REMEDIAL INVESTIGATION
AND FEASIBILITY STUDY

BIOLOGICAL STUDY PROGRAM REPORT

Union Road Site
Town of Cheektowaga,
Erie County, New York
(Site Registry No. 9-15-128)

Dvirka and Bartilucci

Consulting Engineers

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UNION ROAD SITE
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S.0 PROJECT SUMMARY

The presence of contaminants in an ecosystem can result in a variety of effects, ranging from a reduction in population size or changes in community structure, to changes in the structure and function of the entire ecosystem. Methods for measuring these impacts are presented in Ecological Assessments of Hazardous Waste Sites (EPA, 1989c), and require the collection of extensive field data and laboratory analyses. The collection of quantitative data regarding the analysis of plant and animal tissues from the Union Road Site was not included in the initial scope of the Remedial Investigation (RI) for the site. However, based upon the results of the RI, and Environmental Assessment Report prepared as part of the investigation, the potential for heavy metal contaminant exposure to aquatic/terrestrial organisms on and adjacent to the Union Road Site was expressed. As a result of this concern, a work plan addenda for enhanced biological study was approved by the New York State Department of Environmental Conservation (NYSDEC) and undertaken for the site. The report that follows presents the results of this study.

The biological program for the Union Road Site contained three major elements: collection of indigenous biota; analysis of Target Compound List (TCL) metal contaminants in biota; and laboratory evaluation of the toxicity and bioaccumulation potential of contaminated marsh sediments collected from the site.

Tissue Analysis

In total, the field collection program obtained over 400 terrestrial and aquatic organisms (representing 22 separate analyses) from four areas of interest in and adjacent to the Union Road Site. In general, the results of the analyses are as follows:

- For both terrestrial and aquatic samples, antimony, beryllium, cobalt, silver, thallium and vanadium were not detected at levels above the Contract Required Detection Limit (CRDL);
- Mercury was sporadically detected at levels above the detection limit for a single carp sample (0.25 mg/kg dry weight) and 1.0 mg/kg dry weight in a single golden shiner sample, both of which were collected in Slate Bottom Creek. For the remaining mercury analyses, the only amounts above the CRDL were noted in both samples of earthworms taken from the marsh area (0.25 and 0.32 mg/kg, respectively). The remaining 18 analyses were undetected for this compound;

- Cadmium levels in excess of the CRDL were noted in earthworm samples from both the marsh area and Deer Lik Creek locations. These levels were the highest found during the survey (3.0 and 3.6 mg/kg respectively).

- The upland ponded water area adjacent to the site contained the highest recorded tissue levels for aluminum and arsenic (2,780 and 2.2 mg/kg dry weight, respectively) in leopard frog tadpoles. The samples from this area also showed the only concentration detected above the CRDL for vanadium (6.1 mg/kg). Similarly, the highest concentration noted for barium (52.6 mg/kg), iron (5,560 mg/kg) and magnesium (2,040 mg/kg) were found in crayfish samples from this upland ponded area;

- The highest value recorded for copper was noted in an adult satinfin shiner sample collected in Deer Lik Creek (720 mg/kg) at the confluence of the drainage ditch from the marsh area;

- Levels of selenium ranging from 4.0 to 4.1 mg/kg were noted in four earthworm samples from both the marsh area and Deer Lik Creek. In the remaining 18 tissue samples this compound was undetected;

- Zinc tissue values ranged from 23.8 to 123 mg/kg. Earthworms from the marsh and creek areas were found to contain levels of this compound in the upper range (97.5 - 123 mg/kg) of the analyses reported; and

- Calcium and sodium levels encountered were thought to be within the normal limits. Aluminum levels ranged from non detect to 2,780 mg/kg.

- Although many of the species collected would not generally be utilized for human consumption, none of the parameters evaluated exceeded USFDA criteria for human consumption.

Bioassay Program

As the first phase of the ten-day bioassay/bioaccumulation study, laboratory organisms, Pimephales promelias (Fathead Minnow) and Procambarus clarkii (Crayfish) were exposed to sediments collected from the marsh area (adjacent to the USEPA filter fence) within the confines of the Union Road Site. Comparison of organism survival between the control (using clean sediment) versus experimental (using marsh sediment) showed no significant difference in survival between the two sediments.

Survival of crayfish samples averaged 74% in the control and 82% in the test chamber. The lower than 90% survival was attributed to cannibalism of freshly molted test organisms by other crayfish. Fathead minnow survival ranged from 97% in the experimental and 91% in the control test, respectively. Temperature, dissolved oxygen, pH and conductivity in the aquaria were within testing norms.

Bioaccumulation Testing

At the conclusion of the ten-day bioassay test, all organisms surviving were sacrificed and their tissues analyzed for TCL metals. When compared to pre-test and control organisms, those animals exposed to marsh sediments showed slightly elevated (bioaccumulated) levels for iron, lead and zinc. Aluminum levels were elevated in both control and exposed organisms when compared to pre-test organisms, suggesting laboratory contamination or uptake from dilution water utilized during the testing. Crayfish samples showed elevated levels for iron and lead in organisms exposed to Union Road site marsh sediment. There was no statistical difference noted for either test organism for the remaining TCL metals. The bioaccumulation test suggests that little bioaccumulation potential for TCL metals other than those listed above can be ascribed to marsh sediments evaluated.

Overall Conclusions of the Biological Study

- Contaminant levels for a number of heavy metal compounds, namely lead, iron and zinc, suggest the uptake of these contaminants from the surrounding environments. Overall, the levels reported are towards the lower end of contaminant levels found statewide;

- The lack of aquatic biota within the marsh area suggest that toxicity to these forms is occurring within that area. However, this hypothesis is not borne out by laboratory bioassay testing. The possibility exists that short term or chronic factors such as seasonal effects, storm events, or other sediment disturbances or physical/chemical factors such as elevated petroleum hydrocarbon levels noted in this area may act to reduce organism survival over some stage of their life cycle.

- Based upon comparisons of predicted (as presented in the Environmental Assessment Report) versus calculated Bioconcentration Factors (BCFs), and predicted and calculated equilibrium tissue concentrations for lead and zinc, the calculated data shows that both the calculated BCF and actual tissue concentrations recorded in the bioaccumulation tests are higher than predicted for both elements. For tissue concentrations, the test data show the actual values to be one to two orders of magnitude greater than the predicted value. The possibility exists that those organisms tested did not reach equilibrium conditions prior to analysis or that synergistic effects of contaminants within the marsh sediment tested enhanced the uptake of lead and zinc into fish tissue.

- Comparison of the results to previously hypothesized bioconcentration factors and toxicity data presented in the Environmental Assessment Report suggest that, of the compounds predicted to bioaccumulate in fishes, only lead and iron were found to bioaccumulate when compared to control organisms in laboratory tests.

- The actual toxicity noted using contaminated marsh sediments and compared to elutriate tests suggests that the marsh sediment has a toxicity less than that hypothesized from literature data alone (as presented in the Environmental Assessment document). Generally, when comparing heavy metal data for the elutriate of sediment used in the bioassay test to acute and chronic levels, the actual contaminant concentration appears to be at least one order of magnitude and in come cases two to three orders of magnitude lower than the literature identified acute/chronic values. Based upon the study described herein, these literature derived assessments appear to be overly conservative for estimates of the toxic fate of heavy metal materials from the contaminated marsh area of the Union Road site.

In conclusion, the levels calculated as a result of the Biological Study were less than that predicted from the literature. However, there is indication from the elevated levels of metal contaminants found in this study that there is an adverse impact from contaminated materials contained in the aquatic portions of the Union Road site.

Section 1

1.0 INTRODUCTION

In January 1990, Dvirka and Bartilucci Consulting Engineers submitted an Environmental Assessment Report for the Union Road Site. The basic conclusion of that assessment was that on-site contaminants pose a potential acute and chronic toxic risk to aquatic and terrestrial organisms on the site and in adjacent areas, but the risk could not be quantified because of the absence of site specific toxicological data. With regard to the sediment data, several parameters exceeded sediment criteria values for arsenic, cadmium, chromium, copper, lead, manganese, nickel and zinc developed by the NYSDEC Division of Fish and Wildlife for the protection of aquatic organisms. As a result of this finding, a study was designed to address whether metals were being bioaccumulated or were in sufficient levels to cause toxic effects to aquatic organisms utilizing the surface waters on and adjacent to the site.

The study presented in this report was requested by the NYSDEC to provide further insight into aspects of the above conclusion. The scope of work defined for the study was formally transmitted to the NYSDEC and approved in August 1990, and is the result of consultation with NYSDEC Biologists within the Division of Fish and Wildlife and Hazardous Site Assessment Branch. It is noted that, for the present study, the predominant concern highlighted by the Environmental Assessment Report prepared by Sadat Associates, Inc., regarded the exposure of on-site organisms to heavy metal contaminants. This is reflective of the high levels of these contaminants which were found on-site as well as their ability to bioaccumulate and biomagnify in the food chain.

Sampling Effort Focus

The focus of the biological study effort was to provide baseline information on heavy metal contaminants and uptake in and adjacent to the following areas:

- Ponded Water Habitats (Marsh Area) - Depression areas with low permeability soils which entrap water. These areas do not have a constant source of access to creek/river systems such as the marsh area adjacent to the Tar Pit. Terrestrial samples were taken upland of this area;
- Flowing Water Habitats (Deer Lik Creek) - Those areas on or adjacent to the site having water flow as typified by Deer Lik Creek, and two unnamed feeder creeks draining the wetlands/marsh area downstream of the Tar Pit; and
- Upland Ponded Area (North of the Tar Pit) - This area is primarily open and was considered to be outside of the area of concern. This ponded area is located approximately due north of the marsh area outside the security fence.

Section 2

2.0 BACKGROUND - HABITAT ASSESSMENT

2.1 Habitats Within the Study Area

The information and data in this section was obtained during the field investigation and supplemented by data from a number of outside sources. In general, the Union Road Site can be considered a predominantly upland area bordered on the east and south by Slate Bottom Creek and its tributary, Deer Lik Creek. The former railroad yard generally borders the northern and western portions of the site.

The majority of the site is comprised of areas of early and mid-successional uplands which are reestablishing after demolition of the structures associated with the railroad yard and auxiliary buildings. Land within a one-mile radius of the site can be considered predominantly urbanized with a considerable number of stream and creek corridors within the area. Several distinct plant associations or communities have been identified within the study area. These are disturbed land, early successional, upland emergent marshland, open waters, palustrine forested areas and undeveloped area. A representation of the major habitat types is presented in Figure 2.1-1.

Residential areas within the site vicinity are substantial. The site proper had in the past been used for industrial purposes resulting in on-site disturbances and contamination. The area of the demolished railroad roundhouse is essentially devoid of natural vegetation due to the presence of concrete footings remaining after demolition. This area supports patches of weeds and shrubs which also occur in other less active areas. Those disturbed areas support plant species which can reproduce quickly and colonize areas between disturbances. Such plants include goldenrod (Soldago spp.) and thistle (Sonchus spp.).

The low lying disturbed tar pit/marsh area holds runoff water and supports reed grass (Phragmites Spp.). Water is ponded in these areas and, as such, hydrophyllic forms dominate this environment. No regulated wetlands are found on or contiguous to the Union Road site.

The overall vegetative cover ranges from dense within the area of mature trees, to sparse within the area of the demolished railroad roundhouse. Open areas containing low grasses exist along sections of Deer Lik Creek and Slate Bottom Creek which border the eastern and southern borders of the site.

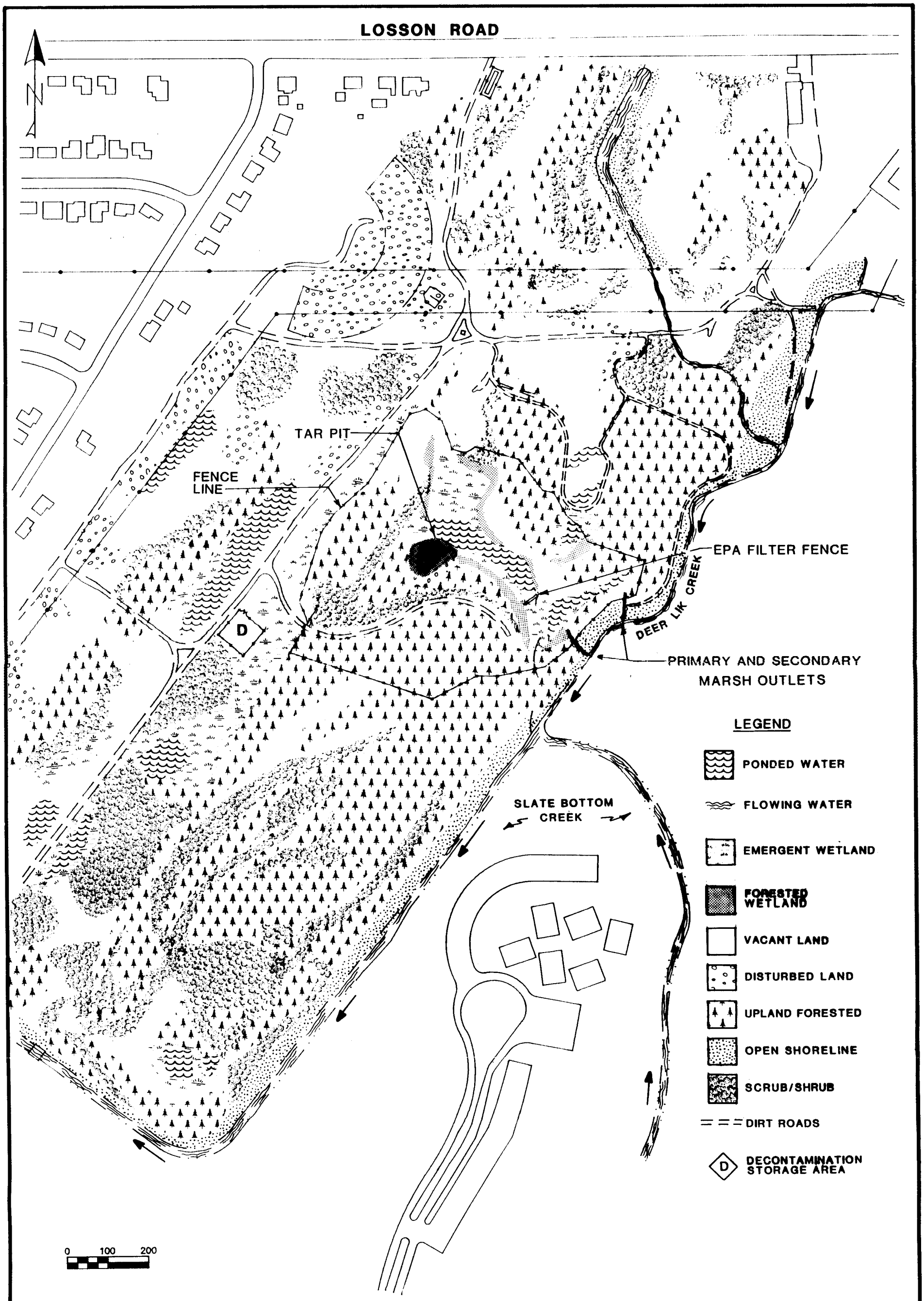
Open Water Systems

The open water systems within the vicinity of this site consist of the marsh area adjacent to the Tar Pit, which holds considerable moisture at least on a seasonal basis, Slate Bottom Creek and an unnamed tributary (locally known as Deer Lik Creek). These two creeks can be characterized as fast moving. Smaller drainage outlets connect the tar pit/marsh complex to Deer Lik and ultimately Slate Bottom Creek along the southeastern edge of the site. Additionally, an upland ponded area exists north of the facility fenceline approximately due north from the marsh area. This area appears to be resultant from water catchment and ponding over a clayey soil. The presence of aquatic organisms within this area suggests it remains ponded over the entire year. This pond is not classified and is not mapped on NYSDEC waterbody lists.

Slate Bottom Creek enters Cayuga Creek approximately one-half mile downstream of the site. Cayuga Creek, along with two other major creeks, Cazenovia Creek and Buffalo Creek, are all tributaries of the Buffalo River Watershed. There are five known listed hazardous waste sites which are within the drainage area of Cayuga Creek upstream of the Union Road site. These are presented in Table 2-1 of the RI/FS Report. It is unclear as to the extent of contaminant contribution to the creek; however, a NYSDEC (1989) report for the Buffalo River Remedial Action Plan notes that contaminant migration to the river is known to occur to Cayuga Creek from both the Land Reclamation Site and the Union Road Site. In addition, Buffalo Creek (two sites) contributes contaminants into the Buffalo River downstream of the confluence of Cayuga Creek and Slate Bottom Creek. However, in view of the present scope of the Biological Study, the contribution of the Union Road Site to the Buffalo River cannot be ascertained.

Cayuga Creek, a New York State Class B and C waterway used for fishing and limited boating, flows approximately one mile north and west of the site (see Figure 2.2-1). Slate Bottom Creek, a Class D waterway suitable for secondary contact recreation, lies adjacent to the site on the east and south and flows into Cayuga Creek approximately one mile west of the site. Slate Bottom Creek enters the Class C portion of Cayuga Creek. The Class B portion of Cayuga Creek lies approximately one mile upstream of the site. The site is also bordered on the east by a tributary to Slate Bottom Creek, known locally as Deer Lik Creek, which is a Class D water body. Both Slate Bottom and Deer Lik Creeks have been proposed to be reclassified to Class C.

Within the marsh area, beyond the Tar Pit, the reed grasses and cattail plants encountered appear healthy and have extensive coverage. In the Tar Pit area, sparse patches of these forms were found surrounding the waste lagoon.



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VEGETATIVE COVERTYPES

FIGURE 2.1-1

Field investigations of the creek environment did not reveal any large colonies of macroalgae; however, in areas of rocky substrate, some green algae colonies were noted outside of excessive water flow. In the transition zone between creek and marsh systems, low grasses and scrub vegetation predominate.

Fish

The aquatic portions of the Union Road Site marsh area and off-site portions of Deer Lik Creek, Slate Bottom Creek and Cayuga Creek downstream undoubtedly support these types of fauna. Little data exists on fish found in the proximity of the site. However, observations of fish in Slate Bottom Creek made during the Phase I field investigation and discussions with NYSDEC concerning potential inhabitants of the creek system suggest that these environments support a number of fish. Table 4.1-1 (in Section 4.0 of this report) presents species of fish which were collected during the Biological Study Program within the study area.

Concerning existing Health Advisories for fish consumption, downstream of the site in the Buffalo River in Erie County, below the confluence of Cayuga Creek and Slate Bottom Creek, NYSDEC recommends no consumption of carp (Cyprinus carpio). It should be noted that during site reconnaissance, prior to the biological study, a number of dead fish as well as live fish (perhaps catfish), about 6 to 10 inches in length, were observed in Slate Bottom Creek just upstream and adjacent to the site.

Reptiles and Amphibians

The only form of these types of organisms on-site were tadpoles, probably of leopard frog (Rana pipens) within the marsh/tar pit area. In addition, American Toad (Bufo americanius) were collected and analyzed as part of the biological study. On-site marshes would provide suitable habitat for a variety of turtles such as wood, painted or spotted varieties. Water snakes may also be present; however, the biological study did not find either snakes or turtles. Near the Roundhouse Area, with the presence of rock, rubble, cement structures, a variety of snakes and lizards may be found during the warmer months, although none were noted during the May, 1989 field reconnaissance nor during the Biological Study Program conducted in the field in August, 1990. (It should be noted that a few dead frogs were observed in the area of the marsh downstream of the Tar Pit).

2.2 RI/FS Sampling Program Summary

As part of the Phase I and II Remedial Investigation and Feasibility Study, a total of 28 sampling locations in and around the marsh area adjacent to the Tar Pit, Deer Lik Creek and Slate Bottom Creek were evaluated for the presence of organic and inorganic contaminants. The generalized locations of those sampling areas are presented in Figure 2.2-1. A presentation of the sampling areas utilized for the biological study collection is presented in Section 3.0, Figure 3.5-1, and basically incorporates the marsh area near the USEPA filter fence and adjacent reaches of Deer Lik Creek and Slate Bottom Creek at the confluence of Deer Lik Creek, as well as an upland ponded area outside of the site security fence line north of the marsh area.

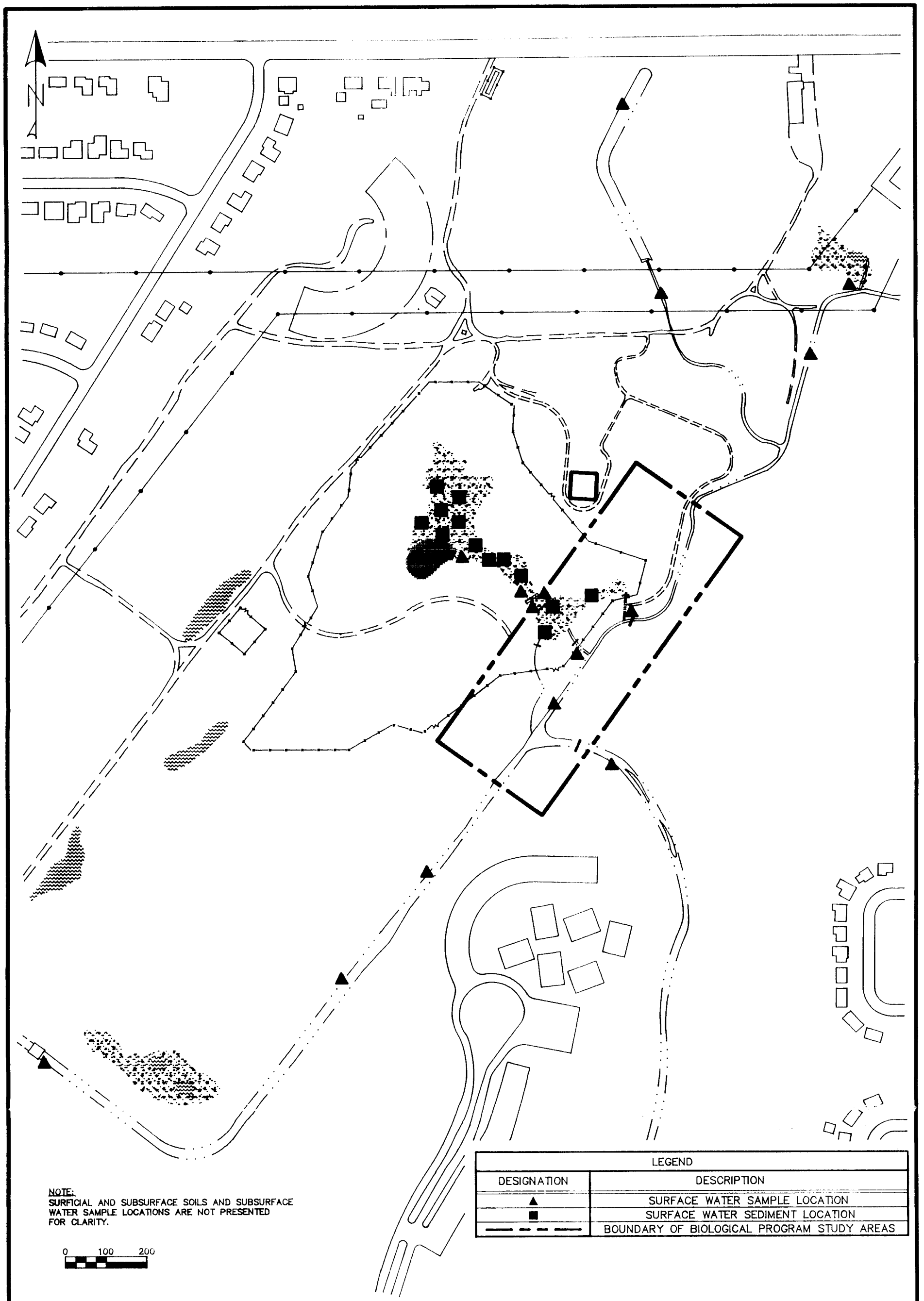
Surface Water Data Collected Under the RI/FS Program

As discussed extensively in the Phase I and II Remedial Investigation Report for the site, except for iron (which appears to be indigenous to the area of the Union Road Site), the analytical results of samples obtained from Slate Bottom Creek and Deer Lik Creek did not contravene NYS Surface Water Standards and Guidelines for either Class C or D water bodies, and undisturbed samples obtained from the marsh contiguous to the Tar Pit, also did not exceed Surface Water Standards and Guidelines.

The only surface water sample that exceeded NJDEP cleanup levels (which were utilized in lieu of NYSDEC Standards on Guidelines for certain groups of compounds) was that which contained disturbed sediment in the marsh area. Cleanup levels for this sample were exceeded for total volatile organic compounds, base neutral compounds and petroleum hydrocarbons. In addition, concentrations for lead were also elevated for this sample as well as an undisturbed sample obtained immediately contiguous to the Tar Pit.

Although chemical contamination of the surface waters on and contiguous to the Union Road Site is low, releases of oil from the underlying sediment and banks in the marsh, as well as Slate Bottom Creek and Deer Lik Creek, have been observed on numerous occasions.

Based upon chemical and physical characteristics of the contaminants in the surface waters, and proximity to the waste source, it appears that the waste formerly disposed by the railroad facility in the Tar Pit, and contaminated sediment and possibly groundwater, is the source of any surface water contamination at the site. Most of the releases of oil occur in the area of the northernmost discharge outlet from the marsh and continue in an attenuated manner, approximately 1,000 feet downstream of the marsh area in Slate Bottom Creek.



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GENERALIZED LOCATIONS OF SURFACE WATER AND SURFACE WATER SEDIMENT SAMPLING POINTS

FIGURE NO. 2.2-1

Surface Water Sediment Data Collected Under the RI/FS Program

Surficial sediment in Slate Bottom Creek and Deer Lik Creek, both, upstream and contiguous to the site, generally exhibits levels of total petroleum hydrocarbons and base neutral compounds above NJDEP Soil Cleanup Levels; however, the highest concentrations of these contaminants as well as lead are located downstream of the site.

Surficial surface water sediment in the marsh adjacent to the Tar Pit (being closer to the waste source) shows substantially higher contaminant levels as compared to the sediment to the creeks. Concentrations of total base neutral compounds, and petroleum hydrocarbons and lead in particular, are very high. Other metals found in the surficial marsh sediment which exceed NJDEP Soil Cleanup Levels, include antimony, arsenic, copper and zinc.

In addition to substantial surficial sediment contamination in the marsh area, samples obtained from borings in the marsh show significant contamination of the subsurface sediment as well. Except for the underlying clay, and extreme northern portion of the marsh, essentially all of the marsh area substantially exceeds NJDEP Soil Cleanup Levels for total base neutral compounds, petroleum hydrocarbons and lead. Other metals, such as arsenic, copper, mercury and nickel also exceed NJDEP cleanup levels.

To better ascertain the surficial sediment levels as they compare to other areas off-site, these data are compared to off-site samples SUSL-4, 22, 23 and 24. These soil samples were taken at depths of 1-3 inches at approximately 1/2-mile distance from the site borders at the primary compass points. These heavy metal data are presented in Table 2.2-1, along with ranges of marsh soil metal concentrations. In view of their distance from the site, they can be considered as an indicator of background metals concentrations within the region and can provide a comparative base for evaluation. When compared to the marsh area soils, these off-site soils show lead exceedance over NJDEP Soil Cleanup Levels (250 ppm) at the north and west off-site locations only (SUSL-4 and SUSL-22). However, in contrast to on-site samples, no other exceedances for heavy metals of soil cleanup levels were noted for these off-site samples. Clearly after review of the data presented in Table 2.2-1, marsh soil levels for antimony, barium, cadmium, calcium, chromium, cobalt, copper, cyanide, iron, lead, manganese, mercury, nickel, potassium, selenium, silver, thallium and zinc were encountered at greater levels in surficial soils on-site than at off-site locations.

Table 2.2-1

OFF-SITE SURFICIAL SOIL ANALYTICAL RESULTS (mg/kg)
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Parameters	Phase I Off-site* NORTH SUSL-4	Phase II Off-site* WEST SUSL-22	SOUTH SUSL-23	EAST SUSL-24	Range of Surficial Soil Levels Marsh Area**	NJDEP Soil Cleanup Levels mg/kg	NYSDEC Soil Cleanup Criteria ug/kg
Inorganics:							
Aluminum	12,000 F	6,780	15,600	13,100	6,050 - 18,700	---	---
Antimony	10.2 B	8.5 BN	3.1 UN	2.9 UN	5.7 - 1,940	---	---
Arsenic	12.2 N	4.6	8.5	4.8	4.6 - 33.1	20	---
Barium	47.9 BF	39.1 B	66.6	23.6 B	75 - 110	---	---
Beryllium	0.38 B	0.18 B	0.42 B	0.2 B	0.1 - 0.35	---	---
Cadmium	0.77 B	0.91 U	0.9 U	0.84 U	0.66 - 2.8	3	---
Calcium	2,980 F	28,400	3,530	366 B	4,420 - 108,000	---	---
Chromium	12.7	11.2	19.9	10.4	13.8 - 34.9	100	---
Cobalt	5.5 B	5.6 B	13	3.6 B	7.0 - 11.4	---	---
Copper	15.4	51.7	25.9	14.7	44.2 - 1,790	170	---
Cyanide	0.67 U	0.7 U	0.7 U	0.64 U	0.66 - 1.8	12	---
Iron	17,900	12,600	24,700	13,900	19,500 - 60,700	---	---
Lead	741 FN	403	27.2	14.7 S	328 - 25,400	250	---
Magnesium	2,380 F	7,020	4,740	1,420	3,670 - 11,300	---	---
Manganese	228 F	315	344	83.3	408 - 753	---	---
Mercury	0.08 U	0.08 B	0.07 U	0.08 B	0.08 - 0.28	1	---
Nickel	14.1	14.2	22.2	12.2	20.9 - 43.7	100	---
Potassium	994 B	1,170 B	1,910	559 B	1,720 - 3,040	---	---
Selenium	0.46 BN	0.38 B	0.39 B	0.55 B	0.30 - 2.1	4	---
Silver	0.55 U	0.48 U	0.48 U	0.44 U	0.50 - 2.6	5	---
Sodium	173 BF	590 B	239 B	117 B	154 - 449	---	---
Thallium	0.28 B	0.38 U	0.31 U	0.32 B	0.19 - 0.58	---	---
Vanadium	21.7	13.4	29.4	19.5	17.5 - 37.9	---	---
Zinc	75.2	87.5	86.5	59.6	90 - 614	350	---
E.P. Toxicity Lead (mg/l)		NA	NA	NA		5.0	---
Asbestos		5-10% Cellulose	10-20% Cellulose	2-4% Cellulose 2-4% mineral wool		---	---

* All off-site locations are approximately 1/2 mile from the site border in the directions indicated. Samples were collected at a depth of 1-3 inches.

** Ranges presented are from Samples MASD-1, MASD-2, and MASD-3.

Although the levels of total lead are very high in some of the marsh sediment, none of the samples analyzed exceed the EP toxicity limits for lead. Apparently, because of the high organic content of the marsh sediment and/or the presence of chelating agents such as sulfur compounds (hydrogen sulfide), metals are not readily released.

Based on the chemical characteristics of the marsh sediment and proximity to the Tar Pit, it is apparent that contamination of the marsh is the result of former waste disposal operations at the railroad facility.

The oils released from the sediment as well as resuspended sediment, causes contamination of the marsh water and surface waters (Deer Lik Creek and Slate Bottom Creek) to which it discharges. The findings of the Baseline Human Health Risk and Environmental Assessments noted that the contaminated marsh sediment is of concern as a threat to human and ecological health as a result of direct contact and ingestion.

The contaminated sediment also was presumed to pose a threat to groundwater underlying the marsh. However, because of the low permeability clay which underlies the marsh, and the high affinity of the contaminants, in particular metals, to the sediments as discussed above, it is unlikely that this matrix contributes significant contamination to groundwater.

In addition to contaminated subsurface marsh sediment, contaminated sediment underlies the relatively clean surficial sediment in the bed of both, Deer Lik Creek and Slate Bottom Creek and in the banks of the creeks. The physical characteristics of this material and results of samples of surface waste material found along the bank of the creeks indicate that it is similar to waste in the Tar Pit and highly contaminated sediment found in the marsh area.

Based on current data obtained during the RI/FS Program, the closest samples in both location and physical characteristics (in and at the northern marsh outlet which was the former bed of Slate Bottom Creek) indicate that the contaminated subsurface material in the bed and banks of Deer Lik Creek and Slate Bottom Creek contains elevated levels of base neutral compounds, and very high concentrations of petroleum hydrocarbons and lead as well as other metals such as arsenic and copper, all of which exceed NJDEP Soil Cleanup Levels. The sample obtained within and immediately beneath the surface of the marsh outlet exceeded the EP toxicity limits for lead and, therefore, is characterized as a hazardous waste.

Waste material/highly contaminated sediment from the bed and banks of Slate Bottom Creek are also deposited in pockets along the higher reaches of the banks of the creek as a result of flood control and rechanneling. This material also exhibits elevated chemical characteristics similar to that described above for the samples from the marsh outlet (i.e., very high levels of lead and petroleum hydrocarbons).

This highly contaminated material in the bed and banks of the creeks could be eroded/suspended during periods of high flow, and contaminants transported downstream and off-site. (Evidence of contamination in Slate Bottom Creek has been observed off-site, west of the culvert which channels the creek under the former railroad yard).

Based on site observations, the contaminated material extends generally 2 to 3 feet into either side of the banks of Deer Lik Creek and Slate Bottom Creek, and extends approximately 2,000 feet downstream from the northernmost outlet from the marsh to the culvert.

2.3 Initial Results of the Environmental Assessment

In the Environmental Assessment document for the Union Road Site, the current levels of contamination at the site were compared with water quality criteria for the protection of freshwater aquatic life and toxicity data from the available literature, to identify potential threats to individual organisms and populations at the site. In addition, the potential for accumulation of contaminants in aquatic and terrestrial organisms and food webs at the Union Road Site was evaluated in a qualitative manner. Published biological concentration prediction factors were used to calculate the potential concentrations of contaminants in the tissues of biota at the site. The chemical/physical properties of the contaminants were used to indicate of the potential for biomagnification of the contamination with increasing trophic levels. It must be noted that the tissue contaminant levels presented in that report were intended to illustrate the potential for bioconcentration, bioaccumulation and biomagnification of contaminants, and were not meant to represent actual levels of contaminants present in the plants and animals at the site.

Comparison of contaminant levels detected in the surface water of the creek system upstream of the marsh area with EPA Ambient Water Quality Criteria for the Protection of Freshwater Aquatic Life and NYSDEC Water Quality Standards/Guidelines indicates that chronic effects to the plants and animals inhabiting the creek system upstream of the marsh are expected. Specifically, the Ambient Water Quality Criteria for chronic effects for cyanide, mercury

and silver were exceeded. Similarly, the NYSDEC water quality standards/guidelines for Class C waters were also exceeded for aluminum, cobalt, cyanide, iron and silver. In addition, the NYSDEC Water Quality Standard/Guideline for iron in Class D waters were exceeded in the surface water of the creek system upstream of the marsh.

Comparison of contaminant levels detected in the surface water of the Slate Bottom Creek downstream of the marsh area with EPA Ambient Water Quality Criteria for the Protection of Freshwater Aquatic Life and NYSDEC Water Quality Standards/Guidelines indicated that chronic effects to the plants and animals inhabiting Slate Bottom Creek downstream of the marsh were likely. Specifically, the Ambient Water Quality Criteria for chronic effects for cyanide, mercury and silver were exceeded. Similarly, the NYSDEC Water Quality Standards/Guidelines for Class C waters were also exceeded for aluminum, cobalt, cyanide, iron and silver in Slate Bottom Creek downstream of the marsh. The NYSDEC Water Quality Standard/Guideline for iron in Class D waters was also exceeded.

In addition, prior to the Biological Study Program, the toxic effects to biota in the creek indicated by the exceedance of water quality standards/guidelines, the plants and animals of the flowing water habitats at the site were predicted to accumulate chemicals in their tissues due to diffusion of contaminants from the surface water. Specifically, arsenic, lead, nickel, selenium and zinc were predicted to bioaccumulate in fish inhabiting both, the creek system upstream of the marsh area and the Slate Bottom Creek downstream of the marsh to levels more than one order of magnitude greater than the concentrations detected in the surface water. In addition, toluene was predicted to bioaccumulate in fish inhabiting the creek system upstream of the marsh to levels more than one order of magnitude greater than that found in the surface water. PAH's were predicted to biomagnify along the aquatic food chains of the creek system upstream and Slate Bottom Creek downstream of the marsh. In addition, PCB's were expected to biomagnify along the aquatic food chain of Slate Bottom Creek downstream of the marsh.

As in the flowing water habitats, contaminant levels detected in the surface water of the marsh exceeded Ambient Water Quality Criteria for the Protection of Freshwater Aquatic Life and NYSDEC Water Quality Standards/Guidelines for Class C Waters. The EPA criteria for chronic effects were exceeded for cyanide, iron, mercury and silver in the marsh surface water. Similarly, the NYSDEC standards/guidelines for Class C waters were exceeded by aluminum, cobalt, cyanide, iron, silver and zinc in the surface water of the marsh.

Uptake of contaminants by plants and animals in the marsh area from the surface water, sediments and Tar Pit leachate was also expected. Specifically, silver, pyrene, phenanthrene, copper, zinc, fluoranthene and fluorene were expected to bioaccumulate to the highest concentrations in the tissues of fish inhabiting the marsh. In addition, PAH's and PCB's are expected to biomagnify along the marsh food chain.

Contaminants at the Union Road Site were also expected to bioconcentrate in terrestrial species. Organic contaminants from the surficial and subsurface soil were predicted to bioaccumulate in terrestrial plants, while inorganics were expected to concentrate in plants to levels higher than those detected in the soil. The potential for contaminants to bioconcentrate in animals of the upland and marsh areas was also indicated by Bioconcentration Factors (BCFs) reported in the literature.

Prior to the Biological Study Program, the Environmental Assessment concluded that quantification of ecological impacts due to contamination at the site indicated that adverse effects to individual plant and animal species at the Union Road site are likely, and that accumulation of contaminants in biota may extend through the aquatic and terrestrial food webs.

Section 3

3.0 APPROACH AND METHODOLOGY

3.1 Operations Plan

The purpose of the biological sampling plan was to provide additional data to better define the nature and extent of heavy metal contamination regarding nearby terrestrial and aquatic organisms.

Additionally, the bioaccumulation testing program was designed to provide baseline information on uptake of heavy metal contaminants in aquatic organisms exposed to marsh sediments at the site. It should be noted that the study does will not provide baseline information on the organisms inhabiting the down stream reaches of Slate Bottom Creek with which to evaluate the effectiveness of remedial activities at the Union Road Site.

3.2 Sample Identification

All samples collected during the field investigation at the Union Road Site were labeled with a sample identification code that identified the site, sample location, sample type and series numbers for sample locations with more than one sample. Samples were labeled according to the following system:

- o Site - Union Road "UR"
- o Sample Location
  - Marsh Area "MA"
  - Tributary to Slate Bottom Creek "SBC"
  - Deer Lik Creek "DLC"
- o Sample Type
  - Terrestrial "TE"
  - Aquatic "AQ"
  - Sediment "SD"
- o Sample Number - For circumstances where more than one sample was collected from the same location and was used in combination with the sample type, a sample number was assigned (fish samples collected at the same location, but different species). More than one sample was generally collected from each area.

As a result of the above sample identification code, an example of a sample label is as follows:

UR	MA	TE	2
Union Road	Marsh Area	Terrestrial Sample	Number 2

3.3 Sample Handling, Packaging and Shipping

All analytical samples were placed in the appropriate sample containers as specified in the 1989 NYSDEC ASP or other accepted protocols such as those specified in USEPA Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW-846) or USACOE/USEPA Dredged Material Bioassay Guidelines (1978). The holding time criteria identified in the ASP was followed where appropriate.

Prior to packaging samples for shipment, the sample containers were checked for proper identification and compared to the field logbook for accuracy. The samples were then wrapped with a cushioning material and placed in a plastic cooler. For samples for chemical/tissue analysis, a sufficient amount of ice packs (blue ice) were placed in the cooler to keep the samples at approximately 4°C until arrival at the laboratory.

All necessary documentation required to accompany the sample during shipment was placed in a sealed plastic bag and taped to the underside of the cooler lid. The cooler was then sealed with fiber (duct) tape, and custody seals were placed in such a manner that any opening of the cooler prior to arrival at the laboratory could be detected.

All samples requiring chemical analysis were shipped within 48 hours of collection to the laboratory in accordance with NYSDEC policy.

3.4 Documentation

The Field Operations Office maintained a bound, consecutively numbered, weatherproof notebook. This notebook contained preprinted sample information forms which were completed at each sampling station. In-situ measurements, such a pH, temperature and conductivity, as well as physical characteristics such as soil type, or surface water flow were recorded on the appropriate data form. Copies of these forms prepared during the study are contained in Appendix E. In addition to the typical forms, a NYSDEC Fish and Wildlife Collection Record Form was completed for all biological samples collected. Copies of these forms are provided in Appendix E.

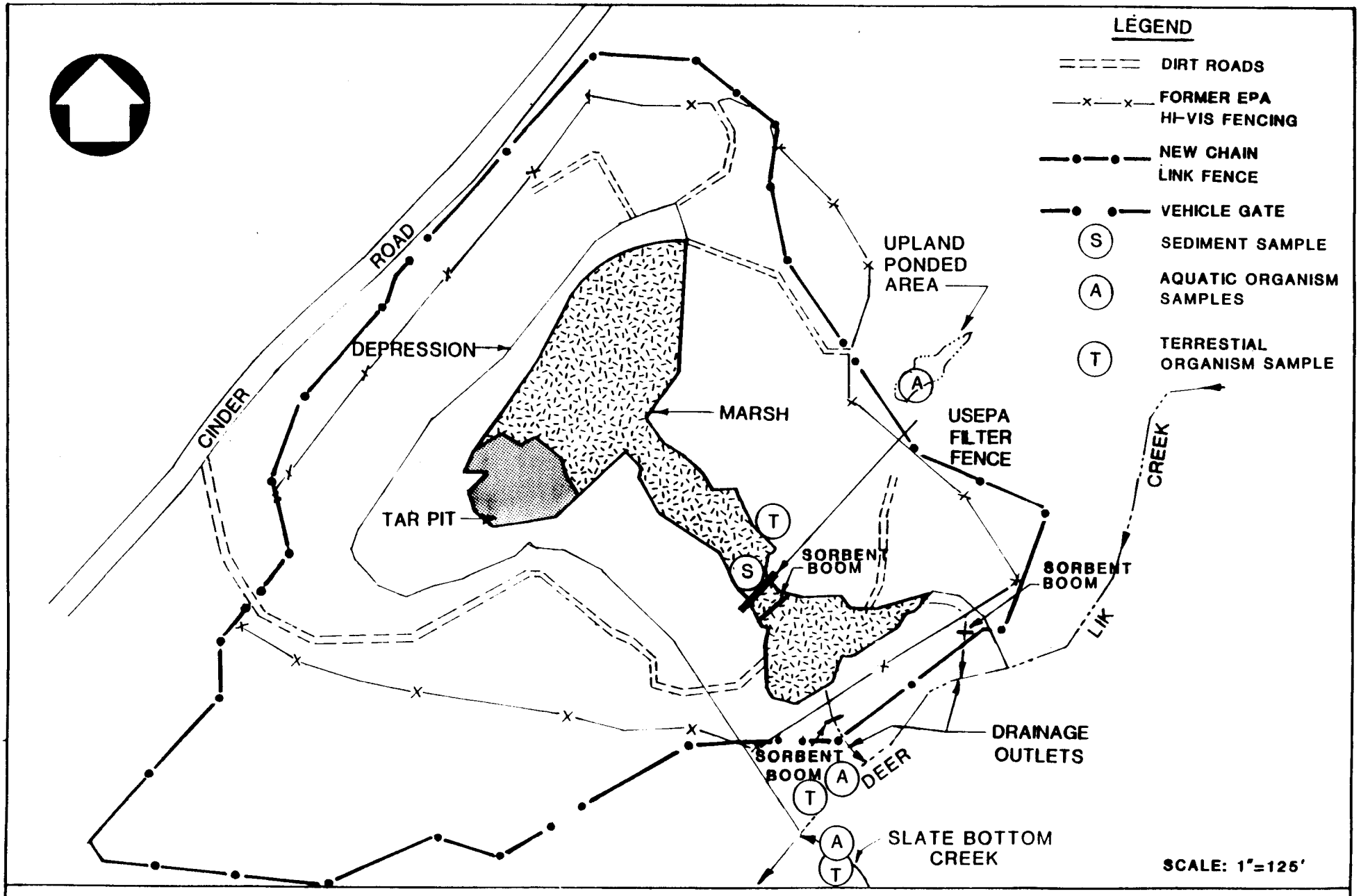
3.5 Field Sampling and Analysis

This section presents a description of the types of equipment and general procedures that were used to obtain samples described in the Workplan Addenda submitted and approved by the NYSDEC in August 1990 for the Biological Study Program. The addenda required the collection of ten (10) biological samples for analyses. However, additional samples collected while in the field were approved for analysis by the NYSDEC Project Manager at the time of collection.

During the course of the biological program, the following samples were obtained:

Sample Type	Area	Analyses
Marsh Sediment	(1) Marsh	Solid Phase
Terrestrial Organisms		Bioassay Testing
	American Toad	
	(1) Deer Lik Creek	TCL - Metals
	(1) Slate Bottom Creek	TCL - Metals
	Earthworms	
	(1) Upland of Marsh	TCL - Metals
	(2) Upland of Deer Lik Creek	TCL - Metals
Aquatic Organisms	(6) Deer Lik Creek	TCL - Metals
	(8) Slate Bottom Creek	TCL - Metals
	(2) Upland Ponded Area	TCL - Metals

A location map of the sampling areas is presented in Figure 3.5-1.



SAMPLE AREA LOCATIONS FOR THE BIOLOGICAL STUDY PROGRAM

Dvirka and Bartilucci CONSULTING ENGINEERS

FIGURE NO. 3.5-1

Terrestrial Organism Collection Methods

The intent of the terrestrial collection program was to collect earthworms for TCL Metal analysis. Earthworms were collected utilizing decontaminated stainless steel scoops to dig up soils. All earthworms encountered were placed into plastic zip lock bags.

After collection, the worms were rinsed with distilled water, measured and placed into zip lock bags for analysis, and kept cold until laboratory analysis. In addition to the above, earthworm samples and american toad samples were also collected in the vicinity of Deer Lik Creek and Slate Bottom Creek.

Aquatic Organism Sampling Methods

These samples were obtained through screening and/or hand netting in the aquatic portions of the marsh area, Deer Lik Creek and Slate Bottom Creek areas.

The following data were taken on each fish collected: date; species identification; total length (nearest mm or smallest sub-unit of weight on weighing instrument); method of collection; and, sample location. All measurements were taken as soon as possible and prior to specimen freezing.

In view of the size of organisms encountered, all samples were sorted by species, location collected and measured to the nearest mm, weighed and placed into composited samples.

All samples were analyzed on a whole body basis and were not scaled or eviscerated. All fish were kept at a temperature below 45°F immediately following data collection. During collection and pre-analytical work-up of the biological specimens, care was taken to avoid contamination. It should be noted that all composited samples were analyzed in accordance with NYSDEC ASP procedures for TCL metals.

Sediment Collection Methods

In general, aquatic sediments can be defined as semi-dry materials ranging from dewatered solids to high viscosity liquids and leachates are less viscous and more like a liquid. Sediments in the context of the present biological study are the deposited material underlying a body of water. On occasion, they may be exposed by evaporation or other means of water loss. In these instances, they can be readily collected by soil or collection methods.

One (1) sediment sample (15 gallons) was collected in the marsh area downstream of the Tar Pit adjacent to the USEPA filter fence. This sediment sample was sent to the laboratory for use in solid phase bioassay/bioaccumulation testing and elutriate testing.

In view of the shallow water depth near the filter fence, the sediments were collected by the use of stainless steel scoop. This method is more applicable to sludges/leachate, but it can be used for sediments provided the water depth is very shallow (a few inches).

3.6 Laboratory Methodology

A listing of the analytes evaluated and their associated methodology is presented on Table 3.5-1. The laboratory data reports and QA/AC reports, as well as biological tissue processing methodologies, are presented in Appendices A, B, and C, respectively.

Table 3.5-1

ANALYTICAL METHODOLOGY SUMMARY

Inductively Coupled Plasma (ICP)	Source Reference Number
Aluminum	200.7
Antimony	200.7
Barium	200.7
Beryllium	200.7
Cadmium	200.7
Calcium	200.7
Chromium	200.7
Cobalt	200.7
Copper	200.7
Iron	200.7
Lead	200.7
Magnesium	200.7
Manganese	200.7
Molybdenum	200.7
Nickel	200.7
Potassium	200.7
Silver	200.7
Sodium	200.7
Tin	200.7
Titanium	200.7
Vanadium	200.7
Zinc	200.7
Furnace AA	
Antimony	204.1
Arsenic	206.2
Lead	239.2
Selenium	270.2
Thallium	279.2
Tin	282.2
Vanadium	286.2
Mercury	245.1

Source: USEPA-600/4-79-020, Methods for Chemical Analysis of Water and Waste

Section 4

4.0 RESULTS OF THE BIOLOGICAL PROGRAM

4.1 On Site Observations

FIELD TEST RESULTS

Physical Data Taken During Collections

The biological collections were performed during the period of August 14 through August 16, 1990. Water temperatures from creek, marsh and ponded water areas ranged from 13.1°C to 27.9°C. Hydrogen Ion (pH) levels were slightly to very basic ranging from 7.23 to 8.8 pH units. Specific conductance values ranged from 46.0 to 835 umhos/cm while turbidity values ranged from 11.38 to 680 nephelometric turbidity units over the study period.

Catch Data

As noted in the Project Summary, approximately 400 specimens were collected from the study area and sorted into 22 separate samples for analysis. The collection data by sample location and species is presented in Table 4.1-1. All fish species collected were either forage fish or young-of-the-year organisms. One american toad sample collected from Slate Bottom Creek appeared to be a small-sexually mature male. In view of the above and in accordance with NYSDEC guidelines for fish contaminant analyses, all samples were analyzed on a whole body (non-eviscerated) basis.

It should be noted that although seining was performed in the aquatic portions of the marsh area, no aquatic biota of any type (including insects) were obtained from this area.

The Remedial Investigation report noted that a number of fish, including dead fish (approximately six), were observed in Slate Bottom Creek upstream and adjacent to the Site. The presence of dead fish may be attributed to any of a number of natural causes such as predation, acute temperature change, storms, ice and snow cover, decomposition of natural materials, spawning mortalities, parasites and disease. The scope of the Phase I and II RI did not include enumeration, species identification or autopsies of the dead fish encountered along Slate Bottom Creek. Therefore, conclusions as the the causes of death of these organisms cannot be reached.

TABLE 4.1-1

BIOLOGICAL COLLECTION DATA
UNION ROAD SITE BIOLOGICAL STUDY PROGRAM

COMMON NAME	SPECIES	NUMBER OF SAMPLES	NUMBER OF ORGANISMS COLLECTED PER SAMPLE LOCATION			
			UPLAND PONDED AREA	MARSH AREA	DEER LIK CREEK	SLATE BOTTOM CREEK
Crayfish	—	4	82	-	35	5
Leopard Frog (Tadpoles)	Rana pipiens	1	10	-	-	-
Golden Shiners	Notemigonus crysoleuceas	1	-	-	-	11
Common Shiner	Notropis cornutus	3	-	-	25	12
Satinfin Shiner	Notropis alalostanus	2	-	-	1	1
Dace	Rhinichthys spp.	1	-	-	5	-
Cutlips Minnow	—	†	-	-	1	-
Johnny Darter	Eheostoma nigrum	†	-	-	1	-
White Sucker	Catostomus commersoni	1	-	-	-	1
Carp	Cyprinus carpio	1	-	-	-	1
Largemouth Bass	Micropterus salmoides	2	-	-	-	4
Black Crappie	Pomoxis nigromaculatus	†	-	-	1	-
American Toad	Bufo americanus	2	-	-	3	1
Earthworm	Lubricus spp.	4	-	140+	65	-
TOTALS	—	22	92	140+	136	36

NOTE: † = Not subjected to analysis because of insufficient sample weight

During the course of the biological sampling program, no dead fish were observed within the collection areas; however, three specimens of common shiner did show the presence of surficial growths or tumors. These specimens were subjected to metal analysis. As such they are no longer available for further study. Lesions/tumors of this type, while suggestive of potential chronic effects of contaminants, are not definitive and can be the result of natural causes as well as sublethal contamination.

4.2 Tissue Contamination Data

The presence of contaminants in an ecosystem can result in a variety of effects, ranging from direct mortality to a few susceptible individuals or reduction in breeding success, or large scale mortality, which functions to reduce population size, to changes in the structure and function of the entire ecosystem. The current levels of contamination at the Union Road Site, as defined during the Phase I and II RI, were compared to toxicity data from the available literature, and potential impacts to individual organisms in each habitat are identified. In addition, the potential for accumulation of contaminants within aquatic and terrestrial food webs was evaluated in a quantitative fashion. These results are presented below:

4.2.1 Biological Analyses

The 22 terrestrial and aquatic sample analyses for biota are presented on Table 4.2-1. It is noted that none of the parameters evaluated exceeded United States Food and Drug Administration (USFDA) criteria for consumption.

Of the 22 samples, 21 recorded levels over the CRDL for aluminum. The highest values were found in a composited tadpole sample from the upland ponded area. Elevated levels were also noted in earthworm samples from the marsh and Deer Lik Creek sampling locations. Somewhat elevated levels for aluminum were also noted in selected crayfish samples for all aquatic areas in which these organisms were collected.

Arsenic was detected in five-of-seven terrestrial samples collected and was below the CRDL for all aquatic samples. The highest value reported was found in tadpoles from the upland ponded area (2.2 mg/kg) with levels over 1 mg/kg in all earthworm samples collected from the marsh and creek areas.

TABLE 4.2-1

TISSUE ANALYSES SUMMARY TABLE - UNION ROAD SITE BIOLOGICAL STUDY PROGRAM

TERRESTRIAL ORGANISM ANALYSES

SAMPLE LOCATION	SPECIES	NUMBER ORGS./ SAMPLE	ORG. LENGTH (cm)	ORG. WEIGHT (g)	CONCENTRATION (mg/kg DRY WEIGHT) Al	Sb	As	Ba	Be	Cd	Ca	Cr	Co	Cu	Fe	Pb	Mg	Mn	Hg	Ni	Ps	Se	Ag	Na	Th	Va	Zr
Upland Area On Site:	Leopard Frog (Tad Poles)	12	5.32	2.78	2,780	ND	2.2	21.6	ND	ND	6,218	12.9	ND	13.7	5,560	8.8	2,040	91.4	ND	12.6	1,750	ND	ND	98.2	ND	6.1	36.(
	Crayfish	10	5.16	4.46	419	ND	ND	52.6	ND	ND	24,900	14.4	ND	115	746	ND	696	50.1	ND	12.6	20,860	ND	ND	1,740	ND	ND	23.(
Deer Lik Creek:	Crayfish	30	3.5	1.6	313	ND	ND	24.2	ND	ND	19,310	13.6	ND	89.3	524	10.5	502	34.1	ND	11.0	2,362	ND	ND	1,222	ND	ND	24.5
	Crayfish	5	5.2	4.2	93.3	ND	ND	22.5	ND	ND	22,660	ND	ND	48.1	155	15.9	505	50.5	ND	ND	2,310	ND	ND	1,733	ND	ND	25.9
	Common Shiner	5	4.1	1.3	87.2	ND	ND	ND	ND	ND	11,200	ND	ND	28.1	220	16.6	498	13.8	ND	ND	2,820	ND	ND	669	ND	ND	71.4
	Common Shiner	20	4.4	1.5	94.0	ND	ND	ND	ND	ND	6,383	28.3	ND	113	266	ND	418	8.4	ND	24.9	2,840	ND	ND	812	ND	ND	53.2
	Satinfin Shiner	1	9.5	10.8	53.8	ND	ND	ND	ND	ND	6,450	24.9	ND	720	180	ND	361	8.8	ND	17.1	2,950	ND	ND	714	ND	ND	52.9
	Dace	5	7.8	6.2	ND	ND	ND	ND	ND	ND	8,423	5.5	ND	19.2	50.5	ND	379	ND	ND	ND	3,020	ND	ND	922	ND	ND	40.4
Slate Bottom Creek:	Crayfish	5	4.2	2.6	194	ND	ND	24.7	ND	ND	20,530	19.2	ND	50.0	336	ND	500	53.8	ND	14.0	2,201	ND	ND	1272	ND	ND	25..
	Carp	1	8.1	9.5	152	ND	ND	ND	ND	ND	7,927	31.0	ND	ND	368	ND	371	10.5	.25	23.8	3,210	ND	ND	932	ND	ND	97.(
	Common Shiner	12	6.9	4.0	51.4	ND	ND	ND	ND	ND	8,632	6.2	ND	61.4	103	ND	356.5	5.4	ND	6.1	3,027	ND	ND	640	ND	ND	6(
	Satinfin Shiner	1	11.2	21.0	21.3	ND	ND	ND	ND	ND	6,612	7.4	ND	97.1	70.6	ND	354	ND	ND	6.2	3,240	ND	ND	654	ND	ND	50.1
	Golden Shiner	11	8.3	8.0	45.4	ND	ND	ND	ND	ND	11,670	ND	ND	ND	91.0	ND	418.7	7.4	ND	ND	3,127	ND	ND	757	ND	ND	55.1
	White Sucker	1	13.2	22.9	52.4	ND	ND	ND	ND	ND	10,430	46.1	ND	13.6	118.0	ND	369	11.6	ND	ND	3,302	ND	ND	788	ND	ND	29.1
	Largemouth Bass	1	10.3	16.7	34.6	ND	ND	ND	ND	ND	10,180	76.4	ND	10.2	354	ND	412	9.6	ND	53.0	3,888	ND	ND	931	ND	ND	38.3
	Largemouth Bass	3	5.9	3.1	20.1	ND	ND	ND	ND	ND	17,620	11.7	ND	36.3	75.9	ND	560	ND	ND	8.6	3,050	ND	ND	860	ND	ND	39.2

NOTE: For summary of detection limits please refer to Table 4.4-1

TABLE 4.2-1 (Cont'd)

TISSUE ANALYSES SUMMARY TABLE - UNION ROAD SITE BIOLOGICAL STUDY PROGRAM

TERRESTRIAL ORGANISM ANALYSES

SAMPLE LOCATION	SPECIES	NUMBER ORGS./ SAMPLE	ORG. LENGTH (cm)	ORG. WEIGHT (g)	CONCENTRATION (mg/kg DRY WEIGHT) AL	Sb	As	Ba	Be	Cd	Ca	Cr	Co	Cu	Fe	Pb	Mg	Mn	Hg	Ni	Ps	Se	Ag	Na	Th	Va	Zn
Union Road Marsh Area	Earthworms	-	-	-	697	ND	1.1	ND	ND	3.00	844	25.6	ND	5.4	1,429	9.7	282	24.2	.25	21.2	1,528	4.1	ND	620	ND	ND	97.50
Adjacent to Tar Pit:	Earthworms	-	-	-	1,117	ND	1.5	ND	ND	3.6	988	10.2	ND	5.5	1,945	23.8	364	34.00	.32	8.9	1,755	4.5	ND	6,424	ND	ND	113
Deer Lik Creek:	Earthworms	50	6	.36	1,600	ND	1.1	11.2	ND	1.7	2,700	29.3	ND	69.1	2,600	22.7	878	58.9	ND	19.70	1,600	4.1	ND	6,660	ND	ND	107
	Earthworms	70	8	.36	1,630	ND	1.1	ND	ND	1.9	3,630	ND	ND	65.8	2,900	ND	1,014	64.8	ND	21.8	1,530	4.9	ND	729	ND	ND	123
	American Toad	3	2	2	254	ND	ND	ND	ND	ND	10,880	14.2	ND	17.5	ND	9.2	380	17.2	ND	11.4	2,202	ND	5.00	1,357	ND	ND	28
Slate Bottom Creek:	American Toad	1	4	5	139	ND	ND	ND	ND	ND	5,248	25.4	ND	186	305	ND	280	9.1	ND	16.6	2,965	ND	ND	1,047	ND	ND	44.6

NOTE: For summary of detection limits please refer to Table 4.1-1

Cadmium levels were below the CRDL for all aquatic samples. However, all earthworm samples showed levels for this element in excess of 1 mg/kg with higher levels (3.0, 3.6 mg/kg) for those specimens collected within contaminated marsh soils.

Copper was encountered in levels over the CRDL in 20 of 22 samples. The highest level reported, 720 mg/kg, was found in a satinfin shiner sample from Deer Lik Creek. Iron was detected in all but one sample, with the highest value of 5,560 mg/kg in the leopard frog tadpole sample from the upland ponded area, and values ranging from 1,429 to 2,900 mg/kg for all earthworm samples collected from both the marsh and Deer Lik Creek areas.

Lead levels in excess of the CRDL were noted in 8 of 22 samples. These samples ranged from 8.8 to 23.8 mg/kg.

All 22 samples contained levels over the CRDL for magnesium, the highest of which were reported in tadpoles from the upland ponded area (2,040 mg/kg). Levels of this element were found in the 300 to 700 mg/kg range for all remaining aquatic samples collected.

Manganese levels over the CRDL were encountered for 19 samples with levels ranging from 5.4 to 91.4 mg/kg.

Mercury levels were below the CRDL for all but three samples collected with values for carp (0.25 mg/kg) and two earthworm samples collected adjacent to the tar pit (0.25 and 0.32 mg/kg, respectively), being the only values reported in the survey for this element.

Nickel levels over the CRDL were found for 17 of 22 samples with values ranging from 6.1 to 53.0 mg/kg.

Selenium levels over the CRDL were noted for all four earthworm samples, (4.1 - 4.9 mg/kg), and were undetected for the remaining 18 samples.

One single analysis of an american toad sample from Slate Bottom Creek contained 5.0 mg/kg of silver. The remaining 21 samples analyzed were undetected for this element. Similarly, a single sample of american toad from the upland ponded area contained the only value for vanadium (6.1 mg/kg) above the CRDL.

Zinc levels were found above the CRDL for all 22 analyses at concentrations generally below 100 mg/kg with the exception of four earthworm samples which had levels ranging from 97.5 to 123 mg/kg.

All 22 samples were found to have tissue concentrations below the CRDL for antimony, beryllium, cobalt and thallium.

4.2.2 Comparison to Other Levels Statewide

The extent to which surface water contaminants partition into plant or animal tissue is highly site- and species-specific. Therefore, the most accurate method of determining the degree of bioconcentration in a given species is site-specific bioconcentration/bioaccumulation testing. Literature and on-site derived bioconcentration factors are presented and discussed in Section 4.4 of this document. However, it is of interest to ascertain the levels of heavy metal contaminants in organisms collected at the Union Road site with similar species collected statewide. To that end, the organism/contaminant data presented in the yearly NYSDEC Toxic Substances Monitoring program over the years 1979 - 1987 have been utilized.

In a search of NYSDEC records, statewide contaminant data for mercury was available for three species also collected at the Union Road Site as part of this study. These species, along with the collection location and mercury data, are presented in Table 4.2-2. The associated level for mercury in the species collected at the Union Road Site is listed at the top of each data section. In the case of white sucker and largemouth bass, the mercury levels are undetected at the Union Road Site, while levels elsewhere in the state show ranges from 0.20 to 0.76 mg/kg for white sucker and 0.11 to 2.39 mg/kg for largemouth bass.

In the case of carp/goldfish, the data from the Union Road Site for mercury (0.25 mg/kg) is within the midrange of levels found for this species collected elsewhere in New York State (0.10 to 0.63 mg/kg).

4.2.3 Existing Surface Water Data - Comparison to Water Quality Criteria

During the Phase I and II RI, surface water samples were collected from the flowing water habitats at the Union Road Site. Three of the surface water samples were obtained from Slate Bottom Creek downstream of the marsh area, and the other three surface water samples were collected from the creek system (Deer Lik Creek and Slate Bottom Creek) upstream of the marsh. The surface water samples were analyzed for TCL+30, total petroleum hydrocarbons and hardness. Results of chemical analysis of the surface water samples are presented in Tables 4 and 5 of the Environmental Assessment Report by Sadat Associates, Inc. (1990). Similarly, three of

TABLE 4.2-2

COMPARISON OF

BIOLOGICAL TISSUE CONTAMINANT DATA FOR MERCURY TO NYSDEC STATEWIDE TOXIC SUBSTANCES MONITORING DATA

FOR SELECTED FISHES ENCOUNTERED AT THE UNION ROAD SITE

SPECIES: Catostomus commersoni / White Sucker

REPORTED UNION ROAD SITE MERCURY LEVEL: None detected (detection level 0.01 mg/kg)

LOCATION	YEAR	AVERAGE MERCURY (ppm)	MERCURY RANGE (ppm)
COHECTON RIVER			
Cohecton	1979	0.25	0.12—0.40
CHEMUNG RIVER			
Chemung	1979	0.26	0.12—0.30
SUSQUEHANNA RIVER			
Smithboro	1979	0.31	0.23—0.42
NIAGARA RIVER			
Lewiston	1979	0.18	0.12—0.25
Fort Niagara	1979	0.42	0.38—0.51
LAKE ONTARIO			
Hamlin	1979	0.42	0.36—0.49
Oswego Harbor	1979	0.23	0.14—0.80
Salmon River	1979	0.48	0.20—0.54
BLACK RIVER			
Brounville	1979	0.36	0.34—0.38
STILLWATER RESERVOIR	1979	0.28	0.22—0.38
STILLWATER RESERVOIR	1982	0.44	NR
CRANBERRY LAKE	1982	0.26	0.18—0.29
KEUKA LAKE	1982	0.21	0.18—0.22
SENECA LAKE	1982	0.24	0.18—0.34
CAYUGA LAKE	1982	0.38	NR
OWESCO LAKE	1982	0.40	0.36—0.42
ONONDAGA LAKE	1982	0.30	0.16—0.45
ONONDAGA LAKE	1985	0.76	0.31—1.49
MOHAWK RIVER			
Little Falls	1985	0.17	0.17—0.18
SARATOGA LAKE	1985	0.36	0.23—0.50
SARATOGA LAKE	1981	0.33	0.27—0.40
GENESEE RIVER			
Blevidere	1982	0.58	NR
Fillmore	1982	0.48	NR
FOURTH LAKE	1982	0.20	NR
HUDSON RIVER			
Fort Edward	1983	0.49	0.42—0.52

NOTE: NR = Data not reported

TABLE 4.2-2 (Cont'd)

COMPARISON OF

BIOLOGICAL TISSUE CONTAMINANT DATA FOR MERCURY TO
NYSDEC STATEWIDE TOXIC SUBSTANCES MONITORING DATA

FOR SELECTED FISHES ENCOUNTERED AT THE UNION ROAD SITE

SPECIES: Micropterus salmoides / Largemouth Bass
REPORTED UNION ROAD SITE MERCURY LEVEL: None detected (detection level 0.01 mg/kg)

LOCATION	YEAR	AVERAGE MERCURY (ppm)	MERCURY RANGE (ppm)
BLACK LAKE			
Morristown	1979	0.36	0.16—0.49
THOMPSON ISLAND	1980	0.33	0.28—0.40
BARGE CANAL			
Montezuma Wildlife Ref.	1981	0.38	0.30—0.46
HICKORY LAKE	1981	0.50	NR
HOOSIC RIVER			
Johnsonville	1981	1.13	1.00—1.26
NEW CROTON RESERVOIR	1981	0.56	0.28—0.84
WAPPINGERS LAKE	1981	0.28	0.28—0.29
FISHKILL CREEK			
Glenham	1981	0.32	0.25—0.40
ST JOHNS POND	1981	0.20	NR
LAKE RONKONKOMA	1981	0.22	0.20—0.34
CHATAUGUA LAKE			
Beamus Point	1982	0.30	NR
INDIAN LAKE			
Fort Drum	1982	2.39	NR
RAQUATTE LAKE			
North Point	1982	0.42	NR
WALLKILL RIVER			
Montgomery	1982	0.38	NR
CONESUS LAKE			
McPherson Point	1983	0.38	NR
GREAT CHAZY RIVER			
Coopersville	1983	0.57	0.49—0.70
HUDSON RIVER			
Above Glen Falls	1983	0.14	NR
Fort Edward	1983	0.78	NR
Thompson Island	1983	0.84	0.66—1.10
HEMPSTEAD LAKE	1985	0.21	0.14—0.25
PINE LAKE	1985	0.11	0.06—0.21
BLYDENBURG POND	1985	0.19	0.14—0.29

NOTE: NR = Data not reported

TABLE 4.2-2 (Cont'd)

COMPARISON OF

BIOLOGICAL TISSUE CONTAMINANT DATA FOR MERCURY TO
NYSDEC STATEWIDE TOXIC SUBSTANCES MONITORING DATA

FOR SELECTED FISHES ENCOUNTERED AT THE UNION ROAD SITE

SPECIES: Cyprinus carpio/Crassus auratus \ Carp/Goldfish

REPORTED UNION ROAD SITE MERCURY LEVEL: 0.25 mg/kg

LOCATION	YEAR	AVERAGE MERCURY (ppm)	MERCURY RANGE (ppm)
BUFFALO RIVER (C)	1980	0.15	0.14—0.16
BUFFALO RIVER (C)	1983	0.10	0.10—0.12
FORT EDWARD (GF)	1980	0.27	0.26—0.28
THOMPSON ISLAND (GF)	1980	0.32	0.32—0.32
ALBANY / TROY (GF)	1980	0.35	0.28—0.51
LACKAWANNA (C)	1981	0.38	NR
NIAGARA RIVER			
Below Buffalo (C)	1981	0.28	0.12—0.38
Below Lewiston (C)	1981	0.36	NR
Fort Niagara (C)	1981	0.44	NR
LAKE ONTARIO			
Irondequoit Bay (C)	1981	0.33	NR
BARGE CANAL			
Montezuma Wildlife Refuge (C)	1981	0.36	NR
LAKE RONKONKOMA (C)	1981	< 0.10	NR
GENESEE RIVER			
West Henrietta (C)	1982	0.38	NR
SAWMILL RIVER			
Farragut River (C)	1982	0.16	NR
SHELDRATE RIVER			
Pinebrook Heights (GF)	1982	0.17	NR
MEADOW LAKE (NYC)			
Fairgrounds (C)	1982	< 0.10	< 0.10—< 0.10
HUDSON RIVER			
Fort Edward (GF)	1983	0.54	0.52—0.54
Thompson Island (GF)	1983	0.54	NR
Troy (GF)	1983	0.37	0.22—0.46
HEMPSTEAD LAKE (C)	1985	0.15	0.06—0.21
ONONDAGA LAKE (C)	1985	0.63	0.13—1.16
ONONDAGA LAKE (C)	1986	0.57	0.15—1.07

NOTES: NR = Data not reported
(c) = carp data
(gf) = goldfish data

the surface water sediment samples were obtained from the creek system downstream of the marsh and three were obtained from the creek system upstream of the marsh. These surface water sediment samples were analyzed for TCL+30 and petroleum hydrocarbons. Results of the analysis of these samples are summarized in Table 6 and 7 of the Environmental Assessment Report.

In order to obtain representative values of surface water and sediment contamination in the creek system and Slate Bottom Creek, the geometric mean concentration was calculated for each contaminant, in each medium. The geometric mean is calculated by the formula:

where:

C_{ij}	=	geometric mean concentration of contaminant i in medium j (mg/l)
C_{ijx}	=	concentration of contaminant i in sample x in medium j (mg/l)
N	=	number of samples in medium j in which contaminant i was detected

Samples collected upstream and downstream of the marsh area are considered separately in the Environmental Assessment Report to determine the possible influence of surface water and sediment transport from the marsh on the receiving waters of Slate Bottom Creek.

Table 4.2-3 compares the geometric mean of the marsh system surface water contamination to the actual elutriate test concentration of marsh sediments utilized in the bioassay/bioaccumulation study. It is noted from the table that for the majority of the TCL metal parameters, the elutriate concentration utilized for testing exceeds (in some cases by orders of magnitude) the geometric mean utilized in the previous environmental assessment. Those original estimates indicated that acute and chronic effects may occur to the flora and fauna of the creek system due to current levels of contamination. According to this hypothesis, theoretically, the actual elutriate concentrations utilized in bioassay testing should have produced a measurable effect from the contaminants on the test organisms.

It must be noted that marsh surface water sample MA-SW-2D was collected after sampling personnel intentionally disturbed the surrounding sediments of those samples. This disturbed sample is most similar to the sediment sample utilized for bioassay studies. The results for this sample were intended to characterize potential surface water conditions during a storm event or other disturbance such as that of a large animal walking through the marsh area. For comparison, the elutriate sample taken at the laboratory from marsh sediment samples subjected to ten day bioassay studies is also presented in Table 4.2-3. When compared to the samples collected during the RI, the values from test sediments utilized in the bioassay were consistently greater than values from the geometric mean of marsh samples with the exception of calcium magnesium, potassium and zinc. Similarly, comparison of the elutriate levels for TCL metals to the intentionally disturbed sample MA-SW-2D also showed generally higher levels in the elutriate for most metals except for aluminum, cadmium, copper, iron, lead, magnesium, potassium and zinc. Therefore, it is believed that the test sediment utilized in the bioassay program provides estimates of toxicity which would be similar to the field program results, but might underestimate the levels of iron, zinc and lead toxicity (of a disturbed sediment sample) for the sediments analyzed.

As defined during the Phase I and II RI, the marsh area consists of the ponded water area adjacent to the Tar Pit. Contamination of surface water in this area is likely to affect the adjacent emergent wetland and palustrine forested wetland habitats, as these areas lie beneath standing water for periods of time. Therefore, the following discussion of standing water habitats includes the effects of the marsh contamination on the ponded water, emergent wetland and palustrine forested wetland habitats.

The Ambient Water Quality Criteria for the Protection of Freshwater Aquatic Life are developed from acute and chronic toxicity data and information on bioaccumulation by aquatic plants and animals, as well as their wildlife consumers (EPA, 1986a). The criteria for acute effects reflect the highest 1-hour average concentration that should not result in unacceptable effects on aquatic organisms or their consumers (EPA, 1986a). The NYSDEC Ambient Water Quality Standards and Guidlines for Class C waters are based upon protection of fishing and fish propagation. The NYSDEC Standards and Guidelines for Class D waters are based upon protection of fishing and fish survival. Slate Bottom Creek is currently classified as a Class D waterway; however, this creek is proposed for reclassification as a Class C waterway. Therefore, both standards were included in this assessment for evaluation of surface waters at the Union Road Site.

TABLE 4.2-3

SURFACE WATER RESULTS AND GEOMETRIC MEAN CONTAMINANT CONCENTRATIONS MARSH - PHASE I AND II RI, UNION ROAD SITE

INORGANICS	MA-SW1[†]	MA-SW2[†]	MA-SW2C[†]	MA-SW2D[†]	MA-SW3[†]	GEOM. MEAN MARSH MARSH (mg/kg)	ELUTRIATE CONCENTRATION TEST SEDIMENT
Aluminum	0.1620	0.0393	0.1530	2.5500	0.1270	0.199	0.2
Antimony	0.0169	0.0169	0.0169	0.0685	0.0419	0.02	0.05
Arsenic	0.0008	0.0009	0.0019	0.0055	0.0010	0.001	0.01
Barium	0.0484	0.0484	0.0752	0.0913	0.0484	0.06	0.02
Beryllium	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.01
Cadmium	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.01
Calcium	168.0000	185.0000	185.0000	191.0000	163.0000	178.00	63.7
Chromium	0.0111	0.0021	0.0166	0.0144	0.0058	0.0079	0.01
Cobalt	0.0084	0.0084	0.0084	0.0084	0.0084	0.0084	0.05
Copper	0.0049	0.0093	0.0052	0.0619	0.0244	0.0129	0.036
Cyanide	0.0100	0.0100	0.0100	0.0100	0.0100	0.01	-
Iron	0.2530	1.2800	4.7300	15.6000	0.2860	1.47	5.18
Lead	0.0020	0.0040	0.0123	0.0488	0.0764	0.013	0.02
Magnesium	21.4000	23.5000	22.1000	25.5000	20.5000	22.5	11.43
Manganese	0.0701	0.0529	0.1490	0.0943	0.0473	0.0756	0.14
Mercury	0.0000	0.0002	0.0002	0.0002	0.0002	0.00012	0.0002
Nickel	0.0060	0.0060	0.0070	0.0060	0.0060	0.00619	0.04
Potassium	4.2500	4.1800	4.2600	4.7500	6.3800	4.70	3.95
Selenium	0.0012	0.0004	0.0004	0.0006	0.0004	0.00054	0.01
Silver	0.0021	0.0021	0.0021	0.0021	0.0021	0.0021	0.01
Sodium	12.3000	11.4000	10.4000	12.8000	13.2000	1.20	18.8
Thallium	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.05
Vanadium	0.0059	0.0059	0.0059	0.0068	0.0059	0.006	0.05
Zinc	0.0073	0.0862	0.0281	0.2400	0.0177	0.0376	0.02

[†]Phase I RI Results

Table 4.2-4 indicates that the geometric mean concentrations of cyanide (1.0×10^{-2} mg/1), iron (1.47 mg/1) mercury (1.26×10^{-4} mg/1) and silver (2.10×10^{-3}) detected in the surface water of the marsh area exceed their respective EPA Ambient Water Quality Criteria for the Protection of Freshwater Aquatic Life for chronic effects. Similarly, the geometric mean concentrations of aluminum (1.99×10^{-1} mg/1), cobalt (8.40×10^{-1} mg/1), cyanide (1.0×10^{-2} mg/1), iron (1.47 mg/1), silver (2.10×10^{-3} mg/1) and zinc (3.76×10^{-2} mg/1) detected in the marsh surface water exceed their respective NYSDEC Ambient Water Quality Standards/Guidelines for Class C waters.

Further review of Table 4.2-4 indicates the instrument detection limits for several of these components (i.e., cobalt, cyanide, mercury and silver) are greater than one or more of the respective water quality standards/guidelines. While it cannot be assumed that these compounds automatically exceed their respective standards, without further investigation it cannot be assumed that the water quality criteria for these compounds are met. In addition, it must be noted that neither EPA Ambient Water Quality Criteria nor NYSDEC Water Quality Standards/Guidelines have been developed for the following TCL metal contaminants detected in the marsh system: calcium; magnesium; manganese; potassium; and, sodium. Therefore, the impacts of the concentrations of these contaminants detected in the marsh on aquatic life cannot be assessed by this screening method.

Table 4.2-5 presents the geometric mean concentrations and water quality standards for contaminants detected in Slate Bottom Creek downstream of the marsh. Table 4.2-5 indicates that the geometric mean concentrations of cyanide (1.0×10^{-2} mg/1), mercury (2.0×10^{-4} mg/1) and silver (2.1×10^{-3} mg/1) detected in the creek system downstream of the marsh exceed their respective EPA Ambient Water Quality Criteria for the Protection of Freshwater Aquatic Life for chronic effects. The geometric mean concentrations of aluminum (2.50×10^{-1} mg/1), cobalt (8.40×10^{-3} mg/1), cyanide (1.0×10^{-2} mg/1), iron (4.31×10^{-1} mg/1) and silver (2.10×10^{-3} mg/1) detected in Slate Bottom Creek exceed their respective NYSDEC Ambient Water Quality Standards/Guidelines for Class C waters. In addition, the NYSDEC standard for iron in Class D waters (i.e., 3.00×10^{-1} mg/1) is exceeded.

TABLE 4.2-4
CONTAMINANT CONCENTRATIONS IN THE UNION ROAD SITE MARSH SURFACE WATER AND NYSDEC AND EPA AMBIENT WATER QUALITY CRITERIA

		EPA WATER QUALITY CRITERIA		NYSDEC STANDARDS/GUIDELINES	
INORGANICS	GEOM. MEAN (mg/l)	ACUTE (mg/l)	CHRONIC (mg/l)	CLASS C WATERS (mg/l)	CLASS D WATERS (mg/l)
Aluminum	1.99E-01	—	—	1.00E-01[1]	—
Antimony	2.68E-02	9.00E+00[2]	1.60E+00[2]	—	—
Arsenic	1.50E-03	3.60E-01	1.90E-01	1.90E-01[1]	3.60E-01[1]
Barium	6.00E-02	—	—	—	—
Beryllium	2.00E-04[3]	1.30E-01[2]	5.30E-03[2]	1.10E+00[1,4]	—
Cadmium	1.70E-03[3]	2.74E-02[4]	4.39E-03[4]	4.39E-03	2.74E-02[1,4]
Calcium	1.78E+02	—	—	—	—
Chromium	7.98E-03	7.12E+00[4]	8.49E-01[4]	8.49E-01[1,4]	7.12E+00[1,4]
Cobalt	8.40E-03[3]	—	—	5.00E-03[5]	1.10E-01[5]
Copper	1.29E-02	8.99E-02[4]	5.15E-02[4]	5.15E-02[1,4]	8.99E-02[1,4]
Cyanide	1.00E-02[3]	2.20E-02	5.20E-03	5.20E-03[5]	2.20E-02[1]
Iron	1.47E+00	—	1.00E+00	3.00E-01[1]	3.00E-01[1]
Lead	1.30E-02	7.32E-01[4]	2.85E-02[4]	2.85E-02[1,4]	7.32E-01[1,4]
Magnesium	2.25E+01	—	—	—	—
Manganese	7.56E-02	—	—	—	—
Mercury	1.26E-04[3]	2.40E-04	1.20E-05	2.00E-04[5]	2.00E-04[5]
Nickel	6.19E-03	6.83E+00[4]	6.07E-01[4]	6.07E-01[1,4]	6.83E+00[1,4]
Potassium	4.70E+00	—	—	—	—
Selenium	5.40E-04	2.60E-01	3.50E-02	1.00E-03[1]	—
Silver	2.10E-03[3]	7.86E-02[4]	1.20E-05[4]	1.00E-04[1]	7.86E-02[1,4]
Sodium	1.20E+01	—	—	—	—
Thallium	3.00E-04[3]	1.40E+00[2]	4.00E-02[2]	8.00E-03[1]	2.00E-02[1]
Vanadium	6.07E-03	—	—	1.40E-02[1]	1.90E-01[1]
Zinc	3.76E-02	5.04E-01[4]	4.56E-01[4]	3.00E-02[1]	1.34E+00[1,4]

[1] Standard

[2] LOAEL (lowest observed effects level)

[3] All samples less than instrument detection limit

[4] Based upon hardness of 560 ug/l in the marsh

[5] Guidance Value

SOURCE: *Environmental Assessment for the Union Road Site*, 1990 - Sadat Associates

TABLE 4.2-5
CONTAMINANT CONCENTRATIONS IN THE UNION ROAD SITE SURFACE WATER DOWNSTREAM OF THE MARSH AND NYSDEC AND EPA AMBIENT WATER QUALITY CRITERIA

		EPA WATER QUALITY CRITERIA		NYSDEC STANDARDS/GUIDELINES	
INORGANICS	GEOM. MEAN (mg/l)	ACUTE (mg/l)	CHRONIC (mg/l)	CLASS C WATERS (mg/l)	CLASS D WATERS (mg/l)
Aluminum	2.50E-01	—	—	1.00E-01[1]	—
Antimony	1.69E-02	9.00E+00[2]	1.60E+00[2]	—	—
Arsenic	4.16E-04	3.60E-01	1.90E-01	1.90E-01[1]	3.60E-01[1]
Barium	4.84E-02	—	—	—	—
Beryllium	2.00E-04[3]	1.30E-01[2]	5.30E-03[2]	1.10E+00[1,4]	—
Cadmium	1.70E-03[3]	1.00E-02[4]	2.18E-03[4]	2.00E-03	1.00E-02[1,4]
Calcium	6.71E+01	—	—	—	—
Chromium	2.25E-03	3.44E+00[4]	4.09E-01[4]	4.09E-01[1,4]	3.44E+00[1,4]
Cobalt	8.40E-03[3]	—	—	5.00E-03[5]	1.10E-01[5]
Copper	4.90E-03	8.99E-02[4]	2.41E-02[4]	2.41E-02[1,4]	3.99E-02[1,4]
Cyanide	1.00E-02[3]	2.20E-02	5.20E-03	5.20E-03[5]	2.20E-02[1]
Iron	4.31E-01	—	1.00E+00	3.00E-01[1]	3.00E-01[1]
Lead	6.26E-04	2.36E-01[4]	9.19E-03[4]	9.00E-03[1,4]	2.37E-01[1,4]
Magnesium	1.34E+01	—	—	—	—
Manganese	6.92E-02	—	—	—	—
Mercury	200E-04[3]	2.40E-03	1.20E-05	2.00E-04[5]	2.00E-04[5]
Nickel	7.34E-03	3.47E+00[4]	3.09E-01[4]	3.09E-01[1,4]	3.47E+00[1,4]
Potassium	232E+00	—	—	—	—
Selenium	5.04E-04	2.60E-01	3.50E-02	1.00E-03[1]	—
Silver	2.10E-03[3]	1.70E-02[4]	1.20E-05[4]	1.00E-04[1]	1.70E-02[1,4]
Sodium	6.90E+01	—	—	—	—
Thallium	3.00E-04[3]	1.40E+00[2]	4.00E-02[2]	8.00E-03[1]	2.00E-02[1]
Vanadium	5.90E-03	—	—	1.40E-02[1]	1.90E-01[1]
Zinc	1.07E-02	2.37E-01[4]	2.15E-01[4]	3.00E-02[1]	6.41E-01[1,4]

[1] Standard

[2] LOAEL (lowest observed effects level)

[3] All samples less than instrument detection limit

[4] Based upon hardness of 560 ug/l in the marsh

[5] Guidance Value

SOURCE: *Environmental Assessment for the Union Road Site*, 1990 - Sadat Associates

Again, review of Table 4.2-5 indicates the instrument detection limits for several compounds, including cobalt, cyanide, mercury and silver, are greater than one or more of their respective water quality standards/guidelines. While it cannot be assumed that these compounds automatically exceed their respective standards, without further investigation it cannot be assumed that the water quality criteria for these compounds are met. In addition, it must be noted that neither EPA Ambient Water Quality Criteria nor NYSDEC Standards/Guidelines have developed for the following contaminants detected in Slate Bottom Creek downstream of the marsh: barium; calcium; magnesium; manganese; potassium; and, sodium. However, the presence of dead fish noted during the Remedial Investigation field program prior to the Biological Study Program, in conjunction with the exceedance of Ambient Water Quality Criteria for acute effects and NYSDEC Water Quality Standards/Guidelines for Class C Waters for several inorganic chemicals in the streams, may suggest toxicity of these contaminants to fish in the system.

4.3 Sediment Bioassay Characterization

4.3.1 Sediment Characterization

During the Phase I and II RI, sediment samples were collected from the marsh area at the Union Road Site (see Figures 4-8 and 4-10 of the RI Report). The chemical results for the marsh samples, which were analyzed for TCL+30, total petroleum hydrocarbons and hardness, are shown in Table 4.3-1 for TCL parameters only.

The exceedance of several water quality standards/guidelines in the marsh surface water (see previous section) indicated that adverse effects to aquatic animals in this area were likely. As discussed in the RI Report, animal species observed in the ponded water habitats are limited to tadpoles. The presence of fish within the marsh area contiguous to the Tar Pit was not noted during the Phase I and II RI.

In this regard, the sediment collected from the marsh area in the vicinity of the USEPA filter fence was subjected to a ten-day bioassay bioaccumulation test. The bioaccumulation results will be discussed in Section 4.4 of this document.

UNION ROAD SITE/TOWN OF CHEEKTOWAGA, NEW YORK

TABLE 4.3-1

REMEDIAL INVESTIGATION/SURFACE WATER SEDIMENT

AND BORING ANALYTICAL RESULTS FOR THE MARSH AREA (mg/kg)

	MARSH BORINGS					MARSH				
PARAMETERS	MB-7 (4-8')	MB-9 (2-4')	MB-12 (3-4')	MB-14 (2-4')	MB-15 (2-4')	MA-SD-1	MA-SD-2	MA-SD-3	NJDEP Cleanup Levels mg/kg	NYSDEC Cleanup Criteria ug/kg
INORGANICS:										
Aluminum	20,800	15,000	7,090	13,100	9,340	13,500	18,700	6,050	-	-
Antimony	2.9	102	1,310	107	1,420	15.7	1,940	177	-	-
Arsenic	2.9	12.2	31.1	3.7	8.6	4.6	33.1	8.9	20	-
Barium	99.9	114	180	92.1	102	75	110	81.7	-	-
Beryllium	0.69	1.1	1.5	0.81	0.83	0.35	0.10	0.13	-	-
Cadmium	0.84	1.1	1.7	0.99	1.1	0.66	1.7	2.8	3	-
Calcium	2,040	12,800	89,300	12,700	23,900	4,420	31,000	108,000	-	-
Chromium	25.1	22	63.8	20	22.2	16.3	34.9	13.8	100	-
Cobalt	12	12.8	13.8	10.3	8.2	11.4	9.5	7.0	-	-
Copper	17.9	414	1,600	247	2,320	44.2	1,790	399	170	-
Cyanide	0.64	0.72	1.1	0.77	0.92	0.66		1.8	12	-
Iron	27,100	24,800	44,300	30,700	29,000	19,100	60,700	41,300	-	-
Lead	13	7,490	20,100	2,840	28,300	328	25,400	3,090	250	-
Magnesium	4,930	5,360	6,450	5,870	4,180	3,670	11,300	3,770	-	-
Manganese	257	361	491	463	423	753	408	425	-	-
Mercury	0.06	0.26	1.3	0.10	0.32	0.08	0.28	0.22	1	-
Nickel	27.3	27	120	24.3	23.6	20.9	43.7	22.5	100	-
Potassium	2,330	1,450	790	1,610	769	1,720	3,040	1,900	-	-
Selenium	0.24	1.4	2.4	0.40	1.2	0.30	1.2	2.1	4	-
Silver	0.44	0.59	3	0.70	3.1	0.50	2.6	1.3	5	-
Sodium	222	382	726	258	423	154	449	380	-	-
Thallium	0.48	0.60	0.69	0.40	0.49	0.27	0.58	0.19	-	-
Vanadium	34.5	30.9	21.4	25.8	21.1	20.8	37.9	17.5	-	-
Zinc	96.7	154	280	111	166	90	336	614	350	-

Table 4.3-1 presents the sediment and boring results from the marsh area samples. As presented in Table 4.3-1, the sample designated as MA-SD-2 represents analytical data in close proximity to the area of sediment collection used in the bioassay program. Sample MA-SD-1 would be indicative of the sediment characteristics at the confluence of the drainage ditch and Deer Lik Creek. It can be noted from the Table 4.3-1 that sample MA-SD-2 exceeds NJDEP Soil Cleanup criteria for arsenic, copper and lead. Comparison of these marsh sediments and surficial boring data to the elutriate level in the test sediment presented in Table 4.3-2 shows that for all TCL metal parameters, the elutriate level is lower than the concentrations reported for each contaminant for sample MA-SD-2. This suggests that the material in the sediment is bound to an organic or inorganic complex limiting its' solubility into water. The kinetics of the rate of absorption or desorption of these materials is unknown and beyond the scope of this assessment.

4.3.2 Results of the Bioassay Program

As part of the bioassay program, prior to initiation of the bioassay, a composite sediment sample was analyzed using an elutriate test to ascertain the types and levels of heavy metal contaminants released from the sediment during testing. The results of this elutriate test, in comparison to literature values for acute 96 hour Lc_{50} data and chronic (sublethal) levels for fathead minnow (the test organism), is presented in Table 4.3-2.

As is presented in this table, in all cases, the elutriate level reported for a particular constituent was below the acute (96 hour Lc_{50} level) and chronic level reported by the literature for this test species.

4.4 Sediment Bioaccumulation Characterization

4.4.1 Bioaccumulation Assessment

Aquatic organisms may take in contaminants by ingestion of contaminated food and through passive diffusion from contaminated water. It has been demonstrated that contaminant uptake from food does not significantly affect the overall rate of uptake in the lower trophic levels, and that metabolism is often too slow to significantly affect the rate of contaminant loss (EPA, 1989b; Walker, 1987). Passive diffusion, therefore, is considered to the driving force for contaminant uptake by aquatic species.

TABLE 4.3-2

COMPARISON OF UNION ROAD SITE SEDIMENT ELUTRIATE DATA TO LITERATURE LC 50 CONCENTRATIONS FOR FATHEAD MINNOW Pimephales promelias[1]

ANALYTE	ELUTRIATE CONCENTRATION[2]	96 HOUR LC 50[3] ACUTE DOSE (RANGE)	SUBLETHAL CHRONIC DOSE	REMARKS
Aluminum	< 0.2	250 ppm	6.7—206 ppm	AL SO_4, pH 7.2—7.6
Antimony	< 0.05	9—80 mg/l	1.0 mg/l	Sbo_3 to largemouth bass.
Arsenic	< 0.010	27—168 mg/l	20—35 ppm	Arsenic trioxide / sodium arsenate mixture effect on carp and shiners.
Barium	< 0.2	200—2,083 mg/l	5,000 mg/l	For carp and eels respectively.
Beryllium	< 0.010	0.15—20 ppm	3 mg/l	Higher toxicities associated with soft water.
Cadmium	< 0.010	0.17—72.6 mg/l	0.0001—0.01 mg/l	For gold fish and pumpkinseed.
Calcium	63.7	7.752 mg/l—11,300 ppm	8,400 mg/l	High toxicity value in distilled water. 1.4 ppm in hard water.
Chromium	< 0.010	5.07 mg/l	10—50 ppm	Toxicity test using soft water
Cobalt	< 0.05	No Data	0.05—5 mg/l	No additional data reported.
Copper	0.036	0.18 ppm—1.5 ppm	2.0 ppm	Data for black bass.
Iron	5.180	No Data for Fishes	10 mg/l	—
Lead	< 0.020	3.2—480 mg/l	1.0 mg/l	Higher toxicities associated with soft water.
Magnesium	11.43	19,000 ppm	No Data	Twenty-four tests using Lepomis macrochirus.
Manganese	0.140	1,000—5,500 mg/l	No Data	Miscellaneous fresh water fish not specified.
Mercury	< 0.0002	0.23 mg/l	0.01 ppm	For Fundulus heteroclitis test water aerated over ninety-six hour period.
Nickel	< 0.04	0.95—42.4 mg/l	10 ppm	Higher toxicities associated with soft water.
Potassium	3.95	17.6—45.6 mg/l	20 ppm	All data for tests using soft water.
Selenium	< 0.010	2.5 mg/l	> 800 ppm	No fish data (data presented is for daphnia).
Silver	< 0.010	0.0043—0.04 mg/l	0.01	Low value for guppies; higher value for Fundulus heteroclitis.
Sodium	18.8	0.23—0.35 ppm	17.8—2,970 ppm	Higher toxicities associated with soft water.
Thallium	< 0.05	No Data	No Data	No Data.
Vanadium	< 0.05	4.8—55.0 ppm	No Data	Higher toxicities associated with soft water.
Zinc	< 0.020	0.88—32.3 ppm	0.10—5.0 ppm	Higher toxicities associated with soft water.

[1] All data refer to Toxicity testing for fathead minnow unless noted

[2] Expressed as mg/l

[3] From scientific literature. Testing conditions vary. All data refer to static bioassay testing unless otherwise noted.

The literature often presents conflicting definitions for bioconcentration, bioaccumulation and biomagnification. Often, these words are used interchangeably. For the purpose of this report, uptake and concentration of contaminants by an organism from the ambient environment or food source to a tissue level which is higher than normally expected is referred to as bioconcentration (EPA, 1989a; Lyman et al., 1982; Van Hook, 1978). Bioaccumulation refers to the bioconcentration of a contaminant in an organism to a level greater than that present in the ambient environment or food source (Lyman et al., 1982). Contaminants which bioconcentrate or bioaccumulate in the tissues of aquatic organisms can accumulate to levels that are harmful to the consumers of these organisms, or to the organisms themselves (Lyman et al., 1982). Biomagnification refers to the increase in contaminant levels in organisms with increasing trophic levels.

Prior to this study, the Environmental Assessment Report noted that in addition to the potential impacts to aquatic life indicated by the exceedance of water quality standards/guidelines, the potential exists for bioconcentration of contaminants in the tissues of aquatic plants and animals. The aquatic bioconcentration factors (BCF_{aq}) for aquatic organisms (usually fish) were obtained from the literature and the resulting equilibrium concentrations in fish were based upon the geometric mean contaminant concentrations detected in the marsh surface water. It must be noted that although it may be possible for fish to inhabit ponded water habitats at the site, the RI Report noted that fish were not observed in the marsh area adjacent to the Tar Pit. Therefore, as indicated in the Preliminary Baseline Health Risk Assessment, estimation of contaminant bioconcentration in fish inhabiting the marsh depicts a hypothetical situation.

It should be further noted that the BCF_{aq}'s and predicted equilibrium concentrations in fish developed in the Environmental Assessment Report indicate that many of the contaminants detected in the surface water of the marsh area may bioaccumulate in organisms inhabiting the marsh. Specifically, silver (6.47 mg/kg), and zinc (1.77 mg/kg) were predicted to bioaccumulate to the highest concentrations (i.e., 1 mg/kg) in the tissues of fish inhabiting the marsh area. However, as noted earlier, BCF_{aq}'s are somewhat situation- and species-specific.

The bioaccumulation test results of the Biological Study Program using the test organisms fathead minnow and crayfish are presented on Tables 4.4-1 and 4.4-2. In general, the bioaccumulation results show little or no bioaccumulation when compared to control and pre-test organisms for the majority of metals tested. However, iron and lead were noted to bioaccumulate in crayfish and iron, lead and zinc in fathead minnows over the ten day testing period.

4.4.2 Site Specific Derived Bioaccumulation Factors

Several approaches that have been used to estimate the bioaccumulation potential of toxic substances are as follows:

- o Empirical measures of bioaccumulation and bioconcentration;
- o Structure-activity relationships;
- o Equilibrium-partitioning models; and
- o Metabolic half-life and detoxification models.

These approaches vary in experimental sophistication and are not necessarily independent of one another. For example, understanding of metabolic half-life and detoxification is useful in determining bioconcentration factors (discussed below), particularly when contaminant concentrations in tissues have not reached equilibrium with exposure concentrations. Also structure-activity relationships are useful in predicting bioconcentration factors for some substances.

Empirical Measures of Bioaccumulation and Bioconcentration

Approaches to measure bioaccumulation of chemical substances may be categorized as simple laboratory two-compartment systems, laboratory multi-compartment systems, or field observations. All three approaches require direct measurement of tissue residues, but vary in the extent to which contaminant concentrations are measured in other environmental media. Tissue residue alone is not a convenient index of bioaccumulation potential because the effects of exposure concentration and metabolic efficiency are not considered. Aquatic organisms can sequester, transform, mobilize and eliminate many chemical contaminants. Effective transformation and elimination are homeostatically controlled, and will lead toward steady-state concentrations of toxic substances in tissues, assuming equilibrium in the partitioning of the substance among aqueous, particulate and biotic phases. The physiological mechanisms necessary to achieve steady-state conditions are described for many substances in simple two-compartment systems and have led to the development of bioconcentration factors (BCFs). Bioconcentration refers to steady-state bioaccumulation of chemicals from a specific medium, usually water (cf., Brungs and Mount 1978; Macek et al. 1979; USEPA 1980; and Taylor 1983).

TABLE 4.4-1

TEN DAY BIOACCUMULATION TEST RESULTS
CRAYFISH (Procambarus clarkii)[1]
UNION ROAD SITE

ANALYTE	DETECTION LEVEL[2]	MEAN PRETEST CONCENTRATION[3]	MEAN CONTROL ORGANISM CONCENTRATION[4]	MEAN EXPERIMENTAL ORGANISM CONCENTRATION[4]
Aluminum	5.0	36.5	135.1	65.05
Antimony	5.0	ND	ND	ND
Arsenic	1.0	ND	ND	ND
Barium	10.0	41.6	96.9	78.5
Beryllium	1.0	ND	ND	ND
Cadmium	1.0	ND	ND	ND
Calcium	1.0	9,363.3	19,185.7	15,985.7
Chromium	5.0	12.9	5.04	ND
Cobalt	5.0	ND	ND	ND
Copper	5.0	72.1	19.7	18.4
Iron	5.0	126.3	244.2	464.7
Lead	5.0	ND	ND	6.6
Magnesium	5.0	290	565.5	483
Manganese	5.0	51.1	95.8	65.2
Mercury	0.1	ND	ND	ND
Nickel	5.0	7.6	ND	ND
Potassium	5.0	1,540	2,111.4	1,817.1
Selenium	1.0	ND	ND	ND
Silver	5.0	ND	ND	ND
Sodium	5.0	1,390	1,817.1	1,662.8
Thallium	5.0	ND	ND	ND
Vanadium	1.0	ND	ND	ND
Zinc	5.0	11.5	34.3	19.8

[1]All results in mg/kg dry weight basis

[2]All detection levels are less-than values

[3]Based upon a three sample set

[4]Based upon a seven sample set

TABLE 4.4-2

TEN DAY BIOACCUMULATION TEST RESULTS
FLATHEAD MINNOW (Pimephales promelias)[1]
UNION ROAD SITE

ANALYTE	DETECTION LEVEL[2]	MEAN PRETEST CONCENTRATION[3]	MEAN CONTROL ORGANISM CONCENTRATION[4]	MEAN EXPERIMENTAL ORGANISM CONCENTRATION[4]
Aluminum	5.0	ND	47.1	40.8
Antimony	5.0	ND	ND	ND
Arsenic	1.0	ND	ND	ND
Barium	10.0	ND	ND	ND
Beryllium	1.0	ND	ND	ND
Cadmium	1.0	ND	ND	ND
Calcium	1.0	7,376.6	7,005.7	6,908.5
Chromium	5.0	38.2	30.7	12.3
Cobalt	5.0	ND	ND	ND
Copper	5.0	178.3	133.2	172.2
Iron	5.0	163.6	193.5	217.5
Lead	5.0	ND	ND	5.2
Magnesium	5.0	307.3	308.2	297.1
Manganese	5.0	5.1	7.4	5.2
Mercury	0.1	0.14	ND	ND
Nickel	5.0	24.4	21.6	8.2
Potassium	5.0	2,503.3	2,421.4	2,540
Selenium	1.0	ND	ND	ND
Silver	5.0	ND	ND	ND
Sodium	5.0	1,133.3	965.8	1,030.4
Thallium	5.0	ND	ND	ND
Vanadium	1.0	ND	ND	ND
Zinc	5.0	36.2	36.5	44.4

[1] All results in mg/kg dry weight basis

[2] All detection levels are less-than values

[3] Based upon a three sample set

[4] Based upon a seven sample set

Two-Compartment Systems and Bioconcentration

In two-compartment systems, a single species is exposed to a toxic substance dissolved in water at concentrations less than those that produce a chronic toxic effect. Under such conditions, many substances show first-order uptake and depuration kinetics such that tissue concentrations increase to a maximum over time and remain constant thereafter (i.e., are at steady-state). At steady-state, the relationship between tissue and water concentrations can be expressed according to the following equation (cf., Esser and Moser 1982; Connell and Miller 1984):

and

$$BCF = C_t/C_w = K_1/K_2$$

where:

BCF = bioconcentration factor
K_1 = uptake rate from the surrounding medium
K_2 = depuration rate from exposed organism
C_w = contaminant concentration in water
C_t = tissue contaminant concentration in the exposed organism.

The above equation states that the bioconcentration factor (BCF) can be determined either from the ratio of contaminant concentration in tissue to that in water, or from the ratio of contaminant uptake rate to depuration rate. Determination of BCFs from steady-state tissue and water concentrations is the traditional approach to estimating bioaccumulation potential and was recommended by the USEPA (1980) in development of water quality criteria.

The foremost limitation to this approach is the assumption of steady-state or equilibrium partitioning of contaminants. Because some bioaccumulated substances are not easily transformed or eliminated, their tissue concentrations may increase during exposure without ever reaching steady-state. In the past, the EPA (1980) indicated that BCFs may be calculated from tissue and water residues existing at the end of a 28-day exposure period if steady-state conditions were not met. Although this approach leads to consistent definitions of bioaccumulation potential for problematic substances, enormous variability in the accuracy of steady-state BCFs estimated by this approach may be encountered. In such circumstances, BCFs should be determined by measuring the kinetics of both, uptake and depuration (Veith et al. 1979, 1980; Bishop and Maki

1980; Kosian et al. 1981; Banerjee et al. 1984). However, this approach may prove experimentally difficult where substances equilibrate slowly or where the depuration rate is much smaller than the uptake rate. In the latter case, curvilinear models used in calculations of BCFs cannot be fit with any confidence (Kosian et al. 1981). In addition, depuration may follow second-order rather than first-order kinetics, and causing slight variations in derived bioconcentration factors (Ellgehausen et al. 1980; Esser and Moser 1982). Inconsistency among methods of exposure (e.g., static equilibrium, flow-through equilibrium, kinetic, and pharmocokinetic methods) and calculation of results may also effect accuracy of BCFs. For instance, Kosian et al. (1981) found that numerous methods of measuring BCFs offered reasonable precision (i.e., were reproducible), but that different methods of calculating the final bioconcentration factor produced results differing by as much as a factor of three.

Although field estimated-BCFs present certain technical and interpretive difficulties in comparison with two compartment systems, they nevertheless provide meaningful information regarding bioaccumulation potential of chemical contaminants. In two-compartment experiments, the principal exposure route is through the integument or respiratory surfaces, and not through ingestion of food or contact with sediments.

Field Derived BCFs

In an attempt to describe the BCF for a two compartment system, we have utilized the more traditional approach which determines the BCF from tissue and water concentrations in this case based upon the values from the elutriate sample and laboratory bioaccumulation results. As noted earlier in this section, this approach requires assumptions of steady-state or equilibrium partitioning of contaminants. The measurement of uptake/depuration kinetics is outside the scope of this analysis.

For the present analysis, the individual whole body tissue data obtained for fathead minnows and crayfish was compared individually to each of the separate analyses as a ratio of contaminant concentration in water to tissue contaminant concentration in the exposed organism using the following equation.

$$BCF = C_t/C_w$$

The results are presented in Table 4.4-3 for those samples found to have contaminant levels in exposed organisms greater than the control. For fathead minnows, these constituents are iron, lead and zinc, and for crayfish, iron and lead. As presented in this table, there is a significant range of BCF's calculated from the laboratory data. A comparison of these calculated data is compared to the predicted BCF data presented in the Environmental Assessment Report for the Union Road Site in Table 4.4-4. Comparison to predicted concentration was not presented for iron. For lead, it can be noted that the predicted BCF lies within the midpoint of the calculated BCF from the laboratory data. However, the actual tissue concentration is two orders of magnitude greater than that predicted for an equilibrium concentration in fish tissue.

Similarly, for zinc, the actual calculated BCF is three to four orders of magnitude greater than the predicted value and the actual measured concentration is one order of magnitude greater than that predicted for an equilibrium concentration in fish tissue.

TABLE 4.4-3

FIELD DERIVED BIOCONCENTRATION FACTORS (BCF's) BASED UPON LABORATORY ANIMAL TISSUE CONCENTRATION AND MARSH SEDIMENT ELUTRIATE DATA[1] UNION ROAD SITE

CRAYFISH - Procambarus clarkii

ANALYTE	ELUTRIATE CONCENTRATION	MEAN PRETEST CONCENTRATION[2]	MEAN CONTROL CONCENTRATION[3]	MEAN EXPERIMENTAL CONCENTRATION[3]	BCF RANGE
Iron	5.18	126.3	244.2	464.7	32.4—51.1
Lead	0.02	ND	ND	6.6	0—250

FATHEAD MINNOW - Pimephales promelias

ANALYTE	ELUTRIATE CONCENTRATION	MEAN PRETEST CONCENTRATION[2]	MEAN CONTROL CONCENTRATION[3]	MEAN EXPERIMENTAL CONCENTRATION[3]	BCF RANGE
Iron	5.18	163	193.5	217.5	0—51.7
Lead	0.02	ND	ND	5.2	0—75
Zinc	0.02	36.2	36.5	44.4	265—1770

[1] All data in Mg/kg dry weight

[2] Based on 4 composite samples

[3] Based on 7 composite samples

NOTE: ND = Not Detected

TABLE 4.4-4

COMPARISON OF CALCULATED VERSUS PREDICTED BIOCONCENTRATION FACTORS FOR FISH FROM THE UNION ROAD SITE
UNION ROAD SITE

ANALYTE	BCF_{aq} EPA[1] 1986 l/kg	PREDICTED EQUILIBRIUM CONCENTRATION IN CREEK[1] FISH BCF_{aq}	CALCULATED[2] BCF o/cw RANGE	AVERAGE TISSUE CONCENTRATION[†] LABORATORY TEST
Iron	-	-	32.4—51.1	54.5
Lead	49.0	0.0307	0—75	5.2
Zinc	0.47	0.503	265—1,770	8.2

[†]Data for Fathead Minnow Pimephales promelias

[1]As presented in Table 11 of the Environmental Assessment Document for the Union Road Site prepared by Sadat Associates Inc., 1990

[2]Based upon 7 composite analyses

Section 5

5.0 CONCLUSIONS

5.1 Sources of Uncertainty

There are a number of uncertainties in performing the environmental assessment and predicting the likely ecological impacts of contamination. General sources of uncertainty include:

- Environmental sampling
- Analytical chemistry
- Environmental parameter measurement
- Ecosystem dynamics
- Comparisons with published data
- Complex interactions of the above

The first three sources of uncertainty are common to any sampling and analysis program. The uncertainties are associated with the representativeness of the sampling as well as the analytical capabilities of the instrumentation. For example, the strategy of surficial soil sampling in the Phase I RI was biased, by design, toward areas of visible contamination. This approach yields worst-case values for geometric mean contaminant concentrations, and may not accurately represent the average levels of contamination to which biota at the site are exposed. Similarly, the numbers of samples collected at the site may not accurately characterize average levels of contamination in surface water and soils.

Additional factors, such as seasonal variations in surface water characteristics and stages in the life cycles of exposed organisms, contribute to the uncertainty in the analyses. However, conversely to sediment and soil analyses, the levels of contamination measured in biological tissues collected from the Union Road Site represent many types of short- or long-term conditions. In this regard, biological sampling at a discrete point in time, may reflect the increase of bioaccumulation from low levels of a specific contaminant, or depuration mechanisms on a specific contaminant that many have resulted from elevated contaminant levels which may have been present, but are no longer present as the source of the contamination has been removed or otherwise prevented from interaction with the environment. This interaction of contaminants at the site and biological uptake is directly resultant from erosional features of the site, storm events, soil/contaminant complexing and isolation, physical/chemical characteristics of the

particular contaminant as well as biological processes such as life cycle, age, trophic interactions of the specific biota, physical proximity of the biota to the material, migratory patterns and growth process partitioning.

Comparison of surface water contamination with USEPA Ambient Water Quality Criteria and NYSDEC Water Quality Standards/Guidelines to predict toxicity in aquatic species yields another source of uncertainty. Data from published aquatic toxicity studies are used by EPA to calculate Ambient Water Quality Criteria (EPA, 1986a). Many of these standards are adopted by NYSDEC as water quality standards/guidelines. Uncertainty lies in the derivation of the toxicty values in the literature as well as in the review and criteria calculation procedures used by EPA and NYSDEC.

Uncertainty also lies in the calculation of plant and animal tissue concentrations at the Union Road Site from bioconcentration factors (BCFs) obtained from the literature. The BCF is the ratio of contaminant concentration in water or soil (Lyman et al., 1982). BCFs are high site- and species-specific (EPA, 1988). Therefore, the most accurate method of determining the degree of bioconcentration in a given species is site-specific bioconcentration/bioaccumulation testing.

The BCFs presented in the Environmental Assessment Report were obtained from the literature and are either estimated from chemical/physical properties or obtained from laboratory or field studies. Lyman et al. (1982) found that laboratory data indicate that aquatic BCFs calculated by standard acceptable methods may be assumed to be accurate within one order of magnitude. However, the applicability of BCFs from the literature to the specific conditions at the Union Road Site is a source of uncertainty. It must also be noted that the tissue concentrations calculated for biota at the site are intended to illustrate the potential for bioconcentration and bioaccumulation of contaminants, and are not meant to represent actual levels of contaminants present in the plants and animals at the site.

Further uncertainty lies in the nature of the exposures in the studies reviewed by EPA in development of the Ambient Water Quality Criteria and in the bioconcentration studies as opposed to the nature of the exposure to biota at the Union Road Site. Toxicity studies are generally conducted for exposure to a single compound of concern. However, chemical toxicity can be affected by the presence of other chemicals. The toxicity of a chemical may be

intensified (synergism) or decreased (antagonism) in the presence of another chemical, or the individual chemicals may retain their individual toxic mechanisms (additivity). Similarly, the uptake of a contaminant may be accelerated or inhibited in the presence of other chemicals. Toxicity and BCF values, generally, do not account for these types of interactions. Therefore, in lieu of the multiple-chemical exposures to biota at the Union Road Site, toxic effects to these species may be more or less severe than predicted. Similarly, the bioconcentration and bioaccumulation of contaminants in the flora and fauna at the site may be more or less severe than indicated by the BCFs. However, the actual data suggests that bioconcentration for those organisms is significantly less than the predicted BCF values.

5.2 Conclusions

Contamination of surface water, sediment and soil can result in a variety of effects within an ecosystem. Such effects range from direct mortality to a few susceptible individuals or reduction in breeding success, or large scale mortality, which functions to reduce population size, to changes in the structure and function of the entire ecosystem. Qualitative evaluation of the current levels of contamination at the Union Road Site, as defined by the Phase I and II RI, indicated that adverse effects to the flora and fauna at the site are probable. Effects expected from the contamination at the site include toxicity to individual aquatic plants and animals, and bioconcentration of contaminants within the aquatic and terrestrial food webs.

The contaminant concentrations in biota as evaluated in this Biological Study Program using surface water sediment sampling, and biological and laboratory testing, as well as published bioconcentration factors, suggest the following:

- Contaminant levels for a number of heavy metal compounds suggest the uptake of these materials from the surrounding environments. Overall, the levels reported are towards the lower end of contaminant levels found statewide;
- The lack of aquatic biota within the marsh area suggest that toxicity to these forms is occuring within this area. However, this hypothesis is not borne out by laboratory bioassay testing. The possibility exists that short-term factors such as seasonal effects, sediment disturbances or other physical factors may act to reduce organism survival over some stage of the biota life cycle;
- Bioaccumulation testing shows bioaccumulation occuring for iron and lead in both species tested as well as for zinc in fathead minnows;

- Based upon comparisons of predicted versus calculated BCF's, and predicted and calculated equilibrium tissue concentrations for lead and zinc, the calculated data shows that both the calculated BCF and actual tissue concentrations recorded in the bioaccumulation tests are higher than predicted for both elements. For tissue concentrations, the test data show the actual values to be one to two orders of magnitude greater than the predicted value. The possibility exists that those organisms tested did not reach equilibrium conditions prior to analysis or that synergistic effects of contaminants within the marsh sediment tested enhanced the uptake of iron, lead and zinc into fish tissue and iron and lead in invertibrate tissue;

- Comparison of the results to previously hypothesized bioconcentration factors and toxicity data presented in the Environmental Assessment Report suggest that, of the compounds predicted to bioaccumulate in fishes, only lead, iron and zinc were found to bioaccumulate when compared to control organisms in laboratory tests;

- The actual toxicity noted using contaminanted marsh sediments and compared to elutriate tests suggests that the marsh sediment has a toxicity less than that hypothesized from literature data alone. Generally, when comparing heavy metal data for the elutriate of sediment used in the bioassay test to acute and chronic levels, the actual contaminant concentration appears to be at least one order of magnitude lower than the literature identified acute/chronic values. Based upon the study described herein, these literature derived assessments appear to be overly conservative for estimates of the toxic fate of heavy metal materials from the contaminated marsh area of the site;

- As testing for organic contaminants was not part of the present Biological Study Program, no conclusions can be drawn for the environmental effect and fate of these materials to Union Road site biota; and

- Overall, the heavy metal contaminants in the sediments appear to be organically or inorganically complexed with a resultant decrease in solubility into overlying waters. During the Remedial Investigation, EP Toxicity analysis for lead on selected marsh sediment samples was performed, including the three samples with the highest concentrations of total lead (28,300, 25,400 and 20,100 mg/kg), resulted in very low levels of lead leachate (0.01, 0.01 and 0.98 mg/l, respectively). Although based on the correlation of total lead to EP Toxicity results as discussed in Section 5.2 of the RI/FS report, concentrations of total lead over 3,000 mg/kg would have been expected to exceed the limits of 5.0 ug/l to characterize the marsh sediment as a hazardous waste, apparently because of the high organic content of the sediment or the presence of chelating agents, the lead is tightly bound and does not readily leach from the sediment.

As discussed in the RI Report, the presence of chelating molecules form rings in which metal ions are held (i.e., in the case of the marsh, most likely by sulfur resulting from the presence of hydrogen sulfide). Bound by chelating sediment agents, the metal ions are not free to form salts and, therefore, are not as leachable as they would be otherwise. However, these conditions may change if the sediments were disturbed, and lead (as well as other metals) could be released/made available to the downstream environment for uptake into biological tissue.

Although the metals do not appear to leach readily from the marsh sediment, the high concentrations of total lead, as well as the high levels of petroleum hydrocarbons and elevated levels of other organic and inorganic contaminants such as antimony and copper, characterize the marsh sediments as a concern.

Section 6

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Appendix A

TOTAL ANALYTICAL SERVICES FOR A SAFE ENVIRONMENT
nytest environmental inc.

October 10, 1990

Dvirka & Bartilucci
6800 Jericho Turnpike
Syosset, N.Y. 11791

Attention: Mr. Ed. Santoro

Nytest is pleased to submit our Project No. 9017236
Log in No. 5686, 5762 on your sample (s) received: 8/17/90, 8/27/90

Test sample (s) associated with this project will be retained for a period of thirty (30) days, unless otherwise instructed.

My staff is available to answer any questions concerning our report and we look forward to serving your future analytical needs.

Very truly yours,

Nytest Environmental Inc.

Remo Gigante

Remo Gigante
Exec. VP

RG: gd
Enc.

box 1518 □ 60 seaview blvd., port washington, ny 11050 □ (516) 625-5500

TOTAL ANALYTICAL SERVICES FOR A SAFE ENVIRONMENT

nytest environmental inc.

Project No.: 9017236
Log in No. : 5686, 5762
P.O. No. : Pending
Date :September 28, 1990

ANALYTICAL DATA REPORT
PACKAGE FOR

Dvirka & Bartilucci

6800 Jericho Turnpike

Syosset, NY 11791

ATTN: Ed Santoro
REF: Union Road, Project No.935

SAMPLE IDENTIFICATION	LABORATORY NUMBER	SAMPLE MATRIX

SEE NEXT PAGE

REPORT PREPARED BY:
PARAG K. SHAH, Ph. D.
ORGANIC LAB. MANAGER

DOUGLAS SHEELEY
LABORATORY DIRECTOR

pd

WE CERTIFY THAT THIS REPORT IS A TRUE REPORT OF RESULTS OBTAINED FROM OUR TESTS OF THIS MATERIAL.

RESPECTFULLY SUBMITTED,
NYTEST ENVIRONMENTAL INC.

REMO GIGANTE
EXECUTIVE V.P.

box 1518 □ 60 seaview blvd., port washington, ny 11050 □ (516) 625-5500

nytest environmental inc.

Table of Contents

Log in No.: 5686, 5762

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CHAIN OF CUSTODY RECORD

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SHIP TO: Nytest Environmental Inc.
60 Seaview Blvd.
Port Washington, NY 11050
(516) 625-5500
Attn. MIKE BRENNAN

REPORT TO: Client Name DVIRKA + BARTILUCCI
Address 6800 JERICHO TURNPIKE
SYOSSET, N.Y. 11791
Phone (516) 364 9892
Attn. ED SANTORO

Project No. 935	Project Name Union Road	Date Shipped 8/16/90	Carrier Federal ERP
Sampler (Signature)	Analytical Protocol 10d. BIOASSAY / TISSUE METALS	Air Bill No.	Cooler No. NEI 002

Sample I.D.	Date Sampled	Time	Sample Description	No. Of Containers	ANALYSIS REQUESTED
URMASE1	8/14	1800	MARSH Sediment	5	10 day Solid Phase BioAssay / BIOACCUM.
URMATE1	8/15	1100	Tissue Samples	1	TCL METALS
URMATE2	8/15	11:15	Tissue Samples	1	TCL METALS
URSBCAQ2	8/15	1615	Tissue Samples	1	TCL METALS
URSBCAQ4	8/15	1615	Tissue Samples	1	TCL METALS.
URSBCAQ3	8/15	1615	Tissue Samples	1	TCL METALS
URSBCTE1	8/15	1615	Tissue Samples	1	TCL METALS.
URSBCAQ6	8/15	1645	Tissue Samples	1	TCL METALS.
URSBCAQ1	8/15	1645	Tissue Samples	1	TCL METALS.
URSBCAQ7	8/15	1645	Tissue Samples	1	TCL METALS.
URSBCAQ8	8/15	1630	Tissue Samples	1	TCL METALS
URSBCAQ5	8/15	1630	Tissue Samples	1	TCL METALS

Relinquished by (Signature)	Date	Time	Rec'd. By (Signature)	Date	Time
Print Name ED SANTORO	8/16	5:00	Print Name		
Relinquished by (Signature)	Date	Time	Rec'd. by (Signature)	Date	Time
Print Name			Print Name		
Relinquished by (Signature)	Date	Time	Received for Laboratory by (Signature)	Date	Time
Print Name			Print Name Robert Fletcher	8/17	500

Special Instructions/Comments HANDLE SAMPLE JARS WITH GLOVES

0001

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CHAIN OF CUSTODY RECORD

SHIP TO: Nytest Environmental Inc.
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Port Washington, NY 11050
(516) 625-5500
Attn. MIKE BRENNAN

REPORT TO: Client Name QUIRK & BARTUCCI
Address 6800 JERICHO TURNPIKE
SYOSSET, NY. 11791
Phone (516) 364-9892
Attn. ED SANTORO

Project No. 935	Project Name UNION ROAD	Date Shipped 8/16/90	Carrier FEDERAL EXP.
Sampler: (Signature)	Analytical Protocol 100 BIOASSAY / TISSUE ANALYSES	Air Bill No.	Cooler No. NEI 002

Sample I.D.	Date/Time Sampled		Sample Description	No. Of Con-tainers	ANALYSIS REQUESTED
URDLCAQ1	8/15	1500	TISSUE SAMPLES	1	TCL METALS.
URDLCAQ2	8/15	1500	TISSUE SAMPLES	1	TCL METALS.
URDLCAQ5	8/15	1520	TISSUE SAMPLES	1	TCL METALS
URDLCAQ3	8/15	1525	TISSUE SAMPLES	1	TCL METALS.
URDLCAQ4	8/15	1540	TISSUE SAMPLES	1	TCL METALS.
URDLCAQ6	8/15	1545	TISSUE SAMPLES	1	TCL METALS.
URDLCTE1	8/15	1600	TISSUE SAMPLES	1	TCL METALS.
URUPAQ2	8/15	12:30	TISSUE SAMPLES	1	TCL METALS
URUPAQ1	8/15	12:30	TISSUE SAMPLES	1	TCL METALS.
URDLCTE2	8/16	10:30	TISSUE SAMPLES	1	TCL METALS
URDLCTE3	8/16	10:30	TISSUE SAMPLES	1	TCL METALS

Relinquished by (Signature) / Print Name	Date / Time	Rec'd. By (Signature) / Print Name	Date / Time
	8/16 5:00		
Relinquished by (Signature) / Print Name	Date / Time	Rec'd. by (Signature) / Print Name	Date / Time
Relinquished by (Signature) / Print Name	Date / Time	Received for Laboratory by (Signature) / Print Name: Robert Fletcher	Date / Time 8/17 8:00

Special Instructions/Comments HANDLE SAMPLE JARS WITH GLOVES.

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Page 1 of 1

SHIP TO: Nytest Environmental Inc.
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Attn. MIKE BRENNAN

[redacted] T TO: Client Name DVIRKA + BARTILUCCI
Address 6800 JERICHO TURNPIKE
SYOSSET NY.
Phone 516 364-9880
Attn. Ed SANTORO

Project No. 935	Project Name Union Road	Date Shipped 8/16/90	Carrier Fed EXP
Sampler: (Signature)	Analytical Protocol USACOE/USEPA BIOASSAY	Air Bill No.	Cooler No.

Sample I.D.	Date/Time Sampled		Sample Description	No. Of Con-tainers	ANALYSIS REQUESTED
URMASO1	8/14/90	1800	MARSH Sediment	5	10-DAY Solid Phase BIOASSAY

Relinquished by (Signature)	Date / Time	Rec'd. By (Signature)	Date / Time
Print Name Ed SANTORO	8/14/90 5:00	Print Name	
Relinquished by (Signature)	Date / Time	Rec'd. by (Signature)	Date / Time
Print Name		Print Name	
Relinquished by (Signature)	Date / Time	Received for Laboratory by (Signature) Robert Fletcher	Date / Time 8/17 500
Print Name		Print Name	

Special Instructions/Comments

0003

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CHAIN OF CUSTODY RECORD

Page 1 of 1

SHIP TO: Nytest Environmental Inc.
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Attn. MIKE BRENNAN

REPORT TO: Client Name DIVIKA & BARTILUCCI
Address 6800 JERICHO TURNPIKE
SYOSSET, NY. 11797
Phone (516) 364 9892
Attn. ED SANTORO

Project No.	Project Name	Date Shipped	Carrier
935	Union Road	8/16/90	Fed EXP
Sampler: (Signature)	Analytical Protocol	Air Bill No.	Cooler No.
	USACOE/USEPA BIOASSAY		

Sample I.D.	Date/Time Sampled		Sample Description	No. Of Containers	ANALYSIS REQUESTED
ULR'MASE1	8/14/90	1800	MARSH Sediment	5	10 Day Solid Phase BIOASSAY

Relinquished by (Signature)	Date / Time	Rec'd. By (Signature)	Date / Time
Print Name ED SANTORO	8/16/90 5:00	Print Name	
Relinquished by (Signature)	Date / Time	Rec'd. by (Signature)	Date / Time
Print Name		Print Name	
Relinquished by (Signature)	Date / Time	Received for Laboratory by (Signature)	Date / Time
Print Name		Print Name Robert Fletcher	8/17 500

Special Instructions/Comments HANDLE Sample Jars With Gloves

0004

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Laboratory Chronicle

Log In No.: 5686, 5762

Client Name: Dvirka & Bartilucci
Date Received: 8/17/90, 8/27/90
Sample ID: As per cover page

Organics Extraction:

1. Acids
2. Base/Neutrals
3. Pesticides/PCBs
4. Dioxin

Analysis:

1. Volatiles
2. Acids
3. Base/Neutrals
4. Pesticides/PCBs
5. Dioxin

Section Supervisor
Review & Approval

Inorganics:

9/22/90, 9/25/90

1. Metals
2. Cyanides
3. Phenols

Other Analysis:

Section Supervisor
Review & Approval

Quality Control Supervisor
Review & Approval

If fractions are re-extracted and re-analyzed include dates for both.

0006

NON-CONFORMANCE SUMMARY
(Case Narrative)

Log In No: 5686, 5762

Samples were analyzed as per required protocols, no problems were encountered.

METHODOLOGY SUMMARY

AQUEOUS METHODOLOGIES:	REF 1	REF 2	REF 3
BNA, Pesticides/PCB's Extraction		3510	
AA/ICP Sample Preparation	200.7		
Furnace Sample Preparation	200.0		
Mercury Sample Preparation	245.1		
Hexavalent Chromium Sample Preparation	218.5		
Clean-Up		3610/3640	
Organochlorine Pesticides and PCB's by Gas Chromatography			608
Herbicides by Gas Chromatography			362
Purgeable Organics by GC/MS			624
Base/Neutral, Acids by GC/MS			625
2,3,7,8-TCDD by GC/MS			613/625
BTEX			602

NON-AQUEOUS METHODOLOGIES:	
BNA, Pesticides/PCB's Extraction	3550
AA/ICP Sample Preparation	3050
Furnace Sample Preparation	3020/3030/3050
Mercury Sample Preparation	7471
Clean-Up	3610/3640

Gas Chromatography/Mass Spectrometry:	
Purgeable Organics	8240
Base/Neutral and Acid Extractables	8270
Organophosphorous Pesticides	8140
Organochlorine Pesticides and PCB's by Gas Chromatography	8080
BTEX	8020

METHODOLOGY SUMMARY

ADDITIONAL INORGANIC PARAMETERS:	REFERENCE 1	REFERENCE 2
Bromide	320.1	
Color	110.2	
Conductance	120.1	
Conductance		9050
Odor	140.1	
pH	150.1	
pH		9040
TDS	160.2	
TSS	160.2	
TS	160.3	
Hardness	130.1	
Temperature	170.1	
Turbidity	180.1	
Acidity	305.1	
Alkalinity	310.1	
Ammonia	350.2/350.3	
Chloride	325.3	
Chloride		9252
Residual Chlorine	330.2	
COD	410.3/405.1	
Cyanide	335.3	
Oil and Grease	413.1/413.2	
Oil and Grease		9070
Fluoride	340.2	
TKN	351.2	
NO2/NO3	353.2	
D.O.	360.2	
Petroleum Hydrocarbons (Reference 4)	418.1	
Phenol	420.2	
Phosphorous	365.1	
Silica	370.1	
Sulfate	375.2/375.4	
Sulfide	376.1	
Surfactants	425.1	
TOC	415.1	

MISCELLANEOUS ANALYSIS:	
Extraction Procedure Toxicity	1310
Ignitability	1010
Corrosivity	1110
Reactivity	Chapter 8.3
Toxicity Characteristic Leaching Procedure (TCLP)	(Ref. 5)

METHODOLOGY SUMMARY

INDUCTIVELY COUPLED PLASMA (ICP):	REFERENCE 1	REFERENCE 2
Aluminum	200.7	6010
Antimony	200.7	6010
Barium	200.7	6010
Beryllium	200.7	6010
Cadmium	200.7	6010
Calcium	200.7	6010
Chromium	200.7	6010
Cobalt	200.7	6010
Copper	200.7	6010
Iron	200.7	6010
Lead	200.7	6010
Magnesium	200.7	6010
Manganese	200.7	6010
Molybdenum	200.7	6010
Nickel	200.7	6010
Potassium	200.7	6010
Silver	200.7	6010
Sodium	200.7	6010
Tin	200.7	6010
Titanium	200.7	6010
Vanadium	200.7	6010
Zinc	200.7	6010

FURNACE AA:		
Antimony	204.1	7041
Arsenic	206.2	7060
Lead	239.2	7421
Selenium	270.2	7740
Thallium	279.2	7841
Tin	282.2	
Vanadium	286.2	7911
Mercury	245.1	7470

METHODOLOGY SUMMARY

REFERENCES:

(1) USEPA-600/4-79-020, Methods for Chemical Analysis of Water and Waste
(2) USEPA SW 846, Test Methods for Evaluating Solid Waste, Third Edition
(3) Federal Register 40 CFR Part 136, Vol. 49, No. 209 Test Parameters for the Analysis of Pollutants
(4) as modified by NJDEP-BISE (for non-aqueous samples)
(5) Federal Register Vol. 51, No. 216 Friday, 11/7/86, pp. 40643-40652

DATA REPORTING QUALIFIERS

U Indicates compound was analyzed for but not detected. Report the minimum detection limit for the sample with the U (e.g. 10U) based on necessary concentration dilution actions. (This is not necessarily the instrument detection limit.) The footnote should read U-Compound was analyzed for but not detected. The number is the minimum attainable detected limit for the sample.

J Indicates an estimated value. This flag is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed or when the mass spectral data indicates the presence of a compound that meets the identification criteria but the result is less than the specified detection limit but greater than zero (e.g.: If limit of detection is 10 ug/l and a concentration of 3 ug/l is calculated, report as 3J.)

B This flag is used when the analyte is found in the blank as well as a sample. It indicates possible/probable blank contamination and warns the data user to take appropriate action.

T This flag indentifies all targeted compounds that were found above the method detection limits.

NA This flag indicates that the data is not applicable

Note: Data on soil samples expressed on a dry weight basis.

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Log In No: 5686

Sample Identification and Results

Sample No: URMATE1
Lab Sample ID No: 5686002

Results in mg/kg (dry wt. basis):	Found
TCL Metals	
Aluminum	697
Antimony	< 5.0
Arsenic	1.1
Barium	< 10.0
Beryllium	< 1.0
Cadmium	3.0
Calcium	844
Chromium	25.6
Cobalt	< 5.0
Copper	5.4
Iron	1429
Lead	9.7
Magnesium	282
Manganese	24.2
Mercury	.25
Nickel	21.2
Potassium	1528
Selenium	4.1
Silver	< 5.0
Sodium	620
Thallium	< 10.0
Vanadium	< 1.0
Zinc	97.5

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Log In No: 5686

Sample Identification and Results

Sample No: URMATE2
Lab Sample ID No: 5686003

Results in mg/kg (dry wt. basis):	Found
TCL Metals	
Aluminum	1117
Antimony	< 5.0
Arsenic	1.5
Barium	< 10.0
Beryllium	< 1.0
Cadmium	3.6
Calcium	988
Chromium	10.2
Cobalt	< 5.0
Copper	5.5
Iron	1945
Lead	23.8
Magnesium	364
Manganese	34.0
Mercury	.318
Nickel	8.9
Potassium	1755
Selenium	4.5
Silver	< 5.0
Sodium	642.4
Thallium	< 10.0
Vanadium	< 1.0
Zinc	113

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Log In No: 5686

Sample Identification and Results

Sample No: URSBCAQ2
Lab Sample ID No: 5686004

Results in mg/kg (dry wt. basis):	Found
TCL Metals	
Aluminum	152
Antimony	< 5.0
Arsenic	< 1.0
Barium	< 10.0
Beryllium	< 1.0
Cadmium	< 1.0
Calcium	7927
Chromium	31.0
Cobalt	< 5.0
Copper	< 5.0
Iron	368
Lead	< 5.0
Magnesium	371
Manganese	10.5
Mercury	.25
Nickel	23.8
Potassium	3210
Selenium	< 1.0
Silver	< 5.0
Sodium	932
Thallium	< 10.0
Vanadium	< 1.0
Zinc	97.0

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Log In No: 5686

Sample Identification and Results

Sample No: URSBCAQ4
Lab Sample ID No: 5686005

Results in mg/kg (dry wt. basis):	Found
TCL Metals	
Aluminum	45.4
Antimony	< 5.0
Arsenic	< 1.0
Barium	< 10.0
Beryllium	< 1.0
Cadmium	< 1.0
Calcium	11670
Chromium	< 5.0
Cobalt	< 5.0
Copper	< 5.0
Iron	91.0
Lead	< 5.0
Magnesium	4187
Manganese	7.4
Mercury	1.0
Nickel	< 5.0
Potassium	3127
Selenium	< 1.0
Silver	< 5.0
Sodium	757
Thallium	< 10.0
Vanadium	< 1.0
Zinc	55.1

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Log In No: 5686

Sample Identification and Results

Sample No: URSBCAQ3
Lab Sample ID No: 5686006

Results in mg/kg (dry wt. basis):	Found
TCL Metals	
Aluminum	34.6
Antimony	< 5.0
Arsenic	< 1.0
Barium	< 10.0
Beryllium	< 1.0
Cadmium	< 1.0
Calcium	10180
Chromium	76.4
Cobalt	< 5.0
Copper	10.2
Iron	354.0
Lead	< 5.0
Magnesium	412
Manganese	9.6
Mercury	< 0.1
Nickel	53.0
Potassium	3888
Selenium	< 1.0
Silver	< 5.0
Sodium	931
Thallium	< 10.0
Vanadium	< 1.0
Zinc	38.3

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Log In No: 5686

Sample Identification and Results

Sample No: URSBCTE1
Lab Sample ID No: 5686007

Results in mg/kg (dry wt. basis):	Found
TCL Metals	
Aluminum	139
Antimony	< 5.0
Arsenic	< 1.0
Barium	< 10.0
Beryllium	< 1.0
Cadmium	< 1.0
Calcium	5248
Chromium	25.4
Cobalt	< 5.0
Copper	186
Iron	305
Lead	< 5.0
Magnesium	280
Manganese	9.1
Mercury	< 0.1
Nickel	16.6
Potassium	2965
Selenium	< 1.0
Silver	< 5.0
Sodium	1047
Thallium	< 10.0
Vanadium	< 1.0
Zinc	44.6

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Log In No: 5686

Sample Identification and Results

Sample No: URSBCAQ6
Lab Sample ID No: 5686008

Results in mg/kg (dry wt. basis):	Found
TCL Metals	
Aluminum	51.4
Antimony	< 5.0
Arsenic	< 1.0
Barium	< 10.0
Beryllium	< 1.0
Cadmium	< 1.0
Calcium	8632
Chromium	6.2
Cobalt	< 5.0
Copper	61.4
Iron	103
Lead	< 5.0
Magnesium	356.5
Manganese	5.4
Mercury	< 0.1
Nickel	6.1
Potassium	3027
Selenium	< 1.0
Silver	< 5.0
Sodium	640
Thallium	< 10.0
Vanadium	< 1.0
Zinc	60

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Log In No: 5686

Sample Identification and Results

Sample No: URSBCAQ1
Lab Sample ID No: 5686009

Results in mg/kg (dry wt. basis):	Found
TCL Metals	
Aluminum	52.4
Antimony	< 5.0
Arsenic	< 1.0
Barium	< 10.0
Beryllium	< 1.0
Cadmium	< 1.0
Calcium	10430
Chromium	46.1
Cobalt	< 5.0
Copper	13.6
Iron	118.0
Lead	< 5.0
Magnesium	369
Manganese	11.6
Mercury	< 0.1
Nickel	< 5.0
Potassium	3302
Selenium	< 1.0
Silver	< 5.0
Sodium	788
Thallium	< 10.0
Vanadium	< 1.0
Zinc	29.1

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Log In No: 5686

Sample Identification and Results

Sample No: URSBCAQ7
Lab Sample ID No: 5686010

Results in mg/kg (dry wt. basis):	Found
TCL Metals	
Aluminum	21.3
Antimony	< 5.0
Arsenic	< 1.0
Barium	< 10.0
Beryllium	< 1.0
Cadmium	< 1.0
Calcium	6612
Chromium	74.0
Cobalt	< 5.0
Copper	97.1
Iron	70.6
Lead	< 5.0
Magnesium	354
Manganese	< 5.0
Mercury	< 0.1
Nickel	< 5.0
Potassium	3240
Selenium	< 1.0
Silver	< 5.0
Sodium	654
Thallium	< 10.0
Vanadium	< 1.0
Zinc	50.1

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Log In No: 5686

Sample Identification and Results

Sample No: URSBCAQ8
Lab Sample ID No: 5686011

Results in mg/kg (dry wt. basis):	Found
TCL Metals	
Aluminum	194
Antimony	< 5.0
Arsenic	< 1.0
Barium	24.7
Beryllium	< 1.0
Cadmium	< 1.0
Calcium	20530
Chromium	19.2
Cobalt	< 5.0
Copper	50.0
Iron	336.0
Lead	< 5.0
Magnesium	500
Manganese	53.8
Mercury	< 0.1
Nickel	14.0
Potassium	2201
Selenium	< 1.0
Silver	< 5.0
Sodium	1272.0
Thallium	< 10.0
Vanadium	< 1.0
Zinc	25.3

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Log In No: 5686

Sample Identification and Results

Sample No: URSBCAQ8
Lab Sample ID No: 5686012

Results in mg/kg (dry wt. basis):	Found
TCL Metals	
Aluminum	20.1
Antimony	< 5.0
Arsenic	< 1.0
Barium	< 10.0
Beryllium	< 1.0
Cadmium	< 1.0
Calcium	17620
Chromium	11.7
Cobalt	< 5.0
Copper	36.3
Iron	75.9
Lead	< 5.0
Magnesium	560
Manganese	< 5.0
Mercury	< 0.1
Nickel	8.6
Potassium	3050
Selenium	< 1.0
Silver	< 5.0
Sodium	860
Thallium	< 10.0
Vanadium	< 1.0
Zinc	39.2

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Log In No: 5686

Sample Identification and Results

Sample No: URDLCAQ1
Lab Sample ID No: 5686013

Results in mg/kg (dry wt. basis):	Found
TCL Metals	
Aluminum	313
Antimony	< 5.0
Arsenic	< 1.0
Barium	24.2
Beryllium	< 1.0
Cadmium	< 1.0
Calcium	19310
Chromium	13.6
Cobalt	< 5.0
Copper	89.3
Iron	524.0
Lead	10.5
Magnesium	502
Manganese	34.1
Mercury	< 0.1
Nickel	11.0
Potassium	2362
Selenium	< 1.0
Silver	< 5.0
Sodium	1222
Thallium	< 10.0
Vanadium	< 1.0
Zinc	24.5

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Log In No: 5686

Sample Identification and Results

Sample No: URDLCAQ2
Lab Sample ID No: 5686014

Results in mg/kg (dry wt. basis):	Found
TCL Metals	
Aluminum	87.2
Antimony	< 5.0
Arsenic	< 1.0
Barium	< 10.0
Beryllium	< 1.0
Cadmium	< 1.0
Calcium	11200
Chromium	< 5.0
Cobalt	< 5.0
Copper	28.1
Iron	220
Lead	16.6
Magnesium	498
Manganese	13.8
Mercury	< 0.1
Nickel	< 5.0
Potassium	2820
Selenium	< 1.0
Silver	< 5.0
Sodium	669
Thallium	< 10.0
Vanadium	< 1.0
Zinc	71.4

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Log In No: 5686

Sample Identification and Results

Sample No: URDLCAQ5
Lab Sample ID No: 5686015

Results in mg/kg (dry wt. basis):	Found
TCL Metals	
Aluminum	53.8
Antimony	< 5.0
Arsenic	< 1.0
Barium	< 10.0
Beryllium	< 1.0
Cadmium	< 1.0
Calcium	6450
Chromium	24.9
Cobalt	< 5.0
Copper	7200
Iron	180
Lead	< 5.0
Magnesium	361
Manganese	8.8
Mercury	< 0.1
Nickel	17.1
Potassium	2950
Selenium	< 1.0
Silver	< 5.0
Sodium	714
Thallium	< 10.0
Vanadium	< 1.0
Zinc	52.5

Log In No: 5686

Sample Identification and Results

Sample No: URDLCAQ3
Lab Sample ID No: 5686016

Results in mg/kg (dry wt. basis):	Found
TCL Metals	
Aluminum	94.0
Antimony	< 5.0
Arsenic	< 1.0
Barium	< 10.0
Beryllium	< 1.0
Cadmium	< 1.0
Calcium	6383
Chromium	28.3
Cobalt	< 5.0
Copper	113
Iron	266
Lead	< 5.0
Magnesium	418
Manganese	8.4
Mercury	< 0.1
Nickel	24.9
Potassium	2840
Selenium	< 1.0
Silver	< 5.0
Sodium	812
Thallium	< 10.0
Vanadium	< 1.0
Zinc	53.2

Log In No: 5686

Sample Identification and Results

Sample No: URDLCAQ4
Lab Sample ID No: 5686017

Results in mg/kg (dry wt. basis):	Found
TCL Metals	
Aluminum	< 5.0
Antimony	< 5.0
Arsenic	< 1.0
Barium	< 10.0
Beryllium	< 1.0
Cadmium	< 1.0
Calcium	8423
Chromium	5.5
Cobalt	< 5.0
Copper	19.2
Iron	50.5
Lead	< 5.0
Magnesium	379
Manganese	< 5.0
Mercury	< 0.1
Nickel	< 5.0
Potassium	3020
Selenium	< 1.0
Silver	< 5.0
Sodium	922
Thallium	< 10.0
Vanadium	< 1.0
Zinc	40.7

Log In No: 5686

Sample Identification and Results

Sample No: URDLCAQ6
Lab Sample ID No: 5686018

Results in mg/kg (dry wt. basis):	Found
TCL Metals	
Aluminum	93.3
Antimony	< 5.0
Arsenic	< 1.0
Barium	22.5
Beryllium	< 1.0
Cadmium	< 1.0
Calcium	22660
Chromium	< 5.0
Cobalt	< 5.0
Copper	48.1
Iron	155
Lead	15.9
Magnesium	505
Manganese	< 5.0
Mercury	< 0.1
Nickel	< 5.0
Potassium	2310
Selenium	< 1.0
Silver	< 5.0
Sodium	1733
Thallium	< 10.0
Vanadium	< 1.0
Zinc	25.9

Log In No: 5686

Sample Identification and Results

Sample No: URDLCTE1
Lab Sample ID No: 5686019

Results in mg/kg (dry wt. basis):	Found
TCL Metals	
Aluminum	254
Antimony	< 5.0
Arsenic	< 1.0
Barium	< 10.0
Beryllium	< 1.0
Cadmium	< 1.0
Calcium	10880
Chromium	14.2
Cobalt	< 5.0
Copper	17.5
Iron	< 5.0
Lead	9.2
Magnesium	380
Manganese	17.2
Mercury	< 0.1
Nickel	11.4
Potassium	2202
Selenium	< 1.0
Silver	< 5.0
Sodium	1357
Thallium	< 10.0
Vanadium	< 1.0
Zinc	28.0

Log In No: 5686

Sample Identification and Results

Sample No: URUOAQ2
Lab Sample ID No: 5686020

Results in mg/kg (dry wt. basis):	Found
TCL Metals	
Aluminum	419
Antimony	< 5.0
Arsenic	< 1.0
Barium	52.6
Beryllium	< 1.0
Cadmium	< 1.0
Calcium	24900
Chromium	14.4
Cobalt	< 5.0
Copper	115
Iron	746
Lead	< 5.0
Magnesium	696
Manganese	50.1
Mercury	< 0.1
Nickel	12.6
Potassium	20680
Selenium	< 1.0
Silver	< 5.0
Sodium	1740
Thallium	< 10.0
Vanadium	< 1.0
Zinc	23.8

Log In No: 5686

Sample Identification and Results

Sample No: URUPAQ1
Lab Sample ID No: 5686021

Results in mg/kg (dry wt. basis):	Found
TCL Metals	
Aluminum	2780
Antimony	< 5.0
Arsenic	2.2
Barium	21.6
Beryllium	< 1.0
Cadmium	< 1.0
Calcium	6218
Chromium	12.9
Cobalt	< 5.0
Copper	13.7
Iron	5560
Lead	8.8
Magnesium	2040
Manganese	91.4
Mercury	< 0.1
Nickel	12.6
Potassium	1750
Selenium	< 1.0
Silver	< 5.0
Sodium	98.2
Thallium	< 10.0
Vanadium	6.1
Zinc	36.0

Log In No: 5686

Sample Identification and Results

Sample No: URDLCTE2
Lab Sample ID No: 5686022

Results in mg/kg (dry wt. basis):	Found
TCL Metals	
Aluminum	1630
Antimony	< 5.0
Arsenic	1.1
Barium	< 10.0
Beryllium	< 1.0
Cadmium	1.9
Calcium	3630
Chromium	< 5.0
Cobalt	< 5.0
Copper	65.8
Iron	2900
Lead	< 5.0
Magnesium	1014
Manganese	64.8
Mercury	< 0.1
Nickel	21.8
Potassium	1530
Selenium	4.9
Silver	< 5.0
Sodium	729
Thallium	< 10.0
Vanadium	< 1.0
Zinc	123

Log In No: 5686

Sample Identification and Results

Sample No: URDLCTE3
Lab Sample ID No: 5686023

Results in mg/kg (dry wt. basis):	Found
TCL Metals	
Aluminum	< 5.0
Antimony	< 5.0
Arsenic	1.1
Barium	< 10.0
Beryllium	< 1.0
Cadmium	< 1.0
Calcium	< 1.0
Chromium	< 5.0
Cobalt	< 5.0
Copper	< 5.0
Iron	< 5.0
Lead	< 5.0
Magnesium	< 5.0
Manganese	< 5.0
Mercury	< 0.1
Nickel	< 5.0
Potassium	< 5.0
Selenium	4.1
Silver	< 5.0
Sodium	< 5.0
Thallium	< 10.0
Vanadium	< 1.0
Zinc	< 5.0

Log In No: 5762

Sample Identification and Results

Sample No: ELUT
Lab Sample ID No: 5762001

Results in mg/l:	Found
TCL Metals	
Aluminum	< 0.2
Antimony	< 0.05
Arsenic	< 0.010
Barium	< 0.2
Beryllium	< 0.010
Cadmium	< 0.010
Calcium	63.7
Chromium	< 0.010
Cobalt	< 0.05
Copper	.036
Iron	5.180
Lead	< 0.020
Magnesium	11.43
Manganese	.140
Mercury	< 0.0002
Nickel	< 0.04
Potassium	3.95
Selenium	< 0.010
Silver	< 0.010
Sodium	18.8
Thallium	< 0.05
Vanadium	< 0.05
Zinc	< 0.020

Log In No: 5686, 5762

Sample Identification and Results

Sample No: TBLK1
Lab Sample ID No: TSBLK

Results in mg/kg:	Found
TCL Metals	
Aluminum	< 5.0
Antimony	< 5.0
Arsenic	< 1.0
Barium	< 10.0
Beryllium	< 1.0
Cadmium	< 1.0
Calcium	< 1.0
Chromium	< 5.0
Cobalt	< 5.0
Copper	< 5.0
Iron	< 5.0
Lead	< 5.0
Magnesium	< 5.0
Manganese	< 5.0
Mercury	< 0.1
Nickel	< 5.0
Potassium	< 5.0
Selenium	< 1.0
Silver	< 5.0
Sodium	< 5.0
Thallium	< 10.0
Vanadium	< 1.0
Zinc	< 5.0

Log In No: 5686, 5762

Sample Identification and Results

Sample No: TBLK2
Lab Sample ID No: TWBLK

Results in mg/l:	Found
TCL Metals	
Aluminum	< 0.2
Antimony	< 0.05
Arsenic	< 0.010
Barium	< 0.2
Beryllium	< 0.010
Cadmium	< 0.010
Calcium	< 1.0
Chromium	< 0.010
Cobalt	< 0.05
Copper	< 0.025
Iron	< 0.050
Lead	< 0.020
Magnesium	< 1.0
Manganese	< 0.015
Mercury	< 0.0002
Nickel	< 0.04
Potassium	< 1.0
Selenium	< 0.010
Silver	< 0.010
Sodium	< 1.0
Thallium	< 0.05
Vanadium	< 0.05
Zinc	< 0.020

nytest environmental inc.

QC / QA REPORT

Client: DVIRKA & BARTILUCCI

Log In No.: 5686, 5762

Date Received: 8/17/90

Parameter(s)	Sample Value ppm	Duplicate Sample Value ppm	Percent RPD	Spike Level ppm	Sample Value ppm	Spiked Sample Value ppm	Percent Recovery	Blank mg/l
Silver	< 5.0	< 5.0	NC	.050	< 5.0	.044	88.0	< 0.010
Arsenic	< 1.0	< 1.0	NC	.200	< 1.0	.240	120	< 0.010
Beryllium	< 1.0	< 1.0	NC	.050	< 1.0	.055	110	< 0.010
Cadmium	< 1.0	< 1.0	NC	.050	< 1.0	.047	94.0	< 0.010
Chromium	< 5.0	< 5.0	NC	.200	< 5.0	.271	135.5	< 0.010
Copper	< 5.0	< 5.0	NC	.250	< 5.0	.284	113.6	< 0.025
Mercury	< 0.1	< 0.1	NC	1.0	< 0.1	1.0	100.0	< 0.0002
Nickel	< 5.0	< 5.0	NC	.500	< 5.0	.601	120.2	< 0.040
Lead	< 5.0	< 5.0	NC	.500	< 5.0	.583	116.6	< 0.020
Antimony	< 5.0	< 5.0	NC	.500	< 5.0	.511	102.2	< 0.050
Selenium	< 1.0	< 1.0	NC	.100	< 1.0	.053	53.0	< 0.010
Thallium	< 10.0	< 10.0	NC	5.0	< 10.0	< 10.0	0	< 0.050
Zinc	.551	.550	0.18	.500	.551	1.59	207.8	< 0.020

nytest environmental inc.

QC / QA REPORT

Client: DVIRKA & BARTILUCCI

Log In No.: 5686, 5762

Date Received: 8/17/90

Parameter(s)	Sample Value ppm	Duplicate Sample Value ppm	Percent RPD	Spike Level ppm	Sample Value ppm	Spiked Sample Value ppm	Percent Recovery	Blank mg/l
Silver	< 5.0	< 5.0	NC	.050	< 5.0	.039	78	< 0.010
Arsenic	< 1.0	< 1.0	NC	.200	< 1.0	.240	120	< 0.010
Beryllium	< 1.0	< 1.0	NC	.050	< 1.0	.053	106	< 0.010
Cadmium	< 1.0	< 1.0	NC	.050	< 1.0	.039	78	< 0.010
Chromium	.192	.188	2.11	.200	.192	.372	90	< 0.010
Copper	.500	.284	55.1	.50	.500	.744	97.6	< 0.025
Mercury	<0.0002	<0.0002	NC	0.001	<0.0002	0.001	100.0	< 0.0002
Nickel	.140	.126	10.5	.500	.140	.630	98	< 0.040
Lead	< 5.0	< 5.0	NC	.500	< 5.0	.487	97.4	< 0.020
Antimony	< 5.0	< 5.0	NC	.500	< 5.0	.486	97.2	< 0.050
Selenium	< 1.0	< 5.0	NC	.100	< 1.0	.120	120	< 0.010
Thallium	< 10.0	< 5.0	NC	5.0	< 10.0	< 10.0	0	< 0.050
Zinc	.253	.273	7.6	.500	.253	2.41	431	< 0.020

TOTAL ANALYTICAL SERVICES FOR A SAFE ENVIRONMENT
nytest environmental inc.

November 13, 1990

Dvirka & Bartilucci
6800 Jericho Tpke
Syosset, N.Y. 11791

Attention: Ed Santoro
Subject : NEI Login #'s 5762, 5686

Dear Ed:

With reference to the subject matter, enclosed please find corrected page (s) :

15, 20, 22, 25, 28, 33, Cover Page

We apologize for this inconvenience. If you have any questions, please do not hesitate to contact me.

Very truly yours,

Nytest Environmental Inc.

Remo Gigante

Remo Gigante
Exec. VP

RG:gd
Enc.

Project No.: 9017236
Log in No. : 5686, 5762
P.O. No. : Pending
Date :September 28, 1990
Revised : November 13,1990

ANALYTICAL DATA REPORT
PACKAGE FOR

Dvirka & Bartilucci

6800 Jericho Turnpike

Syosset, NY 11791

ATTN: Ed Santoro
REF: Union Road, Project No.935

SAMPLE IDENTIFICATION	LABORATORY NUMBER	SAMPLE MATRIX

SEE NEXT PAGE

REPORT PREPARED BY:
PARAG K. SHAH, Ph. D.
ORGANIC LAB. MANAGER

DOUGLAS SHEELEY
LABORATORY DIRECTOR

pd

WE CERTIFY THAT THIS REPORT IS A TRUE REPORT OF RESULTS OBTAINED FROM OUR TESTS OF THIS MATERIAL.

RESPECTFULLY SUBMITTED,
NYTEST ENVIRONMENTAL INC.

REMO GIGANTE
EXECUTIVE V.P.

nytest environmental inc

Log In No: 5686

Sample Identification and Results

Sample No: URSBCAQ4
Lab Sample ID No: 5686005

Results in mg/kg (dry wt. basis):	Found
TCL Metals	
Aluminum	45.4
Antimony	< 5.0
Arsenic	< 1.0
Barium	< 10.0
Beryllium	< 1.0
Cadmium	< 1.0
Calcium	11670
Chromium	< 5.0
Cobalt	< 5.0
Copper	< 5.0
Iron	91.0
Lead	< 5.0
Magnesium	418.7
Manganese	7.4
Mercury	1.0
Nickel	< 5.0
Potassium	3127
Selenium	< 1.0
Silver	< 5.0
Sodium	757
Thallium	< 10.0
Vanadium	< 1.0
Zinc	55.1

nytest environmental inc

Log In No: 5686

Sample Identification and Results

Sample No: URSBCAQ7
Lab Sample ID No: 5686010

Results in mg/kg (dry wt. basis):	Found
TCL Metals	
Aluminum	21.3
Antimony	< 5.0
Arsenic	< 1.0
Barium	< 10.0
Beryllium	< 1.0
Cadmium	< 1.0
Calcium	6612
Chromium	7.40
Cobalt	< 5.0
Copper	97.1
Iron	70.6
Lead	< 5.0
Magnesium	354
Manganese	< 5.0
Mercury	< 0.1
Nickel	6.2
Potassium	3240
Selenium	< 1.0
Silver	< 5.0
Sodium	654
Thallium	< 10.0
Vanadium	< 1.0
Zinc	50.1

nytest environmental inc

Log In No: 5686

Sample Identification and Results

Sample No: URSBCAQ5
Lab Sample ID No: 5686012

Results in mg/kg (dry wt. basis):	Found
TCL Metals	
Aluminum	20.1
Antimony	< 5.0
Arsenic	< 1.0
Barium	< 10.0
Beryllium	< 1.0
Cadmium	< 1.0
Calcium	17620
Chromium	11.7
Cobalt	< 5.0
Copper	36.3
Iron	75.9
Lead	< 5.0
Magnesium	560
Manganese	< 5.0
Mercury	< 0.1
Nickel	8.6
Potassium	3050
Selenium	< 1.0
Silver	< 5.0
Sodium	860
Thallium	< 10.0
Vanadium	< 1.0
Zinc	39.2

nytest environmental inc.

Log In No: 5686

Sample Identification and Results

Sample No: URDLCAQ5
Lab Sample ID No: 5686015

Results in mg/kg (dry wt. basis):	Found
TCL Metals	
Aluminum	53.8
Antimony	< 5.0
Arsenic	< 1.0
Barium	< 10.0
Beryllium	< 1.0
Cadmium	< 1.0
Calcium	6450
Chromium	24.9
Cobalt	< 5.0
Copper	720.0
Iron	180
Lead	< 5.0
Magnesium	361
Manganese	8.8
Mercury	< 0.1
Nickel	17.1
Potassium	2950
Selenium	< 1.0
Silver	< 5.0
Sodium	714
Thallium	< 10.0
Vanadium	< 1.0
Zinc	52.5

nytest environmental inc.

Log In No: 5686

Sample Identification and Results

Sample No: URDLCAQ6
Lab Sample ID No: 5686018

Results in mg/kg (dry wt. basis):	Found
TCL Metals	
Aluminum	93.3
Antimony	< 5.0
Arsenic	< 1.0
Barium	22.5
Beryllium	< 1.0
Cadmium	< 1.0
Calcium	22660
Chromium	< 5.0
Cobalt	< 5.0
Copper	48.1
Iron	155
Lead	15.9
Magnesium	50.5
Manganese	< 5.0
Mercury	< 0.1
Nickel	< 5.0
Potassium	2310
Selenium	< 1.0
Silver	< 5.0
Sodium	1733
Thallium	< 10.0
Vanadium	< 1.0
Zinc	25.9

nytest environmental inc

Log In No: 5686

Sample Identification and Results

Sample No: URDLCTE3
Lab Sample ID No: 5686023

Results in mg/kg (dry wt. basis):	Found
TCL Metals	
Aluminum	1600
Antimony	< 5.0
Arsenic	1.1
Barium	11.2
Beryllium	< 1.0
Cadmium	1.7
Calcium	2700
Chromium	29.3
Cobalt	< 5.0
Copper	69.1
Iron	2600
Lead	22.7
Magnesium	878
Manganese	58.9
Mercury	< 0.1
Nickel	19.7
Potassium	1600
Selenium	4.1
Silver	< 5.0
Sodium	6660
Thallium	< 5.0
Vanadium	3.3
Zinc	107

Project No.: 9017236
Log in No. : 5686, 5762
P.O. No. : Pending
Date :September 28, 1990
Revised : November 13,1990

ANALYTICAL DATA REPORT
PACKAGE FOR

Dvirka & Bartilucci

6800 Jericho Turnpike

Syosset, NY 11791

ATTN: Ed Santoro
REF: Union Road, Project No.935

SAMPLE IDENTIFICATION	LABORATORY NUMBER	SAMPLE MATRIX

S E E N E X T P A G E

REPORT PREPARED BY:
PARAG K. SHAH, Ph. D.
ORGANIC LAB. MANAGER

DOUGLAS SHEELEY
LABORATORY DIRECTOR

WE CERTIFY THAT THIS REPORT IS A TRUE REPORT OF RESULTS OBTAINED FROM OUR TESTS OF THIS MATERIAL.

RESPECTFULLY SUBMITTED,
NYTEST ENVIRONMENTAL INC.

REMO GIGANTE
EXECUTIVE V.P.

pd

nytest environmental inc.

Log In No: 5686

Sample Identification and Results

Sample No: URSBCAQ4
Lab Sample ID No: 5686005

Results in mg/kg (dry wt. basis):	Found
TCL Metals	
Aluminum	45.4
Antimony	< 5.0
Arsenic	< 1.0
Barium	< 10.0
Beryllium	< 1.0
Cadmium	< 1.0
Calcium	11670
Chromium	< 5.0
Cobalt	< 5.0
Copper	< 5.0
Iron	91.0
Lead	< 5.0
Magnesium	418.7
Manganese	7.4
Mercury	1.0
Nickel	< 5.0
Potassium	3127
Selenium	< 1.0
Silver	< 5.0
Sodium	757
Thallium	< 10.0
Vanadium	< 1.0
Zinc	55.1

nytest environmental inc

Log In No: 5686

Sample Identification and Results

Sample No: URSBCAQ7
Lab Sample ID No: 5686010

Results in mg/kg (dry wt. basis):	Found
TCL Metals	
Aluminum	21.3
Antimony	< 5.0
Arsenic	< 1.0
Barium	< 10.0
Beryllium	< 1.0
Cadmium	< 1.0
Calcium	6612
Chromium	7.40
Cobalt	< 5.0
Copper	97.1
Iron	70.6
Lead	< 5.0
Magnesium	354
Manganese	< 5.0
Mercury	< 0.1
Nickel	6.2
Potassium	3240
Selenium	< 1.0
Silver	< 5.0
Sodium	654
Thallium	< 10.0
Vanadium	< 1.0
Zinc	50.1

nytest environmental inc.

Log In No: 5686

Sample Identification and Results

Sample No: URSBCAQ5
Lab Sample ID No: 5686012

Results in mg/kg (dry wt. basis):	Found
TCL Metals	
Aluminum	20.1
Antimony	< 5.0
Arsenic	< 1.0
Barium	< 10.0
Beryllium	< 1.0
Cadmium	< 1.0
Calcium	17620
Chromium	11.7
Cobalt	< 5.0
Copper	36.3
Iron	75.9
Lead	< 5.0
Magnesium	560
Manganese	< 5.0
Mercury	< 0.1
Nickel	8.6
Potassium	3050
Selenium	< 1.0
Silver	< 5.0
Sodium	860
Thallium	< 10.0
Vanadium	< 1.0
Zinc	39.2

nytest environmental inc.

Log In No: 5686

Sample Identification and Results

Sample No: URDLCAQ5
Lab Sample ID No: 5686015

Results in mg/kg (dry wt. basis):	Found
TCL Metals	
Aluminum	53.8
Antimony	< 5.0
Arsenic	< 1.0
Barium	< 10.0
Beryllium	< 1.0
Cadmium	< 1.0
Calcium	6450
Chromium	24.9
Cobalt	< 5.0
Copper	720.0
Iron	180
Lead	< 5.0
Magnesium	361
Manganese	8.8
Mercury	< 0.1
Nickel	17.1
Potassium	2950
Selenium	< 1.0
Silver	< 5.0
Sodium	714
Thallium	< 10.0
Vanadium	< 1.0
Zinc	52.5

nytest environmental inc.

Log In No: 5686

Sample Identification and Results

Sample No: URDLCAQ6
Lab Sample ID No: 5686018

Results in mg/kg (dry wt. basis):	Found
TCL Metals	
Aluminum	93.3
Antimony	< 5.0
Arsenic	< 1.0
Barium	22.5
Beryllium	< 1.0
Cadmium	< 1.0
Calcium	22660
Chromium	< 5.0
Cobalt	< 5.0
Copper	48.1
Iron	155
Lead	15.9
Magnesium	50.5
Manganese	< 5.0
Mercury	< 0.1
Nickel	< 5.0
Potassium	2310
Selenium	< 1.0
Silver	< 5.0
Sodium	1733
Thallium	< 10.0
Vanadium	< 1.0
Zinc	25.9

nytest environmental inc.

Log In No: 5686

Sample Identification and Results

Sample No: URDLCTE3
Lab Sample ID No: 5686023

Results in mg/kg (dry wt. basis):	Found
TCL Metals	
Aluminum	1600
Antimony	< 5.0
Arsenic	1.1
Barium	11.2
Beryllium	< 1.0
Cadmium	1.7
Calcium	2700
Chromium	29.3
Cobalt	< 5.0
Copper	69.1
Iron	2600
Lead	22.7
Magnesium	878
Manganese	58.9
Mercury	< 0.1
Nickel	19.7
Potassium	1600
Selenium	4.1
Silver	< 5.0
Sodium	6660
Thallium	< 5.0
Vanadium	3.3
Zinc	107

TOTAL ANALYTICAL SERVICES FOR A SAFE ENVIRONMENT
nytest environmental inc.

December 5, 1990

Dvirka & Bartilucci
6800 Jericho Tpke.
Syosset, N.Y. 11791

Attention: Ed Santoro
Subject : NEI Login #'s 5686/5782, 5902

Dear Mr. Santoro:

Enclosed please find revised Page 28 (Report Login #'s 5686/5782).

With reference to Login #5906, the detection limit for samples FHC-2 and FHC-3A were doubled because only 0.5 grams could be digested.

If you have any questions, please do not hesitate to call me.

Very truly yours,

Nytest Environmental Inc.

Remo Gigante
Exec. VP

RG:gd
Encs.

box 1518 □ 60 seaview blvd., port washington, ny 11050 □ (516) 625-5500

nytest environmental inc

Log In No: 5686

Sample Identification and Results

Sample No: URDLCAQ6
Lab Sample ID No: 5686018

Results in mg/kg (dry wt. basis):	Found
TCL Metals	
Aluminum	93.3
Antimony	< 5.0
Arsenic	< 1.0
Barium	22.5
Beryllium	< 1.0
Cadmium	< 1.0
Calcium	22660
Chromium	< 5.0
Cobalt	< 5.0
Copper	48.1
Iron	155
Lead	15.9
Magnesium	505
Manganese	50.5
Mercury	< 0.1
Nickel	< 5.0
Potassium	2310
Selenium	< 1.0
Silver	< 5.0
Sodium	1733
Thallium	< 10.0
Vanadium	< 1.0
Zinc	25.9

TOTAL ANALYTICAL SERVICES FOR A SAFE ENVIRONMENT
nytest environmental inc.

FAX COVER SHEET

TO: Ed Santoro DATE: 12/13

FAX NO.: _____

NUMBER OF PAGES (INCLUDING COVER SHEET) 2

FROM: Rene Gigante

MESSAGE: enclosed find Metal Detection Limits as per your request 12-10- Ste Jak Gaspar

NOTE: IF YOU DO NOT RECEIVE THE ENTIRE TRANSMISSION, OR NEED PAGES TO BE RESENT DUE TO ILLEGIBILITY, PLEASE CALL US BACK IMMEDIATELY.

FAX (516) 625-1274

box 1518 □ 60 seaview blvd., port washington, ny 11050 □ (516) 625-5500

TCL METALS

METHOD DETECTION LIMITS

	mg/kg
ALUMINUM	< 5.0
ANTIMONY	< 5.0
ARSENIC	< 1.0
BARIUM	< 10
BERYLLIUM	< 1.0
CADMIUM	< 1.0
CALCIUM	< 1.0
CHROMIUM	< 5.0
COBALT	< 5.0
COPPER	< 5.0
IRON	< 5.0
LEAD	< 5.0
MAGNESIUM	< 5.0
MANGANESE	< 5.0
MERCURY	< 0.1
NICKEL	< 5.0
POTASSIUM	< 5.0
SELENIUM	< 1.0
SILVER	< 5.0
SODIUM	< 5.0
THALLIUM	< 10
VANADIUM	< 1.0
ZINC	< 5.0

Appendix B

TOTAL ANALYTICAL SERVICES FOR A SAFE ENVIRONMENT

nytest environmental inc.

Project No.: 9017236
Log in No. : 5906
P.O. No. : Pending
Date :September 28, 1990

ANALYTICAL DATA REPORT
PACKAGE FOR

Dvirka & Bartilucci

6800 Jericho Turnpike

Syosset, NY 11791

ATTN: Ed Santoro
REF: Union Road, Project No.935

SAMPLE IDENTIFICATION	LABORATORY NUMBER	SAMPLE MATRIX

SEE NEXT PAGE

REPORT PREPARED BY:
PARAG K. SHAH, Ph. D.
ORGANIC LAB. MANAGER

DOUGLAS SHEELEY
LABORATORY DIRECTOR

pd

WE CERTIFY THAT THIS REPORT IS A TRUE REPORT OF RESULTS OBTAINED FROM OUR TESTS OF THIS MATERIAL.

RESPECTFULLY SUBMITTED,
NYTEST ENVIRONMENTAL INC.

REMO GIGANTE
EXECUTIVE V.P.

nytest environmental inc.

OBJECTIVE:

This test was designed to provide tissue for determination of bioaccumulation potential from test sediment by two organisms; Procambarus clarkii and Pimephales promelas. The crayfish, P. clarkii is typical of freshwater benthic organisms living in direct contact with the sediment, thus representing a high risk organism if sediments contain hydrophobic compounds. The fathead minnow, P. promelas, is typical of freshwater pelagic organisms, living above the sediments, and thus represents a high risk organism only if sediments contain compounds which are not highly hydrophobic. Both are hardy animals which are not expected to show acute toxicity except to grossly contaminated sediments.

METHODS:

An aliquot of test sample was placed in each of five replicate ten gallon aquaria to give a final depth of approximately 30 mm of substrate. Five control tanks were also prepared using material collected from Spruce Run Reservoir, in Clinton, New Jersey. No contamination was expected in this sediment. An identical scenario was prepared for each species.

Flow through conditions were provided by means of a set of twenty metering pumps, calibrated to deliver six tank turnovers per day. Certified clean well water from Pennsylvania-American Water Co., Yardley, PA was used as a dilution water source. Organisms were fed ad libitum on a diet of crushed Tetra Min flakes. Organisms were exposed fpr ten days.

Temperature, dissolved oxygen, pH, and conductivity were monitored daily in each chamber. Temperature was maintained at 20 +/- 2° C., and dissolved oxygen was maintained at or near saturation using a forced air circulation system.

Organisms were acclimated to dilution water through partial exchanges over 24 hours. Organisms were randomly added to test chambers. The acute effect of the ten day exposure to test sediment was compared to controls using T-tests. Significant differences were limited to a $p \leq 0.05$.

RESULTS:

Number of Surviving Organisms After 10 Day Exposure

		P. clarkii	P. promelas
Control	1.	12	20
	2.	16	
	3.	15	19
	4.	15	20
	5.	16	14
Mean		14.8	18.3*
Test	1.	15	19
	2.	18	20
	3.	15	20
	4.	17	19
	5.	17	19
Mean		16.4	19.4

* n = 4 replicates, see discussion

Ranges of Water Quality In Exposure Chambers of Pimephales promelas

Rep.		Temp(C)	DO (ppm)	Conduct.	pH
Con.	1	19.0-21.0	7.5-8.4	350-375	7.1-8.1
	2	19.0-21.0	7.5-8.4	355-16500*	7.1-8.1
	3	19.0-21.0	7.7-8.5	350-1150*	7.2-8.1
	4	19.0-21.0	7.6-8.5	350-600	7.2-8.1
	5	19.0-21.0	7.5-8.5	350-375	7.2-8.2
Test	1	19.0-20.5	7.2-8.1	350-385	7.4-8.0
	2	19.0-20.5	7.6-8.4	350-380	7.4-8.1
	3	19.0-20.5	7.6-8.5	350-390	7.4-8.1
	4	19.0-21.0	7.5-8.5	355-400	7.5-8.1
	5	19.0-21.0	7.4-8.5	355-390	7.5-8.1

* Fluctuation due to a clean saltwater leak near test system. Explanation in discussion.

Ranges of Water Quality In Exposure Chambers of Procambarus clarkii

Rep.		Temp(C)	DO (ppm)	Conduct.	pH
Con.	1	19.0-21.0	6.4-8.0	340-400	7.1-7.9
	2	19.0-21.0	6.6-8.2	345-400	7.0-7.9
	3	19.0-21.0	6.8-8.2	350-400	7.1-7.9
	4	19.0-21.0	6.4-8.0	330-390	7.1-7.9
	5	19.0-21.0	6.8-8.2	350-390	7.1-7.9
Test	1	19.5-21.0	3.7-7.9	360-450	7.2-7.9
	2	19.0-21.0	5.7-7.7	350-410	7.2-7.9
	3	19.0-21.0	5.8-7.8	360-1150*	7.2-7.9
	4	19.0-21.0	5.8-7.8	360-420	7.3-7.9
	5	19.0-21.0	5.8-8.1	360-420	7.3-7.9

* Fluctuation due to a clean saltwater leak near test system. Explanation in discussion.

DISCUSSION

No significant differences in survival between test and control samples were found for either species tested.

Control animals in fathead chamber two are not representative of all other control fish due to an inadvertent leak of clean saltwater into the exposure chamber. This leak was corrected, but not soon enough to prevent the loss of 65 percent of organisms in that chamber.

Survival of crayfish averaged 74 percent in the control chambers, 82 percent in the test chamber. These results are not significantly different from each other. The low survival was caused by cannibalism of freshly molted organisms by other crayfish. This is not expected to influence the results of the bioaccumulation analysis.

nytest environmental inc.

SOLID PHASE

Acclimation Starting Date: _____ Exposure Starting Date: 8/24/90 Depuration Starting Date: 5:30 pm

LIVE COUNT

		P. clarki						P. promelas					
	Repl	a1	a2	a3	0	10	d1	a1	a2	a3	0	10	d1
Control Sediment	A			20	20	12				20	20	20	
	B			20	20	16				20	20	7	
	C			20	20	15				20	20	19	
	D			20	20	15				20	20	20	
	E			20	20	16				20	20	14	
Test Sed.	A			20	20	15				20	20	19	
	B			20	20	18				20	20	20	
	C			20	20	15				20	20	20	
	D			20	20	17				20	20	19	
	E			20	20	17				20	20	19	
Test Sed.	A												
	B												
	C												
	D												
	E												
	*			✓	✓					✓	✓		
	Initials			SW	SW	JM				SW	SW	JM	

* Check here to indicate "nothing unusual observed" except for any replicates described below

Notes:

24hrs: P. Clarki are less active in test sediment than in control sediment. KF P. promelas - NO observations due to turbidity of ~~water~~ samples. KF.

Day 2: Same as day 1. KF

Day 5: 2 Dead P. promelas removed From Control 5 JO. Removed 1 P. clarki From Fathead Control 5 and placed Back into Cray Fish Test #1. JO

DAY 7: 13 DEAD P. promelas IN CONTROL 2; CONDUCTIVITY OF 17,000 umhos/cm, DUE TO SALTWATER CONTAMINATION FROM →

ANOTHER CHAMBER ON RACK ABOVE TEST. LEAK OF CLEAN SALTWATER DISCOVERED AND REPAIRED, HOWEVER ~~EH?~~ CONTROL 2 CHAMBER INVALIDATED AS OF THIS DATE. SIO

DAY 8: NUO SIO / Surviving P. promelas in Control 2 appear vigorous and healthy SIO %

DAY 9:

DAY 10:

nytest environmental inc.

rganism: P. elank.

·ting Date: 8-24-90 Starting Time: 5:30 pm

Exposure Condition	Replicate	TEMPERATURE										
		0	1	2	3	4	5	6	7	8	9	10
CONTROL SEDIMENT	A.	19.0	19.5	19.5	20.0	20.5	21.0	20.0	19.5	20.5	20.0	20.0
	B.	19.5	20.0	20.0	20.0	20.5	21.0	20.0	19.0	20.5	20.0	19.5
	C.	19.0	19.5	20.0	20.0	20.5	21.0	20.0	19.0	20.5	20.0	19.5
	D.	19.0	19.5	20.0	20.0	20.5	21.0	19.5	19.0	20.0	20.0	19.5
	E.	19.0	19.5	19.5	20.0	20.5	21.0	19.5	19.0	20.0	19.5	19.5
TEST SEDIMENT	A.	19.5	19.5	19.5	20.0	20.5	21.0	20.0	19.5	20.5	20.0	19.5
	B.	19.0	19.5	19.5	20.0	20.5	21.0	19.5	19.0	20.5	20.0	19.5
	C.	19.0	19.5	19.5	20.0	20.5	21.0	19.5	19.0	20.0	20.0	19.5
	D.	19.0	19.5	19.5	20.5	20.5	21.0	20.0	19.0	20.0	20.0	19.5
	E.	19.0	19.5	19.5	20.5	20.5	21.0	20.0	19.0	20.0	20.0	19.5
	Initials		KA	LT	SG	SG			SG	SG	SG	SG

NOTES:

00045

nytest environmental inc.

Organism: P. clarki

arting Date: 8-24-90 Starting Time: 5:30 p

Exposure Condition	Replicate	DISSOLVED OXYGEN										
		0	1	2	3	4	5	6	7	8	9	10
CONTROL SEDIMENT	A.	8.0	7.1	7.3	7.8	7.2	7.1	7.0	7.1	6.4	6.4	7.3
	B.	8.2	6.7	7.0	7.6	7.6	7.1	7.6	7.5	6.6	6.7	7.6
	C.	8.2	7.5	7.9	7.9	7.7	7.6	7.9	7.7	6.8	7.1	7.6
	D.	8.0	6.4	7.1	7.4	7.8	7.0	7.4	8.0	6.6	6.7	7.3
	E.	8.2	7.2	7.6	7.8	6.5	7.1	7.6	7.7	6.8	7.0	7.6
TEST SEDIMENT	A.	6.2	3.7	7.1	7.5	6.7	7.4	7.8	7.9	6.6	7.2	7.8
	B.	7.7	6.6	5.7	6.8	6.3	6.6	6.9	6.9	6.2	6.2	7.5
	C.	7.8	6.6	6.9	7.2	7.0	5.8	6.0	7.3	6.2	6.7	7.4
	D.	7.8	6.1	6.1	7.2	6.6	6.4	6.2	7.5	5.8	6.0	7.4
	E.	8.1	6.4	7.0	7.2	6.5	7.0	6.8	7.6	6.0	5.8	7.3
	Initials	SG	KT	KT	SG	SG	JV	QB	SK	SK	SK	JV

NOTES: 24hrs: Increased air on Test replicate A. KT

00046

nytest environmental inc.

ganism: P. promelas

ting Date: 8-24-90 Starting Time: 5:30 pm

Exposure Condition	Replicate	TEMPERATURE										
		0	1	2	3	4	5	6	7	8	9	10
CONTROL SEDIMENT	A.	19.0	19.5	19.5	20.0	20.5	21.0	19.5	19.5	20.0	19.5	19.5
	B.	19.0	19.5	20.0	20.0	20.5	21.0	19.5	19.5	20.0	19.5	19.5
	C.	19.0	19.5	19.5	20.0	20.5	21.0	19.5	19.0	20.0	19.5	19.5
	D.	19.0	19.5	19.5	20.0	20.5	21.0	19.5	19.0	20.0	19.5	19.5
	E.	19.0	19.5	19.5	20.0	20.5	21.0	19.5	19.0	20.0	19.5	19.5
TEST SEDIMENT	A.	19.0	19.5	19.5	20.0	20.5	20.5	19.5	19.5	20.5	20.0	19.5
	B.	19.0	19.5	19.5	20.0	20.5	20.5	19.5	19.5	20.5	20.0	19.5
	C.	19.0	19.5	19.5	20.0	20.5	20.5	20.0	19.0	20.5	20.0	19.5
	D.	19.0	19.5	20.0	20.5	20.5	21.0	20.0	19.0	20.5	20.0	19.5
	E.	19.0	19.5	20.0	20.5	20.5	21.0	20.0	19.0	20.5	20.0	19.5
	Initials		KT	KT	SF 50	SF 50		GS	SG	SD	SD	SD

NOTES: Day 7 - 1 dead P. promelas removed From Test 5

NYTEST ENVIRONMENTAL INC.

anism: P. clarki

Starting Date: 8/24/90 Starting Time: 5:30 PM

Exposure Condition	Replicate	pH										
		0	1	2	3	4	5	6	7	8	9	10
CONTROL SEDIMENT	A.	7.1	7.5	7.5	7.4	7.5	7.5	7.8	7.6	7.3	7.5	7.9
	B.	7.0	7.5	7.5	7.4	7.5	7.5	7.8	7.6	7.3	7.5	7.9
	C.	7.1	7.5	7.6	7.5	7.5	7.5	7.8	7.6	7.3	7.6	7.9
	D.	7.1	7.6	7.6	7.5	7.5	7.5	7.8	7.6	7.4	7.6	7.9
	E.	7.1	7.5	7.6	7.5	7.5	7.5	7.7	7.6	7.4	7.6	7.9
TEST SEDIMENT	A.	7.2	7.5	7.6	7.5	7.5	7.6	7.7	7.6	7.5	7.8	7.9
	B.	7.2	7.7	7.6	7.5	7.5	7.5	7.7	7.6	7.5	7.8	7.9
	C.	7.2	7.6	7.6	7.5	7.5	7.5	7.6	7.5	7.5	7.8	7.9
	D.	7.3	7.6	7.6	7.5	7.5	7.5	7.7	7.6	7.5	7.7	7.9
	E.	7.3	7.6	7.6	7.5	7.5	7.5	7.7	7.6	7.5	7.7	7.9
	Initials	SG	KT	KT	JC/SG	JC/SG	DS	DB	SG	SW	SW	EC

NOTES:

00048

Organism: P. clarki

Starting Date: 24 AUG 90

Starting Time: 5:30

Exposure Condition	Replicate	Conductivity 0	1	2	3	4	5	6	7	8	9	
CONTROL SEDIMENT	A.	340	360	370	345	385	375	380	390	400	380	38
	B.	345	360	371	350	380	375	365	400	390	375	3
	C.	350	360	370	350	370	370	365	400	380	365	3
	D.	350	336	365	350	375	375	365	390	380	360	35
	E.	350	355	365	350	380	375	365	390	380* ~~38.0~~	360	35
TEST SEDIMENT	A.	425	375	380	370	390	380	370	450	390	370	36
	B.	380	370	380	375	385	380	365	410	380	370	35
	C.	500	[illegible]	500	375	385	385	1000	1150	390	370	36
	D.	380	375	385	375	385	385	390	420	380	370	36
	E.	385	375	380	375	385	385	370	420	385	370	36
	Initials	DL	RF	RF	JO/SG	JO/SG	[illegible]	SG	SD	SD	[illegible]

*SD 9/1

NOTES:
24hrs: Flow through hose for control D was in control replicate C. RF

nytest environmental inc.

Organism: P. promelas

Starting Date: 8-24-90 Starting Time: 5:30 P.M.

Exposure Condition	Replicate	DISSOLVED OXYGEN										
		0	1	2	3	4	5	6	7	8	9	10
CONTROL SEDIMENT	A.	7.8	8.2	8.4	7.8	8.3	7.5	8.1	8.2	7.6	8.0	8.1
	B.	7.8	8.2	8.4	7.6	8.3	7.5	8.1	8.3	8.0	8.2	8.1
	C.	8.0	8.3	8.5	7.9	8.4	7.7	8.3	8.2	8.0	8.2	8.2
	D.	8.1	8.3	8.4	7.4	8.4	7.6	8.2	8.5	8.0	8.0	8.2
	E.	7.9	8.1	8.4	7.8	8.4	7.5	8.4	8.5	8.0	8.2	8.2
TEST SEDIMENT	A.	7.6	7.7	7.9	7.5	8.1	7.2	8.0	8.0	7.8	7.6	7.9
	B.	8.0	8.1	8.4	7.8	8.2	7.6	8.3	8.3	7.9	8.2	8.3
	C.	8.0	8.1	8.3	7.2	8.4	7.6	8.4	8.5	8.0	8.1	8.1
	D.	8.0	8.0	8.4	7.2	8.4	7.5	8.3	8.5	8.0	8.2	8.2
	E.	8.0	7.9	8.3	7.2	8.4	7.4	8.3	8.5	7.8	8.2	8.0
	Initials	SG	RT	RT	BF/SO	BF/SO		GG	SG	SW	SW	JM

NOTES:

A - 8.2
control B - 8.2
C - 8.2
D - 8.2
E - 8.2

Test A - 7.7
B - 8.1
C - 8.2
D - 8.2
E - 8.2

SO - 8-27

00050

nytest environmental inc.

ganism: P. Promelas

Starting Date: 8/24/90 Starting Time: 5:30 pm

Exposure Condition	Replicate	pH										
		0	1	2	3	4	5	6	7	8	9	10
CONTROL SEDIMENT	A.	7.1	7.5	7.6	7.5	7.5	7.6	7.8	7.5	7.4	7.7	8.1
	B.	7.1	7.5	7.6	7.5	7.5	7.6	7.7	7.7	7.5	7.7	8.1
	C.	7.2	7.5	7.6	7.6	7.6	7.6	7.7	8.0	7.5	7.8	8.1
	D.	7.2	7.6	7.6	7.6	7.6	7.6	7.7	7.7	7.5	7.8	8.1
	E.	7.2	7.6	7.6	7.6	7.6	7.6	7.7	7.8	7.5	7.8	8.2
TEST SEDIMENT	A.	7.4	7.6	7.7	7.6	7.5	7.6	7.7	7.7	7.6	7.7	8.0
	B.	7.4	7.7	7.7	7.6	7.6	7.7	7.7	7.7	7.6	7.7	8.1
	C.	7.4	7.7	7.7	7.6	7.6	7.7	7.7	7.8	7.6	7.8	8.1
	D.	7.5	7.7	7.7	7.7	7.7	7.7	7.7	7.8	7.6	7.8	8.1
	E.	7.5	7.7	7.7	7.7	7.7	7.7	7.7	7.8	7.6	7.8	8.1
	Initials	SG	RT	RT	SG/SG	SG/SG	DT	QB	SG	SH	SH	RT

NOTES:

00051

nytest environmental inc.

nism: P. promelas

Starting Date: 24 AUG 90 Starting Time: 5:30

Exposure Condition	Replicate	Conductivity										
		0	1	2	3	4	5	6	7	8	9	10
CONTROL SEDIMENT	A.	350	360	365	360	370	375	360	360	370	360	350
	B.	360	360	365	360	370	370	370	1650*	410	370	355
	C.	360	360	365	360	370	370	365	1150*	370	360	350
	D.	350	360	365	360	370	370	360	600	370	360	350
	E.	355	370	375	360	370	370	360	370	370	360	350
TEST SEDIMENT	A.	380	370	370	370	375	380	370	385	380	360	350
	B.	375	370	370	370	375	380	365	390	370	360	350
	C.	390	370	370	370	375	360	365	390	375	360	350
	D.	370	370	370	370	375	380	390	400	375	360	355
	E.	370	370	370	370	375	380	365	390	375	360	355
Initials		KM	RF	RF	SG	SG	DM	CB	SG	SM	SM	EC

NOTES: * Saltwater was leaking into tank from clear tubing above SI

00052

nytest environmental inc.

TEST ORGANISM TRANSPORTATION

JOB # 9200 QA/QC SHD

Data: 8.24.90 Investigator: J Myers

(In-lab), mobile, or satellite (circle 1)

Test Species: L. clarkii

Total number of organisms acclimatad: 220

A. Organisms

1. culture (Tank & Log #): ASI Ponds 90-0232[A]
2. Procured from: —
3. Age: —

B. Holding Water

1. Temperature: 22.5°C
2. Salinity: —
* Notes: S.P.

C. Destination

1. Laboratory arrival date/time: 8.24.90 5:00pm
2. Arrival holding water temperature: 22.5°C
3. Acclimation water temperature: N/A
4. Acclimation water salinity: N/A
* Notes:

D. Acclimation

1. Holding water volume (1 gal=3.8L): 500 ml
2. Acclimation chamber volume: N/A
3. Acclimation began (date & time): N/A
4. Changeover rate (ml/minute)(2 drops=1ml): N/A
5. Acclimation ended (date & time): N/A

00053

NYTEST ENVIRONMENTAL Inc.

LABORATORY NUMBER	SAMPLE IDENTIFICATION	TYPE OF SAMPLE
5906001	CF T-1	Miscell.
5906002	CF T-2	Miscell.
5906003	CF T-3A	Miscell.
5906004	CF T-3B	Miscell.
5906005	CF T-3C	Miscell.
5906006	CF T-4	Miscell.
5906007	CF T-5	Miscell.
5906008	CF C-1	Miscell.
5906009	CF C-2	Miscell.
5906010	CF C-3A	Miscell.
5906011	CF C-3B	Miscell.
5906012	CF C-3C	Miscell.
5906013	CF C-4	Miscell.
5906014	CF C-5	Miscell.
5906015	FH T-1	Miscell.
5906016	FH T-2	Miscell.
5906017	FH T-3A	Miscell.
5906018	FH T-3B	Miscell.
5906019	FH T-3C	Miscell.
5906020	FH T-4	Miscell.
5906021	FH T-5	Miscell.
5906022	FH C-1	Miscell.
5906023	FH C-2	Miscell.
5906024	FH C-3A	Miscell.
5906025	FH C-3B	Miscell.
5906026	FH C-3C	Miscell.
5906027	FH C-4	Miscell.
5906028	FH C-5	Miscell.
5906029	PRETEST FH-1	Miscell.
5906030	PRETEST FH-2	Miscell.
5906031	PRETEST FH-3	Miscell.
5906032	PRETEST CF-1	Miscell.
5906033	PRETEST CF-2	Miscell.
5906034	PRETEST CF-3	Miscell.

Table of Contents

Log In #5906

CHAIN OF CUSTODY RECORD

Project # 9200

FACILITY/LOCATION: Aqua Survey Inc	METHOD OF SHIPMENT: FED-X TO Nytest FROM ASI
SAMPLING AND ANALYSES AUTHORIZED BY: Not Applicable	DATE: 9/07/90

SAMPLE #	SAMPLING LOCATION AND DESCRIPTION	DATE	TIME	SAMPLE TYPE C	SAMPLE TYPE G	SAMPLE TYPE SOLID	# OF CONT.	ANALYSES REQUIRED
1-5	Crayfish Test	Tissue					5	
1-5	Crayfish Control	Tissue					5	
1-5	Fathead Test	Tissue					5	
1-5	Fathead Control	Tissue					5	
	Fathead Pretest	Tissue					1	
	Crayfish Pretest	Tissue					1	

SAMPLE COLLECTED BY:	EXACT SAMPLING LOCATION:		
~~SAMPLE RELINQUISHED BY:~~	SAMPLE RECEIVED BY: Brent Brendes	DATE 9/8	TIME 10⁰⁰
SAMPLE RELINQUISHED BY:	SAMPLE RECEIVED BY:	DATE	TIME
SAMPLE RELINQUISHED BY:	SAMPLE RECEIVED BY:	DATE	TIME
SAMPLE RELINQUISHED BY:	SAMPLE RECEIVED BY:	DATE	TIME

SAMPLE RELINQUISHED AFTER ANALYSES:	ANALYZED SAMPLE RECEIVED BY:	DATE	TIME
SAMPLE DESCRIPTION:	# OF CONTAINERS:		

FORM № 3094

AQUA SURVEY, INC.

Laboratory Chronicle

Project No:

Client Name:

Date Recieved:
Sample ID:

Organics Extraction:

1. Acids _____
2. Base/Neutrals _____
3. Pesticides/PCBs _____
4. Dioxin _____

Analysis:

1. Volatiles _____
2. Acids _____
3. Base/Neutrals _____
4. Pesticides/PCBs _____
5. Dioxin _____

Section Supervisor
Review & Approval _____

Inorganics:

1. Metals 10-10-90
2. Cyanides _____
3. Phenols _____

Other Analysis:

_____

_____

_____

Section Supervisor
Review & Approval _____

Quality Control Supervisor
Review & Approval _____

If fractions are re-extracted and re-analyzed include dates for both.

00002

METHODOLOGY SUMMARY

AQUEOUS METHODOLOGIES:	REF 1	REF 2	REF 3
BNA, Pesticides/PCB's Extraction		3510	
AA/ICP Sample Preparation	200.7		
Furnace Sample Preparation	200.0		
Mercury Sample Preparation	245.1		
Hexavalent Chromium Sample Preparation	218.5		
Clean-Up		3610/3640	
Organochlorine Pesticides and PCB's by Gas Chromatography			608
Herbicides by Gas Chromatography			362
Purgeable Organics by GC/MS			624
Base/Neutral, Acids by GC/MS			625
2,3,7,8-TCDD by GC/MS			613/625
BTEX			602

NON-AQUEOUS METHODOLOGIES:	
BNA, Pesticides/PCB's Extraction	3550
AA/ICP Sample Preparation	3050
Furnace Sample Preparation	3020/3030/3050
Mercury Sample Preparation	7471
Clean-Up	3610/3640

Gas Chromatography/Mass Spectrometry:	
Purgeable Organics	8240
Base/Neutral and Acid Extractables	8270
Organophosphorous Pesticides	8140
Organochlorine Pesticides and PCB's by Gas Chromatography	8080
BTEX	8020

METHODOLOGY SUMMARY

INDUCTIVELY COUPLED PLASMA (ICP):	REFERENCE 1	REFERENCE 2
Aluminum	200.7	6010
Antimony	200.7	6010
Barium	200.7	6010
Beryllium	200.7	6010
Cadmium	200.7	6010
Calcium	200.7	6010
Chromium	200.7	6010
Cobalt	200.7	6010
Copper	200.7	6010
Iron	200.7	6010
Lead	200.7	6010
Magnesium	200.7	6010
Manganese	200.7	6010
Molybdenum	200.7	6010
Nickel	200.7	6010
Potassium	200.7	6010
Silver	200.7	6010
Sodium	200.7	6010
Tin	200.7	6010
Titanium	200.7	6010
Vanadium	200.7	6010
Zinc		

FURNACE AA:		
Antimony	204.1	7041
Arsenic	206.2	7060
Lead	239.2	7421
Selenium	270.2	7740
Thallium	279.2	7841
Tin	282.2	
Vanadium	286.2	7911
Mercury	245.1	7470

nytest environmental inc.

METHODOLOGY SUMMARY

ADDITIONAL INORGANIC PARAMETERS:	REFERENCE 1	REFERENCE 2
Bromide	320.1	
Color	110.2	
Conductance	120.1	
Conductance		9050
Odor	140.1	
pH	150.1	
pH		9040
TDS	160.2	
TSS	160.2	
TS	160.3	
Hardness	130.1	
Temperature	170.1	
Turbidity	180.1	
Acidity	305.1	
Alkalinity	310.1	
Ammonia	350.2/350.3	
Chloride	325.3	
Chloride		9252
Residual Chlorine	330.2	
COD	410.3/405.1	
Cyanide	335.3	
Oil and Grease	413.1/413.2	
Oil and Grease		9070
Fluoride	340.2	
TKN	351.2	
NO2/NO3	353.2	
D.O.	360.2	
Petroleum Hydrocarbons (Reference 4)	418.1	
Phenol	420.2	
Phosphorous	365.1	
Silica	370.1	
Sulfate	375.2/375.4	
Sulfide	376.1	
Surfactants	425.1	
TOC	415.1	
TOX		9022
MISCELLANEOUS ANALYSIS:		
Extraction Procedure Toxicity		1310
Ignitability		1010
Corrosivity		1110
Reactivity		Chapter 8.3
Toxicity Characteristic Leaching Procedure (TCLP)		(Ref. 5)

METHODOLOGY SUMMARY

REFERENCES:

(1) USEPA-600/4-79-020, Methods for Chemical Analysis of Water and Waste
(2) USEPA SW 846, Test Methods for Evaluating Solid Waste, Third Edition
(3) Federal Register 40 CFR Part 136, Vol. 49, No. 209 Test Parameters for the Analysis of Pollutants
(4) as modified by NJDEP-BISE (for non-aqueous samples)
(5) Federal Register Vol. 51, No. 216 Friday, 11/7/86, pp. 40643-40652

GENERAL ANALYSIS DATA SHEET

NYTEST ENVIRONMENTAL INC.

SAMPLE NO.

CFC-01

Lab Name: NYTEST ENVIRONMENTAL INC. PROJECT No.: 9017236

Lab Code: 10195 LOGIN No: 5906

Matrix (soil/water): MISC.

Lab Sample ID: 590608

Date Received: 09/08/90

Concentration Units (mg/l or mg/kg): mg/kg

CAS No.	Analyte	Concentration	C
7429-90-5	Aluminum	149	
7440-36-0	Antimony	5.0	U
7440-38-2	Arsenic	1.0	U
7440-39-3	Barium	112	
7440-41-7	Beryllium	1.0	U
7440-43-9	Cadmium	1.0	U
7440-70-2	Calcium	24500	
7440-47-3	Chromium	5.0	U
7440-48-4	Cobalt	5.0	U
7440-50-8	Copper	18.0	
7439-89-6	Iron	295	
7439-92-1	Lead	5.0	U
7439-95-4	Magnesium	603	
7439-96-5	Manganese	82.7	
7439-97-6	Mercury	0.10	U
7440-02-0	Nickel	5.0	U
7440-09-7	Potassium	1960	
7782-49-2	Selenium	1.0	U
7440-22-4	Silver	5.0	U
7440-23-5	Sodium	1630	
7440-28-0	Thallium	5.0	U
7440-62-2	Vanadium	1.0	U
7440-66-6	Zinc	23.0	
	Cyanide		

NOTE: C= CONCENTRATION, WHERE U INDICATES THE SAMPLE IS UNDETECTED AT THAT LEVEL.

Samples reported on an as received basis .

CF C-1

GENERAL ANALYSIS DATA SHEET

NYTEST ENVIRONMENTAL INC.

SAMPLE NO.

CFC-02

Lab Name: NYTEST ENVIRONMENTAL INC. PROJECT No.: 9017236

Lab Code: 10195 LOGIN No: 5906

Matrix (soil/water): MISC.

Lab Sample ID: 590609

Date Received: 09/08/90

Concentration Units (mg/l or mg/kg): mg/kg

CAS No.	Analyte	Concentration	C
7429-90-5	Aluminum	140	
7440-36-0	Antimony	5.0	U
7440-38-2	Arsenic	1.0	U
7440-39-3	Barium	95.3	
7440-41-7	Beryllium	1.0	U
7440-43-9	Cadmium	1.0	U
7440-70-2	Calcium	17800	
7440-47-3	Chromium	5.0	U
7440-48-4	Cobalt	5.0	U
7440-50-8	Copper	20.1	
7439-89-6	Iron	262	
7439-92-1	Lead	5.0	U
7439-95-4	Magnesium	563	
7439-96-5	Manganese	96.0	
7439-97-6	Mercury	0.10	U
7440-02-0	Nickel	5.0	U
7440-09-7	Potassium	2220	
7782-49-2	Selenium	1.0	U
7440-22-4	Silver	5.0	U
7440-23-5	Sodium	1940	
7440-28-0	Thallium	5.0	U
7440-62-2	Vanadium	1.0	U
7440-66-6	Zinc	21.3	
	Cyanide		

NOTE: C= CONCENTRATION, WHERE U INDICATES THE SAMPLE IS UNDETECTED AT THAT LEVEL.

Samples reported on an as received basis .

CF C-2

GENERAL ANALYSIS DATA SHEET

NYTEST ENVIRONMENTAL INC.

SAMPLE NO.

CFC-04

Lab Name: NYTEST ENVIRONMENTAL INC. PROJECT No.: 9017236

Lab Code: 10195 LOGIN No: 5906

Matrix (soil/water): MISC.

Lab Sample ID: 590613

Date Received: 09/08/90

Concentration Units (mg/l or mg/kg): mg/kg

CAS No.	Analyte	Concentration	C
7429-90-5	Aluminum	162	
7440-36-0	Antimony	5.0	U
7440-38-2	Arsenic	1.0	U
7440-39-3	Barium	89.7	
7440-41-7	Beryllium	1.0	U
7440-43-9	Cadmium	1.0	U
7440-70-2	Calcium	20200	
7440-47-3	Chromium	5.3	
7440-48-4	Cobalt	5.0	U
7440-50-8	Copper	21.5	
7439-89-6	Iron	275	
7439-92-1	Lead	5.0	U
7439-95-4	Magnesium	638	
7439-96-5	Manganese	126	
7439-97-6	Mercury	0.10	U
7440-02-0	Nickel	5.0	U
7440-09-7	Potassium	2140	
7782-49-2	Selenium	1.0	U
7440-22-4	Silver	5.0	U
7440-23-5	Sodium	2000	
7440-28-0	Thallium	5.0	U
7440-62-2	Vanadium	1.0	U
7440-66-6	Zinc	19.9	
	Cyanide		

NOTE: C= CONCENTRATION, WHERE U INDICATES THE SAMPLE IS UNDETECTED AT THAT LEVEL.

Samples reported on an as received basis .

GENERAL ANALYSIS DATA SHEET

NYTEST ENVIRONMENTAL INC.

SAMPLE NO.

CFC-05

Lab Name: NYTEST ENVIRONMENTAL INC. PROJECT No.: 9017236

Lab Code: 10195 LOGIN No: 5906

Matrix (soil/water): MISC.

Lab Sample ID: 590614

Date Received: 09/08/90

Concentration Units (mg/l or mg/kg): mg/kg

CAS No.	Analyte	Concentration	C
7429-90-5	Aluminum	115	
7440-36-0	Antimony	5.0	U
7440-38-2	Arsenic	1.0	U
7440-39-3	Barium	96.3	
7440-41-7	Beryllium	1.0	U
7440-43-9	Cadmium	1.0	U
7440-70-2	Calcium	19800	
7440-47-3	Chromium	5.0	U
7440-48-4	Cobalt	5.0	U
7440-50-8	Copper	16.3	
7439-89-6	Iron	240	
7439-92-1	Lead	5.0	U
7439-95-4	Magnesium	580	
7439-96-5	Manganese	115	
7439-97-6	Mercury	0.10	U
7440-02-0	Nickel	5.0	U
7440-09-7	Potassium	1890	
7782-49-2	Selenium	1.0	U
7440-22-4	Silver	5.0	U
7440-23-5	Sodium	1740	
7440-28-0	Thallium	5.0	U
7440-62-2	Vanadium	1.0	U
7440-66-6	Zinc	17.9	
	Cyanide		

NOTE: C= CONCENTRATION, WHERE U INDICATES THE SAMPLE IS UNDETECTED AT THAT LEVEL.

Samples reported on an as received basis .

GENERAL ANALYSIS DATA SHEET

NYTEST ENVIRONMENTAL INC.

SAMPLE NO.

CFC-3A

Lab Name: NYTEST ENVIRONMENTAL INC. PROJECT No.: 9017236

Lab Code: 10195 LOGIN No: 5906

Matrix (soil/water): MISC.

Lab Sample ID: 590610

Date Received: 09/08/90

Concentration Units (mg/l or mg/kg): mg/kg

CAS No.	Analyte	Concentration	C
7429-90-5	Aluminum	118	
7440-36-0	Antimony	5.0	U
7440-38-2	Arsenic	1.0	U
7440-39-3	Barium	73.4	
7440-41-7	Beryllium	1.0	U
7440-43-9	Cadmium	1.0	U
7440-70-2	Calcium	16800	
7440-47-3	Chromium	5.0	U
7440-48-4	Cobalt	5.0	U
7440-50-8	Copper	22.0	
7439-89-6	Iron	208	
7439-92-1	Lead	5.0	U
7439-95-4	Magnesium	526	
7439-96-5	Manganese	75.1	
7439-97-6	Mercury	0.10	U
7440-02-0	Nickel	5.0	U
7440-09-7	Potassium	2250	
7782-49-2	Selenium	1.0	U
7440-22-4	Silver	5.0	U
7440-23-5	Sodium	1780	
7440-28-0	Thallium	5.0	U
7440-62-2	Vanadium	1.0	U
7440-66-6	Zinc	110	
	Cyanide		

NOTE: C= CONCENTRATION, WHERE U INDICATES THE SAMPLE IS UNDETECTED AT THAT LEVEL.

Samples reported on an as received basis .

GENERAL ANALYSIS DATA SHEET

NYTEST ENVIRONMENTAL INC.

SAMPLE NO.

CFC-3B

Lab Name: NYTEST ENVIRONMENTAL INC. PROJECT No.: 9017236

Lab Code: 10195 LOGIN No: 5906

Matrix (soil/water): MISC.

Lab Sample ID: 590611

Date Received: 09/08/90

Concentration Units (mg/l or mg/kg): mg/kg

CAS No.	Analyte	Concentration	C
7429-90-5	Aluminum	124	
7440-36-0	Antimony	5.0	U
7440-38-2	Arsenic	1.0	U
7440-39-3	Barium	130	
7440-41-7	Beryllium	1.0	U
7440-43-9	Cadmium	1.0	U
7440-70-2	Calcium	19800	
7440-47-3	Chromium	5.0	U
7440-48-4	Cobalt	5.0	U
7440-50-8	Copper	19.4	
7439-89-6	Iron	207	
7439-92-1	Lead	5.0	U
7439-95-4	Magnesium	557	
7439-96-5	Manganese	89.1	
7439-97-6	Mercury	0.10	U
7440-02-0	Nickel	5.0	U
7440-09-7	Potassium	2120	
7782-49-2	Selenium	1.0	U
7440-22-4	Silver	5.0	U
7440-23-5	Sodium	1790	
7440-28-0	Thallium	5.0	U
7440-62-2	Vanadium	1.0	U
7440-66-6	Zinc	29.0	
	Cyanide		

NOTE: C= CONCENTRATION, WHERE U INDICATES THE SAMPLE IS UNDETECTED AT THAT LEVEL.

Samples reported on an as received basis .

GENERAL ANALYSIS DATA SHEET

NYTEST ENVIRONMENTAL INC.

SAMPLE NO.

CFC-3C

Lab Name: NYTEST ENVIRONMENTAL INC. PROJECT No.: 9017236

Lab Code: 10195 LOGIN No: 5906

Matrix (soil/water): MISC.

Lab Sample ID: 590612

Date Received: 09/08/90

Concentration Units (mg/l or mg/kg): mg/kg

CAS No.	Analyte	Concentration	C
7429-90-5	Aluminum	138	
7440-36-0	Antimony	5.0	U
7440-38-2	Arsenic	1.0	U
7440-39-3	Barium	81.9	
7440-41-7	Beryllium	1.0	U
7440-43-9	Cadmium	1.0	U
7440-70-2	Calcium	15400	
7440-47-3	Chromium	5.0	U
7440-48-4	Cobalt	5.0	U
7440-50-8	Copper	20.6	
7439-89-6	Iron	223	
7439-92-1	Lead	5.0	U
7439-95-4	Magnesium	492	
7439-96-5	Manganese	87.1	
7439-97-6	Mercury	0.10	U
7440-02-0	Nickel	5.0	U
7440-09-7	Potassium	2200	
7782-49-2	Selenium	1.0	U
7440-22-4	Silver	5.0	U
7440-23-5	Sodium	1840	
7440-28-0	Thallium	5.0	U
7440-62-2	Vanadium	1.0	U
7440-66-6	Zinc	19.4	
	Cyanide		

NOTE: C= CONCENTRATION, WHERE U INDICATES THE SAMPLE IS UNDETECTED AT THAT LEVEL.

Samples reported on an as received basis .

GENERAL ANALYSIS DATA SHEET

NYTEST ENVIRONMENTAL INC.

SAMPLE NO.

CFT-01

Lab Name: NYTEST ENVIRONMENTAL INC. PROJECT No.: 9017236

Lab Code: 10195 LOGIN No: 5906

Matrix (soil/water): MISC.

Lab Sample ID: 590601

Date Received: 09/08/90

Concentration Units (mg/l or mg/kg): mg/kg

CAS No.	Analyte	Concentration	C
7429-90-5	Aluminum	50.4	
7440-36-0	Antimony	5.0	U
7440-38-2	Arsenic	1.0	U
7440-39-3	Barium	79.7	
7440-41-7	Beryllium	1.0	U
7440-43-9	Cadmium	1.0	U
7440-70-2	Calcium	16400	
7440-47-3	Chromium	5.0	U
7440-48-4	Cobalt	5.0	U
7440-50-8	Copper	18.3	
7439-89-6	Iron	463	
7439-92-1	Lead	7.1	
7439-95-4	Magnesium	457	
7439-96-5	Manganese	75.6	
7439-97-6	Mercury	0.10	U
7440-02-0	Nickel	5.0	U
7440-09-7	Potassium	1650	
7782-49-2	Selenium	1.0	U
7440-22-4	Silver	5.0	U
7440-23-5	Sodium	1480	
7440-28-0	Thallium	5.0	U
7440-62-2	Vanadium	1.0	U
7440-66-6	Zinc	18.8	
	Cyanide		

NOTE: C= CONCENTRATION, WHERE U INDICATES THE SAMPLE IS UNDETECTED AT THAT LEVEL.

Samples reported on an as received basis .

CF T-1

GENERAL ANALYSIS DATA SHEET

NYTEST ENVIRONMENTAL INC.

SAMPLE NO.

CFT-02

Lab Name: NYTEST ENVIRONMENTAL INC. PROJECT No.: 9017236

Lab Code: 10195 LOGIN No: 5906

Matrix (soil/water): MISC.

Lab Sample ID: 590602

Date Received: 09/08/90

Concentration Units (mg/l or mg/kg): mg/kg

CAS No.	Analyte	Concentration	C
7429-90-5	Aluminum	65.5	
7440-36-0	Antimony	5.0	U
7440-38-2	Arsenic	1.0	U
7440-39-3	Barium	83.6	
7440-41-7	Beryllium	1.0	U
7440-43-9	Cadmium	1.0	U
7440-70-2	Calcium	17500	
7440-47-3	Chromium	5.0	U
7440-48-4	Cobalt	5.0	U
7440-50-8	Copper	20.3	
7439-89-6	Iron	499	
7439-92-1	Lead	9.5	
7439-95-4	Magnesium	514	
7439-96-5	Manganese	58.6	
7439-97-6	Mercury	0.10	U
7440-02-0	Nickel	5.0	U
7440-09-7	Potassium	1800	
7782-49-2	Selenium	1.0	U
7440-22-4	Silver	5.0	U
7440-23-5	Sodium	1690	
7440-28-0	Thallium	5.0	
7440-62-2	Vanadium	1.0	U
7440-66-6	Zinc	19.8	
	Cyanide		

NOTE: C= CONCENTRATION, WHERE U INDICATES THE SAMPLE IS UNDETECTED AT THAT LEVEL.

Samples reported on an as received basis .

GENERAL ANALYSIS DATA SHEET

NYTEST ENVIRONMENTAL INC.

SAMPLE NO.

CFT-04

Lab Name: NYTEST ENVIRONMENTAL INC. PROJECT No.: 9017236

Lab Code: 10195 LOGIN No: 5906

Matrix (soil/water): MISC.

Lab Sample ID: 590606

Date Received: 09/08/90

Concentration Units (mg/l or mg/kg): mg/kg

CAS No.	Analyte	Concentration	C
7429-90-5	Aluminum	70.1	
7440-36-0	Antimony	5.0	U
7440-38-2	Arsenic	1.0	U
7440-39-3	Barium	88.2	
7440-41-7	Beryllium	1.0	U
7440-43-9	Cadmium	1.0	U
7440-70-2	Calcium	18600	
7440-47-3	Chromium	5.0	U
7440-48-4	Cobalt	5.0	U
7440-50-8	Copper	21.0	
7439-89-6	Iron	472	
7439-92-1	Lead	5.0	U
7439-95-4	Magnesium	578	
7439-96-5	Manganese	83.0	
7439-97-6	Mercury	0.10	U
7440-02-0	Nickel	5.0	U
7440-09-7	Potassium	2180	
7782-49-2	Selenium	1.0	U
7440-22-4	Silver	5.0	U
7440-23-5	Sodium	2100	
7440-28-0	Thallium	5.0	U
7440-62-2	Vanadium	1.0	U
7440-66-6	Zinc	20.8	
	Cyanide		

NOTE: C= CONCENTRATION, WHERE U INDICATES THE SAMPLE IS UNDETECTED AT THAT LEVEL.

Samples reported on an as received basis .

GENERAL ANALYSIS DATA SHEET

NYTEST ENVIRONMENTAL INC.

SAMPLE NO.

CFT-05

Lab Name: NYTEST ENVIRONMENTAL INC. PROJECT No.: 9017236

Lab Code: 10195 LOGIN No: 5906

Matrix (soil/water): MISC.

Lab Sample ID: 590607

Date Received: 09/08/90

Concentration Units (mg/l or mg/kg): mg/kg

CAS No.	Analyte	Concentration	C
7429-90-5	Aluminum	66.6	
7440-36-0	Antimony	5.0	U
7440-38-2	Arsenic	1.0	U
7440-39-3	Barium	95.1	
7440-41-7	Beryllium	1.0	U
7440-43-9	Cadmium	1.0	U
7440-70-2	Calcium	17300	
7440-47-3	Chromium	5.0	U
7440-48-4	Cobalt	5.0	U
7440-50-8	Copper	17.4	
7439-89-6	Iron	471	
7439-92-1	Lead	5.0	U
7439-95-4	Magnesium	513	
7439-96-5	Manganese	71.3	
7439-97-6	Mercury	0.10	U
7440-02-0	Nickel	5.0	U
7440-09-7	Potassium	1910	
7782-49-2	Selenium	1.0	U
7440-22-4	Silver	5.0	U
7440-23-5	Sodium	1890	
7440-28-0	Thallium	5.0	U
7440-62-2	Vanadium	1.0	U
7440-66-6	Zinc	21.3	
	Cyanide		

NOTE: C= CONCENTRATION, WHERE U INDICATES THE SAMPLE IS UNDETECTED AT THAT LEVEL.

Samples reported on an as received basis .

GENERAL ANALYSIS DATA SHEET

NYTEST ENVIRONMENTAL INC.

SAMPLE NO.

CFT-3A

Lab Name: NYTEST ENVIRONMENTAL INC. PROJECT No.: 9017236

Lab Code: 10195 LOGIN No: 5906

Matrix (soil/water): MISC.

Lab Sample ID: 590603

Date Received: 09/08/90

Concentration Units (mg/l or mg/kg): mg/kg

CAS No.	Analyte	Concentration	C
7429-90-5	Aluminum	62.4	
7440-36-0	Antimony	5.0	U
7440-38-2	Arsenic	1.0	U
7440-39-3	Barium	75.0	
7440-41-7	Beryllium	1.0	U
7440-43-9	Cadmium	1.0	U
7440-70-2	Calcium	15400	
7440-47-3	Chromium	5.0	U
7440-48-4	Cobalt	5.0	U
7440-50-8	Copper	17.9	
7439-89-6	Iron	473	
7439-92-1	Lead	10.0	
7439-95-4	Magnesium	468	
7439-96-5	Manganese	58.4	
7439-97-6	Mercury	0.10	U
7440-02-0	Nickel	5.0	U
7440-09-7	Potassium	1890	
7782-49-2	Selenium	1.0	U
7440-22-4	Silver	5.0	U
7440-23-5	Sodium	1480	
7440-28-0	Thallium	5.0	U
7440-62-2	Vanadium	1.0	U
7440-66-6	Zinc	20.7	
	Cyanide		

NOTE: C= CONCENTRATION, WHERE U INDICATES THE SAMPLE IS UNDETECTED AT THAT LEVEL.

Samples reported on an as received basis .

GENERAL ANALYSIS DATA SHEET

NYTEST ENVIRONMENTAL INC.

SAMPLE NO.

CFT-3B

Lab Name: NYTEST ENVIRONMENTAL INC. PROJECT No.: 9017236

Lab Code: 10195 LOGIN No: 5906

Matrix (soil/water): MISC.

Lab Sample ID: 590604

Date Received: 09/08/90

Concentration Units (mg/l or mg/kg): mg/kg

CAS No.	Analyte	Concentration	C
7429-90-5	Aluminum	75.0	
7440-36-0	Antimony	5.0	U
7440-38-2	Arsenic	1.0	U
7440-39-3	Barium	70.4	
7440-41-7	Beryllium	1.0	U
7440-43-9	Cadmium	1.0	U
7440-70-2	Calcium	14300	
7440-47-3	Chromium	5.0	U
7440-48-4	Cobalt	5.0	U
7440-50-8	Copper	18.7	
7439-89-6	Iron	479	
7439-92-1	Lead	5.0	U
7439-95-4	Magnesium	461	
7439-96-5	Manganese	58.4	
7439-97-6	Mercury	0.10	U
7440-02-0	Nickel	5.0	U
7440-09-7	Potassium	1780	
7782-49-2	Selenium	1.0	U
7440-22-4	Silver	5.0	U
7440-23-5	Sodium	1630	
7440-28-0	Thallium	5.0	U
7440-62-2	Vanadium	1.0	U
7440-66-6	Zinc	21.3	
	Cyanide		

NOTE: C= CONCENTRATION, WHERE U INDICATES THE SAMPLE IS UNDETECTED AT THAT LEVEL.

Samples reported on an as received basis .

GENERAL ANALYSIS DATA SHEET

NYTEST ENVIRONMENTAL INC.

SAMPLE NO.

CFT-3C

Lab Name: NYTEST ENVIRONMENTAL INC. PROJECT No.: 9017236

Lab Code: 10195 LOGIN No: 5906

Matrix (soil/water): MISC.

Lab Sample ID: 590605

Date Received: 09/08/90

Concentration Units (mg/l or mg/kg): mg/kg

CAS No.	Analyte	Concentration	C
7429-90-5	Aluminum	65.4	
7440-36-0	Antimony	5.0	U
7440-38-2	Arsenic	1.0	U
7440-39-3	Barium	58.1	
7440-41-7	Beryllium	1.0	U
7440-43-9	Cadmium	1.0	U
7440-70-2	Calcium	12400	
7440-47-3	Chromium	5.0	U
7440-48-4	Cobalt	5.0	U
7440-50-8	Copper	15.2	
7439-89-6	Iron	396	
7439-92-1	Lead	5.0	U
7439-95-4	Magnesium	390	
7439-96-5	Manganese	51.6	
7439-97-6	Mercury	0.10	U
7440-02-0	Nickel	5.0	U
7440-09-7	Potassium	1510	
7782-49-2	Selenium	1.0	U
7440-22-4	Silver	5.0	U
7440-23-5	Sodium	1370	
7440-28-0	Thallium	5.0	U
7440-62-2	Vanadium	1.0	U
7440-66-6	Zinc	16.3	
	Cyanide		

NOTE: C= CONCENTRATION, WHERE U INDICATES THE SAMPLE IS UNDETECTED AT THAT LEVEL.

Samples reported on an as received basis .

GENERAL ANALYSIS DATA SHEET

NYTEST ENVIRONMENTAL INC.

SAMPLE NO.

FHC-01

Lab Name: NYTEST ENVIRONMENTAL INC. PROJECT No.: 9017236

Lab Code: 10195 LOGIN No: 5906

Matrix (soil/water): MISC.

Lab Sample ID: 590622

Date Received: 09/08/90

Concentration Units (mg/l or mg/kg): mg/kg

CAS No.	Analyte	Concentration	C
7429-90-5	Aluminum	66.6	
7440-36-0	Antimony	5.0	U
7440-38-2	Arsenic	1.0	U
7440-39-3	Barium	10.0	U
7440-41-7	Beryllium	1.0	U
7440-43-9	Cadmium	1.0	U
7440-70-2	Calcium	7010	
7440-47-3	Chromium	37.4	
7440-48-4	Cobalt	5.0	U
7440-50-8	Copper	239	
7439-89-6	Iron	267	
7439-92-1	Lead	5.0	U
7439-95-4	Magnesium	321	
7439-96-5	Manganese	6.6	
7439-97-6	Mercury	0.10	U
7440-02-0	Nickel	28.5	
7440-09-7	Potassium	2520	
7782-49-2	Selenium	1.0	U
7440-22-4	Silver	5.0	U
7440-23-5	Sodium	971	
7440-28-0	Thallium	5.0	U
7440-62-2	Vanadium	1.0	U
7440-66-6	Zinc	35.3	
	Cyanide		

NOTE: C= CONCENTRATION, WHERE U INDICATES THE SAMPLE IS UNDETECTED AT THAT LEVEL.

Samples reported on an as received basis .

GENERAL ANALYSIS DATA SHEET

NYTEST ENVIRONMENTAL INC.

SAMPLE NO.

FHC-02

Lab Name: NYTEST ENVIRONMENTAL INC. PROJECT No.: 9017236

Lab Code: 10195 LOGIN No: 5906

Matrix (soil/water): MISC.

Lab Sample ID: 590623

Date Received: 09/08/90

Concentration Units (mg/l or mg/kg): mg/kg

CAS No.	Analyte	Concentration	C
7429-90-5	Aluminum	10.0	U
7440-36-0	Antimony	10.0	U
7440-38-2	Arsenic	2.0	U
7440-39-3	Barium	20.0	U
7440-41-7	Beryllium	2.0	U
7440-43-9	Cadmium	2.0	U
7440-70-2	Calcium	8280	
7440-47-3	Chromium	16.6	
7440-48-4	Cobalt	10.0	U
7440-50-8	Copper	28.6	
7439-89-6	Iron	93.0	
7439-92-1	Lead	10.0	U
7439-95-4	Magnesium	286	
7439-96-5	Manganese	10.0	U
7439-97-6	Mercury	0.10	U
7440-02-0	Nickel	11.4	
7440-09-7	Potassium	1610	
7782-49-2	Selenium	2.0	U
7440-22-4	Silver	10.0	U
7440-23-5	Sodium	890	
7440-28-0	Thallium	5.0	u
7440-62-2	Vanadium	2.0	U
7440-66-6	Zinc	38.6	
	Cyanide		

NOTE: C= CONCENTRATION, WHERE U INDICATES THE SAMPLE IS UNDETECTED AT THAT LEVEL.

Samples reported on an as received basis .

00022

GENERAL ANALYSIS DATA SHEET

NYTEST ENVIRONMENTAL INC.

SAMPLE NO.

FHC-04

Lab Name: NYTEST ENVIRONMENTAL INC. PROJECT No.: 9017236

Lab Code: 10195 LOGIN No: 5906

Matrix (soil/water): MISC.

Lab Sample ID: 590627

Date Received: 09/08/90

Concentration Units (mg/l or mg/kg): mg/kg

CAS No.	Analyte	Concentration	C
7429-90-5	Aluminum	78.1	
7440-36-0	Antimony	5.0	U
7440-38-2	Arsenic	1.0	U
7440-39-3	Barium	10.0	U
7440-41-7	Beryllium	1.0	U
7440-43-9	Cadmium	1.0	U
7440-70-2	Calcium	7240	
7440-47-3	Chromium	46.3	
7440-48-4	Cobalt	5.0	U
7440-50-8	Copper	203	
7439-89-6	Iron	296	
7439-92-1	Lead	5.0	U
7439-95-4	Magnesium	418	
7439-96-5	Manganese	8.7	
7439-97-6	Mercury	0.10	U
7440-02-0	Nickel	31.5	
7440-09-7	Potassium	2680	
7782-49-2	Selenium	1.0	U
7440-22-4	Silver	5.0	U
7440-23-5	Sodium	1010	
7440-28-0	Thallium	5.0	U
7440-62-2	Vanadium	1.0	U
7440-66-6	Zinc	37.1	
	Cyanide		

NOTE: C= CONCENTRATION, WHERE U INDICATES THE SAMPLE IS UNDETECTED AT THAT LEVEL.

Samples reported on an as received basis .

GENERAL ANALYSIS DATA SHEET

NYTEST ENVIRONMENTAL INC.

SAMPLE NO.

FHC-05

Lab Name: NYTEST ENVIRONMENTAL INC. PROJECT No.: 9017236

Lab Code: 10195 LOGIN No: 5906

Matrix (soil/water): MISC. Lab Sample ID: 590628

Date Received: 09/08/90

Concentration Units (mg/l or mg/kg): mg/kg

CAS No.	Analyte	Concentration	C
7429-90-5	Aluminum	38.4	
7440-36-0	Antimony	5.0	U
7440-38-2	Arsenic	1.0	U
7440-39-3	Barium	10.0	U
7440-41-7	Beryllium	1.0	U
7440-43-9	Cadmium	1.0	U
7440-70-2	Calcium	5840	
7440-47-3	Chromium	19.5	
7440-48-4	Cobalt	5.0	U
7440-50-8	Copper	39.0	
7439-89-6	Iron	139	
7439-92-1	Lead	5.0	U
7439-95-4	Magnesium	299	
7439-96-5	Manganese	5.0	U
7439-97-6	Mercury	0.10	U
7440-02-0	Nickel	14.2	
7440-09-7	Potassium	2510	
7782-49-2	Selenium	1.0	U
7440-22-4	Silver	5.0	U
7440-23-5	Sodium	904	
7440-28-0	Thallium	5.0	UL
7440-62-2	Vanadium	1.0	U
7440-66-6	Zinc	34.3	
	Cyanide		

NOTE: C= CONCENTRATION, WHERE U INDICATES THE SAMPLE IS UNDETECTED AT THAT LEVEL.

Samples reported on an as received basis .

GENERAL ANALYSIS DATA SHEET

NYTEST ENVIRONMENTAL INC.

SAMPLE NO.

FHC-3A

Lab Name: NYTEST ENVIRONMENTAL INC. PROJECT No.: 9017236

Lab Code: 10195 LOGIN No: 5906

Matrix (soil/water): MISC.

Lab Sample ID: 590624

Date Received: 09/08/90

Concentration Units (mg/l or mg/kg): mg/kg

CAS No.	Analyte	Concentration	C
7429-90-5	Aluminum	44.8	
7440-36-0	Antimony	10.0	U
7440-38-2	Arsenic	2.0	U
7440-39-3	Barium	20.0	U
7440-41-7	Beryllium	2.0	U
7440-43-9	Cadmium	2.0	U
7440-70-2	Calcium	6340	
7440-47-3	Chromium	35.6	
7440-48-4	Cobalt	10.0	U
7440-50-8	Copper	197	
7439-89-6	Iron	192	
7439-92-1	Lead	10.0	U
7439-95-4	Magnesium	278	
7439-96-5	Manganese	10.0	U
7439-97-6	Mercury	0.10	U
7440-02-0	Nickel	26.0	
7440-09-7	Potassium	2480	
7782-49-2	Selenium	2.0	U
7440-22-4	Silver	10.0	U
7440-23-5	Sodium	976	
7440-28-0	Thallium	5.0	U
7440-62-2	Vanadium	2.0	U
7440-66-6	Zinc	36.2	
	Cyanide		

NOTE: C= CONCENTRATION, WHERE U INDICATES THE SAMPLE IS UNDETECTED AT THAT LEVEL.

Samples reported on an as received basis .

GENERAL ANALYSIS DATA SHEET

NYTEST ENVIRONMENTAL INC.

SAMPLE NO.

FHC-3B

Lab Name: NYTEST ENVIRONMENTAL INC. PROJECT No.: 9017236

Lab Code: 10195 LOGIN No: 5906

Matrix (soil/water): MISC.

Lab Sample ID: 590625

Date Received: 09/08/90

Concentration Units (mg/l or mg/kg): mg/kg

CAS No.	Analyte	Concentration	C
7429-90-5	Aluminum	36.8	
7440-36-0	Antimony	5.0	U
7440-38-2	Arsenic	1.0	U
7440-39-3	Barium	10.0	U
7440-41-7	Beryllium	1.0	U
7440-43-9	Cadmium	1.0	U
7440-70-2	Calcium	7550	
7440-47-3	Chromium	29.0	
7440-48-4	Cobalt	5.0	U
7440-50-8	Copper	83.0	
7439-89-6	Iron	166	
7439-92-1	Lead	5.0	U
7439-95-4	Magnesium	283	
7439-96-5	Manganese	5.5	
7439-97-6	Mercury	0.10	
7440-02-0	Nickel	20.0	
7440-09-7	Potassium	2570	
7782-49-2	Selenium	1.0	U
7440-22-4	Silver	5.0	U
7440-23-5	Sodium	1010	
7440-28-0	Thallium	5.0	
7440-62-2	Vanadium	1.0	U
7440-66-6	Zinc	37.3	
	Cyanide		

NOTE: C= CONCENTRATION, WHERE U INDICATES THE SAMPLE IS UNDETECTED AT THAT LEVEL.

Samples reported on an as received basis .

GENERAL ANALYSIS DATA SHEET

NYTEST ENVIRONMENTAL INC.

SAMPLE NO.

FHC-3C

Lab Name: NYTEST ENVIRONMENTAL INC. PROJECT No.: 9017236

Lab Code: 10195 LOGIN No: 5906

Matrix (soil/water): MISC.

Lab Sample ID: 590626

Date Received: 09/08/90

Concentration Units (mg/l or mg/kg): mg/kg

CAS No.	Analyte	Concentration	C
7429-90-5	Aluminum	55.2	
7440-36-0	Antimony	5.0	U
7440-38-2	Arsenic	1.0	U
7440-39-3	Barium	10.0	U
7440-41-7	Beryllium	1.0	U
7440-43-9	Cadmium	1.0	U
7440-70-2	Calcium	6780	
7440-47-3	Chromium	31.0	
7440-48-4	Cobalt	5.0	U
7440-50-8	Copper	143	
7439-89-6	Iron	202	
7439-92-1	Lead	5.0	U
7439-95-4	Magnesium	273	
7439-96-5	Manganese	6.2	
7439-97-6	Mercury	0.10	U
7440-02-0	Nickel	19.6	
7440-09-7	Potassium	2580	
7782-49-2	Selenium	1.0	U
7440-22-4	Silver	5.0	U
7440-23-5	Sodium	1000	
7440-28-0	Thallium	5.0	U
7440-62-2	Vanadium	1.0	U
7440-66-6	Zinc	36.8	
	Cyanide		

NOTE: C= CONCENTRATION, WHERE U INDICATES THE SAMPLE IS UNDETECTED AT THAT LEVEL.

Samples reported on an as received basis .

FH C-3C

00027

GENERAL ANALYSIS DATA SHEET

NYTEST ENVIRONMENTAL INC.

SAMPLE NO.

FHT-01

Lab Name: NYTEST ENVIRONMENTAL INC. PROJECT No.: 9017236

Lab Code: 10195 LOGIN No: 5906

Matrix (soil/water): MISC.

Lab Sample ID: 590615

Date Received: 09/08/90

Concentration Units (mg/l or mg/kg): mg/kg

CAS No.	Analyte	Concentration	C
7429-90-5	Aluminum	18.9	
7440-36-0	Antimony	5.0	U
7440-38-2	Arsenic	1.0	U
7440-39-3	Barium	10.0	U
7440-41-7	Beryllium	1.0	U
7440-43-9	Cadmium	1.0	U
7440-70-2	Calcium	6400	
7440-47-3	Chromium	12.7	
7440-48-4	Cobalt	5.0	U
7440-50-8	Copper	29.4	
7439-89-6	Iron	158	
7439-92-1	Lead	5.0	U
7439-95-4	Magnesium	331	
7439-96-5	Manganese	5.0	U
7439-97-6	Mercury	0.10	U
7440-02-0	Nickel	8.7	
7440-09-7	Potassium	2730	
7782-49-2	Selenium	1.0	U
7440-22-4	Silver	5.0	U
7440-23-5	Sodium	1200	
7440-28-0	Thallium	5.0	U
7440-62-2	Vanadium	1.0	U
7440-66-6	Zinc	34.8	
	Cyanide		

NOTE: C= CONCENTRATION, WHERE U INDICATES THE SAMPLE IS UNDETECTED AT THAT LEVEL.

Samples reported on an as received basis .

FH T-1

GENERAL ANALYSIS DATA SHEET

NYTEST ENVIRONMENTAL INC.

SAMPLE NO.

FHT-02

Lab Name: NYTEST ENVIRONMENTAL INC. PROJECT No.: 9017236

Lab Code: 10195 LOGIN No: 5906

Matrix (soil/water): MISC.

Lab Sample ID: 590616

Date Received: 09/08/90

Concentration Units (mg/l or mg/kg): mg/kg

CAS No.	Analyte	Concentration	C
7429-90-5	Aluminum	77.2	
7440-36-0	Antimony	5.0	U
7440-38-2	Arsenic	1.0	U
7440-39-3	Barium	10.0	U
7440-41-7	Beryllium	1.0	U
7440-43-9	Cadmium	1.0	U
7440-70-2	Calcium	8440	
7440-47-3	Chromium	19.2	
7440-48-4	Cobalt	5.0	U
7440-50-8	Copper	29.8	
7439-89-6	Iron	361	
7439-92-1	Lead	5.0	U
7439-95-4	Magnesium	380	
7439-96-5	Manganese	6.7	
7439-97-6	Mercury	0.10	U
7440-02-0	Nickel	12.4	
7440-09-7	Potassium	2570	
7782-49-2	Selenium	1.0	U
7440-22-4	Silver	5.0	U
7440-23-5	Sodium	1220	
7440-28-0	Thallium	5.0	U
7440-62-2	Vanadium	1.0	U
7440-66-6	Zinc	74.0	
	Cyanide		

NOTE: C= CONCENTRATION, WHERE U INDICATES THE SAMPLE IS UNDETECTED AT THAT LEVEL.

Samples reported on an as received basis .

FH T-2

00029

GENERAL ANALYSIS DATA SHEET

NYTEST ENVIRONMENTAL INC.

SAMPLE NO.

FHT-04

Lab Name: NYTEST ENVIRONMENTAL INC. PROJECT No.: 9017236

Lab Code: 10195 LOGIN No: 5906

Matrix (soil/water): MISC.

Lab Sample ID: 590620

Date Received: 09/08/90

Concentration Units (mg/l or mg/kg): mg/kg

CAS No.	Analyte	Concentration	C
7429-90-5	Aluminum	43.2	
7440-36-0	Antimony	5.0	U
7440-38-2	Arsenic	1.0	U
7440-39-3	Barium	10.0	U
7440-41-7	Beryllium	1.0	U
7440-43-9	Cadmium	1.0	U
7440-70-2	Calcium	8500	
7440-47-3	Chromium	14.7	
7440-48-4	Cobalt	5.0	U
7440-50-8	Copper	45.5	
7439-89-6	Iron	193	
7439-92-1	Lead	6.5	
7439-95-4	Magnesium	269	
7439-96-5	Manganese	5.0	U
7439-97-6	Mercury	0.10	U
7440-02-0	Nickel	11.8	
7440-09-7	Potassium	2580	
7782-49-2	Selenium	1.0	U
7440-22-4	Silver	5.0	U
7440-23-5	Sodium	927	
7440-28-0	Thallium	5.0	U
7440-62-2	Vanadium	1.0	U
7440-66-6	Zinc	42.4	
	Cyanide		

NOTE: C= CONCENTRATION, WHERE U INDICATES THE SAMPLE IS UNDETECTED AT THAT LEVEL.

Samples reported on an as received basis .

FH T-4

00030

GENERAL ANALYSIS DATA SHEET

NYTEST ENVIRONMENTAL INC.

SAMPLE NO.

FHT-05

Lab Name: NYTEST ENVIRONMENTAL INC. PROJECT No.: 9017236

Lab Code: 10195 LOGIN No: 5906

Matrix (soil/water): MISC.

Lab Sample ID: 590621

Date Received: 09/08/90

Concentration Units (mg/l or mg/kg): mg/kg

CAS No.	Analyte	Concentration	C
7429-90-5	Aluminum	38.4	
7440-36-0	Antimony	5.0	U
7440-38-2	Arsenic	1.0	U
7440-39-3	Barium	10.0	U
7440-41-7	Beryllium	1.0	U
7440-43-9	Cadmium	1.0	U
7440-70-2	Calcium	5580	
7440-47-3	Chromium	9.4	
7440-48-4	Cobalt	5.0	U
7440-50-8	Copper	98.1	
7439-89-6	Iron	130	
7439-92-1	Lead	5.0	U
7439-95-4	Magnesium	271	
7439-96-5	Manganese	5.0	U
7439-97-6	Mercury	0.10	U
7440-02-0	Nickel	5.7	
7440-09-7	Potassium	2580	
7782-49-2	Selenium	1.0	U
7440-22-4	Silver	5.0	U
7440-23-5	Sodium	940	
7440-28-0	Thallium	5.0	U
7440-62-2	Vanadium	1.0	U
7440-66-6	Zinc	33.8	
	Cyanide		

NOTE: C= CONCENTRATION, WHERE U INDICATES THE SAMPLE IS UNDETECTED AT THAT LEVEL.

Samples reported on an as received basis .

GENERAL ANALYSIS DATA SHEET

NYTEST ENVIRONMENTAL INC.

SAMPLE NO.

FHT-3A

Lab Name: NYTEST ENVIRONMENTAL INC. PROJECT No.: 9017236

Lab Code: 10195 LOGIN No: 5906

Matrix (soil/water): MISC.

Lab Sample ID: 590617

Date Received: 09/08/90

Concentration Units (mg/l or mg/kg): mg/kg

CAS No.	Analyte	Concentration	C
7429-90-5	Aluminum	39.1	
7440-36-0	Antimony	5.0	U
7440-38-2	Arsenic	1.0	U
7440-39-3	Barium	10.0	U
7440-41-7	Beryllium	1.0	U
7440-43-9	Cadmium	1.0	U
7440-70-2	Calcium	7680	
7440-47-3	Chromium	11.7	
7440-48-4	Cobalt	5.0	U
7440-50-8	Copper	586	
7439-89-6	Iron	293	
7439-92-1	Lead	5.0	U
7439-95-4	Magnesium	326	
7439-96-5	Manganese	5.0	U
7439-97-6	Mercury	0.10	
7440-02-0	Nickel	6.4	
7440-09-7	Potassium	2410	
7782-49-2	Selenium	1.0	U
7440-22-4	Silver	5.0	U
7440-23-5	Sodium	1140	
7440-28-0	Thallium	5.0	
7440-62-2	Vanadium	1.0	U
7440-66-6	Zinc	47.7	
	Cyanide		

NOTE: C= CONCENTRATION, WHERE U INDICATES THE SAMPLE IS UNDETECTED AT THAT LEVEL.

Samples reported on an as received basis .

GENERAL ANALYSIS DATA SHEET

NYTEST ENVIRONMENTAL INC.

SAMPLE NO.

FHT-3B

Lab Name: NYTEST ENVIRONMENTAL INC. PROJECT No.: 9017236

Lab Code: 10195 LOGIN No: 5906

Matrix (soil/water): MISC.

Lab Sample ID: 590618

Date Received: 09/08/90

Concentration Units (mg/l or mg/kg): mg/kg

CAS No.	Analyte	Concentration	C
7429-90-5	Aluminum	32.0	
7440-36-0	Antimony	5.0	U
7440-38-2	Arsenic	1.0	U
7440-39-3	Barium	10.0	U
7440-41-7	Beryllium	1.0	U
7440-43-9	Cadmium	1.0	U
7440-70-2	Calcium	5080	
7440-47-3	Chromium	7.8	
7440-48-4	Cobalt	5.0	U
7440-50-8	Copper	66.2	
7439-89-6	Iron	156	
7439-92-1	Lead	5.0	U
7439-95-4	Magnesium	235	
7439-96-5	Manganese	5.0	U
7439-97-6	Mercury	0.10	U
7440-02-0	Nickel	5.8	
7440-09-7	Potassium	2320	
7782-49-2	Selenium	1.0	U
7440-22-4	Silver	5.0	U
7440-23-5	Sodium	851	
7440-28-0	Thallium	5.0	
7440-62-2	Vanadium	1.0	U
7440-66-6	Zinc	35.0	
	Cyanide		

NOTE: C= CONCENTRATION, WHERE U INDICATES THE SAMPLE IS UNDETECTED AT THAT LEVEL.

Samples reported on an as received basis .

GENERAL ANALYSIS DATA SHEET

NYTEST ENVIRONMENTAL INC.

SAMPLE NO.

PTCF-1

Lab Name: NYTEST ENVIRONMENTAL INC. PROJECT No.: 9017236

Lab Code: 10195 LOGIN No: 5906

Matrix (soil/water): MISC.

Lab Sample ID: 590632

Date Received: 09/08/90

Concentration Units (mg/l or mg/kg): mg/kg

CAS No.	Analyte	Concentration	C
7429-90-5	Aluminum	34.7	
7440-36-0	Antimony	5.0	U
7440-38-2	Arsenic	1.0	U
7440-39-3	Barium	41.5	
7440-41-7	Beryllium	1.0	U
7440-43-9	Cadmium	1.0	U
7440-70-2	Calcium	8820	
7440-47-3	Chromium	12.9	
7440-48-4	Cobalt	5.0	U
7440-50-8	Copper	74.5	
7439-89-6	Iron	120	
7439-92-1	Lead	5.0	U
7439-95-4	Magnesium	292	
7439-96-5	Manganese	47.1	
7439-97-6	Mercury	0.10	
7440-02-0	Nickel	8.2	
7440-09-7	Potassium	1500	
7782-49-2	Selenium	1.0	U
7440-22-4	Silver	5.0	U
7440-23-5	Sodium	1380	
7440-28-0	Thallium	5.0	U
7440-62-2	Vanadium	1.0	U
7440-66-6	Zinc	11.2	
	Cyanide		

NOTE: C= CONCENTRATION, WHERE U INDICATES THE SAMPLE IS UNDETECTED AT THAT LEVEL.

Samples reported on an as received basis .

GENERAL ANALYSIS DATA SHEET

NYTEST ENVIRONMENTAL INC.

SAMPLE NO.

PTCF-2

Lab Name: NYTEST ENVIRONMENTAL INC. PROJECT No.: 9017236

Lab Code: 10195 LOGIN No: 5906

Matrix (soil/water): MISC.

Lab Sample ID: 590633

Date Received: 09/08/90

Concentration Units (mg/l or mg/kg): mg/kg

CAS No.	Analyte	Concentration	C
7429-90-5	Aluminum	30.9	
7440-36-0	Antimony	5.0	U
7440-38-2	Arsenic	1.0	U
7440-39-3	Barium	41.7	
7440-41-7	Beryllium	1.0	U
7440-43-9	Cadmium	1.0	U
7440-70-2	Calcium	9810	
7440-47-3	Chromium	11.8	
7440-48-4	Cobalt	5.0	U
7440-50-8	Copper	67.3	
7439-89-6	Iron	113	
7439-92-1	Lead	5.0	U
7439-95-4	Magnesium	292	
7439-96-5	Manganese	51.6	
7439-97-6	Mercury	0.10	U
7440-02-0	Nickel	6.3	
7440-09-7	Potassium	1600	
7782-49-2	Selenium	1.0	U
7440-22-4	Silver	5.0	U
7440-23-5	Sodium	1430	
7440-28-0	Thallium	5.0	
7440-62-2	Vanadium	1.0	U
7440-66-6	Zinc	11.5	
	Cyanide		

NOTE: C= CONCENTRATION, WHERE U INDICATES THE SAMPLE IS UNDETECTED AT THAT LEVEL.

Samples reported on an as received basis .

GENERAL ANALYSIS DATA SHEET

NYTEST ENVIRONMENTAL INC.

SAMPLE NO.

FHT-3C

Lab Name: NYTEST ENVIRONMENTAL INC. PROJECT No.: 9017236

Lab Code: 10195 LOGIN No: 5906

Matrix (soil/water): MISC.

Lab Sample ID: 590619

Date Received: 09/08/90

Concentration Units (mg/l or mg/kg): mg/kg

CAS No.	Analyte	Concentration	C
7429-90-5	Aluminum	37.3	
7440-36-0	Antimony	5.0	U
7440-38-2	Arsenic	1.0	U
7440-39-3	Barium	10.0	U
7440-41-7	Beryllium	1.0	U
7440-43-9	Cadmium	1.0	U
7440-70-2	Calcium	6680	
7440-47-3	Chromium	10.6	
7440-48-4	Cobalt	5.0	U
7440-50-8	Copper	351	
7439-89-6	Iron	232	
7439-92-1	Lead	5.0	U
7439-95-4	Magnesium	268	
7439-96-5	Manganese	5.0	U
7439-97-6	Mercury	0.10	U
7440-02-0	Nickel	7.2	
7440-09-7	Potassium	2590	
7782-49-2	Selenium	1.0	U
7440-22-4	Silver	5.0	U
7440-23-5	Sodium	935	
7440-28-0	Thallium	5.0	
7440-62-2	Vanadium	1.0	U
7440-66-6	Zinc	43.2	
	Cyanide		

NOTE: C= CONCENTRATION, WHERE U INDICATES THE SAMPLE IS UNDETECTED AT THAT LEVEL.

Samples reported on an as received basis .

GENERAL ANALYSIS DATA SHEET

NYTEST ENVIRONMENTAL INC.

SAMPLE NO.

PTCF-3

Lab Name: NYTEST ENVIRONMENTAL INC. PROJECT No.: 9017236

Lab Code: 10195 LOGIN No: 5906

Matrix (soil/water): MISC.

Lab Sample ID: 590634

Date Received: 09/08/90

Concentration Units (mg/l or mg/kg): mg/kg

CAS No.	Analyte	Concentration	C
7429-90-5	Aluminum	44.0	
7440-36-0	Antimony	5.0	U
7440-38-2	Arsenic	1.0	U
7440-39-3	Barium	41.8	
7440-41-7	Beryllium	1.0	U
7440-43-9	Cadmium	1.0	U
7440-70-2	Calcium	9460	
7440-47-3	Chromium	14.0	
7440-48-4	Cobalt	5.0	U
7440-50-8	Copper	74.6	
7439-89-6	Iron	146	
7439-92-1	Lead	5.0	U
7439-95-4	Magnesium	286	
7439-96-5	Manganese	54.8	
7439-97-6	Mercury	0.10	U
7440-02-0	Nickel	8.4	
7440-09-7	Potassium	1520	
7782-49-2	Selenium	1.0	U
7440-22-4	Silver	5.0	U
7440-23-5	Sodium	1360	
7440-28-0	Thallium	5.0	U
7440-62-2	Vanadium	1.0	U
7440-66-6	Zinc	12.0	
	Cyanide		

NOTE: C= CONCENTRATION, WHERE U INDICATES THE SAMPLE IS UNDETECTED AT THAT LEVEL.

Samples reported on an as received basis .

PRETEST CF -3

00037

GENERAL ANALYSIS DATA SHEET

NYTEST ENVIRONMENTAL INC.

SAMPLE NO.

PTFH-1

Lab Name: NYTEST ENVIRONMENTAL INC. PROJECT No.: 9017236

Lab Code: 10195 LOGIN No: 5906

Matrix (soil/water): MISC.

Lab Sample ID: 590629

Date Received: 09/08/90

Concentration Units (mg/l or mg/kg): mg/kg

CAS No.	Analyte	Concentration	C
7429-90-5	Aluminum	5.0	U
7440-36-0	Antimony	5.0	U
7440-38-2	Arsenic	1.0	U
7440-39-3	Barium	10.0	U
7440-41-7	Beryllium	1.0	U
7440-43-9	Cadmium	1.0	U
7440-70-2	Calcium	7630	
7440-47-3	Chromium	44.1	
7440-48-4	Cobalt	5.0	U
7440-50-8	Copper	190	
7439-89-6	Iron	188	
7439-92-1	Lead	5.0	U
7439-95-4	Magnesium	358	
7439-96-5	Manganese	5.3	
7439-97-6	Mercury	0.10	U
7440-02-0	Nickel	29.8	
7440-09-7	Potassium	2590	
7782-49-2	Selenium	1.0	U
7440-22-4	Silver	5.0	U
7440-23-5	Sodium	1120	
7440-28-0	Thallium	5.0	U
7440-62-2	Vanadium	1.0	U
7440-66-6	Zinc	37.6	
	Cyanide		

NOTE: C= CONCENTRATION, WHERE U INDICATES THE SAMPLE IS UNDETECTED AT THAT LEVEL.

Samples reported on an as received basis .

PRETEST FH -1

00038

GENERAL ANALYSIS DATA SHEET

NYTEST ENVIRONMENTAL INC.

SAMPLE NO.

PTFH-2

Lab Name: NYTEST ENVIRONMENTAL INC. PROJECT No.: 9017236

Lab Code: 10195 LOGIN No: 5906

Matrix (soil/water): MISC.

Lab Sample ID: 590630

Date Received: 09/08/90

Concentration Units (mg/l or mg/kg): mg/kg

CAS No.	Analyte	Concentration	C
7429-90-5	Aluminum	5.0	U
7440-36-0	Antimony	5.0	U
7440-38-2	Arsenic	1.0	U
7440-39-3	Barium	10.0	U
7440-41-7	Beryllium	1.0	U
7440-43-9	Cadmium	1.0	U
7440-70-2	Calcium	7180	
7440-47-3	Chromium	35.5	
7440-48-4	Cobalt	5.0	U
7440-50-8	Copper	170	
7439-89-6	Iron	153	
7439-92-1	Lead	5.0	U
7439-95-4	Magnesium	282	
7439-96-5	Manganese	5.0	U
7439-97-6	Mercury	0.10	U
7440-02-0	Nickel	22.0	
7440-09-7	Potassium	2480	
7782-49-2	Selenium	1.0	U
7440-22-4	Silver	5.0	U
7440-23-5	Sodium	1160	
7440-28-0	Thallium	5.0	U
7440-62-2	Vanadium	1.0	U
7440-66-6	Zinc	36.7	
	Cyanide		

NOTE: C= CONCENTRATION, WHERE U INDICATES THE SAMPLE IS UNDETECTED AT THAT LEVEL.

Samples reported on an as received basis .

PRETEST FH -2

GENERAL ANALYSIS DATA SHEET

NYTEST ENVIRONMENTAL INC.

SAMPLE NO.

PTFH-3

Lab Name: NYTEST ENVIRONMENTAL INC. PROJECT No.: 9017236

Lab Code: 10195 LOGIN No: 5906

Matrix (soil/water): MISC.

Lab Sample ID: 590631

Date Received: 09/08/90

Concentration Units (mg/l or mg/kg): mg/kg

CAS No.	Analyte	Concentration	C
7429-90-5	Aluminum	5.0	U
7440-36-0	Antimony	5.0	U
7440-38-2	Arsenic	1.0	U
7440-39-3	Barium	10.0	U
7440-41-7	Beryllium	1.0	U
7440-43-9	Cadmium	1.0	U
7440-70-2	Calcium	7320	
7440-47-3	Chromium	35.1	
7440-48-4	Cobalt	5.0	U
7440-50-8	Copper	175	
7439-89-6	Iron	150	
7439-92-1	Lead	5.0	U
7439-95-4	Magnesium	282	
7439-96-5	Manganese	5.0	U
7439-97-6	Mercury	0.22	
7440-02-0	Nickel	21.6	
7440-09-7	Potassium	2440	
7782-49-2	Selenium	1.0	U
7440-22-4	Silver	5.0	U
7440-23-5	Sodium	1120	
7440-28-0	Thallium	5.0	U
7440-62-2	Vanadium	1.0	U
7440-66-6	Zinc	34.3	
	Cyanide		

NOTE: C= CONCENTRATION, WHERE U INDICATES THE SAMPLE IS UNDETECTED AT THAT LEVEL.

Samples reported on an as received basis .

PRETEST FH -3

00040

nytest environmental inc.

Log In No: 5906

Sample Identification and Results

Method Blank

Sample No: TBLK1
Lab Sample ID No: TSBLK

Results in mg/kg: (DRY WT. BASIS)

TCL Metals (all 23 metals.)	Found	
Aluminum	< 5.0	
Antimony	< 5.0	
Arsenic	< 1.0	
Barium	< 10.0	
Beryllium	< 1.0	
Cadmium	< 1.0	
Calcium	< 1.0	
Chromium	< 5.0	
Cobalt	< 5.0	
Copper	< 5.0	
Iron	< 5.0	
Lead	< 5.0	
Magnesium	< 5.0	
Manganese	< 5.0	
Mercury	< 0.1	
Nickel	< 5.0	
Potassium	< 5.0	
Selenium	< 1.0	
Silver	< 5.0	
Sodium	< 5.0	
Thallium	< 10.0	
Vanadium	< 1.0	
Zinc	< 5.0	

Appendix C

NYTEST ENVIRONMENTAL INC.

Sample Preparation:

All organisms surviving the solid phase must be placed in sediment-free water for 24 hours to purge their digestive tracts of sediment. Organisms surviving the solid phase in both the test and reference treatment should then be saved for bioaccumulation analyses. The individual groups of organisms will be placed in a tissuemizer to produce a homogenous sample.

NYTEST ENVIRONMENTAL METHOD: BA201

PARAMETER: Acid Digestion of Sediments, Sludges, Soils, Tissues

Scope and Application :

" This method is an acid digestion procedure used to prepare sediments, sludges, and soil samples for analysis by flame or furnace atomic absorption spectrometry (FLAA and GFAA, respectively) or by inductively coupled argon plasma spectroscopy (ICP).

Summary of Method:

" A representative 1- to 2-g sample is digested in nitric acid and hydrogen peroxide. The digestate is then refluxed with either nitric acid or hydrochloric acid. Dilute HCL is used as the final reflux acid for (1) the ICP analysis of As, and Se, and (2) the flame AA or ICP analysis of AL, Ba, BE, Ca, Cd, Cr, Co, Cu, Fe, Mo, Pb, Ni, K, Na, Tl, V and Zn. Dilute nitric acid is employed as the final dilution acid for the furnace AA analysis of As, Be, Cd, Cr, Co, Pb, Mo, Se, Tl, and V."

Interferences:

" Sludge samples can contain diverse matrix types, each of which may present its own analytical challenge. Spiked samples and any relevant standard reference material (LCS) should be processed to aid in determining whether Method 3050 is applicable to a given waste".

Apparatus:

1) Beakers

2) Watch glasses

3) Drying oven : that can be maintained at 30 deg. C.

4) Thermometer: That covers a range of 0 to 200 deg C.

5) Whatman No. 41 filter paper (or equivalent)

Reagents:

1) ASTM Type II water

2) Concentrated nitric acid, reagent grade (HNO_3)

3) Concentrated hydrochloric acid, reagent grade (HCL)

4) Hydrogen Peroxide (30%) (H_2O_2)

Procedure:

1) Mix the sample thoroughly to achieve homogeneity. For each digestion procedure, weigh to the nearest 0.01g and transfer to a beaker a 1 gram portion of the sample.

2) Add 10 mL of 1:1 HNO_3, mix the slurry, and cover with a watch glass. Heat the sample to 95 deg. C. and reflux for 10 to 15 minutes without boiling. Allow the sample to cool, add 5 mL of concentrated HNO_3, replace the watch glass, and reflux for 30 min. Repeat this last step to ensure complete digestion. Using a watch glass, allow the solution to evaporate to 5mL without boiling, while maintaining a covering of solution over the bottom of the beaker.

3) Allow the sample to cool and 2 ml of Type II water and 3 mL of 30% H_2O_2. Cover the beaker with a watch glass and return the covered beaker to the hot plate for warming and to start the peroxide reaction. Care must be taken to ensure that losses do not occur due to excessively vigorous effervescence. Heat until effervescence subsides and cool the beaker.

4) Continue to add 30% H_2O_2 in 1-mL aliquots with warming until the general sample appearance is unchanged. Do not add more than a total of 10 mL 30% H_2O_2.

5) IF the sample is being prepared for the ICP analysis of As, Se, or the flame or ICP analysis of Al, Ba, Be, Ca, Cd, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Na, Tl, V, and Zn, then add 5 mL of conc. HCL and 10 mL of Type II water, return the covered beaker to the hot plate, and reflux for an additional 15 minutes without boiling, After cooling, dilute to 100 mL with Type II water. Particulates in the digestate that may clog the nebulizer should be removed by filtration. Filter the sample through Whatman No. 41 filter paper and dilute to 100 mL with Type II water.

The diluted sample has an approximate acid concentration of 5.0% (v/v) HCL and 5.0% (v/v) HNO_3. The sample is now ready for analysis.

6) If the sample is being prepared for the furnace analysis of As, Be, Cd, Cr, Co, Pb, Mo, Se, Tl, and V, cover the sample with a watch glass and continue heating the acid-peroxide digestate until the volume

has been reduced to approximately 5 mL. After cooling, dilute to 100 mL with Type II water. Particulates in the digestate should be removed by filtration. Filter the sample through Whatman No. 41 filter paper and dilute to 100 mL with Type II water.

The diluted sample has an approximate acid concentration of 5.0% (v/v) HNO_3. The sample is now ready for analysis. (Matrix modifier added at the time of analysis).

DIGESTION PROCEDURES FOR ROUTINE (NON - CLP) ANALYSIS

1. Spike sample analysis :

* One spike sample must be analyzed for each days run . (20 SAMPLES)

* Samples identified as field or trip blanks can not be used for spike sample analysis.

* The spike is added before the digestion (i.e., prior to the addition of other reagents).

* A spike sample must be prepared for both Furnace (F) and ICP (A) samples.

* Prepare spike as follows:

Water ICP (A) sample: add 1 ml of ICP spike solution A, B, C and Ag to 100 mls of sample.

Water Furnace (F) sample: add 1 ml of Furnace spike solution to 100 mls of sample.

Soil ICP (A) sample: add 2 ml of ICP spike solution A, B, C and Ag to 1 gram of sample.

Soil Furnace (F) sample: add 1 ml of Furnace spike solution to 1 gram of sample.

NYTEST ENVIRONMENTAL METHOD : BA200

PARAMETER: Analysis of Fish for Mercury

Scope and application:

"This method is used for determination of total mercury (organic and inorganic) in fish".

" The range of the method is 0.2 to 5 ug/g but may be extended above or below the normal instrument and recorder control".

Summary of the Method:

" A weighted portion of the sample is digested with sulfuric and nitric acid at 58 deg. C. followed by overnight oxidation with potassium permanganate at room temperature. Mercury is subsequently measured by the conventional cold vapor technique".

Procedure :

1) " Weigh 0.2 to 0.3-portions of the sample and place in the bottom of a dry BOD bottle. Care must be taken that none of the sample adheres to the side of the bottle. Add 4-mL of conc. H_2SO_4, and 1-mL of conc. HNO_3 and place in a water bath maintained at 58 deg. C. until the tissue is completely dissolved (30 to 60 minutes)".

2) " Cool to 4 deg. C. in an ice bath and cautiously add 5-mL of potassium permanganate solution in 1 ml increments. Add an additional 10-ml or more of permanganate, as necessary to maintain oxidizing conditions. Allow to stand overnight at room temperature".

3) " Add enough distilled water to bring the total volume to approximately 125-mL. Add 6-mL of sodium chloride hydroxylamine sulfate solution to reduce the excess permanganate".

4) Wait at least 30 seconds after the addition of hydroxylamine. Treating each bottle individually, add 5-mL of the stannous sulfate solution and immediately attach the bottle to the aeration apparatus.

Calculation:

1) Measure the peak height of the unknown from

the chart and read the mercury value from the standard curve.

2) Calculate the mercury concentration in the sample by the formula:

$$\text{ug Hg/gram} = \frac{\text{ug Hg in aliquot}}{\text{wt. of aliquot in grams}}$$

Reference : " Interim Methods for Sampling and Analysis of Priority Pollutants in sediment and Fish Tissues, August 1977".

Appendix D

SAMPLE INFORMATION RECORD

SITE Union Road SAMPLE CREW E Santoro/T Maher/J Lovejoy

SAMPLE LOCATION/WELL NO. UR MA SE 1 Marsh Area Sediment Sample

FIELD SAMPLE I.D. NUMBER UR MA SE 1 DATE 8/14/90

TIME 17:12 WEATHER clear TEMPERATURE 80°

SAMPLE TYPE:

GROUND WATER _____ SEDIMENT X

SURFACE WATER/STREAM _____ AIR _____

SOIL _____ OTHER (Describe, i.e., septage, leachate) _____

WELL INFORMATION (fill out for groundwater samples):

DEPTH TO WATER _____ MEASUREMENT METHOD _____

DEPTH OF WELL _____ MEASUREMENT METHOD _____

VOLUME REMOVED _____ REMOVAL METHOD _____

FIELD TEST RESULTS:

COLOR Brown pH 7.23 ODOR pet. hydrocarbon odor

TEMPERATURE (°F) 13.1°C SPECIFIC CONDUCTANCE (umhos/cm) 835

OTHER (OVA, Methane meter, etc.) MicroTip <1 ppm NTU = 430

CONSTITUENTS SAMPLED:

10d Bioassay test

REMARKS: Lots of organic material, rotting leaves, items mixed with material, visible oil sheen and black oil deposits floating on surface of marsh.

WELL CASING VOLUMES

GAL/FT	1-1/4" = 0.077	2" = 0.16	3" = 0.37	4" = 0.65
	1-1/2" = 0.10	2-1/2" = 0.24	3-1/2" = 0.50	6" = 1.46

SAMPLE INFORMATION RECORD

SITE Union Road SAMPLE CREW E. Santoro/J. Lovejoy

SAMPLE LOCATION/WELL NO. _____

FIELD SAMPLE I.D. NUMBER UR MA AO 1-3 DATE 8/15/90

TIME 10:55 WEATHER sunny TEMPERATURE 85-90

SAMPLE TYPE:

GROUND WATER _____ SEDIMENT _____

SURFACE WATER/STREAM _____ AIR _____

SOIL _____ OTHER (Describe, i.e., septage, leachate) Aquatic organisms & earthworms.

WELL INFORMATION (fill out for groundwater samples):

DEPTH TO WATER _____ MEASUREMENT METHOD _____

DEPTH OF WELL _____ MEASUREMENT METHOD _____

VOLUME REMOVED _____ REMOVAL METHOD _____

FIELD TEST RESULTS:

COLOR lt. brown pH 7.54 ODOR _____

TEMPERATURE (°F) 18°C SPECIFIC CONDUCTANCE (umhos/cm) 625

OTHER (OVA, Methane meter, etc.) Turbidity - 13.8 NTU

CONSTITUENTS SAMPLED:

6 seine tows - No samples

3 earthworm samples - 10' x 3' dug area 130-140 worms 50 worms sample
Ranging in size from .25 - 130 mm in length.

REMARKS: Oil globules on surface

WELL CASING VOLUMES

GAL/FT	1-1/4" = 0.077	2" = 0.16	3" = 0.37	4" = 0.65
	1-1/2" = 0.10	2-1/2" = 0.24	3-1/2" = 0.50	6" = 1.46

SAMPLE INFORMATION RECORD

SITE Union Road SAMPLE CREW E. Santoro/J. Lovejoy

SAMPLE LOCATION/WELL NO. upland area north of northern site gate - ponded area

FIELD SAMPLE I.D. NUMBER URUPAQ 1,2,3 DATE 8/15/90

TIME 12:30 WEATHER clear, sunny TEMPERATURE 80s

SAMPLE TYPE:

GROUND WATER _____ SEDIMENT _____

SURFACE WATER/STREAM _____ AIR _____

SOIL _____ OTHER (Describe, i.e., septage, leachate) aquatic samples

WELL INFORMATION (fill out for groundwater samples):

DEPTH TO WATER _____ MEASUREMENT METHOD _____

DEPTH OF WELL _____ MEASUREMENT METHOD _____

VOLUME REMOVED _____ REMOVAL METHOD _____

FIELD TEST RESULTS:

COLOR medium brown pH 8.10 ODOR none

TEMPERATURE (°F) 24.25°C SPECIFIC CONDUCTANCE (umhos/cm) 250

OTHER (OVA, Methane meter, etc.) Turbidity 680 NTUs

CONSTITUENTS SAMPLED:

Aquatic samples small crawfish medium crawfish tadpoles

80 + 12 med. samples taken 10 mod. samples taken

REMARKS: Upland area adjacent to site.

WELL CASING VOLUMES

GAL/FT				
	1-1/4" = 0.077	2" = 0.16	3" = 0.37	4" = 0.65
	1-1/2" = 0.10	2-1/2" = 0.24	3-1/2" = 0.50	6" = 1.46

SAMPLE INFORMATION RECORD

SITE Union Road SAMPLE CREW E. Santoro/ J. Lovejoy

SAMPLE LOCATION/WELL NO. URSBC Slate Bottom Creek (Zone B)

FIELD SAMPLE I.D. NUMBER URSBCAQ 1 DATE 8/15/90

TIME 4:15 pm WEATHER p. cloudy TEMPERATURE 80°

SAMPLE TYPE:

GROUND WATER _____ SEDIMENT _____

SURFACE WATER/STREAM X AIR _____

SOIL _____ OTHER (Describe, i.e., septage, leachate) _____

WELL INFORMATION (fill out for groundwater samples):

DEPTH TO WATER _____ MEASUREMENT METHOD _____

DEPTH OF WELL _____ MEASUREMENT METHOD _____

VOLUME REMOVED _____ REMOVAL METHOD _____

FIELD TEST RESULTS:

COLOR clear-lt. brown pH 8.80 ODOR slight, organic

TEMPERATURE (°F) 27.9°C SPECIFIC CONDUCTANCE (umhos/cm) 46.0

OTHER (OVA, Methane meter, etc.) Turbidity = 33.6 NTU

CONSTITUENTS SAMPLED:

_____ _____ _____ _____

_____ _____ _____ _____

REMARKS: Zone B Slate Bottom Creek

WELL CASING VOLUMES				
GAL/FT	1-1/4" = 0.077	2" = 0.16	3" = 0.37	4" = 0.65
	1-1/2" = 0.10	2-1/2" = 0.24	3-1/2" = 0.50	6" = 1.46

0919R

SAMPLE INFORMATION RECORD

SITE Union Road SAMPLE CREW E. Santoro/J. Lovejoy

SAMPLE LOCATION/WELL NO. URDLC Deer Lik Creek (Zone A)

FIELD SAMPLE I.D. NUMBER URDLCAQ 1 DATE 8/15/90

TIME 3:00 pm WEATHER p. cloudy TEMPERATURE 80°F

SAMPLE TYPE:

GROUND WATER _____ SEDIMENT _____

SURFACE WATER/STREAM X AIR _____

SOIL _____ OTHER (Describe, i.e., septage, leachate) _____

WELL INFORMATION (fill out for groundwater samples):

DEPTH TO WATER _____ MEASUREMENT METHOD _____

DEPTH OF WELL _____ MEASUREMENT METHOD _____

VOLUME REMOVED _____ REMOVAL METHOD _____

FIELD TEST RESULTS:

COLOR clear pH 8.57 ODOR none

TEMPERATURE (°F) 24.5 SPECIFIC CONDUCTANCE (umhos/cm) 528

OTHER (OVA, Methane meter, etc.) Turbidity = 11.30 NTU

CONSTITUENTS SAMPLED:

REMARKS: Zone A north of confluence with Slate Bottom Creek.

WELL CASING VOLUMES				
GAL/FT	1-1/4" = 0.077	2" = 0.16	3" = 0.37	4" = 0.65
	1-1/2" = 0.10	2-1/2" = 0.24	3-1/2" = 0.50	6" = 1.46

SAMPLE INFORMATION RECORD

SITE Union Road SAMPLE CREW J. Lovejoy

SAMPLE LOCATION/WELL NO. Deer Lik Creek/DLCTEZ

FIELD SAMPLE I.D. NUMBER URDLCTEZ DATE 8/16/90

TIME 10:30 am WEATHER p. sunny TEMPERATURE 75°

SAMPLE TYPE:

GROUND WATER _____ SEDIMENT _____

SURFACE WATER/STREAM _____ AIR _____

SOIL _____ OTHER (Describe, i.e., septage, leachate) earthworms

WELL INFORMATION (fill out for groundwater samples):

DEPTH TO WATER _____ MEASUREMENT METHOD _____

DEPTH OF WELL _____ MEASUREMENT METHOD _____

VOLUME REMOVED _____ REMOVAL METHOD _____

FIELD TEST RESULTS:

COLOR _____ pH _____ ODOR _____

TEMPERATURE (°F) _____ SPECIFIC CONDUCTANCE (umhos/cm) _____

OTHER (OVA, Methane meter, etc.) _____

CONSTITUENTS SAMPLED:

tissue samples: TCL metals

REMARKS: Refer to Deer Lik Creek aquatic samples collected 8/15/90 for field test results

WELL CASING VOLUMES

GAL/FT	1-1/4" = 0.077	2" = 0.16	3" = 0.37	4" = 0.65
	1-1/2" = 0.10	2-1/2" = 0.24	3-1/2" = 0.50	6" = 1.46

0919R

SAMPLE INFORMATION RECORD

SITE Union Road SAMPLE CREW J. Lovejoy

SAMPLE LOCATION/WELL NO. Deer Lik Creek

FIELD SAMPLE I.D. NUMBER URDLCTE 3 DATE 8/16/90

TIME 10:30 am WEATHER p. sunny TEMPERATURE 75°

SAMPLE TYPE:

GROUND WATER _____ SEDIMENT _____

SURFACE WATER/STREAM _____ AIR _____

SOIL _____ OTHER (Describe, i.e., septage, leachate) earth

WELL INFORMATION (fill out for groundwater samples):

DEPTH TO WATER _____ MEASUREMENT METHOD _____

DEPTH OF WELL _____ MEASUREMENT METHOD _____

VOLUME REMOVED _____ REMOVAL METHOD _____

FIELD TEST RESULTS:

COLOR _____ pH _____ ODOR _____

TEMPERATURE (°F) _____ SPECIFIC CONDUCTANCE (umhos/cm) _____

OTHER (OVA, Methane meter, etc.) _____

CONSTITUENTS SAMPLED:

Tissue samples for TCL metals

REMARKS: Refer to Deer Lik Creek aquatic samples collected 8/15/90 for field test results.

WELL CASING VOLUMES				
GAL/FT	1-1/4" = 0.077	2" = 0.16	3" = 0.37	4" = 0.65
	1-1/2" = 0.10	2-1/2" = 0.24	3-1/2" = 0.50	6" = 1.46

0919R

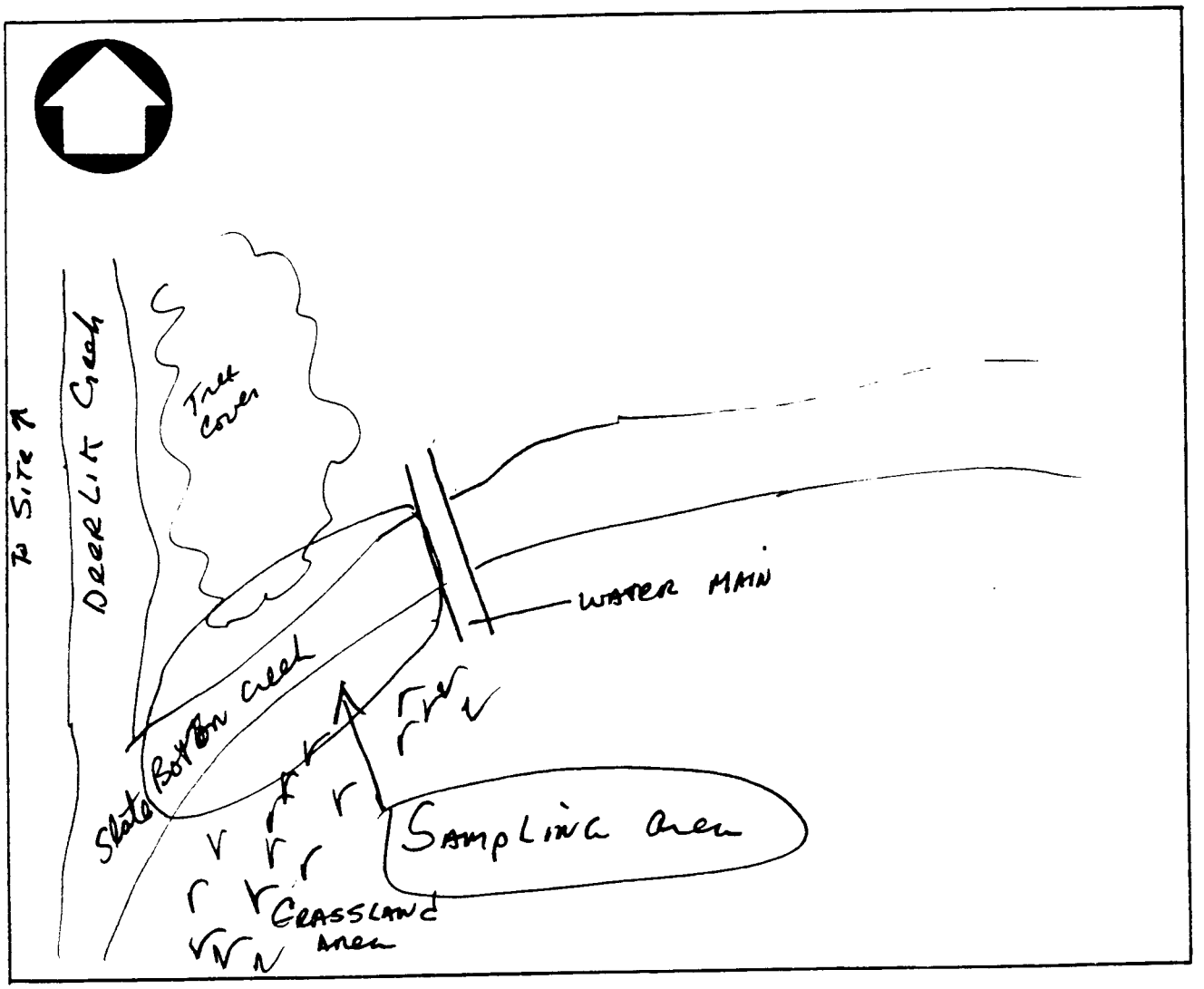
LOCATION SKETCH

Project Union Road Sample Crew E. Santoro/J. Lovejoy

Site Location Slate Bottom Creek

Sample Location(s) and/or Well Number(s) UR SBC AO

Location of sample points, wells, borings, etc., with reference to three permanent reference points. Measure all distances, clearly label roads, wells and permanent features.



0918R

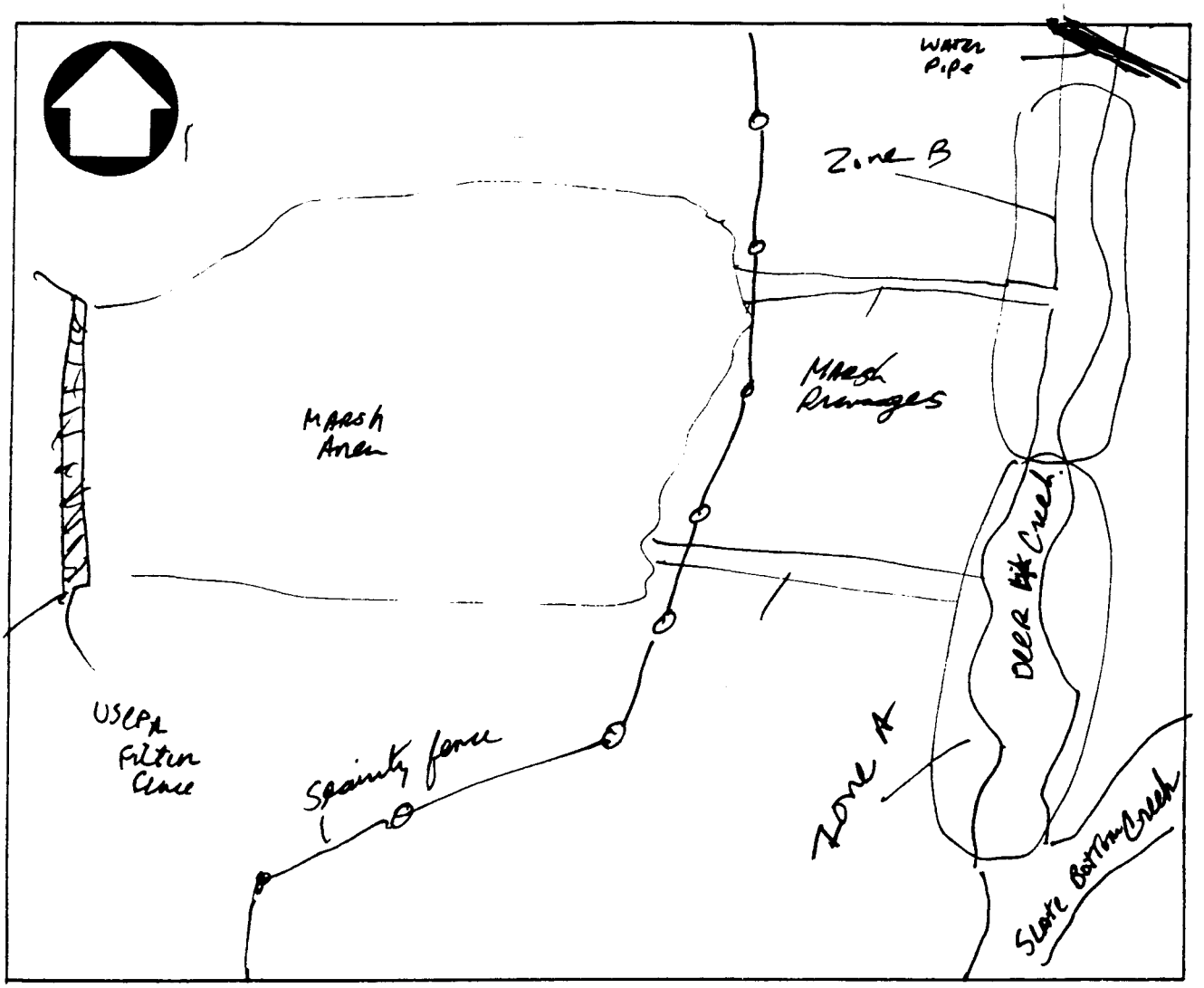
LOCATION SKETCH

Project Union Road Sample Crew E. Santoro/J. Lovejoy

Site Location Deer Lik Creek, Zone A

Sample Location(s) and/or Well Number(s) UR DLC AQ

Location of sample points, wells, borings, etc., with reference to three permanent reference points. Measure all distances, clearly label roads, wells and permanent features.



0918R

LOCATION SKETCH

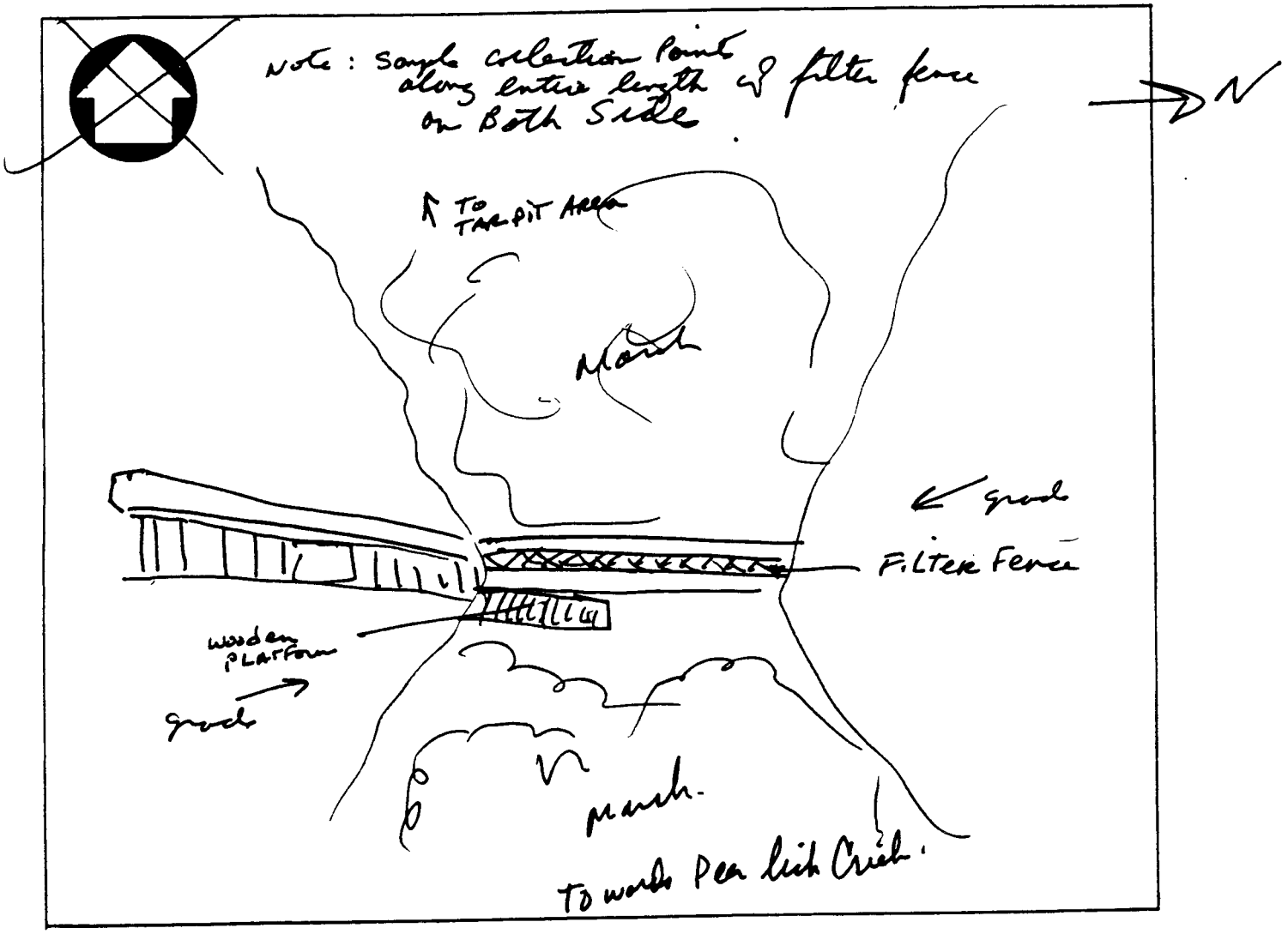
Project Union Road Sample Crew E Santoro/T Maher/J Lovejoy

Site Location Adjacent to old USEPA filter fence.

Sample Location(s) and/or Well Number(s) URMASE 1

15-1 gallon plastic bottles for sediment collection.

Location of sample points, wells, borings, etc., with reference to three permanent reference points. Measure all distances, clearly label roads, wells and permanent features.



0918R

LOCATION SKETCH

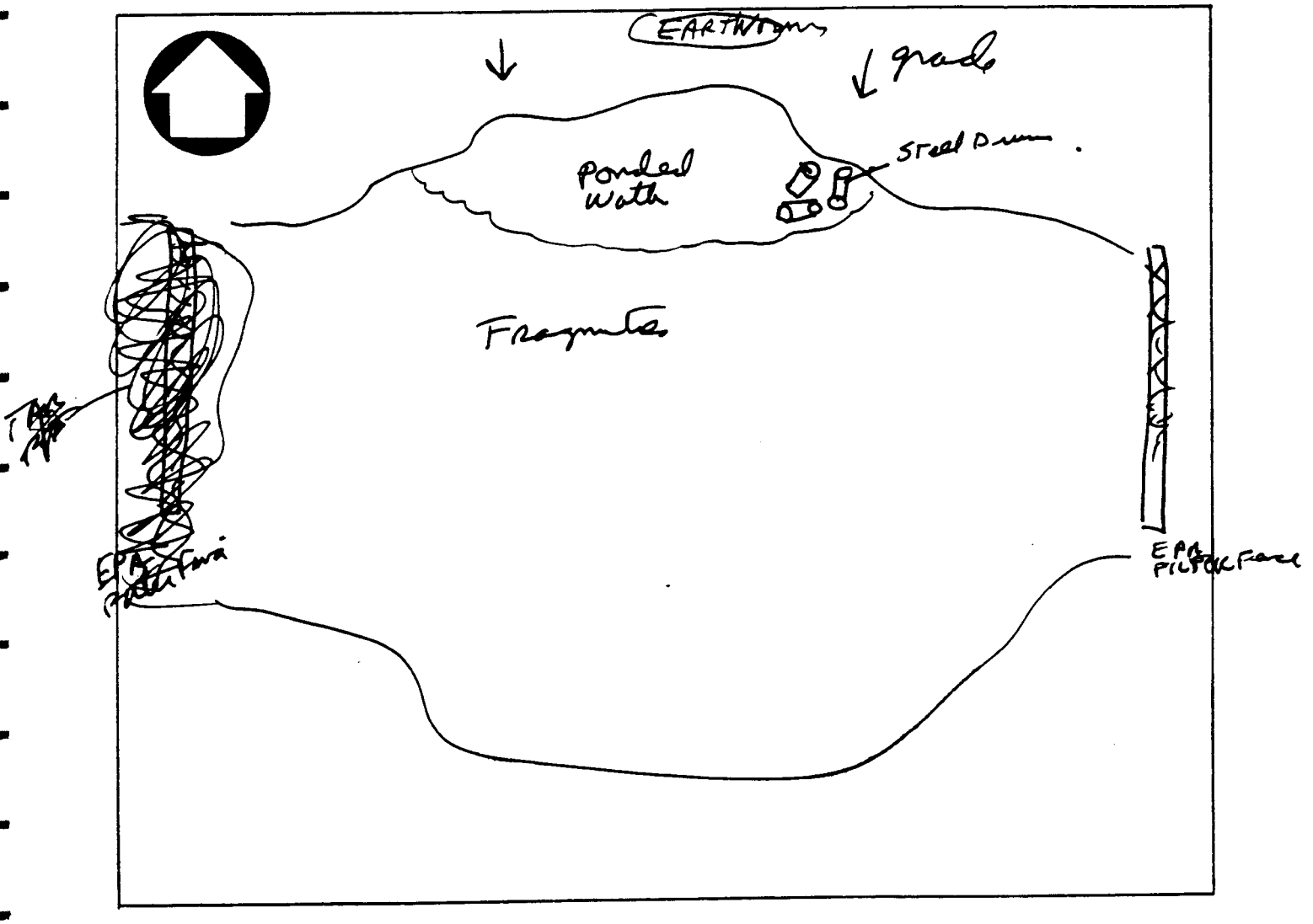
Project Union Road Sample Crew _____

Site Location Marsh area upstream of USEPA fence

Sample Location(s) and/or Well Number(s) URMATE 1,2,3

_____

Location of sample points, wells, borings, etc., with reference to three permanent reference points. Measure all distances, clearly label roads, wells and permanent features.



0918R

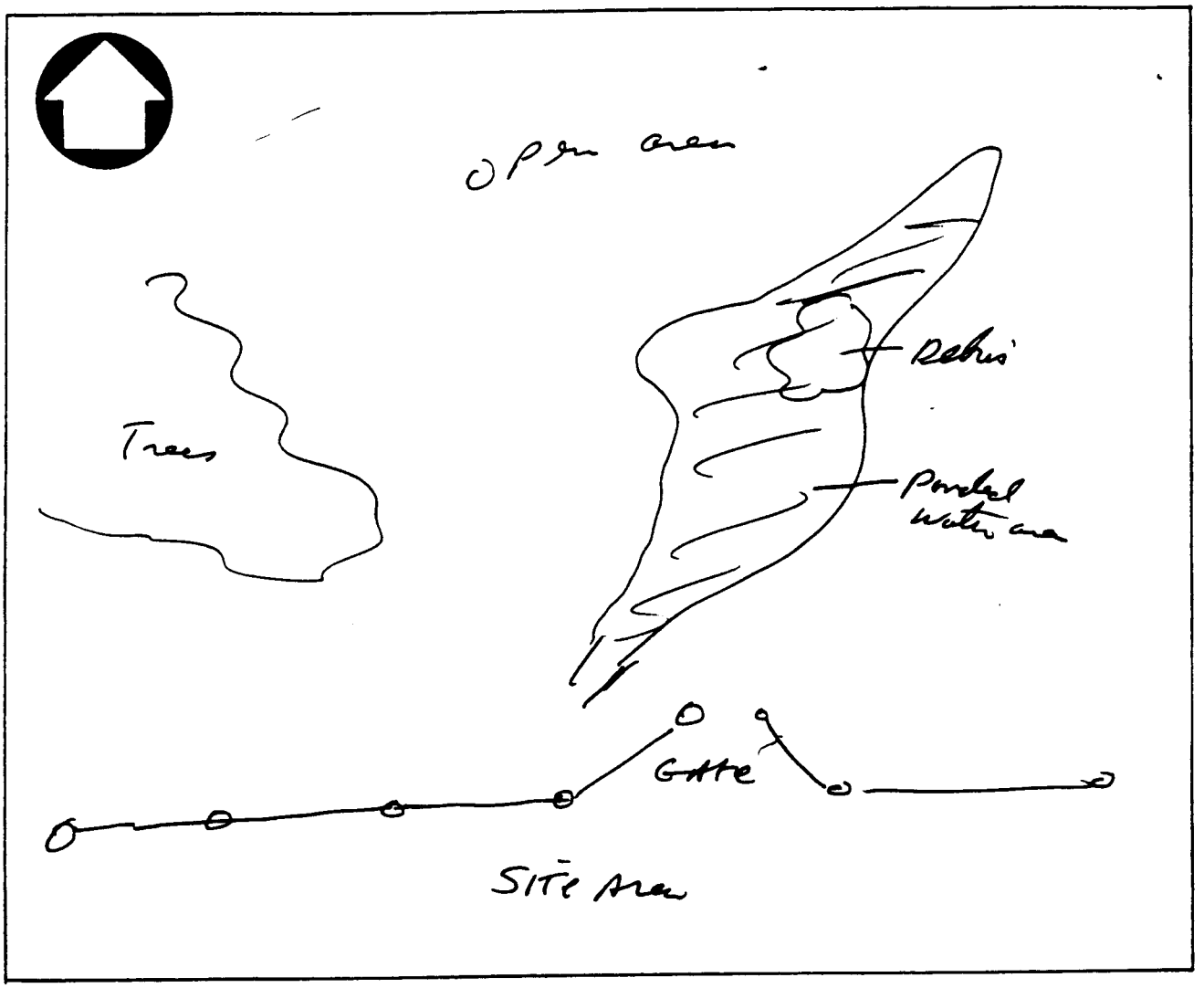
LOCATION SKETCH

Project Union Road Sample Crew E. Santoro/J. Lovejoy

Site Location upland area, ponded water adjacent to northern site entrance.

Sample Location(s) and/or Well Number(s) UR UP AQ 1,2,3

Location of sample points, wells, borings, etc., with reference to three permanent reference points. Measure all distances, clearly label roads, wells and permanent features.



0918R

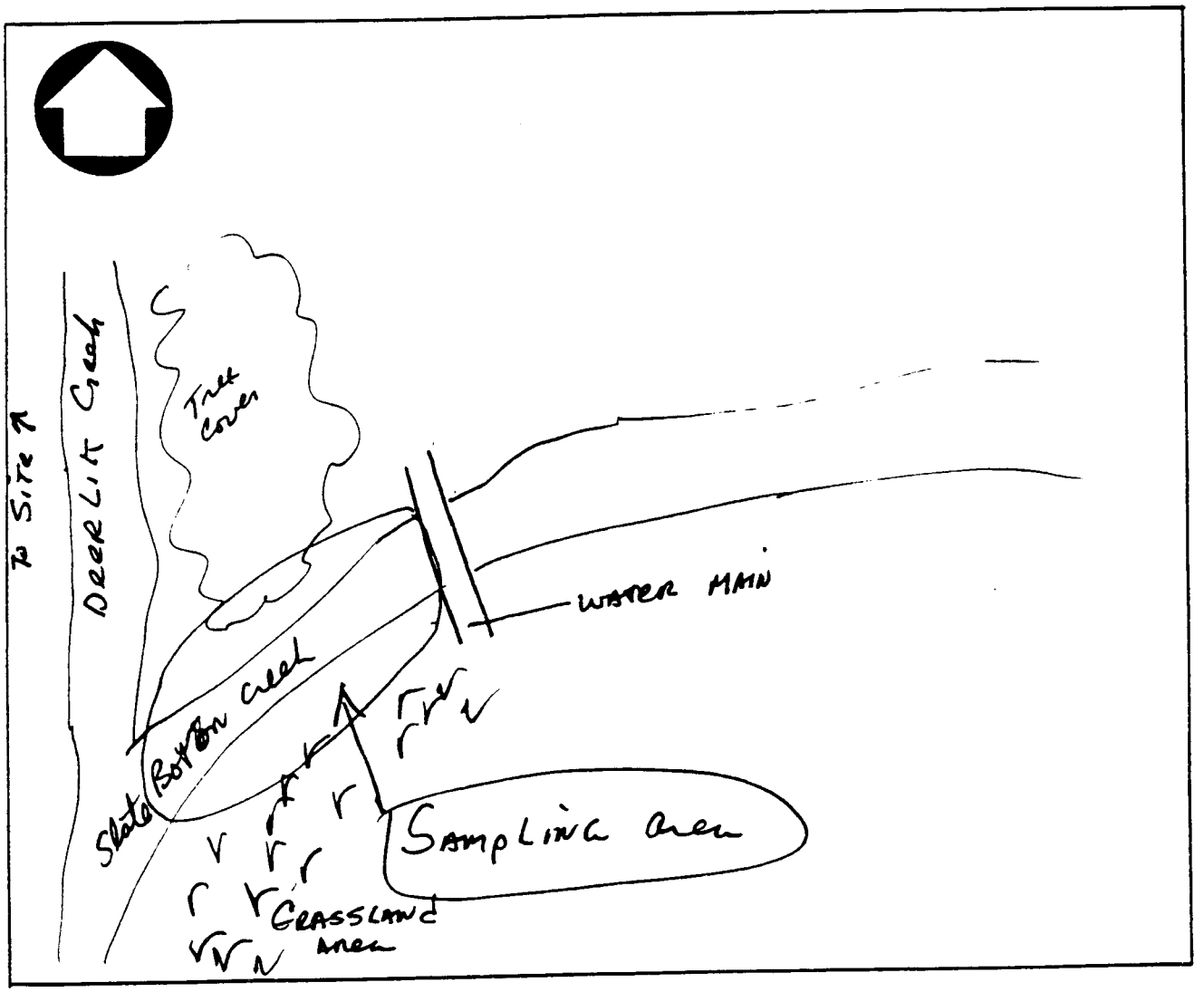
LOCATION SKETCH

Project Union Road Sample Crew E. Santoro/J. Lovejoy

Site Location Slate Bottom Creek

Sample Location(s) and/or Well Number(s) UR SBC AQ

Location of sample points, wells, borings, etc., with reference to three permanent reference points. Measure all distances, clearly label roads, wells and permanent features.



0918R

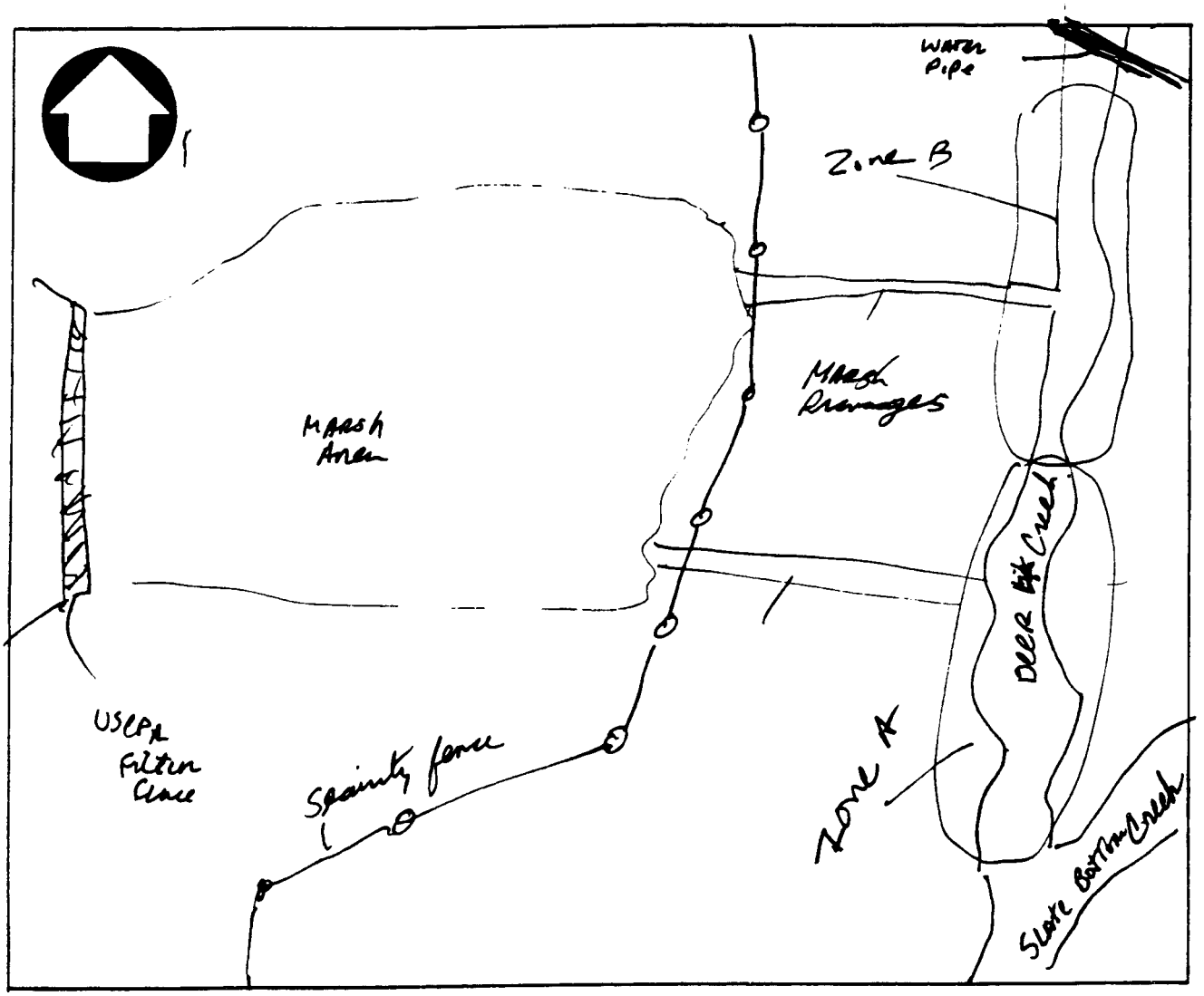
LOCATION SKETCH

Project Union Road Sample Crew E. Santoro/J. Lovejoy

Site Location Deer Lik Creek, Zone A

Sample Location(s) and/or Well Number(s) UR DLC AO

Location of sample points, wells, borings, etc., with reference to three permanent reference points. Measure all distances, clearly label roads, wells and permanent features.



0918R

LOCATION SKETCH

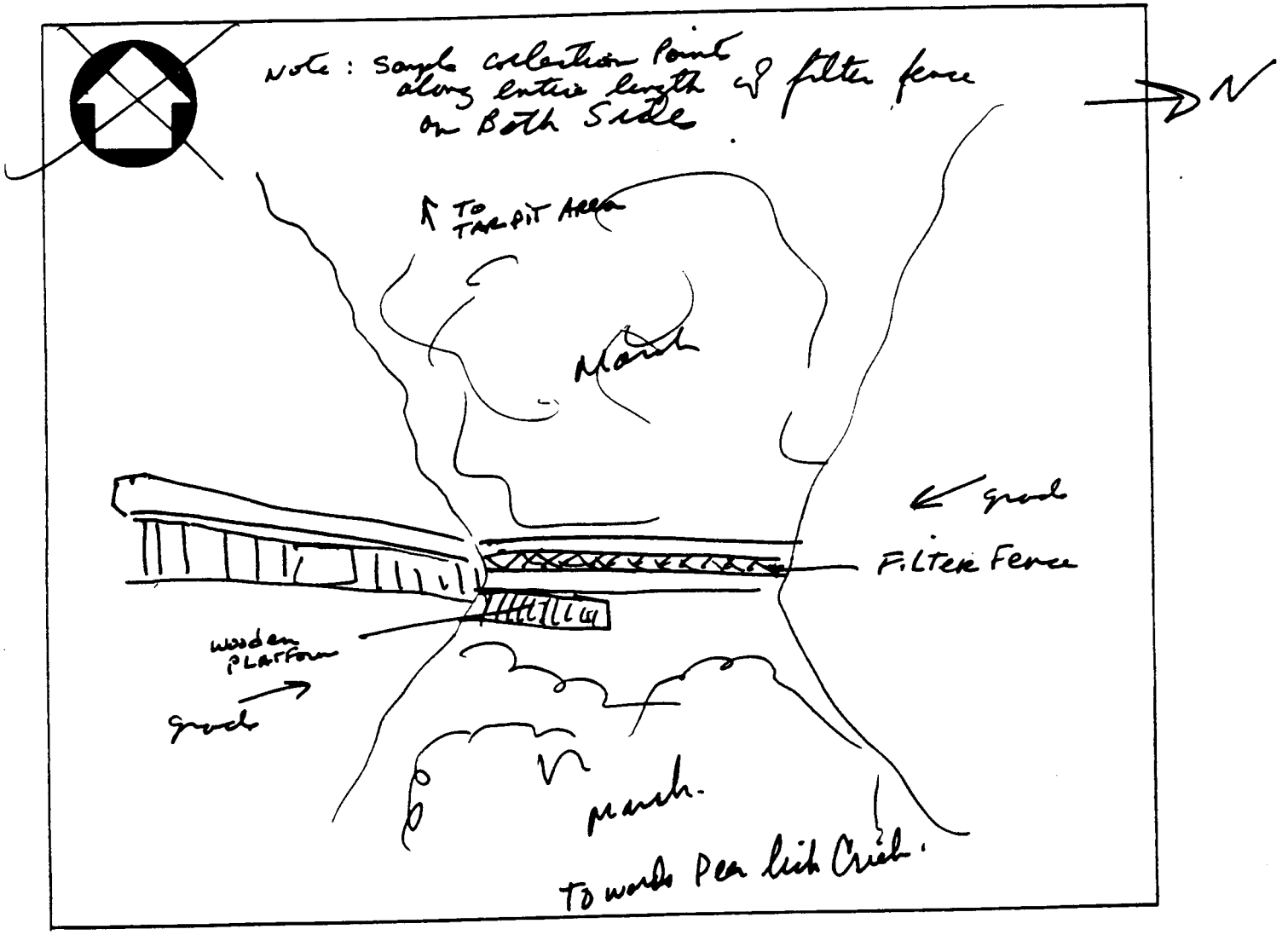
Project Union Road Sample Crew E Santoro/T Maher/J Lovejoy

Site Location Adjacent to old USEPA filter fence.

Sample Location(s) and/or Well Number(s) URMASE 1

15-1 gallon plastic bottles for sediment collection.

Location of sample points, wells, borings, etc., with reference to three permanent reference points. Measure all distances, clearly label roads, wells and permanent features.



0918R

LOCATION SKETCH

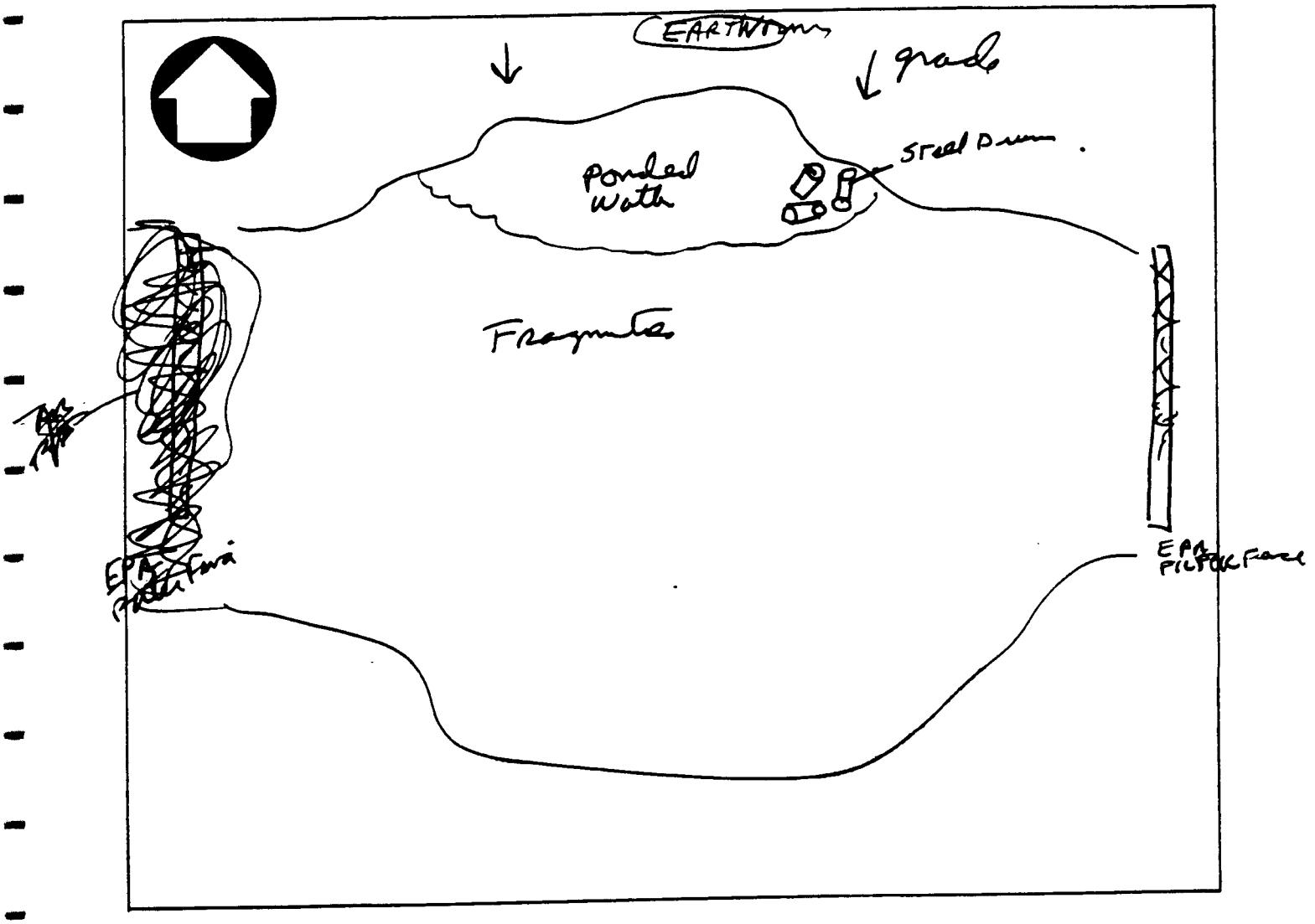
Project Union Road Sample Crew _____

Site Location Marsh area upstream of USEPA fence

Sample Location(s) and/or Well Number(s) URMATE 1,2,3

_____

Location of sample points, wells, borings, etc., with reference to three permanent reference points. Measure all distances, clearly label roads, wells and permanent features.



0918R

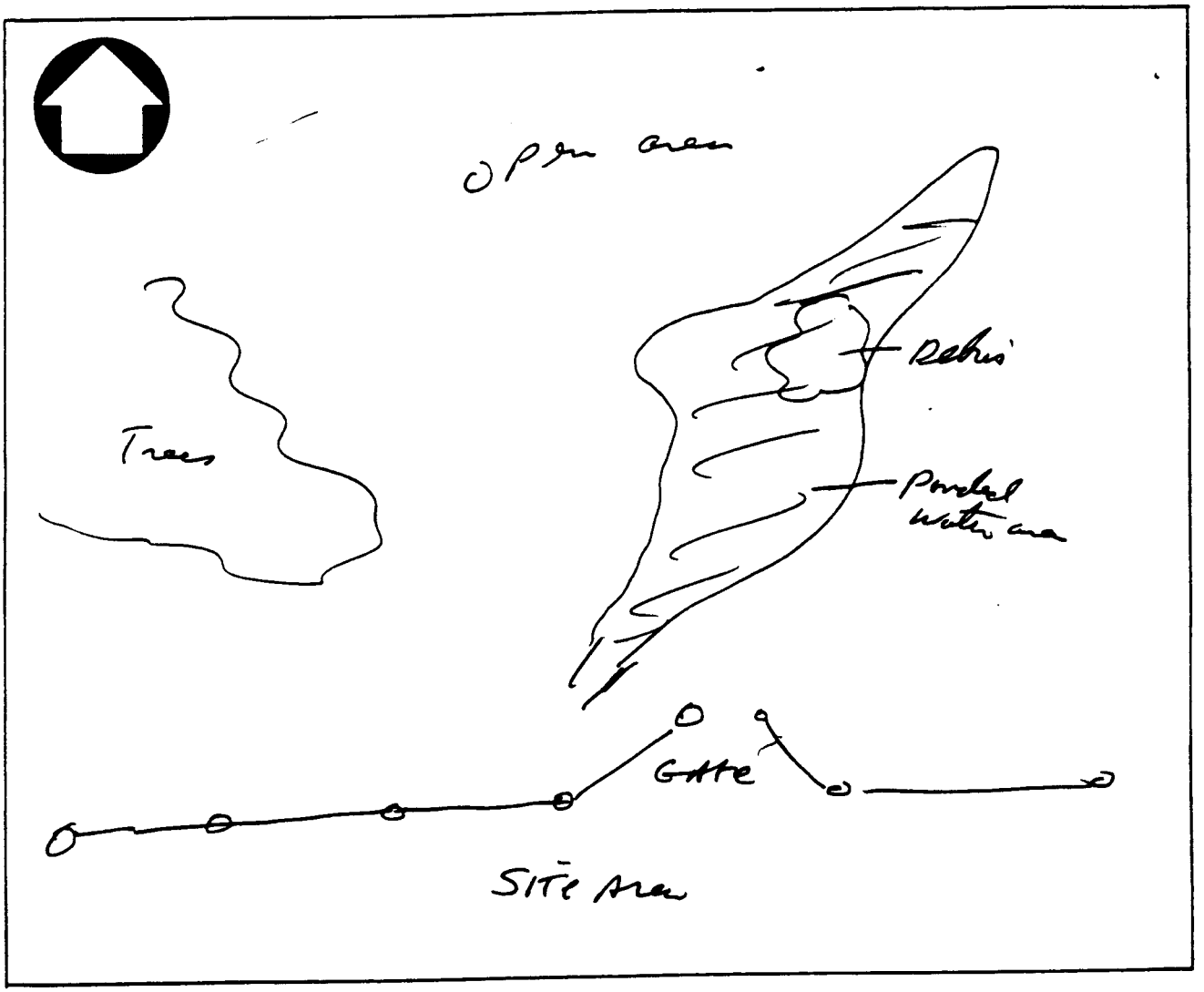
LOCATION SKETCH

Project Union Road Sample Crew E. Santoro/J. Lovejoy

Site Location upland area, ponded water adjacent to northern site entrance.

Sample Location(s) and/or Well Number(s) UR UP AQ 1,2,3

Location of sample points, wells, borings, etc., with reference to three permanent reference points. Measure all distances, clearly label roads, wells and permanent features.



0918R

Appendix E

82-14-61(2/84)

FISH/WILDLIFE COLLECTION RECORD
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF FISH AND WILDLIFE

DH REGION ____ FOR Union Road RI/FS PROGRAM TOXIC SUBSTANCE MONITORING PROGRAM

COLLECTOR(S) Edward Santoro - Dvirka + Bartilucci USING SEINE NET COLLECTION METHOD.

ECIMENS PRESERVED BY FREEZING/Cold METHOD.

LL IN APPROPRIATE BLANKS AS COMPLETELY AS POSSIBLE. ALL SAMPLES ARE Whole Body NON-EVISCERATED

R LAB E ONLY B ENTRY).	COLLECTION OR TAG NO.	SPECIES	DATE TAKEN	LOCATION	AGE	SEX &/OR REPROD. CONDIT.	AVG LENGTH (CM)	AVG WEIGHT (g)	REMARKS
		RANA PIPIENS	8/15/90	UPLAND AREA OFF-Site	Y	—	5.32	2.78	12 SPECIMENS
		CRAYFISH	8/15/90	" "	A	M/F	5.16	4.46	10 SPECIMENS
		CRAYFISH	8/15/90	DEER LIK CREEK ADJACENT TO SITE	A	M/F	3.5	1.6	30 SPECIMENS
		CRAYFISH	8/15/90	"	A	M/F	5.4	4.2	5 SPECIMEN
		COMMON SHINER	8/15/90	"	A	M/F	4.1	1.3	5 SPECIMENS
		"	"	"	"	"	4.4	1.5	20 SPECIMEN
		SATINFIN SHINER	"	"	"	"	9.5	10.8	1 SPECIMEN
		DACE Rhinithys Spp.	"	"	"	"	7.8	6.2	5 SPECIMENS
		CRAYFISH	8/15/90	SLATE BOTTOM CREEK/ADJACENT TO SITE	A	M/F	4.2	2.6	5 SPECIMENS
		CARP	"	"	YoY	—	8.1	9.5	1 SPECIMEN
		COMMON SHINER	"	"	A	M/F	6.9	4.0	12 SPECIMENS
		SATINFIN SHINER	"	"	A	UNK.	11.2	21.0	1 SPECIMEN
		Golden SHINER	8/16/90	"	A	UNK.	8.3	8.0	11 SPECIMENS
		White SUCKER	"	"	YOY	—	13.2	22.9	1 SPECIMEN
		TARGE MOUTH	"	"	YoY	—	10.3	16.7	1 SPECIMEN

82-14-61(2/84)

FISH/WILDLIFE COLLECTION CORD
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF FISH AND WILDLIFE

TOXIC SUBSTANCE MONITORING PROGRAM

OM REGION ______ FOR ______________________________

COLLECTOR(S) ______________________________ USING ______________ COLLECTION METHOD.

ECIMENS PRESERVED BY ______________________ METHOD.

LL IN APPROPRIATE BLANKS AS COMPLETELY AS POSSIBLE.

R LAB E ONLY R ENTRY	COLLECTION OR TAG NO.	SPECIES	DATE TAKEN	LOCATION	AGE	SEX &/OR REPROD. CONDIT.	LENGTH (cm)	WEIGHT (g)	REMARKS
1.		LARGEMOUTH BASS	8/16/90	SLATE BOTTOM CREEK	YOY	—	5.9	3.1	3 SPECIMENS