 are located. The total area was gridded in 15-foot squares and the total number grids for each respective well area was determined. The number of grids representing each well was divided by the total number of grids for the site multiplied by the average TDS value for each respective well. The representative well TDS values were totaled giving an area-weighted TDS concentration for the entire subject property of 6,417.5 mg/L (See Table 7).

2 CONCLUSIONS

In response to the Board's Site Cleanup Requirements, adopted March 9, 1999, Clayton has completed the additional remedial investigation of the nature and extent of contamination associated with waste materials that exist on the subject property. Based on our analysis of the current data, we have drawn the following conclusions:

- The tracer study has not indicated hydraulic conductivity between the wells adjacent to the subsurface culverts northwest of the 5050 Coliseum Way property (Wells LF-5 and CW-13) with the wells CW-10 and CW-12. The distance between well CW-13 and CW-12 is approximately 105 feet and the study period since dye injection occurred and the last sample was pulled and analyzed was 51 days. Clayton concludes that the backfill material surrounding the sides and bottoms of the Second Line G and Courtland Creek Culverts is not a preferential pathway for contaminated groundwater for the site.

  Clayton sampled surface waters in the Second Line G and Courtland Creek Culverts for tracer dyes. Rhodamine WT was detected in a surface water sample (Sample W5) collected in the Courtland Creek Culvert at Coliseum Way seven days after injection of the dye into well CW-13. Rhodamine WT has continually been detected in the Courtland Creek Culvert since the first detection. Well CW-13 was placed between the Courtland Creek Culvert and the Second Line G Culvert separated by a distance of only about 10 feet. Tap water was added to the well during every sampling event to flush the dye into the aquifer. Clayton also inspected the interior of the Courtland Creek Culvert in this area and observed cracks and groundwater weeps along the base of the sidewalls all along the concrete culvert. Field observations indicate that the only water influx into this culvert is from groundwater seeps and surface releases along the north side of 50th Avenue between the railroad tracks just north of the subject property and Coliseum Way. Clayton estimates that groundwater migration into the Courtland Creek Culvert is less than one gallon per minute. (It should be noted that other industrial property uses have occurred on the properties northwest of the subject property, one of which is a metal scrap yard, and the culvert has a significant buildup of sediments within the culvert that potentially contain elevated metal concentrations).

Surface water samples collected in the Second Line G Culvert both upstream and downstream of the dye injection area have been found to contain Fluorescein dye at various times during our study. Background samples did not indicate any Fluorescein dyes in any of the groundwater or surface water samples collected in the area; however, Fluorescein was detected in most surface water sample collected in the Second Line G Culvert following dye injection into well LF-12. Clayton believes that the data indicates upgradient discharges to the storm water in the Second Line G Culvert of substances containing Fluorescein dye. Some upstream Fluorescein concentrations have been found that are at or greater than the downstream concentrations. One Fluorescein detection in a Courtland Creek surface water sample (sample C4) occurred following a period of precipitation, which may indicate that the source is from surface runoff entering the culvert since no other obvious sources are known to exist along this section of the culvert and no upstream storm water appeared to enter the culvert due to the observed flow rates. Therefore, Clayton believes the Fluorescein (a common dye used in radiator coolant) detected in storm water samples has sources that may originate from upgradient industrial businesses or vehicular use of the public streets upgradient of the subject property.

- Weep water samples collected in the area of well MW-4 were found to contain detectable cadmium and zinc concentrations. Field observations indicate that the total groundwater influx to surface water in the open storm channel near MW-4 is one gallon per minute or less during low tide periods. The highest zinc concentration detected in the six weep water samples was 9.4 mg/L, with an average concentrations of only 3.2 mg/L for the northwest boundary to the 5051 Coliseum Way property.

- Surface water samples collected along the Second Line G Culvert and the Courtland Creek Culvert northwest of the subject property between September 1998 and March 1999 (four sampling events) indicate that only arsenic, cadmium, and zinc were detected at significant concentrations. Zinc was generally detected in surface water samples at concentrations ranging from 0.05 to 0.55 mg/L. One upgradient surface water sample in the Second Line G Culvert near San Leandro Street had a zinc concentration of 1.4 mg/L. Clayton is unable to evaluate the total metal loading contribution attributable to the upper portion of the Courtland Creek channel at this time due to the recent finding that the Courtland Creek Culvert, the major source of storm water that flows through the lower portion of the Second Line G Culvert, joins the Second Line G Culvert upstream of the subject property. Based on the results of the tracer study and limited impact of groundwater to the Second Line G Culvert, Clayton concludes that the metals loading to this culvert is neglible since no significant groundwater migration into the Second Line G Culvert has been identified. This conclusion is further validated by the physical inspection and video tape records made by Clayton in 1997.

agree w/ qualitative assessment - cannot provide quantitative est.

Surface water samples collected in the Courtland Creek Culvert at Coliseum Way indicate slightly elevated metals concentrations from those found in the other storm water samples. Zinc concentrations in the Courtland Creek Culvert have been consistently between 0.5 and 0.55 mg/L during the three sampling events conducted

between September 1998 and March 1999. Arsenic and barium have also been detected in the same surface water samples but at lower concentrations.

- Metals mass loading calculations for surface waters have been made based on the available data and visual observations of surface flow in the studied storm water channels. Clayton estimates that approximately 7.6 pounds of zinc per year and 0.1 pounds of cadmium per year is impacting surface waters from the 5051 Coliseum Way property. Metals loading from the Courtland Creek Culvert attributed to groundwater migration to surface water (base flow conditions) northwest of the 5050 Coliseum Way property consists of only about 2.6 pounds of zinc per year, 0.5 pounds of barium per year, and 0.3 pounds of arsenic per year. Due to tidal influence in the Courtland Creek Culvert, the estimated mass loading of metals may be as much as one half of the amount estimated. Metals loading estimates from upstream sources that flow by the subject property likely exceed 2,000 pounds of zinc per year and possibly 1,000 pounds of barium per year from the Second Line G Culvert alone. Therefore, Clayton concludes that the metals loading from the subject property to the surface waters and ultimately the bay are insignificant compared to the general storm water metals loading rates that are occurring from other upgradient unidentified sources.

  Although, not reported in this investigation, quarterly monitoring of metals in groundwater at the subject property indicates significant metal concentrations in solution. These metal concentrations appear to be attenuating with time across the site and the impact to surface waters will likely attenuate as well. This subject will be addressed in the future Remediation/Risk Management Plan report due on July 30, 1999.

- Additional grab-groundwater samples collected southeast of the 54th Avenue Creek indicate that soluble metal concentrations exceed MCLs for nine metals. However, the concentrations appear to be decreasing with increasing distance from the subject property.

- Clayton calculated an area-weighted TDS concentration for the subject property of 6,417.5 mg/L. The area-weighted TDS concentration significantly exceeds that 3,000 mg/L level established for potential underground sources of drinking water. The area perimeter is impacted by saline bay waters during high tide flows and the historic use of the region as industrial property does not present a favorable situation for the potential future use of groundwater in this region. Groundwater samples collected in July 1998 from depths between 25 and 47 feet bgs in two sample locations (CSB-8 and CSB-9) indicated that the TDS concentrations ranged between 15,000 and 25,000 mg/L and did not appear to be associated with the groundwater contamination issues associated with the former industrial use of the subject property.

3 LIMITATIONS

The information and opinions rendered in this report are exclusively for use by Millennium Holdings Inc, it affiliates, and agents. Clayton Environmental Consultants, Inc. will not distribute or publish this report without the consent of Millennium Holdings Inc, except as required by law or court order. The information and opinions included in this report were given in response to a specific scope of work and should be considered and implemented only in light of that particular scope of work. The services provided by Clayton in completing this project have been provided in a manner consistent with the normal standards of the profession. No other warranty, expressed or implied, is made.

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May 25, 1999

TABLE 1
Dye in Carbon Sampler Analytical Results
Coliseum Way Properties
Concentrations in Micrograms per Liter (ug/L)

Sample Location			2nd Line G East 8th		2nd Line G Coliseum Way		Cortland Creek Coliseum Way		CW-10		CW-12		LF-5		CW-13		LF-12	
Sample No.	Date Placed	Date Pulled	Fluorescein	Rhodamine	Fluorescein	Rhodamine	Fluorescein	Rhodamine	Fluorescein	Rhodamine	Fluorescein	Rhodamine	Fluorescein	Rhodamine	Fluorescein	Rhodamine	Fluorescein	Rhodamine
C1	3/10/99	3/12/99	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C2	3/12/99	3/16/99	NS	NS	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		3/16/99*													Rhodamine WT Injection		Fluorescein Injection	
C3	3/16/99	3/19/99	NS	NS	**0.652**	ND	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	NS	NS
C4	3/19/99	3/23/99	NS	NS	**1.93**	ND	**1.13**	ND	ND	ND	ND	ND	ND	ND	NS	NS	NS	NS
C5	3/23/99	3/26/99	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	NS	NS
C6	3/26/99	4/1/99	**2.57**	ND	**1.06**	ND	ND	**0.499**	ND	ND	ND	ND	ND	ND	NS	NS	NS	NS
C7	4/1/99	4/8/99	NS	NS	**1.20**	ND	ND	**3.05**	ND	ND	ND	ND	ND	ND	NS	NS	NS	NS
C8	4/8/99	4/15/99	ND	ND	ND	ND	ND	**1.83**	ND	ND	ND	ND	ND	ND	NS	NS	NS	NS
C9	4/15/99	4/22/99	**1.30**	ND	**0.796**	ND	ND	**36.6**	ND	ND	ND	ND	NS	NS	NS	NS	NS	NS
C10	4/22/99	4/29/99	**0.311**	ND	**0.579**	ND	ND	**1.27**	ND	ND	ND	ND	ND	ND	NS	NS	NS	NS
C11	4/29/99	5/6/99	**1.15**	ND	**1.72**	ND	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	NS	NS

Notes:
NS = Not Sampled
ND = Not Detected
-- = Not Analyzed
* = Dye injected into monitoring well after sample C2 collected

TABLE 2
Dye in Water Analtyical Results
Coliseum Way Properties
Concentrations is Micrograms per Liter (ug/L)

descrete water samples

Sample Location		2nd Line G East 8th		2nd Line G Coliseum Way		Courtland Creek Coliseum Way		CW-10		CW-12		LF-5		CW-13		LF-12	
Sample No.	Date Sampled	Fluorescein	Rhodamine	Fluorescein	Rhodamine	Fluorescein	Rhodamine	Fluorescein	Rhodamine	Fluorescein	Rhodamine	Fluorescein	Rhodamine	Fluorescein	Rhodamine	Fluorescein	Rhodamine
W1	3/12/99	NS	NS	--	--	--	--	--	--	--	--	--	--	--	--	--	--
W2	3/16/99	NS	NS	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	3/16/99*													Rhodamine Dye Injection		Fluorescein Dye Injection	
W3	3/19/99	NS	NS	--	--	--	--	--	--	--	--	--	--	NS	NS	NS	NS
W4	3/23/99	NS	NS	--	--	--	--	--	--	--	--	--	--	NS	NS	NS	NS
W5	3/26/99	NS	NS	ND	ND	ND	**0.055**	--	--	--	--	--	--	NS	NS	NS	NS
W6	4/1/99	NS	NS	--	--	--	--	--	--	--	--	--	--	NS	NS	NS	NS
W7	4/8/99	NS	NS	--	--	--	--	--	--	--	--	--	--	NS	NS	NS	NS
W8	4/15/99	**0.063**	ND	ND	ND	ND	ND	--	--	--	--	--	--	NS	NS	NS	NS
W9	4/22/99	ND	ND	ND	ND	ND	**1.98**	--	--	--	--	--	--	NS	NS	NS	NS
W10	4/29/99	**0.031**	ND	ND	ND	ND	ND	--	--	--	--	--	--	NS	NS	NS	NS
W11	5/6/99	ND	ND	ND	ND	ND	**0.54**	--	--	--	--	--	--	NS	NS	NS	NS

Notes:
NS = Not Sampled
ND = Not Detected
-- = Not Analyzed
* = Dye injected into monitoring well after sample W2 collected

TABLE 3
Summary of Select Metals and pH Results
Weep Water Samples
Coliseum Way Properties
[All data, except pH, reported in milligrams per Liter (mg/L)]

SAMPLE NO.	WW-1	WW-2	WW-3	WW-4	WW-5	WW-6
Sample Date:	**1/13/99**	**1/13/99**	**1/13/99**	**1/13/99**	**1/13/99**	**1/13/99**
METALS						
Arsenic	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Barium	<0.01	<0.1	<0.1	<0.1	<0.1	<0.1
Cadmium	0.08	<0.05	<0.05	<0.05	<0.05	<0.05
Zinc	9.4	1.7	2.9	2.7	1.9	0.8
pH (Standard Units)	7.4	7.2	7.3	7.3	7.4	7.7

TABLE 4
Summary of Select Metals Results
Storm Water Samples
Coliseum Way Properties
[All data reported in milligrams per Liter (mg/L)]

SAMPLE NO.	SW-1	SW-2	SWUG-A	SWUG-B	CLD-DG-W3	2G-DG-W3
Sample Date:	**1/13/99**	**1/13/99**	**3/19/99**	**3/19/99**	**3/19/99**	**3/19/99**
METALS						
Arsenic	< 0.05	< 0.05	< 0.05	< 0.05	0.07	< 0.05
Barium	0.09	0.07	0.04	0.04	0.11	0.05
Cadmium	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Zinc	1.4	0.50	0.06	0.05	0.52	0.09

.09 mole × 10^-3 mg/g × 1g/454g + 2#/l + 1.8 × 10^9

l → # 2.

8.00#/gal ≈

≈ 1#/l

8#/4l ≈ 2#/l

Table 5
Metals Mass Loading Estimates in Surface Waters
Coliseum Way Properties

Sample Point	Date	Sample	Metal	Metal Conc. (mg/L)	Estimated Flow (Ft^3/Minute)	Estimated Pounds Water per Year	Metal Mass Pounds per Year
SECOND LINE G CULVERT							
San Leandro St. & 49th Ave.	1/13/99	SW-1	Ba	0.09	50	1.80E+09	161.6
			Zn	1.4	50	1.80E+09	2513.0
	3/19/99	SWUG-A	Ba	0.09	126	4.52E+09	407.1
			Zn	0.06	126	4.52E+09	271.4
50th Ave. & East 8th Ave.	3/19/99	SWUG-B	Ba	0.04	83.2	2.99E+09	119.5
			Zn	0.05	83.2	2.99E+09	149.3
Coliseum Way and 50th Ave.	1/13/99	SW-2	Ba	0.07	200	7.18E+09	502.6
			Zn	0.5	200	7.18E+09	3590.0
	3/19/99	2G-DG-W3	Ba	0.05	540	1.94E+10	969.3
			Zn	0.09	540	1.94E+10	1744.7
COURTLAND CREEK CULVERT							
Coliseum Way and 50th Ave.	10/13/98	2SW	As[(t)]	0.06	0.13	4.67E+06	0.3
			Ba[(t)]	0.11	0.13	4.67E+06	0.5
			Zn[(t)]	0.55	0.13	4.67E+06	2.6
	3/19/99	CLD-DG-W3	As	0.07	1.6	5.74E+07	4.0
			Ba	0.11	1.6	5.74E+07	6.3
			Zn	0.52	1.6	5.74E+07	29.9
OPEN STORMWATER CHANNEL ADJACENT TO MW-4 @ 5051 COLISEUM WAY							
Weep Water Samples*	1/13/99	WW-1 thru WW-6	Cd**	0.055	0.0665	2.39E+06	0.1
			Zn**	3.2	0.0665	2.39E+06	7.6

mg/L = Milligrams per liter
Constants Used: 1 cubic foot of water equals 62.3 pounds and 7.48 gallons
(t) = Data reported in Clayton's Additional Remedial Investigation and Third Quarter 1998 Monitoring Report, November 5, 1998.
* = Flow rate used is assumed to be one half that observed due to tidal influence
** = Concentration averaged for 6 sample points (Data presented in Table 3).

Table 6
Additional Grab-Groundwater Analtyical Results
54th Avenue Creek
Coliseum Way Properties
Oakland, California
All data reported in milligrams per kilogram (mg/kg)

SAMPLE Discrete Depth (feet, bgs) Where Applicable	CSB-10	CSB-11	CSB-12	CSB-13	MCL
Total Metals					
Antimony (Sb)	<0.03	< 0.03	< 0.03	< 0.03	0.006
Arsenic (As)	<0.05	**0.23**	**0.07**	**0.19**	0.05
Barium (Ba)	**2.7**	**48**	**16**	**51**	1
Beryllium (Be)	<0.005	< 0.005	< 0.005	< 0.005	0.004
Cadmium (Cd)	**0.015**	**0.025**	**0.015**	**0.030**	0.005
Chromium (Cr)	<0.01	**0.58**	**0.16**	**0.47**	0.05
Cobalt (Co)	<0.01	0.08	0.02	0.09	NE
Copper (Cu)	0.02	**1.8**	0.67	**1.7**	1.3*
Lead (Pb)	<0.05	**8.7**	**2.9**	**13**	0.00025**
Mercury (Hg)	0.0016	0.0007	**0.0041**	0.0017	0.002
Molybdenum (Mo)	3.2	0.02	< 0.01	0.01	NE
Nickel (Ni)	**0.36**	**0.29**	0.09	**0.33**	0.1
Selenium (Se)	<0.07	< 0.07	< 0.07	< 0.07	0.05
Silver (Ag)	<0.01	< 0.01	< 0.01	< 0.01	0.1*
Thallium (Tl)	<0.05	< 0.05	<0.05	< 0.05	0.002
Vanadium (V)	<0.01	0.21	0.05	0.23	NE
Zinc (Zn)	0.39	4.7	4.5	**8.30**	5
Total Dissolved Solids	2,400	4,100	2,500	3,700	
pH (Standard Units)	8.7	9.4	8.3	6.9	

Abbreviations and Modifiers:
MCL = Maximum Contaminant Levels for Drinking Water from California Code of Regulations (CCR) Title 22, Section 64431 through 64444
(* Copper = federal action level; ** Lead = Calif. Proposition 65 level; * Silver = Secondary MCL)
NE = Not Established
<0.03 = The analyte was not detected at or above the laboratory reporting limit concentration listed

TABLE 7
Area Weighted TDS in Groundwater
Coliseum Way Properties
Concentrations in Milligrams per Liter (mg/L)

Site	Monitoring Well	Sample Date	TDS	pH (SU)	Average TDS (3-98 to 2-99)	No. of Grid Squares (Approx. 225 sf ea.)	Area Weighted TDS in Zone
5050	LF-1	25-Mar-98	24,000	4.02			
5050	LF-1	17-Jun-98	26,000	4.66			
5050	LF-1	9-Sep-98	23,000	4.12			
5050	LF-1	10-Dec-98	15,000	4.51			
5050	LF-1	24-Feb-99	12,000	3.98	20000	57	329.8
5050	LF-2	24-Mar-98	2,900	6.18			
5050	LF-2	18-Jun-98	2,800	6.35			
5050	LF-2	10-Sep-98	2,900	6.30			
5050	LF-2	10-Dec-98	2,900	5.90			
5050	LF-2	24-Feb-99	2,900	6.60	2880	90	75.0
5050	LF-3	25-Mar-98	2,800	6.51			
5050	LF-3	18-Jun-98	3,200	6.48			
5050	LF-3	10-Sep-98	2,800	6.43			
5050	LF-3	10-Dec-98	2,900	6.22			
5050	LF-3	24-Feb-99	2,900	6.62	2920	62	52.4
5050	LF-4	24-Mar-98	1,500	6.67			
5050	LF-4	18-Jun-98	1,800	6.79			
5050	LF-4	10-Sep-98	1,500	6.61			
5050	LF-4	10-Dec-98	1,500	6.90			
5050	LF-4	24-Feb-99	1,500	7.05	1560	73	32.9
5050	LF-5	25-Mar-98	5,600	5.87			
5050	LF-5	18-Jun-98	21,000	6.19			
5050	LF-5	9-Sep-98	7,800	6.22			
5050	LF-5	9-Dec-98	12,000	6.11			
5050	LF-5	23-Feb-99	6,800	6.41	10640	80	246.2
5050	LF-6	24-Mar-98	5,900	4.74			
5050	LF-6	18-Jun-98	6,100	5.31			
5050	LF-6	10-Sep-98	6,600	5.13			
5050	LF-6	10-Dec-98	6,400	4.52			
5050	LF-6	24-Feb-99	6,000	4.65	6200	76	136.3
5050	LF-7	24-Mar-98	970	7.12			
5050	LF-7	18-Jun-98	970	7.17			
5050	LF-7	10-Sep-98	950	7.37			
5050	LF-7	10-Dec-98	980	6.96			
5050	LF-7	24-Feb-99	1,000	7.45	974	91	25.6
5050	LF-8	24-Mar-98	1,300	7.13			
5050	LF-8	18-Jun-98	1,400	7.03			
5050	LF-8	10-Sep-98	1,500	6.90			
5050	LF-8	10-Dec-98	1,400	7.00			
5050	LF-8	24-Feb-99	1,400	7.57	1400	39	15.8

TABLE 7
Area Weighted TDS in Groundwater
Coliseum Way Properties
Concentrations in Milligrams per Liter (mg/L)

Site	Monitoring Well	Sample Date	TDS	pH (SU)	Average TDS (3-98 to 2-99)	No. of Grid Squares (Approx. 225 sf ea.)	Area Weighted TDS in Zone
5050	LF-9	10-Dec-98	2,600	5.67			
5050	LF-9	25-Feb-99	2,500	6.16	2550	27	19.9
5050	LF-10	24-Mar-98	4,100	6.51			
5050	LF-10	18-Jun-98	5,600	6.53			
5050	LF-10	9-Sep-98	7,300	7.79			
5050	LF-10	10-Dec-98	8,700	5.62			
5050	LF-10	24-Feb-99	8,000	6.82	6740	105	204.7
5050	LF-11	25-Mar-98	54,000	3.83			
5050	LF-11	17-Jun-98	58,000	4.89			
5050	LF-11	9-Sep-98	51,000	5.34			
5050	LF-11	10-Dec-98	66,000	3.77			
5050	LF-11	24-Feb-99	57,000	3.77	57200	56	926.6
5050	LF-12	25-Mar-98	7,100	4.00			
5050	LF-12	18-Jun-98	12,000	4.02			
5050	LF-12	9-Sep-98	12,000	4.85			
5050	LF-12-H	8-Oct-98	11,000	3.30			
5050	LF-12-L	8-Oct-98	10,000	3.50			
5050	LF-12	10-Dec-98	13,000	3.87			
5050	LF-12	23-Feb-99	11,000	3.68	11400	51	168.2
5050	LF-13	24-Mar-98	640	7.55			
5050	LF-13	18-Jun-98	600	7.27			
5050	LF-13	10-Sep-98	910	7.34			
5050	LF-13	10-Dec-98	980	7.07			
5050	LF-13	24-Feb-99	950	7.23	816	77	18.2
5050	LF-14	25-Mar-98	4,300	4.85			
5050	LF-14	17-Jun-98	4,500	4.69			
5050	LF-14	10-Sep-98	4,200	5.00			
5050	LF-14	10-Dec-98	4,500	4.56			
5050	LF-14	25-Feb-99	4,400	5.13	4380	63	79.8
5050	LF-15	25-Mar-98	25,000	4.64			
5050	LF-15	17-Jun-98	27,000	4.25			
5050	LF-15	11-Sep-98	30,000	5.57			
5050	LF-15	10-Dec-98	35,000	4.10			
5050	LF-15	25-Feb-99	29,000	3.91	29200	50	422.3
5050	LF-16	25-Mar-98	16,000	4.52			
5050	LF-16	17-Jun-98	18,000	4.41			
5050	LF-16	10-Sep-98	17,000	4.51			
5050	LF-16	10-Dec-98	17,000	3.97			
5050	LF-16	25-Feb-99	16,000	4.42	16800	52	252.7

TABLE 7
Area Weighted TDS in Groundwater
Coliseum Way Properties
Concentrations in Milligrams per Liter (mg/L)

Site	Monitoring Well	Sample Date	TDS	pH (SU)	Average TDS (3-98 to 2-99)	No. of Grid Squares (Approx. 225 sf ea.)	Area Weighted TDS in Zone
5050	LF-17	24-Mar-98	1,000	7.22			
5050	LF-17	18-Jun-98	1,200	7.02			
5050	LF-17	9-Sep-98	1,000	6.87			
5050	LF-17	10-Dec-98	1,200	6.35			
5050	LF-17	25-Feb-99	1,100	6.92	1100	54	17.2
5050	LFMW-1	24-Mar-98	820	6.94			
5050	LFMW-1	17-Jun-98	910	7.11			
5050	LFMW-1	9-Sep-98	900	6.95			
5050	LFMW-1	9-Dec-98	960	6.84			
5050	LFMW-1	25-Feb-99	950	6.97	908	58	15.2
5050	LFMW-2	24-Mar-98	5,700	4.93			
5050	LFMW-2	18-Jun-98	6,300	4.94			
5050	LFMW-2	9-Sep-98	5,700	4.62			
5050	LFMW-2	10-Dec-98	9,800	4.51			
5050	LFMW-2	25-Feb-99	5,200	4.67	6540	69	130.5
5050	LFMW-3	24-Mar-98	3,400	4.57			
5050	LFMW-3	18-Jun-98	6,100	4.64			
5050	LFMW-3	9-Sep-98	6,300	5.24			
5050	LFMW-3	10-Dec-98	6,500	3.93			
5050	LFMW-3	25-Feb-99	2,700	4.43	5000	59	85.3
5050	LFMW-4	24-Mar-98	1,900	6.40			
5050	LFMW-4	17-Jun-98	1,700	6.77			
5050	LFMW-4	9-Sep-98	1,900	5.96			
5050	LFMW-4	9-Dec-98	2,100	6.29			
5050	LFMW-4	25-Feb-99	2,000	6.65	1920	47	26.1
5051	MWA-1	27-Apr-98	5,100	5.80			
5051	MWA-1	19-Jun-98	5,400	5.70			
5051	MWA-1	11-Sep-98	6,600	6.21			
5051	MWA-1	9-Dec-98	6,500	6.15			
5051	MWA-1	25-Feb-99	110	7.16	4742	76	104.2
5051	MWA-2	27-Apr-98	1,300	7.04			
5051	MWA-2	19-Jun-98	1,500	6.76			
5051	MWA-2	11-Sep-98	1,500	6.73			
5051	MWA-2	9-Dec-98	1,500	6.87			
5051	MWA-2	25-Feb-99	1,400	7.17	1440	165	68.7
5051	MWA-3	27-Apr-98	2,200	7.11			
5051	MWA-3	19-Jun-98	2,300	6.20			
5051	MWA-3	11-Sep-98	1,800	6.98			
5051	MWA-3	9-Dec-98	1,700	6.28			
5051	MWA-3	25-Feb-99	6,900	7.41	2980	131	112.9

TABLE 7
Area Weighted TDS in Groundwater
Coliseum Way Properties
Concentrations in Milligrams per Liter (mg/L)

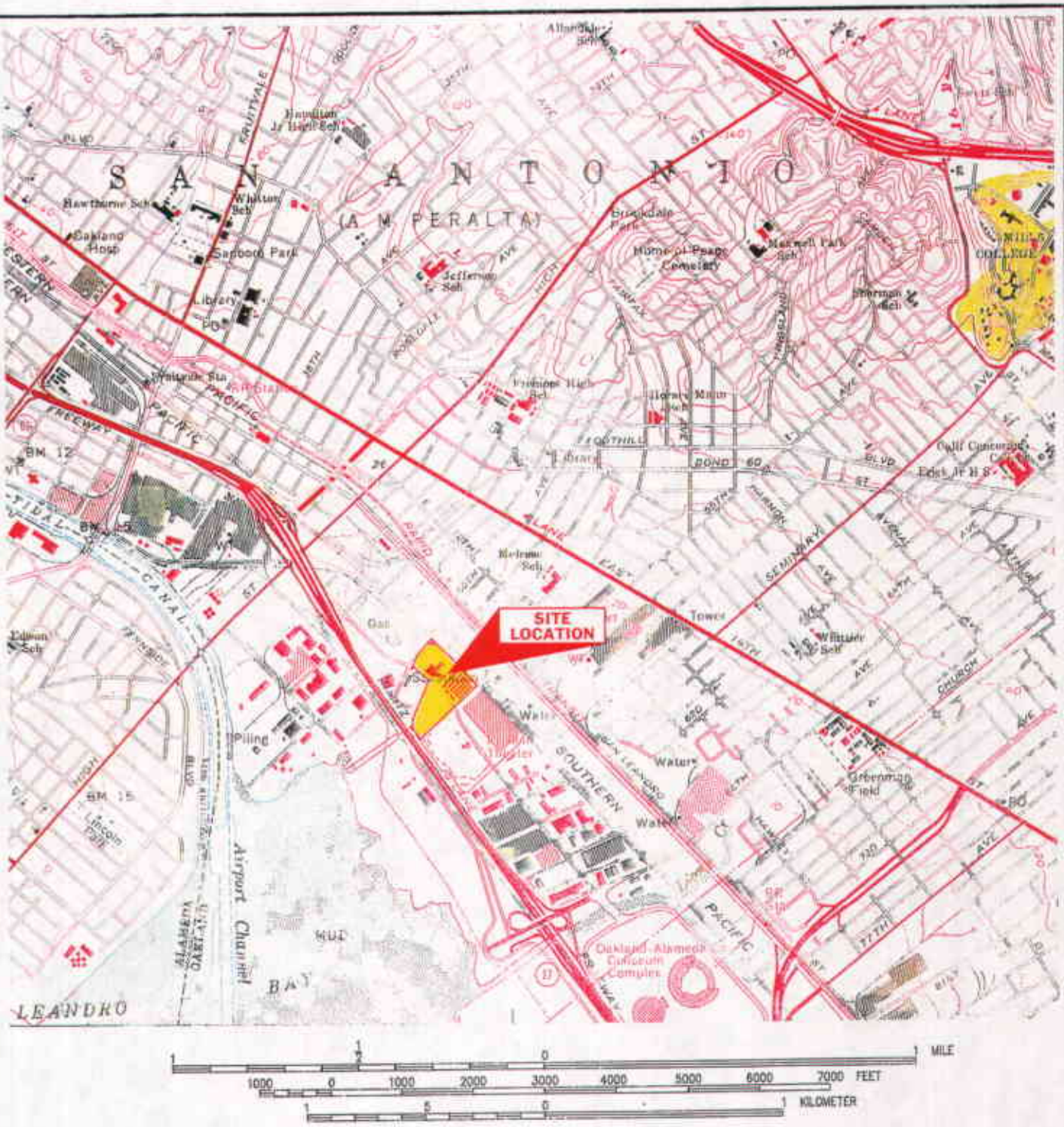
Site	Monitoring Well	Sample Date	TDS	pH (SU)	Average TDS (3-98 to 2-99)	No. of Grid Squares (Approx. 225 sf ea.)	Area Weighted TDS in Zone
5051	MW-4	27-Apr-98	6,800	6.21			
5051	MW-4	19-Jun-98	6,800	5.64			
5051	MW-4	11-Sep-98	7,800	5.98			
5051	MW-4	9-Dec-98	7,300	5.59			
5051	MW-4	25-Feb-99	6,000	7.12	6940	59	118.4
5051	MW-5	27-Apr-98	2,800	7.37			
5051	MW-5	19-Jun-98	2,800	6.89			
5051	MW-5	11-Sep-98	2,800	6.99			
5051	MW-5	9-Dec-98	3,000	6.99			
5051	MW-5	25-Feb-99	2,600	7.28	2800	109	88.3
5051	MW-6	27-Apr-98	3,700	7.37			
5051	MW-6	19-Jun-98	3,600	7.40			
5051	MW-6	11-Sep-98	3,400	7.18			
5051	MW-6	8-Dec-98	3,300	7.22			
5051	MW-6	24-Feb-99	3,800	6.80	3560	191	196.7
5051	MW-7	27-Apr-98	6,300	7.10			
5051	MW-7	19-Jun-98	5,700	7.29			
5051	MW-7	11-Sep-98	5,900	6.73			
5051	MW-7	8-Dec-98	9,500	6.81			
5051	MW-7	24-Feb-99	16,000	6.11	8680	203	509.7
5051	MW-8	27-Apr-98	8,400	7.10			
5051	MW-8	19-Jun-98	8,400	6.48			
5051	MW-8	11-Sep-98	1,800	6.67			
5051	MW-8	8-Dec-98	7,700	7.00			
5051	MW-8	24-Feb-99	7,000	6.46	6660	180	346.8
5200	CW-1	25-Mar-98	1,000	7.61			
5200	CW-1	19-Jun-98	1,700	6.95			
5200	CW-1	10-Sep-98	1,500	6.70			
5200	CW-1	4-Dec-98	1,200	6.79			
5200	CW-1	24-Feb-99	1,500	6.93	1380	81	32.3
5200	CW-2	25-Mar-98	900	8.61			
5200	CW-2	19-Jun-98	930	6.88			
5200	CW-2	10-Sep-98	1,200	6.81			
5200	CW-2	4-Dec-98	1,300	7.06			
5200	CW-2	24-Feb-99	900	7.08	1046	101	30.6
5200	CW-3	25-Mar-98	2,200	10.75			
5200	CW-3	19-Jun-98	1,100	10.80			
5200	CW-3	10-Sep-98	8,000	10.10			
5200	CW-3	4-Dec-98	2,700	10.53			
5200	CW-3	24-Feb-99	2,500	8.11	3300	168	160.4

TABLE 7
Area Weighted TDS in Groundwater
Coliseum Way Properties
Concentrations in Milligrams per Liter (mg/L)

Site	Monitoring Well	Sample Date	TDS	pH (SU)	Average TDS (3-98 to 2-99)	No. of Grid Squares (Approx. 225 sf ea.)	Area Weighted TDS in Zone
5200	CW-4	25-Mar-98	1,500	9.86			
5200	CW-4	19-Jun-98	1,400	9.83			
5200	CW-4	10-Sep-98	1,500	9.40			
5200	CW-4	4-Dec-98	1,500	9.78			
5200	CW-4	24-Feb-99	1,500	8.07	1480	90	38.5
5200	CW-5	25-Mar-98	1,400	7.92			
5200	CW-5	19-Jun-98	1,400	7.60			
5200	CW-5	10-Sep-98	1,100	7.35			
5200	CW-5	4-Dec-98	1,200	7.58			
5200	CW-5	24-Feb-99	1,300	7.27	1280	50	18.5
ACPWA-E	CW-6	29-Sep-98	3,900	6.71			
ACPWA-E	CW-6-H	8-Oct-98	4,300	6.60			
ACPWA-E	CW-6-L	8-Oct-98	4,100	6.70			
ACPWA-E	CW-6	4-Dec-98	3,300	7.30			
ACPWA-E	CW-6	24-Feb-99	3,000	6.99	3720	76	81.8
ACPWA-E	CW-7-D2	29-Sep-98	770				
ACPWA-E	CW-7-H	8-Oct-98	860	10.70			
ACPWA-E	CW-7-L	8-Oct-98	880	10.50			
ACPWA-E	CW-7	4-Dec-98	800	9.72			
ACPWA-E	CW-7	24-Feb-99	710	8.31	804	167	38.8
EBMUD	CW-8	11-Sep-98	8,700	7.54			
EBMUD	CW-8	8-Dec-98	4,500	7.30			
EBMUD	CW-8	25-Feb-99	2,300	7.34	5167	67	100.1
EBMUD	CW-9	11-Sep-98	21,000	6.72			
EBMUD	CW-9	8-Dec-98	21,000	7.03			
EBMUD	CW-9	24-Feb-99	19,000	6.75	20333	143	841.1
ACPWA-W	CW-10-D2	29-Sep-98	17,000				
ACPWA-W	CW-10-H	8-Oct-98	21,000	7.20			
ACPWA-W	CW-10-L	8-Oct-98	19,000	7.30			
ACPWA-W	CW-10	8-Dec-98	21,000	7.11			
ACPWA-W	CW-10	23-Feb-99	16,000	7.22	18800	31	168.6
ACPWA-W	CW-12	29-Sep-98	12,000	7.95			
ACPWA-W	CW-12-H	8-Oct-98	13,000	7.80			
ACPWA-W	CW-12-L	8-Oct-98	13,000	7.70			
ACPWA-W	CW-12	8-Dec-98	13,000	7.53			
ACPWA-W	CW-12	23-Feb-99	1,400	7.50	10480	12	36.4

TABLE 7.
Area Weighted TDS in Groundwater
Coliseum Way Properties
Concentrations in Milligrams per Liter (mg/L)

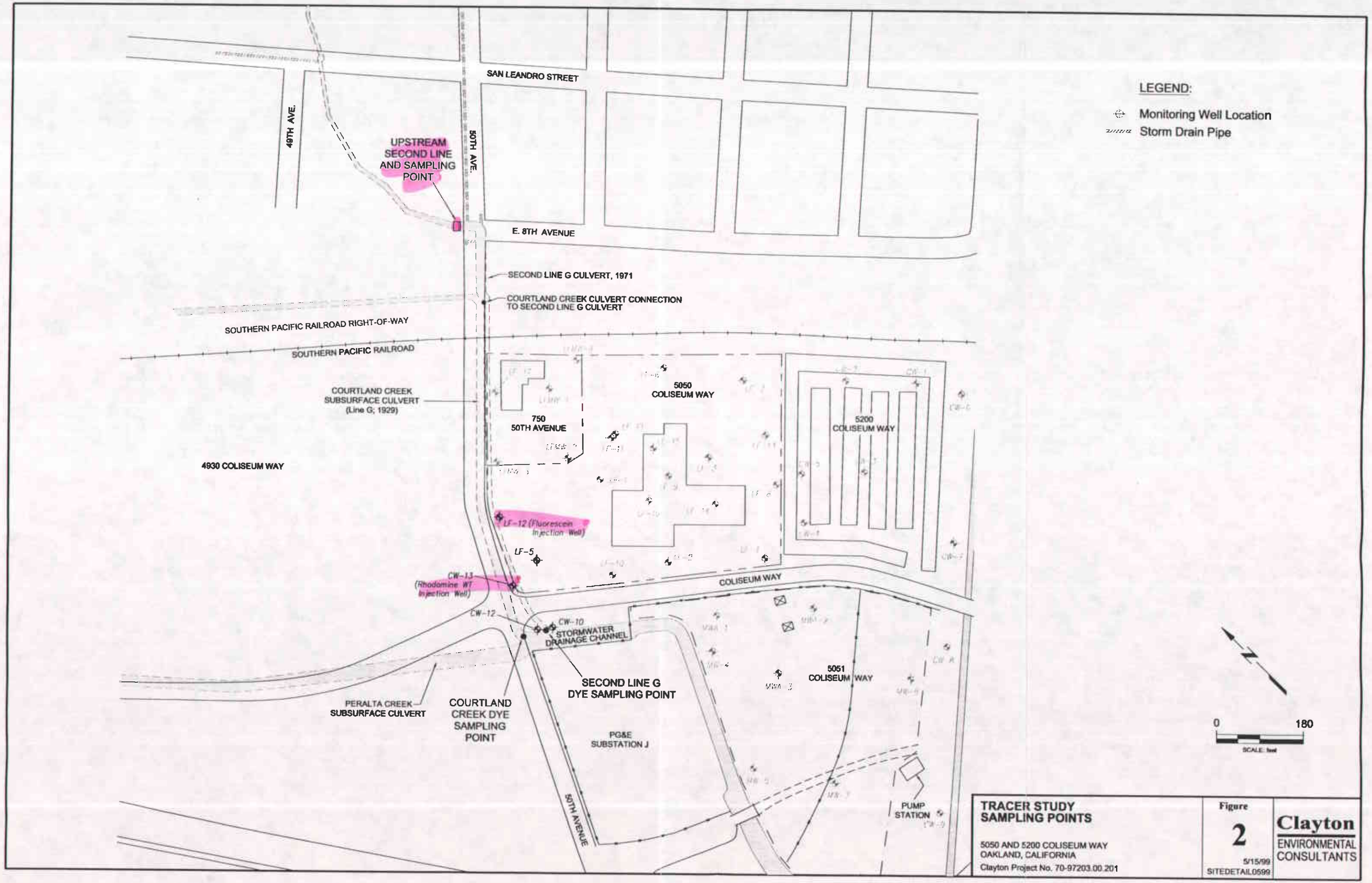
Site	Monitoring Well	Sample Date	TDS	pH (SU)	Average TDS (3-98 to 2-99)	No. of Grid Squares (Approx. 225 sf ea.)	Area Weighted TDS in Zone
5050	CW-13	11-Sep-98	8,600	5.66			
5050	CW-13-H	8-Oct-98	9,300	5.60			
5050	CW-13-L	8-Oct-98	9,100	5.60			
5050	CW-13	8-Dec-98	7,600	7.64			
5050	CW-13	23-Feb-99	1,400	6.71	7200	21	43.7
					Total Grids =	3457	
						Area Weighted TDS =	**6417.5**



Portion of 7.5-Minute Oakland East, California Quadrangle Map
United States Department of the Interior
Geological Survey
1959
Photorevised 1980

N

SITE LOCATION MAP Coliseum Way Properties Oakland, California Client: Lempres & Tulfsberg Clayton Project No. 70-97203.00.300	Figure 1 97203-6-16	Clayton ENVIRONMENTAL CONSULTANTS



TRACER STUDY SAMPLING POINTS

5050 AND 5200 COLISEUM WAY
OAKLAND, CALIFORNIA
Clayton Project No. 70-97203.00.201

Figure 2

5/15/99
SITEDETAIL0599

Clayton ENVIRONMENTAL CONSULTANTS

SW-1
SWUG-A

San Leandro St. & 49th Ave.
Open Culvert
SW-1 *(1/13/99)*
Barium 161.6 #/yr
Zinc 2,513.0 #/yr
SWUG-A *(3/19/99)*
Barium 407.1 #/yr
Zinc 271.4 #/yr

UG = upgradient

49TH AVE.

50TH AVE.

SAN LEANDRO STREET

E. 8TH AVENUE

SWUG-B

50th Ave. & E. 8th Ave.
Open Culvert
SWUG-B *(3/19/99)*
Barium 119.5 #/yr
Zinc 149.3 #/yr

SECOND LINE G CULVERT, 1971

COURTLAND CREEK CULVERT CONNECTION TO SECOND LINE G CULVERT

SOUTHERN PACIFIC RAILROAD RIGHT-OF-WAY

SOUTHERN PACIFIC RAILROAD

COURTLAND CREEK SUBSURFACE CULVERT (Line G; 1929)

Second Line G Culvert
2G-DG-W3 *(3/19/99)*
Barium 969.3 #/yr
Zinc 1,744.7 #/yr
SW-2 *(1/13/99)*
Barium 502.6 #/yr
Zinc 3,590.0 #/yr

4930 COLISEUM WAY

Courtland Creek Culvert
CLD-DG-W3 *(3/19/99)*
Arsenic 4.0 #/yr
Barium 6.3 #/yr
Zinc 29.9 #/yr

750 50TH AVENUE

5050 COLISEUM WAY

5200 COLISEUM WAY

COLISEUM WAY

2G-DG-W3

STORMWATER DRAINAGE CHANNEL

SW-2

CLD-DG-W3

PERALTA CREEK SUBSURFACE CULVERT

5061 COLISEUM WAY

PG&E SUBSTATION J

WW-1
WW-2
WW-3
WW-4
WW-5
WW-6

Weap Water Open Storm Water Channel
WW-1 thru' WW-6 *(1/13/99)*
Cadmium 0.1 #/yr
Zinc 7.6 #/yr
(Adjusted for Tide)

50TH AVENUE

PUMP STATION

LEGEND:

- Monitoring Well Location
- Storm Drain Pipe
- Sample Point

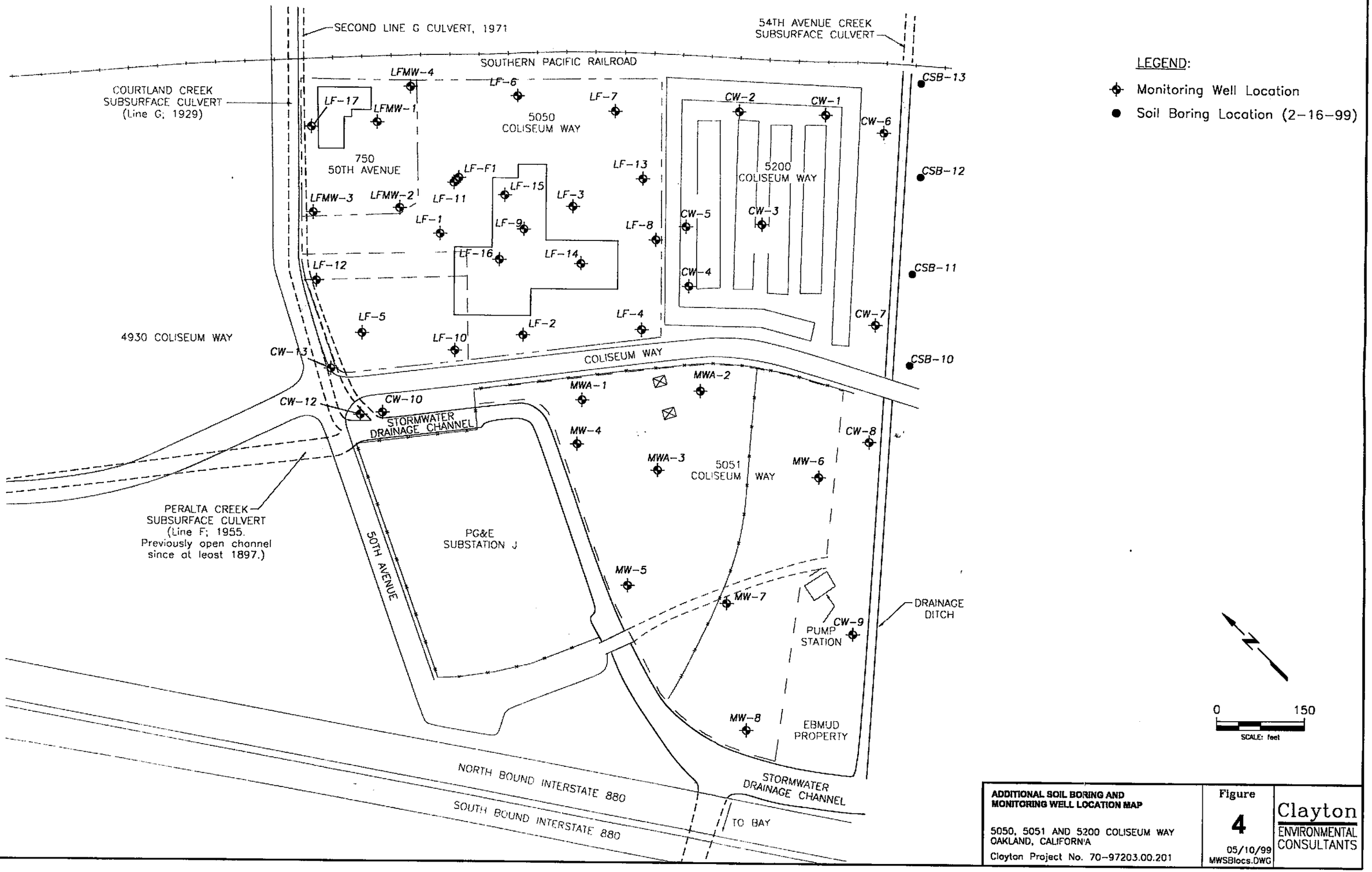
Note:
Mass metal loading estimates in pounds per year (#/yr) (See Table 5).

0 160
SCALE: feet

METALS LOADING ESTIMATES IN SURFACE WATER JANUARY 13 AND MARCH 19, 1999
5050 AND 5200 COLISEUM WAY
OAKLAND, CALIFORNIA
Clayton Project No. 70-67203.00.201

Figure 3
5/15/99
SITEDETAIL0599

Clayton ENVIRONMENTAL CONSULTANTS



ADDITIONAL SOIL BORING AND MONITORING WELL LOCATION MAP

5050, 5051 AND 5200 COLISEUM WAY
OAKLAND, CALIFORNIA

Clayton Project No. 70-97203.00.201

Figure 4

05/10/99
MWSBlocs.DWG

Clayton ENVIRONMENTAL CONSULTANTS

APPENDIX A

MATERIAL SAFETY DATA SHEETS FOR FLUORESCENT DYES

MATERIAL SAFETY DATA SHEET

15174 URANINE C (Fluorescein)

SECTION I - IDENTIFICATION

MANUFACTURER/DISTRIBUTOR. CHEMCENTRAL/Dyes & Pigments Division
13395 Huron River Drive
Romulus, Michigan 48174
EMERGENCY PHONE NUMBER... (313) 941-4800
EFFECTIVE DATE..... 04/19/1995
REVISED DATE..... 04/19/1995
CHEMICAL NAME..... Acid Yellow 73
TRADE NAME..... 15174 URANINE C

CHEMICAL FAMILY..... Xanthene
CHEMICAL FORMULA..... 45350

SECTION II - HAZARDOUS INGREDIENTS

HAZARDOUS COMPONENTS	HAZARDOUS %	TLV (Units)	PROD. CAS #

None as per part 29 CFR 1910.1200. This product supplied is in compliance with TSCA Reporting Requirements, SARA Title III. Not Listed.

SECTION III - PHYSICAL DATA

BOILING Point(F)..... n/a
FREEZING POINT (F)..... N/A
VOLATILITY/VOL(%)..... n/a
MELTING POINT..... N/A
VAPOR PRESSURE (mm Hg)... n/a
VAPOR DENSITY (Air=1).... n/a
SOLUBILITY IN H20..... Moderate
APPEARANCE/ODOR..... Orange powder, no characteristic odor.
SPECIFIC GRAVITY (H20=1). Approximately 1
EVAPORATION RATE..... N/A
PH..... N/A

SECTION IV FIRE & EXPLOSION HAZARD DATA

FLASH POINT..... n/a
LOWER FLAME LIMIT..... n/a
HIGHER FLAME LIMIT..... n/a
EXTINGUISH MEDIA..... Water fog, CO2, or Dry chemical.

MATERIAL SAFETY DATA SHEET

15174 URANINE C (Fluorescein)

FOR FIRE..... Fire fighters should be equipped with self contained breathing apparatus and turnout gear.

UNUSUAL FIRE HAZARD..... Adequate ventilation and clean up must be maintained to minimize dust accumulation. May form explosive dust/air mixture.

SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE.... Not Established

OVER EXPOSURE EFFECTS.... Contact with eyes may result in severe irritation. Contact with skin may result in irritation. Ingestion may result in gastric disturbances. Inhalation of dust may irritate respiratory tract.

FIRST AID PROCEDURES..... Flush eyes with flowing water at least 15 minutes. If irritation develops, consult a physician. Wash affected skin areas thoroughly with soap and water. If irritation develops, consult a physician. Remove and launder contaminated clothing before reuse. If swallowed, dilute with water and induce vomiting. Get immediate medical attention. If inhaled, move to fresh air. Aid in breathing, if necessary, and get medical attention.
NEVER GIVE FLUIDS OR INDUCE VOMITING IF PATIENT IS UNCONSCIOUS OR HAS CONVULSIONS.

SECTION VI - REACTIVITY DATA

CHEMICAL STABILITY..... Stable

CONDITIONS TO AVOID..... N/A

INCOMPATIBLE MATERIALS... Unknown

DECOMPOSITION PRODUCTS... Carbon monoxide, Carbon dioxide, and oxides of Nitrogen.

HAZARDOUS POLYMERIZATION. Does not occur

POLYMERIZATION AVOID..... N/A

SECTION VII - SPILL OR LEAK PROCEDURE

FOR SPILL ..... Spills should be contained and placed in suitable containers.

WASTE DISPOSAL METHOD.... Do not discharge into sewers or waterways. Dispose of in accordance with local regulations.

SECTION VIII - SPECIAL PROTECTION

RESPIRATORY PROTECTION... NIOSH/OSHA approved dust respirator as necessary.

VENTILATION..... Local exhaust to control dusts.

PROTECTIVE GLOVES..... To prevent skin contact.

MATERIAL SAFETY DATA SHEET

15174 URANINE C (fluorescein)

EYE PROTECTION..... Goggles.
PROTECTIVE EQUIPMENT..... Eye wash fountains should be easily accessible.
HANDLING AND STORAGE..... Keep away from excessive heat and moisture. Keep containers closed.

SECTION IX - SPECIAL PRECAUTIONS

HAZARD CLASS..... N/A
DOT SHIPPING NAME..... Ink Material
NMFC Item #101720
REPORTABLE QUANTITY (RQ). N/A
UN NUMBER..... N/A
NA #..... N/A
DOT LABELS REQUIRED..... Mfg. Label Only
SPECIAL SHIPPING INSTRUCTIONS:
MANUFACTURER'S LABEL ONLY
PACKAGING SIZE..... Various

FOOT NOTES
This information is furnished without warranty, representation, or license of any kind, except that it is accurate to the best of CHEMCENTRAL Corporation's knowledge or obtained from sources believed by CHEMCENTRAL Corporation to be accurate. The CHEMCENTRAL Corporation does not assume any legal responsibility for use or reliance upon same. Customers are encouraged to conduct their own tests. Before using any product, read its label.

NA = Not Applicable

REFERENCES

MATERIAL SAFETY DATA SHEET

16972 Rhodamine WT 20%

SECTION I - IDENTIFICATION

MANUFACTURER/DISTRIBUTOR. CHEMCENTRAL/Dyes & Pigments Division
13395 Huron River Drive
Romulus, Michigan 48174
EMERGENCY PHONE NUMBER... (313) 941-4800
EFFECTIVE DATE..... 11/11/1996
REVISED DATE..... 11/11/1996
CHEMICAL NAME..... Acid Red 388
TRADE NAME..... 16972 Rhodamine WT 20%

CHEMICAL FAMILY..... Xanthene
CHEMICAL FORMULA..... Proprietary

SECTION II - HAZARDOUS INGREDIENTS

HAZARDOUS COMPONENTS	HAZARDOUS %	TLV (Units)	PROD. CAS #
Trimellitic Acid	2.6%	Not Established	528-44-9

This product supplied is in compliance with TSCA Reporting Requirements, SARA Title III. Not Listed.

SECTION III - PHYSICAL DATA

BOILING Point(F)..... 100C
FREEZING POINT (F)..... Not evaluated
VOLATILITY/VOL(%)..... N/A
MELTING POINT..... N/A
VAPOR PRESSURE (mm Hg)... Not evaluated
VAPOR DENSITY (Air=1).... N/A
SOLUBILITY IN H20..... Soluble
APPEARANCE/ODOR..... Dark red liquid, no odor
SPECIFIC GRAVITY (H20=1). 1.13
EVAPORATION RATE..... N/A
PH..... 10.5-10.8

SECTION IV FIRE & EXPLOSION HAZARD DATA

FLASH POINT..... N/A
LOWER FLAME LIMIT..... N/A
HIGHER FLAME LIMIT..... N/A
EXTINGUISH MEDIA..... Water fog, CO2, or Dry chemical.

APPENDIX B

OZARK UNDERGROUND LABORATORY'S

CERTIFICATES OF ANALYSIS &

PROCEDURES AND CRITERIA

OZARK UNDERGROUND LABORATORY

1572 Aley Lane • Protem, Missouri 65733 • (417) 785-4289 • FAX (417) 785-4290

REVISED

March 23, 1999

CERTIFICATE OF ANALYSIS

Don Ashton
Clayton Environmental Consultants
P. O. Box 9019
Pleasanton, CA 94566

RE: Coliseum Way, Oakland, CA, Project #70-97203.00.201
Dye analysis results for charcoal samplers shipped on March 12, 1999
Ozark Underground Laboratory (OUL) numbers H8573 through H8580.

Dear Mr. Ashton:

We have completed analysis of the charcoal samplers received at the OUL on March 15, 1999. We have indicated the OUL number for the samplers on the enclosed table.

The fluorescein and rhodamine WT (RWT) dye concentrations are based upon standards routinely used at the OUL. The fluorescein is a mixture of 75% dye and 25% diluent; the RWT is a 20% solution. The concentrations are based upon the as-sold weight of the dye.

A summary of the results is presented in Table 1. Additional sampling information is available on the enclosed analysis graphs.

Sincerely,

Thomas J. Aley

Thomas Aley, PHG & RG

Enclosures:
1. Table 1. Analysis results for charcoal samplers
2. Sample Collection Data Sheet
3. Discrepancy sheet
4. Sample analysis graphs

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Ozark Underground Laboratory for
Clayton Environmental Consultants

Project name: Coliseum Way, Oakland, CA, Project #70-97203.00.201
Samples Collected by: Marc Mullaney
Sample shipped: March 12, 1999
Sample received at OUL: March 15, 1999
Sample analyzed by OUL: March 15, 1999

Table 1. Results for charcoal samplers analyzed for the presence of fluorescein and rhodamine WT (RWT) dyes. Peak wavelengths are reported in nanometers (nm); dye concentrations are reported in parts per billion (ppb).

OUL Lab #	OUL Stn. #	Clayton Stn. #	Station Name	Date ~~Pulled~~ PLACED 1999	Date Pulled 1999	Fluorescein		RWT	
						Peak	Conc.	Peak	Conc.
H8573	1	2GA-C1	Second Line G Culvert	3-10 1520	3-12 1510	ND		ND	
H8574	2	2GB-C1	Second Line G Culvert	3-10 1520	3-12 1511	ND		ND	
H8575	3	CW-12-C1	Well CW-12	3-10 1530	3-12 1540	ND		ND	
H8576	4	CW-10-C1	Well CW-10	3-10 1545	3-12 1554	ND		ND	
H8577	5	CW-13-C1	Well CW-13	3-10 1548	3-12 1606	ND		ND	
H8578	6	LF-5-C1	Well LF-5	3-10 1605	3-12 1615	ND		ND	
H8579	7	LF-12-C1	Well LF-12	3-10 1615	3-12 1620	ND		ND	
H8580	Laboratory Control Charcoal Blank								

FOOTNOTES:

ND = None Detected

Figure 1. Sample Collection Data Sheet

Project #269
Analyzed 3-15-99
by M. Ridinger

SAMPLE COLLECTION DATA SHEET

Week No. 1

SAMPLES FOR FLUORESCENCE ANALYSIS

Ozark Underground Laboratory, Inc.
1572 Aley Lane - Protem, MO 65733 - (417) 785-4289 - fax (417) 785-4290

Project: COLISEUM WAY Samples Collected By: MARC MULLANEY

Samples Shipped By: FED EX Date Samples Shipped: 3/12/99

Samples Received By: J. Stevenson Date Samples Received: 3/15/99 1300

Analyze for: Fluorescein ____ Eosine ____ Rhodamine WT ____ Other ____

Bill to: CLAYTON ENVIRONMENTAL Send Results to: DON ASHTON
(925) 426-2600

for lab use only		*for field technician use — please indicate stations where dye was visible in the field*							*for lab use only*
# CHAR REC'D BY OUL	OUL NUMBER	STATION NUMBER	STATION NAME	DYE SPOT	DATE PLACED	TIME PLACED	DATE PULLED	TIME PULLED	# WATER REC'D BY OUL
	H8573	2GA-C	SECOND WELL G CULVERT	1	3-10-99	15:20	3/12/99	1510	0
	H8574	2GB-C	"	2	"	"	"	1511	0
2	H8575	CW-12-C	WELL CW-12	3	"	15:30		1540	0
HOLD 0		CW-12-W	"		"	"		—	
2	H8576	CW-10-C	WELL CW-10	4	"	15:45		1554	0
HOLD 0		CW-10-W	"		"	"		—	
2	H8577	CW-13-C	WELL CW-13	5	"	15:48		1606	0
HOLD 0		CW-13-W	"		"	"		—	
2	H8578	LF-5-C	WELL LF-5	6	"	16:05		1615	0
HOLD 0		LF-5-W	"		"	"		—	
2	H8579	LF-12-C	WELL LF-12	7	"	16:15		1620	0
HOLD 0		LF-12-W	"		"	"	✓	—	

Comments: 48580 = Charcoal Blank

Charts for samples on this page proofed by OUL staff _____

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OZARK UNDERGROUND LABORTORY

DISCREPANCIES BETWEEN CHAIN-OF-CUSTODY SHEETS AND ACTUAL SAMPLES RECEIVED Page 1 of 1

Company & Project Name: Coliseum Way / Clayton Environmental **Date Rec'd by OUL:** 3-15-99 **Wk #** 1

Lab #	Sta #	Station Name	Date Pulled	Problem	Solution

Comments: Please write Pulled date + time on whirl-Pak bags. Also on water vials. L.L.

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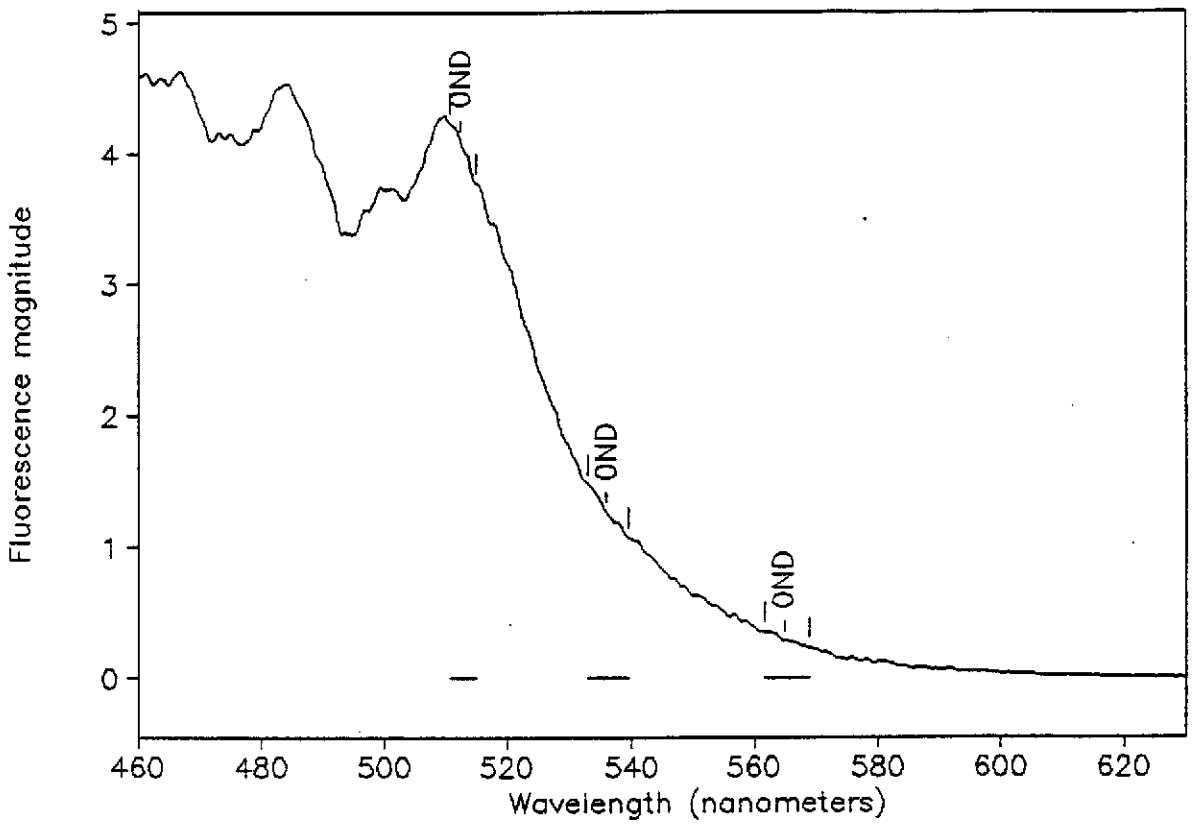
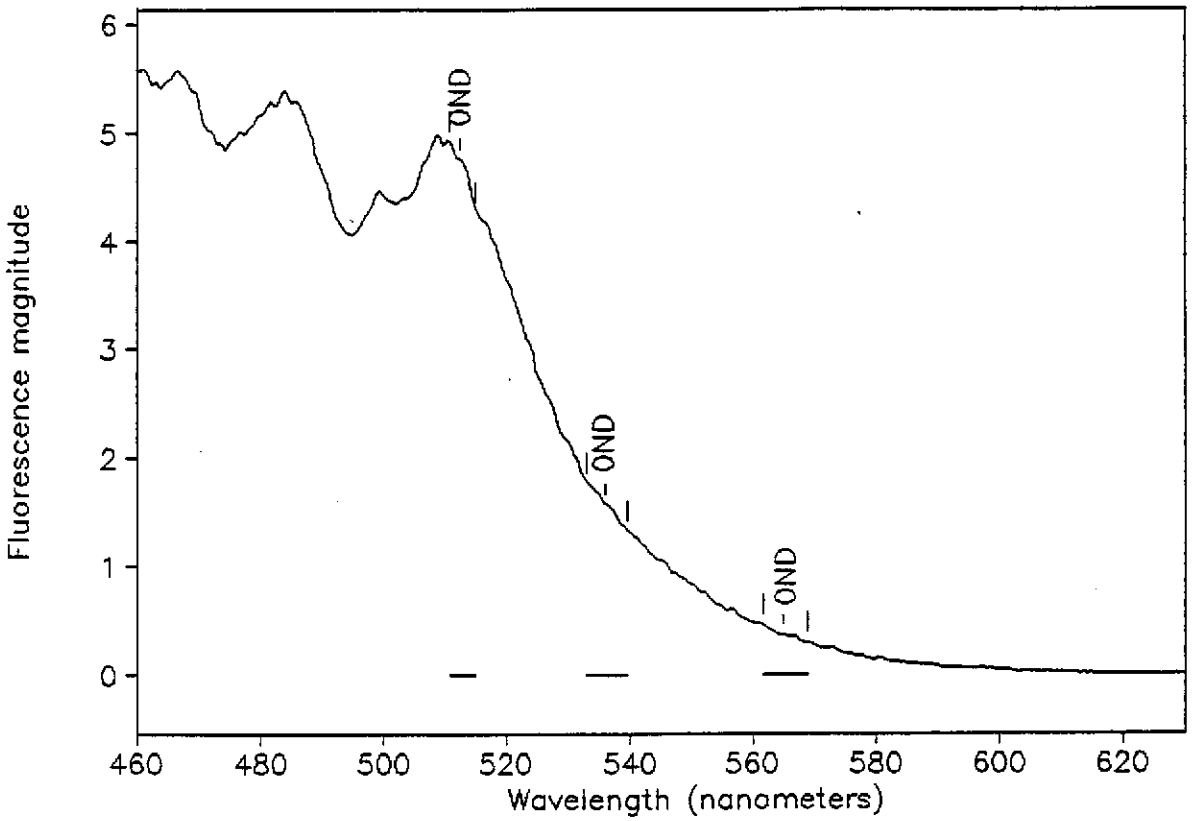


Station 1: Second Line G Culvert
OUL number: H8573 Type: Charcoal Analyzed: 03–15–1999
Date placed: 03–10–1999 Date recovered: 3–12–1999
Time placed: 1520 Time recovered: 1510
Coliseum Way Station #2GA–C1

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
512.5	510.7	515.0	0	0	0	ND
536.0	533.0	539.6	0	0	0	ND
565.0	561.7	568.9	0	0	0	ND

Ozark Underground Laboratory

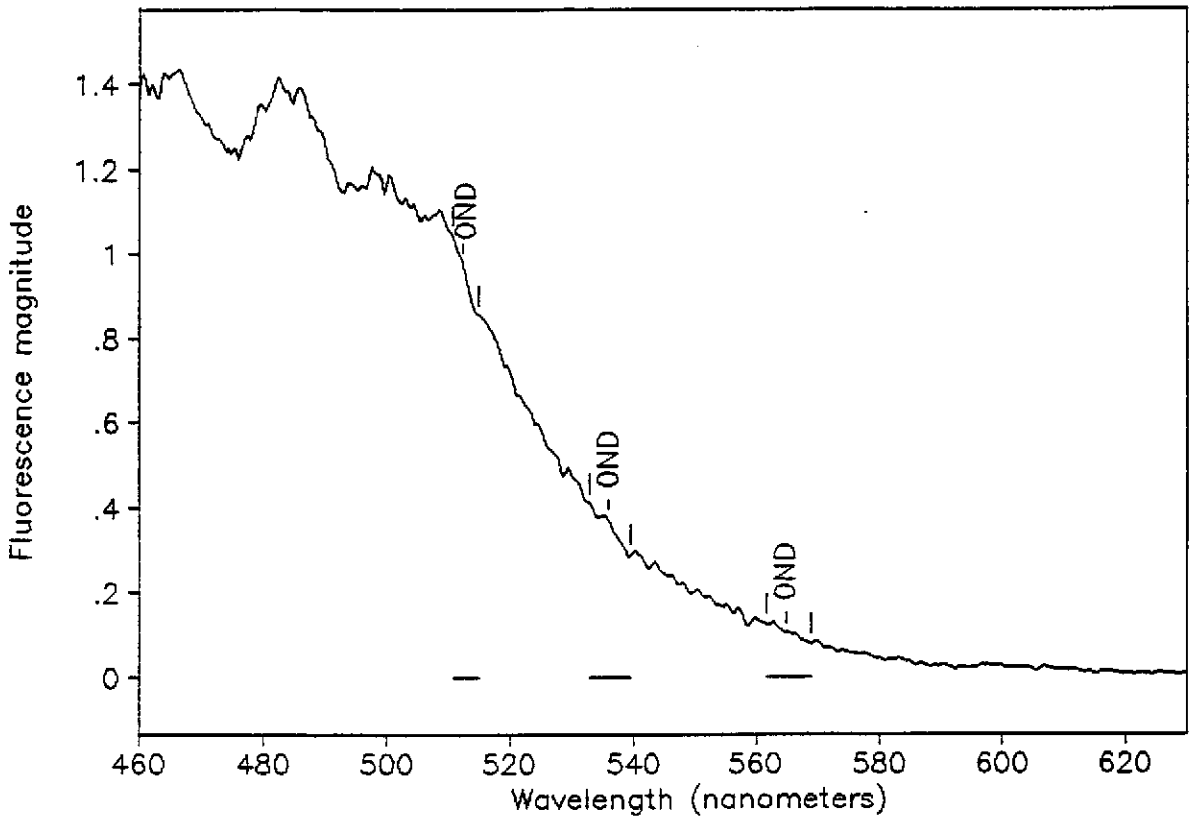


Station 2: Second Line G Culvert
OUL number: H8574 Type: Charcoal Analyzed: 03–15–1999
Date placed: 03–10–1999 Date recovered: 3–12–1999
Time placed: 1520 Time recovered: 1511
Coliseum Way Station # 2GB–C1

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
512.5	510.7	515.0	0	0	0	ND
536.0	533.0	539.6	0	0	0	ND
565.0	561.7	568.9	0	0	0	ND

Ozark Underground Laboratory

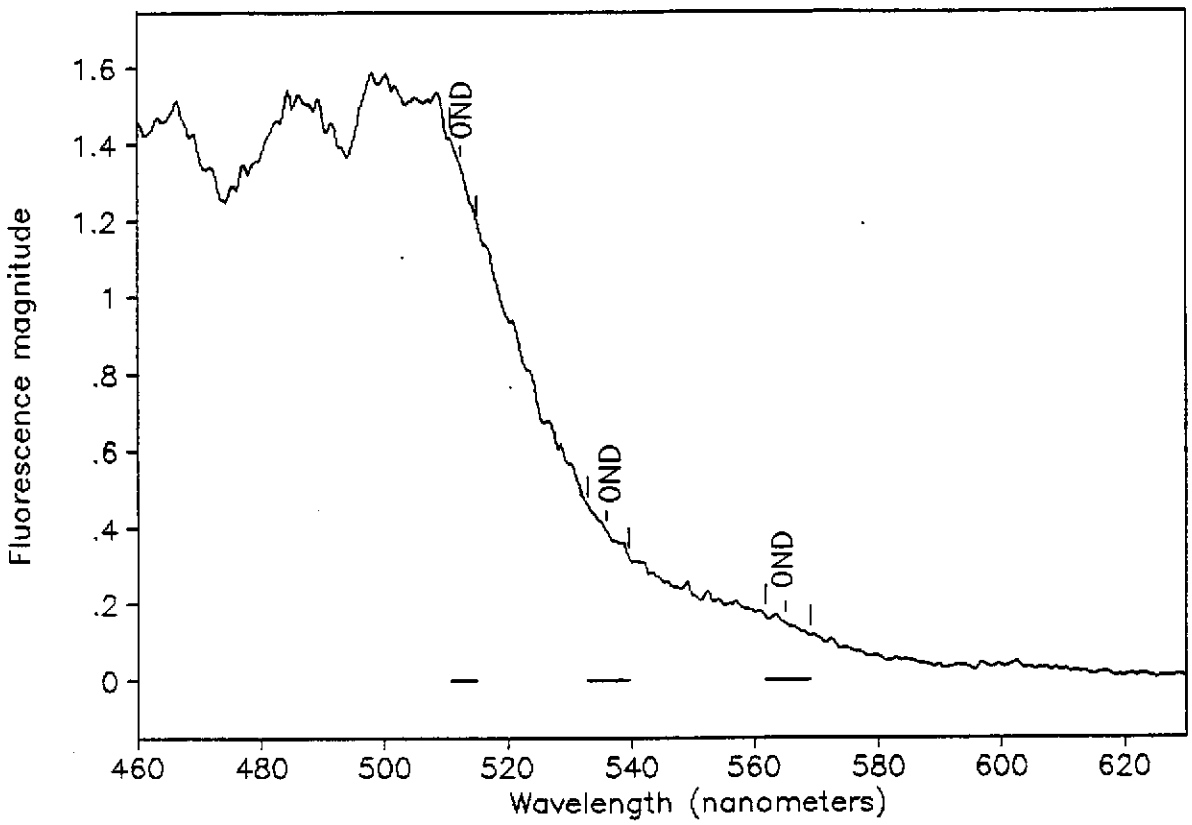


Station 3: Well CW-12
OUL number: H8575 Type: Charcoal Analyzed: 03-15-1999
Date placed: 03-10-1999 Date recovered: 3-12-1999
Time placed: 1530 Time recovered: 1540
Coliseum Way Station # CW-12-C1

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
512.5	510.7	515.0	0	0	0	ND
536.0	533.0	539.6	0	0	0	ND
565.0	561.7	568.9	0	0	0	ND

Ozark Underground Laboratory

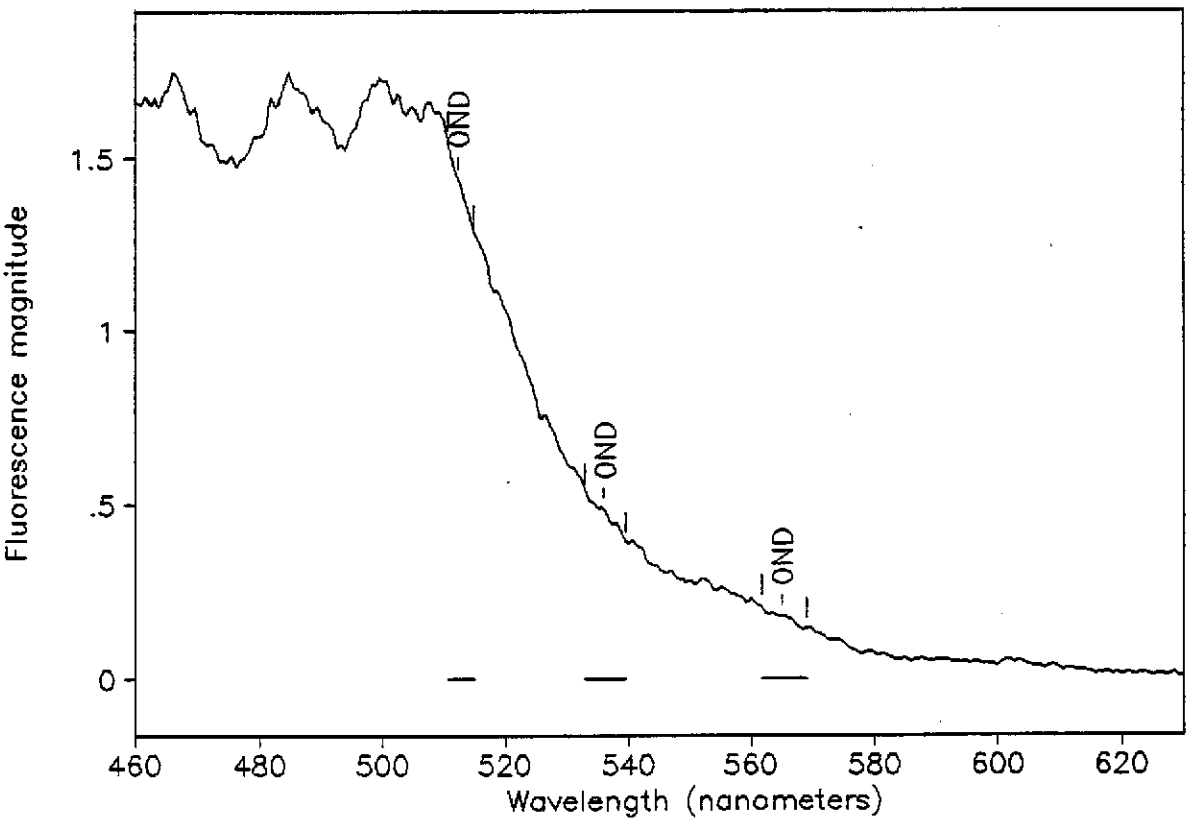


Station 4: Well CW–10
OUL number: H8576 Type: Charcoal Analyzed: 03–15–1999
Date placed: 03–10–1999 Date recovered: 3–12–1999
Time placed: 1545 Time recovered: 1554
Coliseum Way Station # CW–10–C1

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
512.5	510.7	515.0	0	0	0	ND
536.0	533.0	539.6	0	0	0	ND
565.0	561.7	568.9	0	0	0	ND

Ozark Underground Laboratory

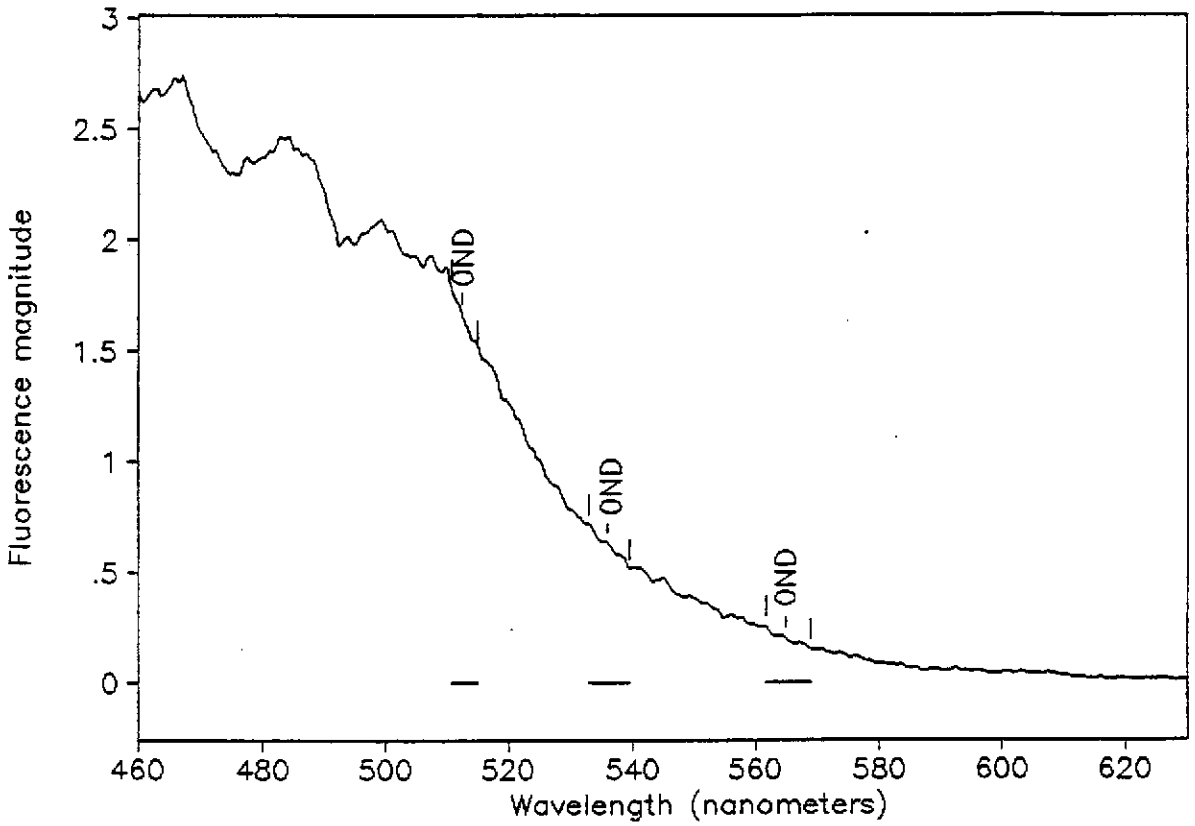


Station 5: Well CW-13
OUL number: H8577 Type: Charcoal Analyzed: 03-15-1999
Date placed: 03-10-1999 Date recovered: 3-12-1999
Time placed: 1548 Time recovered: 1606
Coliseum Way Station # CW-13-C1

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
512.5	510.7	515.0	0	0	0	ND
536.0	533.0	539.6	0	0	0	ND
565.0	561.7	568.9	0	0	0	ND

Ozark Underground Laboratory

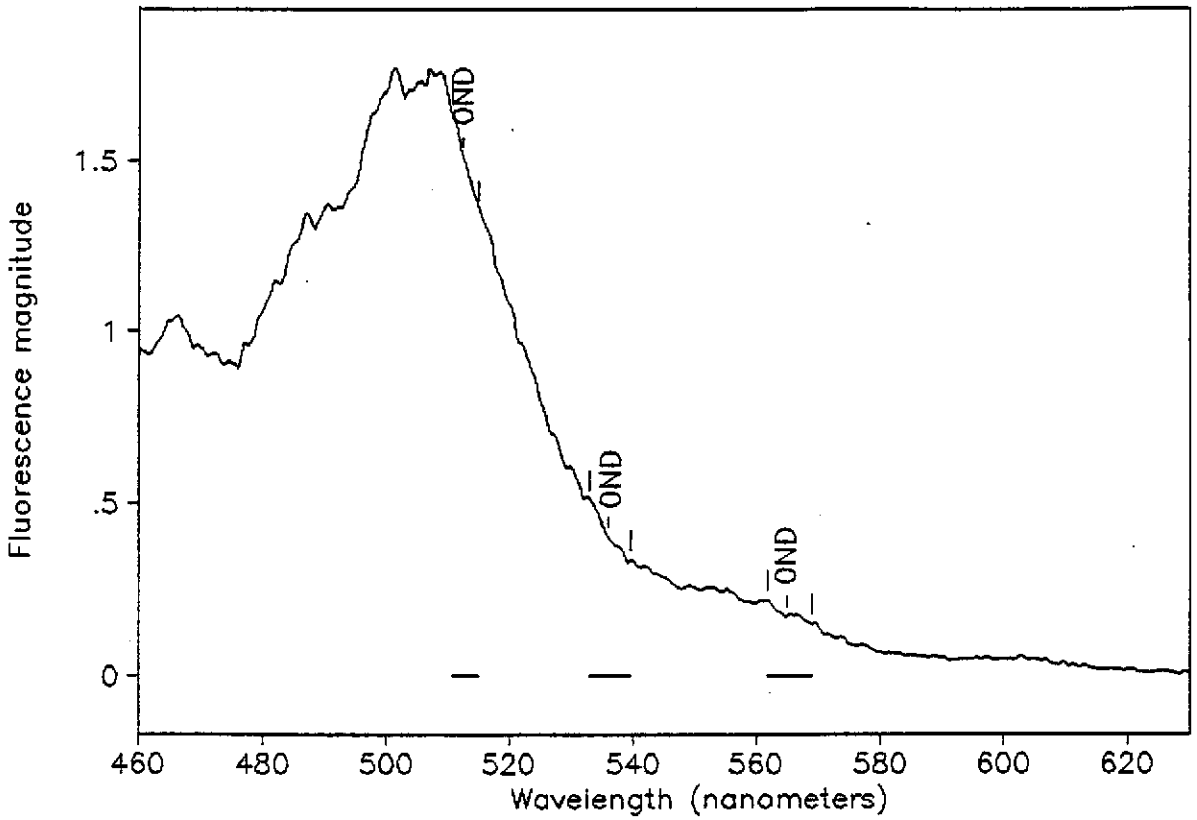


Station 6: Well LF-5
OUL number: H8578 Type: Charcoal Analyzed: 03-15-1999
Date placed: 03-10-1999 Date recovered: 3-12-1999
Time placed: 1605 Time recovered: 1615
Coliseum Way Station # LF-5-C1

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
512.5	510.7	515.0	0	0	0	ND
536.0	533.0	539.6	0	0	0	ND
565.0	561.7	568.9	0	0	0	ND

Ozark Underground Laboratory



Station 7: Well LF-12
OUL number: H8579 Type: Charcoal Analyzed: 03-15-1999
Date placed: 03-10-1999 Date recovered: 03-12-1999
Time placed: 1615 Time recovered: 1620
Coliseum Way Station # LF-12-C1

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
512.5	510.7	515.0	0	0	0	ND
536.0	533.0	539.6	0	0	0	ND
565.0	561.7	568.9	0	0	0	ND

OZARK UNDERGROUND LABORATORY

1572 Aley Lane • Protem, Missouri 65733 • (417) 785-4289 • FAX (417) 785-4290

April 6, 1999

CERTIFICATE OF ANALYSIS

Don Ashton
Clayton Environmental Consultants
P. O. Box 9019
Pleasanton, CA 94566

RE: Coliseum Way, Oakland, CA, Project #70-97203.00.201
Dye analysis results for charcoal samplers shipped on March 26, 1999
Ozark Underground Laboratory (OUL) numbers H9036 through H9051.

Dear Mr. Ashton:

We have completed analysis of the charcoal samplers received at the OUL on March 29, 1999. We have indicated the OUL number for the samplers on the enclosed table.

The fluorescein and rhodamine WT (RWT) dye concentrations are based upon standards routinely used at the OUL. The fluorescein dye is a mixture of 75% dye and 25% diluent; the RWT is a 20% solution. The concentrations are based upon the as-sold weight of the dye.

A summary of the results is presented in Table 1. Additional sampling information is available on the enclosed analysis graphs.

Sincerely,

Thomas J. Aley

Thomas Aley, PHG & RG

Enclosures:
1. Table 1. Analysis results for charcoal samplers
2. Sample Collection Data Sheets
3. Discrepancy sheet
4. Sample analysis graphs

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Ozark Underground Laboratory for
Clayton Environmental Consultants

Project name: Coliseum Way, Oakland, CA, Project #70-97203.00.201
Samples Collected by: Marc Mullaney
Sample shipped: March 26, 1999
Sample received at OUL: March 29, 1999
Sample analyzed by OUL: April 6, 1999

Table 1. Results for charcoal samplers analyzed for the presence of fluorescein and rhodamine WT (RWT) dyes. Peak wavelengths are reported in nanometers (nm); dye concentrations are reported in parts per billion (ppb).

OUL Lab #	OUL Stn. #	Clayton Stn. #	Station Name	Date Placed 1999	Date Pulled 1999	Fluorescein		RWT	
						Peak	Conc.	Peak	Conc.
H9036	1	2G-C3	Second Line G Culvert	3-16 1436	3-19 1516	510.8*	0.652	ND	
H9037	8	CLDA-C3	Cortland Creek	3-16 1425	3-19 1515	ND		ND	
H9038	3	CW-12-C3	MW CW-12	3-16 1450	3-19 1534	ND		ND	
H9039	4	CW-10-C3	MW CW-10	3-16 1457	3-19 1538	ND		ND	
H9040	Laboratory Control Charcoal Blank								
H9041	6	LF-5-C3	MW LF-5	3-16 1515	3-19 1629	ND		ND	
H9042	1	2G-C4	Second Line G Culvert	3-19 1520	3-23 1149	511.5	1.93	ND	
H9043	8	CLD-C4	Cortland Creek	3-19 1522	3-23 1143	511.1	1.13	ND	
H9044	3	CW-12-C4	MW CW-12	3-19 1537	3-23 1202	ND		ND	
H9045	4	CW-10-C4	MW CW-10	3-19 1540	3-23 1211	ND		ND	
H9046	6	LF-5-C4	MW LF-5	3-19 1632	3-23 1243	ND		ND	
H9047	1	2G-C5	Second Line G Culvert	3-23 1153	3-26 1426	ND		ND	
H9048	8	CLD-C5	Cortland Creek	3-23 1146	3-26 1427	ND		ND	
H9049	3	CW-12-C5	MW CW-12	3-23 1208	3-26 1452	ND		ND	
H9050	4	CW-10-C5	MW CW-10	3-23 NT	3-26 1504	ND		ND	
H9051	6	LF-5-C5	MW LF-5	3-23 1249	3-26 1607	ND		ND	

FOOTNOTES:

* = A fluorescence peak is present that is atypical in shape but in the normally acceptable wavelength range for fluorescein dye in elutant (510.7 to 515.0 nm) and has been calculated as a positive dye recovery.

ND = None Detected

NT = No time given

Figure 1. Sample Collection Data Sheet

SAMPLE # Week No. 2

SAMPLE COLLECTION DATA SHEET

SAMPLES FOR FLUORESCENCE ANALYSIS

Ozark Underground Laboratory, Inc.
1572 Aley Lane - Protem, MO 65733 - (417) 785-4289 - fax (417) 785-4290

Project: COLISEUM Samples Collected By: MARC MULLANEY

Samples Shipped By: FED EX Date Samples Shipped: 3/26/99

Samples Received By: Dixie Hardy @ 1330 Date Samples Received: 3/29/99

Analyze for: Fluorescein X Eosine ____ Rhodamine WT ____ X Other ____

Bill to: CLAYTON ENVIRONMENTAL Send Results to: DON ASHTON F (925) 426-0106

for lab use only		*for field technician use* please indicate stations where dye was visible in the field						*for lab use only*
# CHAR REC'D BY OUL	OUL NUMBER	STATION NUMBER	STATION NAME	DATE PLACED	TIME PLACED	DATE PULLED	TIME PULLED	# WATER REC'D BY OUL
1		26A-C2	2ND LINE "G" CULVERT	3/12/99	1520	3/16/99	1429	Ø
1		26B-C2	" "	"	1521	"	1435	Ø
1		CL0A-C2	CORTLAND CREEK		1536		1415	Ø
1		CL0B-C2	" "		1537		1415	Ø
2		CW-12-C2	MW-CW-12		1550		1445	Ø
2		CW-10-C2	CW-10		1559		1454	Ø
2		CW-13-C2	CW-13		1618		1507	Ø
2		LF-5-C2	LF-5		1618		1513	Ø
2		LF-12-C2	LF-12		1623		1527	Ø

HOLD #2

Comments: ____

Charts for samples on this page proofed by OUL staff ____

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Project # 267
Analyzed 4-6-99
by M. Richings

Ozark Underground Laboratory

Dye Analysis Procedures and Criteria

Figure 1. Sample Collection Data Sheet

SAMPLE Week No. 3

SAMPLE COLLECTION DATA SHEET

SAMPLES FOR FLUORESCENCE ANALYSIS

Ozark Underground Laboratory, Inc.
1572 Aley Lane · Protem, MO 65733 · (417) 785-4289 · fax (417) 785-4290

Project: COLISEUM Samples Collected By: MARC MULLANEY

Samples Shipped By: FED EX Date Samples Shipped: 3/26/99

Samples Received By: Lisa Leedy @1330 Date Samples Received: 3/29/99

Analyze for: Fluorescein X Eosine ___ Rhodamine WT X Other ___

Bill to: CLAYTON-DON ASHTON Send Results to: DON ASHTON F(925) 426-0106

for lab use only		*for field technician use please indicate stations where dye was visible in the field*						*for lab use only*
# CHAR REC'D BY OUL	OUL NUMBER	STATION NUMBER	STATION NAME	DATE PLACED	TIME PLACED	DATE PULLED	TIME PULLED	# WATER REC'D BY OUL
2	H9036	26~~6~~-C3	2ND LINE "B" CULVERT	3/16/99	1436	3/19/99	1516	Ø
		~~266-C3~~	"					
2	H9037	CLOA-C3			1425		1515	Ø
		~~CLOB-C3~~						
2	H9038	CW-12-C3	MW-CW-12		1450		1534	Ø
2	H9039	CW-10-C3	MW-CW-10		1457		1538	Ø
2	H9041	LF-5-C3	MW-LF-5		1515		1629	Ø
Ø		CW-12-W3	MW-CW-12		—		1550	1
Ø		CW-10-W3	MW-CW-10	√	—	√	1545	1
Ø		LF-5-W3	MW-LF-5		—		1630	1

HOLD WATER SAMPLES

Comments: H9040 = Charcoal Blank

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Analyzed 4-6-99 by M. Richinger

Figure 1. Sample Collection Data Sheet

SAMPLE Week No. 4

SAMPLE COLLECTION DATA SHEET

SAMPLES FOR FLUORESCENCE ANALYSIS

Ozark Underground Laboratory, Inc.
1572 Aley Lane - Protem, MO 65733 - (417) 785-4289 - fax (417) 785-4290

Project: COLESEUM WAY Samples Collected By: MARC MULLANEY

Samples Shipped By: FEDEX Date Samples Shipped: 3/26/99

Samples Received By: Lee Landers @ 1330 Date Samples Received: 3/29/99

Analyze for: Fluorescein X Eosine ____ Rhodamine WT X Other ____

Bill to: CLAYTON ENVIRONMENTAL Send Results to: DON ASHTON F (925) 426-0186

for lab use only		*for field technician use — please indicate stations where dye was visible in the field*						*for lab use only*
# CHAR REC'D BY OUL	OUL NUMBER	STATION NUMBER	STATION NAME	DATE PLACED	TIME PLACED	DATE PULLED	TIME PULLED	# WATER REC'D BY OUL
2	H9042	26-C4	2nd LINE 6" CULVERT	3/19/99	1520	3/23/99	1149	0
2	H9043	CLD-C4		↓	1522	↓	1143	0
2	H9044	CW-12-C4	MW-CW-12		1537		1202	0
2	H9045	CW-10-C4	MW-CW-10		1540		1205	0
2	H9046	LF-5-C4	MW-LF-5	✓	1632		1248	0
0	/	CW-12-W4	MW-CW-12	—	—		1205	1
0	/	CW-10-W4	MW-CW-10	—	—	↓	1215	1
0	/	LF-5-W4	MW-LF-5	—	—	✓	1246	1

HOLD WATER SAMPLES

Comments: Above 3 water samples should be W4 per Don Ashton on 4-1-99 mma

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Ozark Underground Laboratory

Analyzed 4-6-99 by M. Ridinger

Dye Analysis Procedures and Criteria

Figure 1. Sample Collection Data Sheet

SAMPLE # 5

Week No.

SAMPLE COLLECTION DATA SHEET

SAMPLES FOR FLUORESCENCE ANALYSIS

Ozark Underground Laboratory, Inc.
1572 Aley Lane - Protem, MO 65733 - (417) 785-4289 - fax (417) 785-4290

Project: COLISEUM WAY Samples Collected By: MARC MULLANEY

Samples Shipped By: FED EX Date Samples Shipped: 3/26/99

Samples Received By: Lisa Landry @ 1330 Date Samples Received: 3/29/99

Analyze for: Fluorescein X Eosine ____ Rhodamine WT X Other ____

Bill to: CLAYTON ENVIRONMENTAL Send Results to: DON HEATON
F (925) 426-0106

for lab use only		*for field technician use* please indicate stations where dye was visible in the field						*for lab use only*
# CHAR REC'D BY OUL	OUL NUMBER	STATION NUMBER	STATION NAME	DATE PLACED	TIME PLACED	DATE PULLED	TIME PULLED	# WATER REC'D BY OUL
2	H9047	2G-C5	2ND LINE "G" CULVERT	3/23/99	1153	3/26/99	1426	Ø
2	H9048	CLD-C5	CORTLAND CREEK	↓	1146	↓	1427	Ø
2	H9049	CW-12-C5	MW-CW-12	↓	1208	↓	1452	Ø
Ø	—	CW-12-W5	MW-CW-12	—	—		1457	1
Ø	—	2G-W5	2ND LINE "G" CULVERT	—	—		1426	1
Ø	—	CLD-W5	CORTLAND CREEK	—	—		1427	1
2	H9050	CW-10-C5	MW-CW-10	3/23/99			1504	Ø
Ø	—	CW-10-W5	MW-CW-10	—	—		1507	1
2	H9051	LF-5-C5	MW-LF-5	3/23/99	1249	↓	1607	Ø
Ø	—	LF-5-W5	MW-LF-5	—	—	↓	1608	1
Below added by OUL staff - mma								
Ø	—	2G-W5				3/26	1428	1

HOLD WATER SAMPLES

Comments: did not receive sample for CLD-W5 3/26 1427;
did receive sample for 2G-W5 3/26 1428. mma 4-1-99
Marc Mullaney would to make the 2G-W5 3/26 1428 sample the missing CLD-W5 sample. mma 4/2/99

Charts for samples on this page proofed by OUL staff ____

Page ____ of ____

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OZARK UNDERGROUND LABORTORY

DISCREPANCIES BETWEEN CHAIN-OF-CUSTODY SHEETS AND ACTUAL SAMPLES RECEIVED Page 1 of 1

Company & Project Name: Coliseum Way - Clayton Environmental **Date Rec'd by OUL:** 3-29-99 **Wk #** _____

Lab #	Sta #	Station Name	Date Pulled	Problem	Solution
		All Whirlpaks	3/16	NA dates or times	used COC dates & times
	CW-12-	W3 MW-CW-12	3/23	Chain of custody identifies	COC is for "Sample 4"
	CW-10-	W3 MW-CW-10	3/23	these samples as ---W3.	-Called Dan Ashton -
	LF-5-	W3 LF-5-W3	3/23	Vials are labeled ---W4	He said they should be W4 mma
	CLD-W5	Cortland Creek	3/26	did not receive this sample. } Marc	
	2G-W5		3/26	not on COC but received. } Mullaney	
					said to relabel the
					2G-W5 sample
					to be the missing
					CLD-W5 sample (at
					3-26 1427. He will
					make a record of this
					in his file - mma
					4-2-99

Comments:

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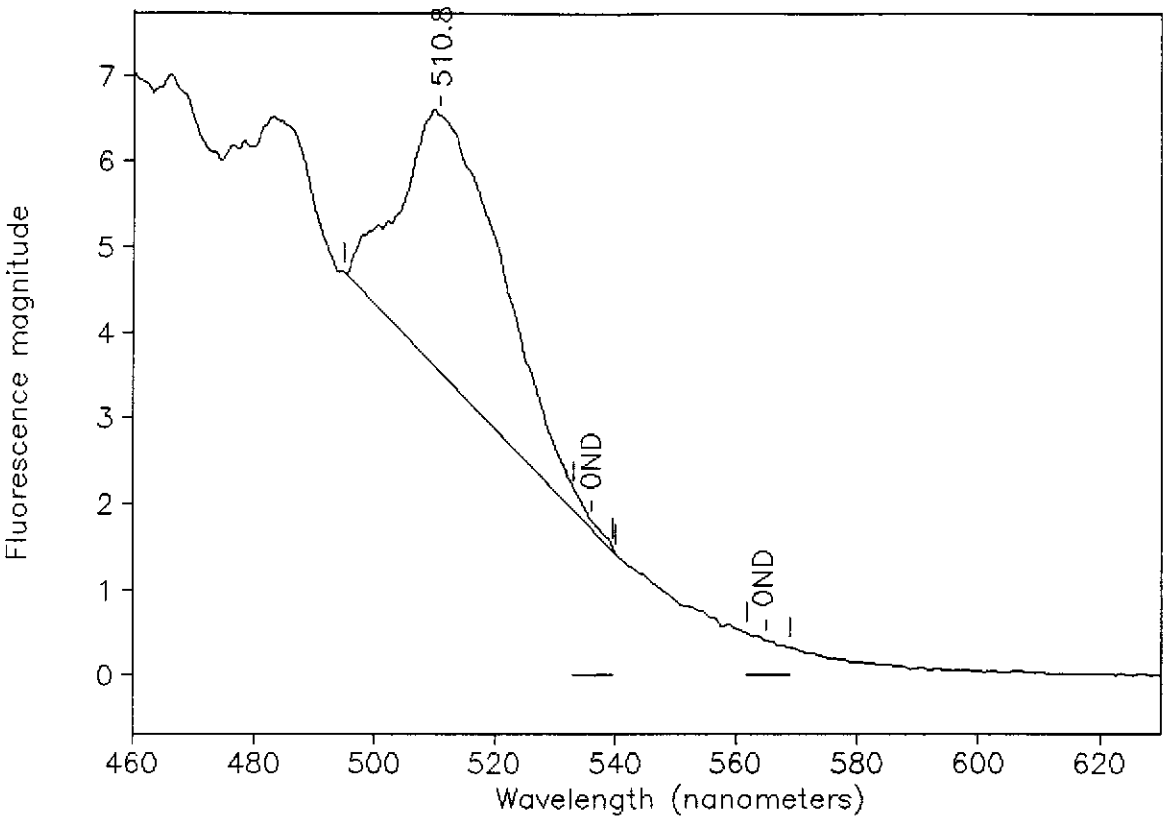
Ozark Underground Laboratory

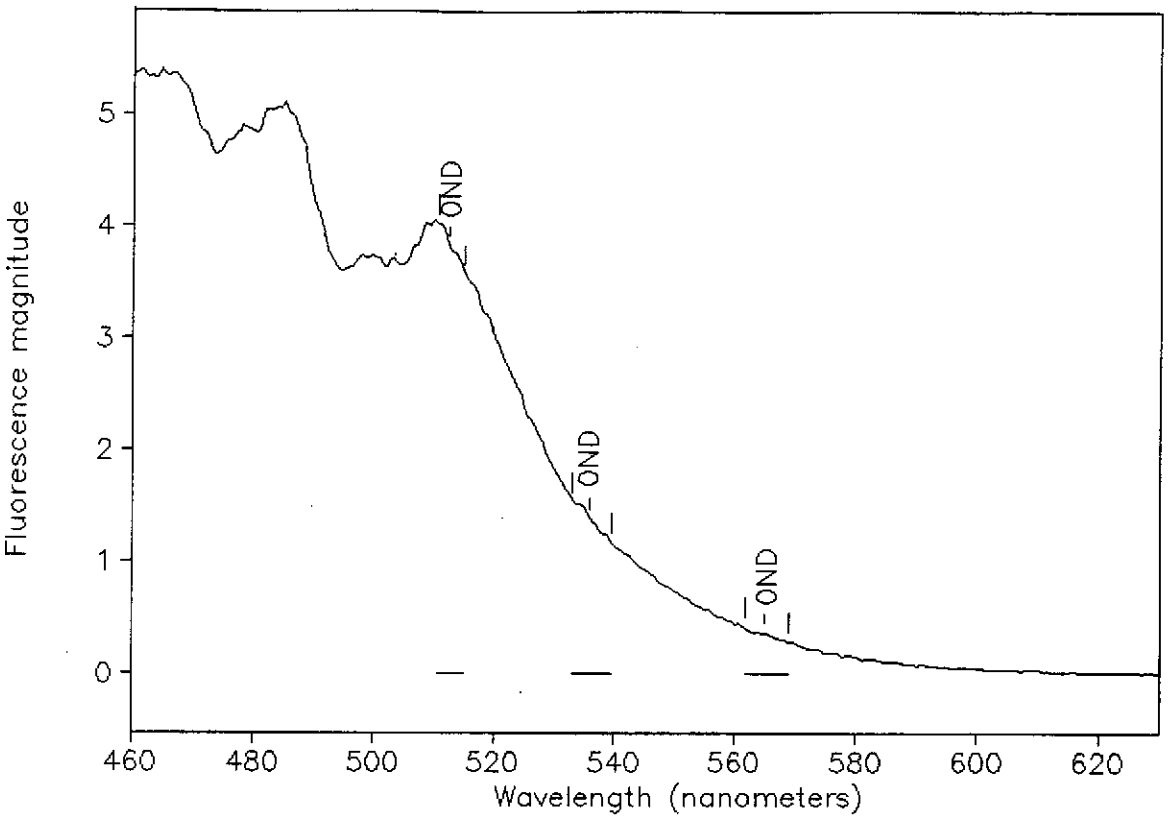


Station 1: Second Line G Culvert
OUL number: H9036 Type: Charcoal Analyzed: 04-06-1999
Date placed: 03-16-1999 Date recovered: 03-19-1999
Time placed: 1436 Time recovered: 1516
Clayton Environmental Station # 2G-C3

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
510.8	494.8	540.0	3.00	62.00	0.05	0.652
536.0	533.0	539.6	0	0	0	ND
565.0	561.7	568.9	0	0	0	ND

Ozark Underground Laboratory

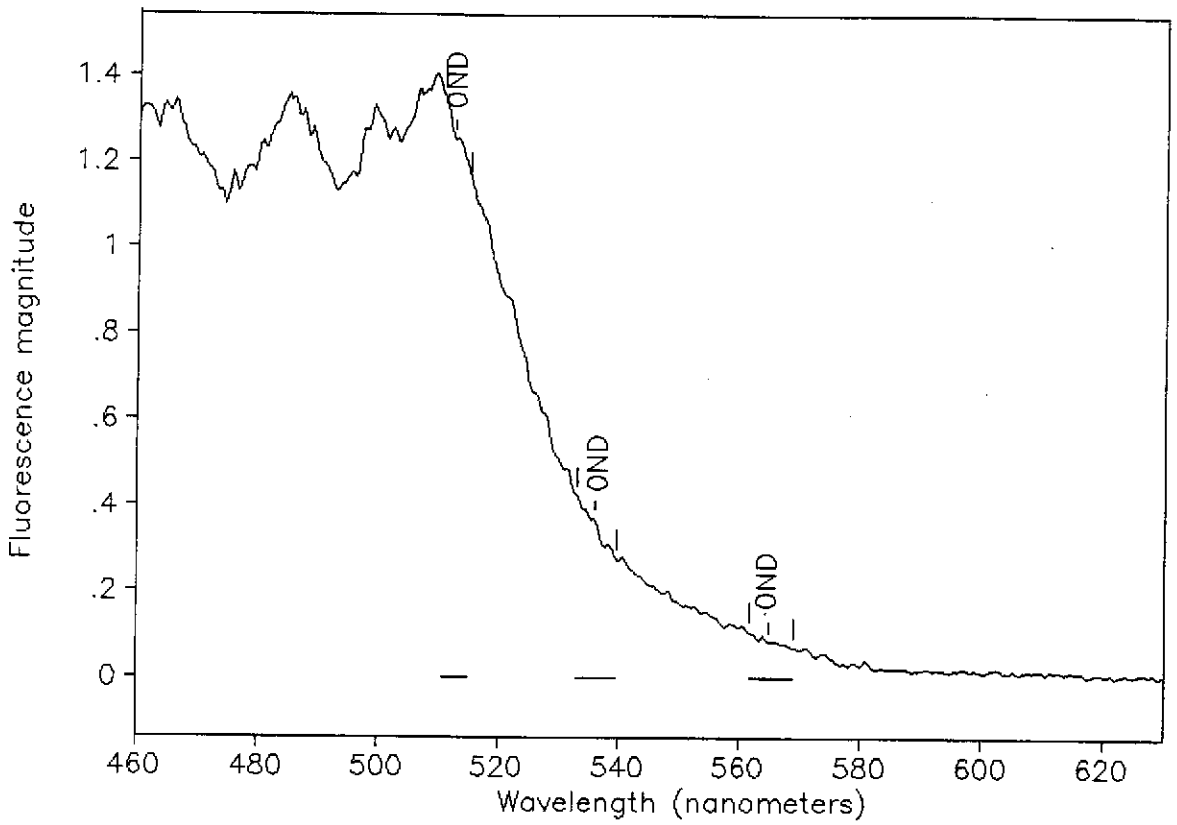


Station 8: Cartland Creek
OUL number: H9037 Type: Charcoal Analyzed: 04–06–1999
Date placed: 03–16–1999 Date recovered: 03–19–1999
Time placed: 1425 Time recovered: 1515
Clayton Environmental Station # CLDA–C3

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
512.5	510.7	515.0	0	0	0	ND
536.0	533.0	539.6	0	0	0	ND
565.0	561.7	568.9	0	0	0	ND

Ozark Underground Laboratory

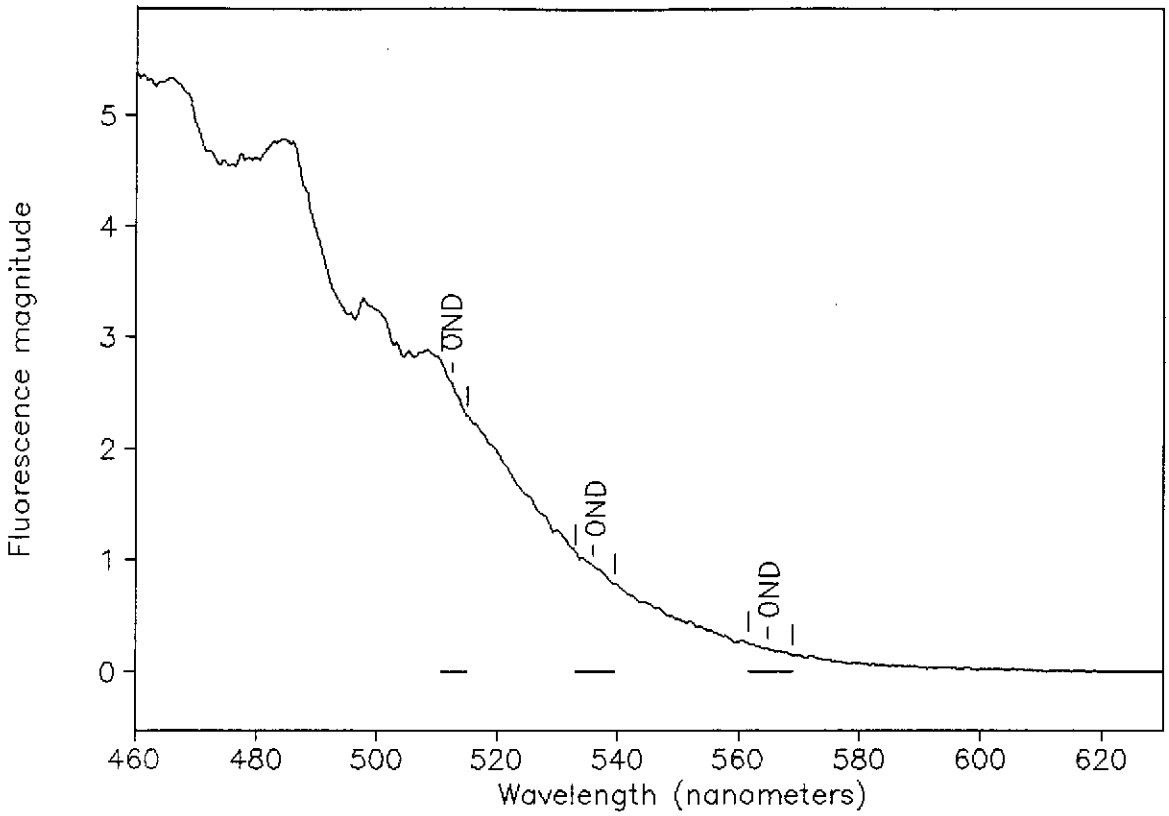


Station 3: MW CW-12
OUL number: H9038 Type: Charcoal Analyzed: 04-06-1999
Date placed: 03-16-1999 Date recovered: 03-19-1999
Time placed: 1450 Time recovered: 1534
Clayton Environmental Station # CW-12C3

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
512.5	510.7	515.0	0	0	0	ND
536.0	533.0	539.6	0	0	0	ND
565.0	561.7	568.9	0	0	0	ND

Ozark Underground Laboratory

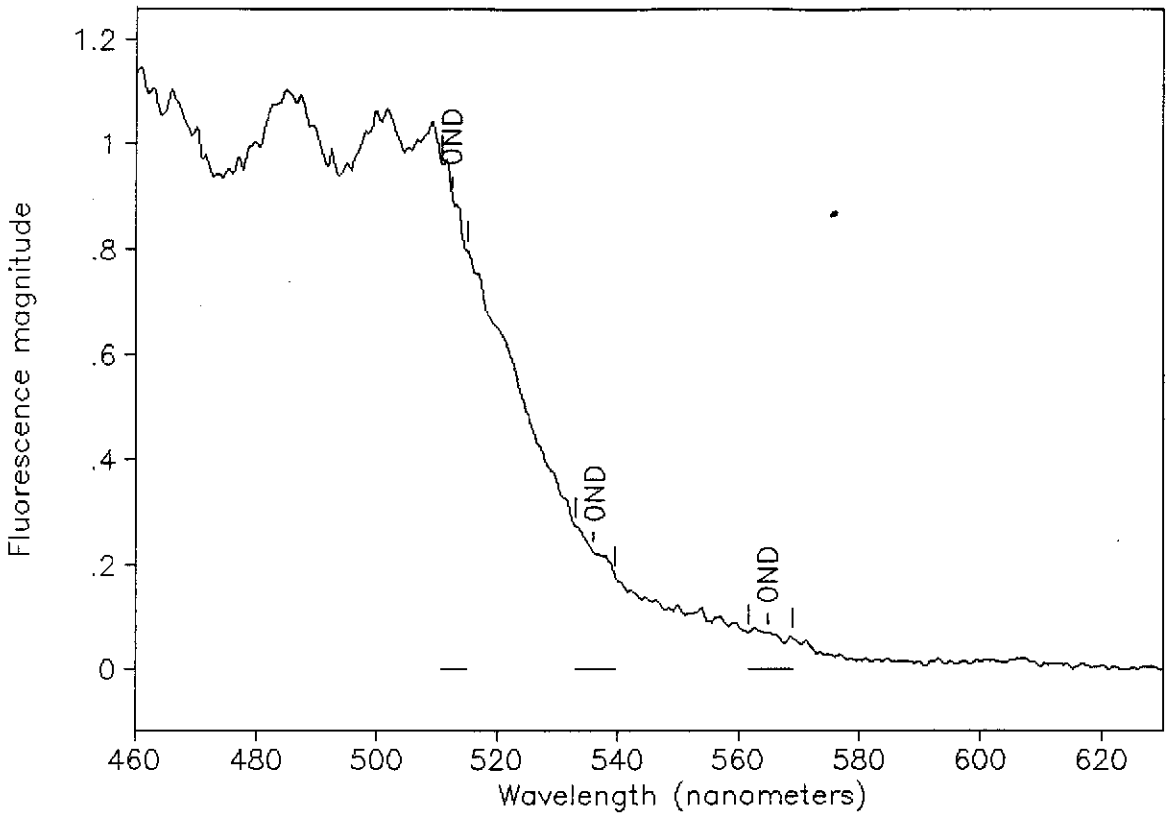


Station 4: MW CW-10
OUL number: H9039 Type: Charcoal Analyzed: 04-06-1999
Date placed: 03-16-1999 Date recovered: 03-19-1999
Time placed: 1457 Time recovered: 1538
Clayton Environmental Station # CW-10-C3

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
512.5	510.7	515.0	0	0	0	ND
536.0	533.0	539.6	0	0	0	ND
565.0	561.7	568.9	0	0	0	ND

Ozark Underground Laboratory

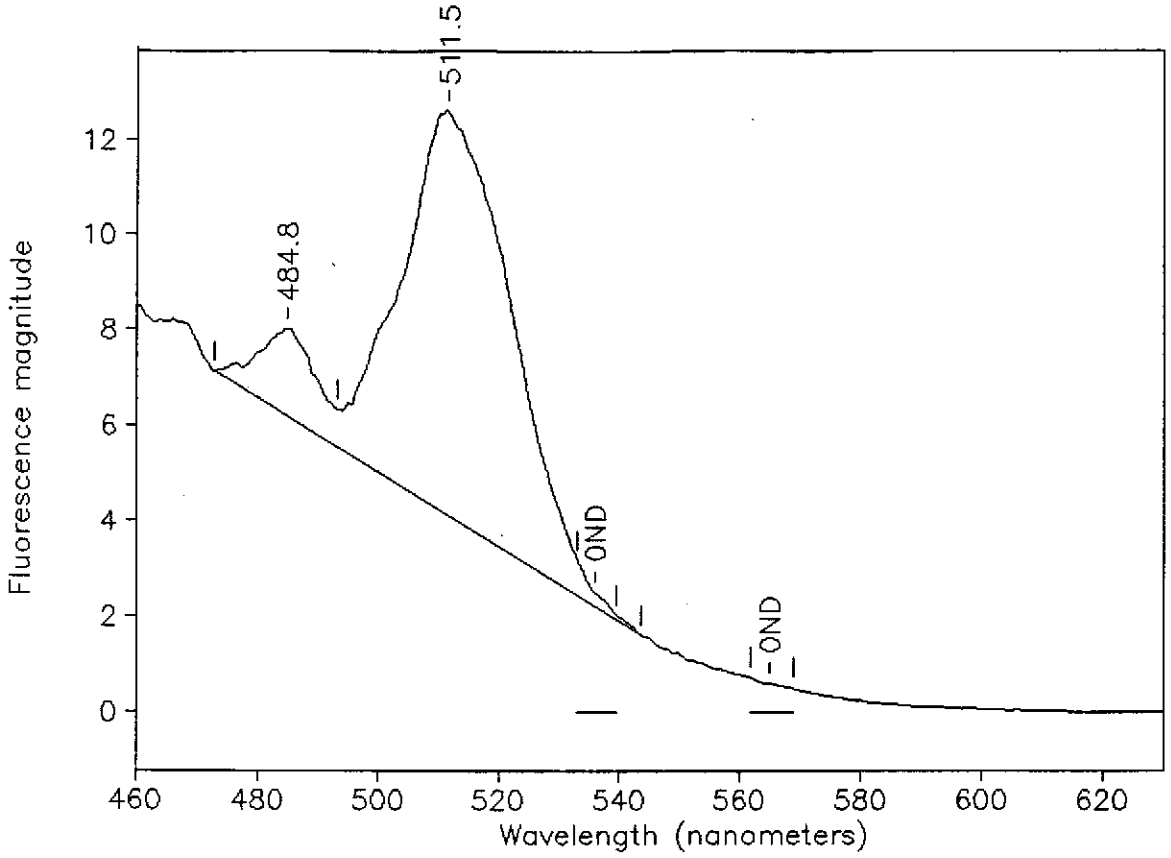


Station 6: MW LF-5
OUL number: H9041 Type: Charcoal Analyzed: 04-06-1999
Date placed: 03-16-1999 Date recovered: 03-19-1999
Time placed: 1515 Time recovered: 1629
Clayton Environmental Station # LF-5-C3

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
512.5	510.7	515.0	0	0	0	ND
536.0	533.0	539.6	0	0	0	ND
565.0	561.7	568.9	0	0	0	ND

Ozark Underground Laboratory



Station 1: Second Line G Culvert
OUL number: H9042 Type: Charcoal Analyzed: 4–6–1999
Date placed: 3–19–1999 Date recovered: 3–23–1999
Time placed: 1520 Time recovered: 1149
Clayton Environmental Station # 2G–C4

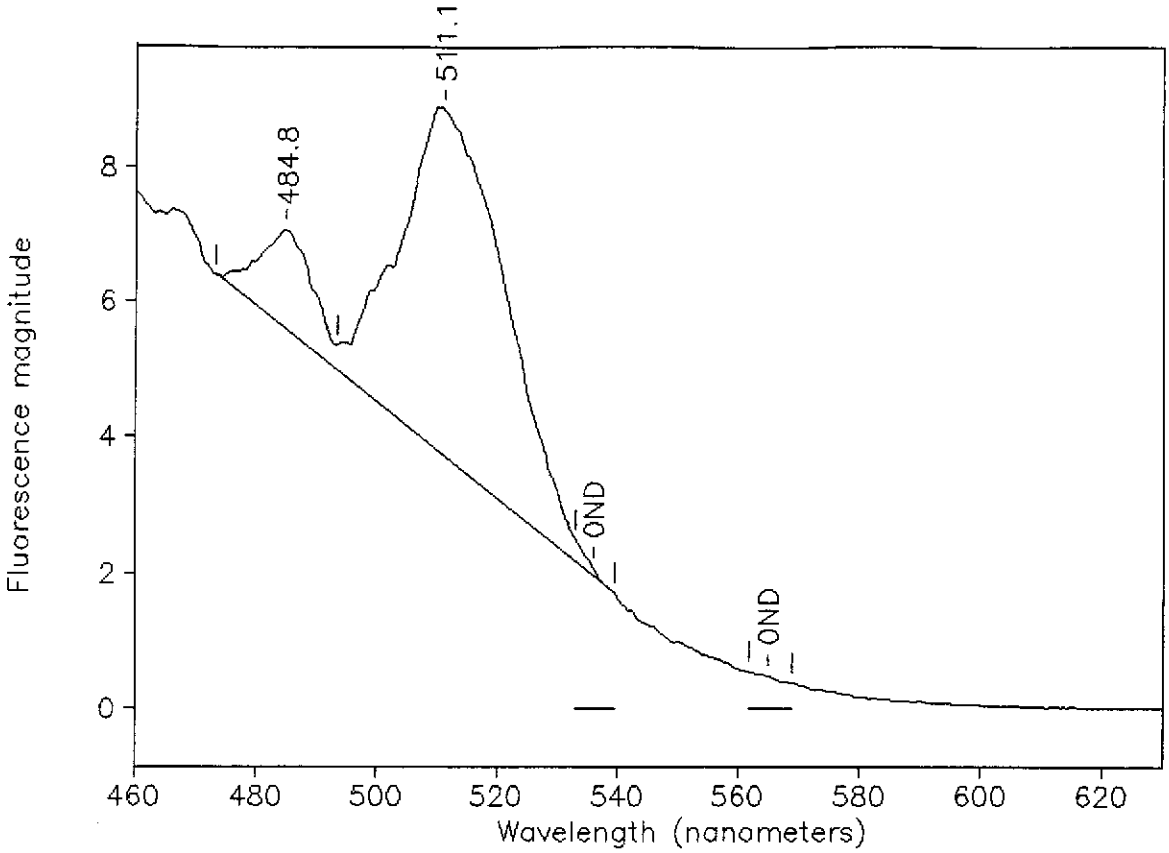
Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
511.5	493.2	543.6	8.52	183.09	0.05	1.93
536.0	533.0	539.6	0	0	0	ND
565.0	561.7	568.9	0	0	0	ND

Peaks close to normal range of tracer dyes:

484.8	472.8	493.2	1.85	20.70	0.09	0

Ozark Underground Laboratory



Station 8: Cortland Creek
OUL number: H9043 Type: Charcoal Analyzed: 04-06-1999
Date placed: 03-19-1999 Date recovered: 03-23-1999
Time placed: 1522 Time recovered: 1143
Clayton Environmental Station # CLD-C4

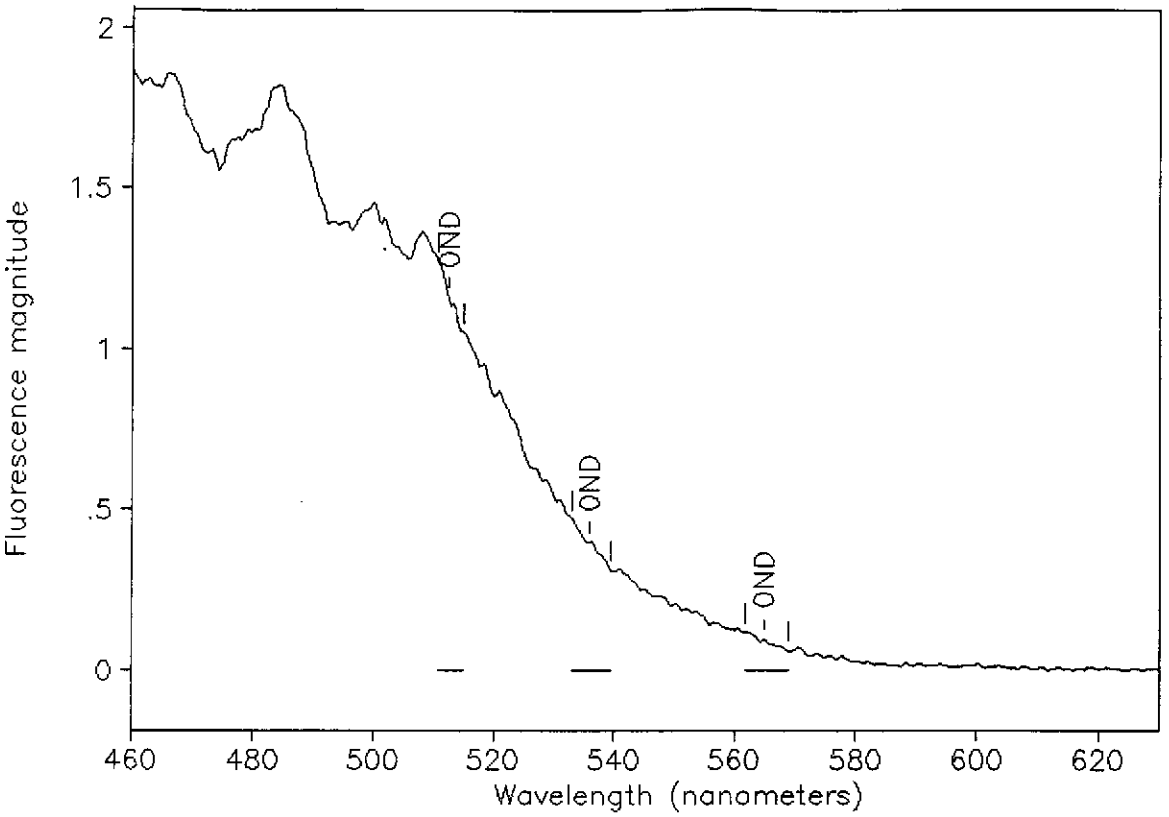
Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
511.1	493.4	539.6	5.14	107.11	0.05	1.13
536.0	533.0	539.6	0	0	0	ND
565.0	561.7	568.9	0	0	0	ND

Peaks close to normal range of tracer dyes:

484.8	473.2	493.4	1.49	15.76	0.09	0

Ozark Underground Laboratory

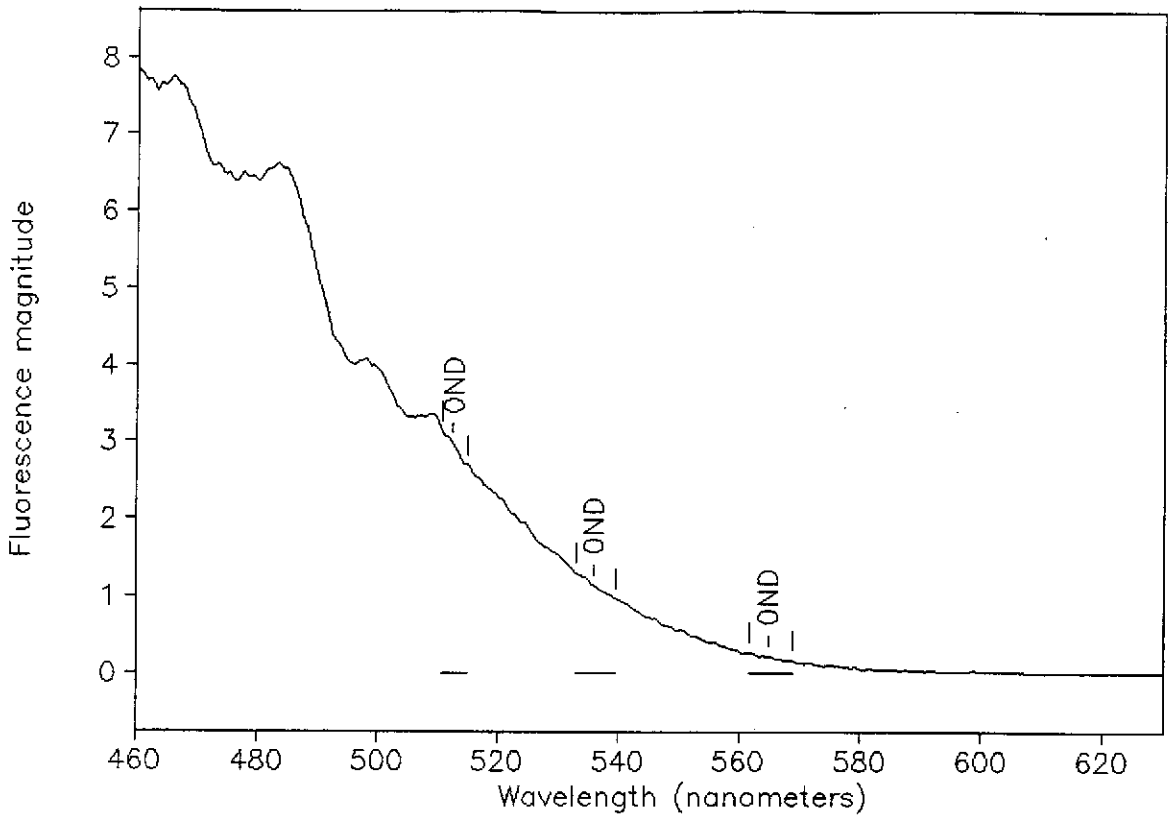


Station 3: MW CW-12
OUL number: H9044 Type: Charcoal Analyzed: 04-06-1999
Date placed: 03-19-1999 Date recovered: 03-23-1999
Time placed: 1537 Time recovered: 1202
Clayton Environmental Station # CW-12-C4

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
512.5	510.7	515.0	0	0	0	ND
536.0	533.0	539.6	0	0	0	ND
565.0	561.7	568.9	0	0	0	ND

Ozark Underground Laboratory

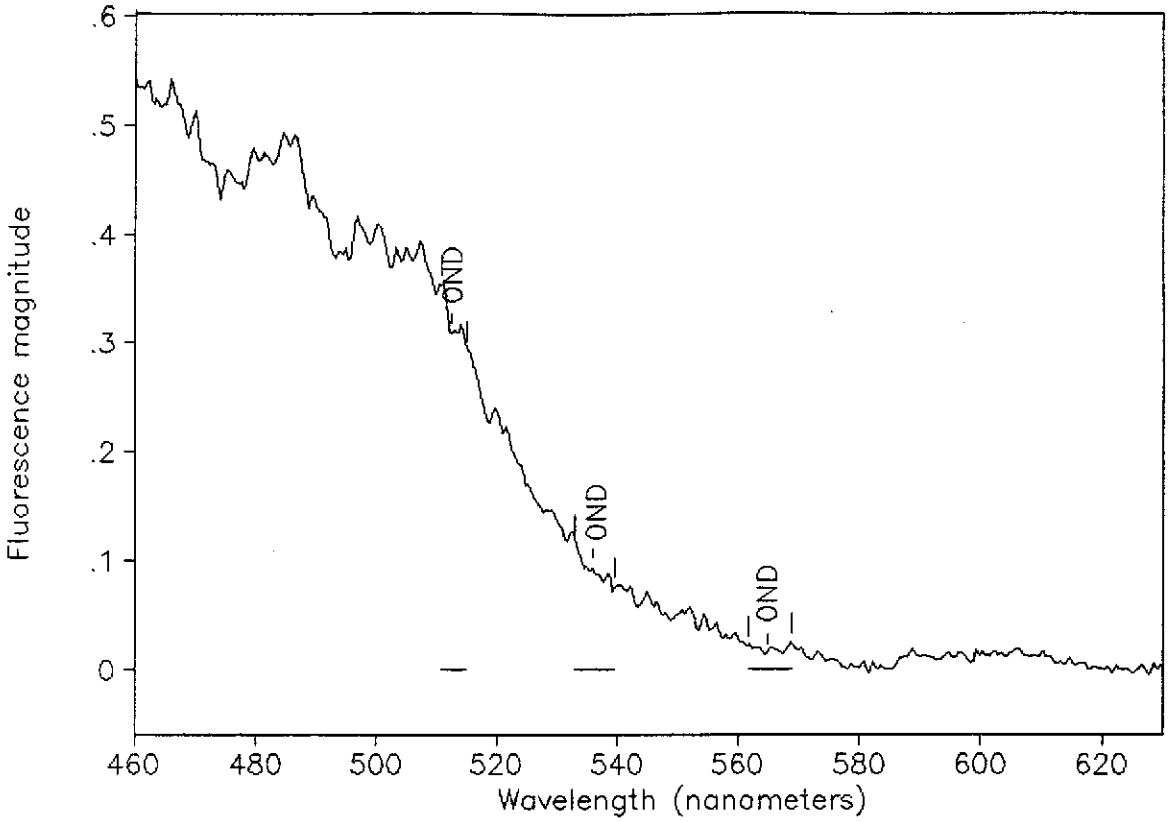


Station 4: MW CW-10
OUL number: H9045 Type: Charcoal Analyzed: 04-06-1999
Date placed: 03-19-1999 Date recovered: 03-23-1999
Time placed: 1540 Time recovered: 1211
Clayton Environmental Station # CW-10-C4

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
512.5	510.7	515.0	0	0	0	ND
536.0	533.0	539.6	0	0	0	ND
565.0	561.7	568.9	0	0	0	ND

Ozark Underground Laboratory

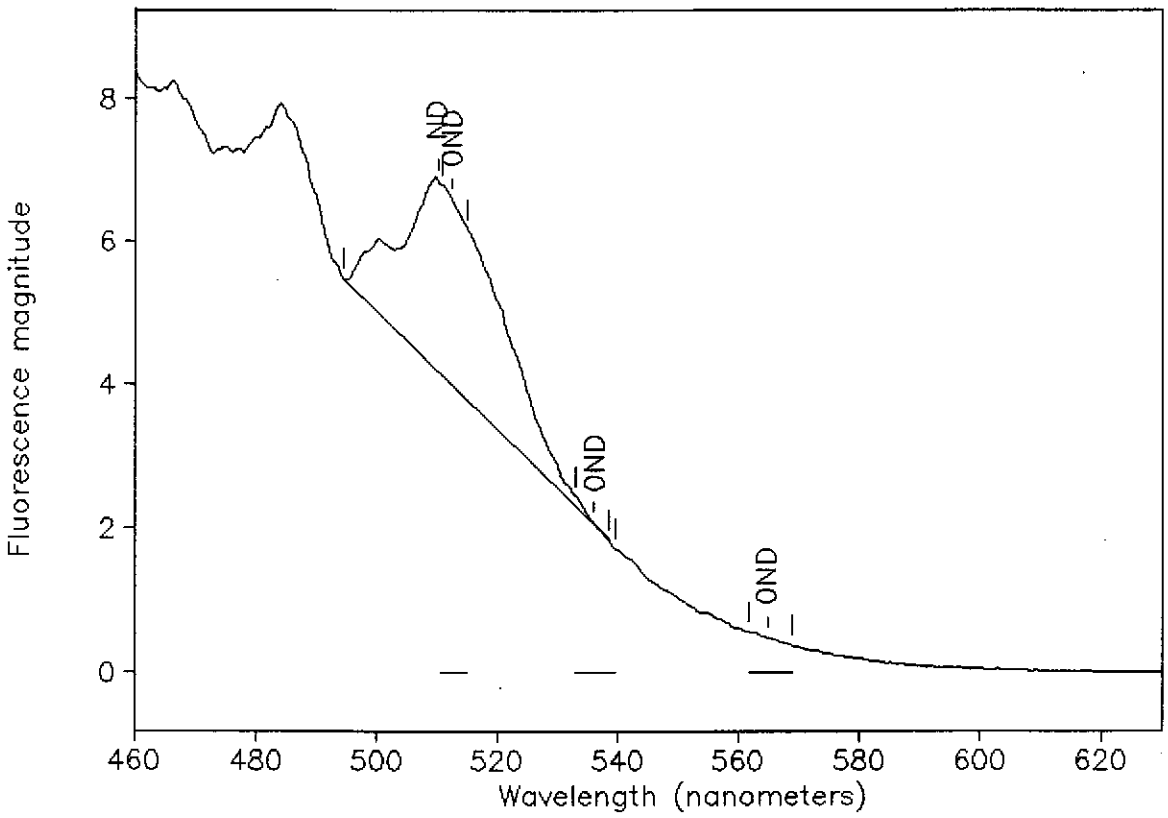


Station 6: MW LF-5
OUL number: H9046 Type: Charcoal Analyzed: 04-06-1999
Date placed: 03-19-1999 Date recovered: 03-23-1999
Time placed: 1632 Time recovered: 1243
Clayton Environmental Station # LF-5-C4

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
512.5	510.7	515.0	0	0	0	ND
536.0	533.0	539.6	0	0	0	ND
565.0	561.7	568.9	0	0	0	ND

Ozark Underground Laboratory



Station 1: Second Line G Culvert
OUL number: H9047 Type: Charcoal Analyzed: 4-6-1999
Date placed: 3-23-1999 Date recovered: 3-26-1999
Time placed: 1153 Time recovered: 1426
Clayton Environmental Station # 2G-C5

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
512.5	510.7	515.0	0	0	0	ND
536.0	533.0	539.6	0	0	0	ND
565.0	561.7	568.9	0	0	0	ND

Peaks close to normal range of tracer dyes:

510.2	494.4	538.4	2.71	53.48	0.05	0

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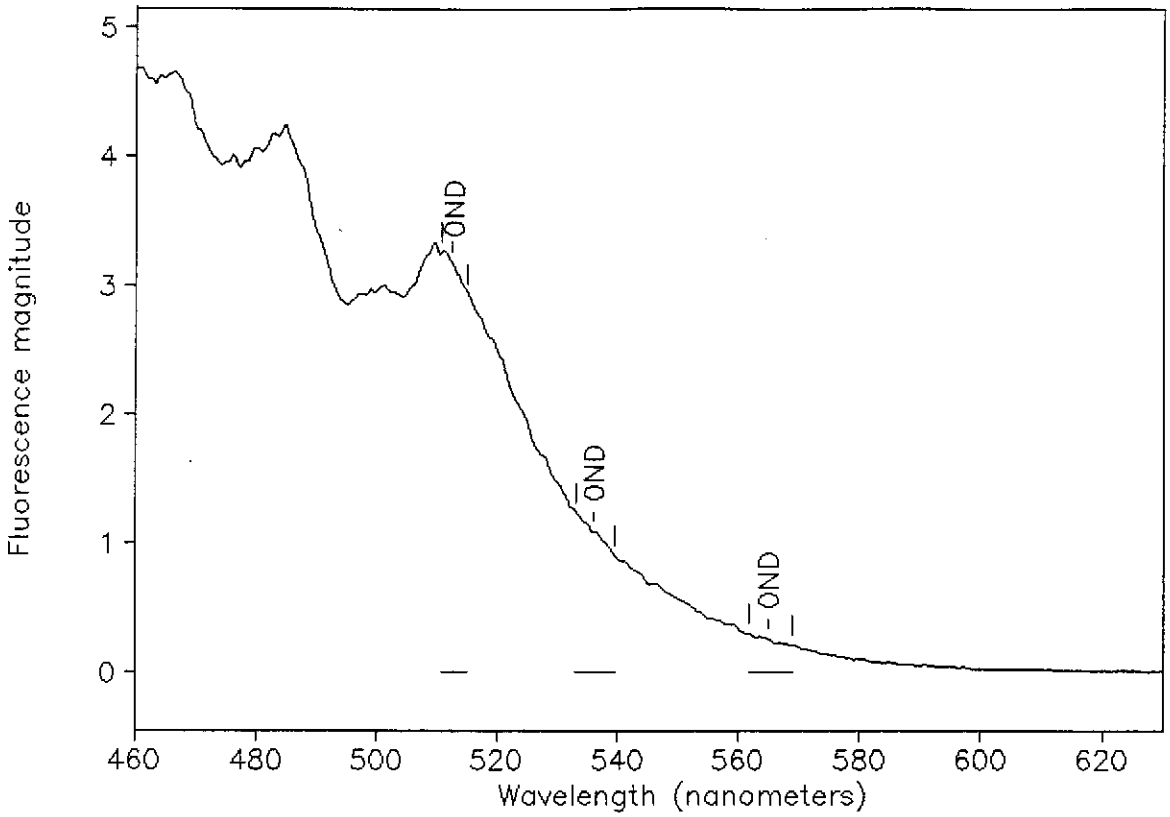
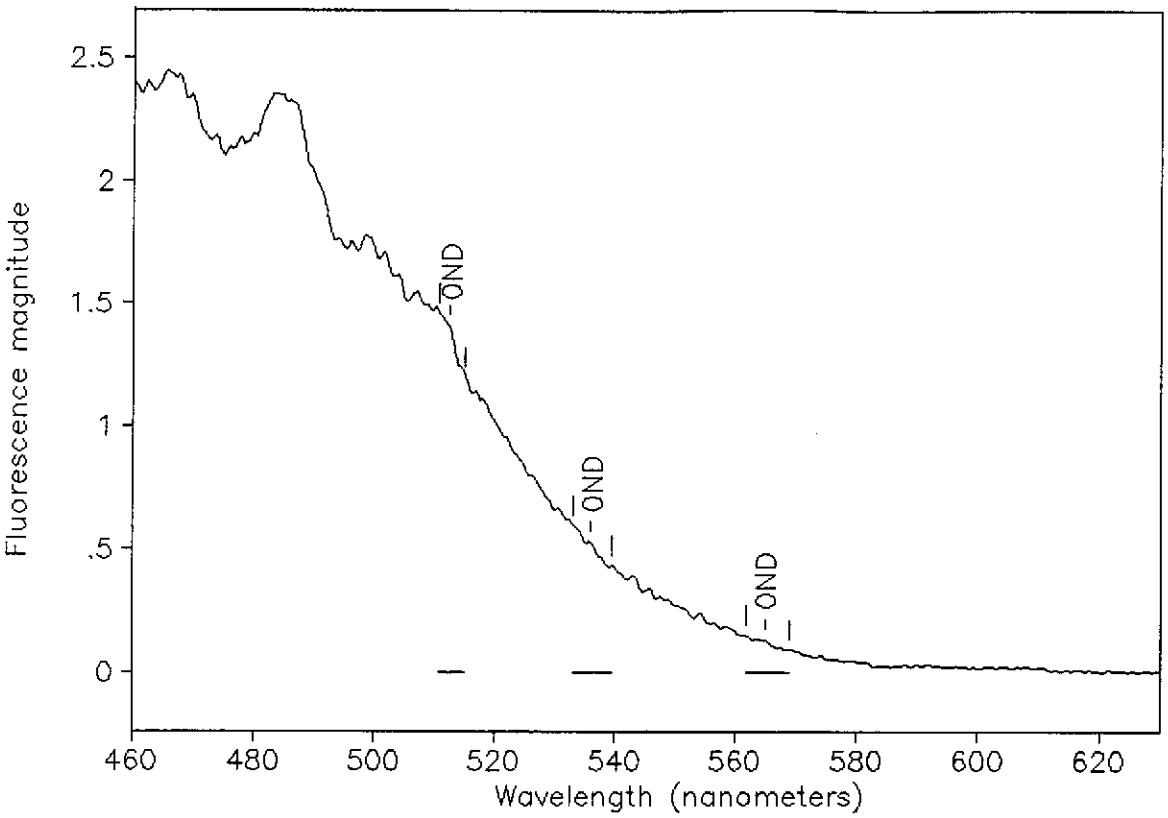


Station 8: Cortland Creek
OUL number: H9048 Type: Charcoal Analyzed: 04–06–1999
Date placed: 03–23–1999 Date recovered: 03–26–1999
Time placed: 1146 Time recovered: 1427
Clayton Environmental Station # CLD–C5

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
512.5	510.7	515.0	0	0	0	ND
536.0	533.0	539.6	0	0	0	ND
565.0	561.7	568.9	0	0	0	ND

Ozark Underground Laboratory

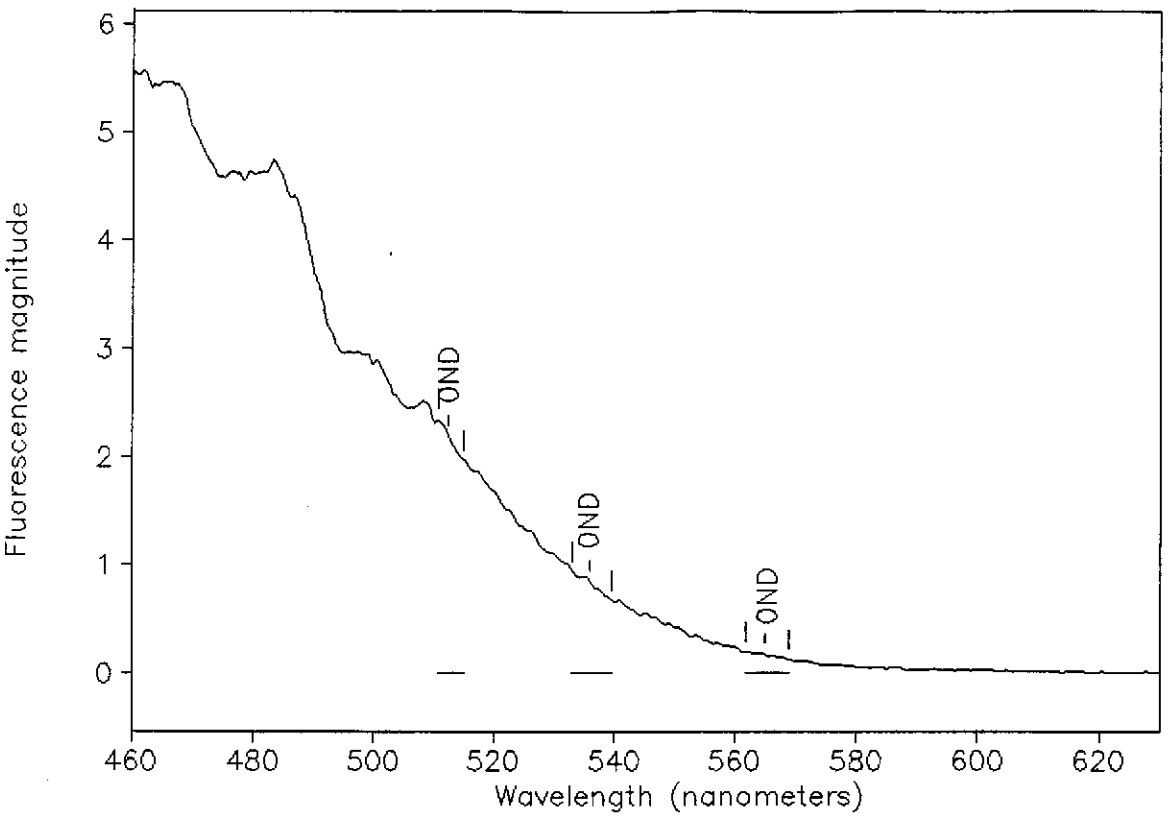


Station 3: MW CW-12
OUL number: H9049 Type: Charcoal Analyzed: 04-06-1999
Date placed: 03-23-1999 Date recovered: 03-26-1999
Time placed: 1208 Time recovered: 1452
Clayton Environmental Station # CW-12-C5

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
512.5	510.7	515.0	0	0	0	ND
536.0	533.0	539.6	0	0	0	ND
565.0	561.7	568.9	0	0	0	ND

Ozark Underground Laboratory

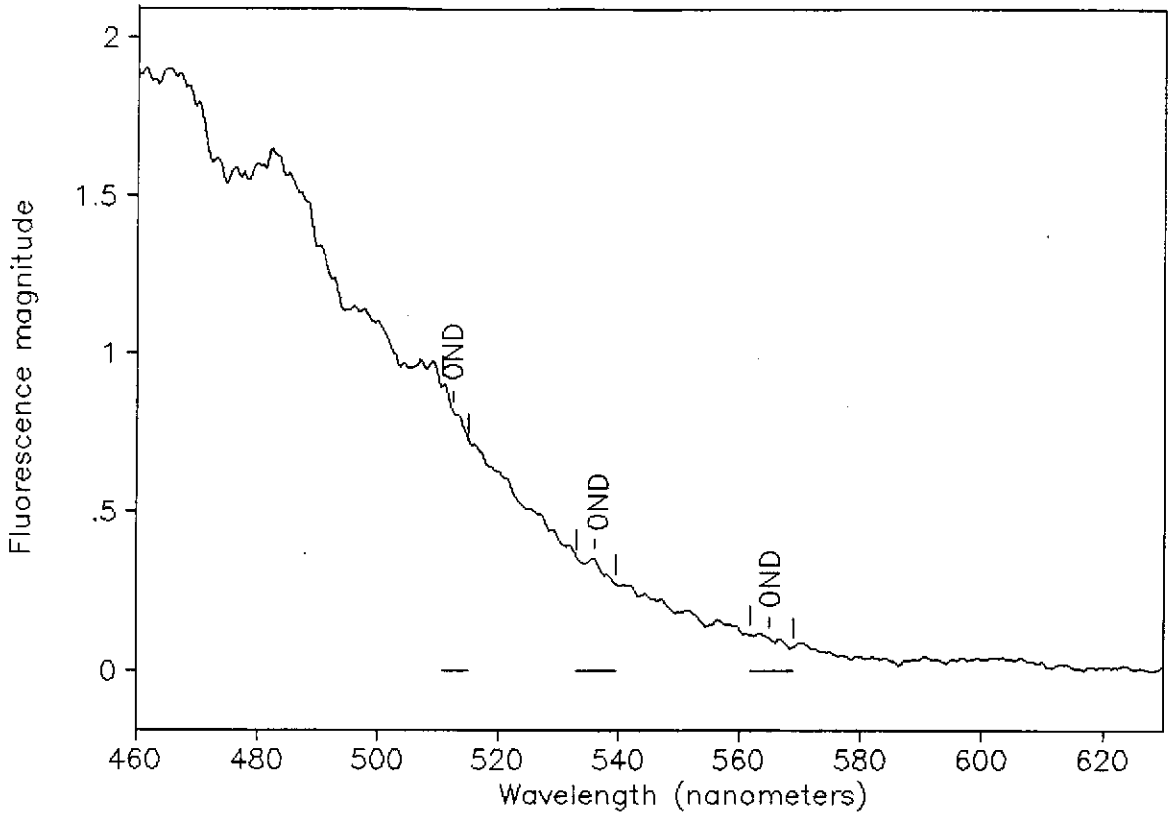


Station 4: MW CW-10
OUL number: H9050 Type: Charcoal Analyzed: 04-06-1999
Date placed: 03-23-1999 Date recovered: 03-26-1999
Time placed: Time recovered: 1504
Clayton Environmental Station # CW-10-C5

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
512.5	510.7	515.0	0	0	0	ND
536.0	533.0	539.6	0	0	0	ND
565.0	561.7	568.9	0	0	0	ND

Ozark Underground Laboratory



Station 6: MW LF-5
OUL number: H9051 Type: Charcoal Analyzed: 04-06-1999
Date placed: 03-23-1999 Date recovered: 03-26-1999
Time placed: 1249 Time recovered: 1607
Clayton Environmental Station # LF-5-C5

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
512.5	510.7	515.0	0	0	0	ND
536.0	533.0	539.6	0	0	0	ND
565.0	561.7	568.9	0	0	0	ND

OZARK UNDERGROUND LABORATORY

1572 Aley Lane • Protem, Missouri 65733 • (417) 785-4289 • FAX (417) 785-4290

April 19, 1999

CERTIFICATE OF ANALYSIS

Don Ashton
Clayton Environmental Consultants
P. O. Box 9019
Pleasanton, CA 94566

RE: Coliseum Way, Oakland, CA, Project #70-97203.00.201
Dye analysis results for charcoal samplers shipped on April 2, 1999
and water samples shipped on March 26, 1999
Ozark Underground Laboratory (OUL) numbers H9495 through H9501,
H9610 and H9611.

Dear Mr. Ashton:

We have completed analysis of the charcoal samplers received at the OUL on April 5, 1999 and the two water samples received at the OUL on March 29, 1999 per your request. We have indicated the OUL number for the samples on the enclosed table.

The fluorescein and rhodamine WT (RWT) dye concentrations are based upon standards routinely used at the OUL. The fluorescein dye is a mixture of 75% dye and 25% diluent; the RWT is a 20% solution. The concentrations are based upon the as-sold weight of the dye.

A summary of the results is presented in Table 1. Additional sampling information is available on the enclosed analysis graphs.

Sincerely,

Thomas J. Aley

Thomas Aley, PHG & RG

Enclosures:
1. Table 1. Analysis results for charcoal samplers
2. Sample Collection Data Sheets
3. Sample analysis graphs

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Ozark Underground Laboratory for
Clayton Environmental Consultants

Project name: Coliseum Way, Oakland, CA, Project #70-97203.00.201
Samples Collected by: Marc Mullaney
Sample shipped: March 26 and April 2, 1999
Sample received at OUL: March 29 and April 5, 1999
Sample analyzed by OUL: April 13 and 14, 1999

Table 1. Results for charcoal and water samples analyzed for the presence of fluorescein and rhodamine WT (RWT) dyes. Peak wavelengths are reported in nanometers (nm); dye concentrations are reported in parts per billion (ppb). Results are for charcoal elutant unless otherwise indicated.

OUL Lab #	OUL Stn. #	Clayton Stn. #	Station Name	Date Placed 1999	Date Pulled 1999	Fluorescein		RWT	
						Peak	Conc.	Peak	Conc.
H9495	1	2G-C6	Second Line G Culvert	3-26 1428	4-1 1621	511.3	1.06	ND	
H9496	8	CLD-C6	Cortland Creek	3-26 1429	4-1 1616	ND		563.2*	0.499
H9497	3	CW-12-C6	MW CW-12	3-26 1459	4-1 1632	ND		ND	
H9498	4	CW-10-C6	MW CW-10	3-26 1512	4-1 1642	ND		ND	
H9499	6	LF-5-C6	MW LF-5	3-26 1612	4-1 1659	ND		ND	
H9500	Laboratory Control Charcoal Blank								
H9501	9	Upstream-C6	Upstream	3-26 1545	4-1 1523	511.4	2.57	ND	
H9610	1	2G-W5	Second Line G Culvert	**WATER**	3-26 1426	ND		ND	
H9611	8	CLD-W5	Cortland Creek	**WATER**	3-26 1427	ND		570.0*	0.055

FOOTNOTES:

ND = None Detected

* = A deflection in the normally acceptable wavelength range for rhodamine WT (RWT) dye is present but is not sufficiently well defined at this time to be interpreted as a positive dye recovery. Should there be a positive detection of RWT in the next sampling interval this sample may in fact indicate the very earliest arrival of the dye.

Project 201
Analyzed 4-13-99 by M-Ridinger

Figure 1. Sample Collection Data Sheet

SAMPLE # 6
~~Week No.~~

SAMPLE COLLECTION DATA SHEET

SAMPLES FOR FLUORESCENCE ANALYSIS

Ozark Underground Laboratory, Inc.
1572 Aley Lane · Protem, MO 65733 · (417) 785-4289 · fax (417) 785-4290

Project: COLISEUM WAY Samples Collected By: MARC MULLANEY

Samples Shipped By: FED EX Date Samples Shipped: 4/2/99

Samples Received By: Mark Arnold @ 1300 Date Samples Received: 4/5/99

Analyze for: Fluorescein X Eosine ___ Rhodamine WT X Other ___

Bill to: CLAYTON ENVIRONMENTAL Send Results to: DON ASHTON
(925) 426-0106

FOLD WATER

for lab use only		*for field technician use — please indicate stations where dye was visible in the field*							*for lab use only*
# CHAR REC'D BY OUL	OUL NUMBER	STATION NUMBER	STATION NAME		DATE PLACED	TIME PLACED	DATE PULLED	TIME PULLED	# WATER REC'D BY OUL
2	H9495	26-16	2nd LINE 6	CARBON	3/26/99	1428	4/1/99	1621	Ø
Ø		26-W6	"	WATER		—		1610	1
2	H9496	CLD-C6	COLTLAND CREEK	CARBON		1429		1616	Ø
Ø		CLD-W6	"	WATER		—		1618	1
2	H9497	CW-12-C6	MW-CW-12	CARBON		1459		1632	Ø
Ø		CW-12-W6	MW-CW-12	WATER		—		1634	1
2	H9498	CW-10-C6	MW-CW-10	CARBON		1572		1642	Ø
Ø		CW-10-W6	"	WATER		—		1647	1
		~~CW-10-C6~~							
2	H9499	LF-5-C6	MW-LF-5	CARBON		1612		1659	Ø
Ø		LF-5-W6	"	WATER		—		1702	1
2	H9501	UPSTREAM-C6	UPSTREAM	CARBON	✓	1545	✓	1523	Ø
Ø		UPSTREAM-W6	"	WATER	✓	—	✓	1537	1

Comments: H9500 = Charcoal Blank

Charts for samples on this page proofed by OUL staff ___

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Project #269
enclosed 4-14-99
by M. Rehinge

SAMPLE COLLECTION DATA SHEET

Week No. _____

SAMPLES FOR FLUORESCENCE ANALYSIS

Ozark Underground Laboratory, Inc.
1572 Aley Lane · Protem, MO 65733 · (417) 785-4289 · fax (417) 785-4290

Project: Coliseum Way Samples Collected By: Marc Mullaney

Samples Shipped By: Fed Ex Date Samples Shipped: 3/26/99

Samples Received By: Lisa Landry @ 1330 Date Samples Received: 3/29/99

Analyze for: Fluorescein X Eosine ____ Rhodamine WT X Other ____

Bill to: Clayton Environmental Send Results to: Don Ashton
F(925)426-0106

for lab use only **These lab #'s are for Water only**		*for field technician use* *please indicate stations where dye was visible in the field*					*for lab use only*
# CHAR REC'D BY OUL	OUL LAB NUMBER	OUL STATION NUMBER	STATION NAME + Clayton Environ. Station #	DATE PLACED	TIME PLACED	DATE PULLED	TIME PULLED	# WATER REC'D BY OUL
Samples logged in on another sheet	H9610	10	2G-W5-2nd Line "G" Culvert			3/26	1426	Samples logged in on another sheet
	H9611	11	CLD-W5-Cortland Creek			3/26	1427	
Samples logged in on another sheet								Samples logged in on another sheet
Samples logged in on another sheet								Samples logged in on another sheet
Samples logged in on another sheet								Samples logged in on another sheet
Samples logged in on another sheet								Samples logged in on another sheet

Comments: _____

This Sheet filled out by OUL staff. Charts for samples on this page proofed by OUL

Figure 1. Sample Collection Data Sheet

SAMPLE # 5

SAMPLE COLLECTION DATA SHEET Week No. 5

SAMPLES FOR FLUORESCENCE ANALYSIS

Ozark Underground Laboratory, Inc.
1572 Aley Lane · Protem, MO 65733 · (417) 785-4289 · fax (417) 785-4290

Project: COLISEUM WAY Samples Collected By: MARC MULLANEY

Samples Shipped By: FED EX Date Samples Shipped: 3/26/99

Samples Received By: Lora Landry @ 1330 Date Samples Received: 3/29/99

Analyze for: Fluorescein X Eosine ____ Rhodamine WT X Other ____

Bill to: CLAYTON ENVIRONMENTAL Send Results to: DON ASHTON
F (925) 426-0106

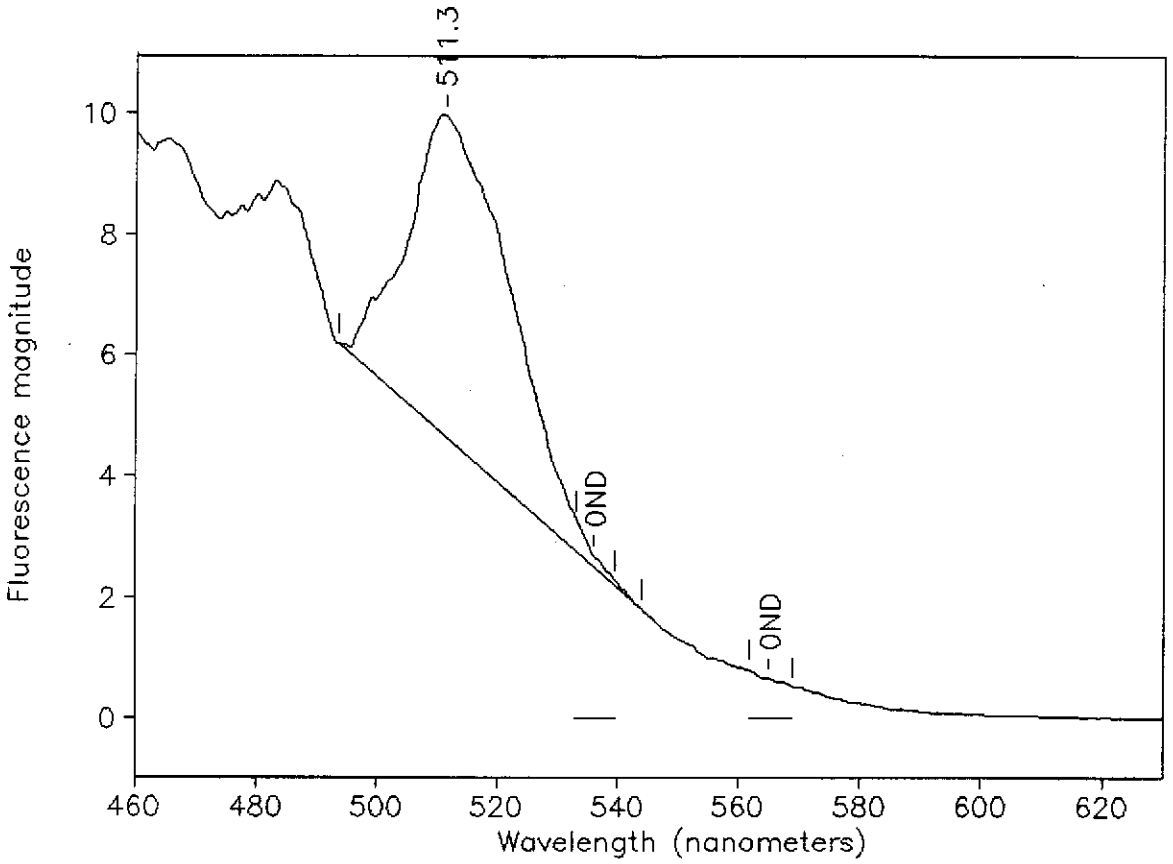
for lab use only		*for field technician use please indicate stations where dye was visible in the field*						*for lab use only*
# CHAR REC'D BY OUL	OUL NUMBER	STATION NUMBER	STATION NAME	DATE PLACED	TIME PLACED	DATE PULLED	TIME PULLED	# WATER REC'D BY OUL
		2G-C5	2ND LINE "G" CULVERT	3/23/99	1153	3/26/99	1426	
		CLD-C5	CORTLAND CREEK	↓	1146		1427	
		CW-12-C5	MW-CW-12	↓	1208		1452	
		CW-12-W5	MW-CW-12	—	—		1457	
		2G-W5	2ND LINE "G" CULVERT	—	—		1426	
		CLD-W5	CORTLAND CREEK	—	—		1427	
		CW-10-C5	MW-CW-10	3/23/99			1504	
		CW-10-W5	MW-CW-10	—	—		1507	
		LF-5-C5	MW-LF-5	3/23/99	1249	↓	1607	
		LF-5-W5	MW-LF-5	—	—	↓	1608	

HOLD WATER SAMPLES

Comments: ____

Charts for samples on this page proofed by OUL staff ____

Ozark Underground Laboratory

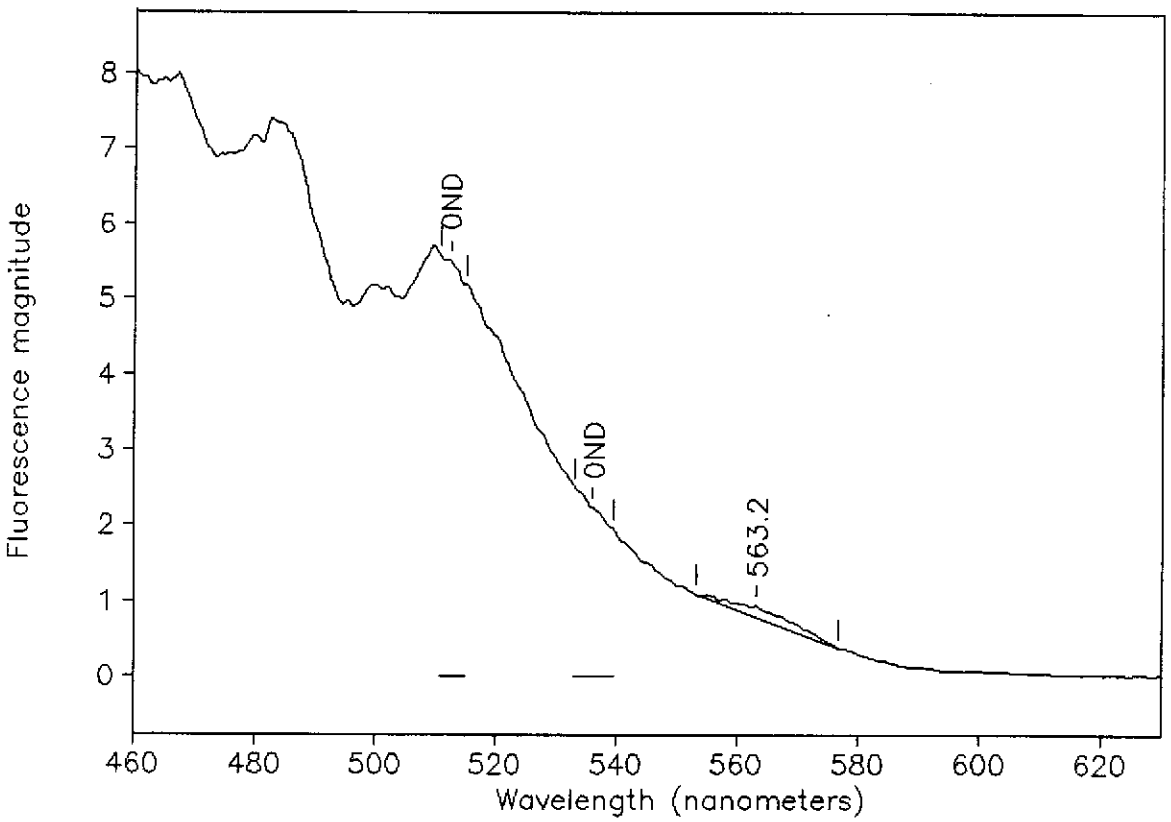


Station 1: Second Line G Culvert
OUL number: H9495 Type: Charcoal Analyzed: 04-13-1999
Date placed: 03-26-1999 Date recovered: 04-01-1999
Time placed: 1428 Time recovered: 1621
Clayton Environmental Station # 2G-C6

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
511.3	493.6	544.0	5.32	109.66	0.05	1.06
536.0	533.0	539.6	0	0	0	ND
565.0	561.7	568.9	0	0	0	ND

Ozark Underground Laboratory

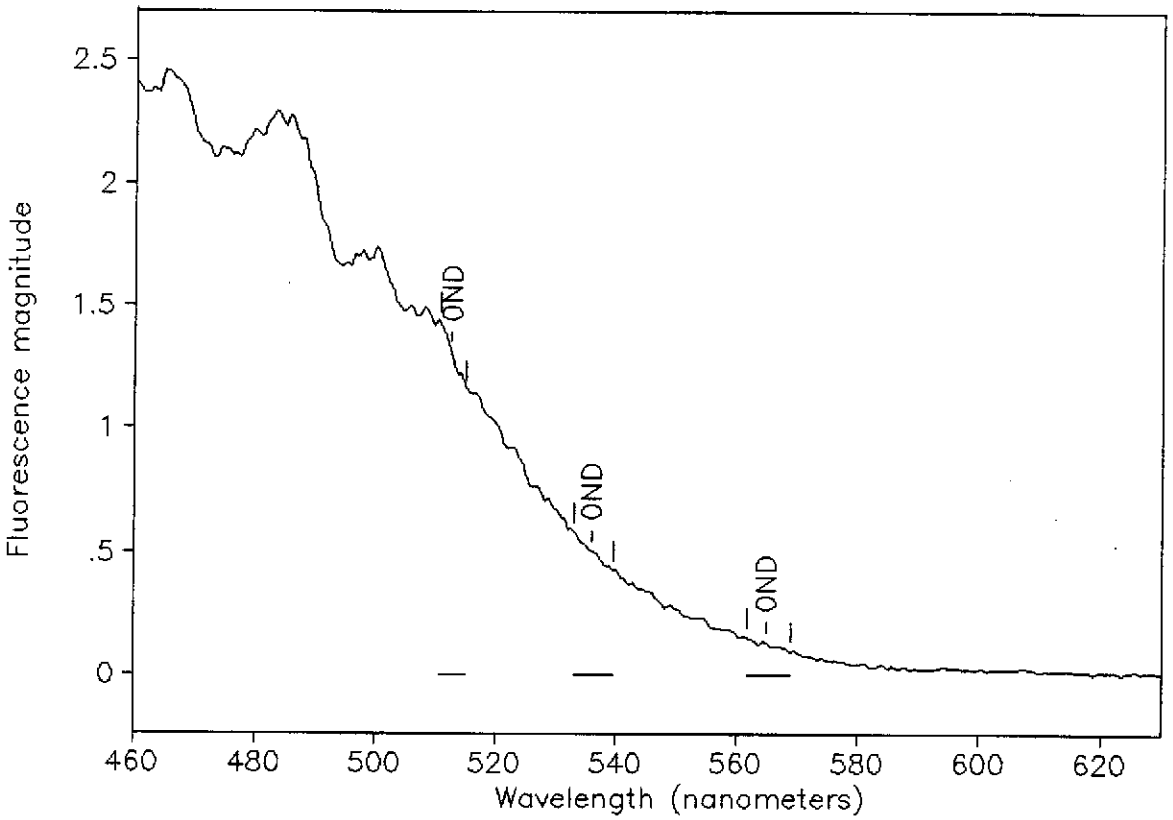


Station 8: Cortland Creek
OUL number: H9496 Type: Charcoal Analyzed: 04–13–1999
Date placed: 03–26–1999 Date recovered: 04–01–1999
Time placed: 1429 Time recovered: 1616
Clayton Environmental Station # CLD–C6

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
512.5	510.7	515.0	0	0	0	ND
536.0	533.0	539.6	0	0	0	ND
563.2	553.2	576.8	0.16	2.01	0.08	0.499

Ozark Underground Laboratory

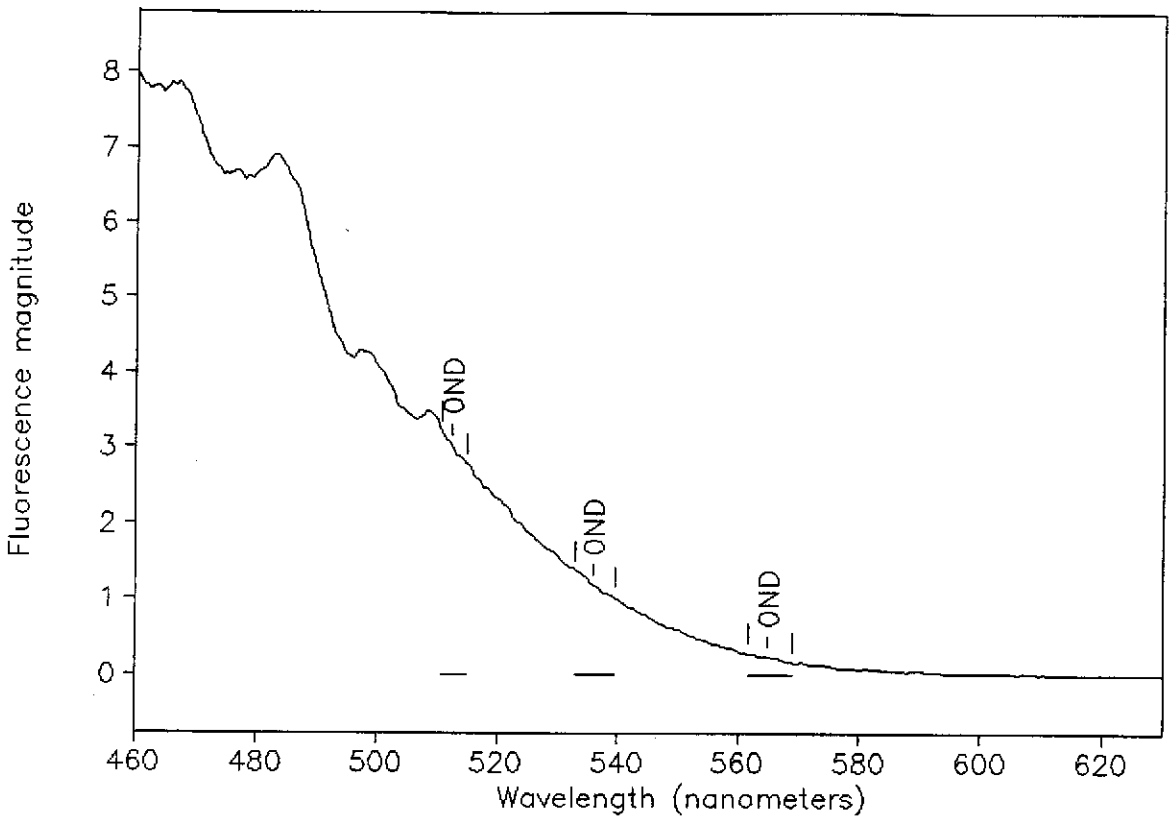


Station 3: MW CW-12
OUL number: H9497 Type: Charcoal Analyzed: 04-13-1999
Date placed: 03-26-1999 Date recovered: 04-01-1999
Time placed: 1459 Time recovered: 1632
Clayton Environmental Station # CW-12-C6

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
512.5	510.7	515.0	0	0	0	ND
536.0	533.0	539.6	0	0	0	ND
565.0	561.7	568.9	0	0	0	ND

Ozark Underground Laboratory

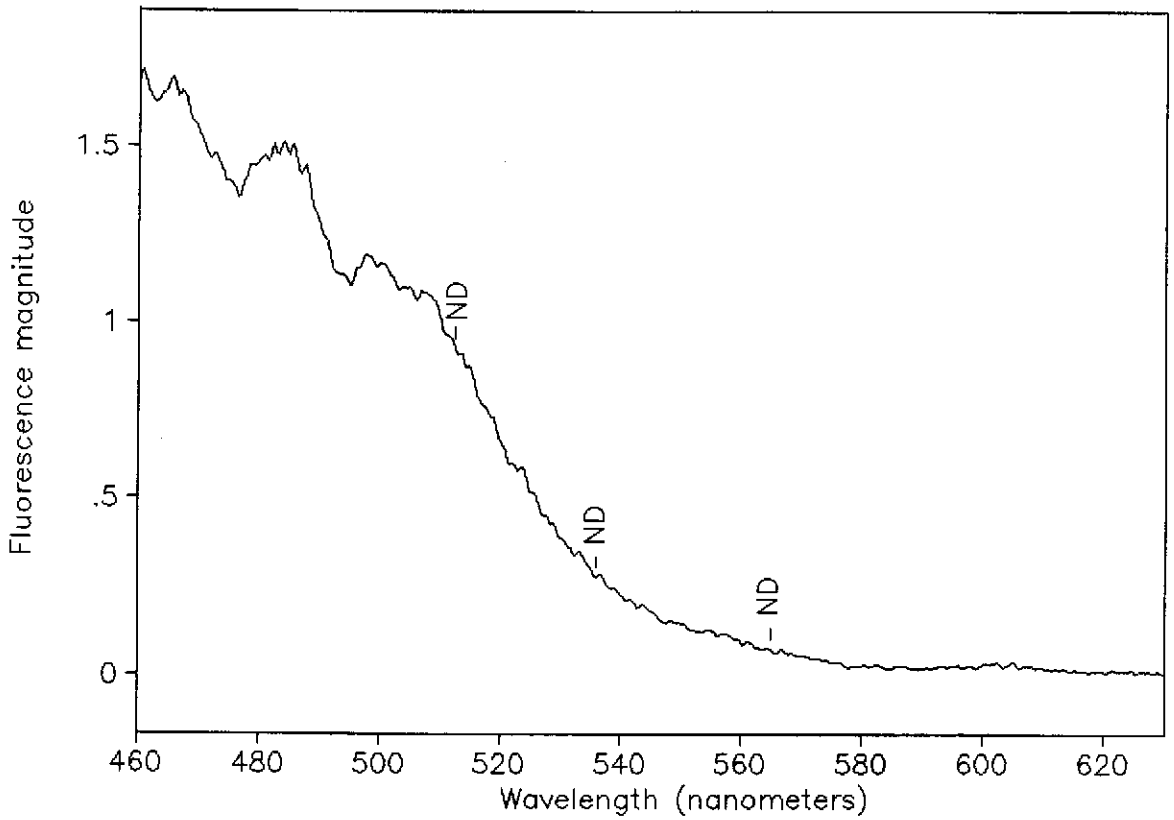


Station 4: MW CW-10
OUL number: H9498 Type: Charcoal Analyzed: 04-13-1999
Date placed: 03-26-1999 Date recovered: 04-01-1999
Time placed: 1512 Time recovered: 1642
Clayton Environmental Station # CW-10-C6

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
512.5	510.7	515.0	0	0	0	ND
536.0	533.0	539.6	0	0	0	ND
565.0	561.7	568.9	0	0	0	ND

Ozark Underground Laboratory

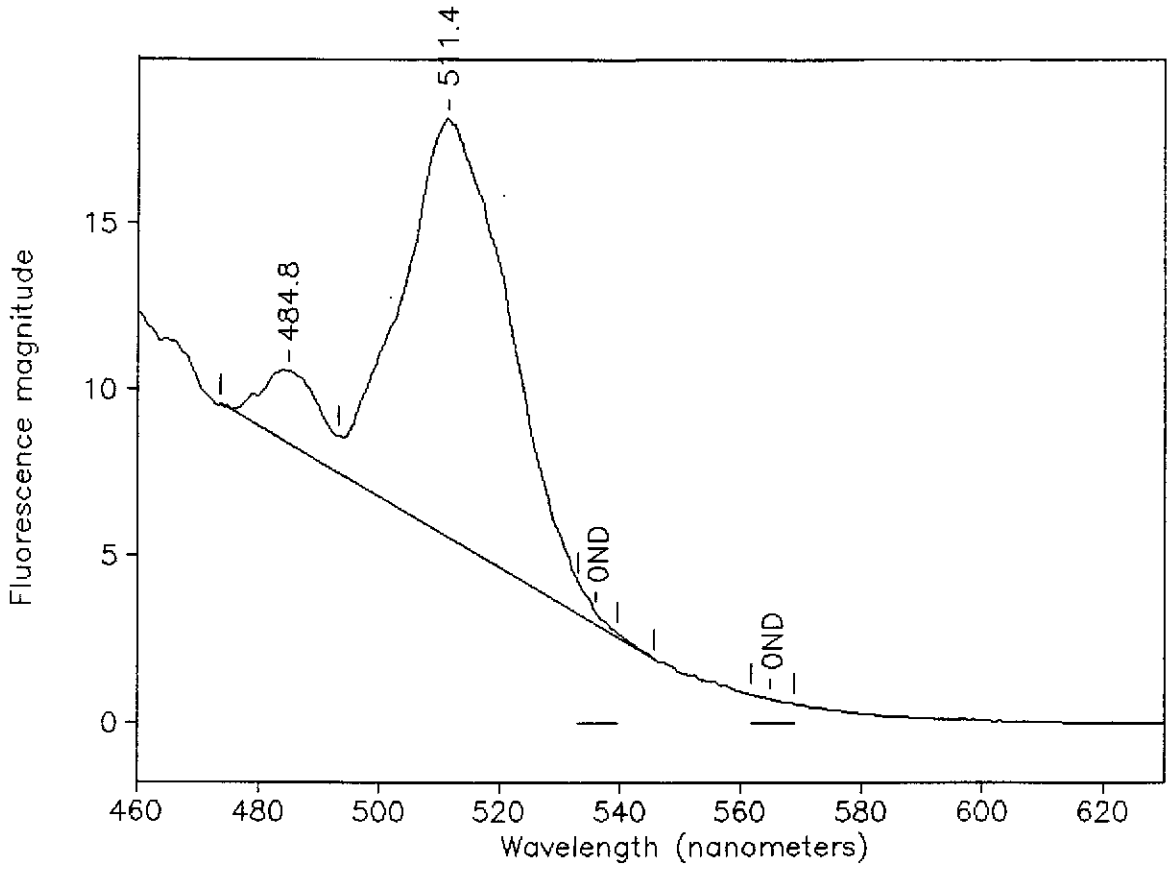


Station 6: MW LF-5
OUL number: H9499 Type: Charcoal Analyzed: 4-13-1999
Date placed: 3-26-1999 Date recovered: 4-1-1999
Time placed: 1612 Time recovered: 1659
Clayton Environmntal Station # LF-5-C6

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
512.5	510.7	515.0	0	0	0	ND
536.0	533.0	539.6	0	0	0	ND
565.0	561.7	568.9	0	0	0	ND

Ozark Underground Laboratory



Station 9: Upstream
OUL number: H9501 Type: Charcoal Analyzed: 4–13–1999
Date placed: 3–26–1999 Date recovered: 4–1–1999
Time placed: 1545 Time recovered: 1523
Clayton Environmental Station # Upstream–C6

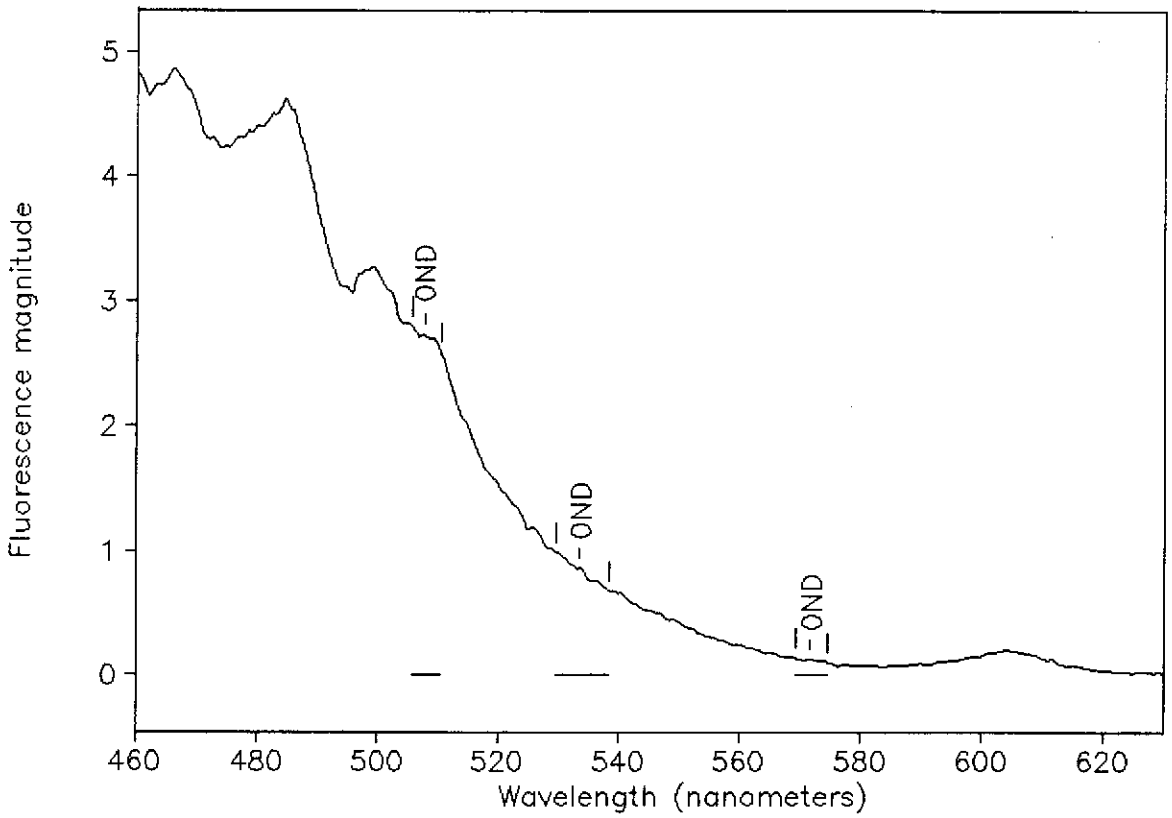
Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
511.4	493.2	545.6	12.58	265.09	0.05	2.57
536.0	533.0	539.6	0	0	0	ND
565.0	561.7	568.9	0	0	0	ND

Peaks close to normal range of tracer dyes:

484.8	473.6	493.2	2.19	25.28	0.09	0

Ozark Underground Laboratory

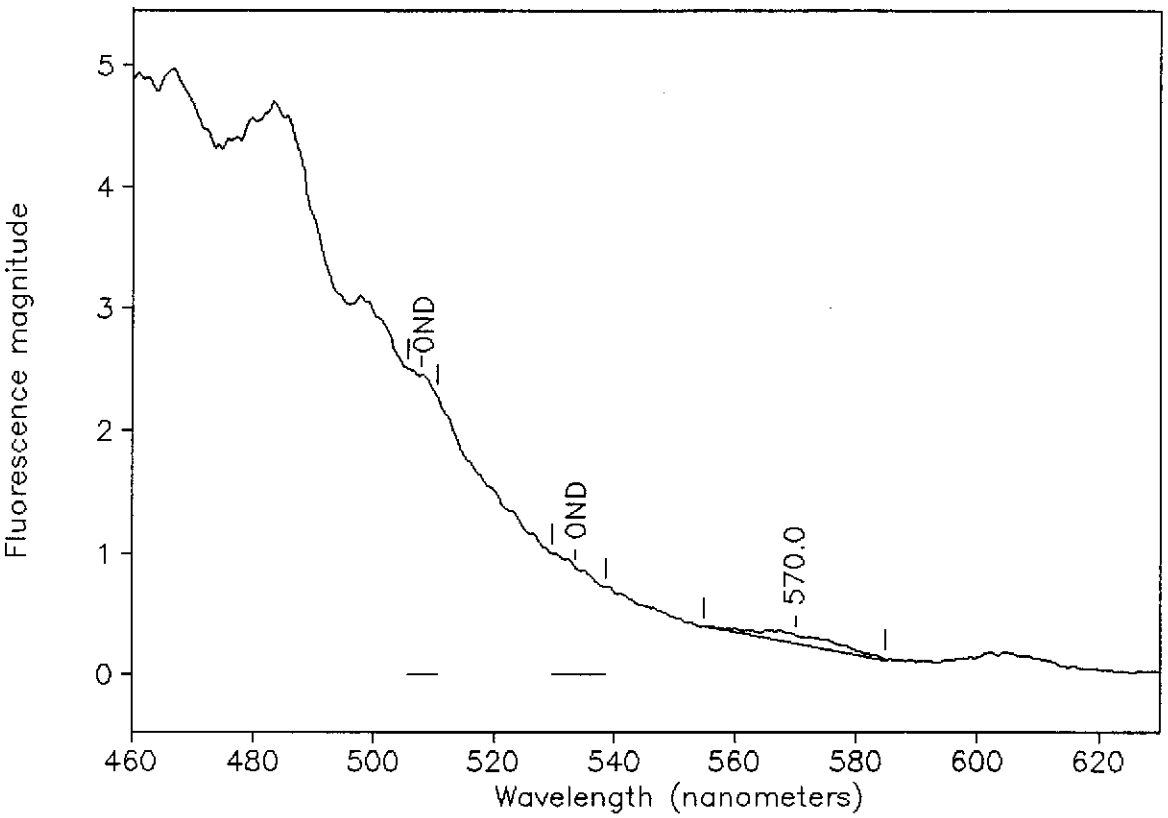


Station 1: Second Line G Culvert
OUL number: H9610 Type: Water Analyzed: 04-14-1999
Date collected: 03-26-1999 Time collected: 1426
Clayton Environmental Station # 2G-W5

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
507.7	505.6	510.5	0	0	0	ND
533.5	529.6	538.4	0	0	0	ND
571.8	569.4	574.8	0	0	0	ND

Ozark Underground Laboratory



Station 8: Cortland Creek
OUL number: H9611 Type: Water Analyzed: 04–14–1999
Date collected: 03–26–1999 Time collected: 1427
Clayton Environmental Station # CLD–W5

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
507.7	505.6	510.5	0	0	0	ND
533.5	529.6	538.4	0	0	0	ND
570.0	554.8	584.8	0.06	1.37	0.05	0.055

OZARK UNDERGROUND LABORATORY

1572 Aley Lane • Protem, Missouri 65733 • (417) 785-4289 • FAX (417) 785-4290

April 27, 1999

CERTIFICATE OF ANALYSIS

Don Ashton
Clayton Environmental Consultants
P. O. Box 9019
Pleasanton, CA 94566

RE: Coliseum Way, Oakland, CA, Project #70-97203.00.201
Dye analysis results for charcoal samplers shipped on April 12, 1999.
Ozark Underground Laboratory (OUL) numbers H9695 through H9700.

Dear Mr. Ashton:

We have completed analysis of the charcoal samplers received at the OUL on April 13, 1999. We have indicated the OUL number for the samplers on the enclosed table.

The fluorescein and rhodamine WT (RWT) dye concentrations are based upon standards routinely used at the OUL. The fluorescein dye is a mixture of 75% dye and 25% diluent; the RWT is a 20% solution. The concentrations are based upon the as-sold weight of the dye.

A summary of the results is presented in Table 1. Additional sampling information is available on the enclosed analysis graphs.

Sincerely,

Thomas J. Aley

Thomas Aley, PHG & RG

Enclosures:
1. Table 1. Analysis results for charcoal samplers
2. Sample Collection Data Sheets
3. Discrepancy sheet
4. Sample analysis graphs

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Ozark Underground Laboratory for
Clayton Environmental Consultants

Project name: Coliseum Way, Oakland, CA, Project #70-97203.00.201
Samples Collected by: Marc Mullaney
Sample shipped: April 12, 1999
Sample received at OUL: April 13, 1999
Sample analyzed by OUL: April 21, 1999

Table 1. Results for charcoal samplers analyzed for the presence of fluorescein and rhodamine WT (RWT) dyes. Peak wavelengths are reported in nanometers (nm); dye concentrations are reported in parts per billion (ppb).

OUL Lab #	OUL Stn. #	Clayton Stn. #	Station Name	Date Placed 1999	Date Pulled 1999	Fluorescein		RWT	
						Peak	Conc.	Peak	Conc.
H9695	1	2G-C7	Second Line G Culvert	4-1 1621	4-8 1537	510.8*	1.20	ND	
H9696	8	CLD-C7	Cortland Creek	4-1 1616	4-8 1528	ND		561.9	3.05
H9697	3	CW-12-C7	MW CW-12	4-1 1638	4-8 1546	ND		ND	
H9698	4	CW-10-C7	MW CW-10	4-1 1650	4-8 1556	ND		ND	
H9699	6	LF-5-C7	MW LF-5	4-1 1706	4-8 1636	ND		ND	
H9700	Laboratory Control Charcoal Blank								

FOOTNOTES:

* = A fluorescence peak is present that is atypical in shape but in the normally acceptable wavelength range for fluorescein dye in elutant (510.7 to 515.0 nm) and has been calculated as a positive dye recovery.

ND = None Detected

Ozark Underground Laboratory

Project #269
Analyzed 4-26-99
by M Ridinger

Dye Analysis Procedures and Criteria

Figure 1. Sample Collection Data Sheet

SAMPLE # 7

SAMPLE COLLECTION DATA SHEET

SAMPLES FOR FLUORESCENCE ANALYSIS

Ozark Underground Laboratory, Inc.

1572 Aley Lane - Protem, MO 65733 - (417) 785-4289 - fax (417) 785-4290

Project: COLISEUM WAY Samples Collected By: MARC MULLANEY

Samples Shipped By: FED EX Date Samples Shipped: 4/12/99

Samples Received By: Marty Armbrust @ 1230 Date Samples Received: 4/13/99

Analyze for: Fluorescein X Eosine ( ) Rhodamine WT X Other:

Bill to: CLAYTON ENVIRONMENTAL Send Results to: DON ASHTON (925) 426-0106 (F)

for lab use only		*for field technician use* *please indicate stations where dye was visible in the field*						*for lab use only*
# CHAR REC'D BY OUL	OUL NUMBER	STATION NUMBER	STATION NAME	DATE PLACED	TIME PLACED	DATE PULLED	TIME PULLED	# WATER REC'D BY OUL
1	H9695	26-C7	2ND LINE & CULVERT	4/1/99	1621	4/8/99	1537	0
0		26-W7	"	—	—		1537	1
1	H9696	CLD-C7	CORTLAND CREEK	4/1/99	1616		1528	0
0		CLD-W7	"	—	—		1528	1
1	H9697	CW-12-C7	MW-CW-12	4/1/99	1638		1546	0
0		CW-12-W7	" " "	—	—		1549	1
2	H9698	CW-10-C7	MW-CW-12 *	4/1/99	1650		1556	0
1	H9699	LF-5-C7	MW-LF-5	4/1/99	1706		1636	0
0		CW-10-W7	MW-CW-12 *	—	—		1600	1
0		LF-5-W7	MW-LF-5	—	—		1639	1
		~~UPSTREAM-C7~~	~~UPSTREAM CULVERT~~	~~4/1/99~~	~~1543~~		~~1619~~	LOST SAMPLE
0		UPSTREAM-W7	" "	—	—		1619	1

HOLD H2O SAMPLES

Comments: H9700 = Charcoal Blank

Charts for samples on this page proofed by OUL staff _____

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* See discrepancy sheet - mma

OZARK UNDERGROUND LABORTORY

DISCREPANCIES BETWEEN CHAIN-OF-CUSTODY SHEETS AND ACTUAL SAMPLES RECEIVED Page 1 of 1

Company & Project Name: Clayton Environmental - Coliseum Way **Date Rec'd by OUL:** 4-13-99 **Wk #** _____

Lab #	Sta #	Station Name	Date Pulled	Problem	Solution
11298	CW-10-C7	Charcoal	4/8/99 1554	Stn # on COC & ziplock both indicate CW-10. Previously this # has been associated with stn. name MW-CW-10. However the stn name indicated on this COC is MW-CW-12. There is also a sample with the stn #, name & packet all indicate CW-12 & was analyzed as such.	This sample has been analyzed as MW-CW-10. mma
—	CW-10-C7	Water		Same as above	Analysis on hold. mma

Comments:

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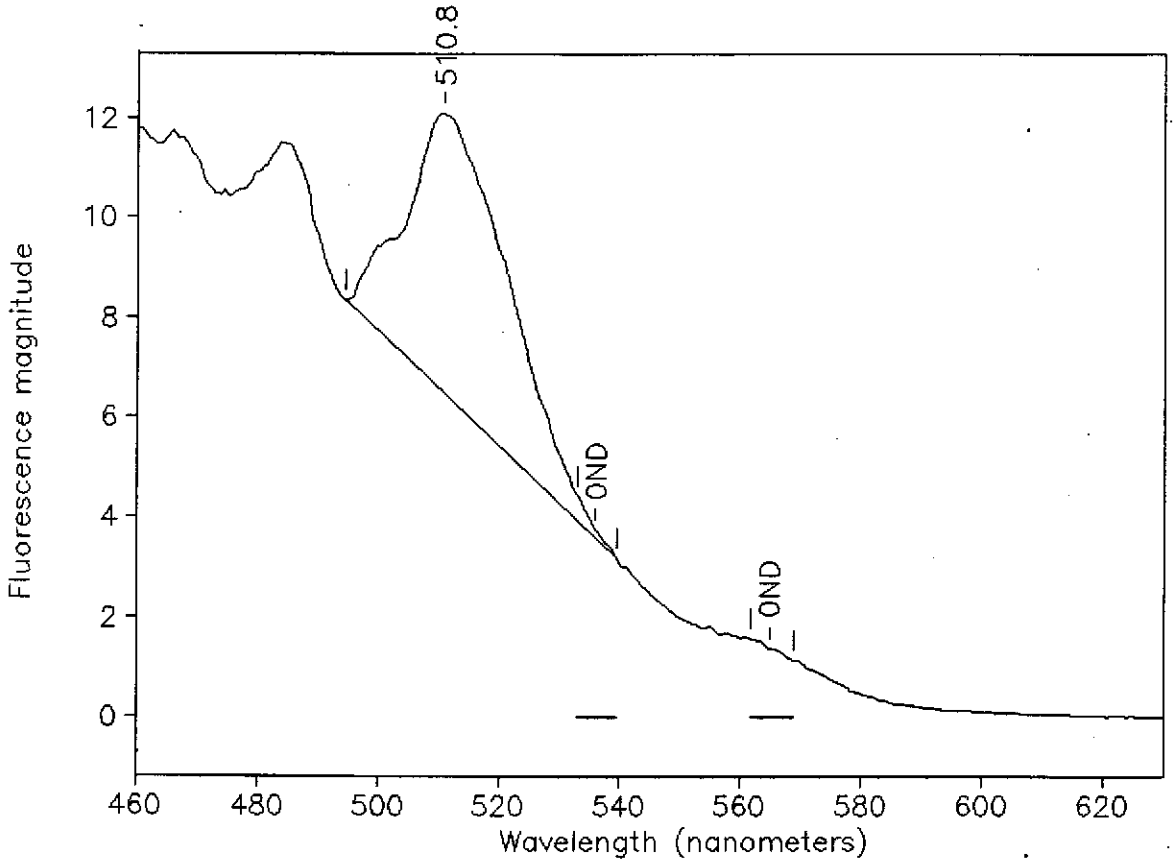
Ozark Underground Laboratory

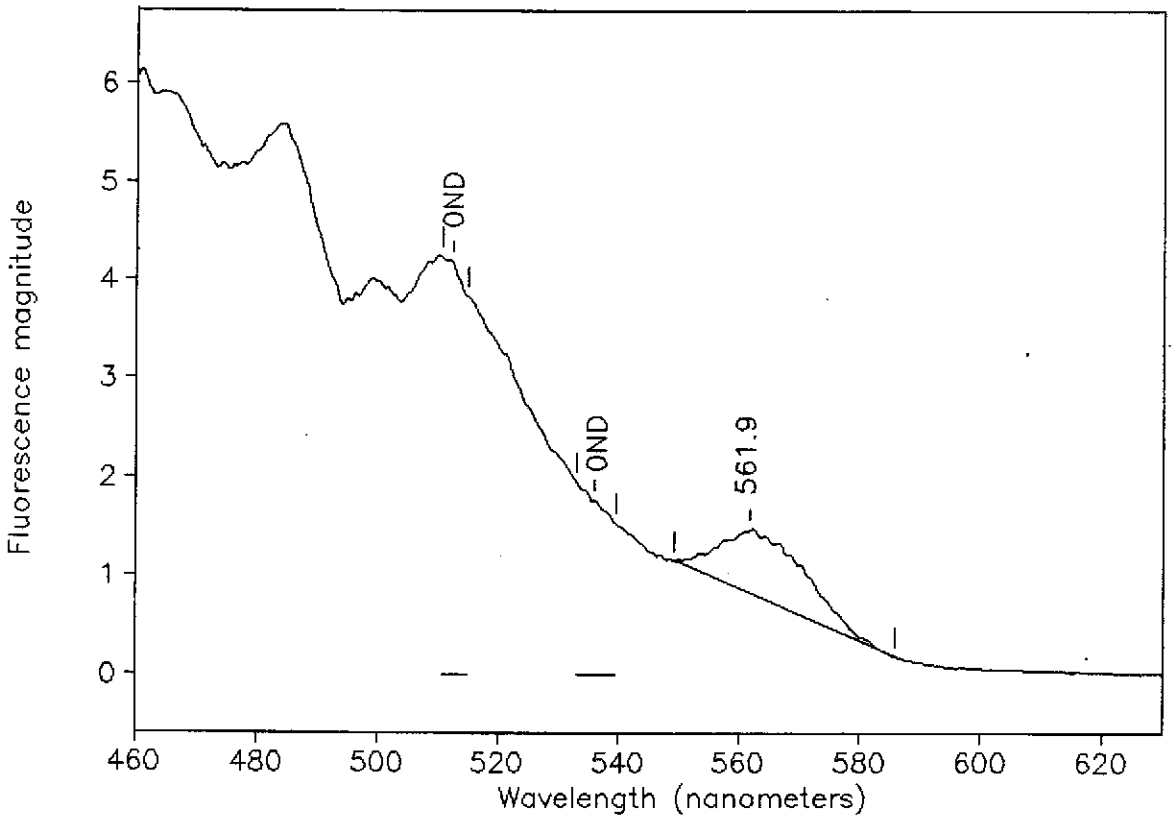


Station 1: Second Line G Culvert
OUL number: H9695 Type: Charcoal Analyzed: 4–21–1999
Date placed: 4–1–1999 Date recovered: 4–8–1999
Time placed: 1621 Time recovered: 1537
Clayton Environmental Station # 2G–C7

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
510.8	494.4	539.6	5.65	114.24	0.05	1.20
536.0	533.0	539.6	0	0	0	ND
565.0	561.7	568.9	0	0	0	ND

Ozark Underground Laboratory

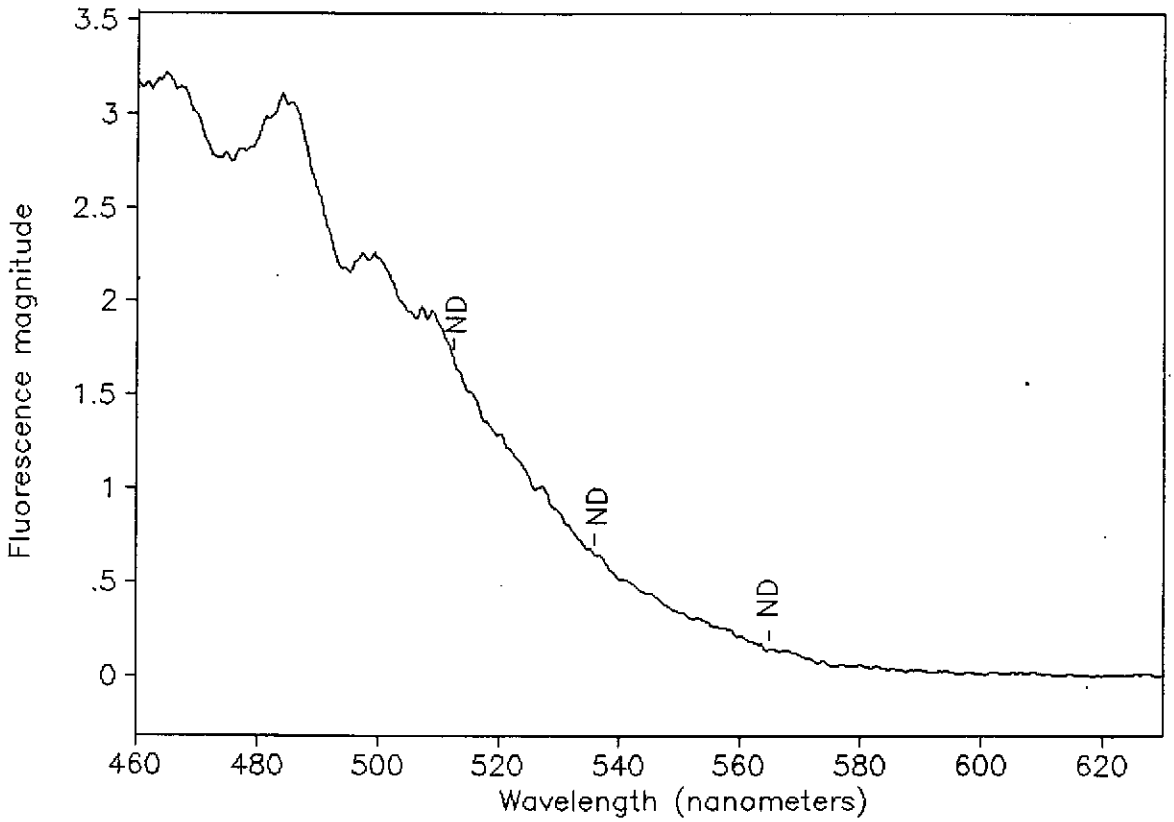


Station 8: Cortland Creek
OUL number: H9696 Type: Charcoal Analyzed: 4–21–1999
Date placed: 4–1–1999 Date recovered: 4–8–1999
Time placed: 1616 Time recovered: 1528
Clayton Environmental Station # CLD–C7

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
512.5	510.7	515.0	0	0	0	ND
536.0	533.0	539.6	0	0	0	ND
561.9	549.2	586.0	0.65	11.54	0.06	3.05

Ozark Underground Laboratory

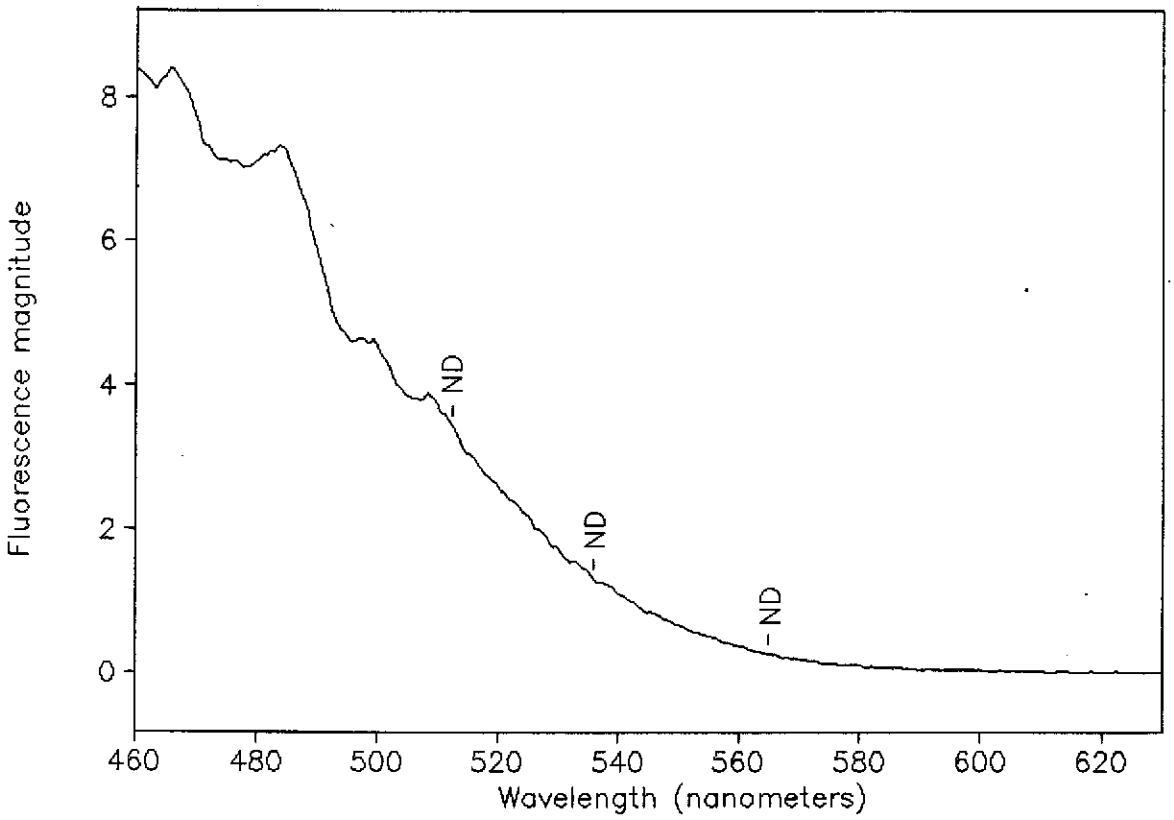


Station 3: MW CW-12
OUL number: H9697 Type: Charcoal Analyzed: 4-21-1999
Date placed: 4-1-1999 Date recovered: 4-8-1999
Time placed: 1638 Time recovered: 1546
Clayton Environmental Station # CW-12-C7

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
512.5	510.7	515.0	0	0	0	ND
536.0	533.0	539.6	0	0	0	ND
565.0	561.7	568.9	0	0	0	ND

Ozark Underground Laboratory

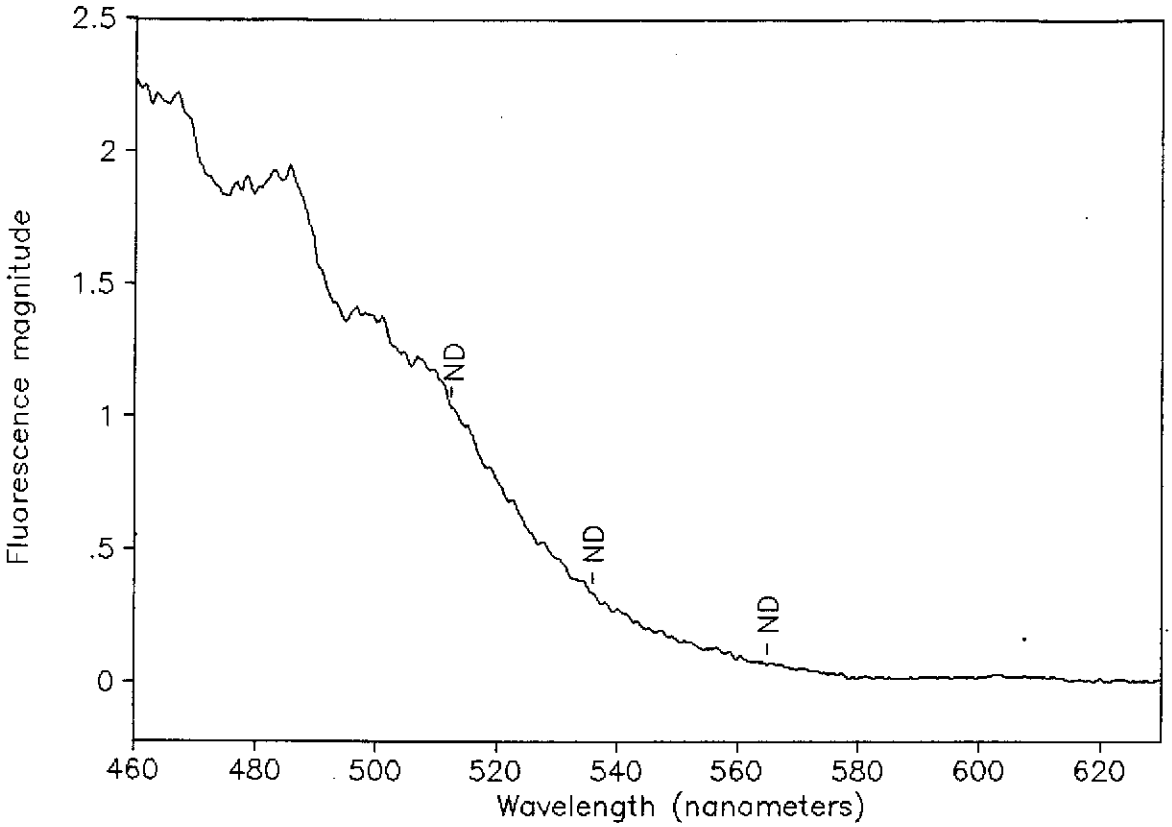


Station 4: MW CW–10
OUL number: H9698 Type: Charcoal Analyzed: 4–21–1999
Date placed: 4–1–1999 Date recovered: 4–8–1999
Time placed: 1650 Time recovered: 1556
Clayton Environmental Station # CW–10–C7

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
512.5	510.7	515.0	0	0	0	ND
536.0	533.0	539.6	0	0	0	ND
565.0	561.7	568.9	0	0	0	ND

Ozark Underground Laboratory



Station 6: MW LF-5
OUL number: H9699 Type: Charcoal Analyzed: 4-21-1999
Date placed: 4-1-1999 Date recovered: 4-8-1999
Time placed: 1706 Time recovered: 1636
Clayton Environmental Station # LF-5-C7

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
512.5	510.7	515.0	0	0	0	ND
536.0	533.0	539.6	0	0	0	ND
565.0	561.7	568.9	0	0	0	ND

OZARK UNDERGROUND LABORATORY

1572 Aley Lane • Protem, Missouri 65733 • (417) 785-4289 • FAX (417) 785-4290

May 4, 1999

CERTIFICATE OF ANALYSIS

Don Ashton
Clayton Environmental Consultants
P. O. Box 9019
Pleasanton, CA 94566

RE: Coliseum Way, Oakland, CA, Project #70-97203.00.201
Dye analysis results for charcoal and water samples shipped on April 26, 1999.
Ozark Underground Laboratory (OUL) numbers H9982 through H9998.

Dear Mr. Ashton:

We have completed analysis of the charcoal and water samples received at the OUL on April 27, 1999. We have indicated the OUL number for the samples on the enclosed table.

The fluorescein and rhodamine WT (RWT) dye concentrations are based upon standards routinely used at the OUL. The fluorescein dye is a mixture of 75% dye and 25% diluent; the RWT is a 20% solution. The concentrations are based upon the as-sold weight of the dye.

A summary of the results is presented in Table 1. Additional sampling information is available on the enclosed analysis graphs.

Sincerely,

Thomas J. Aley

Thomas Aley, PHG & RG

Enclosures:
1. Table 1. Analysis results for charcoal and water samples
2. Sample Collection Data Sheets
3. Sample analysis graphs

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Ozark Underground Laboratory for
Clayton Environmental Consultants

Project name: Coliseum Way, Oakland, CA, Project #70-97203.00.201
Samples Collected by: Marc Mullaney
Sample shipped: April 26, 1999
Sample received at OUL: April 27, 1999
Sample analyzed by OUL: May 3, 1999

Table 1. Results for charcoal and water samples analyzed for the presence of fluorescein and rhodamine WT (RWT) dyes. Peak wavelengths are reported in nanometers (nm); dye concentrations are reported in parts per billion (ppb). All results are for charcoal elutant unless otherwise indicated.

OUL Lab #	OUL Stn. #	Clayton Stn. #	Station Name	Date Placed 1999	Date Pulled 1999	Fluorescein		RWT	
						Peak	Conc.	Peak	Conc.
H9982	1	2G-C8	Second Line G Culvert	4-8 1540	4-15 1742	ND		ND	
H9983	8	CLD-C8	Cortland Creek	4-8 1535	4-15 1733	ND		562.0	1.83
H9984	3	CW-12-C8	MW CW-12	4-8 1551	4-15 1749	ND		ND	
H9985	4	CW-10-C8	MW CW-10	4-8 1601	4-15 1800	ND		ND	
H9986	6	LF-5-C8	MW LF-5	4-8 1643	4-15 1813	ND		ND	
H9987	9	Upstream-C8	Upstream	4-8 1631	4-15 1647	ND		ND	
H9988	8	CLD-C9	Cortland Creek	4-15 1733	4-22 1250	ND		563.4	36.6
H9989	1	2G-C9	Second Line G Culvert	4-15 1742	4-22 1301	511.6	0.796	ND	
H9990	3	CW-12-C9	MW CW-12	4-15 1753	4-22 1315	ND		ND	
H9991	4	CW-10-C9	MW CW-10	4-15 1804	4-22 1322	ND		ND	
H9992	9	Upstream-C9	Upstream	4-15 1652	4-22 1350	511.4	1.30	ND	
H9993	1	2G-W8	Second Line G Culvert	**Water**	4-15 1742	ND		ND	
H9994	8	CLD-W8	Cortland Creek	**Water**	4-15 1733	ND		ND	
H9995	9	Upstream-W8	Upstream	**Water**	4-15 1700	505.2*	0.063	ND	
H9996	8	CLD-W9	Cortland Creek	**Water**	4-22 1250	ND		570.0	1.98
H9997	1	2G-W9	Second Line G Culvert	**Water**	4-22 1301	ND		ND	
H9998	9	Upstream-W9	Upstream	**Water**	4-22 1356	ND		ND	

FOOTNOTES:

ND = None Detected

* = A fluorescence peak is present that is out of the normally acceptable wavelength range for fluorescein dye in water (505.6 to 510.5 nm) but has been calculated as a positive dye recovery.

Project Day
Analyzed 5-3-99
by M. Ridinger

Figure 1. Sample Collection Data Sheet

SAMPLE # ~~Week No.~~ 8

SAMPLE COLLECTION DATA SHEET

SAMPLES FOR FLUORESCENCE ANALYSIS

Ozark Underground Laboratory, Inc.
1572 Aley Lane · Protem, MO 65733 · (417) 785-4289 · fax (417) 785-4290

Project: COLISEUM WAY Samples Collected By: MARC MULLANEY

Samples Shipped By: FED EX Date Samples Shipped: 4/26/99

Samples Received By: Marty Arnold @ 1230 Date Samples Received: 4/27/99

Analyze for: Fluorescein X Eosine ___ Rhodamine WT X Other ___

Bill to: CLAYTON ENVIRONMENTAL Send Results to: DON ASHTON

for lab use only		*for field technician use please indicate stations where dye was visible in the field*						*for lab use only*
# CHAR REC'D BY OUL	OUL NUMBER	STATION NUMBER	STATION NAME Entered by OUL staff	DATE PLACED	TIME PLACED	DATE PULLED	TIME PULLED	# WATER REC'D BY OUL
2	H9982	26-CB	Second Line 'G' Culvert	4/8/99	1540	4/16/99	1742	0
0	/	26-WB	" " "		—		1742	1
2	H9983	CLD-CB	Cortland Creek		1535		1733	0
0	/	CLD-WB	" " "		—		1733	1
2	H9984	CW-12-CB	MW-CW-12		1551		1749	0
HOLD 0	/	CW-12-WB	" " "		—		1758	1
2	H9985	CW-10-CB	MW-CW-10		1601		1800	0
HOLD 0	/	CW-10-WB	" " "		—		1802	1
/	/	~~CW-13~~	—	/	—	/	—	/
2	H9986	LF-5-CB	MW-LF-5		1643		1813	0
HOLD 0	/	LF-5-WB	" "		—		1815	1
2	H9987	UPSTREAM-CB	Upstream	↓	1631	↓	1647	0
0	/	UPSTREAM-WB	"		—		1700	1

Comments: RESULTS REQUESTED 4/27/99

Charts for samples on this page proofed by OUL staff ___

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Analyzed 5-3-99 By M. Rehmer

Figure 1. Sample Collection Data Sheet

SAMPLE # 9

Week No. 9

SAMPLE COLLECTION DATA SHEET

SAMPLES FOR FLUORESCENCE ANALYSIS

Ozark Underground Laboratory, Inc.
1572 Aley Lane · Protem, MO 65733 · (417) 785-4289 · fax (417) 785-4290

Project: COLISEUM WAY Samples Collected By: MIKE MULLANEY

Samples Shipped By: FED EX Date Samples Shipped: 4/26/99

Samples Received By: Marty Arnold @ 1230 Date Samples Received: 4/27/99

Analyze for: Fluorescein X Eosine ( ) Rhodamine WT X Other

Bill to: CLAYTON ENVIRONMENTAL Send Results to: DON ASHTON

for lab use only		for field technician use please indicate stations where dye was visible in the field						for lab use only
# CHAR REC'D BY OUL	OUL NUMBER	STATION NUMBER	STATION NAME entered by OUL staff mma	DATE PLACED	TIME PLACED	DATE PULLED	TIME PULLED	# WATER REC'D BY OUL
2	H9988	CLD-C9	Cortland Creek	4/15/99	1733	4/27/99	1250	Ø
Ø	/	CLD-W9	" "		—		1250	1
2	H9989	2G-C9	Second Lane "G" Culvert		1742		1301	Ø
Ø	/	2G-W9	" " "		—		1301	1
2	H9990	CW-12-C9	mw-cw-12		1753		1315	Ø
Ø	/	CW-12-W9	"		—		1316	1
2	H9991	CW-10-C9	mw-cw-10		1804		1322	Ø
Ø	/	CW-10-W9	"		—		1324	1
Ø	/	LF5-C9	CAR PARKED ON	—	—	—	—	/
Ø	/	LF5-W9	" " "	—	—	—	—	/
2	H9992	UPSTREAM-C9	Upstream	↓	1652	↓	1350	Ø
Ø	/	UPSTREAM-W9	"	↓	—	↓	1356	1

HOLD HOLD HOLD

Comments: RESULTS REVIEWED BY 4/29/99

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analyzed 5-5-11
by M. Ridinger

SAMPLE COLLECTION DATA SHEET

Week No. _____

SAMPLES FOR FLUORESCENCE ANALYSIS

Ozark Underground Laboratory, Inc.
1572 Aley Lane · Protem, MO 65733 · (417) 785-4289 · fax (417) 785-4290

Project: Coliseum Way Samples Collected By: Marc Mullaney

Samples Shipped By: Fed Ex Date Samples Shipped: 4/26/99

Samples Received By: Marty Arnold @ 1230 Date Samples Received: 4/27/99

Analyze for: Fluorescein X Eosine ____ Rhodamine WT X Other ____

Bill to: Clayton Environmental Send Results to: Don Ashton

for lab use only **These lab #'s are for Water only**		*for field technician use* *please indicate stations where dye was visible in the field*				*for lab use only*
# CHAR REC'D BY OUL	**OUL LAB NUMBER**	**OUL STATION NUMBER**	**STATION NAME**	**DATE PULLED 1999**	**TIME PULLED**	**# WATER REC'D BY OUL**
Samples logged in on another sheet	H9993	2G-W8	Second Line @ Culvert	4/15	1742	Samples logged in on another sheet
	H9994	CLD-W8	Cortland Cr.	4/15	1733	
	/	LF-5-W8		4/15	1815	
	H9995	Upstream-W8	UPStream	4/15	1700	
Samples logged in on another sheet	H9996	CLD-W9	Cortland Cr	4/22	1250	Samples logged in on another sheet
	H9997	2G-W9	Second Line Culvert	4/22	1301	
	H9998	Upstream-W9		4/22	1356	
Samples logged in on another sheet						Samples logged in on another sheet
Samples logged in on another sheet						Samples logged in on another sheet
Samples logged in on another sheet						Samples logged in on another sheet

Comments: _____

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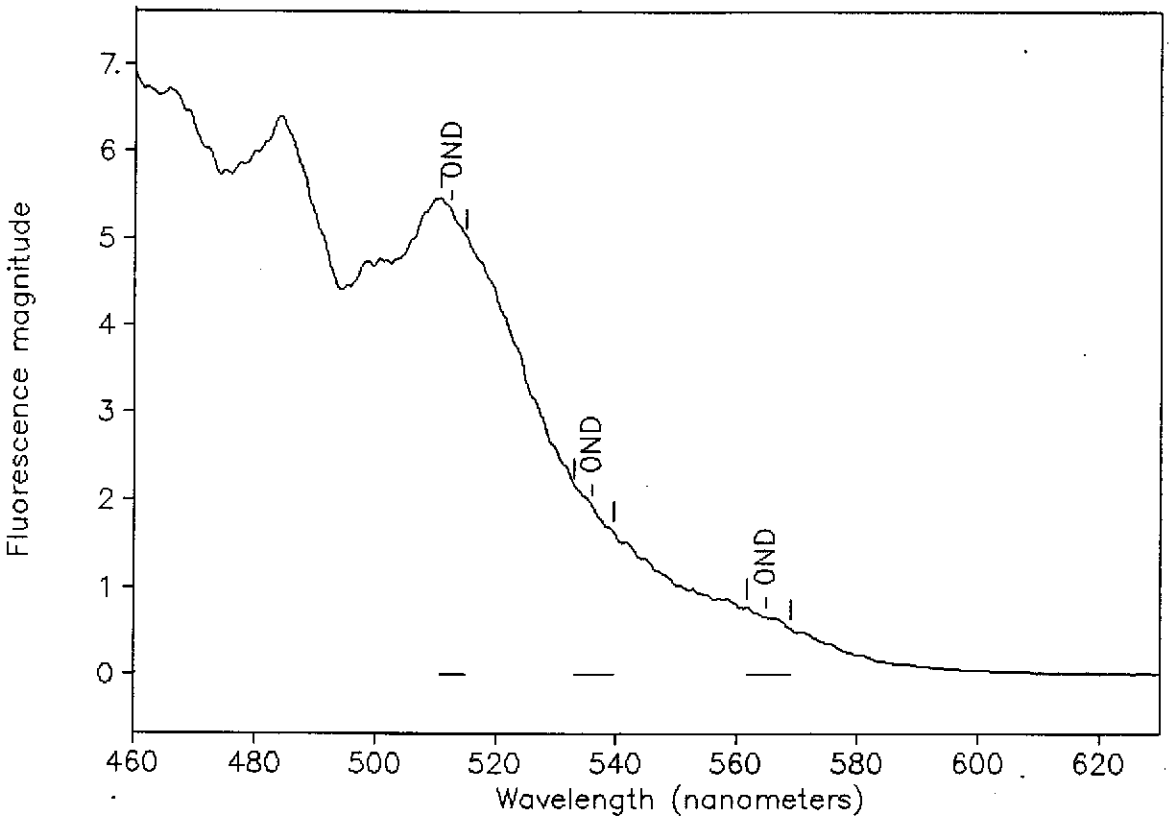
Ozark Underground Laboratory

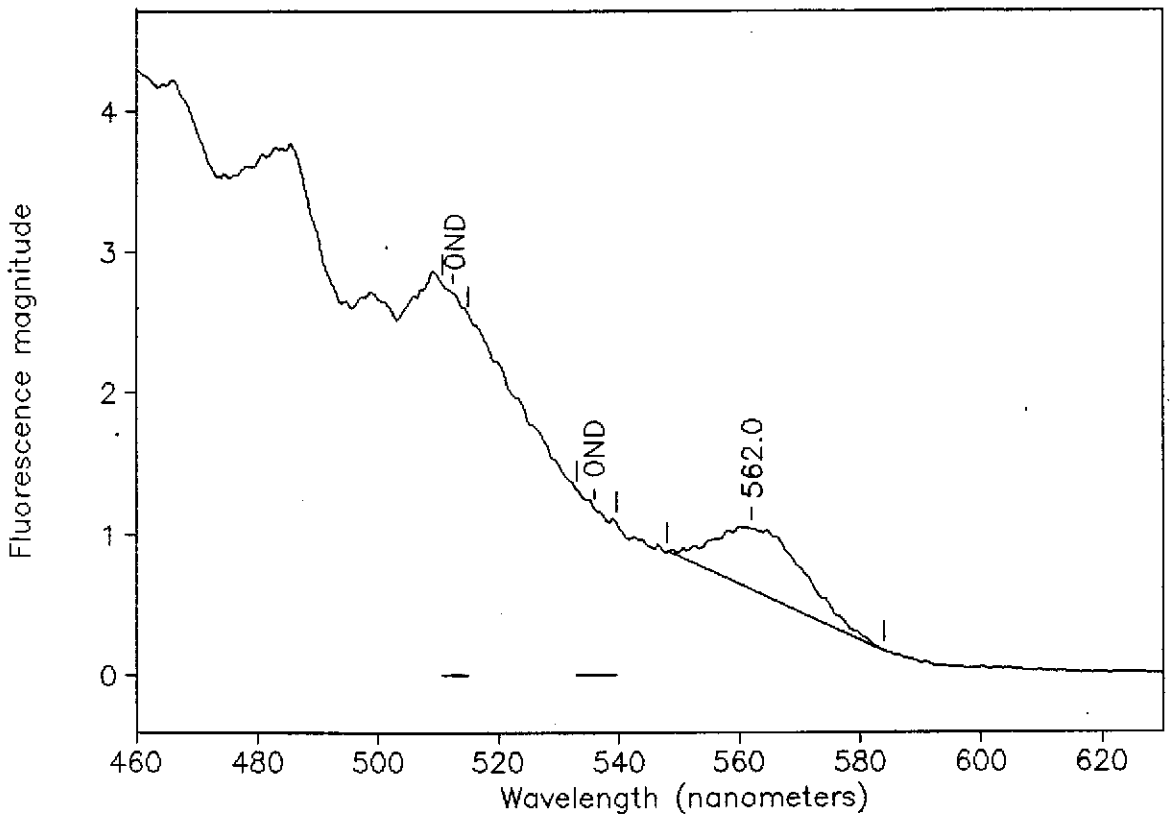


Station 1: Second Line G Culvert
OUL number: H9982 Type: Charcoal Analyzed: 5–3–1999
Date placed: 4–8–1999 Date recovered: 4–15–1999
Time placed: 1540 Time recovered: 1742
Clayton Environmental Sta # 2G–C8

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
512.5	510.7	515.0	0	0	0	ND
536.0	533.0	539.6	0	0	0	ND
565.0	561.7	568.9	0	0	0	ND

Ozark Underground Laboratory

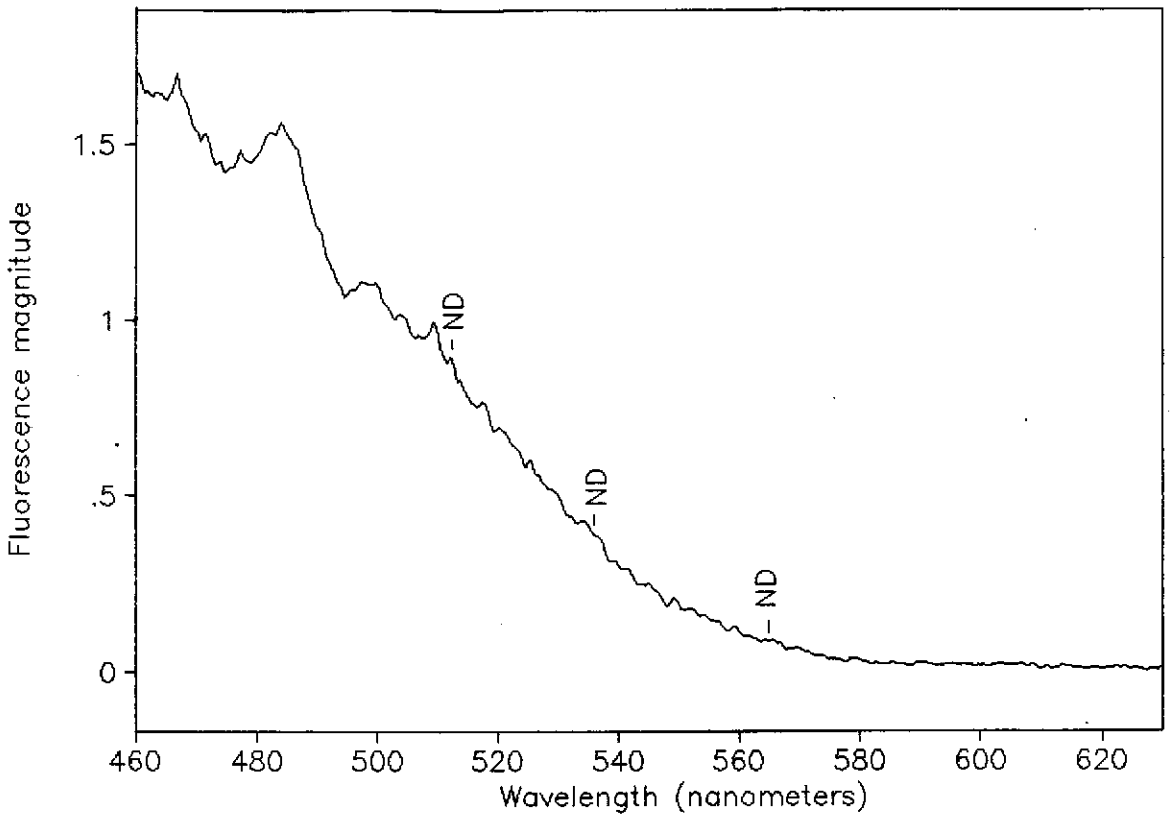


Station 8: Cortland Creek
OUL number: H9983 Type: Charcoal Analyzed: 5–3–1999
Date placed: 4–8–1999 Date recovered: 4–15–1999
Time placed: 1535 Time recovered: 1733
Clayton Environmental Sta # CLD–C8

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
512.5	510.7	515.0	0	0	0	ND
536.0	533.0	539.6	0	0	0	ND
562.0	548.0	584.0	0.44	7.96	0.06	1.83

Ozark Underground Laboratory

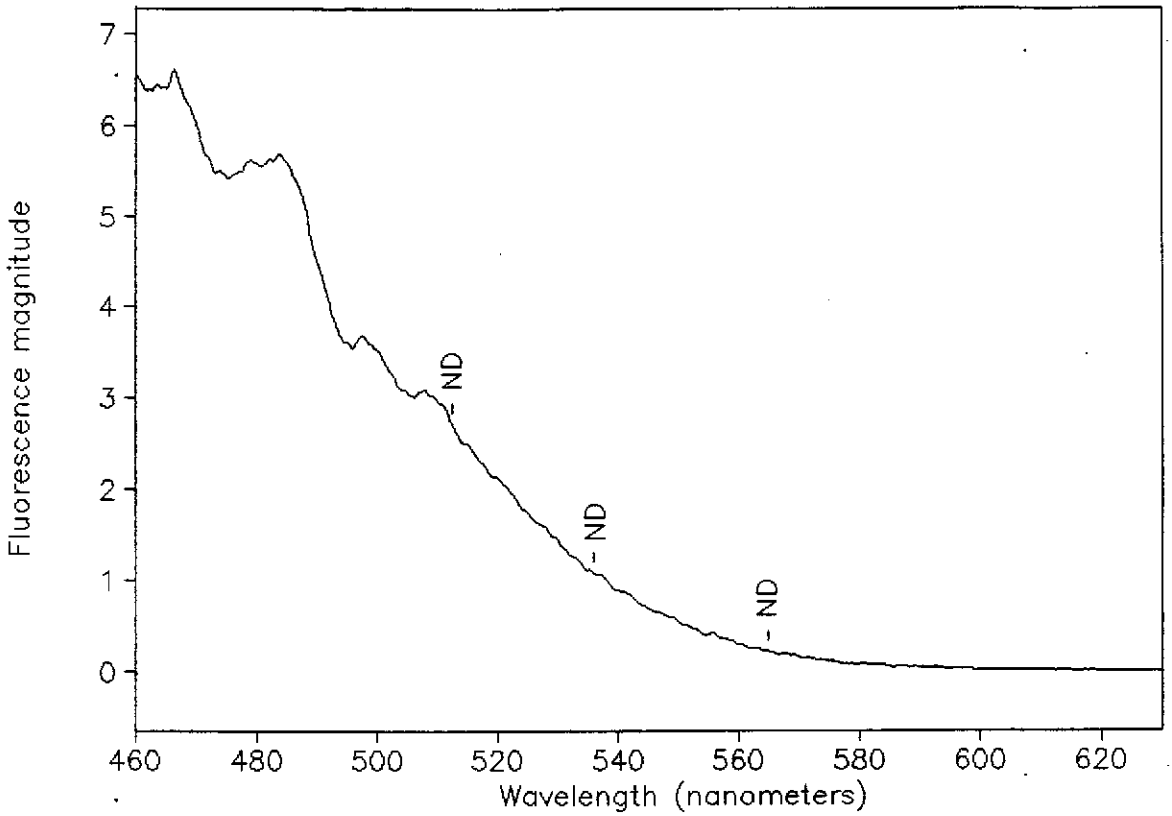


Station 3: MW CW-12
OUL number: H9984 Type: Charcoal Analyzed: 5-3-1999
Date placed: 4-8-1999 Date recovered: 4-15-1999
Time placed: 1551 Time recovered: 1749
Clayton Environmental Sta # CW-12-C8

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
512.5	510.7	515.0	0	0	0	ND
536.0	533.0	539.6	0	0	0	ND
565.0	561.7	568.9	0	0	0	ND

Ozark Underground Laboratory

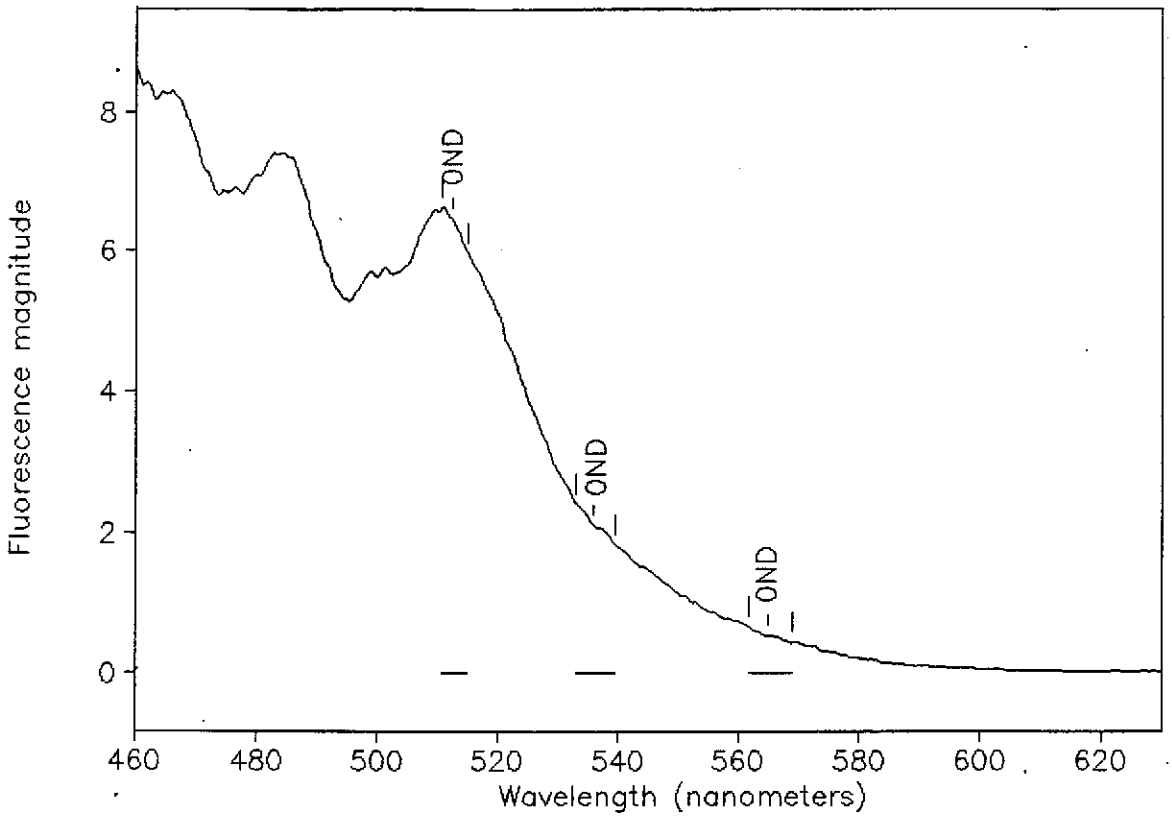


Station 4: MW CW-10
OUL number: H9985 Type: Charcoal Analyzed: 5-3-1999
Date placed: 4-8-1999 Date recovered: 4-15-1999
Time placed: 1601 Time recovered: 1800
Clayton Environmental Sta # CW-10-C8

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
512.5	510.7	515.0	0	0	0	ND
536.0	533.0	539.6	0	0	0	ND
565.0	561.7	568.9	0	0	0	ND

Ozark Underground Laboratory

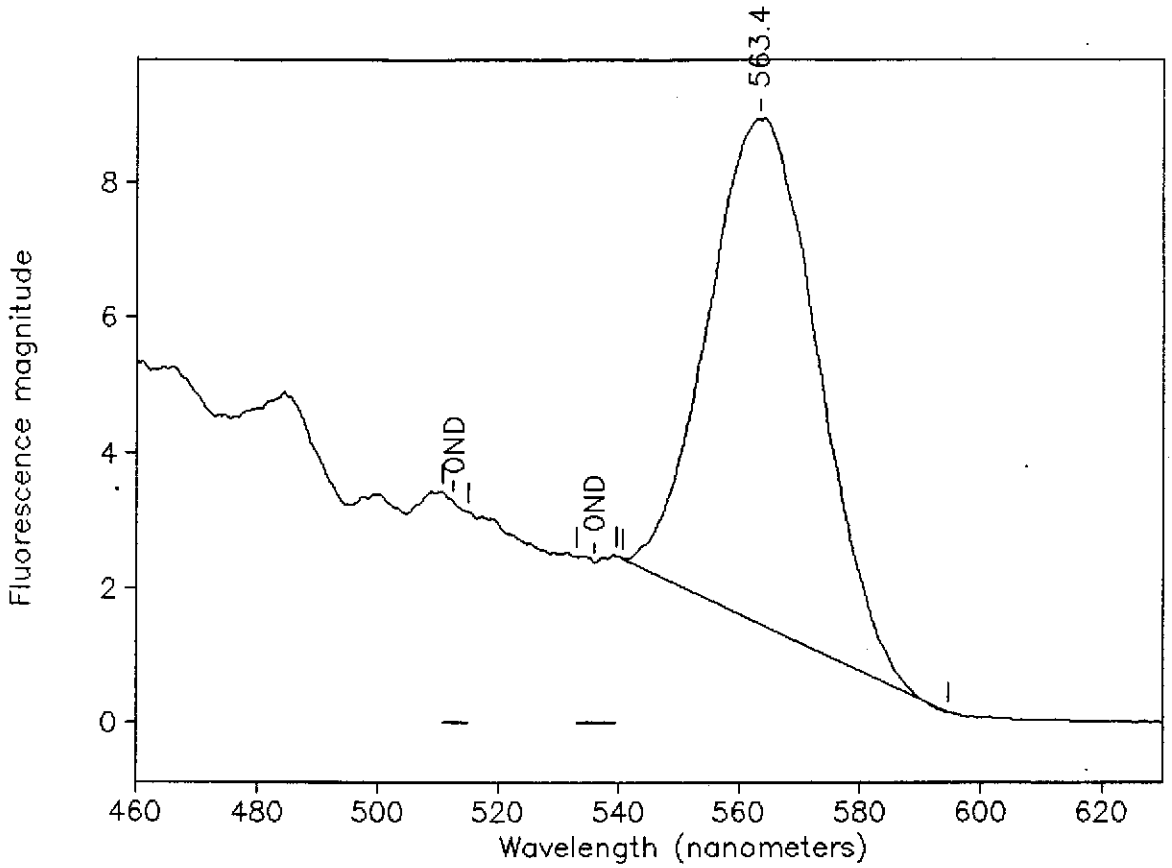


Station 9: Upstream
OUL number: H9987 Type: Charcoal Analyzed: 5–3–1999
Date placed: 4–8–1999 Date recovered: 4–15–1999
Time placed: 1631 Time recovered: 1647
Clayton Environmental Sta # UPSTREAM–C8

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
512.5	510.7	515.0	0	0	0	ND
536.0	533.0	539.6	0	0	0	ND
565.0	561.7	568.9	0	0	0	ND

Ozark Underground Laboratory

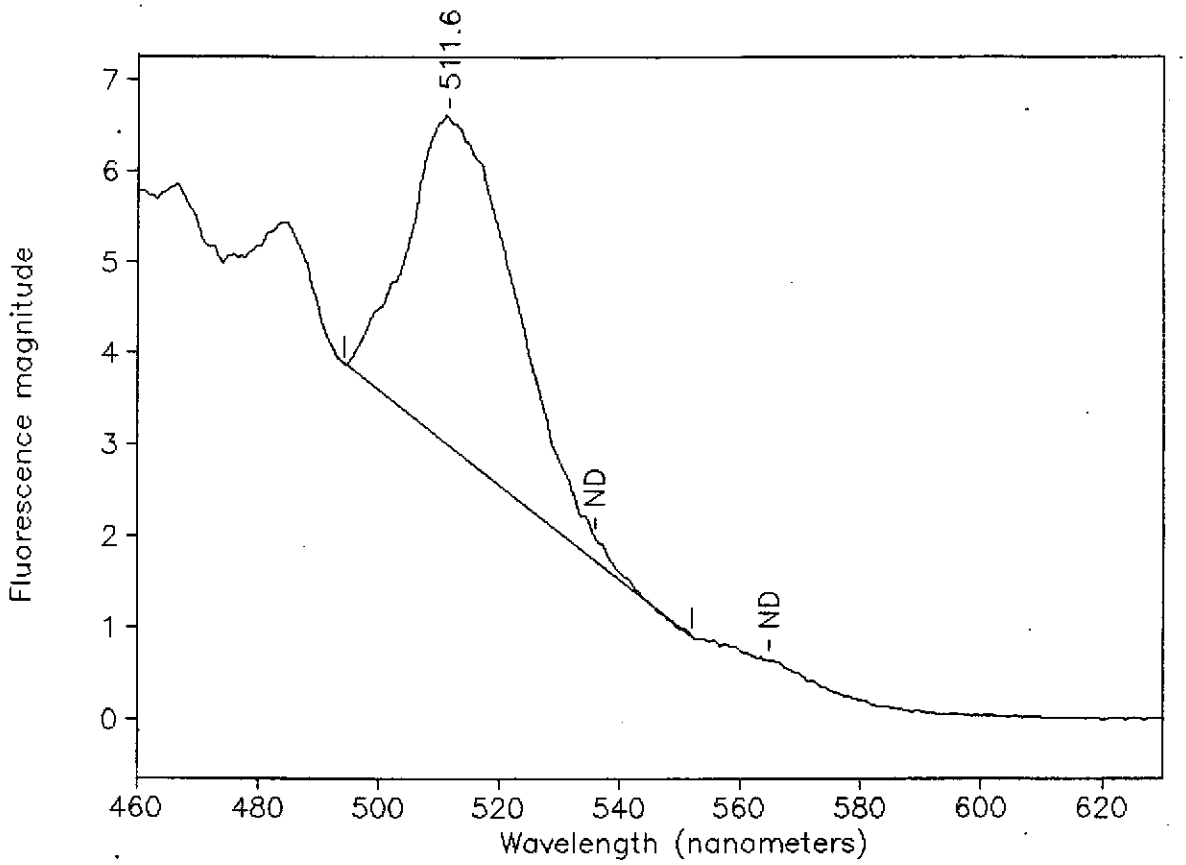


Station 8: Cortland Creek
OUL number: H9988 Type: Charcoal Analyzed: 5–3–1999
Date placed: 4–15–1999 Date recovered: 4–22–1999
Time placed: 1733 Time recovered: 1250
Clayton Environmental Sta # CLD–C9

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
512.5	510.7	515.0	0	0	0	ND
536.0	533.0	539.6	0	0	0	ND
563.4	540.7	594.6	7.46	159.00	0.05	36.6

Ozark Underground Laboratory

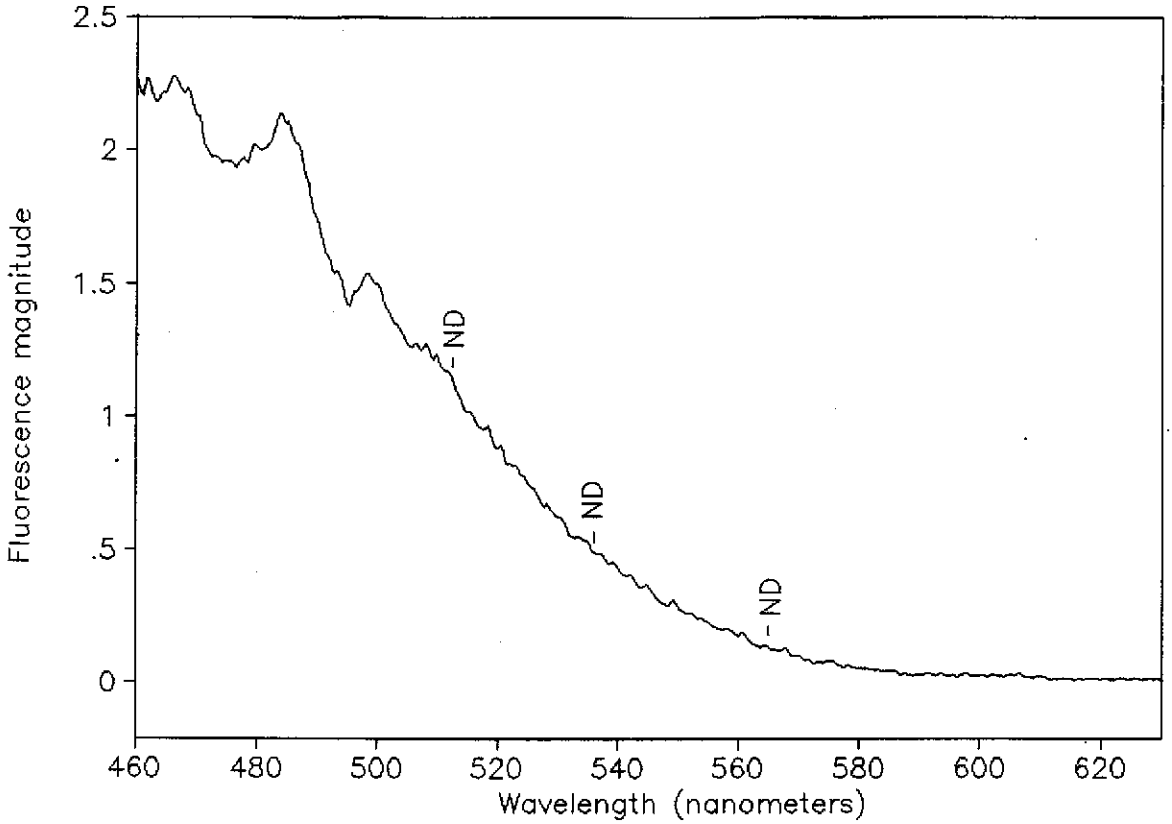


Station 1: Second Line G Culvert
OUL number: H9989 Type: Charcoal Analyzed: 5–3–1999
Date placed: 4–15–1999 Date recovered: 4–22–1999
Time placed: 1742 Time recovered: 1301
Clayton Environmental Sta # 2G–C9

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
511.6	494.3	552.0	3.59	77.46	0.05	0.796
536.0	533.0	539.6	0	0	0	ND
565.0	561.7	568.9	0	0	0	ND

Ozark Underground Laboratory

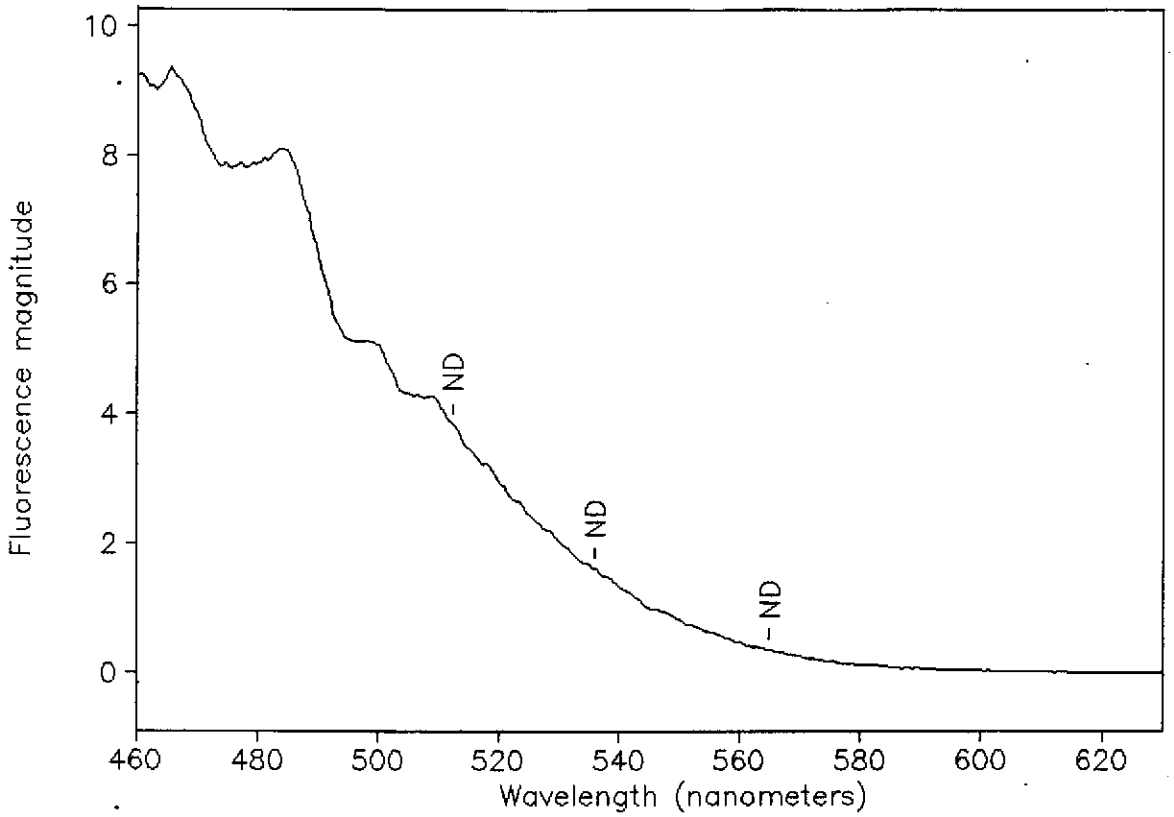


Station 3: MW CW-12
OUL number: H9990 Type: Charcoal Analyzed: 5-3-1999
Date placed: 4-15-1999 Date recovered: 4-22-1999
Time placed: 1753 Time recovered: 1315
Clayton Environmental Sta # CW-12-C9

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
512.5	510.7	515.0	0	0	0	ND
536.0	533.0	539.6	0	0	0	ND
565.0	561.7	568.9	0	0	0	ND

Ozark Underground Laboratory

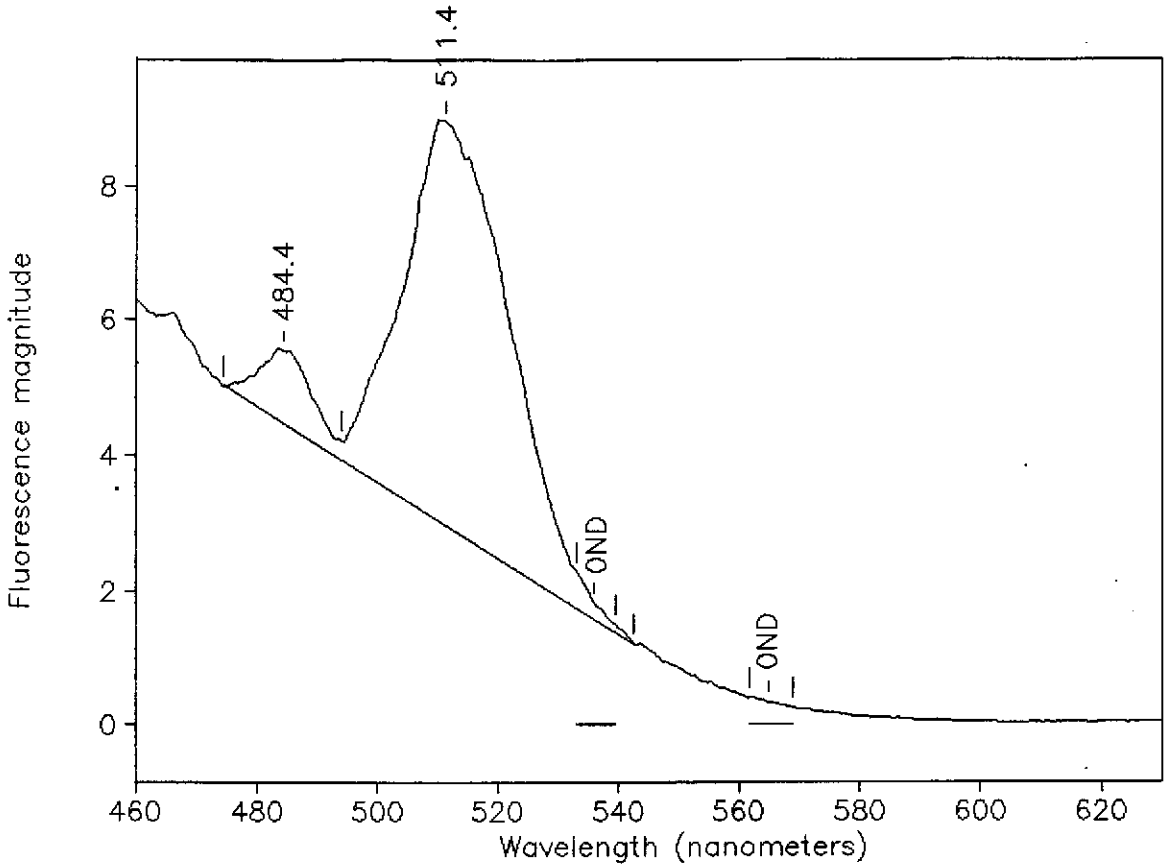


Station 4: MW CW-10
OUL number: H9991 Type: Charcoal Analyzed: 5-3-1999
Date placed: 4-15-1999 Date recovered: 4-22-1999
Time placed: 1804 Time recovered: 1322
Clayton Environmental Sta # CW-10-C9

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
512.5	510.7	515.0	0	0	0	ND
536.0	533.0	539.6	0	0	0	ND
565.0	561.7	568.9	0	0	0	ND

Ozark Underground Laboratory



Station 9: Upstream
OUL number: H9992 Type: Charcoal Analyzed: 5-3-1999
Date placed: 4-15-1999 Date recovered: 4-22-1999
Time placed: 1652 Time recovered: 1350
Clayton Environmental Sta # UPSTREAM-C9

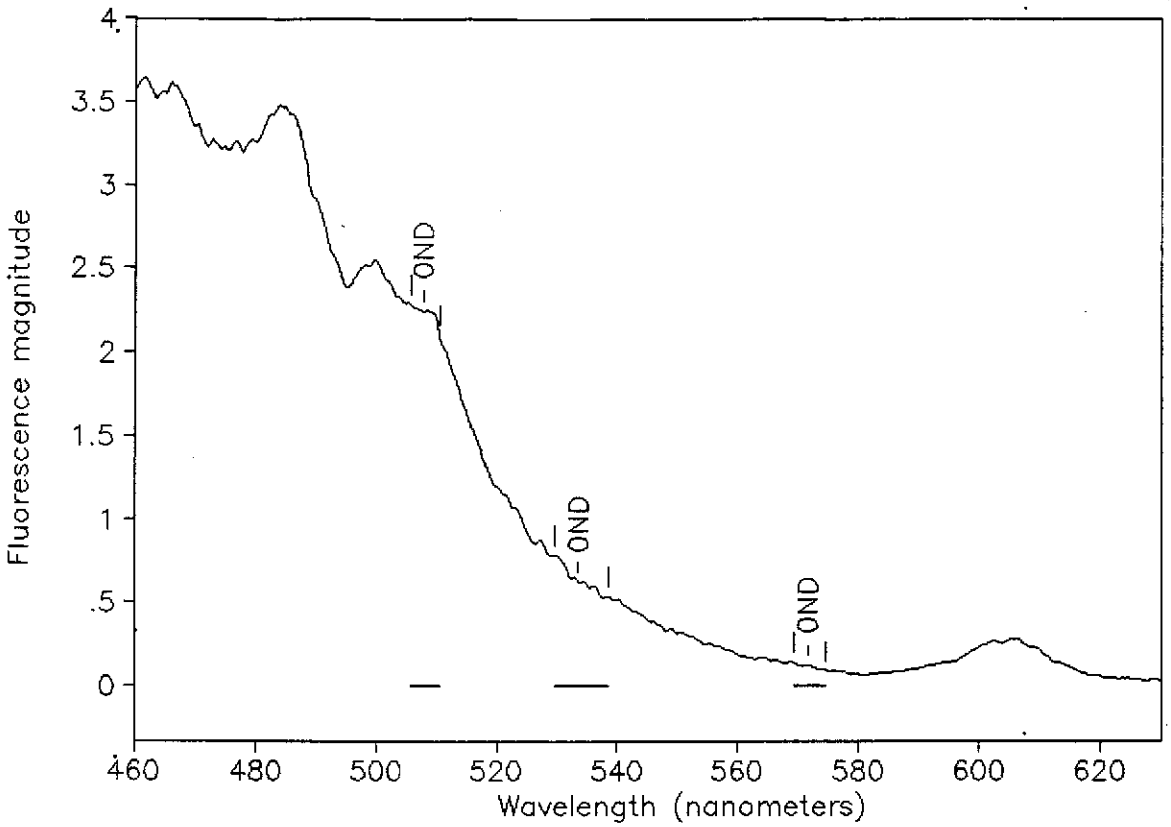
Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
511.4	494.0	542.4	6.00	126.48	0.05	1.30
536.0	533.0	539.6	0	0	0	ND
565.0	561.7	568.9	0	0	0	ND

Peaks close to normal range of tracer dyes:

484.4	474.4	494.0	1.07	11.51	0.09	0

Ozark Underground Laboratory

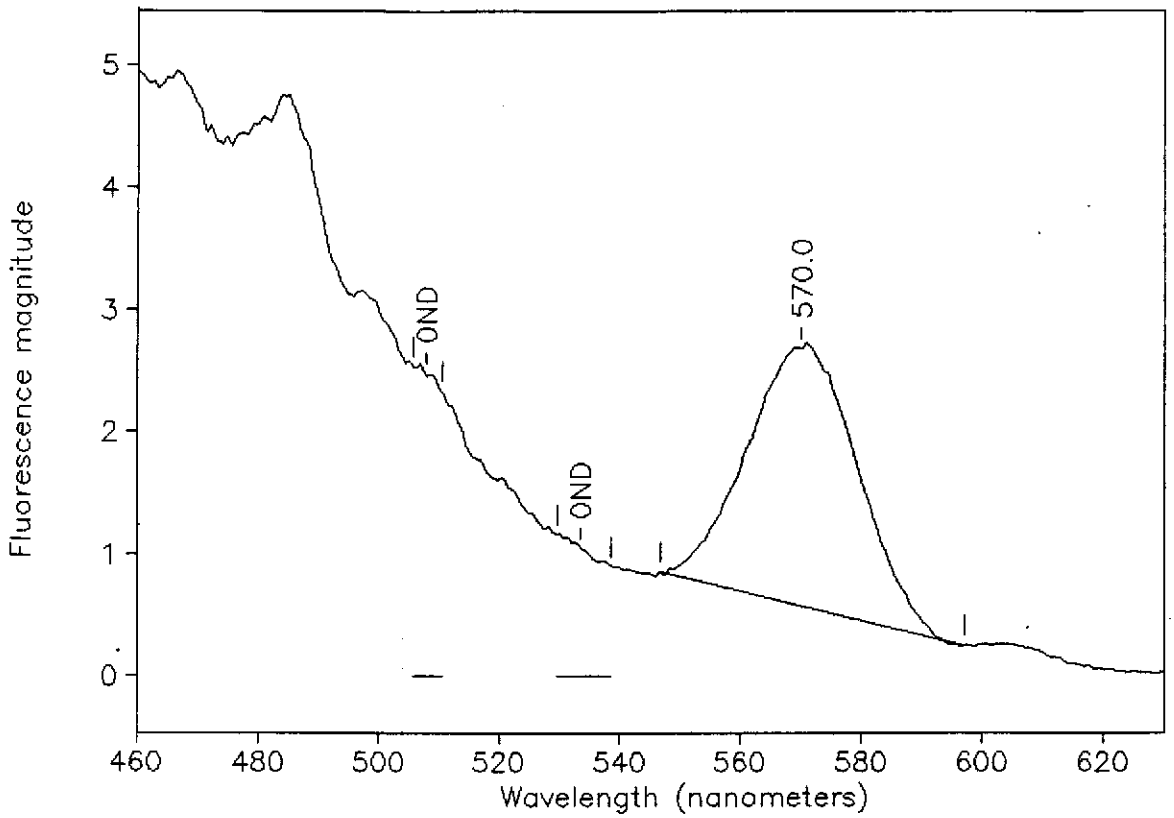


Station 1: Second Line G Culvert
OUL number: H9993 Type: Water Analyzed: 5-3-1999
Date collected: 4-15-1999 Time collected: 1742
Clayton Environmental Sta # 2G-W8

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
507.7	505.6	510.5	0	0	0	ND
533.5	529.6	538.4	0	0	0	ND
571.8	569.4	574.8	0	0	0	ND

Ozark Underground Laboratory

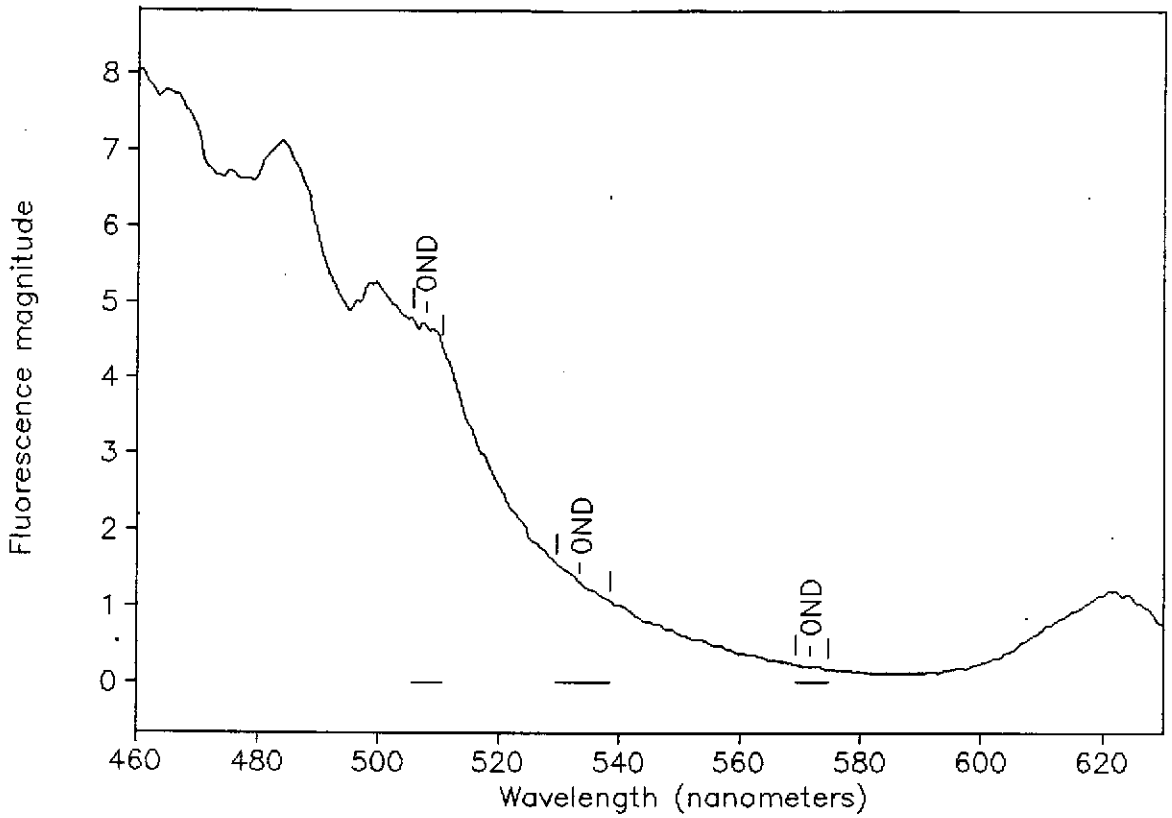


Station 8: Cortland Creek
OUL number: H9996 Type: Water Analyzed: 5-3-1999
Date collected: 4-22-1999 Time collected: 1250
Clayton Environmental Sta # CLD-W9

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
507.7	505.6	510.5	0	0	0	ND
533.5	529.6	538.4	0	0	0	ND
570.0	546.8	597.2	2.11	45.03	0.05	1.98

Ozark Underground Laboratory



Station 9: Upstream
OUL number: H9998 Type: Water Analyzed: 5–3–1999
Date collected: 4–22–1999 Time collected: 1356
Clayton Environmental Sta # UPSTREAM–W9

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
507.7	505.6	510.5	0	0	0	ND
533.5	529.6	538.4	0	0	0	ND
571.8	569.4	574.8	0	0	0	ND

OZARK UNDERGROUND LABORATORY

1572 Aley Lane • Protem, Missouri 65733 • (417) 785-4289 • FAX (417) 785-4290

May 18, 1999

CERTIFICATE OF ANALYSIS

Don Ashton
Clayton Environmental Consultants
P. O. Box 9019
Pleasanton, CA 94566

RE: Coliseum Way, Oakland, CA, Project #70-97203.00.201
Dye analysis results for charcoal and water samples shipped on May 4, 1999.
Ozark Underground Laboratory (OUL) numbers J0158 through J0167.

Dear Mr. Ashton:

We have completed analysis of the charcoal and water samples received at the OUL on May 5, 1999. We have indicated the OUL number for the samples on the enclosed table.

The fluorescein and rhodamine WT (RWT) dye concentrations are based upon standards routinely used at the OUL. The fluorescein dye is a mixture of 75% dye and 25% diluent; the RWT is a 20% solution. The concentrations are based upon the as-sold weight of the dye.

A summary of the results is presented in Table 1. Additional sampling information is available on the enclosed analysis graphs.

Sincerely,

Thomas Aley, PHG & RG

Enclosures:
1. Table 1. Analysis results for charcoal and water samples
2. Sample Collection Data Sheets
3. Sample analysis graphs

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Ozark Underground Laboratory for Clayton Environmental Consultants

Project name: Coliseum Way, Oakland, CA, Project #70-97203.00.201
Samples Collected by: Marc Mullaney
Sample shipped: May 4, 1999
Sample received at OUL: May 5, 1999
Sample analyzed by OUL: May 6, 1999

Table 1. Results for charcoal and water samples analyzed for the presence of fluorescein and rhodamine WT (RWT) dyes. Peak wavelengths are reported in nanometers (nm); dye concentrations are reported in parts per billion (ppb). All results are for charcoal elutant unless otherwise indicated.

OUL Lab #	OUL Stn. #	Clayton Stn. #	Station Name	Date Placed 1999	Date Pulled 1999	Fluorescein		RWT	
						Peak	Conc.	Peak	Conc.
J0158	1	2G-C10	Second Line G Culvert	4-22 1309	4-29 1549	510.8*	0.579	ND	
J0159	8	CLD-C10	Cortland Creek	4-22 1255	4-29 1535	ND		561.2#	1.27
J0160	Laboratory Control Charcoal Blank								
J0161	3	CW-12-C10	MW CW-12	4-22 1319	4-29 1554	ND		ND	
J0162	4	CW-10-C10	MW CW-10	4-22 1328	4-29 1604	ND		ND	
J0163	6	LF-5-C10	MW LF-5	4-15 1818	4-29 1625	ND		ND	
J0164	9	Upstream-C10	Upstream	4-22 1353	4-29 1515	510.4$	0.311	ND	
J0165	1	2G-W10	Second Line G Culvert	WATER	4-29 1544	ND		ND	
J0166	8	CLD-W10	Cortland Creek	WATER	4-29 1537	ND		ND	
J0167	9	Upstream-W10	Upstream	WATER	4-29 1511	504.4@	0.031	ND	

FOOTNOTES:

ND = None Detected

* = A fluorescence peak is present that is atypical in shape but in the normally acceptable wavelength range for fluorescein dye in elutant (510.7 to 515.0 nm) and has been calculated as a positive dye recovery.

\# = A fluorescence peak is present that is out of the normally acceptable wavelength range for rhodamine WT dye in elutant (561.7 to 568.9 nm) but has been calculated as a positive dye recovery.

$ = A fluorescence peak is present that is atypical in shape and out of the normally acceptable wavelength range for fluorescein dye in elutant (510.7 to 515.0 nm) but has been calculated as a positive dye recovery since there have been positive dye recoveries at this station previously.

@ = A fluorescence peak is present that is out of the normally acceptable wavelength range for fluorescein dye in water (505.6 to 510.5 nm) but has been calculated as a positive dye recovery.

OZARK UNDERGROUND LABORATORY

1572 Aley Lane • Protem, Missouri 65733 • (417) 785-4289 • FAX (417) 785-4290

May 19, 1999

CERTIFICATE OF ANALYSIS

Don Ashton
Clayton Environmental Consultants
P. O. Box 9019
Pleasanton, CA 94566

RE: Coliseum Way, Oakland, CA, Project #70-97203.00.201
Dye analysis results for charcoal and water samples shipped on May 6, 1999.
Ozark Underground Laboratory (OUL) numbers J0234 through J0243.

Dear Mr. Ashton:

We have completed analysis of the charcoal and water samples received at the OUL on May 7, 1999. We have indicated the OUL number for the samples on the enclosed table.

The fluorescein and rhodamine WT (RWT) dye concentrations are based upon standards routinely used at the OUL. The fluorescein dye is a mixture of 75% dye and 25% diluent; the RWT is a 20% solution. The concentrations are based upon the as-sold weight of the dye.

A summary of the results is presented in Table 1. Additional sampling information is available on the enclosed analysis graphs.

Sincerely,

Thomas Aley, PHG & RG

Enclosures:
1. Table 1. Analysis results for charcoal and water samples
2. Sample Collection Data Sheets
3. Sample analysis graphs

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Ozark Underground Laboratory for Clayton Environmental Consultants

Project name: Coliseum Way, Oakland, CA, Project #70-97203.00.201
Samples Collected by: Marc Mullaney
Sample shipped: May 6, 1999
Sample received at OUL: May 7, 1999
Sample analyzed by OUL: May 10, 1999

Table 1. Results for charcoal and water samples analyzed for the presence of fluorescein and rhodamine WT (RWT) dyes. Peak wavelengths are reported in nanometers (nm); dye concentrations are reported in parts per billion (ppb). All results are for charcoal elutant unless otherwise indicated.

OUL Lab #	OUL Stn. #	Clayton Stn. #	Station Name	Date Placed 1999	Date Pulled 1999	Fluorescein		RWT	
						Peak	Conc.	Peak	Conc.
J0234	1	2G-C11	Second Line G Culvert	4-29 1550	5-6 1018	511.5	1.72	ND	
J0235	8	CLD-C11	Cortland Creek	4-29 1537	5-6 1033	ND		ND	
J0236	3	CW-12-C11	MW CW-12	4-29 1600	5-6 1045	ND		ND	
J0237	4	CW-10-C11	MW CW-10	4-29 1610	5-6 1056	ND		ND	
J0238	6	LF-5-C11	MW LF-5	4-29 1630	5-6 1141	ND		ND	
J0239	9	Upstream-C11	Upstream	4-29 1518	5-6 1127	510.9	1.15	ND	
J0240	Laboratory Control Charcoal Blank								
J0241	1	2G-W11	Second Line G Culvert	WATER	5-6 1020	ND		ND	
J0242	8	CLD-W11	Cortland Creek	WATER	5-6 1032	ND		569.6	0.540
J0243	9	Upstream-W11	Upstream	WATER	5-6 1129	ND		ND	

FOOTNOTES:

ND = None Detected

OZARK UNDERGROUND LABORATORY

1572 Aley Lane • Protem, Missouri 65733 • (417) 785-4289 • FAX (417) 785-4290

PROCEDURES AND CRITERIA
ANALYSIS OF FLUORESCEIN, EOSINE, RHODAMINE WT, SULFORHODAMINE B, AND PYRANINE DYES IN WATER AND CHARCOAL SAMPLERS

February 18, 1998

Thomas Aley, PHG 179
President
Ozark Underground Laboratory

PROCEDURES

Introduction

This document describes standard procedures and criteria currently in use at the Ozark Underground Laboratory as of the date shown on the title page. Some samples may be subjected to different procedures and criteria because of unique conditions; such non-standard procedures and criteria are identified in reports for those samples. Standard procedures and criteria change as knowledge and experience increases and as equipment is improved or up-graded. A summary of changes in standard procedures and criteria is maintained by the Ozark Underground Laboratory.

Dye Nomenclature

Fluorescein is C.I. Acid yellow 73, Color Index Number 45350. Rhodamine WT is Acid Red 388; there is no assigned Color Index Number for this dye. Eosine (sometimes called eosin) is Acid Red 87, Color Index Number 45380. Sulforhodamine B is C.I. Acid Red 52, Color Index Number 45100. Pyranine is Solvent Green 7 (also called D&C Green 8), Color Index Number 59040.

Description of the Samplers

The charcoal samplers are packets of fiberglass screening partially filled with approximately 4.25 grams of activated coconut charcoal. The charcoal used by the Ozark Underground Laboratory is Barnebey and Sutcliffe coconut shell carbon, 6 to 12 mesh, catalog type AC.

The most commonly used samplers are about 4 inches long by two inches wide. A cigar-shaped sampler is made for use in very small diameter wells (such as 1 inch diameter wells); this is a special order item and should be specifically requested when it is needed. All of the samplers are closed by heat sealing.

Placement of Samplers

Samplers (also called charcoal packets) are placed so as to be exposed to as much water as possible. In springs and streams they are typically attached to a rock or other anchor in a riffle area. Attachment of the packets uses galvanized wire (electric fence wire is ideal); other types of anchoring wire can be used. Electrical wire with plastic insulation is also good. Packets are attached so that they extend outward from the anchor rather than being flat against it. Two or more separately anchored packets are typically used for sampling springs and streams. The use of fewer packets is discouraged except when the spring or stream is so small that there is not appropriate space for placing multiple packets.

When pumping wells are being sampled, the samplers are placed in sample holders made of PVC pipe fittings. Brass hose fittings are installed at the end of the sample holders so that the sample holders can be installed on outside hose bibs and water which has run through the samplers can be directed to waste through a connected garden hose.

The samplers can be unscrewed in the middle so that charcoal packets can be changed. The middle portions of the samplers consists of 1.5 inch diameter pipe and pipe fittings.

Charcoal packets can also be lowered into monitoring wells for sampling purposes. In general, if the well is screened, samplers should be placed approximately in the middle of the screened interval. Some sort of weight should be added near the charcoal packet to insure that it will not float. The weight should be of such a nature that it will not affect water quality. One common approach is to anchor the packets to the top of a dedicated weighted disposable bailer with a plastic cable tie. We typically run nylon cord from the top of the well to the charcoal packet and its weight.

In some cases, especially with narrow wells and appreciable well depths, the weighted disposable bailers sink very slowly or may even fail to sink because of friction and floating of the anchoring cord. In such cases a stainless steel weight may be added to the top of the disposable bailer. We have had good success with two to three ounce segments of stainless steel pipe which have an outside diameter of 1.315 inches and an inside diameter of 1.049 inches; such pipe weighs about 1.7 pounds per linear foot. The weight of the stainless steel is approximately 497 pounds per cubic foot. The pipe segments can be attached over the anchoring cord at the top of the bailer. All weights should be cleaned prior to use; the cleaning approach should comply with decontamination procedures in use at the project site.

Placement of samplers requires adjustment to field conditions. The above placement comments are intended as guidance, not firm requirements.

Rinsing of Charcoal Packets Prior to Sampling

Charcoal packets routinely contain some fine powder which washes off rapidly when they are placed in water. Since such material could remain in monitoring wells, charcoal packets to be placed in such wells are triple rinsed with distilled, demineralized, or reagent water known to be free of tracer dyes. This rinsing is typically done by soaking. With this approach, approximately 25 packets are placed in one gallon of water and soaked for at least 10 minutes. The packets are then removed from the water and excess water is shaken off the packets. The packets are then placed in a second gallon of water and again soaked for at least 10 minutes. After this soaking they are removed from the water and excess water is shaken off the packets. The packets are then placed in a third gallon of water and the procedure is again repeated. Rinsed packets are placed in plastic bags and are placed at sampling stations within three days. Packets can also be rinsed in jets of water for about one minute; this requires more water and is typically difficult to do in the field with water known to be free of tracer dyes.

Collection and Replacement of Samplers

Samplers are routinely collected and replaced from each of the sampling stations. The frequency of sampler collection and replacement is determined by the nature of the study. Collections at one week intervals are common, but shorter or longer collection frequencies are acceptable and sometimes more appropriate. Shorter sampling frequencies are often used in the early phases of a study to better characterize time of

travel. As an illustration, we often collect and change charcoal packets 1, 2, 4, and 7 days after dye injection. Subsequent sampling is then weekly.

Where convenient, the collected samplers should be briefly rinsed in the water being sampled. This is typically not necessary with well samples. The packets are shaken to remove excess water. Next, the packet (or packets) are placed in a plastic bag (Whirl-Pak bags are ideal). The bag is labeled on the outside with a permanent type felt marker pen. The notations include station name or number and the date and time of collection. Labels are not inserted inside the sample bags.

For most projects the Ozark Underground Laboratory supplies the Whirl-Pak bags. Prior to use, 1% of the new bags are randomly selected. Each bag is soaked in the standard eluting solution and then analyzed for the presence of any of the tracer dyes being used.

Collected samplers are kept in the dark to minimize algal growth on the charcoal prior to analysis work. We prefer (and in some studies require) that samples be placed on "blue ice" or ice upon collection and that they be shipped refrigerated with "blue ice" by overnight express. Our experience indicates that it is not essential for samplers to be maintained under refrigeration, yet maintaining them under refrigeration clearly minimizes some potential problems. A product known as "green ice" should not be used for maintaining the samples in a refrigerated condition since this product contains a dye which could contaminate samples if the "green ice" container were to break or leak.

New charcoal samplers are routinely placed when used charcoal packets are collected. The last set of samplers placed at a stream or spring is commonly not collected.

Water samples are often collected. They should be collected in either glass or plastic; the Ozark Underground Laboratory routinely uses 50 ml research grade polypropylene copolymer Perfector Scientific vials (Catalog Number 2650) for such water samples. The vials should be placed in the dark and refrigerated immediately after collection. They should be refrigerated until shipment. For most projects the Ozark Underground Laboratory supplies the vials. Prior to use, 1% of the new vials are randomly selected. Each vials is soaked in the standard eluting solution and then analyzed for the presence of any of the tracer dyes being used.

When water or charcoal samplers are collected for shipment to the Ozark Underground Laboratory they should be shipped promptly. We receive good overnight and second day air service from both UPS and Fed Ex; Airborne Service is excessively slow, and the Postal Service does not provide next day service to us.

Each shipment of charcoal samplers or water samples must be accompanied by a sample tracking sheet. These sheets (which bear the title "Samples for Fluorescence Analysis") are provided by the Ozark Underground Laboratory and summarize placement and collection data. These sheets can be augmented by a client's chain of custody forms or any other relevant documentation. Figure 1 is one of our blank sample forms.

Receipt of Samplers

Samplers shipped to the Ozark Underground Laboratory are refrigerated upon receipt. Prior to cleaning and analysis, samplers are assigned a laboratory identification number. All samples are logged in upon receipt and are recorded in a bound journal.

It sometimes occurs that there are discrepancies between the chain-of-custody sheets and the actual samples received. When this occurs, a "Discrepancy Sheet" form is completed and sent to the shipper of the sample for resolution. A copy of this form is enclosed as Figure 2. The purpose of the form is to help resolve discrepancies, even when they may be minor.

Cleaning of Samplers

Samplers are cleaned by spraying them with jets of clean water. At the Laboratory we use unchlorinated water for the cleansing to minimize dye deterioration. Effective cleansing cannot generally be accomplished simply by washing in a conventional laboratory sink even if the sink is equipped with a spray unit.

The duration of packet washing depends upon the condition of the sampler. Very clean samplers may require less than a minute of washing; dirtier samplers may require several minutes of washing.

After washing, the packets are shaken to remove excess water. Next, the packets are cut open and the charcoal is emptied into a new disposable plastic beaker. The beaker has been pre-labeled with the laboratory identification number. The charcoal is now ready for elution. The emptied fiberglass screen packet is discarded. At stations where two or more charcoal packets are collected, one is selected for analysis and the other is frozen and retained until the end of the study. In some studies the analysis protocol stipulates that 5% of the samples should be duplicates; in these cases the second charcoal packet is separately analyzed. Note that these are duplicate samples, not replicate samples since each packet is, of necessity, placed in a somewhat different location and is therefore exposed to somewhat different conditions.

Cleaning of Glassware

Most of our work uses disposable plastic containers. A small amount of glassware is occasionally used for preparation of standards. It is dedicated to this use. In the event that any glassware does come in contact with tracer dyes it will be carefully cleaned before re-use. To do this cleaning, containers are rinsed several times in clean water. Glassware which may be contaminated with dyes is washed with detergent, and then again rinsed. Next, the glassware is soaked for one hour or more in a bleach and water solution. Upon removal from this soaking, the glassware is rinsed again and allowed to air dry.

Figure 1. Sample Collection Data Sheet

SAMPLE COLLECTION DATA SHEET

Week No. ____

SAMPLES FOR FLUORESCENCE ANALYSIS

Ozark Underground Laboratory, Inc.
1572 Aley Lane · Protem, MO 65733 · (417) 785-4289 · fax (417) 785-4290

Project: _____ Samples Collected By: _____

Samples Shipped By: _____ Date Samples Shipped: ____/____/____

Samples Received By: _____ Date Samples Received: ____/____/____

Analyze for: Fluorescein _____ Eosine _____ Rhodamine WT _____ Other _____

Bill to: _____ Send Results to: _____

for lab use only		*for field technician use please indicate stations where dye was visible in the field*						*for lab use only*
# CHAR REC'D BY OUL	OUL NUMBER	STATION NUMBER	STATION NAME	DATE PLACED	TIME PLACED	DATE PULLED	TIME PULLED	# WATER REC'D BY OUL

Comments: _____

Charts for samples on this page proofed by OUL staff _____

Elution of the Charcoal

There are various eluting solutions which can be used for the recovery of tracer dyes. The solutions typically include an alcohol, some water, and a strong basic solution such as aqueous ammonia.

The standard elution solution now used at the Ozark Underground Laboratory is a mixture of 5% aqua ammonia and 95% isopropyl alcohol solution and sufficient potassium hydroxide flakes to saturate the solution. The isopropyl alcohol is 70% alcohol and 30% water. The aqua ammonia solution is 29% ammonia. The potassium hydroxide is added until a super-saturated layer is visible in the bottom of the container. This super-saturated layer is not used for elution. Preparation of eluting solutions uses dedicated glassware which is never used in contact with dyes or dye solutions.

The eluting solution we use will elute fluorescein, eosine, rhodamine WT, sulforhodamine B, and pyranine dyes. It is also suitable for separating fluorescein peaks from peaks of some naturally present materials found in some samplers.

Fifteen ml of the eluting solution is poured over the washed charcoal in a disposable sample beaker. The sample beaker is capped. The sample is allowed to stand for 60 minutes. After this time, the liquid is carefully poured off the charcoal into a new disposable beaker which has been appropriately labeled with the laboratory identification number. A few grains of charcoal may inadvertently pass into the second beaker; no attempt is made to remove these from the second sample beaker. After the pouring, a small amount of the elutant will remain in the initial sample beaker. After the transfer of the elutant to the second sample beaker, the contents of the first sample beaker (the eluted charcoal) are discarded.

Analysis on the Shimadzu RF-540 or RF-5000U

The Laboratory uses both a Shimadzu RF-540 and a Shimadzu RF-5000U Spectrofluorophotometer capable of syncronous scanning. The RF5000U is the primary instrument used; the RF-540 is the back-up instrument.

A sample of the elutant is withdrawn from the sample container using a disposable polyethylene pipette. Approximately 3 ml of the elutant is then placed in disposable rectangular polystyrene cuvette. The cuvette has a maximum capacity of 3.5 ml. The cuvette is designed for fluorometric analysis; all four sides and the bottom are clear. The spectral range of the cuvettes is 340 to 800 nm. The pipettes and cuvettes are discarded after one use.

The cuvette is then placed in the RF-5000U or the RF-540. Both instruments are controlled by a programmable computer. Each instrument is capable of conducting substantial data analysis.

Our instruments are operated and maintained in accordance with the manufacturer's recommendations. On-site installation of the instruments and a training session on the instrument was provided by Delta Instrument Company, the dealer for Shimadzu Instruments.

Our typical analysis of an elutant sample where fluorescein, eosine, rhodamine WT, sulforhodamine B, or pyranine dyes may be present includes synchronous scanning of excitation and emission spectra with a 17 nm separation between excitation and emission. The excitation scan is from 443 to 613 nm; the emission scan is from 460 to 630 nm. The emission fluorescence from the scan is plotted on a graph. The typical scan speed is "very fast;" typical sensitivity is "high."

The excitation slit for charcoal packet elutants is typically 5 nm, the emission slit is typically 2 nm on the RF-540 and 3 nm on the RF-5000U. This is because the RF-540 does not provide a 3 nm slit setting and the RF-5000U does not provide a 2 nm slit setting. For water samples, the excitation slit is typically 5 nm, and the emission slit is typically 10 nm.; the same settings are used for both instruments. The abscissa scale is typically set so as to keep the resulting chart to a size which can readily be photocopied. The ordinate scale selected is designed to provide good data resolution while not exceeding the upper limit of the resulting graph.

A plot of the synchronous scan for each sample is produced by the instrument; the plot shows emission fluorescence only. It is photocopied as a part of the final record. The synchronous scans are subjected to computer peak picks; peaks are picked to the nearest 0.1 nm.

The original RF-540 plots are on pressure sensitive chart paper. During analysis, identification numbers and other notes are made on the original charts. All samples run on the RF-5000U are stored on disk and printed on normal typing paper with a laser printer; sample information is printed on the chart.

Quantification

We routinely calculate the magnitude of fluorescence peaks for fluorescein, eosine, rhodamine WT, sulforhodamine B, and pyranine dyes. Dye quantities are expressed in microgram per liter (parts per billion; ppb). On the RF-540 the dye concentrations are calculated by separating fluorescence peaks due to dyes from background fluorescence on the charts, and then measuring the height of the peak due to the dye. These heights are proportional to those obtained from standard solutions. On the RF-5000U the dye concentrations are calculated by separating fluorescence peaks due to dyes from background fluorescence on the charts, and then calculating the area within the fluorescence peak. This area is proportional to areas obtained from standard solutions.

Where there are multiple fluorescence peaks it is sometimes necessary to calculate dye concentrations based upon the height of the fluorescence peak rather that the area.

We run dye concentration standards each day the machine is used. Eight separate standards are used; the standard or standards appropriate for the analysis work being conducted is selected. All standards are based upon the as-sold weights of the dyes. The standards are as follows:

1) 10 ppb fluorescein and 100 ppb rhodamine WT in well water from the Jefferson City-Cotter Formation.

2) 10 ppb eosine in well water from the Jefferson City-Cotter Formation.

3) 100 ppb sulforhodamine B in well water, etc.

4) 10 ppb fluorescein and 100 ppb rhodamine WT in the standard elutant

5) 10 ppb eosine in the standard elutant.

6) 100 ppb sulforhodamine B in standard elutant.

7) 10 ppb pyranine in a solution consisting of 50% well water and 50% standard elutant. This is necessary since the fluorescence of pyranine varies with pH at pH values of less than about 9.5.

8) 10 ppb pyranine in the standard elutant.

Standards are prepared as follows:

Step 1. A small sample of the as-sold dye is placed in a pre-weighted sample vial and the vial is again weighted to determine the weight of the dye. We attempt to use a sample weighting between 1 and 5 grams. This sample is then diluted with well water to make a 1% dye solution by weight (based upon the as-sold weight of the dye). The resulting dye solution is allowed to sit for at least four hours to insure that all dye is fully dissolved.

Step 2. One part of each dye solution from Step 1 is placed in a mixing container with 99 parts of well water. Separate mixtures are made for fluorescein, rhodamine WT, eosine, sulforhodamine B, and pyranine. The resulting solutions contain 100 mg/l dye (100 parts per million dye). The typical prepared volume of this mixture is appropriate for the sample bottles being used; we commonly prepare about 350 ml. of the Step 2 solutions. The dye solution from Step 1 that is used in making the Step 2 solution is withdrawn with a digital Finnpipette which is capable of measuring volumes between 0.200 and 1.000 ml at intervals of 0.005 ml. The calibration certificate with this instrument indicates that the accuracy (in percent) is as follows:

At 0.200 ml, 0.90%

At 0.300 ml, 0.28%

At 1.000 ml, 0.30%

The Step 2 solution is called the long term standard. Ozark Underground Laboratory experience indicates that Step 2 solutions, if kept refrigerated, will not deteriorate appreciably over periods of less than a year. Furthermore, these Step 2 solutions may last substantially longer than one year.

Step 3. A series of intermediate-term dye solutions are made. Approximately 45 ml. of each intermediate-term dye solution is made. All volume measurements of less than 5 ml are made with a digital Finnpipette. (see description in Step 2). All other volume measurements are made with Rheinland Kohn Geprufte Sicherheit 50 ml. capacity pump dispenser which will pump within plus or minus 1% of the set value. The following solutions are made; all concentrations are based on the as-sold weight of the dyes:

1) A solution containing 1 ppm fluorescein dye and 10 ppm rhodamine WT dye.

2) A solution containing 1 ppm eosine.

3) A solution containing 10 ppm sulforhodamine B dye.

4) A solution containing 1 ppm eosine.

Step 4. A series of eight short-term dye standards are made from solutions in Step 3. These standards were identified earlier in this section. In the experience of the Ozark Underground Laboratory these standards have a useful shelf life in excess of one week. However, in practice, they are kept under refrigeration and new standards are made weekly.

Dilution of Samples

Some samples contain dye concentrations greater than the analytical instrument can accurately measure. The analysis graph for such a sample is often flat-topped, indicating that it exceeds the measuring scale. In some cases there is a fluorescence peak which looks similar to accurate peaks except that the peak emission wavelength is longer than normally associated with the dye in question. These peaks routinely have arbitrary fluorescence unit values of 800 or more (the maximum value on this arbitrary scale is 1000). All of these samples need to be diluted to permit accurate analysis.

In addition, some water samples have high turbidity or color which interferes with accurate detection and measurement of dye concentrations. It is often possible to dilute these samples and then measure the dye concentration in the diluted sample.

The typical dilution is 100 fold. One part of the test sample is combined with 99 parts of water (if the test sample is water) or with 99 parts of the standard elutant (if the test sample is elutant). Typically, 0.300 ml of the test solution is combined with 29.700 ml of water (or elutant as appropriate) to yield a new test solution. All volume measurements of less than 5 ml are made with a digital Finnpipette. which is capable of measuring volumes between 0.200 and 1.000 ml at intervals of 0.005 ml. The calibration certificate with this instrument indicates that the accuracy (in percent) is as follows:

At 0.200 ml, 0.90%

At 0.300 ml, 0.28%

At 1.000 ml, 0.30%

All other volume measurements are made with Rheinland Kohn Geprufte Sicherheit 50 ml. capacity pump dispenser which will pump within plus or minus 1% of the set value.

Quality Control

Laboratory blanks are run for every sample where the last two digits of the laboratory numbers are 00, 20, 40, 60, or 80. A charcoal packet is placed in a pumping well sampler and at least 25 gallons of unchlorinated water is passed through the sampler at a rate of about 2.5 gallons per minute. The sampler is then subjected to the same analytical protocol as all other samplers.

System functioning tests of the analytical instruments are conducted in accordance with the manufacturer's recommendations.

All materials used in sampling and analysis work are routinely analyzed for the presence of any compounds which might create fluorescence peaks in or near the acceptable wavelength ranges for any of the tracer dyes. This testing typically includes approximately 1% of materials used.

Reports

Reports are provided in accordance with the needs of the client. At a minimum we provide copies of the analysis graphs and a listing of stations and samples where dye was detected. The reports indicate dye concentrations.

Work at the Ozark Underground Laboratory is directed by Mr. Thomas Aley. Mr. Aley has 32 years of professional experience in hydrology and hydrogeology. He is certified as a Professional Hydrogeologist (Certificate #179) by the American Institute of Hydrology. Mr. Aley has 30 years of professional experience in groundwater tracing with fluorescent tracing agents.

CRITERIA FOR DETERMINATION OF POSITIVE DYE RECOVERIES

Table 1. RF-540 Spectrofluorophotometer. Normal emission wavelength ranges and detection limits for fluorescein, eosine, and rhodamine WT dyes in water and elutant samples. The normal acceptable wavelength range equals the mean plus and minus two standard deviations; these values are from actual groundwater tracing studies previously conducted by the Ozark Underground Laboratory (OUL). Detection limits are based upon the as-sold weight of the dye normally used by the OUL. Insufficient data exist for sulforhodamine B on this instrument.

Dye and Medium	Normal Acceptable Emission Wavelength Range (nm)	Detection Limit (ppb)
Fluorescein in Elutant	515.3 to 519.6	0.0150
Fluorescein in Water	509.2 to 514.1	0.0005
Eosine in Elutant	538.0 to 544.6	0.0300
Eosine in Water	534.0 to 542.8	0.0010
Rhodamine WT in Elutant	567.2 to 574.4	0.2350
Rhodamine WT in Water	574.5 to 579.9	0.0100

Table 2. RF-5000U Spectrofluorophotometer. Normal emission wavelength ranges and detection limits for fluorescein, eosine, rhodamine WT, and sulforhodamine B dyes in water and elutant samples. The normal acceptable wavelength range equals the mean plus and minus two standard deviations; these values are from actual groundwater tracing studies previously conducted by the OUL. Detection limits are based upon the as-sold weight of the dye normally used by the OUL.

Dye and Medium	Normal Acceptable Emission Wavelength Range (nm)	Detection Limit (ppb)
Fluorescein in Elutant	510.7 to 515.0	0.0100
Fluorescein in Water	505.6 to 510.5	0.0005
Eosine in Elutant	533.0 to 539.6	0.0200
Eosine in Water	529.6 to 538.4	0.0010
Rhodamine WT in Elutant	561.7 to 568.9	0.1550
Rhodamine WT in Water	569.4 to 574.8	0.0070
Sulforhodamine in Elutant	567.5 to 577.5	0.1150
Sulforhodamine in Water	576.2 to 579.7	0.0090

Please note that Tables 1 and 2 do not include values for pyranine in elutant or for pyranine in any type of water sample. This is because these data are under development; our data base is not yet large enough to identify "normal" conditions. The data for identifying normal acceptable emission wavelength ranges must be based upon samples from actual tracing work, and the values are instrument specific and matrix specific. Study specific criteria are used for those studies where pyranine is utilized. These criteria are based upon the existing OUL data base.

Normal Criteria Used by the Ozark Underground Laboratory for Determining Positive Fluorescein Dye Recoveries in Elutants from Charcoal Samplers.

There is often some fluorescence background in the range of fluorescein dye present at some of the stations used in groundwater tracing studies. We routinely conduct background sampling prior to the introduction of any tracer dyes to characterize this background fluorescence and to identify the existence of any tracer dyes which may be present in the area. For charcoal packet elutant samples subjected to analysis on the RF-540 we routinely identify all fluorescence peaks with wavelengths between 508.5 and 525.5 nm. For charcoal packet elutant samples subjected to analysis on the RF-5000U we routinely identify all fluorescence peaks with wavelengths between 503.9 and 520.9 nm. The fact that a fluorescence peak is identified in our analytical results is not proof that it is fluorescein dye or that it is fluorescein dye from the trace of concern. The

following 4 criteria are used to identify fluorescence peaks which are deemed to be fluorescein dye recoveries from our tracing work.

Criterion 1. There must be at least one fluorescence peak at the station in question in the range of 515.3 to 519.6 nm for samples analyzed by the RF-540. The range must be 510.7 to 515.0 for samples analyzed by the RF-5000U.

Criterion 2. The dye concentration associated with the fluorescence peak must be at least 3 times the detection limit. For the RF-540 the fluorescein detection limit in elutant samples is 0.015 ppb, thus this dye concentration limit equals 0.045 ppb. For the RF-5000U the fluorescein detection limit in elutant samples is 0.010 ppb, thus this dye concentration limit equals 0.030 ppb.

Criterion 3. The dye concentration must be at least 10 times greater than any other concentration reflective of background at the sampling station in question.

Criterion 4. The shape of the fluorescence peak must be typical of fluorescein. Much background fluorescence yields low, broad, and asymmetrical fluorescence peaks rather than the more narrow and symmetrical fluorescence peaks typical of fluorescein. In addition, there must be no other factors which suggest that the fluorescence peak may not be fluorescein dye from our groundwater tracing work.

Normal Criteria Used by the Ozark Underground Laboratory for Determining Positive Fluorescein Dye Recoveries in Water Samples.

There is commonly some fluorescence background in the general range of fluorescein dye at some sampling stations used in groundwater tracing studies. The following criteria are used to identify fluorescence peaks which are deemed to be fluorescein dye in water.

Criterion 1. The associated charcoal samplers for the station should also contain fluorescein dye in accordance with the criteria listed above. These criteria may be waived if no charcoal sampler exists.

Criterion 2. There must be no factors which suggest that the fluorescence peak may not be fluorescein dye from our groundwater tracing work. For samples analyzed on the RF-540, the fluorescence peak should generally be in the range of 509.2 to 514.2. For samples analyzed on the RF-5000U, the fluorescence peak should generally be in the range of 505.6 to 510.5 nm.

Criterion 3. The dye concentration associated with the fluorescence peak must be at least three times the detection limit. Our fluorescein detection limit in water samples is 0.0005 ppb, thus this dye concentration limit equals 0.0015 ppb.

Normal Criteria Used by the Ozark Underground Laboratory for Determining Positive Eosine Dye Recoveries in Elutants from Charcoal Samplers.

There is generally little or no detectable fluorescence background in the general range of eosine dye encountered in most groundwater tracing studies. The following four criteria are used to identify fluorescence peaks which are deemed to be eosine dye.

Criterion 1. There must be at least one fluorescence peak at the station in question in the range of 538.0 to 544.6 nm for samples analyzed by the RF-540. The range must be 533.0 to 539.6 nm for samples analyzed by the RF-5000U.

Criterion 2. The dye concentration associated with the fluorescence peak must be at least 3 times the detection limit. For the RF-540 the eosine detection limit in elutant samples is 0.030 ppb, thus this dye concentration limit equals 0.090 ppb. For the RF-5000U the eosine detection limit in elutant samples is 0.020 ppb, thus this dye concentration limit equals 0.060 ppb.

Criterion 3. The dye concentration must be at least 10 times greater than any other concentration reflective of background at the sampling station in question.

Criterion 4. The shape of the fluorescence peak must be typical of eosine. Much background fluorescence yields low, broad, and asymmetrical fluorescence peaks rather than the more narrow and symmetrical fluorescence peaks typical of eosine. In addition, there must be no other factors which suggest that the fluorescence peak may not be eosine dye from our groundwater tracing work.

Normal Criteria Used by the Ozark Underground Laboratory for Determining Positive Eosine Dye Recoveries in Water Samples.

There is generally little or no detectable fluorescence background in the general range of eosine dye encountered in most groundwater tracing studies. The following three criteria are used to identify fluorescence peaks which are deemed to be eosine dye.

Criterion 1. The associated charcoal samplers for the station should also contain eosine dye in accordance with the criteria listed above. These criteria may be waived if no charcoal sampler exists.

Criterion 2. There must be no factors which suggest that the fluorescence peak may not be eosine dye from our groundwater tracing work. For samples analyzed on the RF-540, the fluorescence peak should generally be in the range of 534.0 to 542.8 nm. For samples analyzed on the RF-5000U, the fluorescence peak should generally be in the range of 529.6 to 538.4 nm.

Criterion 3. The dye concentration associated with the fluorescence peak must be at least three times the detection limit. Our eosine detection limit in water samples is 0.001 ppb, thus this dye concentration limit equals 0.003 ppb.

Normal Criteria Used by the Ozark Underground Laboratory for Determining Positive Rhodamine WT Dye Recoveries in Elutants from Charcoal Samplers.

There is generally little or no detectable fluorescence background in the general range of Rhodamine WT dye encountered in most groundwater tracing studies. The following four criteria are used to identify fluorescence peaks which are deemed to be Rhodamine WT.

Criterion 1. For samples analyzed on the RF-540, there must be at least one fluorescence peak at the station in question in the range of 567.0 to 574.4 nm. For

samples analyzed on the RF-5000U, there must be at least one fluorescence peak at the station in question in the range of 561.7 to 568.9 nm.

Criterion 2. The dye concentration associated with the Rhodamine WT peak must be at least 3 times the detection limit. For the RF-540 the detection limit in elutant samples is 0.235 ppb, thus this dye concentration limit equals 0.705 ppb. For the RF-5000U, the detection limit in elutant samples is 0.155 ppb, thus this dye concentration limit equals 0.465 ppb.

Criterion 3. The dye concentration must be at least 10 times greater than any other concentration reflective of background at the sampling station in question.

Criterion 4. The shape of the fluorescence peak must be typical of Rhodamine WT. In addition, there must be no other factors which suggest that the fluorescence peak may not be dye from the groundwater tracing work under investigation.

Normal Criteria Used by the Ozark Underground Laboratory for Determining Positive Rhodamine WT Dye Recoveries in Water Samples.

The following criteria are used to identify fluorescence peaks which are deemed to be Rhodamine WT dye in water.

Criterion 1. The associated charcoal samplers for the station should also contain Rhodamine WT dye in accordance with the criteria listed above. These criteria may be waived if no charcoal sampler exists.

Criterion 2. There must be no factors which suggest that the fluorescence peak may not be Rhodamine WT dye from the tracing work under investigation. For samples analyzed with the RF-540, the fluorescence peak should generally be in the range of 574.5 to 579.9 nm. For samples analyzed with the RF-5000U, the fluorescence peak should generally be in the range of 569.4 to 574.8 nm.

Criterion 3. The dye concentration associated with the fluorescence peak must be at least three times the detection limit. Our Rhodamine WT detection limit in water samples is 0.007 ppb, thus this dye concentration limit equals 0.021 ppb.

Normal Criteria Used by the Ozark Underground Laboratory for Determining Positive Sulforhodamine B Dye Recoveries in Elutants from Charcoal Samplers.

There is generally little or no detectable fluorescence background in the general range of sulforhodamine B dye encountered in most groundwater tracing studies. The following four criteria are used to identify fluorescence peaks which are deemed to be sulforhodamine B.

Criterion 1. For samples analyzed on the RF-5000U, there must be at least one fluorescence peak at the station in question in the range of 567.5 to 577.5 nm.

Criterion 2. The dye concentration associated with the sulforhodamine B peak must be at least 3 times the detection limit. For the RF-5000U, the detection limit in elutant samples is 0.115 ppb, thus this dye concentration limit equals 0.345 ppb.

Criterion 3. The dye concentration must be at least 10 times greater than any other concentration reflective of background at the sampling station in question.

Criterion 4. The shape of the fluorescence peak must be typical of sulforhodamine B. In addition, there must be no other factors which suggest that the fluorescence peak may not be dye from the groundwater tracing work under investigation.

Normal Criteria Used by the Ozark Underground Laboratory for Determining Positive Sulforhodamine B dye Recoveries in Water Samples.

The following criteria are used to identify fluorescence peaks which are deemed to be sulforhodamine B dye in water.

Criterion 1. The associated charcoal samplers for the station should also contain sulforhodamine B dye in accordance with the criteria listed earlier. These criteria may be waived if no charcoal sampler exists.

Criterion 2. There must be no factors which suggest that the fluorescence peak may not be sulforhodamine B dye from the tracing work under investigation. For samples analyzed with the RF-5000U, the fluorescence peak should generally be in the range of 576.2 to 579.7 nm.

Criterion 3. The dye concentration associated with the fluorescence peak must be at least three times the detection limit. Our sulforhodamine B detection limit in water samples is 0.009 ppb, thus this dye concentration limit equals 0.027 ppb.

Normal Criteria Used by the Ozark Underground Laboratory for Determining Positive Pyranine Dye Recoveries in Elutants from Charcoal Samplers.

These methods are presently under development. The criteria will be similar to those for the other tracer dyes, but a full specification of the criteria cannot be made until an acceptable wavelength range for this dye in the elutant is developed based upon an adequate set of data from actual groundwater traces with pyranine. Tests presently in progress with this dye are using both 17 and 35 nm bandwidth separations. Specification of criteria should be completed in late 1996.

Studies in which pyranine is currently used as a groundwater tracing agent use the data presently available for determining acceptable wavelength ranges and detection limits. These studies identify the fact that the data set available is insufficient for the values and criteria to be viewed as "normal OUL criteria".

Normal Criteria Used by the Ozark Underground Laboratory for Determining Positive Pyranine Dye Recoveries in Water Samples.

These methods are presently under development. The criteria will be similar to those for the other tracer dyes, but a full specification of the criteria cannot be made until an acceptable wavelength range for this dye in water samples is developed based upon an adequate set of data from actual groundwater traces with pyranine. Tests presently in progress with this dye are using both 17 and 35 nm bandwidth separations. Specification of criteria should be completed in late 1996.

The fluorescence of pyranine decreases below a pH of about 9.5. Adjustment for this is done by diluting the water sample with an equal volume of the standard OUL elutant. For some waters which are neutral to slightly basic the pH adjustment can be made by adding sufficient potassium hydroxide to make a solution which is 5% potassium hydroxide and 95% collected water sample. Work in progress by the OUL is examining the utility of both approaches; the better approach will be identified in our final procedures and criteria document.

Studies in which pyranine is currently used as a groundwater tracing agent use the data presently available for determining acceptable wavelength ranges and detection limits. These studies identify the fact that the data set available is insufficient for the values and criteria to be viewed as "normal OUL criteria".

Examples of Dye Analysis Graphs

The following dye analysis graphs have resulted from actual groundwater tracing studies. All samples are from the OUL Shimadzu RF-5000U spectrofluorophotometer.

(**NOTE TO READER:** Figures 3 through 12 are only available in copies of this document distributed in paper form. These forms are not available in copies of OUL's Procedures and Criteria distributed in electronic form.)

Figure 3 shows a typical analysis graph for a charcoal sampler which contains no tracer dyes.

Figure 4 shows a typical analysis graph for a water sample which contains no tracer dyes. The fluorescence peak at about 605 nm is out of the range of all of the tracer dyes; this peak is due to fluorescence of the plastic in the disposable cuvette.

Figure 5 shows a typical analysis graph for a charcoal sampler which contains fluorescein dye. The fluorescence peak is at 511.9 nm, and the dye concentration is 3.13 ppb.

Figure 6 shows a typical analysis graph for a water sample which contains fluorescein dye. The fluorescence peak is at 507.8 nm, and the dye concentration is 0.166 ppb.

Figure 7 shows a typical analysis graph for a charcoal sampler which contains eosine dye. Note that this sample has received a 50-fold dilution. The fluorescence peak is at 538.3 nm; the concentration is 14.5 ppb X 50 = 725 ppb eosine.

Figure 8 shows a typical analysis graph for a charcoal sampler which contains rhodamine WT dye. The fluorescence peak is at 562.9 nm, and the dye concentration is; 17.1 ppb.

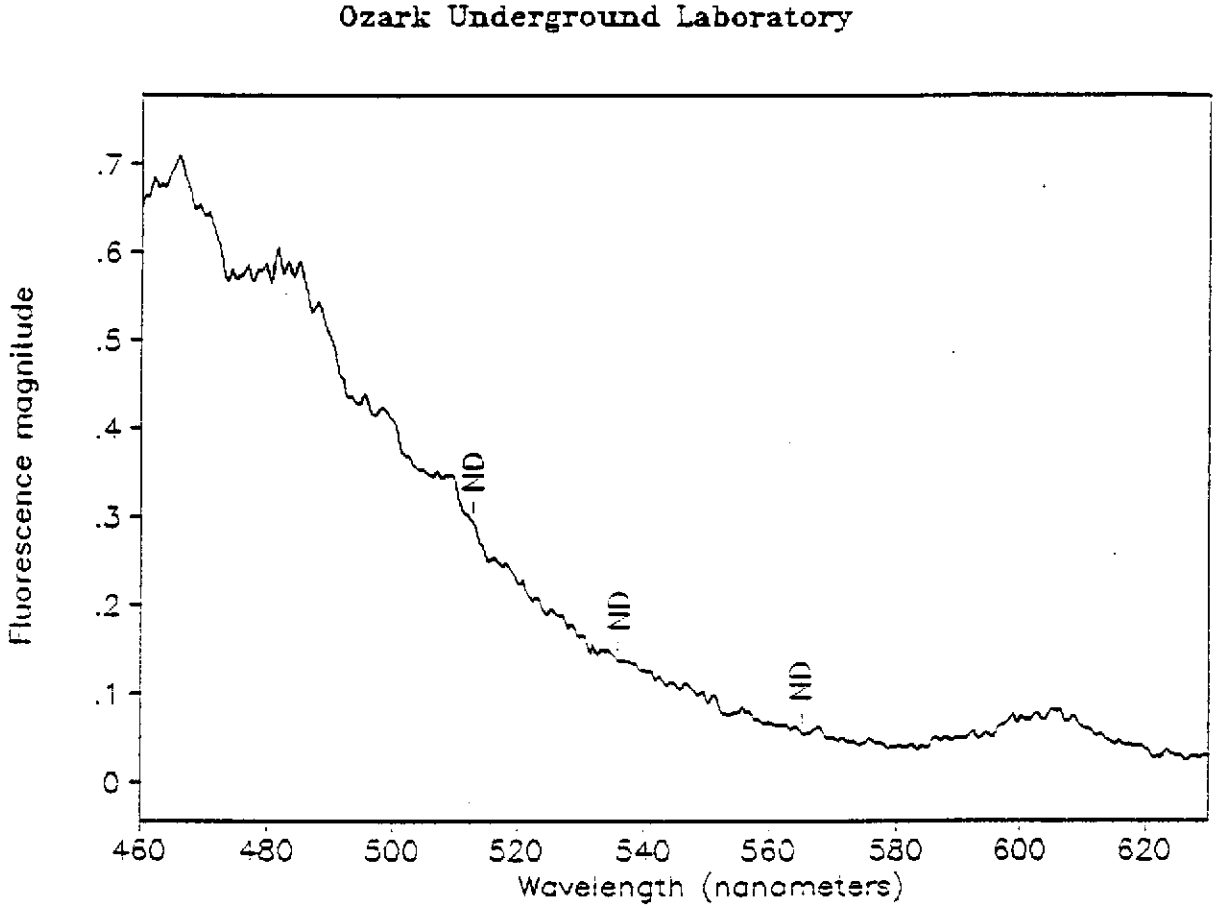
Figure 9 shows a typical analysis graph for a water sample which contains rhodamine WT dye. The fluorescence peak is at 570.8 nm, and the dye concentration is 7.10 ppb.

Figure 10 shows a typical analysis graph for a water sample which contains both eosine and rhodamine WT. The fluorescence peak representing eosine is at 531.9 nm,

and the dye concentration is 0.535 ppb. The fluorescence peak representing rhodamine WT is at 569.8 nm, and the dye concentration is 1.62 ppb.

Figure 11 shows a typical analysis graph for a charcoal sampler which contains sulforhodamine B dye. The fluorescence peak is at 573.8 nm, and the dye concentration is 22.3 ppb.

Figure 12 shows a typical analysis graph for a water sample which contains both fluorescein and sulforhodamine B dyes. The fluorescence peak representing fluorescein is a 509.0 nm, and the dye concentration is 0.217 ppb. The fluorescence peak representing sulforhodamine B is at 577.8 nm, and the concentration is 2.45 ppb.

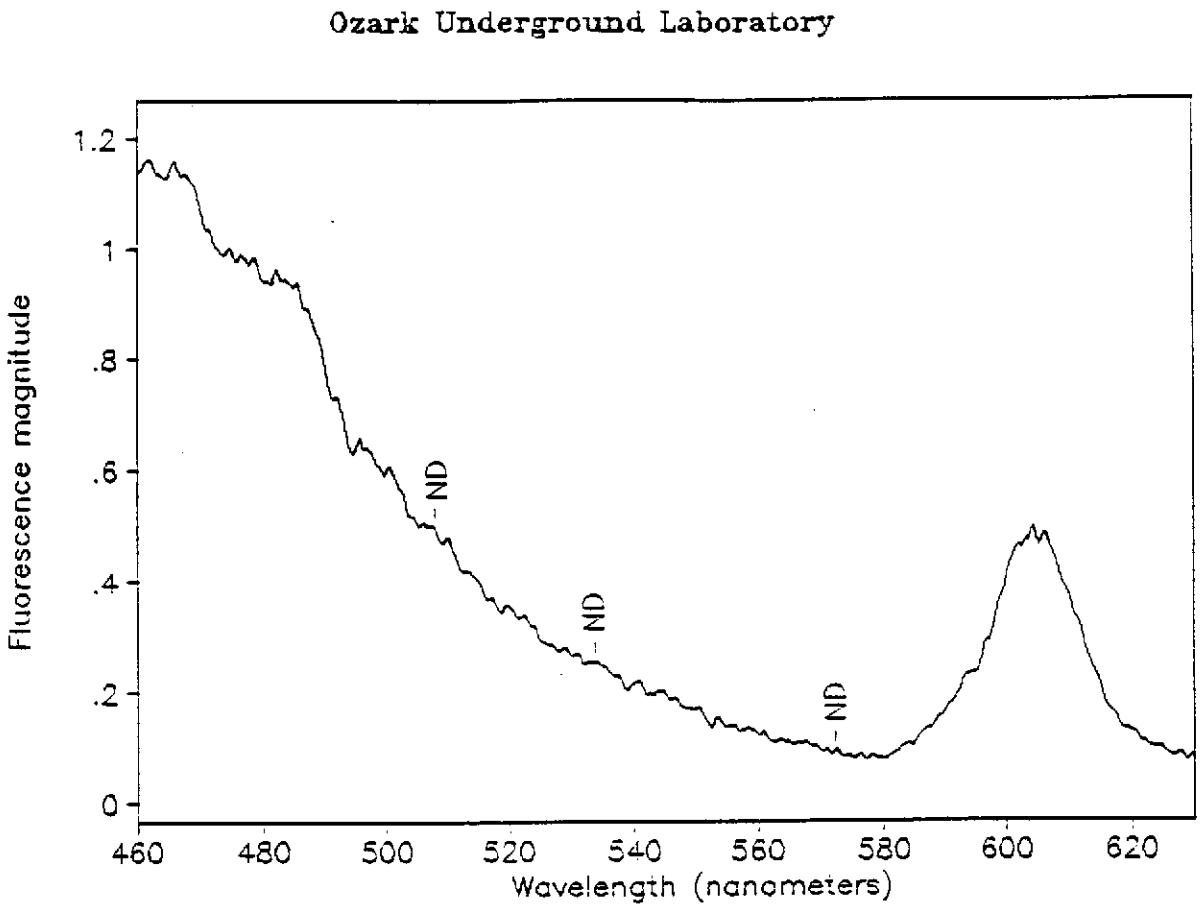


Station 201: Well EW-1
OUL number: C8073 Type: Charcoal Analyzed: 6-2-1994
Date placed: 5-17-1994 Date recovered: 5-23-1994
Time placed: 0910 Time recovered: 1653

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
512.8	510.7	515.0	0	0	0	ND
536.0	532.8	539.4	0	0	0	ND
565.2	561.7	568.9	0	0	0	ND

Figure 3. A typical analysis graph for a charcoal sampler which contains no tracer dyes.

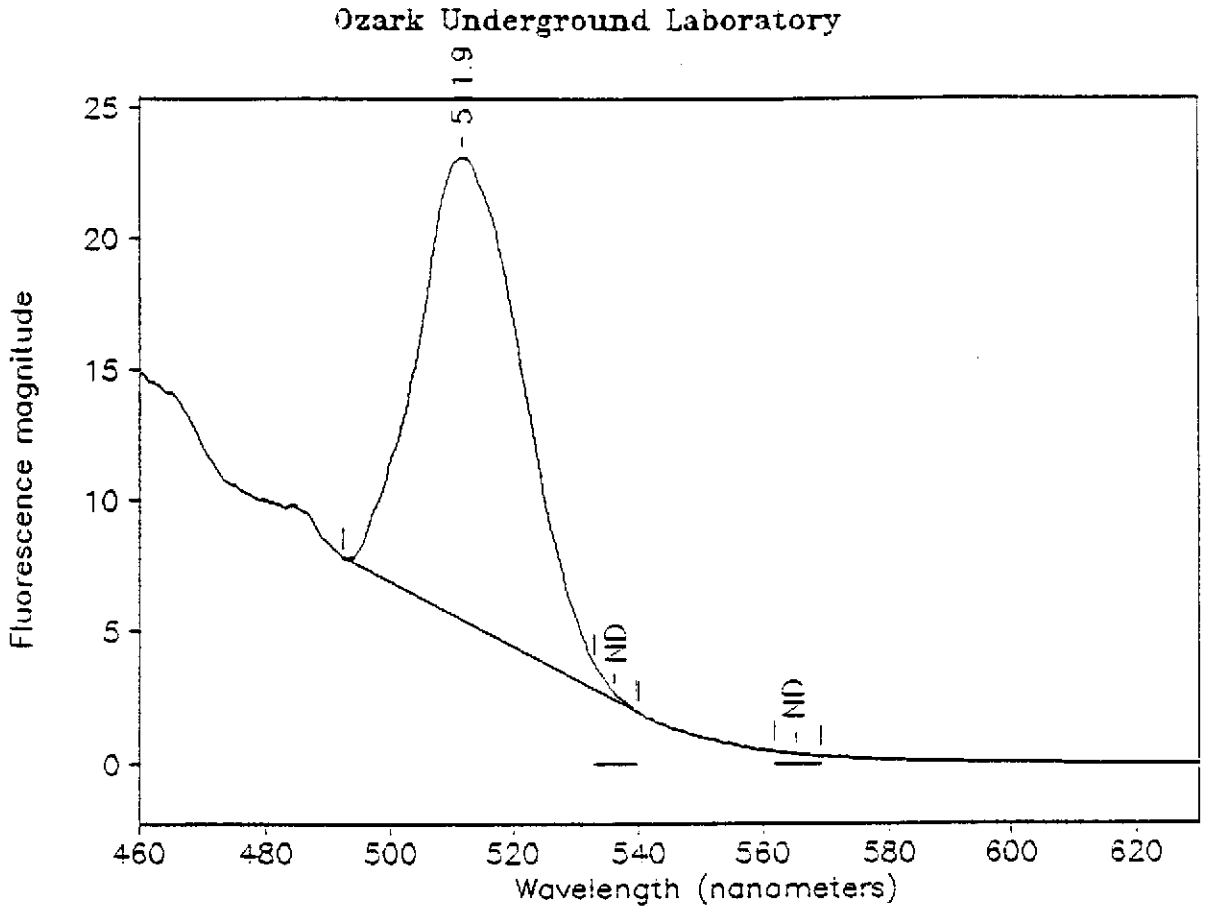


Station 1: Bear Creek Springs
OUL number: D8888 Type: Water Analyzed: 1-6-1995
Date collected: 12-29-1994 Time collected: 1410

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
508.0	505.6	510.5	0	0	0	ND
533.8	529.6	538.4	0	0	0	ND
572.1	569.4	574.8	0	0	0	ND

Figure 4. A typical analysis graph for a water sample which contains no tracer dyes. The fluorescence peak at about 605.0 nm is out of the range of all of the tracer dyes; this peak is due to fluorescence of the plastic in the disposable cuvette.

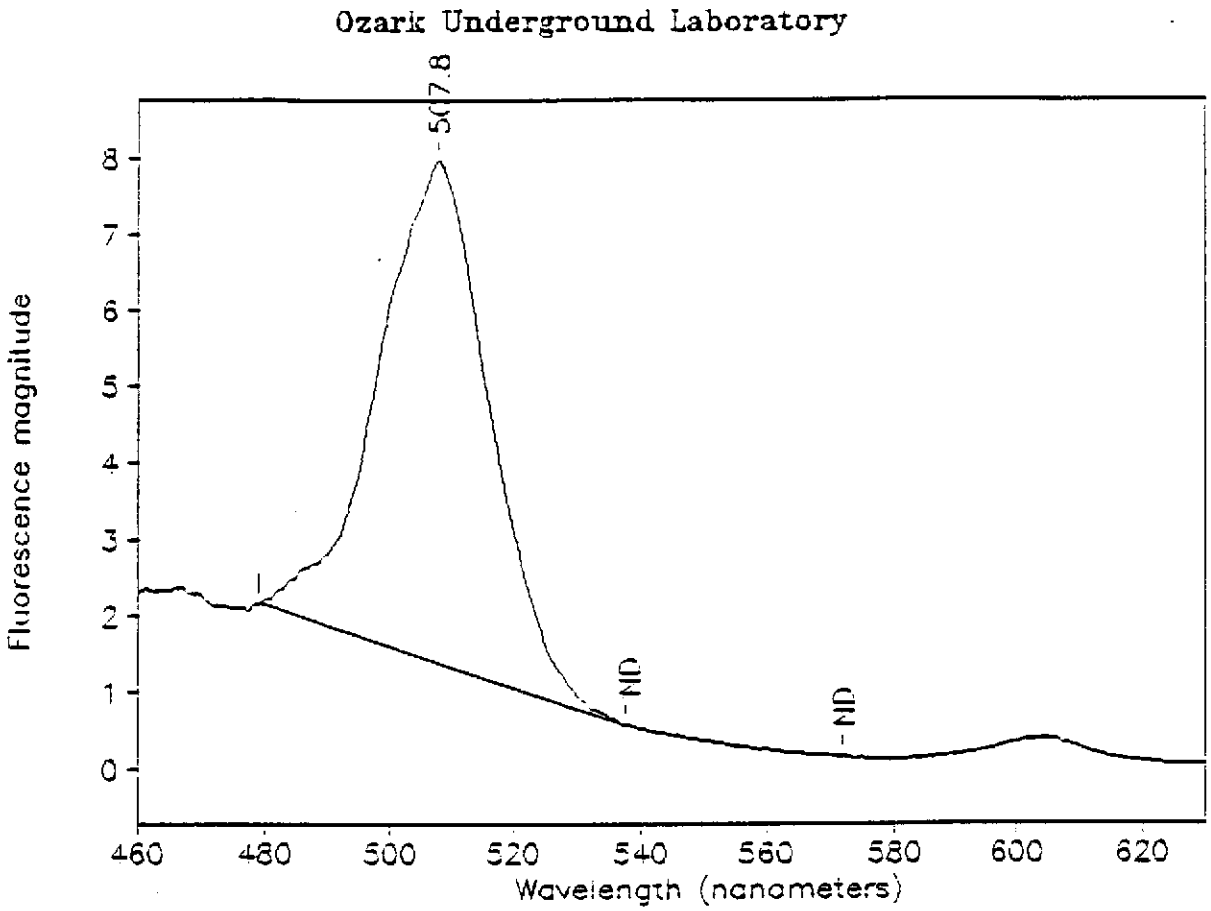


Station 17: Lick Branch Road Spring
OUL number: E0474 Type: Charcoal Analyzed: 3-17-1995
Date placed: 3-9-1995 Date recovered: 3-16-1995
Time placed: 1235 Time recovered: 1305

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
511.9	492.4	540.0	17.72	354.75	0.05	3.13
536.2	533.0	539.6	0	0	0	ND
565.2	561.7	568.9	0	0	0	ND

Figure 5. A typical analysis graph for a charcoal sampler which contain fluorescein dye. The fluorescence peak is at 511.9 nm, and the dye concentration is 3.13 ppb.

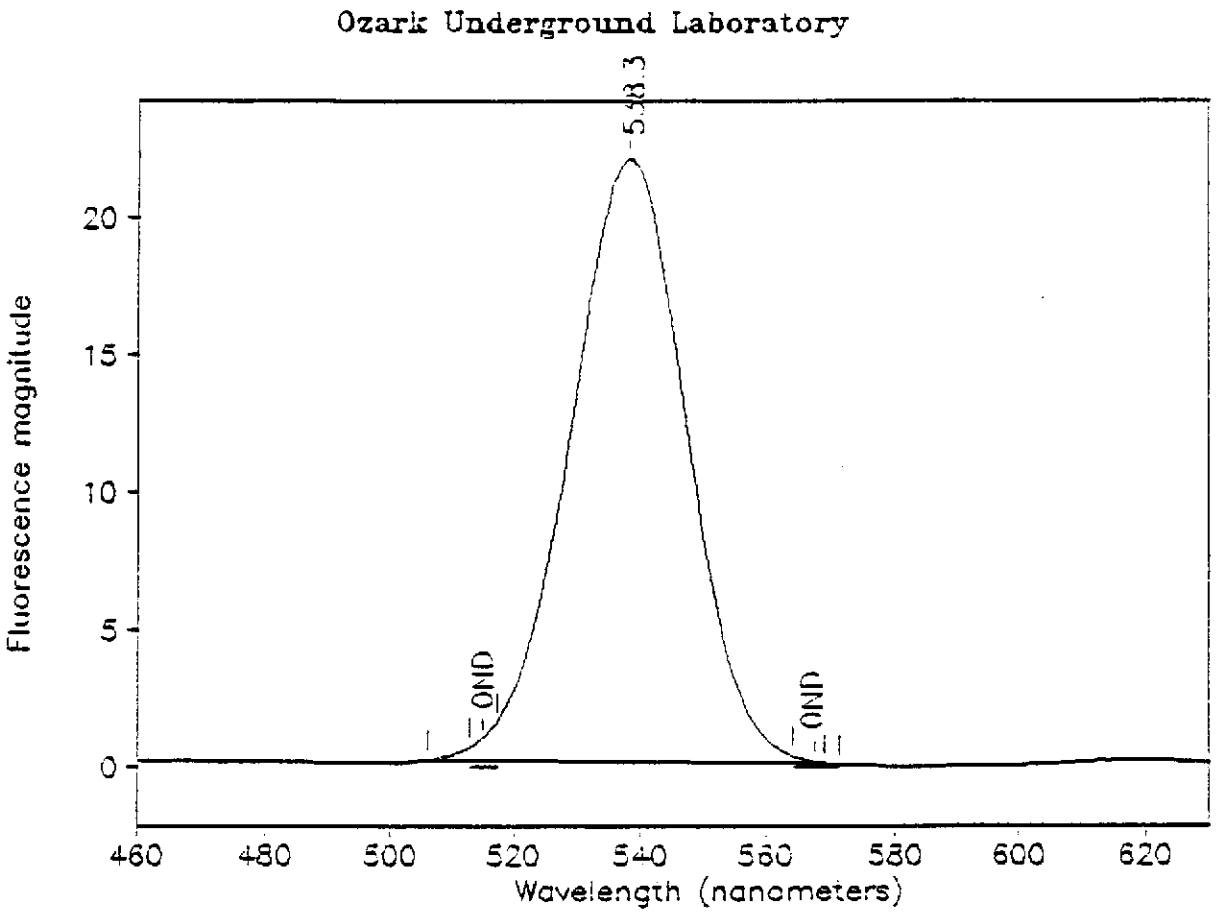


Station 325: Dozens Spring
OUL number: C9696 Type: Water Analyzed: 7-1-1994
Date collected: 6-22-1994 Time collected: 1500

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
507.8	479.0	537.2	6.60	138.79	0.05	0.166
537.6	529.7	544.7	0	0	0	ND
571.7	569.1	574.5	0	0	0	ND

Figure 6. A typical analysis graph for a water sample which contains fluorescein dye. The fluorescence peak is at 507.8 nm, and the dye concentration is 0.166 ppb.

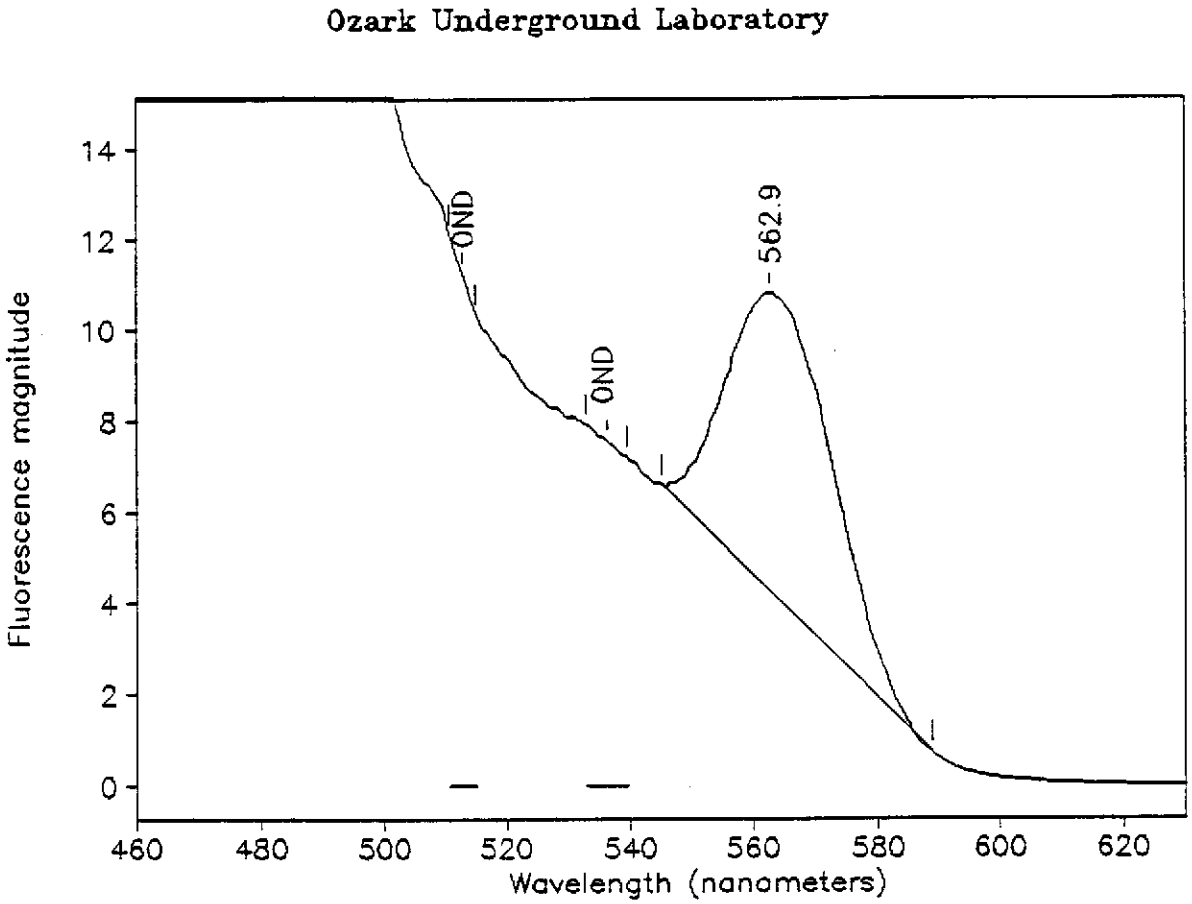


Station 242: Well 88-1
OUL number: C8846 Type: Charcoal Analyzed: 06-22-1994 Diluted 1:50
Date placed: 06-11-1994 Date recovered: 06-14-1994
Time placed: 1350 Time recovered: 1145

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
515.0	512.9	517.2	0	0	0	ND
538.3	506.1	569.0	21.93	469.41	0.05	14.5
567.6	564.1	571.3	0	0	0	ND

Figure 7. A typical analysis graph for a charcoal sampler which contains eosine dye. Note that this sample has received a 50-fold dilution. The fluorescence peak is at 538.3 nm; the concentration is 14.5 ppb X 50 = 725 ppb eosine.

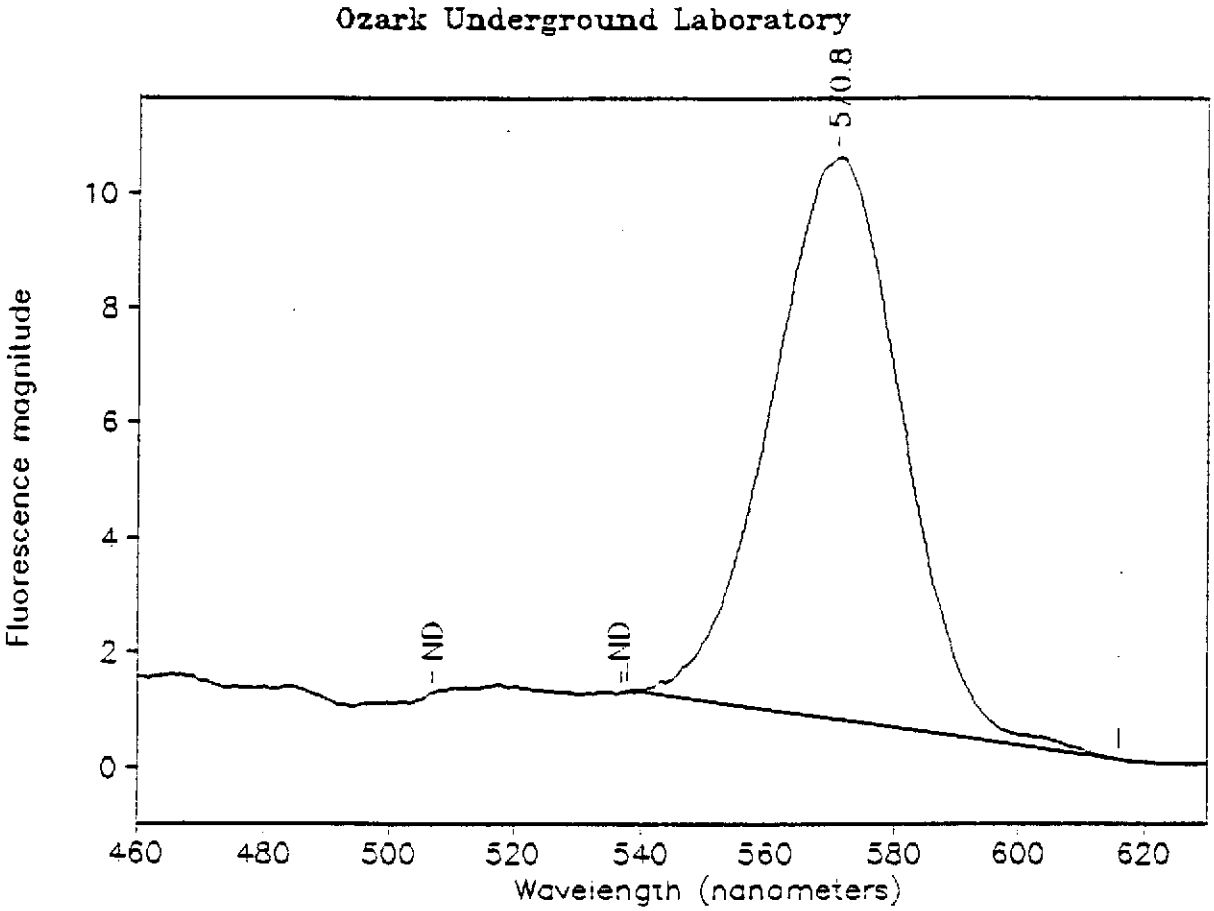


Station 1: Bear Creek Springs
OUL number: D9573 Type: Charcoal Analyzed: 1–30–1995
Date placed: 1–13–1995 Date recovered: 1–18–1995
Time placed: 1450 Time recovered: 1105

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
512.8	510.7	515.0	0	0	0	ND
536.3	533.0	539.6	0	0	0	ND
562.9	545.2	588.8	6.57	131.03	0.05	17.1

Figure 8. A typical analysis graph for a charcoal sampler which contains rhodamine WT dye. The fluorescence peak is at 562.9 nm, and the dye concentration is 17.1 ppb.

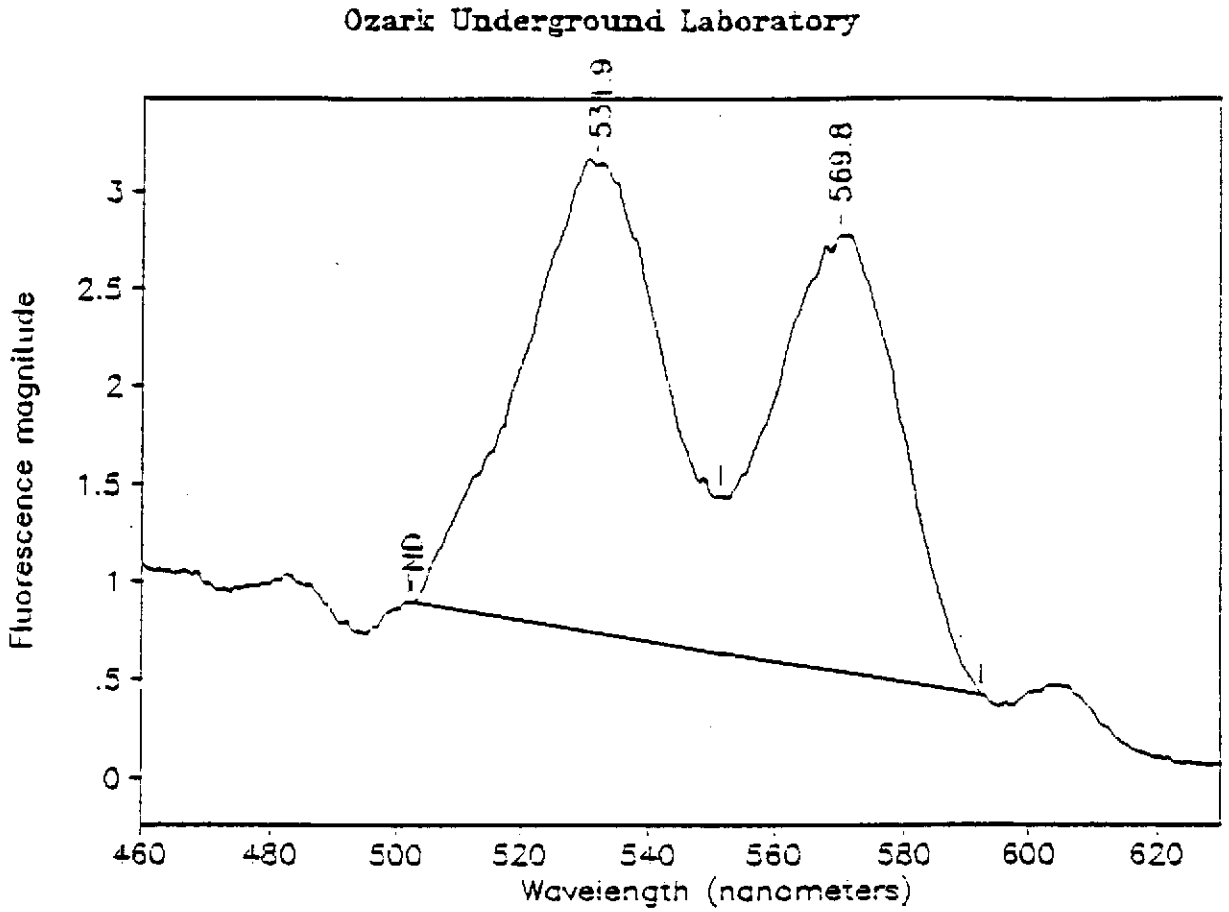


Station 299: Rowe Spring
OUL number: C8821 Type: Water Analyzed: 6-17-1994
Date collected: 6-11-1994 Time collected: 1530

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
506.9	504.5	509.4	0	0	0	ND
536.8	528.8	543.8	0	0	0	ND
570.8	537.9	615.9	9.82	235.96	0.04	7.1

Figure 9. A typical analysis graph for a water sample which contains rhodamine WT dye. The fluorescence peak is at 570.8 nm, and the dye concentration is 7.10 ppb.

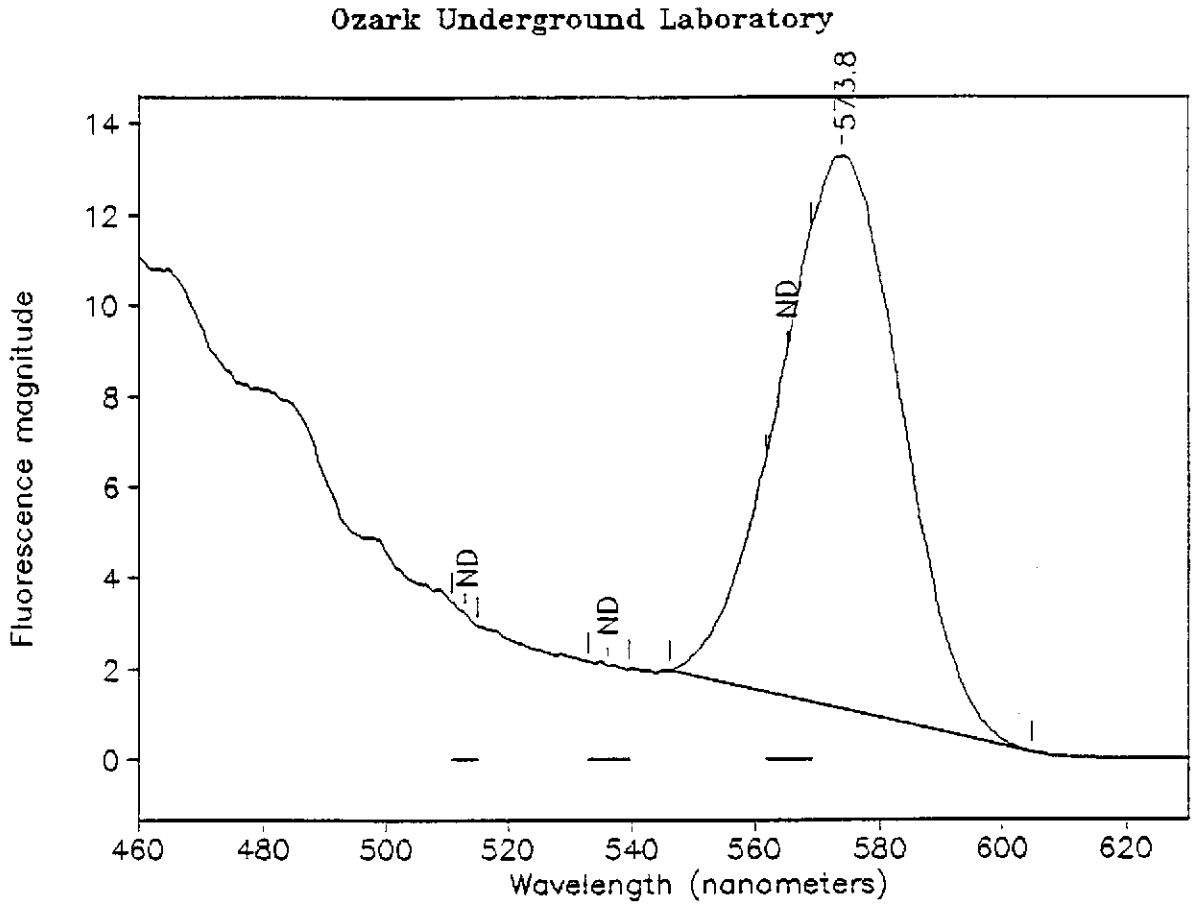


Station 299: Rowe Spring
OUL number: D0161 Type: Water Analyzed: 7-11-1994
Date collected: 6-30-1994 Time collected: 0715

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
502.3	499.9	504.7	0	0	0	ND
531.9	501.8	551.4	2.40	64.49	0.04	0.535
569.8	551.4	592.3	2.24	52.25	0.04	1.62

Figure 10. A typical analysis graph for a water sample which contains both eosine and rhodamine WT dyes. The fluorescence peak representing eosine is at 531.9 nm, and the dye concentration is 0.535 ppb. The fluorescence peak representing rhodamine WT is at 569.8 nm, and the dye concentration is 1.62 ppb.



Station 4: Mouth of Denning Creek
OUL number: E0364 Type: Charcoal Analyzed: 03-10-1995
Date placed: 03-03-199 Date recovered: 03-09-1995
Time placed: 1345 Time recovered: 1325

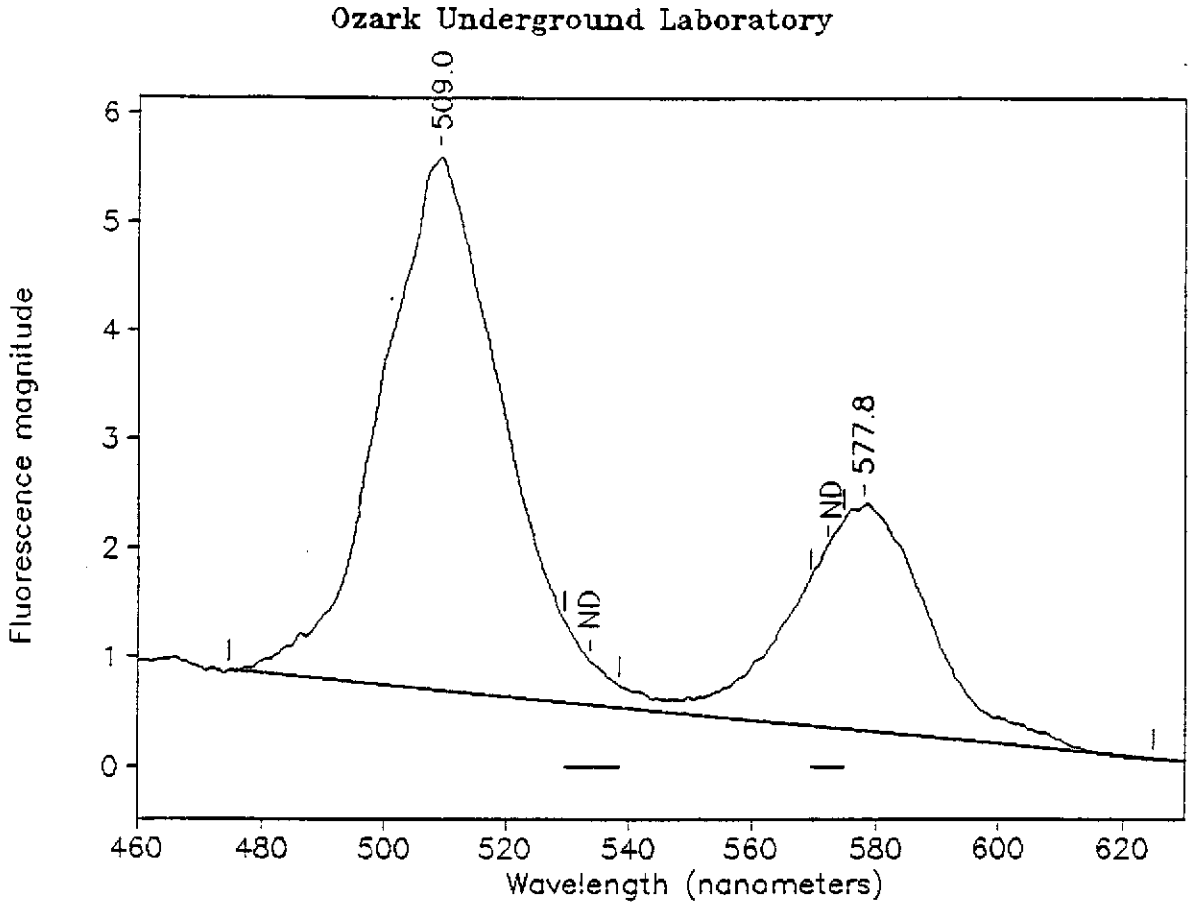
Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
512.8	510.7	515.0	0	0	0	ND
536.2	533.0	539.6	0	0	0	ND
565.2	561.7	568.9	0	0	0	ND

Peaks close to normal range of tracer dyes:

573.8	546.2	604.7	12.20	279.07	0.04	0

Figure 11. A typical analysis graph for a charcoal sampler which contains sulforhodamine B dye. The fluorescence peak is at 573.8 nm, and the dye concentration is 22.3 ppb.



Station 326: Hawbaker Spring
OUL number: D7684 Type: Water Analyzed: 12-09-1994
Date collected: 10-12-1994 Time collected: 1500

Peaks within normal range of tracer dyes:

Peak nm	Left X	Right X	Height	Area	H/A	Conc.
509.0	474.8	624.8	4.92	129.55	0.04	0.217
533.8	529.6	538.4	0	0	0	ND
572.1	569.4	574.8	0	0	0	ND

Peaks close to normal range of tracer dyes:

577.8	474.4	624.8	2.07	169.78	0.01	0

Figure 12. A typical analysis graph for a water sample which contains both fluorescein and sulforhodamine B dyes. The fluorescence peak representing fluorescein is at 509.0 nm, and the dye concentration is 0.217 ppb. The fluorescence peak representing sulforhodamine B is at 577.8 nm, and the concentration is 2.45 ppb.

APPENDIX C

SURFACE WATER ANALYTICAL RESULTS

San Francisco Regional Office

1252 Quarry Lane
P.O. Box 9019
Pleasanton, CA 94566
(925) 426-2600
Fax (925) 426-0106

Clayton
LABORATORY
SERVICES

January 28, 1999

Mr. Don Ashton
CLAYTON ENVIRONMENTAL CONS.
1252 Quarry Lane
Pleasanton, CA 94566

Client Ref.: 70-97203.00.201
Clayton Project No.: 99011.13

Dear Mr. Ashton:

Attached is our analytical laboratory report for the samples received on January 14, 1999. Also enclosed is a copy of the Chain-of-Custody record acknowledging receipt of these samples.

Please note that any unused portion of the samples will be discarded after February 27, 1999, unless you have requested otherwise.

We appreciate the opportunity to assist you. If you have any questions concerning this report, please contact Client Services at (925) 426-2657.

Sincerely,

Patricia Flynn
Client Services Representative
San Francisco Regional Office

PVF/kmd

Attachments

California DHS ELAP Certification Number 1196

Analytical Results
for
Clayton Environmental Consultants, Inc.
Client Reference: 70-97203.00.201
Clayton Project No. 99011.13

Sample Identification: WW-1
Lab Number: 9901113-01
Sample Matrix/Media: WATER

Date Sampled: 01/13/99
Date Received: 01/14/99

Analyte	Concentration	Method Detection Limit	Units	Date Prepared	Date Analyzed	Prep Method	Method Reference
Arsenic	<0.5	0.5	mg/L	01/18/99	01/27/99	EPA 200.7	EPA 200.7
Barium	<0.1	0.1	mg/L	01/18/99	01/27/99	EPA 200.7	EPA 200.7
Cadmium	0.08	0.05	mg/L	01/18/99	01/27/99	EPA 200.7	EPA 200.7
Zinc	9.4	0.1	mg/L	01/18/99	01/27/99	EPA 200.7	EPA 200.7
pH	7.4	--	S.U.	--	01/14/99	--	EPA 150.1

ND: Not detected at or above limit of detection
--: Information not available or not applicable

Analytical Results
for
Clayton Environmental Consultants, Inc.
Client Reference: 70-97203.00.201
Clayton Project No. 99011.13

Sample Identification: WW-2
Lab Number: 9901113-02
Sample Matrix/Media: WATER

Date Sampled: 01/13/99
Date Received: 01/14/99

Analyte	Concentration	Method Detection Limit	Units	Date Prepared	Date Analyzed	Prep Method	Method Reference
Arsenic	<0.5	0.5	mg/L	01/18/99	01/27/99	EPA 200.7	EPA 200.7
Barium	<0.1	0.1	mg/L	01/18/99	01/27/99	EPA 200.7	EPA 200.7
Cadmium	<0.05	0.05	mg/L	01/18/99	01/27/99	EPA 200.7	EPA 200.7
Zinc	1.7	0.1	mg/L	01/18/99	01/27/99	EPA 200.7	EPA 200.7
pH	7.2	--	S.U.	--	01/14/99	--	EPA 150.1

ND: Not detected at or above limit of detection
--: Information not available or not applicable

Analytical Results
for
Clayton Environmental Consultants, Inc.
Client Reference: 70-97203.00.201
Clayton Project No. 99011.13

Sample Identification: WW-3
Lab Number: 9901113-03
Sample Matrix/Media: WATER

Date Sampled: 01/13/99
Date Received: 01/14/99

Analyte	Concentration	Method Detection Limit	Units	Date Prepared	Date Analyzed	Prep Method	Method Reference
Arsenic	<0.5	0.5	mg/L	01/18/99	01/27/99	EPA 200.7	EPA 200.7
Barium	<0.1	0.1	mg/L	01/18/99	01/27/99	EPA 200.7	EPA 200.7
Cadmium	<0.05	0.05	mg/L	01/18/99	01/27/99	EPA 200.7	EPA 200.7
Zinc	2.9	0.1	mg/L	01/18/99	01/27/99	EPA 200.7	EPA 200.7
pH	7.3	--	S.U.	--	01/14/99	--	EPA 150.1

ND: Not detected at or above limit of detection
--: Information not available or not applicable

Analytical Results
for
Clayton Environmental Consultants, Inc.
Client Reference: 70-97203.00.201
Clayton Project No. 99011.13

Sample Identification: WW-4
Lab Number: 9901113-04
Sample Matrix/Media: WATER

Date Sampled: 01/13/99
Date Received: 01/14/99

Analyte	Concentration	Method Detection Limit	Units	Date Prepared	Date Analyzed	Prep Method	Method Reference
Arsenic	<0.5	0.5	mg/L	01/18/99	01/27/99	EPA 200.7	EPA 200.7
Barium	<0.1	0.1	mg/L	01/18/99	01/27/99	EPA 200.7	EPA 200.7
Cadmium	<0.05	0.05	mg/L	01/18/99	01/27/99	EPA 200.7	EPA 200.7
Zinc	2.7	0.1	mg/L	01/18/99	01/27/99	EPA 200.7	EPA 200.7
pH	7.3	--	S.U.	--	01/14/99	--	EPA 150.1

ND: Not detected at or above limit of detection
--: Information not available or not applicable

Analytical Results
for
Clayton Environmental Consultants, Inc.
Client Reference: 70-97203.00.201
Clayton Project No. 99011.13

Sample Identification: WW-5
Lab Number: 9901113-05
Sample Matrix/Media: WATER

Date Sampled: 01/13/99
Date Received: 01/14/99

Analyte	Concentration	Method Detection Limit	Units	Date Prepared	Date Analyzed	Prep Method	Method Reference
Arsenic	<0.5	0.5	mg/L	01/18/99	01/27/99	EPA 200.7	EPA 200.7
Barium	<0.1	0.1	mg/L	01/18/99	01/27/99	EPA 200.7	EPA 200.7
Cadmium	<0.05	0.05	mg/L	01/18/99	01/27/99	EPA 200.7	EPA 200.7
Zinc	1.9	0.1	mg/L	01/18/99	01/27/99	EPA 200.7	EPA 200.7
pH	7.4	--	S.U.	--	01/14/99	--	EPA 150.1

ND: Not detected at or above limit of detection
--: Information not available or not applicable

Analytical Results
for
Clayton Environmental Consultants, Inc.
Client Reference: 70-97203.00.201
Clayton Project No. 99011.13

Sample Identification: WW-6
Lab Number: 9901113-06
Sample Matrix/Media: WATER

Date Sampled: 01/13/99
Date Received: 01/14/99

Analyte	Concentration	Method Detection Limit	Units	Date Prepared	Date Analyzed	Prep Method	Method Reference
Arsenic	<0.5	0.5	mg/L	01/18/99	01/27/99	EPA 200.7	EPA 200.7
Barium	<0.1	0.1	mg/L	01/18/99	01/27/99	EPA 200.7	EPA 200.7
Cadmium	<0.05	0.05	mg/L	01/18/99	01/27/99	EPA 200.7	EPA 200.7
Zinc	0.8	0.1	mg/L	01/18/99	01/27/99	EPA 200.7	EPA 200.7
pH	7.7	--	S.U.	--	01/14/99	--	EPA 150.1

ND: Not detected at or above limit of detection
--: Information not available or not applicable

Analytical Results
for
Clayton Environmental Consultants, Inc.
Client Reference: 70-97203.00.201
Clayton Project No. 99011.13

Sample Identification: SW-1
Lab Number: 9901113-07
Sample Matrix/Media: WATER

Date Sampled: 01/13/99
Date Received: 01/14/99

Analyte	Concentration	Method Detection Limit	Units	Date Prepared	Date Analyzed	Prep Method	Method Reference
Arsenic	<0.05	0.05	mg/L	01/18/99	01/27/99	EPA 200.7	EPA 200.7
Barium	0.09	0.01	mg/L	01/18/99	01/27/99	EPA 200.7	EPA 200.7
Cadmium	<0.005	0.005	mg/L	01/18/99	01/27/99	EPA 200.7	EPA 200.7
Zinc	1.4	0.01	mg/L	01/18/99	01/27/99	EPA 200.7	EPA 200.7

ND: Not detected at or above limit of detection
--: Information not available or not applicable

Analytical Results
for
Clayton Environmental Consultants, Inc.
Client Reference: 70-97203.00.201
Clayton Project No. 99011.13

Sample Identification: SW-2
Lab Number: 9901113-08
Sample Matrix/Media: WATER

Date Sampled: 01/13/99
Date Received: 01/14/99

Analyte	Concentration	Method Detection Limit	Units	Date Prepared	Date Analyzed	Prep Method	Method Reference
Arsenic	<0.05	0.05	mg/L	01/18/99	01/27/99	EPA 200.7	EPA 200.7
Barium	0.07	0.01	mg/L	01/18/99	01/27/99	EPA 200.7	EPA 200.7
Cadmium	<0.005	0.005	mg/L	01/18/99	01/27/99	EPA 200.7	EPA 200.7
Zinc	0.50	0.01	mg/L	01/18/99	01/27/99	EPA 200.7	EPA 200.7

ND: Not detected at or above limit of detection
--: Information not available or not applicable

Analytical Results
for
Clayton Environmental Consultants, Inc.
Client Reference: 70-97203.00.201
Clayton Project No. 99011.13

Sample Identification: CW-13
Lab Number: 9901113-09
Sample Matrix/Media: WATER

Date Sampled: 01/13/99
Date Received: 01/14/99

Analyte	Concentration	Method Detection Limit		Units	Date Prepared	Date Analyzed	Prep Method	Method Reference
Ammonia-N	2.9	0.05		mg/L	--	01/15/99	--	EPA 350.3
Arsenic	<0.05	0.05		mg/L	01/18/99	01/27/99	EPA 200.7	EPA 200.7
Barium	0.04	0.01		mg/L	01/18/99	01/27/99	EPA 200.7	EPA 200.7
Cadmium	0.81	0.005		mg/L	01/18/99	01/27/99	EPA 200.7	EPA 200.7
Nitrate-N	0.13	0.05		mg/L	--	01/15/99	--	EPA 300.0
Nitrite-N	<0.5	0.5	a	mg/L	--	01/15/99	--	EPA 300.0
Sulfate	3000	0.1		mg/L	--	01/15/99	--	EPA 300.0
Zinc	140	0.01		mg/L	01/18/99	01/27/99	EPA 200.7	EPA 200.7
pH	6.2	--		S.U.	--	01/14/99	--	EPA 150.1

ND: Not detected at or above limit of detection
--: Information not available or not applicable

a Note: Detection limits increased due to matrix interference.

Analytical Results
for
Clayton Environmental Consultants, Inc.
Client Reference: 70-97203.00.201
Clayton Project No. 99011.13

Sample Identification: METHOD BLANK
Lab Number: 9901113-10
Sample Matrix/Media: WATER

Date Sampled: --
Date Received: --

Analyte	Concentration	Method Detection Limit	Units	Date Prepared	Date Analyzed	Prep Method	Method Reference
Ammonia-N	<0.05	0.05	mg/L	--	01/15/99	--	EPA 350.3
Arsenic	<0.05	0.05	mg/L	01/18/99	01/27/99	EPA 200.7	EPA 200.7
Barium	<0.01	0.01	mg/L	01/18/99	01/27/99	EPA 200.7	EPA 200.7
Cadmium	<0.005	0.005	mg/L	01/18/99	01/27/99	EPA 200.7	EPA 200.7
Nitrate-N	<0.05	0.05	mg/L	--	01/15/99	--	EPA 300.0
Nitrite-N	<0.05	0.05	mg/L	--	01/15/99	--	EPA 300.0
Zinc	<0.01	0.01	mg/L	01/18/99	01/27/99	EPA 200.7	EPA 200.7

ND: Not detected at or above limit of detection
--: Information not available or not applicable

Clayton LABORATORY SERVICES

REQUEST FOR LABORATORY ANALYTICAL SERVICES

IMPORTANT
Date Results Requested: 1-29-99
Rush Charges Authorized? ☐ Yes ☒ No
☐ Phone or ☐ Fax Results

For Clayton Use Only
Clayton Lab Project No.
9901113

REPORT RESULTS TO
Name: DON ASHTON
Company:
Mailing Address:
City, State, Zip:
Telephone No.: X-279
FAX No.:
Client Job No.: 70-97203.00.201
Dept.: ERMR

SEND INVOICE TO
Purchase Order No.:
Name:
Company:
Dept.:
Address:
City, State, Zip:

Special instructions and/or specific regulatory requirements:
(method, limit of detection, etc.)
Samples split + preserved w/ H_2SO_4 at lab

* Explanation of Preservative

Samples are:
(check if applicable)
☐ Drinking Water
☒ Groundwater/SURFACE
☐ Wastewater

ANALYSIS REQUESTED
(Enter an 'X' in the box below to indicate request. Enter a 'P' if Preservative added.*)

CLIENT SAMPLE IDENTIFICATION	DATE SAMPLED	TIME SAMPLED	MATRIX/ MEDIA	CONTAINER ~~AIR VOLUME~~ (specify units)	Number of Containers	METALS: As, Ba, Cd, Zn	NITRATE + NITRITE	SULFATES	AMMONIA	pH	FOR LAB USE ONLY
WW-1	1-13-99	16:18	WATER	500 ml Plastic	1	X				X	
WW-2		15:50				X				X	
WW-3		15:50				X				X	
WW-4		15:44				X				X	
WW-5		16:15				X				X	
WW-6 (~200 ml)		16:12				X				X	
SW-1		16:45				X					
SW-2		16:59				X					
CW-13		17:08				X		X		X	
11		11		H_2SO_4		P		P			

CHAIN OF CUSTODY
Collected by: DON ASHTON (print)
Relinquished by: Don Ashton Date/Time 1-14-99 16:40
Relinquished by: Date/Time
Method of Shipment:
Authorized by: Don C. Ashton (Client Signature MUST Accompany Request) Date 1-14-99

Collector's Signature: Don Ashton
Received by: Date/Time
Received by: Date/Time
Received at Lab by: Date/Time 1/14/99 1640
Sample Condition Upon Receipt: ☐ Acceptable ☐ Other (explain)

Please return completed form and samples to one of the Clayton Group Services, Inc. labs listed below:

Detroit Regional Lab
22345 Roethel Drive
Novi, MI 48375
(800) 806-5887
(248) 344-1770
FAX (248) 344-2655

Atlanta Regional Lab
400 Chastain Center Blvd., N.W., Suite 490
Kennesaw, GA 30144
(800) 252-9919
(770) 499-7500
FAX (770) 423-4990

San Francisco Regional Lab
1252 Quarry Lane
Pleasanton, CA 94566
(800) 294-1755
(925) 426-2657
FAX (925) 426-0106

Seattle Regional Lab
4636 E. Marginal Way S., Suite 215
Seattle, WA 98134
(800) 568-7755
(206) 763-7364
FAX (206) 763-4189

DISTRIBUTION:
White = Clayton Laboratory
Yellow = Clayton Accounting
Pink = Client Copy

9/07 2nk

Clayton LABORATORY SERVICES

REQUEST FOR LABORATORY ANALYTICAL SERVICES

IMPORTANT
Date Results Requested: 1-29-99
Rush Charges Authorized? ☐ Yes ☒ No
☐ Phone or ☐ Fax Results

Page 1 of 1

For Clayton Use Only
Clayton Lab Project No.
9901113

REPORT RESULTS TO
Name: DON ASHTON
Company:
Mailing Address:
City, State, Zip:
Telephone No.: X-279 FAX No.:
Client Job No.: 70-97203.00.201
Dept.: ENVR

SEND INVOICE TO
Purchase Order No.:
Name:
Company: Dept.:
Address:
City, State, Zip:

Special instructions and/or specific regulatory requirements: (method, limit of detection, etc.)
REQUEST LOWER DETECTION LIMITS FOR METALS, IF POSSIBLE, PRIMARILY FOR Zn. SPECIFICALLY FOR SAMPLES WW-4 THRU SW-2. OTHERS MAY BE AS HIGH AS 1900 ppm Zn.

Samples are: (check if applicable)
☐ Drinking Water
☒ Groundwater/Surface
☐ Wastewater

* Explanation of Preservative

ANALYSIS REQUESTED
(Enter an 'X' in the box below to indicate request. Enter a 'P' if Preservative added.*)

CLIENT SAMPLE IDENTIFICATION	DATE SAMPLED	TIME SAMPLED	MATRIX/ MEDIA	AIR VOLUME (specify units)	Number of Containers	METALS: As, Ba, Cd, Zn	NITRATE	SULFATES	PHENOLS	pH	FOR LAB USE ONLY
WW-1	1-13-99	16:19	WATER	SAMPLE	1	X				X	
WW-2		15:50				X				X	
WW-3		15:50				X				X	
WW-4		15:44				X				X	
WW-5		16:15				X				X	
WW-6 (~200 mL)		16:12				X				X	
SW-1		16:45				X				X	
SW-2		16:59				X				X	
SW-13		17:08				X	X			X	
"		"		H_2SO_4		P		P			

CHAIN OF CUSTODY
Collected by: DON ASHTON (print)
Relinquished by: [signature] Date/Time: 1-14-99 4:40
Relinquished by: Date/Time:
Method of Shipment:
Authorized by: [signature] (Client Signature MUST Accompany Request) Date: 1-14-99

Collector's Signature: [signature]
Received by: Date/Time:
Received by: Date/Time:
Received at Lab by: [signature] Date/Time: 1-15-99 4:40
Sample Condition Upon Receipt: ☐ Acceptable ☐ Other (explain)

Please return completed form and samples to one of the Clayton Group Services, Inc. labs listed below:

Detroit Regional Lab
22345 Roethel Drive
Novi, MI 48375
(800) 806-5687
(248) 344-1770
FAX (248) 344-2655

Atlanta Regional Lab
400 Chastain Center Blvd., N.W., Suite 490
Kennesaw, GA 30144
(800) 252-9919
(770) 499-7500
FAX (770) 423-4990

San Francisco Regional Lab
1252 Quarry Lane
Pleasanton, CA 94566
(800) 294-1755
(925) 426-2657
FAX (925) 426-0106

Seattle Regional Lab
4636 E. Marginal Way S., Suite 215
Seattle, WA 98134
(800) 568-7755
(206) 763-7364
FAX (206) 763-4169

DISTRIBUTION:
White = Clayton Laboratory
Yellow = Clayton Accounting
Pink = Client Copy

9/97 20K

San Francisco Regional Office

1252 Quarry Lane
P.O. Box 9019
Pleasanton, CA 94566
(925) 426-2600
Fax (925) 426-0106

Clayton
LABORATORY
SERVICES

March 31, 1999

Mr. Don Ashton
CLAYTON ENVIRONMENTAL CONS.
1252 Quarry Lane
Pleasanton, CA 94566

Client Ref.: 70-97203.00.201
Clayton Project No.: 99032.33

Dear Mr. Ashton:

Attached is our analytical laboratory report for the samples received on March 19, 1999. Also enclosed is a copy of the Chain-of-Custody record acknowledging receipt of these samples.

Please note that any unused portion of the samples will be discarded after April 30, 1999, unless you have requested otherwise.

We appreciate the opportunity to assist you. If you have any questions concerning this report, please contact Client Services at (925) 426-2657.

Sincerely,

Patricia Flynn
Client Services Representative
San Francisco Regional Office

PVF/pvf

Attachments

California DHS ELAP Certification Number 1196

Analytical Results
for
Clayton Environmental Consultants, Inc.
Client Reference: 70-97203.00.201
Clayton Project No. 99032.33

Sample Identification: SWUG-A
Lab Number: 9903233-01
Sample Matrix/Media: WATER

Date Sampled: 03/19/99
Date Received: 03/19/99

Analyte	Concentration	Method Detection Limit	Units	Date Prepared	Date Analyzed	Prep Method	Method Reference
Arsenic, dissolved	<0.05	0.05	mg/L	03/23/99	03/24/99	EPA 200.7	EPA 200.7
Barium, dissolved	0.04	0.01	mg/L	03/23/99	03/24/99	EPA 200.7	EPA 200.7
Cadmium, dissolved	<0.005	0.005	mg/L	03/23/99	03/24/99	EPA 200.7	EPA 200.7
Zinc, dissolved	0.06	0.01	mg/L	03/23/99	03/24/99	EPA 200.7	EPA 200.7

ND: Not detected at or above limit of detection
--: Information not available or not applicable

Analytical Results
for
Clayton Environmental Consultants, Inc.
Client Reference: 70-97203.00.201
Clayton Project No. 99032.33

Sample Identification: SWUG-B
Lab Number: 9903233-02
Sample Matrix/Media: WATER

Date Sampled: 03/19/99
Date Received: 03/19/99

Analyte	Concentration	Method Detection Limit	Units	Date Prepared	Date Analyzed	Prep Method	Method Reference
Arsenic, dissolved	<0.05	0.05	mg/L	03/23/99	03/24/99	EPA 200.7	EPA 200.7
Barium, dissolved	0.04	0.01	mg/L	03/23/99	03/24/99	EPA 200.7	EPA 200.7
Cadmium, dissolved	<0.005	0.005	mg/L	03/23/99	03/24/99	EPA 200.7	EPA 200.7
Zinc, dissolved	0.05	0.01	mg/L	03/23/99	03/24/99	EPA 200.7	EPA 200.7

ND: Not detected at or above limit of detection
--: Information not available or not applicable

Analytical Results
for
Clayton Environmental Consultants, Inc.
Client Reference: 70-97203.00.201
Clayton Project No. 99032.33

Sample Identification: CLD-DG-W3
Lab Number: 9903233-03
Sample Matrix/Media: WATER

Date Sampled: 03/19/99
Date Received: 03/19/99

Analyte	Concentration	Method Detection Limit	Units	Date Prepared	Date Analyzed	Prep Method	Method Reference
Arsenic, dissolved	0.07	0.05	mg/L	03/23/99	03/24/99	EPA 200.7	EPA 200.7
Barium, dissolved	0.11	0.01	mg/L	03/23/99	03/24/99	EPA 200.7	EPA 200.7
Cadmium, dissolved	<0.005	0.005	mg/L	03/23/99	03/24/99	EPA 200.7	EPA 200.7
Zinc, dissolved	0.52	0.01	mg/L	03/23/99	03/24/99	EPA 200.7	EPA 200.7

ND: Not detected at or above limit of detection
-: Information not available or not applicable

Analytical Results
for
Clayton Environmental Consultants, Inc.
Client Reference: 70-97203.00.201
Clayton Project No. 99032.33

Sample Identification: 2G-DG-W3
Lab Number: 9903233-04
Sample Matrix/Media: WATER

Date Sampled: 03/19/99
Date Received: 03/19/99

Analyte	Concentration	Method Detection Limit	Units	Date Prepared	Date Analyzed	Prep Method	Method Reference
Arsenic, dissolved	<0.05	0.05	mg/L	03/23/99	03/24/99	EPA 200.7	EPA 200.7
Barium, dissolved	0.05	0.01	mg/L	03/23/99	03/24/99	EPA 200.7	EPA 200.7
Cadmium, dissolved	<0.005	0.005	mg/L	03/23/99	03/24/99	EPA 200.7	EPA 200.7
Zinc, dissolved	0.09	0.01	mg/L	03/23/99	03/24/99	EPA 200.7	EPA 200.7

ND: Not detected at or above limit of detection
--: Information not available or not applicable

Analytical Results
for
Clayton Environmental Consultants, Inc.
Client Reference: 70-97203.00.201
Clayton Project No. 99032.33

Sample Identification: METHOD BLANK
Lab Number: 9903233-05
Sample Matrix/Media: WATER

Date Sampled: --
Date Received: --

Analyte	Concentration	Method Detection Limit	Units	Date Prepared	Date Analyzed	Prep Method	Method Reference
Arsenic, dissolved	<0.05	0.05	mg/L	03/23/99	03/24/99	EPA 200.7	EPA 200.7
Barium, dissolved	<0.01	0.01	mg/L	03/23/99	03/24/99	EPA 200.7	EPA 200.7
Cadmium, dissolved	<0.005	0.005	mg/L	03/23/99	03/24/99	EPA 200.7	EPA 200.7
Zinc, dissolved	<0.01	0.01	mg/L	03/23/99	03/24/99	EPA 200.7	EPA 200.7

ND: Not detected at or above limit of detection
--: Information not available or not applicable

Clayton ENVIRONMENTAL CONSULTANTS

INTERDEPARTMENTAL INTERNAL CHAIN-OF-CUSTODY

IMPORTANT
Date Results Requested: 4-2-99
Rush Charges Authorized? ☐ Yes ☒ No

For Clayton Use Only
Clayton Lab Project No.
9903233

INTERDEPARTMENTAL INFORMATION
Consultant's Name: DON ASHTON
Consultant's Office Location: SFO
Consultant's Internal Project No.: 70.97203.00.201

OUTSIDE CLIENT INFORMATION
CFMS Client Code:
Company Name:
Client Name:
Mailing Address: Telephone No.: X-679
City, State, Zip:

PRICING INFORMATION
☐ Fee Schedule Price
☐ Discount Price . % off list _____
☐ Special Price Attached

Send Report to:
☐ Client ☐ Internal Office

Send Via:
☐ Reg. Mail ☐ Overnight Mail
☐ Fax Fax # _____

Special instructions:
FILTER & PRESERVE IN LAB

Routine QA Acceptable? ☐ Yes ☐ No
Routine Detection Limits Acceptable? ☐ Yes ☐ No
Routine Analyte List Acceptable? ☐ Yes ☐ No

ANALYSIS REQUESTED
(Enter an 'X' in the box below to indicate request; Enter a 'P' if Preservative added.*)

CLIENT SAMPLE IDENTIFICATION	DATE SAMPLED	TIME SAMPLED	MATRIX/ MEDIA	~~AIR VOLUME~~ CONTAINER (specify units)	Number of Containers	METALS As, Ba, Cd, Zn	FOR LAB USE ONLY
SWUG-A	3-19-99	17:00	WATER	PLASTIC 500 mL	1	X	
SWUG-B	"	17:09		"	1	X	
CLD-DG-W3	"	17:21		"	1	X	
~~CLD~~29-DG-W3	"	17:22		"	1	X	

CHAIN OF CUSTODY

Collected by: DON ASHTON (print)	Collector's Signature:		
Relinquished by:	Date/Time 3-19-99	Received by:	Date/Time
Relinquished by:	Date/Time 19:19	Received by: Denise Harrington	Date/Time 3/19/99 @ 1919
Authorized by: (Client Signature MUST Accompany Request)	Date 3-19-99	Sample Condition Upon Receipt: ☐ Acceptable ☐ Other (explain)	

Please return completed form and samples to one of the Clayton Environmental Consultants, Inc. labs:
Detroit Regional Lab: (810) 344-1770 Atlanta Regional Lab: (800) 252-9919
San Francisco Regional Lab: (800) 294-1755 Seattle Regional Lab: (800) 568-7755

Distribution:
White & Yellow: Lab
Pink: Consultant

1/97

APPENDIX D

WELL PERMIT

ALAMEDA COUNTY PUBLIC WORKS AGENCY

WATER RESOURCES SECTION
951 TURNER COURT, SUITE 300, HAYWARD, CA 94545-2651
PHONE (510) 670-5575 ANDREAS GODFREY FAX (510) 670-5262
(510) 670-5248 ALVIN KAN

DRILLING PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

LOCATION OF PROJECT County of Alameda
Public Works Agency
5100 Coliseum Way, Oakland California

California Coordinates Source ____ ft. Accuracy ± ____ ft. See attached
CCN ____ / ____ / ____ CCE ____ / ____ / ____ ft.
APN ____ / ____ / ____

CLIENT
Name millenium holdings, Inc
Address 100 International Phone ____
City Suite 500 Zip ____
Mont Valley, MD 21030

APPLICANT
Name Mark Williams
Clayton Environmental Fax 925 426 0106
Address 1256 Quarry Lane Phone 925 426 2607
City Pleasanton CA Zip 94566

TYPE OF PROJECT

Well Construction		Geotechnical Investigation	
Cathodic Protection	☐	General	☐
Water Supply	☐	Contamination	☐
Monitoring	☒	Well Destruction	☐

PROPOSED WATER SUPPLY WELL USE

New Domestic	☐	Replacement Domestic	☐
Municipal	☐	Irrigation	☐
Industrial	☐	Other ____	☐

DRILLING METHOD:

Mud Rotary	☐	Air Rotary	☐	Auger	☐
Cable	☐	Other	☒ Geoprobe/hydraulic		

DRILLER'S LICENSE NO. C57 695970 ECA

WELL PROJECTS
Drill Hole Diameter 2 in. Maximum Depth 10 ft. Number 4
Casing Diameter 2 in.
Surface Seal Depth ____ ft.

Geoprobe grab groundwater sample
CSB-7
CSB-8
CSB-9
CSB-10

GEOTECHNICAL PROJECTS
Number of Borings ____ Maximum Depth ____ ft.
Hole Diameter ____ in.

ESTIMATED STARTING DATE 2/9/99
ESTIMATED COMPLETION DATE 2/12/99

I hereby agree to comply with all requirements of this permit and Alameda County Ordinance No. 73-68.

APPLICANT'S SIGNATURE Mark Williams DATE 2/2/99

FOR OFFICE USE

PERMIT NUMBER 99WR051
WELL NUMBER ____
APN ____

PERMIT CONDITIONS

Circled Permit Requirements Apply

A. GENERAL
1. A permit application should be submitted so as to arrive at the ACPWA office five days prior to proposed starting date.
2. Submit to ACPWA within 60 days after completion of permitted work the original Department of Water Resources Water Well Drillers Report or equivalent for well projects, or drilling logs and location sketch for geotechnical projects.
3. Permit is void if project not begun within 90 days of approval date.

B. WATER SUPPLY WELLS
1. Minimum surface seal thickness is two inches of cement grout placed by tremie.
2. Minimum seal depth is 50 feet for municipal and industrial wells or 20 feet for domestic and irrigation wells unless a lesser depth is specially approved.

C. GROUNDWATER MONITORING WELLS INCLUDING PIEZOMETERS
1. Minimum surface seal thickness is two inches of cement grout placed by tremie.
2. Minimum seal depth for monitoring wells is the maximum depth practicable or 20 feet.

D. GEOTECHNICAL
Backfill bore hole with compacted cuttings or heavy bentonite and upper two feet with compacted material. In areas of known or suspected contamination, tremied cement grout shall be used in place of compacted cuttings.

E. CATHODIC
Fill hole above anode zone with concrete placed by tremie.

F. WELL DESTRUCTION
See attached.

G. SPECIAL CONDITIONS

APPROVED Cynthia Bailey DATE 2/8/99

Note: Boreholes will be backfilled with hydrated bentonite grout once the groundwater sample has been obtained.

APPENDIX E

GROUNDWATER ANALYTICAL RESULTS

San Francisco Regional Office

1252 Quarry Lane
P.O. Box 9019
Pleasanton, CA 94566
(925) 426-2600
Fax (925) 426-0106

Clayton
LABORATORY
SERVICES

February 23, 1999

Mr. Mark Williams
CLAYTON ENVIRONMENTAL CONS.
1252 Quarry Lane
Pleasanton, CA 94566

Client Ref.: NONE
Clayton Project No.: 99021.67

Dear Mr. Williams:

Attached is our analytical laboratory report for the samples received on February 16, 1999. Also enclosed is a copy of the Chain-of-Custody record acknowledging receipt of these samples.

Please note that any unused portion of the samples will be discarded after March 25, 1999, unless you have requested otherwise.

We appreciate the opportunity to assist you. If you have any questions concerning this report, please contact Client Services at (925) 426-2657.

Sincerely,

Patricia Flynn
Client Services Representative
San Francisco Regional Office

PVF/pvf

Attachments

California DHS ELAP Certification Number 1196

Analytical Results
for
Clayton Environmental Consultants, Inc.

Clayton Project No. 99021.67

Sample Identification: CSB-10
Lab Number: 9902167-01
Sample Matrix/Media: WATER

Date Sampled: 02/16/99
Date Received: 02/16/99

Analyte	Concentration	Method Detection Limit	Units	Date Prepared	Date Analyzed	Prep Method	Method Reference
Antimony	<0.03	0.03	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Arsenic	<0.05	0.05	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Barium	2.7	0.01	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Beryllium	<0.005	0.005	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Cadmium	0.015	0.005	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Chromium	<0.01	0.01	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Cobalt	<0.01	0.01	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Copper	0.02	0.01	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Lead	<0.05	0.05	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Mercury	0.0016	0.0005	mg/L	02/16/99	02/17/99	EPA 245.2	EPA 245.2
Molybdenum	3.2	0.01	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Nickel	0.36	0.02	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Selenium	<0.07	0.07	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Silver	<0.01	0.01	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Thallium	<0.05	0.05	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Total Dissolved Solids	2400	10	mg/L	--	02/16/99	--	EPA 160.1
Vanadium	<0.01	0.01	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Zinc	0.39	0.01	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7

ND: Not detected at or above limit of detection
--: Information not available or not applicable

Analytical Results
for
Clayton Environmental Consultants, Inc.

Clayton Project No. 99021.67

Sample Identification: CSB-11
Lab Number: 9902167-02
Sample Matrix/Media: WATER

Date Sampled: 02/16/99
Date Received: 02/16/99

Analyte	Concentration	Method Detection Limit	Units	Date Prepared	Date Analyzed	Prep Method	Method Reference
Antimony	<0.03	0.03	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Arsenic	0.23	0.05	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Barium	48	0.01	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Beryllium	<0.005	0.005	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Cadmium	0.025	0.005	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Chromium	0.58	0.01	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Cobalt	0.08	0.01	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Copper	1.8	0.01	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Lead	8.7	0.05	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Mercury	0.0007	0.0005	mg/L	02/16/99	02/17/99	EPA 245.2	EPA 245.2
Molybdenum	0.02	0.01	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Nickel	0.29	0.02	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Selenium	<0.07	0.07	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Silver	<0.01	0.01	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Thallium	<0.05	0.05	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Total Dissolved Solids	4100	10	mg/L	--	02/16/99	--	EPA 160.1
Vanadium	0.21	0.01	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Zinc	4.7	0.01	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7

ND: Not detected at or above limit of detection
--: Information not available or not applicable

Analytical Results
for
Clayton Environmental Consultants, Inc.

Clayton Project No. 99021.67

Sample Identification: CSB-12
Lab Number: 9902167-03
Sample Matrix/Media: WATER

Date Sampled: 02/16/99
Date Received: 02/16/99

Analyte	Concentration	Method Detection Limit	Units	Date Prepared	Date Analyzed	Prep Method	Method Reference
Antimony	<0.03	0.03	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Arsenic	0.07	0.05	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Barium	16	0.01	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Beryllium	<0.005	0.005	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Cadmium	0.015	0.005	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Chromium	0.16	0.01	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Cobalt	0.02	0.01	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Copper	0.67	0.01	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Lead	2.9	0.05	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Mercury	0.0041	0.0005	mg/L	02/16/99	02/17/99	EPA 245.2	EPA 245.2
Molybdenum	<0.01	0.01	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Nickel	0.09	0.02	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Selenium	<0.07	0.07	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Silver	<0.01	0.01	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Thallium	<0.05	0.05	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Total Dissolved Solids	2500	10	mg/L	--	02/16/99	--	EPA 160.1
Vanadium	0.05	0.01	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Zinc	4.5	0.01	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7

ND: Not detected at or above limit of detection
--: Information not available or not applicable

Analytical Results
for
Clayton Environmental Consultants, Inc.

Clayton Project No. 99021.67

Sample Identification: CSB-13
Lab Number: 9902167-04
Sample Matrix/Media: WATER

Date Sampled: 02/16/99
Date Received: 02/16/99

Analyte	Concentration	Method Detection Limit	Units	Date Prepared	Date Analyzed	Prep Method	Method Reference
Antimony	<0.03	0.03	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Arsenic	0.19	0.05	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Barium	51	0.01	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Beryllium	<0.005	0.005	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Cadmium	0.030	0.005	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Chromium	0.47	0.01	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Cobalt	0.09	0.01	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Copper	1.7	0.01	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Lead	13	0.05	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Mercury	0.0017	0.0005	mg/L	02/16/99	02/17/99	EPA 245.2	EPA 245.2
Molybdenum	0.01	0.01	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Nickel	0.33	0.02	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Selenium	<0.07	0.07	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Silver	<0.01	0.01	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Thallium	<0.05	0.05	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Total Dissolved Solids	3700	10	mg/L	--	02/16/99	--	EPA 160.1
Vanadium	0.23	0.01	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Zinc	8.3	0.01	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7

ND: Not detected at or above limit of detection
--: Information not available or not applicable

Analytical Results
for
Clayton Environmental Consultants, Inc.

Clayton Project No. 99021.67

Sample Identification: METHOD BLANK
Lab Number: 9902167-05
Sample Matrix/Media: WATER

Date Sampled: --
Date Received: --

Analyte	Concentration	Method Detection Limit	Units	Date Prepared	Date Analyzed	Prep Method	Method Reference
Antimony	<0.03	0.03	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Arsenic	<0.05	0.05	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Barium	<0.01	0.01	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Beryllium	<0.005	0.005	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Cadmium	<0.005	0.005	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Chromium	<0.01	0.01	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Cobalt	<0.01	0.01	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Copper	<0.01	0.01	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Lead	<0.05	0.05	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Mercury	<0.0005	0.0005	mg/L	02/16/99	02/17/99	EPA 245.2	EPA 245.2
Molybdenum	<0.01	0.01	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Nickel	<0.02	0.02	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Selenium	<0.07	0.07	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Silver	<0.01	0.01	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Thallium	<0.05	0.05	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Total Dissolved Solids	<10	10	mg/L	--	02/16/99	--	EPA 160.1
Vanadium	<0.01	0.01	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7
Zinc	<0.01	0.01	mg/L	02/17/99	02/17/99	EPA 200.7	EPA 200.7

ND: Not detected at or above limit of detection
--: Information not available or not applicable

Clayton LABORATORY SERVICES

INTERDEPARTMENTAL INTERNAL CHAIN-OF-CUSTODY

IMPORTANT
Date Results Requested: _____
Rush Charges Authorized? ☐ Yes ☐ No

For Clayton Use Only
Clayton Lab Project No.
[illegible]167

INTERDEPARTMENTAL INFORMATION
Consultant's Name: Mark Williams
Consultant's Office Location: San Francisco, ERM
Consultant's Internal Project No.: _____

OUTSIDE CLIENT INFORMATION
CFMS Client Code:
Company Name:
Client Name:
Mailing Address: Telephone No.:
City, State, Zip:

PRICING INFORMATION
☒ Fee Schedule Price
☐ Discount Price . % off list _____
☐ Special Price Attached

Send Report to:
☐ Client ■ Internal Office

Send Via:
☐ Reg. Mail ☐ Overnight Mail
☐ Fax Fax # _____

Special Instructions:

Routine QA Acceptable? ☒ Yes ☐ No
Routine Detection Limits Acceptable? ☒ Yes ☐ No
Routine Analyte List Acceptable? ☑ Yes ☐ No

ANALYSIS REQUESTED
(Enter an 'X' in the box below to indicate request; Enter a 'P' if Preservative added.*)

CLIENT SAMPLE IDENTIFICATION	DATE SAMPLED	TIME SAMPLED	MATRIX/ MEDIA	AIR VOLUME (specify units)	Number of Containers	CAM-17 metals	TDS	FOR LAB USE ONLY
~~CSB-7~~ CSB-10	2/16/99				32	X	X	
~~CSB-8~~ CSB-11						X	X	
~~CSB-9~~ CSB-12						X	X	
~~CSB-10~~ CSB-13						X	X	
QC								

CHAIN OF CUSTODY

Collected by: MARK WILLIAMS (print) Collector's Signature: [signature]
Relinquished by: [signature] Date/Time 2/16 99
Relinquished by: Date/Time
Authorized by: Date

Received by: Date/Time 2/16/99
Received by: [signature] Date/Time 2/16/99 0935
Sample Condition Upon Receipt: ☐ Acceptable ☐ Other (explain)

(Client Signature MUST Accompany Request)

Please return completed form and samples to one of the Clayton Laboratory Services locations below:
Detroit Regional Lab: (800) 806-5887 Atlanta Regional Lab: (800) 252-9919
San Francisco Regional Lab: (800) 294-1755 Seattle Regional Lab: (800) 568-7755

Distribution:
White & Yellow: Lab
Pink: Consultant

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