915012

# GROUNDWATER ASSESSMENT

# PLANT D AREA

# BUFFALO COLOR CORPORATION

"Phase II Investigation"

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WASTE ENFORCEMENT
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## I. Summary

The analytical data resulting from the monitoring well sampling during "wet" & "dry" seasons indicates that the groundwater flow from the weathering area and the iron sludge ponds is minimal and the loadings to the Buffalo River do not contravene any existing or proposed criteria or standards. Based on a review of the data, no remedial action is planned and we request the sites be reclassified to a "D" rating requiring no further action.

## II. Historical Background

On April 13, 1982 an agreement was executed between Buffalo Color Corporation and the Commissioner's designee of the Department of Environmental Conservation. The agreement covered a field investigation program and remedial program, if required, for inactive wastes disposal sites on the Buffalo Color property at 340 Elk Street, Buffalo, New York. These sites were listed in a document titled "Hazardous Waste Disposal sites in New York State" prepared by the New York State Department of Environmental Conservation and the New York State Department of Health.

The sites were classified in the inventory as follows:

a) The Deepwell - Code E: "Periodic surveillance and chemical analysis required for properly closed and maintained site".

b) Iron oxide sludge Lagoons - Code B: "Detailed chemical analysis and for hydrogeological survey is needed if warranted by the sites potential health and/or environmental impact".

c) The Weathering Area - Code B: "Detailed chemical analysis and/or hydrogeological survey is needed if warranted by the sites potential health and/or environmental impact".

The agreement required that thirty (30) days after completion of Field Investigation, Buffalo Color Corporation would submit a field investigation report. The purpose of the report was to provide the data and a comprehensive assessment of such data resulting from the field investigation.

## III. Site Descriptions

### General

Buffalo Color Corporation was formed July 1, 1977. At that time the new company took over the site formerly used to manufacture dyestuffs and organic chemicals by the Allied Corporation.

1984

Currently, facility operations involve the organic syntheses of two dyestuffs, alkylanilines and five anhydrides. Approximately 70.0% of the company's present production entails the manufacture of Indigo dye. Since 1977 the take over by Buffalo Color there has been no manufacture of any dyes, intermediates or organic chemicals that required disposal on-site.

d posed of ammonium sulfate 1957-1965

a) The Deep Well: The Deep Well is situated on that portion of the Property located east of South Park Avenue. It was used by Allied for the disposal of ammonium sulfate solution resulting from the manufacture of antioxidant-B and n-butyraldoxime, an anti-skinning agent for paint, from about October, 1957, until about the end of 1965, at which time the manufacturing processes generating said wastes were relocated to another facility operated by Allied. The sulfate solution was filtered through an activated carbon filter system, to recover butyric acid and other organics prior to disposal in the Deep Well.

b) The Lagoons: The Lagoons, of which there are two, are situated on the northeast corner of a peninsula, which is located on that portion of the property west of South Park Avenue. The peninsula projects into the Buffalo River at a point approximately two miles upstream of the confluence of the Buffalo River with the Niagara River. A graphic description of the peninsula, including the Lagoons and the Weathering Area, entitled Plot Plan A, is attached hereto and hereby made a part hereof as Appendix A. Iron oxide sludge, a residue from the aniline manufacturing processes, was disposed of in the Lagoons by Allied prior to 1960. From 1960 through 1975, iron oxide sludge wastes from the manufacture of sulphonated naphthalene, were disposed of in the Lagoons by Allied. The Lagoons were used to settle out solids prior to the release of the remaining liquid into the Buffalo River. A portion of the dewatered iron oxide was then excavated and sold for iron value.

$_2O_3$ sludge (residue from aniline process)
posed < 1960
1960-75 $Fe_2O_3$ sludge f m sulphonated napthalene process.

c) The Weathering Area: The Weathering Area is situated on the southern tip of the peninsula described in subparagraph (b) of this Paragraph, and is identified on Plot Plan A. The Weathering Area was used by Allied from the 1930's until in or about 1976 for the storage of various metal oxide sludges, resulting from the manufacture of triphenylmethane ("TPM") dyes. Although some of said sludge wastes and residue were sold for their metal content, some portion of them remain in the place of their original storage at the Weathering Area.

metal oxide sludges from TPM dyes.

## IV. Description of Program

A field investigation was developed utilizing a phased approach to develop the required data so that a sound assessment could be made of the data and any environmental impact determined.

### Phase I

✓ Piezometers
✓ river height
✓ 14 BHs ~~to~~ gw
✓ 6 comp. soil samples

This phase involved the installation of piezometers throughout the Plant D area and suitable measuring locations on the river. The piezometers were utilized to plot a contour map of the shape of the surface of the water table in Plant D. The contour map developed would indicate the direction of ground water flow beneath the iron sludge ponds and weathering area. In addition, soil/waste samples were collected from the sludge pond and weathering area - There were fourteen individual sampling sites selected and continuously split-spooned sampled to ground water level. These samples were then composited resulting in six composites representing the plant side and river side of the site. The composites were then analyzed for the contaminants listed in the agreement.

### Phase II

✓ mw installed
✓ 1 up, 2 down
@ Weath. area
& lagoon

This phase involved the installation of monitoring wells and river sampling stations. The installation of the wells included, one upgradient and two down gradient wells for the weathering area and the same number for the iron sludge pond area. The river sampling points were located upstream and downstream of the Plant D area.

### Phase III

✓ 3 gw/river samples

This phase consisted of ground water river sampling and analysis. The samples were analyzed for those parameters found in the agreement. The sampling ~~to~~ took place on September 27, 1983 and on April 12 & 19, 1984. The September sampling was during dry weather and the April sampling during wet weather.

Detailed protocals for sample collection, compositing, handling, laboratory analysis, quality assurance and quality control were prepared and approved by the agency prior to the start of sampling.

## V. Soil Samples

In December 1982, fourteen soil borings were made in the weathering area and the two iron sludge pond sites. A series of split-spoon samples were taken from each location for specific composites. In all 145 soil samples were taken and physiscal descriptions and sampling levels were recorded. All samples and drilling logs were examined by J. A. Gouck, Consultant to Buffalo Color, Richard Hoffman of NYDEC and Ms. C. Wojtowicz of Ecology and Environment. The purpose of the examination was to determine which samples were to be composited. A total of six composites were prepared and analyzed -- two from each of the three sites being investigated. Appendix I contains the analytical report for these samples.

Fly ash disposed

The data (Appendix I) indicates heavy metal loadings present in the weathering area composite. This is to be expected, since the site was used to dewater various metal hydroxides derived from the manufacturing processes prior to resale for recovery. It must be pointed out that the Plant D area in the late nineteenth century was very swampy and subsequently was used as the disposal site for fly-ash from boiler operations. The analytical data for the iron sludge ponds also indicates the presence of heavy metals. Some of these could be residual impurities in the iron oxide powder that was used in chemical processing and the excess sent to the sludge ponds for dewatering and eventual resale for the iron content.

The following materials showed no detectable amount in any of the 18 well samples collected in either wet of dry weather.

Present in soil, not in gw.

Acenaphthene
Fluorene
Anthracene
Phenanthrene
Fluoranthene
Pyrene
Chrysene
Benzo (a) anthracene
Benzo (b) Fluoranthene
Benzo (k) Fluoranthene
Benzo (a) Pyrene

The detected presence of these materials in the soil of Plant D was not unexpected due to the past use of the area as a repository for fly-ash from the burning of coal. Likewise, their detection in the river near the railroad bridge during dry weather is relatable to the proximity of that site to the residuals of past coke and petroleum manufacture which may be present in the river mud. However, the absense of the materials from the groundwater indicates that the material is fixed and is not leaching into the groundwater. Neither the weathering area nor the iron sludge ponds constitute any threat to the Buffalo River environment by virtue of these materials. Therefore, they should be dropped from further consideration.

## VI. Hydrology

2.5gpm @ FeO ponds
1.4gpm @ wea. area

Prior to the monitoring well sampling on April 12 & 19, 1984, water level readings were taken on 21 separate occasions. This data was analyzed and plotted by an Ecology and Environment hydrologist. The resultant data is found in Appendix II. Based on this data that indicates a ground water flow of 2.5 gpm at the iron oxide ponds and 1.4 gpm at the weathering area. The impact on the Buffalo River can be determined.

## VII. Analytical Data

A review of all the data listed in Table I indicates there are extremely low concentrations of heavy metals and organic chemicals in the groundwater going to the Buffalo River. All sampling and analytical procedures used were approved by the Agency prior to being used in the field or the laboratory. Appendix III includes the reports for the three sampling events.

## VIII. Assessment

The State of New York in setting stream standards uses values based on best water usage. Discharges to a lower stream classification shall not cause the contravention of a higher water quality stream classification at the confluence of both streams. The State has not officially changed any stream standards in the last 15 years. The only numerical standards found in the present regulation are:

1. Phenolic compounds - 0.00 1 mg/l as phenol;
2. Cyanide - 0.1 mg/l as CN;
3. Ferro Ferricyanide - 0.4 mg/l as $Fe(CN)_6$;
4. Copper - 0.2 mg/l as Cu;
5. Zinc - 0.3 mg/l as Zn and
6. Cadmium - 0.3 mg/l as Cd.

All other standards were a narrative or non-numerical in nature.

Early in 1978, the DEC started to prepare water quality criteria based on numerical standards. These criteria were to be part of the required three year review under the Clean Water Act. The proposal revised and expanded on best usage of water under each classification in order to clarify such usages. The rationale for setting numerical standards was developed after reviewing fish toxicity factors, human toxicity factors, and the Federal drinking water standards. These proposals were never completed.

The agency is presently proposing a change in water quality standards and usages for all surface waters in the State. They have developed criteria for about 200 toxic substances and have listed them in a division of Waters Technical and Operational Guidance Series (TOGS-84-Water-38). These criteria have been set by an interagency committee of aquatic biologists, toxicologists, and engineers from the DEC and the State Dept. of Health. The committee recommends the values that should be used as ambient criteria. This assessment will be based on the proposed ambient criteria for those paramenters on the list and will also refer to the "mass allocation" plan for the Niagara River being developed by the DEC (Appendix IV).

The ambient water quality criteria being proposed by the Agency is that level found in the water after discharges have had an opportunity for complete mixing with the receiving waters. TOGS 84-W-38 listed the following metals of concern at the site and the numerical values for ambient water quality:

| Parameter Mg/l | Stream Classification | Toxicity | Mg/l<br>ppm | Plant D Total Contribution |
|---|---|---|---|---|
| Arsenic | AA,A | Human | .05 ✓ | .0005 |
| | D | Aquatic | .01 ✓ | |
| Chromium (Hy) | AA,A | Human | .05 ✓ | .0002 |
| | D | Aquatic | .021 ✓ | |
| Chromium (Total) | AA,A | Human | .05 ✓ | .0003 |
| | D | Aquatic | ~~.05~~ * | |
| Copper | AA,A | Human | 1.0 ✓ | .026 |
| | D | Aquatic | * ✓ | |
| Lead | AA,A | Human | .05 ✓ | .001 |
| | D | Aquatic | * ✓ | |
| Nickel | AA,A | Human | .015 ✓ | .001 |
| | D | Aquatic | * ✓ | |
| Zinc | AA,A | Human | 5 ✓ | .005 |
| | D | Aquatic | * ✓ | |

* Value depends on hardness of receiving water.

None of the total contributions of heavy metals from the Plant D site contravene class AA, or A proposed criteria. In addition, the Niagara River load allocations for the Buffalo River "Reach" (Appendix IV) for the metal parameters are:

| Parameter | Allocation Lbs. | Balance Lbs. | Worst Case Plant D Contribution Lbs. |
|---|---|---|---|
| Arsenic | 30.0 | 29.5 | 0.136 |
| Copper | 120 | 43.675 | 6.83 |
| Chromium | 30 | 13 | 0.076 |
| Lead | 13.0 | 6.1 | 0.36 |
| Nickel | 18.0 | 15.4 | 0.33 |
| Zinc | 180.0 | 164.8 | 1.29 |

The loadings from the Plant D area, in a "worst case" situation have no significant impact on the Buffalo River.

Of the three organic chemicals, other then the poly nuclear aromatics, only Benzidine is specifically mentioned in TOGS (84-W-38) and the levels on:

Class AA,A - Human - .04 ppb ✓
Class D - Aquatic - 0.1 ppb ✓

The level of benzidine found in all of the samples equates to 0.00004 mg/l or .04 ppb.

The proposed criteria refer to unlisted organic chemicals in this manner: any organic would have an ambient allowable level of 50 ppb and in combination with another organics with an allowable level of 100 ppb. The combination of 1-naphthylamine and 2-4 Dinitrotoluene would total 13 ppb.

In using the proposed water quality criteria being developed by the DEC, there is no evidence of contravention of any existing regulations or those being proposed. It is our judgement that there is no evidence of any adverse impact on the Environment and the sites should be reclassified to the "D" rating and no further action (beyond sampling) be required or taken.

# TABLE I

| Parameters | WELL NO. 6 | | | WELL NO. 9 | | | WELL NO. 12 | | | WELL NO. 13 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 9/17/83 | 11/12/84 | 4/19/84 | 9/17/83 | 11/12/84 | 4/19/84 | 9/17/83 | 11/12/84 | 4/19/84 | 9/17/83 | 11/12/84 | 4/19/84 |
| PH, S.U. | 7.8 | 7.17 | 7.71 | 8.14 | 7.38 | 7.67 | 7.37 | 6.01 | 6.75 | 5.72 | 4.98 | 4.95 |
| Tot. Org. Carbon Mg/l. | 118 | 180 | 150 | 74.3 | 47 | 52 | 49.2 | 48 | 47 | 50.6 | 70 | 61 |
| Tot. Org. Halogen Mg/l. | 0.18 | .09 | .024 | .28 | .42 | .23 | .042 | .015 | .021 | .13 | 0.1 | .069 |
| Arsenic Mg/l | 0.21 | .383 | .62 | .078 | <.01 | .037 | .101 | .017 | .042 | .176 | .496 | .801 |
| Chromium Tot Mg/l | .042 | .093 | .093 | <.01 | .022 | .042 | <.01 | .164 | .397 | <.01 | .072 | .071 |
| Chromium Hex Mg/l | .007 | .06 | .096 | .006 | .007 | .042 | <.01 | .164 | .319 | <.01 | .105 | .037 |
| Copper Mg/l | <.005 | <.05 | .056 | <.05 | <.05 | <.05 | <.05 | .071 | .589 | 8.98 | 110 | 3.70 |
| Lead Mg/l | <.01 | .033 | .089 | <.01 | .045 | <.022 | <.01 | .682 | 1.08 | <.01 | 2.65 | .331 |
| Mercury Mg/l. | <.0004 | <.00004 | .0009 | <.0004 | <.0004 | <.0004 | <.0004 | .0005 | .0061 | <.0004 | <.0004 | .0008 |
| Nickel Mg/l. | .110 | <.05 | .07 | <.05 | <.05 | <.05 | 0.64 | <.05 | .143 | 4.86 | 3.44 | 1.87 |
| Zinc Mg/l. | <.05 | .143 | .251 | <.05 | .058 | .088 | <.05 | .291 | 1.34 | 17.10 | 15.3 | 9.93 |
| 1-Naphthylamine ppb | <0.6 | <0.6 | <.6 | 10.5 | <.06 | <.06 | 6.1 | <.06 | <0.6 | <.6 | 7.1 | 3.0 |
| 2-4 Dinitrotoluene ppb | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | 582 | 507 | 6270 |
| Benzidine ppb | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Acenaphthylene ppb | - | <1.5 | <1.5 | - | <1.5 | <1.5 | - | <1.5 | <1.5 | - | <1.5 | <1.5 |
| Fluorene ppb | - | <1.5 | <1.5 | - | <1.5 | <1.5 | - | <1.5 | <1.5 | - | <1.5 | <1.5 |
| Anthracene ppb | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 |
| Phenanthrene ppb | - | - | - | - | - | - | - | - | - | - | - | - |
| Fluoranthene ppb | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 |
| Pyrene ppb | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 |
| Chrysene ppb | <2.5 | <2.5 | <2.5 | <2.5 | <2.5 | <2.5 | <2.5 | <2.5 | <2.5 | <2.5 | <2.5 | <2.5 |
| Benzo(a)anthracene ppb | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | | | | | | | | <2.5 | <2.5 | <2.5 |
| Benzo(a)fluoranthene ppb | <2.5 | <2.5 | <2.5 | <2.5 | <2.5 | <2.5 | <2.5 | <2.5 | <2.5 | - | - | - |
| Benzo(b) " ppb | - | - | - | - | - | - | - | - | - | - | - | - |
| Benzo(a) pyrene ppb | - | - | - | - | - | - | - | - | - | | | |

TABLE I (cont.)

| WELL NO. 14 | | | WELL NO. 15 | | | DOWN STREAM R.R. BRIDGE | | | UP STREAM S. PARK BRIDGE | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 9/17/83 | 11/12/84 | 4/19/84 | 9/17/83 | 11/12/84 | 4/19/84 | 9/17/83 | 11/12/84 | 4/19/84 | 9/17/83 | 11/12/84 | 4/19/84 |
| 7.34 | 7.25 | 7.55 | 7.65 | 8.59 | 7.43 | 7.73 | 7.25 | 7.20 | 7.60 | 7.3 | 7.95 |
| 190 | 370 | 330 | 29.3 | 900 | 900 | 11.5 | 10 | 18 | 5.93 | 5.7 | 15 |
| 0.3 | .22 | .22 | 2.0 | .73 | .96 | .044 | .006 | <.005 | .05 | <.005 | <.005 |
| .184 | .013 | 1.25 | .114 | .102 | .025 | .068 | <.01 | <.01 | .028 | <.01 | <.01 |
| <.01 | .128 | .484 | <.01 | .389 | .167 | <.01 | <.01 | <.01 | <.01 | <.01 | <.01 |
| <.01 | .128 | .207 | <.01 | .109 | .05 | <.01 | <.005 | <.005 | <.01 | <.005 | <.005 |
| <.05 | 2.9 | 1.25 | <.05 | .387 | .130 | <.05 | <.05 | <.05 | <.05 | <.05 | <.05 |
| <.01 | 2.0 | .997 | <.01 | .266 | .178 | <.01 | <.01 | 0.01 | <.01 | <.01 | .045 |
| <.00004 | .0024 | .0044 | <.00004 | .0005 | <.0004 | <.0004 | <.0004 | <.0004 | <.0004 | <.0004 | <0.0004 |
| .05 | .407 | .354 | .072 | .217 | | <.05 | <.05 | <.05 | <.05 | <.05 | <.05 |
| <.05 | 2.58 | 1.88 | <.05 | .408 | .154 | <.05 | .074 | .064 | <.05 | <.05 | <.05 |
| 943 | 324 | 3300 | 3020 | 49600 | 29300 | 6.02 | 43 | <.06 | <.6 | <.6 | <.6 |
| <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| 2.35 | <1.0 | <1.0 | <1.0 | 240 | 144 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| - | <1.5 | <1.5 | - | <1.5 | <1.5 | - | <1.5 | <1.5 | - | <1.5 | <1.5 |
| - | <1.5 | <1.5 | - | <1.5 | <1.5 | - | <1.5 | <1.5 | - | <1.5 | <1.5 |
| <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | 3.94 | <1.5 | <1.5 | BMDL | <1.5 | <1.5 |
| - | - | - | - | - | - | - | - | - | | - | - |
| <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | 3.81 | <1.5 | <1.5 | BMDL | <1.5 | <1.5 |
| <1.5. | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | 4.0 | <1.5 | <1.5 | BMDL | <1.5 | <1.5 |
| <2.5 | <2.5 | <2.5 | <2.5 | <2.5 | <2.5 | 6.31 | <2.5 | <2.5 | BMDL | <2.5 | <2.5 |
| - | - | - | - | - | - | - | - | - | - | - | - |
| <2.5 | <2.5 | <2.5 | <2.5 | <2.5 | <2.5 | 7.74 | <2.5 | <2.5 | BMDL | <2.5 | <2.5 |
| - | - | - | - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - | - | - | - |

## ASSUMPTION: WORST CASE

1. Buffalo River Low Flow - 32MGD
2. 7200 GPD - ground water flow at each well
3. Use highest analytical result for each parameter at each well (4/12 & 4/19)

## TABLE II

| | Well #12 | | Well #13 | | Well #14 | | Well #15 | | Total | Buffalo River |
|---|---|---|---|---|---|---|---|---|---|---|
| **Description** | Mg/l | Lbs/Day | Mg/l | Lbs/Day | Mg/l | Lbs/Day | Mg/l | Lbs/Day | PPD | Mg/l |
| Arsenic | 0.101 | .006 | .801 | .048 | 1.25 | .075 | .114 | .007 | 0.136 | .0005 |
| Cr - Tot | .397 | .02 | .072 | .004 | .484 | .029 | .389 | .023 | .076 | .003 |
| Cr - Hx | .319 | .019 | .105 | .006 | 2.07 | .012 | .109 | .007 | .044 | .0002 |
| Copper | .589 | .035 | .110 | 6.6 | 2.9 | .17 | .387 | .023 | 6.83 | .026 |
| Pb | 1.08 | .065 | 2.65 | .159 | 2.0 | .12 | .266 | .016 | .36 | .001 |
| Hg | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ |
| Ni | .143 | .008 | 4.86 | .292 | .407 | .02 | .217 | .013 | .33 | .001 |
| Zn | 1.34 | .08 | 17.1 | 1.03 | 2.58 | .155 | .408 | .024 | 1.29 | .005 |
| Ave. TOC | 48 | 2.88 | 60.5 | 3.63 | 297 | 17.82 | 900 | 54 | 78.33 | .29 |
| 1 Naphylamine | .0061 | .0004 | .0071 | .0004 | 3.30 | .198 | 49.6 | 2.98 | 3.179 | .012 |
| 2-4 Dinitro-Toluene | - | - | 6.27 | .376 | - | - | - | - | .376 | .001 |
| Benzidine | - | - | - | - | .00235 | .0001 | .240 | .01 | .0101 | .0004 |

APPENDIX I

# ANALYSIS OF SOIL COMPOSITES FROM IRON SLUDGE PONDS AND WEATHERING AREA

March 2, 1983

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# 1. INTRODUCTION

The Analytical Services Center (ASC) of Ecology and Environment, Inc., (E & E) was contracted by Buffalo Color Corporation (BCC) to prepare sample composites and perform chemical analysis of soil samples obtained from borings. This report presents the results of analysis of six soil composites.

# 2. SAMPLES

A series of split-spoon soil samples from the Plant D Area of BCC's Buffalo Plant were delivered to the ASC by BCC between December 14 and 22, 1982. A total of 145 soil samples were received and assigned E & E laboratory numbers. Sample information and descriptions can be found in Table 2-1. Chain-of-custody forms, detailing possession of the samples, are found in Appendix A.

The samples were taken from a "weathering area" and two iron oxide ponds. The codes in Table 2-2 were used to identify sample locations.

All samples were examined at the ASC by Mr. James Gouck of BCC, Mr. Richard Hoffman of the New York State Department of Environmental Conservation (DEC), and Ms. Caryn Wojtowicz of E & E. The purpose of examining the samples and drilling logs was to determine which samples were to be composited.

A total of six composites were prepared--two from each of the three sites being investigated. Table 2-1 lists the components of each composite. Each composite was assigned a number (1 through 6) as designated in Table 2-3.

Table 2-1

SAMPLE INFORMATION

| Client's Identification | E & E Laboratory Number 82- | Physical Description | Included in Composite Number |
|---|---|---|---|
| weathering area plant side | | | |
| WP-1 Sample 1A | 2576 | Bluish | 1 |
| WP-1 Sample 1B | 2577 | Hard, black | 1 |
| WP-1 Sample 2 | 2578 | Blue to blue-green | 1 |
| WP-1 Sample 3 | 2579 | Brown with some blue | 1 |
| WP-1 Sample 4 | 2580 | - | * |
| WP-1 Sample 5 | 2581 | - | * |
| WP-1 Sample 6 | 2582 | - | * |
| WP-2 Sample 1A | 2589 | Dark purple, gelatinous | 1 |
| WP-2 Sample 1B | 2590 | Dry, dark purple, some brown granules | 1 |
| WP-2 Sample 2 | 2591 | Brown/black, oily | 1 |
| WP-2 Sample 3 | 2592 | Brown wood, chip-like | 1 |
| WP-2 Sample 4 | 2593 | Light brown sandy clay | 1 |
| WP-2 Sample 5 | 2594 | - | * |
| WP-2 Sample 6 | 2595 | - | * |
| WP-3 Sample 1A | 2583 | Purple cinders | * |
| WP-3 Sample 1B | 2584 | Sandy color and texture | 1 |
| WP-3 Sample 2 | 2585 | Sandy color and texture | 1 |
| WP-3 Sample 4 | 2586 | Clay | 1 |
| WP-3 Sample 5 | 2587 | - | * |
| WP-3 Sample 6 | 2588 | - | * |
| weathering area river side | | | |
| WR-1 Sample 1 | 2552 | - | 2 |
| WR-1 Sample 2 | 2553 | - | 2 |
| WR-1 Sample 3 | 2554 | - | 2 |
| WR-1 Sample 4 | 2570 | - | * |
| WR-1 Sample 5 | 2571 | - | * |
| WR-1 Sample 6 | 2572 | - | * |
| WR-2 Sample 1 | 2555 | Reddish chunks | 2 |
| WR-2 Sample 2 | 2556 | Mottled, rusty | 2 |
| WR-2 Sample 3 | 2557 | Reddish-brown chunks | 2 |
| WR-2 Sample 4 | 2558 | Clay-like | 2 |
| WR-2 Sample 5 | 2573 | - | * |
| WR-2 Sample 6 | 2574 | - | * |
| WR-2 Sample 7 | 2575 | - | * |
| WR-3 Sample 1A | 2559 | Purple, greasy | 2 |
| WR-3 Sample 1B | 2560 | Reddish-brown cinders | 2 |
| WR-3 Sample 2 | 2561 | Reddish brown gravel | 2 |
| WR-3 Sample 3 | 2562 | Stone, clay, pink tinge | 2 |

Table 2-1 (Cont.)

| Client's Identification | E & E Laboratory Number 82- | Physical Description | Included in Composite Number |
|---|---|---|---|
| WR-3 Sample 4 | 2596 | - | * |
| WR-3 Sample 5 | 2597 | Coarse | * |
| WR-3 Sample 6 | 2598 | Sandy, silt | * |
| Lagoon 1 Plant S.de Bn #1 | | | |
| 1P1 Sample 1 | 2572 | - | * |
| 1P1 Sample 2 | 2573 | - | * |
| 1P1 Sample 3 | 2574 | - | * |
| 1P1 Sample 4 | 2575 | - | * |
| 1P1 Sample 5 | 2576 | Sand and gravel | * |
| 1P1 Sample 6 | 2577 | Light, sandy, porous | * |
| 1P1 Sample 7 | 2578 | Light, sandy, porous | * |
| 1P1 Sample 8 | 2579 | Reddish black gravel | 6 |
| 1P1 Sample 9 | 2580 | Clay-like | * |
| 1P1 Sample 10 | 2581 | Clay-like | * |
| 1P1 Sample 11 | 2582 | Clay-like | * |
| 1P1 Sample 12 | 2583 | Gray clay, some sand | 5 |
| 1P1 Sample 13 | 2584 | Reddish clay | 5 |
| 1P1 Sample 14 | 2585 | - | * |
| 1P1 Sample 15 | 2586 | - | * |
| Lagoon 1, Plant Side, Bn #2 | | | |
| 1P2 Sample 1 | 2853 | - | * |
| 1P2 Sample 2 | 2854 | - | * |
| 1P2 Sample 3 | 2855 | - | * |
| 1P2 Sample 4 | 2856 | Fine, black, dry gravel | 6 |
| 1P2 Sample 5 | 2857 | Light, sandy, porous | * |
| 1P2 Sample 6 | 2858 | Light, sandy, porous | * |
| 1P2 Sample 7 | 2859 | Reddish brown, chunky, some wood | 6 |
| 1P2 Sample 8 | 2860 | Light, sandy, porous | * |
| 1P2 Sample 9 | 2861 | - | * |
| 1P2 Sample 10 | 2862 | - | * |
| 1P2 Sample 11 | 2863 | - | * |
| 1P2 Sample 12 | 2864 | - | 5 |
| 1P2 Sample 13 | 2865 | Gray, gravelly clay | 5 |
| [illegible] | | | |
| 1R1 Sample 1 | 2866 | - | * |
| 1R1 Sample 2 | 2867 | Black gravel with sheen | 6 |
| 1R1 Sample 3 | 2868 | - | * |
| 1R1 Sample 4 | 2869 | - | * |
| 1R1 Sample 5 | 2870 | Black chunks, reddish brown coating | 6 |
| 1R1 Sample 6 | 2871 | Black soil, stones, brick | 6 |
| 1R1 Sample 7 | 2872 | - | * |
| 1R1 Sample 8 | 2873 | - | * |
| 1R1 Sample 9 | 2874 | Wet soil, brownish-black | 6 |
| 1R1 Sample 10 | 2875 | - | * |
| 1R1 Sample 11 | 2876 | - | * |

Table 2-1 (Cont.)

| Client's Identification | E & E Laboratory Number 82- | Physical Description | Included in Composite Number |
|---|---|---|---|
| 1R1 Sample 12 | 2877 | Wet black clay, some brown material | 5 |
| 1R1 Sample 13 | 2878 | Sandy, wet, black clay | 5 |
| 1R1 Sample 14 | 2879 | - | * |
| Lagoon 1 River Side Bn #2 | | | |
| 1R2 Sample 1 | 2824 | - | * |
| 1R2 Sample 2 | 2825 | - | * |
| 1R2 Sample 3 | 2826 | Wet, black, oily | * |
| 1R2 Sample 4 | 2827 | - | * |
| 1R2 Sample 5 | 2828 | - | * |
| 1R2 Sample 6 | 2829 | - | * |
| 1R2 Sample 7 | 2830 | - | * |
| 1R2 Sample 8 | 2831 | Thick, black, wet clay | 6 |
| 1R2 Sample 9 | 2832 | - | * |
| 1R2 Sample 10 | 2833 | Black chunk | 6 |
| 1R2 Sample 11 | 2834 | - | * |
| 1R2 Sample 12 | 2835 | Black clay | 5 |
| 1R2 Sample 13A | 2836 | - | 5 |
| 1R2 Sample 13B | 2837 | - | 5 |
| 1R2 Sample 14A | 2838 | - | * |
| 1R2 Sample 14B | 2839 | - | * |
| 1R2 Sample 15 | 2840 | - | * |
| 1R2 Sample 16 | 2841 | - | * |
| Lagoon 2 Plant Side Bn #1 | | | |
| 2P1 Sample 1 | 2638 | - | * |
| 2P1 Sample 2 | 2639 | - | * |
| 2P1 Sample 3 | 2640 | - | * |
| 2P1 Sample 4 | 2641 | - | * |
| 2P1 Sample 5 | 2642 | - | * |
| 2P1 Sample 6 | 2643 | - | 4 |
| 2P1 Sample 7 | 2644 | - | 3 |
| 2P1 Sample 8 | 2645 | - | 3 |
| 2P1 Sample 9 | 2646 | Dark sand | 3 |
| 2P1 Sample 10 | 2647 | Dark sand | 3 |
| Lagoon 2 Plant Side Bn #2 | | | |
| 2P2 Sample 1 | 2648 | - | 4 |
| 2P2 Sample 2 | 2649 4 | - | * |
| 2P2 Sample 3 | 2650 | - | 4 |
| 2P2 Sample 4 | 2651 | - | * |
| 2P2 Sample 5 | 2652 | - | 4 |
| 2P2 Sample 6 | 2653 | - | * |
| 2P2 Sample 7 | 2654 | - | 4 |
| 2P2 Sample 8 | 2655 | - | 3 |
| 2P2 Sample 9 | 2656 | - | 3 |
| 2P2 Sample 10 | 2657 | - | 3 |
| 2P2 Sample 11 | 2658 | - | * |

Table 2-1 (Cont.)

| Client's Identification | E & E Laboratory Number 82- | Physical Description | Included in Composite Number |
|---|---|---|---|
| Lagoon 2, | River Side | Bm 1 | |
| 2R1 Sample 1 | 2610 | Black clay | * |
| 2R1 Sample 2 | 2611 | Black, viscous, wet clay | * |
| 2R1 Sample 3 | 2612 | Black, viscous, wet clay | * |
| 2R1 Sample 4 | 2613 | Black, viscous, very wet clay | * |
| 2R1 Sample 5 | 2614 | Black, viscous, very wet clay | * |
| 2R1 Sample 6 | 2615 | Black, greasy, mud-like | * |
| 2R1 Sample 7A | 2616 | - | * |
| 2R1 Sample 7B | 2617 | - | * |
| 2R1 Sample 8 | 2618 | - | 4 |
| 2R1 Sample 9 | 2619 | - | 3 |
| 2R1 Sample 10 | 2620 | Chunky, wet, black | * |
| 2R1 Sample 11 | 2621 | Brownish-red, greasy, mud-like | 3 |
| 2R1 Sample 12 | 2622 | Brownish-red, greasy, mud-like | 3 |
| 2R1 Sample 13 | 2623 | Brownish-red, greasy, mud-like | 3 |
| 2R1 Sample 14 | 2624 | Clay gravel, deep red color | 3 |
| 2R1 Sample 15 | 2625 | Clay | * |
| Lagoon 2 | River Side | Bm 2 | |
| 2R2 Sample 1 | 2626 | - | * |
| 2R2 Sample 2 | 2627 | - | 4 |
| 2R2 Sample 3 | 2628 | - | * |
| 2R2 Sample 4 | 2629 | - | * |
| 2R2 Sample 5 | 2630 | - | 3 |
| 2R2 Sample 6 | 2631 | - | 3 |
| 2R2 Sample 7 | 2632 | Mottled, granular, goldish color | 3 |
| 2R2 Sample 8 | 2633 | Black, thick, mud-like | 3 |
| 2R2 Sample 9 | 2634 | Black, thick, mud-like | 3 |
| 2R2 Sample 10 | 2635 | Clay | * |
| 2R2 Sample 11 | 2636 | Clay | * |

*DEC and BCC agreed that these samples would not be included in sample composites.

Table 2-2

SAMPLE LOCATION CODES

| Code | Sample Location |
|---|---|
| WP | Weathering Area, Plant Side |
| WR | Weathering Area, River Side |
| 1P1 | #1 Iron Oxide Pond, Plant Side, Borehole 1 |
| 1P2 | #1 Iron Oxide Pond, Plant Side, Borehole 2 |
| 1R1 | #1 Iron Oxide Pond, River Side, Borehole 1 |
| 1R2 | #1 Iron Oxide Pond, River Side, Borehole 2 |
| 2P1 | #2 Iron Oxide Pond, Plant Side, Borehole 1 |
| 2P2 | #2 Iron Oxide Pond, Plant Side, Borehole 2 |
| 2R1 | #2 Iron Oxide Pond, River Side, Borehole 1 |
| 2R2 | #2 Iron Oxide Pond, River Side, Borehole 2 |

Table 2-3

COMPOSITE SAMPLE IDENTIFICATION

| Composite Number | Designation |
|---|---|
| 1 | Weathering Area, Plant Side |
| 2 | Weathering Area, River Side |
| 3 | #2 Iron Oxide Pond, Water Table and Below |
| 4 | #2 Iron Oxide Pond, Above Water Table |
| 5 | #1 Iron Oxide Pond, Water Table and Below |
| 6 | #1 Iron Oxide Pond, Above Water Table |

# 3. METHODS OF ANALYSIS

## 3.1 COMPOSITING PROCEDURE

The following procedure was used to prepare sample composites for analysis. All composites were split with DEC. Each containerized split-spoon soil sample used in a composite was sieved through an eight-mesh screen to remove stones and debris. Screening was accomplished using a Teflon® scraper to force material through the screen. This screening insured that sample weight was not distorted by stones and debris with respect to any compound that was present. The screened sample was weighed and returned to its original container for storage until all soil samples were screened.

A portion of each screened sample was then weighed to provide equal portions for the homogenization step. The weighed portions were thoroughly mixed in pre-cleaned, 16-ounce sample bottles using a spatula. A homogeneous mixture was attained by stirring the sample at least 10 to 15 times. The mixed sample was then placed on a Teflon® sheet and shaped into a rectangular form of even thickness. The rectangle was quartered with two diagonal quarters used for the ASC composite and two alternate quarters used for the DEC composite. The composites for DEC were placed in pre-cleaned containers, sealed, and subsequently picked up by Mr. Hoffman for delivery to a laboratory under contract to DEC.

The stainless steel spatulas, screens, and pans were washed with laboratory grade detergent; rinsed three times with tap water; rinsed with pesticide-grade acetone; and then rinsed with an ASTM Type I water. The equipment was dryed in an oven at 105° C for 15 minutes. Only the equipment that had come to room temperature was used for screening and mixing.

## 3.2 ANALYTICAL PROCEDURES

In an agreement dated April 13, 1982, DEC's Hazardous Waste Compliance Team and BBC compiled a list of chemicals of concern for this project. E & E proposed certain analytical methods to be used to detect those chemicals. The methods were subsequently agreed to by DEC and are listed in Tables 3-1, 3-2, and 3-3.

Table 3-1

## ANALYTICAL METHODS USED FOR ORGANIC ANALYSES (EXTRACTION METHOD 8.86)

| Compound | Method No.* |
|---|---|
| Volatiles** | 8.01 |
| 1,1,2-Trichloroethylene | 8.01 |
| Monochlorbenzene | 8.01 |
| o-Dichlorobenzene | 8.01 |
| m-Dichlorobenzene | 8.01 |
| p-Dichlorobenzene | 8.01 |
| Extractables | |
| Total polychlorinated biphenyls (PCBs) | 8.08 |
| Polynuclear aromatic screen | 8.25 |
| 1-Napthylamine | 8.25 |
| 1,2,4-Trichlorobenzene | 8.25 |
| 1,2,4,5-Tetrachlorobenzene | 8.25 |
| 2-Chlorophenol | 8.25 |
| p-Chlorophenol | 8.25 |
| 2,4-Dichlorophenol | 8.25 |
| 2,4,5-Trichlorophenol | 8.25 |
| 2,4-Dinitrotoluene | 8.25 |
| Benzyl chloride | 8.25 |
| Benzidine | 8.25 |
| m-Toluenediamine | 8.25 |
| 2,4-Dinitrophenol | 8.25 |
| p-Nitroaniline | 8.25 |
| Toluene diisocyanate | 8.25 |
| 1,2-Dinitrobenzene | 8.25 |
| m-Dinitrobenzene | 8.25 |
| p-Dinitrobenzene | 8.25 |

*United States Environmental Protection Agency (EPA), 1980, Test Methods for Evaluating Solid Waste, SW-846, Washington, D.C.

**No extraction.

Table 3-2

ANALYTICAL METHODS USED
FOR METAL ANALYSES

| Metal | Method No.* |
|---|---|
| Arsenic | 206.2 |
| Chromium, total | 218.2 |
| Chromium, hexavalent** | |
| Copper | 220.2 |
| Lead | 239.2 |
| Mercury | 245.5 |
| Nickel | 249.2 |
| Zinc | 289.1 |

*EPA, March 1979, Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, Washington, D.C.

**Hexavalent chromium was extracted according to Method 3060 and analyzed according to Method 7195 in EPA, 1980, Test Methods for Evaluating Solid Waste, SW-846, Washington, D.C.

Table 3-3

### ANALYTICAL METHODS
### USED FOR
### MISCELLANEOUS ANALYSES

| Parameter | Method No.* |
|---|---|
| pH | 423 |

*American Public Health Association, American Water Works Association, and Water Pollution Control Federation, 1980, <u>Standard Methods for the Examination of Water and Wastewater</u>, 15th edition, Washington, D.C.

# 4. QUALITY ASSURANCE/QUALITY CONTROL

## 4.1 QUALITY ASSURANCE

All phases of this study, including the final report, have been independently audited by E & E's internal quality assurance group. All data and the contents of the report have been accepted by the group and authorized for release.

## 4.2 QUALITY CONTROL

All glassware used was washed with soap and rinsed with deionized water. The glassware used for organics analysis was rinsed again with acetone and hexane and dried in an oven. The glassware used for metals was rinsed with nitric acid, followed by deionized water, and dried in an oven.

All solvents were pesticide-grade and were submitted to extraction and concentration procedures similar to those used for actual samples.

Low working-level standards are prepared fresh daily from stock standards. The stock standards are prepared fresh monthly from pure analytical standards.

Consistent with the quality control program, sample blanks were analyzed to determine whether any interferences were present that may have been contributed by the solvents, the glassware, or the procedure itself. No interferences were detected.

The accuracy of the analytical method is determined by the use of spiked samples* and is calculated as the percent recovery. Spikes of varying amounts were analyzed to further ensure the accuracy of the method. The percent recovery for the spiked samples is given in Table 4-1. All percent recoveries were within acceptable limits.

To further ensure the accuracy of the analyses for the various parameters tested, EPA quality assurance materials were analyzed along with the samples. The results of those analyses are presented in Table 4-2. All results were within acceptable limits.

The precision of the analytical method is determined by the analyses of replicate samples within the appropriate concentration ranges. Results of the replicate analyses appear in Table 4-3. An acceptable level of precision was obtained for all replicates.

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*Spiked samples are those that have a known quantity of chemical added and are used to estimate accuracy through percent recovery.

Table 4-1

## QUALITY CONTROL FOR ACCURACY: PERCENT RECOVERY FOR SPIKED SAMPLES

| Compound/Element | E & E Composite No. | Original Value | Amount Added | Amount Determined | Percent Recovery |
|---|---|---|---|---|---|
| | | | mg/kg | | |
| 2,4-Dichlorophenol | 6 | <2.4 | 36.93 | 26.89 | 72.8 |
| Benzidine | 6 | <1.0 | 26.9 | 18.0 | 66.9 |
| p-Nitroaniline | 1 | <0.8 | 20.0 | 13.1 | 65.5 |
| 1-Naphthylamine | 1 | <0.2 | 25.0 | 21.1 | 84.4 |
| Toluene diisocyanate | 6 | <0.7 | 11.3 | 10.49 | 95.1 |
| Trichloroethylene | 1 | <1.0 | 3.6 | 3.2 | 88.9 |
| Chlorobenzene | 1 | <0.1 | 2.4 | 1.9 | 79.2 |
| 1,2-Dichlorobenzene | 1 | <0.1 | 1.8 | 1.5 | 83.3 |
| 1,3-Dichlorobenzene | 1 | <0.1 | 1.6 | 1.4 | 87.5 |
| 1,4-Dichlorobenzene | 1 | <0.1 | 2.2 | 1.8 | 81.8 |
| Aroclor 1260 | 6 | <0.2 | 12.2 | 11.3 | 92.6 |
| Arsenic | 6 | 63.5 | 24.9 | 85.6 | 88.8 |
| Chromium, total | 6 | 825 | 500 | 1,320 | 99 |
| Chromium, hexavalent | 1 | 0.567 | 2.00 | 2.50 | 96.7 |
| Copper | 3 | 2,480 | 4,990 | 7,360 | 97.8 |
| Lead | 4 | 746 | 994 | 1,840 | 110 |
| Mercury | 4 | 11.3 | 4.80 | 16.3 | 104.8 |
| Nickel | 2 | 103 | 99.6 | 217 | 114.5 |
| Zinc | 2 | 795 | 4,980 | 6,070 | 106 |

Note: All spike results fall within the 95% confidence limits of our control charts.

< = None detected at stated detection limit.

Table 4-2

## QUALITY CONTROL FOR ACCURACY:
## PERCENT DIFFERENCE--EPA QUALITY ASSURANCE MATERIALS

|  | Concentrations in µg/L |  |  |
|---|---|---|---|
| Element | Known | Determined | Percent Difference |
| Arsenic | 40 | 41.7 | 4.3 |
| Chromium | 0.25 | 0.252 | 0.8 |
| Copper | 0.35 | 0.344 | 1.7 |
| Lead | 0.400 | 0.382 | 4.5 |
| Zinc | 0.400 | 0.411 | 2.8 |

Note: These results are within the 95% confidence interval for these parameters.

## Table 4-3

## QUALITY CONTROL FOR PRECISION: RESULTS OF REPLICATE ANALYSES

| Compound/Element | E & E Composite No. | Original Analysis (mg/kg) A | Replicate Analysis (mg/kg) B | Relative Percent Difference (RPD)* |
|---|---|---|---|---|
| Arsenic | 1 | 108 | 97.0 | 10.73 |
| Chromium, total | 1 | 758 | 838 | 5.01 |
| Chromium, hexavalent | 5 | <0.5 | <0.5 | 0 |
| Copper | 1 | 5,610 | 7,430 | 13.96 |
| Copper | 6 | 410 | 397 | 1.61 |
| Lead | 1 | 57,600 | 47,000 | 10.31 |
| Mercury | 6 | 0.744 | 0.738 | 0.40 |
| Nickel | 1 | 60.9 | 67.9 | 5.43 |
| Zinc | 1 | 2,130 | 1,800 | 8.40 |
| Benzidine | 6 | <1.0 | <1.0 | 0 |
| p-Nitroaniline | 6 | <0.8 | <0.8 | 0 |
| 1,2,4-Trichlorobenzene | 6 | <1.0 | <1.0 | 0 |
| 2-Chlorophenol | 6 | <2.4 | <2.4 | 0 |
| 2,4-Dichlorophenol | 6 | <2.4 | <2.4 | 0 |
| Trichloroethylene | 6 | <1.0 | <1.0 | 0 |
| Chlorobenzene | 6 | <0.1 | <0.1 | 0 |
| 1,2-Dichlorobenzene | 6 | <0.1 | <0.1 | 0 |
| 1,3-Dichlorobenzene | 6 | <0.1 | <0.1 | 0 |
| 1,4-Dichlorobenzene | 6 | <0.1 | <0.1 | 0 |
| Aroclor 1221 | 3 | <0.5 | <0.5 | 0 |
| Aroclor 1232 | 3 | <0.2 | <0.2 | 0 |
| Aroclor 1016 | 3 | <0.2 | <0.2 | 0 |
| Aroclor 1242 | 3 | <0.2 | <0.2 | 0 |
| Aroclor 1248 | 3 | <0.2 | <0.2 | 0 |
| Aroclor 1254 | 3 | <0.2 | <0.2 | 0 |
| Aroclor 1260 | 3 | <0.2 | <0.2 | 0 |

Note: These results fall within the 95% confidence limits of our control charts.

< = None detected at stated detection limit.

$$* \text{ RPD} = \frac{[A-B]}{A + B/2} \times 100$$

# 5. RESULTS

The results of the analyses are presented in Tables 5-1 through 5-4. Values are reported in mg/kg dry weight of the soil composites.

Table 5-1

## RESULTS OF CHEMICAL ANALYSES OF SOIL COMPOSITES FOR METALS* AND pH

| Element | E & E Composite Number<br>1 | 2 | 3<br>(mg/kg dry weight) | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Arsenic | 108 | 1,870 | 694 | 84.8 | 42.8 | 63.5 |
| Chromium, total | 758 | 1,050 | 55.8 | 715 | 50.3 | 825 |
| Chromium, hexavalent | 0.567 | 3.16 | 2.76 | <0.5 | <0.5 | <0.5 |
| Copper | 5,610 | 6,200 | 2,480 | 1,320 | 1,030 | 410 |
| Lead | 57,600 | 26,200 | 923 | 746 | 262 | 116 |
| Mercury | 138 | 39.8 | 1.17 | 11.3 | 7.40 | 0.744 |
| Nickel | 60.9 | 103 | 60.9 | 167 | 49.9 | 187 |
| Zinc | 2,130 | 795 | 4,400 | 3,030 | 4,070 | 474 |
| pH, S.U. | 8.7 | 5.6 | 7.4 | 7.1 | 8.0 | 7.6 |

*All metals are "Total"

Lagoon 2: below W.T. above W.T.

Lagoon 1: below W.T. above W.T.

1 : Weathering Area Plant Side

2 : Weathering Area River Side

Table 5-2

RESULTS OF CHEMICAL ANALYSES OF SOIL
COMPOSITES FOR EXTRACTABLE ORGANICS

| Compound | E & E Composite Number<br>1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| | (mg/kg dry weight) | | | | | |
| 1-Napthylamine | <0.2 | <0.2 | <0.2 | 57.3 | <0.2 | 23.1 |
| 1,2,4-Trichlorobenzene | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| 1,2,4,5-Trichlorobenzene | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| 2-Chlorophenol | <2.4 | <2.4 | <2.4 | <2.4 | <2.4 | <2.4 |
| p-Chlorophenol | <2.4 | <2.4 | <2.4 | <2.4 | <2.4 | <2.4 |
| 2,4-Dichlorophenol | <2.4 | <2.4 | <2.4 | <2.4 | <2.4 | <2.4 |
| 2,4,5-Trichlorophenol | <1.2 | <1.2 | <1.2 | <1.2 | <1.2 | <1.2 |
| 2,4-Dinitrotoluene | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Benzyl Chloride | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Benzidine | <1.0 | <1.0 | 1.51 | <1.0 | 4.52 | <1.0 |
| m-Toluenediamine | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 |
| 2,4-Dinitrophenol | <2.5 | <2.5 | <2.5 | <2.5 | <2.5 | <2.5 |
| p-Nitroaniline | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 |
| Toluene diisocyanate | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 |
| 1,2-Dinitrobenzene | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| m-Dinitrobenzene | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| p-Dinitrobenzene | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Aroclor 1221 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Aroclor 1232 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |
| Aroclor 1016 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |
| Aroclor 1242 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |
| Aroclor 1248 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |
| Aroclor 1254 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |
| Aroclor 1260 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |

< = None detected at stated detection limits.

## Table 5-3

## RESULTS OF CHEMICAL ANALYSIS OF SOIL COMPOSITES FOR POLYNUCLEAR AROMATIC HYDROCARBONS

| Compound | E & E Composite Number | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| | (mg/kg dry weight) | | | | | |
| Acenaphthylene | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 |
| Acenaphthene | 1.20 | 1.07 | <0.6 | <0.6 | <0.6 | <0.6 |
| Naphthalene | 1.85 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Fluorene | 1.08 | 1.87 | 0.38 | 0.71 | <0.1 | 0.54 |
| Anthracene | 9.59 | 0.89 | 0.52 | 1.32 | 0.44 | 0.22 |
| Phenanthrene | * | * | * | * | * | * |
| Fluoranthene | 10.21 | 1.87 | 0.68 | 1.83 | 0.32 | 0.50 |
| Pyrene | 6.73 | 1.21 | 0.56 | 1.45 | 0.28 | 0.41 |
| Chrysene | 4.63 | 0.87 | 0.42 | 1.22 | 0.29 | 0.17 |
| Benzo(a)anthracene | ** | ** | ** | ** | ** | ** |
| Benzo(b)fluoranthene | 7.94 | 1.78 | 0.59 | 3.40 | <0.2 | 1.90 |
| Benzo(k)fluoranthene | *** | *** | *** | *** | *** | *** |
| Benzo(a)pyrene | *** | *** | *** | *** | *** | *** |
| Indeno(1,2,3-cd)pyrene | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Dibenzo(a,h)anthracene | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Benzo(ghi)perylene | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |

< = None detected at stated detection limit.

*Anthracene and phenanthrene are an isomeric pair which cannot be separated under these chromatographic conditions. Values are based on calculations using anthracene as a standard.

**Chrysene and benzo(a)anthracene are an isomeric pair. Values are based on calculations using chrysene as a standard.

***Benzo(b)fluoranthene, benzo(k)fluoranthene, and benzo(a)pyrene are an isomeric group. Values are based on calculations using benzo(b)fluoranthene as a standard.

## Table 5-4

## RESULTS OF CHEMICAL ANALYSES OF SOIL COMPOSITES FOR VOLATILE ORGANICS

| Compound | E & E Composite Number<br>(mg/kg dry weight)<br>1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Trichloroethylene | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Chlorobenzene | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 1,2-Dichlorobenzene | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 1,3-Dichlorobenzene | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 1,4-Dichlorobenzene | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |

< = None detected at stated detection limits.

# APPENDIX A

# CHAIN-OF-CUSTODY FORMS

**ecology and environment, inc.**
International Specialists in the Environmental Sciences

# CHAIN OF CUSTODY RECORD

| | |
|---|---|
| Proj. No. | Project Name<br>BUFFALO COLOR FILL SAMPLING |
| AMPLERS: (Signature) Don Owens | |

| TA. NO. | DATE | TIME | COMP. | GRAB | STATION LOCATION | NO. OF CONTAINERS | | | | | | | REMARKS | ASSIGNED E&E Lab # | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 12/14/82 | | | | WR-1 SAMPLE 1 | 1 | | | | | | | 0-2' depth | 2552 | ✓ |
| | | | | | WR-1 SAMPLE 2 | 1 | | | | | | | 2-3.4' depth | 2553 | ✓ |
| | | | | | WR-1 SAMPLE 3 | 1 | | | | | | | 4-6' depth | 2554 | ✓ |
| | | | | | WR-1 SAMPLE 4 | 1 | | | | | | | 6-8' depth | 2570 | |
| | | | | | WR-1 SAMPLE 5 | 1 | (LOG ONLY) | | | | | | 8-10' depth | 2571 | |
| | | | | | WR-1 SAMPLE 6 | 1 | (LOG ONLY) | | | | | | 10-12' depth | 2572 | |
| | | | | | WR-2 SAMPLE 1 | 1 | | | | | | | 0-2' depth | 2555 | ✓ |
| | | | | | WR-2 SAMPLE 2 | 1 | | | | | | | 2-4' depth | 2556 | ✓ |
| | | | | | WR-2 SAMPLE 3 | 1 | | | | | | | 4-6' depth | 2557 | ✓ |
| | | | | | WR-2 SAMPLE 4 | 1 | | | | | | | 6-8' depth | 2558 | ✓ |
| | | | | | WR-2 SAMPLE 5 | 1 | (LOG ONLY) | | | | | | 8-10' depth | 2573 | |
| | | | | | WR-2 SAMPLE 6 | 1 | (LOG ONLY) | | | | | | 10-12' depth | 2574 | |
| | | | | | WR-2 SAMPLE 7 | 1 | (LOG ONLY) | | | | | | 12-14' depth | 2575 | |
| | | | | | WR-3 SAMPLE 1A | 1 | | | | | | | 0-0.2' depth | 2559 | ✓ |
| | | | | | WR-3 SAMPLE 1B | 1 | | | | | | | ~~0.5-2.0' depth~~ | ~~2560~~ | ✓ |
| | | | | | WR-3 SAMPLE 2 | 1 | | | | | | | 2.0-4.0' depth | 2561 | ✓ |
| | | | | | WR-3 SAMPLE 3 | 1 | | | | | | | 4.0-6.0' depth | 2562 | ✓ |

A-2

| | | | | | |
|---|---|---|---|---|---|
| elinquished by: (Signature)<br>Don Owens | Date/Time | Received by: (Signature) | Relinquished by: (Signature) | Date/Time | Received by (Signature) |
| elinquished by: (Signature)<br>12/14/82 | Date/Time | Received by: (Signature) | Relinquished by: (Signature) | Date/Time | Received by: (Signature) |
| elinquished by: (Signature)<br>Peter Lombardo | Date/Time<br>12/14/82 4:20 | Received for Laboratory by: (Signature)<br>C. Szostowicz | Date/Time 4:20<br>12/14/82 CAW | Remarks (LOG only) samples not received at lab. CAW<br>no WR-1 sample #4 received CAW<br>See notes 12/15/82 | |

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# CHAIN OF CUSTODY RECORD

| Proj. No. | Project Name |
|---|---|
| | FILL SAMPLING<br>BUFFALO COLOR |

SAMPLERS: (Signature) Don Owens

| STA. NO. | DATE | TIME | COMP. | GRAB | STATION LOCATION | NO. OF CONTAINERS | | REMARKS |
|---|---|---|---|---|---|---|---|---|
| | | | | | WP-1 - SAMPLE 1A | 1 | | 0 - 0.8' depth 2576✓ |
| | | | | | WP-1 - SAMPLE 1B | 1 | | 1.3 - 2.0' depth 2577✓ |
| | | | | | WP-1 - SAMPLE 2 | 1 | | 2.0 - 4.0' depth 2578✓ |
| | | | | | WP-1 - SAMPLE 3 | 1 | | 4.0 - 6.0' depth 2579✓ |
| | | | | | WP-1 - SAMPLE 4 | 1 | | 6.0 - 8.0' depth 2580✓ |
| | | | | | WP-1 - SAMPLE 5 | 1 | (LOG ONLY) | 8.0 - 10.0' depth 2581✓ |
| | | | | | WP-1 - SAMPLE 6 | 1 | (LOG ONLY) | 10.0 - 12.0' depth 2582 |

| Relinquished by: (Signature) | Date/Time | Received by: (Signature) | Relinquished by: (Signature) | Date/Time | Received by: (Signature) |
|---|---|---|---|---|---|
| Don Owens | 12/15 3 00 pm | J Gourd | | | |
| Relinquished by (Signature) J Gourd | Date/Time 12/15 4 00 pm | Received by: (Signature) | Relinquished by: (Signature) | Date/Time | Received by: (Signature) |
| Relinquished by: (Signature) | Date/Time 12/15 4pm | Received for Laboratory by: (Signature) | Date/Time | Remarks seals intact | |

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# CHAIN OF CUSTODY RECORD

| | |
|---|---|
| Proj No. | Project Name<br>FILL SAMPLING<br>BUFFALO COLOR |
| SAMPLERS: (Signature) Don Owens | |

| STA. NO. | DATE | TIME | COMP. | GRAB | STATION LOCATION | NO. OF CON-TAINERS | | | | | | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 12/6/82 | | | | WP-3 - SAMPLE 1A | 1 | | | | | | 0 - 0.2' depth 2583 ✓ |
| | | | | | WP-3 - SAMPLE 1B | 1 | | | | | | 1.0 - 2.0' depth 2584 ✓ |
| | | | | | WP-3 SAMPLE 2 | 1 | | | | | | 2.0 - 4.0' depth 2585 ✓ |
| | | | | | WP-3 SAMPE 3 | 0 | | | | | | 4.0 - 6.0' depth |
| | | | | | WP-3 SAMPLE 4 | 1 | | | | | | 6.0 - 8.0' depth 2586 ✓ |
| | | | | | WP-3 SAMPLE 5 | 1 | (LOG ONLY) | | | | | 8.0 - 10.0' depth 2587 ✓ |
| | | | | | WP-3 SAMPLE 6 | 1 | (LOG ONLY) | | | | | 10 - 12.0' depth 2588 ✓ |
| | | | | | WP-4 SAMPLE 1A | 1 | | | | | | 0 - 0.7' depth 2589 |
| | | | | | WP-4 SAMPLE 1B | 1 | | | | | | 1.5 - 2.0' depth 2590 |
| | | | | | WP-4 SAMPLE 2 | 1 | | | | | | 2.0 - 4.0 depth 2591 |
| | | | | | WP-4 SAMPLE 3 | 1 | | | | | | 4.0 - 6.0 depth 2592 |
| | | | | | WP-4 SAMPLE 4 | 1 | | | | | | 6.0 - 8.0 depth 2593 |
| | | | | | WP-4 SAMPLE 5 | 1 | (LOG ONLY) | | | | | 8.0 - 10.0 depth 2594 |
| | | | | | WP-A SAMPLE 6 | 1 | (LOG ONLY) | | | | | 10.0 - 12.0 depth 2595 |
| | | | | | | | | | | | | ~~depth~~ |

| | | | | | |
|---|---|---|---|---|---|
| Relinquished by: (Signature) | Date/Time<br>12/15 3 00 pm | Received by: (Signature)<br>J. Gaurel | Relinquished by: (Signature) | Date/Time | Received by: (Signature) |
| Relinquished by: (Signature)<br>J. Gaurel | Date/Time<br>12/15 4 00 pm | Received by: (Signature) | Relinquished by: (Signature) | Date/Time | Received by: (Signature) |
| Relinquished by: (Signature) | Date/Time<br>12/15 4 pm | Received for Laboratory by: (Signature)<br>Oztowicz | Date/Time<br>12/15 4 00 pm | Remarks Seals intact<br>WP-4 should read WP2<br>samples correct | |

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A-4

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# CHAIN OF CUSTODY RECORD

| | |
|---|---|
| Proj. No. | |
| Project Name | FILL SAMPLING<br>BUFFALO COLOR CORP |
| SAMPLERS: (Signature) | Don Owens |

| STA. NO. | DATE | TIME | COMP. | GRAB | STATION LOCATION | NO. OF CONTAINERS | | | | | | | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | ZR-1 SAMPLE 1 | 1 | | | | | | | 0-2.0' depth 2610 ✓ |
| | | | | | ZR-1 SAMPLE 2 | 1 | | | | | | | 2.0-4.0' depth 2611 ✓ |
| | | | | | ZR-1 SAMPLE 3 | 1 | | | | | | | 4.0-6.0' depth 2612 ✓ |
| | | | | | ZR-1 SAMPLE 4 | 1 | | | | | | | 6.0-8.0' depth 2613 ✓ |
| | | | | | ZR-1 SAMPLE 5 | 1 | | | | | | | 8.0-10.0' depth 2614 ✓ |
| | | | | | ZR-1 SAMPLE 6 | 1 | | | | | | | 10.0-12.0' depth 2615 ✓ |
| | | | | | ZR-1 SAMPLE 7 A+B | 1 | | | | | | | 12.0-14.0' depth 2616, 2617 ✓ |
| | | | | | ZR-1 SAMPLE 8 | 1 | | | | | | | 14.0-16.0 depth 2618 ✓ |
| | | | | | ZR-1 SAMPLE 9 | 1 | | | | | | | 16.0-18.0' depth 2619 ~~2618~~ gw |
| | | | | | ZR-1 SAMPLE 10 | 1 | | | | | | | 18.0-20.0' depth 2620 ✓ |

| Relinquished by: (Signature) | Date/Time | Received by: (Signature) | Relinquished by: (Signature) | Date/Time | Received by: (Signature) |
|---|---|---|---|---|---|
| Don Owens | 12/15 4:00 pm | J A Younk | | | |
| Relinquished by: (Signature) | Date/Time | Received by: (Signature) | Relinquished by: (Signature) | Date/Time | Received by: (Signature) |
| J A Younk | 12/16 1:30 pm | | | | |
| Relinquished by: (Signature) | Date/Time | Received for Laboratory by: (Signature) | Date/Time | Remarks | |
| | | Nozlowicz | 12/16/?? 1:15 PM | See Notes | |

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# CHAIN OF CUSTODY RECORD

| | |
|---|---|
| Proj. No. | Project Name BUFFALO COLOR |
| SAMPLERS: (Signature) BARTH D Don Owens | |

| STA. NO. | DATE | TIME | COMP. | GRAB | STATION LOCATION | NO. OF CONTAINERS | REMARKS |
|---|---|---|---|---|---|---|---|
| 1 | 12/17 | | | X | 2P-1 #1 | 1 | LAGOON # 2 PLANT SIDE #1 2638 |
| | | | | X | 2P-1 #2 | 1 | 2639 |
| | | | | X | 2P-1 #3 | 1 | 2640 |
| | | | | X | 2P-1 #4 | 1 | 2641 |
| | | | | X | 2P-1 #5 | 1 | 2642 |
| | | | | X | 2P-1 #6 | 1 | 2643 |
| | | | | X | 2P-1 #7 | 1 | 2644 |
| | | | | X | 2P-1 #8 | 1 | 2645 |
| | | | | X | 2P-1 #9 | 1 | 2646 |
| | | | | X | 2P-1 #10 | 1 | 2647 |
| 2 | 12/17 | | | X | 2P-2 #1 | 1 | LAGOON # 2 PLANT SIDE #2 |
| | | | | | 2P-2 #2 | 1 | |
| | | | | | 2P-2 #3 | 1 | |
| | | | | | 2P-2 #4 | 1 | |
| | | | | | 2P-2 #5 | 1 | |

| | | | | | |
|---|---|---|---|---|---|
| Relinquished by: (Signature) Don Owens | Date/Time 12/17 | Received by: (Signature) D Sauer | Relinquished by: (Signature) D Sauer | Date/Time 12/17 1610 | Received by: (Signature) Mike Pierce SBC |
| Relinquished by: (Signature) Mike Pierce SBC | Date/Time 4:35 12/17 | Received by: (Signature) Wojtowicz | Relinquished by: (Signature) | Date/Time | Received by: (Signature) |
| Relinquished by: (Signature) | Date/Time | Received for Laboratory by: (Signature) Wojtowicz | Date/Time 12/17/82 4:35 | Remarks Seals intact - No signatures Indicated | |

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# CHAIN OF CUSTODY RECORD

| | |
|---|---|
| Proj. No. | Project Name BUFFALO COLOR |
| SAMPLERS: (Signature) EARTH DIMENSIONS Ron Owens | |

| STA. NO. | DATE | TIME | COMP. | GRAB | STATION LOCATION | NO. OF CONTAINERS | | | | | | | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 12/17 | | | X | 2P2 #6 | 1 | | | | | | | LAGOON #2 PLANT SIDE 2 |
| | | | | X | 2P-2 7 | 1 | | | | | | | |
| | | | | X | 2P-2 8 | 1 | | | | | | | |
| | | | | X | 2P-2 9 | 1 | | | | | | | |
| | | | | X | 2P-2 10 | 1 | | | | | | | |
| | | | | X | 2P-2 11 | 1 | | | | | | | |
| | | | | | LAST ITEM | | | | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| Relinquished by: (Signature) Ron Owens | Date/Time 12/17 | Received by: (Signature) | Relinquished by: (Signature) | Date/Time 12/17 1610 | Received by: (Signature) Mike Pierce SBC |
| Relinquished by: (Signature) Mike Pierce SBC | Date/Time | Received by: (Signature) | Relinquished by: (Signature) | Date/Time | Received by: (Signature) |
| Relinquished by: (Signature) | Date/Time | Received for Laboratory by: (Signature) | Date/Time 12/17/82 4:55 | Remarks Seals intact No signature ~~Initialed~~ | |

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# CHAIN OF CUSTODY RECORD

Proj. No.

Project Name: FILL SAMPLING BUFFALO COLOR CORP.

SAMPLERS: (Signature) Don Owens

| STA. NO. | DATE | TIME | COMP | GRAB | STATION LOCATION | NO. OF CONTAINERS | | | | | | | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 12/16/82 | | | | 2R-1 SAMPLE 11 | 1 | | | | | | | 20.0 - 22.0' depth 2621 ✓ |
| | | | | | 2R-1 SAMPLE 12 | 1 | | | | | | | 22.0 - 24.0' depth 2622 ✓ |
| | | | | | 2R-1 SAMPLE 13 | 1 | | | | | | | 24.0 - 26.0' depth 2623 ✓ |
| | | | | | 2R-1 SAMPLE 14 | 1 | | | | | | | 26.0 - 28.0' depth 2624 ✓ |
| | | | | | 2R-1 SAMPLE 15 | 1 | | | | | | | 28.0 - 30.0' depth 2625 ✓ |
| | | | | | 2R-2 SAMPLE 1 | 1 | | | | | | | 0 - 2.0' depth 2626 ✓ |
| | | | | | 2R-2 SAMPLE 2 | 1 | | | | | | | 2.0 - 4.0' depth 2627 ✓ |
| | | | | | 2R-2 SAMPLE 3 | 1 | | | | | | | 4.0 - 6.0' depth 2628 ✓ |
| | | | | | 2R-2 SAMPLE 4 | 1 | | | | | | | 6.0 - 7.6' depth 2629 ✓ |
| | | | | | 2R-2 SAMPLE 5 | 1 | | | | | | | 10.0 - 12.0' depth 2630 ✓ |
| | | | | | 2R-2 SAMPLE 6 | 1 | | | | | | | 12.0 - 12.3' depth 2631 ✓ |
| | | | | | 2R-2 SAMPLE 7 | 1 | | | | | | | 12.3 - 14.0' depth 2632 ✓ |
| | | | | | 2R-2 SAMPLE 8 | 1 | | | | | | | 16.0 - 18.0' depth 2633 ✓ |
| | | | | | 2R-2 SAMPLE 9 | 1 | | | | | | | 18.0 - 20.0' depth 2634 ✓ |
| | | | | | 2R-2 SAMPLE 10 | 1 | | | | | | | 20.0 - 22.0' depth 2635 ✓ |
| | | | | | 2R-2 SAMPLE 11 | 1 (LOG ONLY) | | | | | | | 22.0 - 24.0' depth 2636 ✓ |

| | | | | | |
|---|---|---|---|---|---|
| Relinquished by: (Signature) Don Owens | Date/Time | Received by: (Signature) J A Gouck | Relinquished by: (Signature) | Date/Time | Received by: (Signature) |
| Relinquished by: (Signature) J A Gouck | Date/Time 12/17 | Received by: (Signature) D Sauer | Relinquished by: (Signature) D Sauer | Date/Time 12/17 | Received by: (Signature) Carl C |
| Relinquished by: (Signature) Carl C | Date/Time | Received for Laboratory by: (Signature) X DHA / C Stojkovic | Date/Time 12/17 9am | Remarks All samples received with seals intact but not signed Initialed | |

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# CHAIN OF CUSTODY RECORD

Proj. No.

Project Name

SAMPLERS: *(Signature)* Douglas J Olson

| STA. NO. | DATE | TIME | COMP. | GRAB | STATION LOCATION | NO. OF CONTAINERS | | | | | | | | REMARKS | E+E # |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 12/20 | | | | 1P1 - #1 | 1 | | | | | | | | 2' depth | 2672 |
| | | | | | 1P1 - #2 | 1 | | | | | | | | 2'-4' | 2673 |
| | | | | | 1P1 - #3 | 1 | | | | | | | | 4-6' | 2674 |
| | | | | | 1P1 - #4 | 1 | | | | | | | | 6-8' | 2675 |
| | | | | | 1P1 - #5 | 1 | | | | | | | | 8-10' | 2676 |
| | | | | | 1P1 - #6 | 1 | | | | | | | | 10-12' | 2677 |
| | | | | | 1P1 - #7 | 1 | | | | | | | | 12-14' | 2678 |
| | | | | | 1P1 - #8 | 1 | | | | | | | | 14-16' | 2679 |
| | | | | | 1P1 - #9 | 1 | | | | | | | | 16-18' log only | 2680 |

| | | | | | |
|---|---|---|---|---|---|
| Relinquished by: *(Signature)*<br>Douglas J. Olson | Date/Time<br>12/20/82 12<sup></sup> | Received by: *(Signature)* | Relinquished by: *(Signature)* | Date/Time<br>12/20/82 12 | Received by: *(Signature)* |
| Relinquished by: *(Signature)* | Date/Time<br>12/21 9 30 | Received by: *(Signature)*<br>for lab CAW | Relinquished by: *(Signature)* | Date/Time | Received by: *(Signature)* |
| Relinquished by: *(Signature)* | Date/Time | Received for Laboratory by: *(Signature)*<br>Wojtowicz | Date/Time<br>12/21/82 9 30 | Remarks Seals intact | |

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# CHAIN OF CUSTODY RECORD

Proj. No.

Project Name BUFFALO COLOR

SAMPLERS: *(Signature)*

| STA. NO. | DATE | TIME | COMP. | GRAB | STATION LOCATION | NO. OF CONTAINERS | | | | | | | REMARKS<br>E & E lab # |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 12/21 | | | X | HOLE IR2 1 | 1 | | | | | | | 2824 |
| | | | | X | 2 | 1 | | | | | | | 2825 |
| | | | | X | 3 | 1 | | | | | | | 2826 |
| | | | | X | 4 | 1 | | | | | | | 2827 |
| | | | | X | 5 | 1 | | | | | | | 2828 |
| | | | | X | 6 | 1 | | | | | | | 2829 |
| | | | | X | 7 | 1 | | | | | | | 2830 |
| | | | | X | 8 | 1 | | | | | | | 2831 |
| | | | | X | 9 | 1 | | | | | | | 2832 |
| | | | | X | 10 | 1 | | | | | | | 2833 |
| | | | | X | 11 | 1 | | | | | | | 2834 |
| | | | | X | 12 | 1 | | | | | | | 2835 |
| | | | | X | 13A | 1 | | | | | | | 2836 |
| | | | | X | 13B | 1 | | | | | | | 2837 |
| | | | | X | 14A | 1 | | | | | | | 2838 |

| | | | | | |
|---|---|---|---|---|---|
| Relinquished by: *(Signature)*<br>Harold Golden | Date/Time<br>12/21 1600 | Received by: *(Signature)* | Relinquished by: *(Signature)* | Date/Time<br>12/22 | Received by: *(Signature)* |
| Relinquished by: *(Signature)* | Date/Time<br>12/22 11⁴⁵ | Received by: *(Signature)*<br>for lab | Relinquished by: *(Signature)* | Date/Time | Received by: *(Signature)* |
| Relinquished by: *(Signature)* | Date/Time | Received for Laboratory by: *(Signature)* | Date/Time<br>12/22 11⁴⁵ am | Remarks | |

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# CHAIN OF CUSTODY RECORD

| | |
|---|---|
| Proj. No. | Project Name<br>BUFFALO COLOR |
| SAMPLERS: (Signature) | |

| STA. NO. | DATE | TIME | COMP. | GRAB | STATION LOCATION | NO. OF CONTAINERS | REMARKS |
|---|---|---|---|---|---|---|---|
| | 12/21 | | | X | 14B | 1 | 2839 |
| | ↓ | | | X | 15 | 1 | 2840 |
| | | | | X | 16 | 1 | 2841 |

LAST ITEM

| Relinquished by: (Signature) | Date/Time | | Received by: (Signature) | Relinquished by: (Signature) | Date/Time | Received by: (Signature) |
|---|---|---|---|---|---|---|
| Harold Bolden | 12/21 | 1600 | | | 12/22 | |

| Relinquished by: (Signature) | Date/Time | | Received by: (Signature) | Relinquished by: (Signature) | Date/Time | Received by: (Signature) |
|---|---|---|---|---|---|---|
| | 12/22 | 11 | for lab | | | |

| Relinquished by: (Signature) | Date/Time | | Received for Laboratory by: (Signature) | Date/Time | | Remarks |
|---|---|---|---|---|---|---|
| | | | | 12/21/82 | 11 45 am | |

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# CHAIN OF CUSTODY RECORD

| | |
|---|---|
| Proj. No. | Project Name<br>Buffalo Color |
| SAMPLERS: (Signature)<br>Douglas Jackson | |

| STA. NO. | DATE | TIME | COMP. | GRAB | STATION LOCATION | NO. OF CONTAINERS | | | | | | | REMARKS | | E&E # |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1P1-10 | | | | | | | | 18-20' | depth | 2681 |
| | | | | | 1P1-11 | | | | | | | | 20-22' | " | 2682 |
| | | | | | 1P1-12 | | | | | | | | 22-24' | " | 2683 |
| | | | | | 1P1-13 | | | | | | | | 24-26' | " | 2684 |
| | | | | | 1P1-14 | | | | | | | | 26-28' | " | 2685 |
| | | | | | 1P1-15 | | | | | | | | 28-30' | " | 2686 |

| | | | | | |
|---|---|---|---|---|---|
| Relinquished by: (Signature) | Date/Time<br>12/21 9 30 Am | Received by: (Signature)<br>for laboratory | Relinquished by: (Signature) | Date/Time | Received by: (Signature) |
| Relinquished by: (Signature) | Date/Time | Received by: (Signature) | Relinquished by: (Signature) | Date/Time | Received by: (Signature) |
| Relinquished by: (Signature) | Date/Time | Received for Laboratory by: (Signature) | Date/Time<br>12/21 9 30 | Remarks Seals intact | |

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# CHAIN OF CUSTODY RECORD

| | | |
|---|---|---|
| Proj. No. | Project Name BUFFALO COLOR | NO. OF CON-TAINERS |
| SAMPLERS: *(Signature)* | | |

| STA. NO. | DATE | TIME | COMP. | GRAB | STATION LOCATION | NO. OF CON-TAINERS | | | | | | | | REMARKS<br>E&E lab # |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 12/22 | | | X | IRI #1 | 1 | | | | | | | | 2866 |
| | 12/22 | | | X | 2 | 1 | | | | | | | | 2867 |
| | 12/22 | | | X | 3 | 1 | | | | | | | | 2868 |
| | 12/22 | | | X | 4 | 1 | | | | | | | | 2869 |
| | 12/22 | | | X | 5 | 1 | | | | | | | | 2870 |
| | 12/22 | | | X | 6 | 1 | | | | | | | | 2871 |
| | 12/22 | | | X | 7 | 1 | | | | | | | | 2872 |
| | 12/22 | | | X | 8 | 1 | | | | | | | | 2873 |
| | 12/22 | | | X | 9 | 1 | | | | | | | | 2874 |
| | 12/22 | | | X | 10 | 1 | | | | | | | | 2875 |
| | 12/22 | | | X | 11 | 1 | | | | | | | | 2876 |
| | 12/22 | | | X | 12 | 1 | | | | | | | | 2877 |
| | 12/22 | | | X | 13 | 1 | | | | | | | | 2878 |
| | 12/22 | | | X | 14 | 1 | | | | | | | | 2879 |
| | | | | | LAST ITEM | | | | | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| Relinquished by: *(Signature)*<br>Harold Bolden | Date/Time<br>12/27 0950 | Received by: *(Signature)*<br>David E Sauer | Relinquished by: *(Signature)*<br>D Sauer | Date/Time<br>12/27 1005 | Received by: *(Signature)* |
| Relinquished by: *(Signature)* | Date/Time<br>1025 | Received by: *(Signature)*<br>for lab | Relinquished by: *(Signature)* | Date/Time | Received by: *(Signature)* |
| Relinquished by: *(Signature)* | Date/Time | Received for Laboratory by: *(Signature)*<br>Wojtowicz | Date/Time<br>12/27/82 1025 | Remarks Seals intact | |

ec y and environment, inc.
Interne .al Specialists in the Environmental Sciences

# CHAIN OF CUSTODY RECORD

| Proj. No. | Project Name |
|---|---|
| | BUFFALO COLOR |

SAMPLERS: (Signature)

| STA. NO. | DATE | TIME | COMP. | GRAB | STATION LOCATION | NO. OF CONTAINERS | | | | | | | | REMARKS<br>E+E lab # |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 12/22 | | | X | 1P-2 #1 | 1 | | | | | | | | 2853 |
| | | | | X | 2 | 1 | | | | | | | | 2854 |
| | | | | X | 3 | 1 | | | | | | | | 2855 |
| | | | | X | 4 | 1 | | | | | | | | 2856 |
| | | | | X | 5 | 1 | | | | | | | | 2857 |
| | | | | X | 6 | 1 | | | | | | | | 2858 |
| | | | | X | 7 | 1 | | | | | | | | 2859 |
| | | | | X | 8 | 1 | | | | | | | | 2860 |
| | | | | X | 9 | 1 | | | | | | | | 2861 |
| | | | | X | 10 | 1 | | | | | | | | 2862 |
| | ↓ | | | X | 11 | 1 | | | | | | | | 2863 |
| | 12/23 | | | X | 12 | 1 | | | | | | | | 2864 |
| | ↓ | | | X | 13 | 1 | | | | | | | | 2865 |
| | | | | | LAST ITEM | | | | | | | | | |

| Relinquished by: (Signature) | Date/Time | Received by: (Signature) | Relinquished by: (Signature) | Date/Time | Received by: (Signature) |
|---|---|---|---|---|---|
| Harold Solden | 12/27 0950 | R Sauer | R Sauer | 12/27 $10^{05}$ | |
| Relinquished by: (Signature) | Date/Time | Received by: (Signature) | Relinquished by: (Signature) | Date/Time | Received by: (Signature) |
| | $10^{25}$ | for lab | | | |
| Relinquished by: (Signature) | Date/Time | Received for Laboratory by: (Signature) | Date/Time | Remarks | |
| | | Nogdowicz | 12/27/82 $10^{25}$ | Seals intact | |

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APPENDIX II

# REWIEW AND EVALUATION OF GROUNDWATER DISCHARGE ELK STREET PLANT

June 25, 1984

Prepared for:

Buffalo Color Corporation
Buffalo, New York

# DRAFT

## BUFFALO COLOR REPORT REVIEW

REVIEWERS:

Jack Krajewski - DEE, Buffalo Field Unit
Robert Leary - DEE, Buffalo Field Unit
Vance Bryant - DEE, Albany Core Unit
Dick Hoffman - DEE, Albany Field Unit
Ed Horn - DEC, Fish & Wildlife - Declined to review
Ed Kuzia - DEC, Water
Kevin Walter - DEE, Albany Core - will comment on 10/23/84
Ahmed Tayyebi - DSHW, Buffalo

COMMENTS

In general the review has generated two types of comments; those criticizing the quality of the report and those criticizing the conclusions.

Buffalo Color has concluded the following:

1. Groundwater flow from the lagoons and weathering area is minimal
2. Chemical contribution to the Buffalo River from the sites is negligible
3. Contributions (chemical) to the Niagara River Load allocations are insignificant
4. The lagoons and weathering area should be re-classified to a D-rating - no further action required

The comments regarding these conclusions are listed below:

1. Minimal groundwater flow:

The worst case evaluation presented by Buffalo Color is for a groundwater flow rate of 5gpm through the waste areas. This translates to 300 gallons per hour. The company considers this a negligible discharge level. In view of the contaminants it contains this amount is not negligible.

a) The 5gpm figure used by Buffalo Color is unsubstantiated in the report. The closest figures to the 5gpm rate are found in the 3/26/84 water balance flow rate estimate - they add up to 5.6gpm.

The figures in the Hydrology section of the report are listed as 2.5 and 1.4gpm.

b) The flow rate calculations were done for the high and low precipitation periods rather than the high and low groundwater periods.

c) Little or no data was provided to support the interpretations presented by the company. Water level data was incomplete and significant errors were found in the data that was submitted. The number of water leve~~y~~l reading events was inaccurate and ambiguous. The ability to check their calculations was greatly impaired because of lack of data.

d) No geologic data interpretation or evaluation was provided in the report. This information is critical to the proper calculation of flow rates.

e) Two methods were used to determine flow rates through the waste areas. Both methods have questionable portions or errors.

    Flow net method

    1) Estimates for permeability (10 gal/day/$ft^2$) and aquifer thickness (50 ft) are unsubstantiated and ignore the geologic data obtained in the field investigation. These two factors are critical in this method.

    2) Effect of storm drains on water levels at well #6 were not considered or explained.

3) Effect of railroad embankment on groundwater divide is considered negligible. Therefore flow nets should be larger at the sludge ponds.

4) The permeability of the waste material is significantly different than the native soils.

5) Mathematical errors were found in the calculations.

Water balance method

1) Lake evaporation used in the report does not correlate with runoff and evapotranspiration.

2) The calculations of the areas for recharge of the waste sites are underestimated.

3) Runoff may be significant in the waste site areas, but there are no storm sewers and the sludge ponds have depressions in the center which will increase recharge.

4) Weather data used is not the most recent. 1981 data indicates an inch more precipitation.

f) The consultant, Ecology & Environment, who did the groundwater flow rate calculations, indicates there are insufficient monitoring points to define groundwater contours. The author of the consultant report was not indicated.

g) Site map referenced in report was not included

2. Chemical contribution from sites:

Buffalo Color ignores groundwater standards and guidelines in their assessment and only mentions SPDES guidelines, but does not list them. They base their argument on Class D stream standards and Niagara River load allocations. The Niagara River load allocations will be addressed in section 3.

## Introduction

Buffalo Color Corporation, Buffalo, New York, has directed Ecology and Environment, Inc., (E & E) to review hydrologic data obtained from part of their plant site at Elk Street, Buffalo. Two areas of the plant are involved, the so called "weathering area" where metal oxides were formerly stored on the surface for resale, and sludge ponds one and two, where iron wastes were dewatered for resale (Fig. 1). Both areas are immediately adjacent to the Buffalo River, and the company has had groundwater monitoring wells installed around them to determine water table elevations and to sample groundwater quality. The area has low slopes, is entirely composed of artificial fill and has little vegetation cover. There is no artificial drainage in the area of concern.

E & E adopted two approaches to estimate rates of discharge from groundwater through the two areas thought to be contaminated by past plant practices. The first approach used was to draw estimated groundwater contours and flow lines to define the area draining through each site. From the estimated hydraulic gradient and the estimated transmissivity of the subsurface materials, it is possible to derive a rate of flow through each site. Conservation estimates were used which tend, if anything, to overestimate rates of discharge. The second approach was to estimate where the groundwater divides were to determine how great a recharge area upgradient of the sites might be discharging through them and then to make a conservative estimate of the maximum flow rates from the water balance of the area. The estimated annual water balance, ignoring runoff and transpiration, is 35" of precipitation and 26-28" of lake evaporation, leaving, at most, 9" of infiltration (NOAA, 1963). For monthly calculations, we used 50% infiltration for March and 25% infiltration for June.

Although there are insufficient measurement points to satisfactorily define the groundwater contours in the entire area, the railroad embankment to the east must create at least a slight groundwater mound under it, and preclude entry of groundwater from the east, where existing storm drains will also direct both surface and groundwater flow away from the disposal sites.

## Analysis of Available Data

The rate of flow of groundwater passing through a section of an aquifer may be calculated by a modified form of the Darcy equation:

$$Q = TIL \qquad (1)$$

(Walton, 1970)

Where $Q$ = rate of flow of water through cross section of aquifer, in gpd,
$T$ = coefficient of transmissivity, in gpd/ft,
$I$ = hydraulic gradient, in ft/mile,
$L$ = mean width of cross section of aquifer, in miles.

The value of transmissivity was estimated to be roughly 500 gallons per day per foot based upon an estimated aquifer thickness of 50 feet and a permeability of 10 gallons per day per foot squared. The mean width of cross section of the aquifer was measured off the water table contour maps. The hydraulic gradient is defined by the formula:

$$I = \frac{c_i}{W_a} \qquad (2)$$

Where $I$ = hydraulic gradient, in ft/mile,
$c_i$ = contour interval of water table map, in feet,
$W_a$ = $\frac{A'}{L}$, where $A'$ is the area between two limiting flow lines and water table contours between the two limiting flow lines, in miles.

The rate of groundwater flow into the Buffalo River was estimated at the "weathering area" and the number one and two sludge ponds for June 8, 1982, and March 26, 1984. These dates were chosen in order to provide calculations of groundwater flow under extremes of precipitation. The month of June experiences the least amount of rainfall during the year, while March experiences the greatest for those months with recorded water table data (Table 1).

# TABLE 1
# MEAN PRECIPITATION IN BUFFALO, NEW YORK [1]

| MONTH | PRECIPITATION (inches) | WATER LEVEL MEASUREMENTS[2] |
|---|---|---|
| January | 2.84 | 0 |
| February | 2.72 | 0 |
| March | 3.24 | 5 |
| April | 3.01 | 10 |
| May | 2.95 | 6 |
| June | 2.54 | 33 |
| July | 2.57 | 1 |
| August | 3.05 | 0 |
| September | 3.13 | 0 |
| October | 3.00 | 0 |
| November | 3.60 | 0 |
| December | 3.00 | 0 |

1 - Precipitation measurements were taken at Greater Buffalo International Airport.

2 - Number of monitoring well water level measurements performed between the dates June 1, 1982 and April 24, 1984, as provided to Ecology and Environment, Inc.

From Climates of the States, Volume 1: Eastern States, Water Information Center, Inc., 1974.

June 8, 1982 analysis

Weathering Area

$A'$ = $1.04 \times 10^{-3}$ square miles (shaded area A on Figure 3),
$L$ = 0.0341 miles,
$c_i$ = 0.3 feet (elevations 573.7 - 573.4 feet a.m.s.l.),

$$I = \frac{0.3 \text{ feet}}{1.04 \times 10^{-3} \text{ miles}^{2}\ 2/0.0341 \text{ miles}} = 9.84 \text{ ft/mile},$$

$T$ = 500 gallons per day per foot,

$Q_n$ = 500 gpd/ft X 9.8 ft/mi X 0.0341 miles,
= 168 gpd or 0.117 gallons per minute.

Sludge Pond One and Two Area

$A'$ = $5.25 \times 10^{-3}$ square miles (shaded area B on Figure 3),
$L$ = 0.0921 miles,
$c_i$ = 0.5 feet (elevations 573.9-573.4 feet a.m.s.l.),

$$I = \frac{0.5 \text{ feet}}{5.25 \text{ X } 10\text{-}3 \text{ miles } 2/0.0921 \text{ miles}} = 8.77 \text{ ft/miles},$$

$Q_n$ = 500 gpd/ft X 8.77 ft/mile X 0.0921 miles,
= 404 gpd or 0.281 gallons per minute.

These analysis are sensitive to the assumptions made as to what value of T should be used.

March 26, 1984 analysis

Weathering Area

$A'$ = 1.17 X $10^{-3}$ square miles (shaded area A on Figure 2),

$L$ = 0.0567 miles,

$c_i$ = 0.2 feet (elevations 573.8 - 573.6 feet a.m.s.l.),

$$I = \frac{0.2 \text{ feet}}{1.168 \times 10^{-3} \text{ miles}^2 / 0.0567 \text{ miles}} = 9.71 \text{ feet/mile},$$

$Qn$ = 500 gpd/ft X 9.71 feet/mile X 0.0567 miles,

= 0.121 gallons per minute.

Sludge Pond One and Two Area

Pond One

$A'$ = 3.26 X $10^{-4}$ square miles (shaded area B on Figure 2),

$L$ = 0.0266 miles,

$c_i$ = 0.1 feet (elevations 574.2 - 574.1 feet a.m.s.l.),

$$I = \frac{0.1 \text{ feet}}{3.26 \times 10^{-4} \text{ miles}^2 / 0.0266 \text{ miles}} = 8.16 \text{ feet/mile},$$

$Qn$ = 500 gpd/ft X 16.3 feet/mile x 0.0266 miles,

= 217 gpd or 0.151 gallons per minute.

Pond Two

$A'$ = 8.91 X $10^{-4}$ square miles (shaded area C on Figure 2),

$L$ = 0.0266 miles,

$c_i$ = 0.5 feet (elevations 574.6 - 574.1 feet a.m.s.l.),

$$I = \frac{0.5 \text{ feet}}{8.9 \times 10^{-4} \text{ miles}^2 / 0.0266 \text{ miles}} = 14.9 \text{ feet/mile},$$

$Qn$ = 500 gpd/feet X 14.9 feet/mile X 0.0266 miles,

= 199 gallons per day or 0.138 gallons per minute.

An alternate method relies on the mass balance of the aquifer in regards to area, rainfall and evaporation. The rate of flow of groundwater into the Buffalo River, ignoring runoff, should follow the following equation:

$$Q = (P-ET) \times A \quad (3)$$

Where $Q$ = recharge to the Buffalo River,
$P$ = precipitation in feet,
$ET$ = evapotranspiration in feet,
$A$ = area of groundwater water shed.

The area from monitoring well 9 to the southeastern edge of the weathering zone and between the flow lines tangent to the weathering zone is roughly 41,700 feet.

The mean precipitation for June is 2.54 in or 0.212 feet (Table 1). Loss by evapotranspiration can only be estimated. A figure of 25% of the precipitation will be used as a conservative estimate.

$$Q = (0.212 \text{ feet} - 0.159 \text{ feet}) \times 41{,}700 \text{ feet}^2,$$
$$= 2210 \text{ ft}^3,$$
$$= 16{,}500 \text{ gallons during the month of June, or } 0.370 \text{ gallons per minute.}$$

The rate of groundwater flow into the Buffalo River from the area of the sludge ponds can only be estimated from general considerations of the limits from which groundwater is likely to drain, since the monitoring well data is too sparse. As an outside estimate an area of five acres could drain to the river through the sludge pond area. This would result in a discharge of two gallons per minute in June.

The mass balance approach may be applied to the March 26, 1984 data set for calculation of flow rates in the weathering area. By equation 3,

$Q$ = (0.270 feet - 0.135 feet) X 44,100 $\text{feet}^2$,

= 5950 $\text{feet}^3$,

or 44,500 gallons during the month of March,
or 1 gallon per minute.

The portion of the groundwater watershed upgradient of the two sludge ponds was estimated to be 201600 square feet. Applying equation 3,

$Q$ = (0.270 feet - 0.135 feet) X 201,600 $\text{feet}^2$,

= 27.216 $\text{feet}^3$,

or 203,600 gallons during the month of March,
or 4.56 gallons per minute.

Again it should be emphasized that these figures do not take runoff into account. As much of the area is buildings and paved areas, this could lead to a very significant reduction in these figures. For example, a ground water model of part of the City of Niagara Falls uses a figure of 7" <u>per year</u> for recharge to undeveloped areas, and only 3" <u>per year</u> for developed areas.

## Summary

The highest flow rates through the ponds and weathering zone occurs during months of greatest precipitation. The March 26, 1984 analysis should yield typical flow rates for those months with high precipitation. A flow rate of 0.121 gallons per minute was calculated for sludge ponds one and two respectively using a flow net analysis. The results of the mass balance analysis yielded figures roughly an order of magnitude higher. These higher figures could be thought of as the worst case situation for calculations of discharge to the Buffalo River.

# REFERENCES

National Oceanic and Atmospheric Administration, 1963, Climatic Atlas of the United States, National Oceanic and Atmospheric Administration, Asheville, NC.

Water Information Center, Inc., 1974, Climates of the States, Volume 1: Eastern States, Water Information Center, Inc., Syosset, NY.

Walton, W.C., 1970, Ground Water Resource Evaluation: New York, McGraw-Hill Corporation.

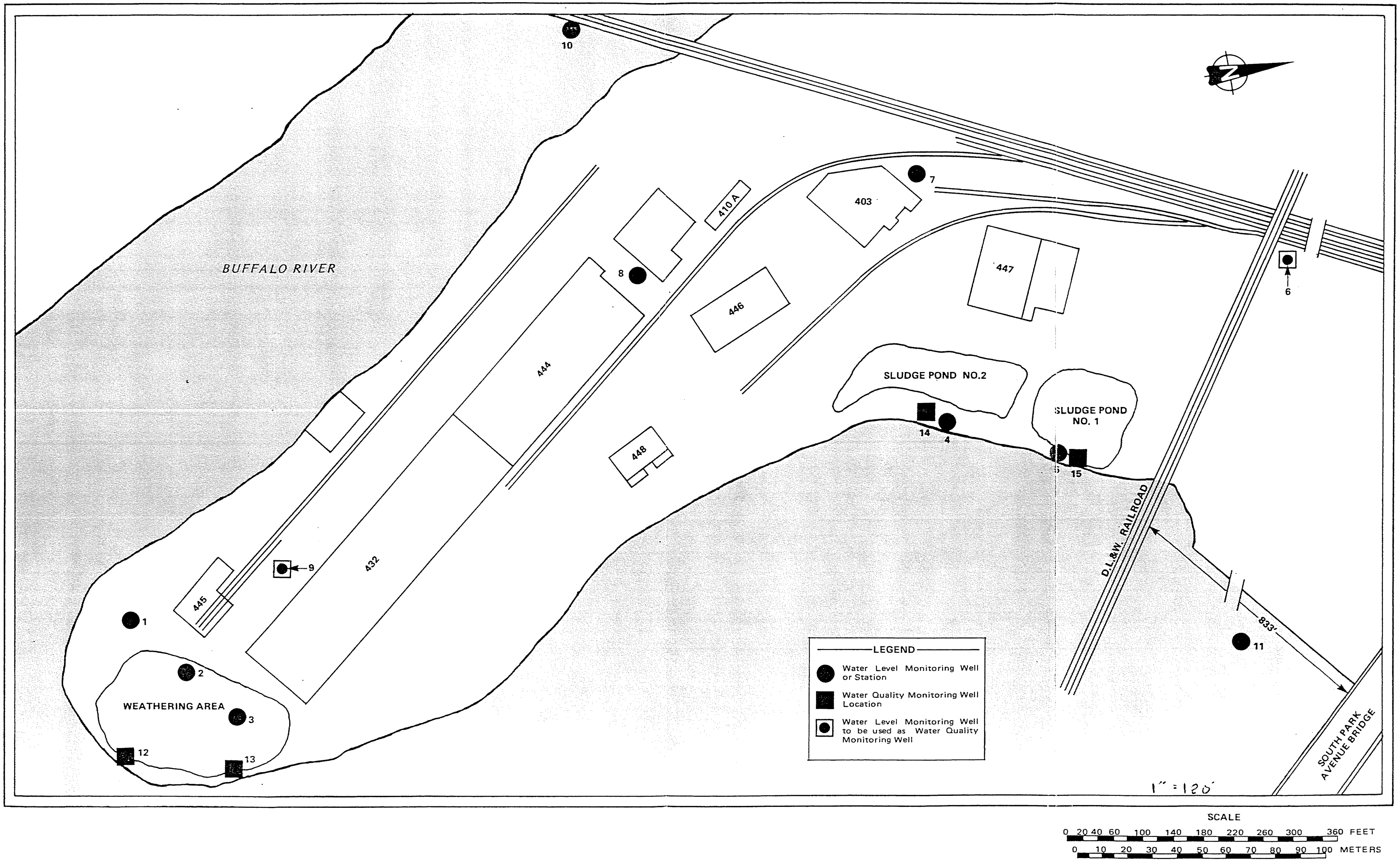

Figure 1 LOCATION OF MONITORING WELLS

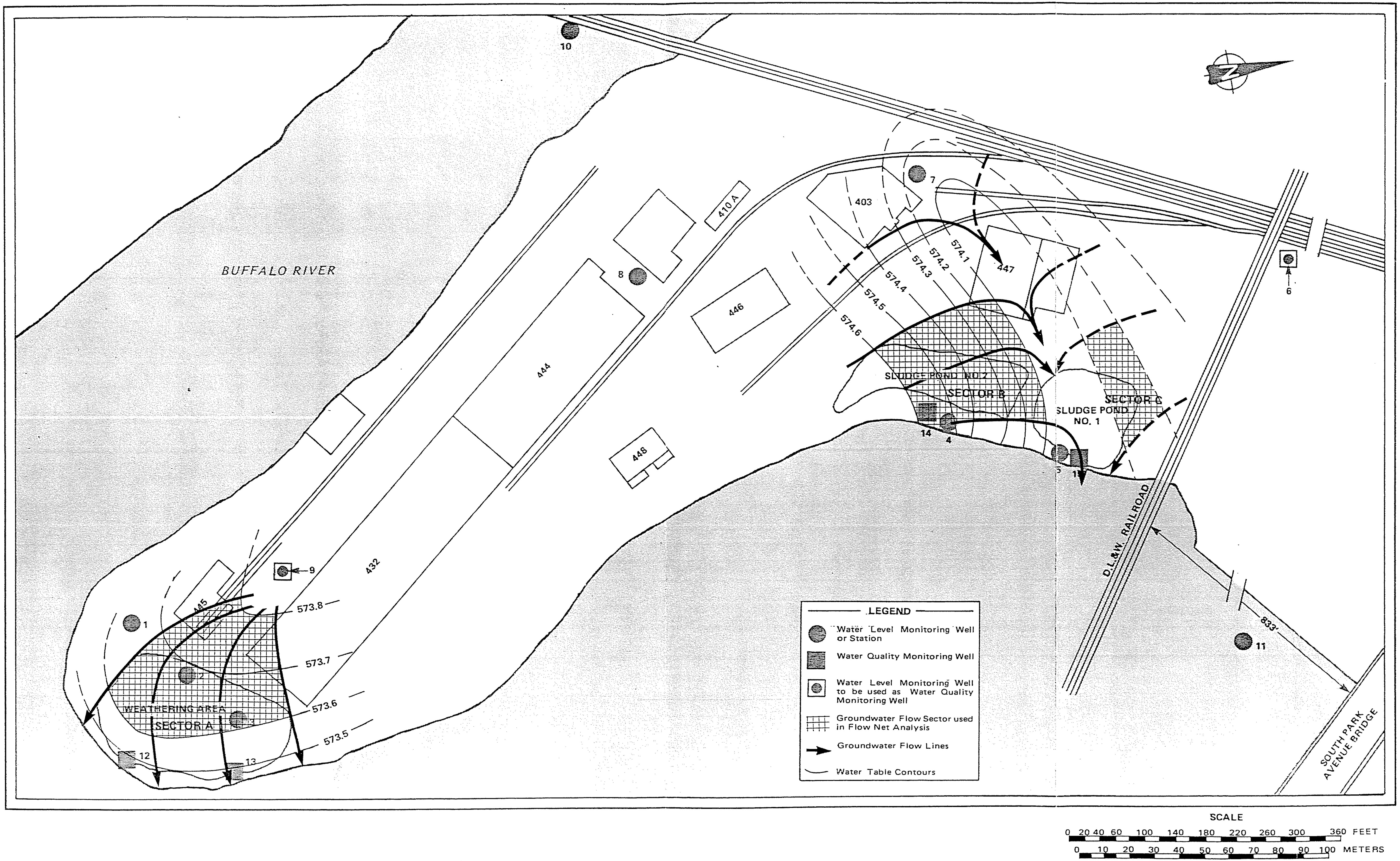

Figure 2 FLOW NET ANALYSIS OF THE WEATHERING AREA AND SLUDGE PONDS ONE AND TWO FOR MARCH 26, 1984

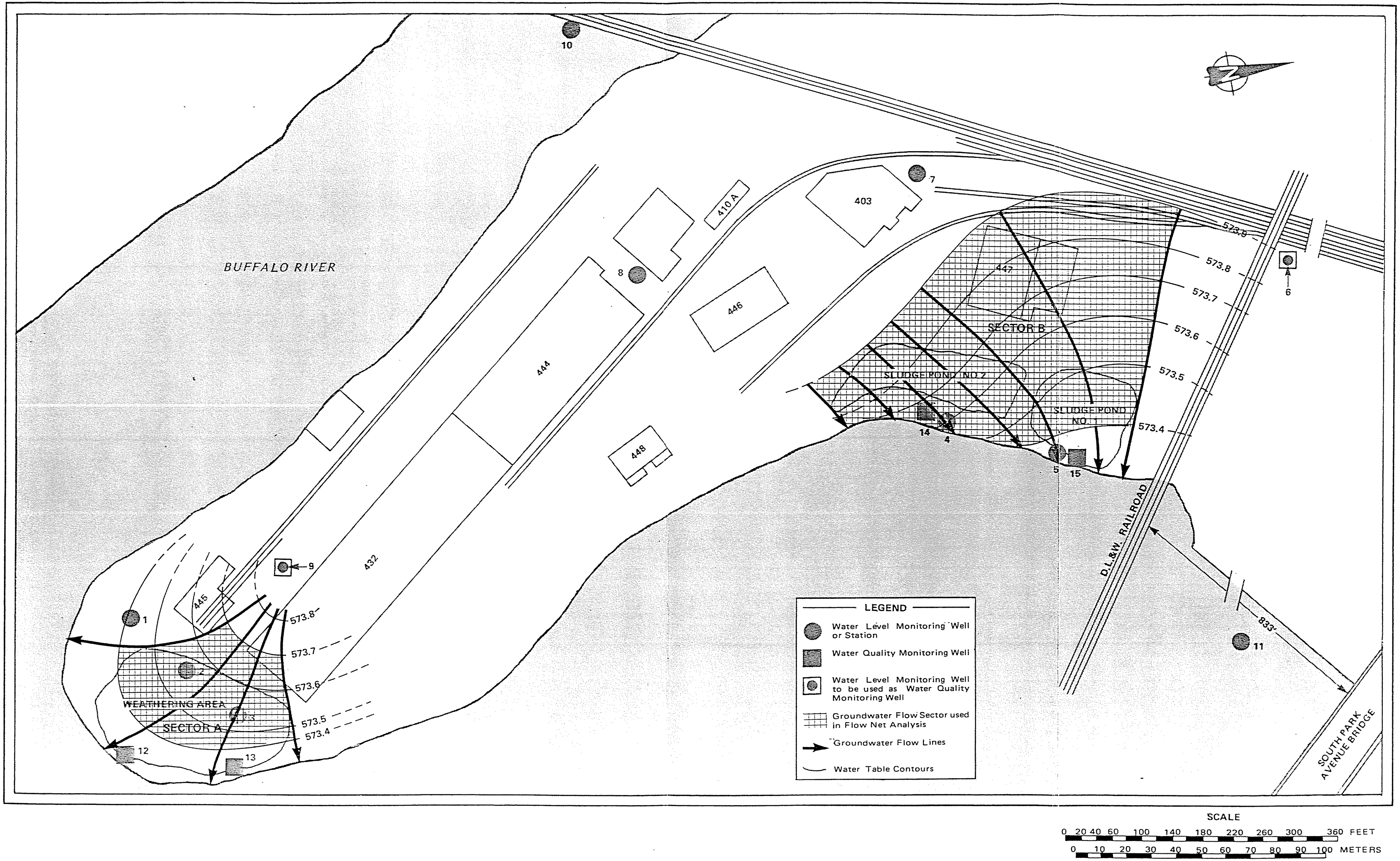

Figure 3 FLOW NET ANALYSIS OF THE WEATHERING AREA AND SLUDGE PONDS ONE AND TWO FOR JUNE 8, 1982

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APPENDIX III (1 of 3)

1st Round of sampling

# ANALYSIS OF GROUNDWATER SAMPLES

OCTOBER, 1983

PREPARED FOR:

Buffalo Color Corporation
P.O. Box 7027
Buffalo, New York

**ecology and environment, inc.**
195 SUGG ROAD, P.O. BOX D, BUFFALO, NEW YORK 14225, TEL. 716-632-4491
International Specialists in the Environmental Sciences
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# TABLE OF CONTENTS

## 1. INTRODUCTION

Buffalo Color Corporation contracted with Ecology and Environment, Inc. (E & E) for the collection and analysis of a series of groundwater samples from their Buffalo plant site.

## 2. SAMPLES

Water samples were collected from six monitoring wells on the Buffalo Color Corporation properties and two from the River, one upstream and one downstream of the plant, by Ecology and Environment (E & E) field personnel, Glenn Millner and Nancy Aungst.

The samples were collected in pre-cleaned bottles prepared at E & E's Analytical Services Center (ASC). The samples were collected and delivered to the Analytical Services Center on September 27, 1983, by Nancy Aungst.

Chain of Custody records were maintained at all times.

The samples were assigned E & E Lab numbers as indicated:

| E & E Lab Number 83- | Client Identification |
|---|---|
| 3562 | Well #6 |
| 3563 | Well #9 |
| 3564 | Well #12 |
| 3565 | Well #13 |
| 3566 | Well #14 |
| 3567 | Well #15 |
| 3568 | River Sample, Railroad Bridge |
| 3569 | River Sample, South Park Ave. |

## 3. RESULTS

Results are presented in the following two tables. Table 3-1 is expressed in milligrams per liter. Table 3-2 is expressed in micrograms per liter.

Table 3-1

## RESULTS OF CHEMICAL ANALYSIS OF WATER SAMPLES

| E & E Lab Number 83- | 3562 | 3563 | 3564 | 3565 | 3566 | 3567 | 3568 | 3569 |
|---|---|---|---|---|---|---|---|---|
| Sample Identity: | Well #6 | Well #9 | Well #12 | Well #13 | Well #14 | Well #15 | River Sample Railroad Bridge | River Sample Southpark Ave. |
| (All Results in mg/L) | | | | | | | | |
| pH, S.U. | 7.80 | 8.14 | 7.37 | 5.72 | 7.34 | 7.65 | 7.73 | 7.60 |
| Total Organic Carbon | 118 | 74.3 | 49.2 | 50.6 | 190 | 293 | 11.5 | 5.93 |
| Total Organic Halogen | 0.18 | 0.28 | 0.042 | 0.13 | 0.30 | 2.0 | 0.044 | 0.050 |
| Arsenic | 0.210 | 0.078 | 0.101 | 0.176 | 0.184 | 0.114 | 0.068 | 0.028 |
| Chromium-Total | 0.042 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Chromium-Hexavalent | 0.007 | 0.006 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 | < 0.005 |
| Copper | < 0.050 | < 0.050 | < 0.050 | 8.98 | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Lead | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Mercury | < 0.0004 | < 0.0004 | < 0.0004 | < 0.0004 | < 0.0004 | < 0.0004 | < 0.0004 | < 0.0004 |
| Nickel | 0.110 | < 0.050 | 0.064 | 4.86 | 0.050 | 0.072 | < 0.050 | < 0.050 |
| Zinc | < 0.050 | < 0.050 | < 0.050 | 17.10 | < 0.050 | < 0.050 | < 0.050 | < 0.050 |

Table 3-2

## RESULTS OF CHEMICAL ANALYSIS OF WATER SAMPLES FOR ORGANIC COMPOUNDS

(ug/L)

| PARAMETER | E & E Lab No. 83- | 3562 | 3563 | 3564 | 3565 | 3566 | 3567 | 3568 | 3569 |
|---|---|---|---|---|---|---|---|---|---|
| | Sample Identity | #6 | #9 | #12 | #13 | #14 | #15 | River #1 | River#2 |
| 1-Naphthylamine | | < 0.6 | 10.5 | 6.10 | < 0.6 | 943 | 3020 | 6.02 | < 0.6 |
| 2,4-Dinitotoluene | | < 5.0 | < 5.0 | < 5.0 | 582 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Benzidine | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | 2.35 | < 1.0 | < 1.0 | < 1.0 |
| Anthracene | | < 1.5 | < 1.5 | < 1.5 | < 1.5 | < 1.5 | < 1.5 | 3.94 | BMDL |
| Phenanthrene | | * | * | * | * | * | * | * | * |
| Fluoranthene | | < 1.5 | < 1.5 | < 1.5 | < 1.5 | < 1.5 | < 1.5 | 3.81 | BMDL |
| Pyrene | | < 1.5 | < 1.5 | < 1.5 | < 1.5 | < 1.5 | < 1.5 | 4.00 | BMDL |
| Chrysene | | < 2.5 | < 2.5 | < 2.5 | < 2.5 | < 2.5 | < 2.5 | 6.31 | BMDL |
| Benzo(a)anthracene | | ** | ** | ** | ** | ** | ** | ** | ** |
| Benzo(b)fluoranthene | | < 2.5 | < 2.5 | < 2.5 | < 2.5 | < 2.5 | < 2.5 | 7.74 | BMDL |
| Benzo(k)fluoranthene | | *** | *** | *** | *** | *** | *** | *** | *** |
| Benzo(a)pyrene | | *** | *** | *** | *** | *** | *** | *** | *** |

< = none detected at stated detection limit

* Anthracene and phenanthrene are an isomeric pair which cannot be separated under these chromatographic conditions. The values are based on calculations using anthracene as a standard.

** Chrysene and benzo(a)anthracene are an isomeric pair. Values are based on chrysene standards.

*** Benzo(b)fluoranthene, benzo(k)fluoranthene, and benzo(a)pyrene are an isomeric group. Values are based on benzo(b) fluoranthene.

BMDL - compound present, below measurable detection limit

## 4. METHODS OF ANALYSIS

All the required organic compounds were analyzed in accordance with EPA Method 625, "Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater", EPA-600/4-82-057, July 1982.

The metals analyses were performed according to "Methods for Chemical Analysis of Water and Wastes", EPA-600/4-79-020, 1979.

| METAL | METHOD NO. |
|---|---|
| Arsenic | 206.2 |
| Chromium | 218.2 |
| Chromium, Hexavalent | 218.4 |
| Copper | 220.2 |
| Lead | 239.2 |
| Mercury | 245.1 |
| Nickel | 249.2 |
| Zinc | 289.1 |

Total Organic Carbon and pH analyses were performed in accordance with Method 505 and 423 of "Standard Methods for the Examination of Water and Wastewater", 15th Edition.

Total Organic Halide analysis was performed according to Interim Methods as published by EPA, Cincinnati, November, 1980.

# 5. QUALITY ASSURANCE/QUALITY CONTROL

## 5.1 QUALITY ASSURANCE

All phases of this study, including the final report, have been independently audited by E & E's internal quality assurance group. All data and the contents of the report have been accepted by the group and authorized for release.

## 5.2 QUALITY CONTROL

All glassware used was washed with soap and rinsed with deionized water. The glassware that was used for organics was rinsed again with acetone and hexane and dried in an oven. The glassware that was used for metals was rinsed with nitric acid followed by deionized water and dried in an oven.

All solvents were pesticide grade and were submitted to extraction and concentration procedures similar to those used for actual samples.

Low working-level standards are prepared fresh daily from stock standards. The stock standards are prepared fresh monthly from pure analytical standards.

Consistent with the quality control program, sample blanks were analyzed to determine whether any interferences were present that may have been contributed by the solvents, the glassware, or the procedure itself. No interferences were detected.

The accuracy of the analytical method is determined by the use of spiked samples* and is calculated as the percent recovery. Spikes of varying amounts were analyzed to further ensure the accurace of the method. The percent recovery for the spiked samples is given in Table 5-1.

The precision of the analytical method is determined by the analyses of duplicate samples within the appropriate concentration ranges. Results of the duplicate analyses appear in Table 5-2.

---

* Spiked samples are those that have a known quantity of chemical added and are used to estimate accuracy through percent recovery.

Table 5-1

## QUALITY CONTROL FOR ACCURACY: PERCENT RECOVERY FOR SPIKED SAMPLES

| Compound | E&E Lab No. 83- | Original Value | Amount Added | Amount Determined | Percent Recovery |
|---|---|---|---|---|---|
| Arsenic, mg/L | 3567 | 0.114 | 0.250 | 0.357 | 97.2 |
| Total Chromium, mg/L | 3562 | 0.042 | 0.100 | 0.156 | 114 |
| Chromium, Hexavalent, mg/L | 3562 | 0.007 | 0.025 | 0.033 | 104 |
| | 3569 | ND | 0.025 | 0.0275 | 110 |
| Copper, mg/L | 3564 | ND | 1.000 | 0.943 | 94.3 |
| Lead, mg/L | 3563 | ND | 0.100 | 0.111 | 111 |
| Mercury, mg/L | 3567 | ND | 0.004 | 0.039 | 97.5 |
| Nickel, mg/L | 3562 | 0.110 | 0.100 | 0.252 | 142 |
| Zinc, mg/L | 3568 | ND | 1.000 | 1.023 | 102.3 |
| 1-Naphthylamine, ug/L | 3562 | ND | 52.6 | 48.9 | 93.0 |
| 2,4-Dinitrotoluene, ug/L | 3562 | ND | 58.0 | 54.4 | 93.8 |
| Benzidine, ug/L | 3562 | ND | 33.0 | 36.4 | 110 |

Note: All spike results fall within the 95% confidence limits of our control charts.

ND = None detected.

Table 5-2

## QUALITY CONTROL FOR PRECISION: RESULTS OF REPLICATE ANALYSES

| | E&E Lab No. 83- | Original Analysis A | Replicate Analysis B | Relative Percent Difference RPD |
|---|---|---|---|---|
| Total Organic Carbon, mg/L | 3564 | 49.2 | 48.6 | 1.23 |
| Mercury, mg/L | 3565 | < 0.0004 | < 0.0004 | 0 |
| 1-Naphthylamine, ug/L | 3569 | < 0.6 | < 0.6 | 0 |
| 2,4-Dinitrotoluene,ug/L | 3569 | < 5.0 | < 5.0 | 0 |
| Benzidine, ug/L | 3569 | < 1.0 | < 1.0 | 0 |
| Polynuclear Aromatic Hydrocarbons, ug/L | 3569 | < 2.5 | < 2.5 | 0 |

Note: These results fall within the 95% confidence limits of our control charts.

= None detected at the stated detection limit

$$\text{RPD} = \frac{[A-B]}{A+B/2} \text{ X } 100$$

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U-0094-D753

APPENDIX III (2 of 3)

4/12/84
SAMPLING
E&E for BC
2nd round sampling

# ANALYSIS OF GROUNDWATER SAMPLES

April 12, 1984

Prepared for:

BUFFALO COLOR CORPORATION
P.O. Box 7027
Buffalo, New York

**ecology and environment, inc.**
195 SUGG ROAD, P.O. BOX D, BUFFALO, NEW YORK 14225, TEL. 716-632-4491
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# TABLE OF CONTENTS

# 1. INTRODUCTION

Buffalo Color Corporation contracted with Ecology and Environment, Inc. (E & E) for the collection and analysis of a series of groundwater samples from their Buffalo plant site.

This report presents the results of the second round of sampling.

# 2. SAMPLES

Water samples were collected from six monitoring wells on the Buffalo Color Corporation properties and two from the River, one upstream and one downstream of the plant by Ecology and Environment (E & E) field personnel Glenn Millner and Jim Chieh.

The samples were collected in pre-cleaned bottles prepared at E & E's Analytical Services Center (ASC). The samples were collected and delivered to the Analytical Services Center on April 12, 1984.

Chain of Custody records were maintained at all times.

The samples were assigned E & E Lab numbers as indicated:

| E & E Lab Number 84- | Client Identification |
|---|---|
| 1738 | Railroad Bridge |
| 1739 | South Park Bridge |
| 1740 | Well #9 |
| 1741 | Well #6 |
| 1742 | Well #13 |
| 1743 | Well #14 |
| 1744 | Well #12 |
| 1745 | Well #15 |

# 3. RESULTS

The analytical results are presented in the following two tables. Table 3-1 is expressed in milligrams per liter. Table 3-2 is expressed in micrograms per liter.

Table 3-1

## RESULTS OF CHEMICAL ANALYSIS OF WATER SAMPLES
(All results in mg/L)

| E & E Lab Number 84- Sample Identity | 1741 MW#6 | 1740 MW#9 | 1744 MW#12 | 1742 MW#13 | 1743 MW#14 | 1745 MW#15 | 1738 Railroad Bridge | 1739 South Park Bridge |
|---|---|---|---|---|---|---|---|---|
| Parameter | | | | | | | | |
| pH, S.U. | 7.17 | 7.38 | 6.01 | 4.98 | 7.25 | 8.59 | 7.25 | 7.30 |
| Total Organic Carbon | 180 | 47 | 48 | 70 | 370 | 900 | 10 | 5.7 |
| Total Organic Halogen | 0.094 | 0.42 | 0.015 | 0.1 | 0.22 | 0.73 | 0.006 | <0.005 |
| Arsenic | 0.383 | <0.01 | 0.017 | 0.496 | 0.013 | 0.102 | <0.01 | <0.01 |
| Chromium, total | 0.093 | 0.022 | 0.164 | 0.072 | <0.128 | 0.389 | <0.01 | <0.01 |
| Chromium, hexavalent | 0.060 | 0.007 | 0.164 | 0.105 | 0.128 | 0.109 | <0.005 | <0.005 |
| Copper | <0.05 | <0.05 | 0.071 | 110 | 2.90 | 0.387 | <0.05 | <0.05 |
| Lead | 0.033 | 0.045 | 0.682 | 2.65 | 2.00 | 0.266 | <0.01 | <0.01 |
| Mercury | <0.0004 | <0.0004 | 0.0005 | <0.0004 | 0.0024 | 0.0005 | <0.0004 | <0.0004 |
| Nickel | <0.05 | <0.05 | <0.05 | 3.44 | 0.407 | 0.217 | <0.05 | <0.05 |
| Zinc | 0.143 | 0.058 | 0.291 | 15.3 | 2.58 | 0.408 | 0.074 | <0.05 |

Table 3-2

## RESULTS OF CHEMICAL ANALYSIS OF WATER SAMPLES FOR ORGANIC COMPOUNDS (ug/L)

| E & E Lab No. 84- Sample Identity | 1741 MW#6 | 1740 MW#9 | 1744 MW#12 | 1742 MW#13 | 1743 MW#14 | 1745 MW#15 | 1738 Rail-road Bridge | 1739 South Park Bridge |
|---|---|---|---|---|---|---|---|---|
| Parameter | | | | | | | | |
| 1-Naphtylamine | <0.6 | <0.6 | <0.6 | 7.1 | 324 | 49,600 | 43 | <0.6 |
| 2,4-Dinitrotoluene | <5.0 | <5.0 | <5.0 | 507 | <5.0 | <5.0 | <5.0 | <5.0 |
| Benzidine | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | 240 | <1.0 | <1.0 |
| Acenaphthylene | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 |
| Fluorene | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 |
| Anthracene | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 |
| Phenanthrene | * | * | * | * | * | * | * | * |
| Fluoranthene | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 |
| Pyrene | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 |
| Chrysene | <2.5 | <2.5 | <2.5 | <2.5 | <2.5 | <2.5 | <2.5 | <2.5 |
| Benzo (a) anthracene | ** | ** | ** | ** | ** | ** | ** | ** |
| Benzo (b) fluoranthene | <2.5 | <2.5 | <2.5 | <2.5 | <2.5 | <2.5 | <2.5 | <2.5 |
| Benzo (k) fluoranthene | *** | *** | *** | *** | *** | *** | *** | *** |
| Benzo (a) pyrene | *** | *** | *** | *** | *** | *** | *** | *** |

< = none detected at stated detection limit.

* Anthracene and phenanthrene are an isomeric pair which cannot be separated under these chromatographic conditions. The values are based on a combined standard.

** Chrysene and benzo (a) anthracene are an isomeric pair not separable under these chromatographic conditions. The values are based on a combined standard.

*** Benzo (b) fluoranthene, benzo (k) fluoranthene and benzo (a) pyrene are an isomeric group. Values are based on a combined standard.

# 4. METHODS OF ANALYSIS

All the required organic compounds were analyzed in accordance with EPA Method 625, "Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater", EPA-600/4-82-057, July 1982.

The metals analyses were performed according to "Methods for Chemical Analyses of Water and Wastes, "EPA-600/4-79-020, 1979.

| Element | Method Number |
|---|---|
| Arsenic | 206.2 |
| Chromium | 218.2 |
| Chromium, Hexavalent | 218.4 |
| Copper | 220.2 |
| Lead | 239.2 |
| Mercury | 245.1 |
| Nickel | 249.2 |
| Zinc | 289.1 |

Total Organic Carbon and pH analyses were performed in accordance with Methods 505 and 423 of Standard Methods for the Examination of Water and Wastewater, 15th Edition.

Total Organic Halide Analysis was performed according to Interim Methods as published by EPA, Cincinnati, November, 1980.

# 5. QUALITY ASSURANCE/QUALITY CONTROL

## 5.1 QUALITY ASSURANCE

All phases of this study, including the final report, have been independently audited by E & E's internal quality assurance group. All data and the contents of the report have been accepted by the group and authorized for release.

## 4.2 QUALITY CONTROL

All glassware used was washed with soap and rinsed with deionized water. The glassware that was used for organics was rinsed again with acetone and hexane and dried in an oven. The glassware that was used for metals was rinsed with nitric acid followed by deionized water and dried in an oven.

All solvents were pesticide grade and were submitted to extraction and concentration procedures similar to those used for actual samples.

Low working-level standards are prepared fresh daily from stock standards. The stock standards are prepared from pure analytical standards.

Consistent with the quality control program, sample blanks were analyzed to determine whether any interferences were present that may have been contributed by the solvents, the glassware, or the procedure itself. No interferences were detected.

The accuracy of the analytical method is determined by the use of spiked samples* and is calculated as the percent recovery. Spikes of

---

*Spiked samples are those that have a known quantity of chemical added and are used to estimate accuracy through percent recovery.

varying amounts were analyzed to further ensure the accuracy of the method. The percent recovery for the spiked samples is given in Table 5-1.

In order to further assure the accuracy of the analyses for the various parameters tested, EPA quality assurance materials were analyzed along with the samples. The results of those analyses are presented in Table 5-2.

The precision of the analytical method is determined by the analyses of duplicate samples within the appropriate concentration ranges. Results of the duplicate analyses appear in Table 5-3.

Table 5-1

## QUALITY CONTROL FOR ACCURACY: PERCENT RECOVERY FOR SPIKED WATER SAMPLES

| Element | E & E Laboratory No. 84- | Original Value | Amount Added | Amount Determined | Percent Recovery |
|---|---|---|---|---|---|
| | | (mg/L) | | | |
| Arsenic | 1745 | 0.102 | 0.100 | 0.194 | 92 |
| Chromium, total | 1743 | <0.01 | 0.020 | 0.026 | 130 |
| | 1741 | 0.093 | 0.200 | 0.310 | 108 |
| | 1742 | 0.072 | 0.200 | 0.293 | 110 |
| Lead | 1743 | 200 | 10.0 | 11.4 | 94 |
| Mercury | 1739 | <0.0004 | 0.002 | 0.002 | 100 |
| Nickel | 1743 | 0.407 | 1.000 | 1.307 | 91 |

Table 5-2

### QUALITY CONTROL FOR ACCURACY: PERCENT DIFFERENCE--EPA QUALITY ASSURANCE MATERIALS

| Element | Concentrations in ug/L Known | Determined | Percent Difference |
|---|---|---|---|
| Arsenic | 27 | 21.7 | 19.6 |
| Chromium | 261 | 269 | 3.1 |
| Copper | 339 | 326 | 3.8 |
| Lead | 435 | 428 | 1.6 |
| Mercury | 8.7 | 8.4 | 3.4 |
| Nickel | 207 | 206 | 0.5 |
| Zinc | 418 | 415 | 0.7 |

Table 5-3

## QUALITY CONTROL FOR PRECISION RESULTS OF ANALYSIS OF REPLICATE ANALYSES OF WATER SAMPLES

| Parameter | E & E Laboratory No. 84- | Original Analysis | Replicate Analysis | Relative Percent Difference RPD |
|---|---|---|---|---|
| pH. S.U. | 1645 | 8.59 | 8.45 | -- |
| Arsenic | 1739 | <0.01 | <0.01 | 0 |
| Chromium | 1739 | 0.01 | 0.01 | 0 |
| Copper | 1739 | <0.05 | <0.05 | 0 |
| Lead | 1739 | <0.01 | <0.01 | 0 |
| Mercury | 1738 | <0.0004 | <0.0004 | 0 |
| Nickel | 1739 | <0.1 | <0.1 | 0 |
| Zinc | 1739 | <0.05 | <0.05 | 0 |

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U-0129-D754

Appendix III (3 of 3)

4/19/84
SAMPLING
E&E for BC
3rd round sampling

# ANALYSIS OF GROUNDWATER SAMPLES

April 19, 1984

Prepared for:

BUFFALO COLOR CORPORATION
P.O. Box 7027
Buffalo, New York

**ecology and environment, inc.**
195 SUGG ROAD, P.O. BOX D, BUFFALO, NEW YORK 14225, TEL. 716-632-4491
International Specialists in the Environmental Sciences
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# TABLE OF CONTENTS

# 1. INTRODUCTION

Buffalo Color Corporation contracted with Ecology and Environment, Inc. (E & E) for the collection and analysis of a series of groundwater samples from their Buffalo plant site.

This report presents the results of the third round of sampling.

# 2. SAMPLES

Water samples were collected from six monitoring wells on the Buffalo Color Corporation properties and two from the River, one upstream and one downstream of the plant by Ecology and Environment (E & E) field personnel Glenn Millner and Kit Pitkin.

The samples were collected in pre-cleaned bottles prepared at E & E's Analytical Services Center (ASC). The samples were collected and delivered to the Analytical Services Center on April 19, 1984.

Chain of Custody records were maintained at all times.

The samples were assigned E & E Lab numbers as indicated:

| E & E Lab Number 84- | Client Identification |
|---|---|
| 1952 | South Park Bridge |
| 1953 | Railroad Bridge |
| 1954 | Well #6 |
| 1955 | Well #9 |
| 1956 | Well #12 |
| 1957 | Well #13 |
| 1958 | Well #14 |
| 1959 | Well #15 |

# 3. RESULTS

The analytical results are presented in the following two tables. Table 3-1 is expressed in milligrams per liter. Table 3-2 is expressed in micrograms per liter.

## Table 3-1

## RESULTS OF CHEMICAL ANALYSIS OF WATER SAMPLES
(All results in mg/L)

| E & E Lab Number 84-<br>Sample Identity | 1954<br>MW#6 | 1955<br>MW#9 | 1956<br>MW#12 | 1957<br>MW#13 | 1958<br>MW#14 | 1959<br>MW#15 | 1953<br>Railroad Bridge | 1952<br>South Park Bridge |
|---|---|---|---|---|---|---|---|---|
| Parameter | | | | | | | | |
| pH, S.U. | 7.71 | 7.67 | 6.75 | 4.95 | 7.55 | 7.43 | 7.20 | 7.95 |
| Total Organic Carbon | 150 | 52 | 47 | 61 | 330 | 900 | 18 | 15 |
| Total Organic Halogen | 0.024 | 0.23 | 0.021 | 0.069 | 0.22 | 0.96 | <0.005 | <0.005 |
| Arsenic | 0.620 | 0.037 | 0.042 | 0.801 | 1.250 | 0.025 | <0.01 | <0.01 |
| Chromium, total | 0.093 | 0.042 | 0.397 | 0.071 | 0.404 | 0.167 | <0.01 | <0.01 |
| Chromium, hexavalent | 0.096 | 0.042 | 0.319 | 0.037 | 0.207 | 0.050 | <0.005 | <0.005 |
| Copper | 0.056 | <0.05 | 0.589 | 3.70 | 1.25 | 0.130 | <0.05 | <0.05 |
| Lead | 0.089 | 0.022 | 1.08 | 0.331 | 0.997 | 0.178 | 0.01 | 0.045 |
| Mercury | 0.0009 | <0.0004 | 0.0061 | 0.0008 | 0.0044 | <0.0004 | <0.0004 | <0.0004 |
| Nickel | 0.070 | <0.05 | 0.143 | 1.87 | 0.354 | -- | <0.05 | <0.05 |
| Zinc | 0.251 | 0.088 | 1.34 | 9.93 | 1.88 | 0.154 | 0.064 | <0.05 |

Table 3-2

## RESULTS OF CHEMICAL ANALYSIS OF WATER SAMPLES FOR ORGANIC COMPOUNDS (ug/L)

| E & E Lab No. 84- Sample Identity | 1954 MW#6 | 1955 MW#9 | 1956 MW#12 | 1957 MW#13 | 1958 MW#14 | 1959 MW#15 | 1953 Rail-road Bridge | 1952 South Park Bridge |
|---|---|---|---|---|---|---|---|---|
| Parameter | | | | | | | | |
| 1-Naphtylamine | <0.6 | <0.6 | <0.6 | 3.0 | 3300 | 29,300 | <0.6 | <0.6 |
| 2,4-Dinitrotoluene | <5.0 | <5.0 | <5.0 | 6270 | <5.0 | <5.0 | <5.0 | <5.0 |
| Benzidine | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | 144 | <1.0 | <1.0 |
| Acenaphthylene | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 |
| Fluorene | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 |
| Anthracene | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 |
| Phenanthrene | * | * | * | * | * | * | * | * |
| Fluoranthene | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 |
| Pyrene | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 |
| Chrysene | <2.5 | <2.5 | <2.5 | <2.5 | <2.5 | <2.5 | <2.5 | <2.5 |
| Benzo (a) anthracene | ** | ** | ** | ** | ** | ** | ** | ** |
| Benzo (b) fluoranthene | <2.5 | <2.5 | <2.5 | <2.5 | <2.5 | <2.5 | <2.5 | <2.5 |
| Benzo (k) fluoranthene | *** | *** | *** | *** | *** | *** | *** | *** |
| Benzo (a) pyrene | *** | *** | *** | *** | *** | *** | *** | *** |

< = none detected at stated detection limit.

* Anthracene and phenanthrene are an isomeric pair which cannot be separated under these chromatographic conditions. The values are based on a combined standard.

** Chrysene and benzo (a) anthracene are an isomeric pair not separable under these chromatographic conditions. The values are based on a combined standard.

*** Benzo (b) fluoranthene, benzo (k) fluoranthene and benzo (a) pyrene are an isomeric group. Values are based on a combined standard.

# 4. METHODS OF ANALYSIS

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The metals analyses were performed according to "Methods for Chemical Analyses of Water and Wastes, "EPA-600/4-79-020, 1979.

| Element | Method Number |
|---|---|
| Arsenic | 206.2 |
| Chromium | 218.2 |
| Chromium, Hexavalent | 218.4 |
| Copper | 220.2 |
| Lead | 239.2 |
| Mercury | 245.1 |
| Nickel | 249.2 |
| Zinc | 289.1 |

Total Organic Carbon and pH analyses were performed in accordance with Methods 505 and 423 of Standard Methods for the Examination of Water and Wastewater, 15th Edition.

Total Organic Halide Analysis was performed according to Interim Methods as published by EPA, Cincinnati, November, 1980.

# 5. QUALITY ASSURANCE/QUALITY CONTROL

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## 4.2 QUALITY CONTROL

All glassware used was washed with soap and rinsed with deionized water. The glassware that was used for organics was rinsed again with acetone and hexane and dried in an oven. The glassware that was used for metals was rinsed with nitric acid followed by deionized water and dried in an oven.

All solvents were pesticide grade and were submitted to extraction and concentration procedures similar to those used for actual samples.

Low working-level standards are prepared fresh daily from stock standards. The stock standards are prepared from pure analytical standards.

Consistent with the quality control program, sample blanks were analyzed to determine whether any interferences were present that may have been contributed by the solvents, the glassware, or the procedure itself. No interferences were detected.

The accuracy of the analytical method is determined by the use of spiked samples* and is calculated as the percent recovery. Spikes of

---

*Spiked samples are those that have a known quantity of chemical added and are used to estimate accuracy through percent recovery.

varying amounts were analyzed to further ensure the accuracy of the method. The percent recovery for the spiked samples is given in Table 5-1.

In order to further assure the accuracy of the analyses for the various parameters tested, EPA quality assurance materials were analyzed along with the samples. The results of those analyses are presented in Table 5-2.

The precision of the analytical method is determined by the analyses of duplicate samples within the appropriate concentration ranges. Results of the duplicate analyses appear in Table 5-3.

Table 5-1

## QUALITY CONTROL FOR ACCURACY: PERCENT RECOVERY FOR SPIKED WATER SAMPLES

| Element | E & E Laboratory No. 84- | Original Value | Amount Added | Amount Determined | Percent Recovery |
|---|---|---|---|---|---|
| Arsenic,mg/L | 1958 | 1.25 | 3.00 | 4.32 | 102 |
| Chromium, mg/L | 1953 | <0.01 | 0.02 | 0.02 | 100 |
| Copper, mg/L | 1952 | <0.05 | 0.250 | 0.234 | 94 |
| Lead, mg/L | 1957 | 0.331 | 1000 | 1.27 | 94 |
| Mercury, mg/L | 1956 | 0.0061 | 0.002 | 0.0076 | 78 |
| Nickel | 1958 | 0.354 | 1.000 | 1.286 | 93 |
| 1-Naphthylamine, ug/L | 1952 | <0.6 | 330 | 405 | 123 |
| 2,4-Dinitrotoluene, ug/L | 1952 | <5.0 | 725 | 440 | 61 |
| Pyrene, ug/L | 1952 | <1.5 | 140 | 160 | 114 |

Table 5-2

## QUALITY CONTROL FOR ACCURACY:
## PERCENT DIFFERENCE--EPA QUALITY ASSURANCE MATERIALS

| | Concentrations in ug/L | | |
|---|---|---|---|
| Element | Known | Determined | Percent Difference |
| Arsenic | 27 | 21.7 | 19.6 |
| Chromium | 261 | 269 | 3.1 |
| Copper | 339 | 348 | 2.7 |
| Lead | 43 | 47.1 | 9.5 |
| Mercury | 8.7 | 8.4 | 3.4 |
| Nickel | 207 | 206 | 0.5 |
| Zinc | 418 | 415 | 0.7 |

Table 5-3

## QUALITY CONTROL FOR PRECISION RESULTS OF ANALYSIS OF REPLICATE ANALYSES OF WATER SAMPLES

| Parameter | E & E Laboratory No. 84- | Original Analysis | Replicate Analysis | Relative Percent Difference RPD |
|---|---|---|---|---|
| Arsenic, mg/L | 1952 | <0.01 | <0.01 | 0 |
| Chromium, mg/L | 1953 | <0.01 | <0.01 | 0 |
| Copper, mg/L | 1952 | <0.05 | <0.05 | 0 |
| Mercury, mg/L | 1954 | 0.009 | 0.009 | 0 |
| Nickel | 1952 | <0.1 | <0.1 | 0 |
| 1-Naphthylamine, ug/L | 1953 | <0.6 | <0.6 | 0 |
| 2,4-Dinitrotoluene, ug/L | 1953 | <5.0 | <5.0 | 0 |
| Benzidine, ug/L | 1959 | <1.0 | <1.0 | 0 |
| Ploynuclear Aromatic Hydrocarbons, ug/L | 1959 | <2.5 | <2.5 | 0 |

< = None detected at stated detection limit.

APPENDIX IV

New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233

Robert F. Flacke
Commissioner

September 29, 1982

Mr. John Westendorf
Chemist
City of Niagara Falls
1200 Buffalo Avenue
Niagara Falls, New York 14302

Dear Mr. Westendorf:

Re: Niagara River Allocation Plan

In accordance with previous phone conversations and meetings, I am sending you a copy of our "first cut" allocation plan for the Niagara River. Also included are a user guidance for the printout and a rationale document explaining the Department's allocation methodology for the Niagara River.

Should you have any questions, please contact me.

Sincerely,

Joseph DiMura, P.E.
Assistant Sanitary Engineer
Municipal Wastewater Section

JD/pl

Enclosure

cc: Mr. Adamczyk w/o enclosure

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DIVISION OF HAZARDOUS
WASTE ENFORCEMENT
REGION 9

# RATIONALE FOR WASTE LOAD APPLICATIONS FOR SPDES PERMITTED DISCHARGES TO THE NIAGARA RIVER

This rationale document is in response to the many public inquiries the Department has received as to the details of the waste load allocation process for the Niagara River discharges to the Niagara River. The assimilative capacity allocation process for any Niagara River segment and the Niagara River in total is one that consideres conservative and nonconservative substances in the aggregate from all sources, makes appropriate additions and subtractions for future inputs and losses from the system, and allocates the resource against the sum total of all discharges and the response of the waterway. DEC has been conservative, a proper present rationale for the protection of public health and the environment.

The presence of many substances in the Niagara River is recognized. For most, there is no valid reliable statistically based actual sample data to provide requisite information. Their presence is the result of many now uncontrolled discharges which exceed limitations to be imposed through the permit process. Background is a downward moving target that will diminish in direct proportion to the control of discharges (except for those substances which have accumulated out of the water column by bioaccumulation or benthic deposition which may be subsequently released). It is unreasonable to penalize, in proposed permit discharge limitations, against a background which is now prejudicially influenced by excessive unpermitted discharges.

DEC has attempted to use head-of-the-river data as a way of discounting present discharges so that the allocations are made against a base not influenced by present discharges to be controlled by more restrictive permits. Even if there were good measurements there and/or along the river of presently existing background concentrations, the results must be discounted because background measurements are obviously currently biased on the high side by dischargers exceeding proposed permit limitations. This is true at the outlet of Lake Erie as well as in the river itself.

For man-made substances, which must (will) be controlled on the land, the background (river concentration) will be the aggregate of the resulting discharges, not be a measurement of the present state. That is why assumption zero is rational for background when the substances are subject to future control, as the allocation process is to bring about future compliance, not to penalize proposed discharges for present uncontrolled pollution. Canadian dischargers will not use the remaining half of the assimilative capacity for similar substances. The mixed concentration in the entire river, since we on the U.S. side are allocating to the objective, will only be approximately half of the total water quality objective.

The Niagara River study has an objective directed at determining background concentrations and river dynamics to better understand the concentration, distribution and fate of various toxic pollutants in the Niagara River ecosystem. Any attempt at preconclusion is ill-advised. The processes are not well understood, particularly the nonconservative action of certain volatile compounds which may be removed from the system under hydrologic conditions such as exist at Niagara Falls, and whose decay and removal from the system adds a further conservative element to our allocation processes. Permits may be modified should significant new information become available about the water resource which would indicate that the allocations made under present knowledge are inappropriate.

would allow higher effluent limits and still maintain water quality objectives. Any permit may be subject to reconsideration and reopening by the Department, by the permittee, or by any group or agency who can present significant data to indicate that substantive changes are appropriate, either upward or downward, in permit values.

Attachment A details the actual procedure for allocating SPDES permit effluent limit loadings on a pollutant specific basis.

[illegible] A

# Procedure for Allocating SPDES
# Permit Effluent Limit Loadings for
# Discharges to the Niagara River Basin

## I. Establish Water Quality Objective

A. Use New York State Water Quality Standards and Classifications limit for substances listed.

B. For substances not listed:

1. Obtain recommended limit for protection of drinking water supplies from NYS Department of Health - Toxics Bureau.

2. Obtain recommended limit for protection of fisheries from NYS Department of Environmental Conservation - Bureau of Environmental Protection.

3. Apply most stringent of the above as the water quality objective.

## II. Determine Low Flow Hydrology

A. For the purpose of allocating waste loads, the Niagara River is broken into four hydrological segments. In addition, the inputs from the Buffalo River are included. The four Niagara River segments are:

1. Upper Niagara River

2. Tonawanda Channel

3. Falls Section

4. Lower Niagara River

B. Determine Minimum Average Seven Consecutive Day once in Ten Years (MA7CD/10) low flow from historical records for the entire Niagara River this is 145,000 cfs.

C. For Main Channel use 1/2 MA7CD/10 as the U.S. may use on one-half of the boundary resource. 72,500 cfs.

D. For Tonawanda Channel use flow distribution + stratification. 24,800 cfs.

E. For Section, Niagara Falls to Robert Moses, use 1/2 minimum regulated flow of 25,000 cfs x .70 (70%). 17,500 cfs. Department policy requires holding 30% reserve in regulated streams for future growth.

F. For Lower River use 1/2 MA7CD/10. 72,500 cfs., as for the Main Channel, for the hydro power takeouts are returned to the flow.

G. For Buffalo River use BRIC discharge flow.

## Determine Background Water Quality

Determine statistically valid existing ambient water quality concentrations for all substances where data is available. Where no data exists, assume zero concentration as manmade substances will be controlled by permit and are not natural gackground. Permit limits will assure point source contributed background does not exceed water quality objective. The following sources provided input to background data:

A. New York State Water Quality surveillance Network.

B. United State Geological Survey.

C. Ontario Ministry of the Environment.

D. Water Supply Intake Data

## IV. Determine Allowable River Segment Load

A. Allowable load = (ambient concentration objective - background concentration) x usable streamflow x conversion. This total load is available for allocation among the dischargers.

B. For lake discharge use mixing zone dilution to determine allowable load.

V. A. * Water Quality based load:

Allocate available load to segment dischargers. Available load = segment load - upstream point source loads (identified from SPDES allowable effluent loadings).

B. Permit limit is the more stringent of the water quality based allowable limit and the technology based (EPA) effluent limit.

* When background water quality equals or exceeds water quality objective levels in Lake Erie prior to discharges of Niagara River industries, and no capacity is available for a substance discharge, the permit load becomes the water quality no. x effluent flow x conversion factor, or the discharge concentration equals the water quality objective.

This procedure is conservative as it does not account for any losses of chemical substances due to decay, absorption, deposition, evaporation, or volitilization due to natural forces within the river itself.

# USER GUIDANCE FOR NIAGARA RIVER LOAD ALLOCATION PRINTOUT

## A. General

The printout lists mass loadings from 22 major point source discharges to the Niagara River (see Figure 1 and Table 1). For allocation purposes the Niagara River is divided into four hydrological segments, with inputs from the Buffalo River included (see Figure 2 and Table 1). For each river segment an industrial listing and balance sheet is printed. The industrial listing, includes mass loadings (in lbs/day) from the major discharges to that river segment. The balance sheet lists the total allocations (based on ambient standard) and compares it with the sum of the mass loadings from the discharges on the industrial listing. The balance also calculates a running sum and running balance starting with the Buffalo River and proceeding down the Niagara River and ending with the lower Niagara Section.

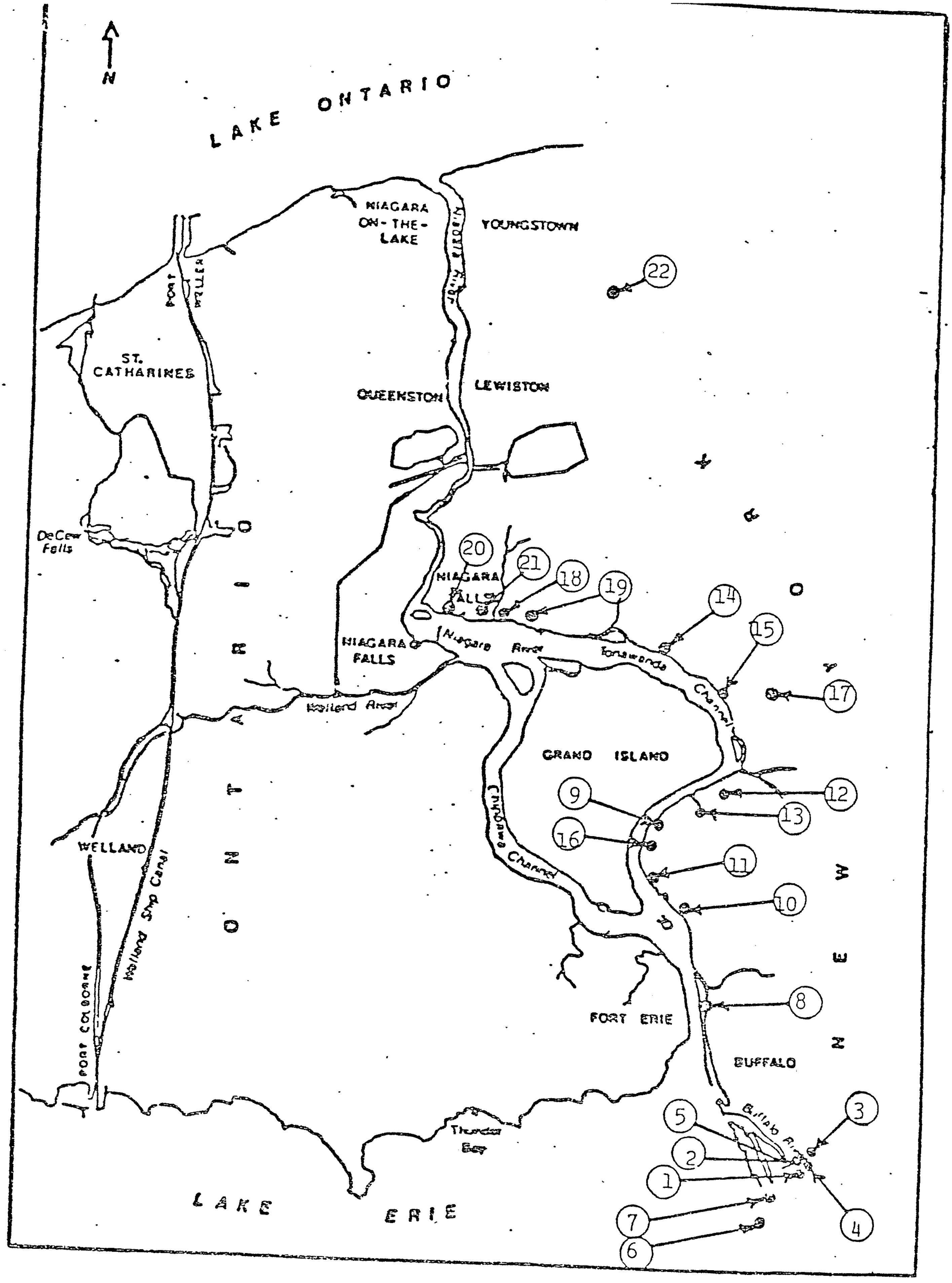
## B. Industrial Listing

Listed vertically are all of the substances currently under consideration for allocation. All of the substances listed have been detected in at least one of the discharges to the Niagara River. Included are toxic, non-toxic and conventional substances. Under each discharge the permit status is listed (see Table 2). For each discharge a mass loading is listed for applicable substances. The technical basis for each entry has been referred to (see Table 3). It should be noted that all entries are not SPDES effluent limits or proposed limits. Numbers that are not limits have been included for allocation purposes.

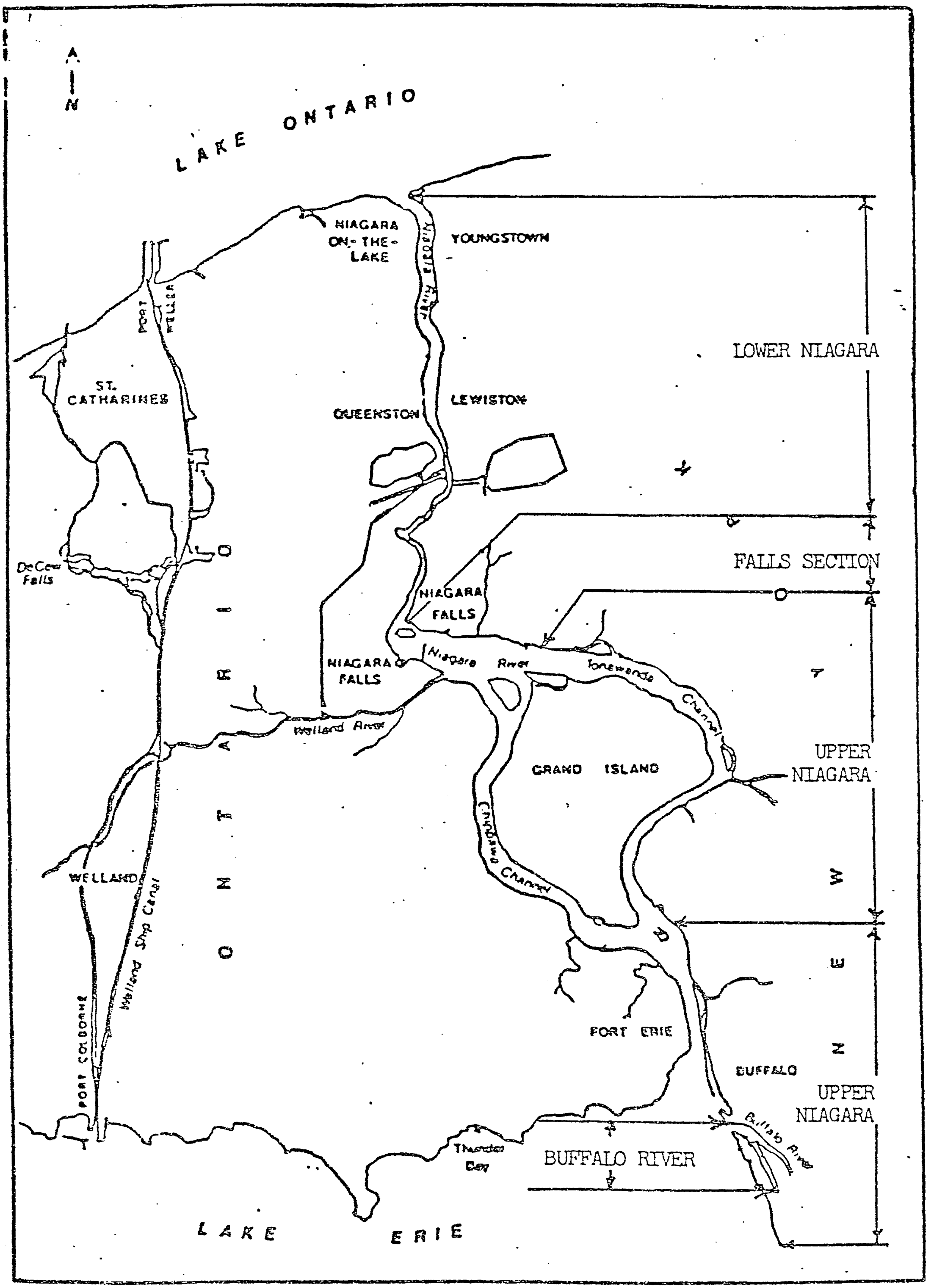
## 6. Balance Sheet

Listed vertically (in mg/l) next to each substance in the ambient water quality standard which is used for calculating the total allowable allocation for each river segment. The technical basis for each number has been referenced (see Table 4). The balance sheet also calculates the following:

1. The sum of all discharges to each segment (lbs/day).
2. The total allocation to each segment based on the listed ambient standard (if listed).
3. The sum is compared to the allocation and a balance is printed. For substances that do not have an alloction listed, a negative number appears.
4. Starting with the Buffalo River and proceeding downstream, a running sum and running balance are calculated.



POINT SOURCE DISCHARGE LOCATIONS



HYDROLOGICAL STREAM SEGMENTS

## TABLE 1 - LIST OF DISCHARGES

| Receiving Water Segment | Number | Discharge Name | Design Flow | SPDES Permit Number |
|---|---|---|---|---|
| Buffalo River | 1 | Donner - Hanna | 14.1 | NY0003310 |
| | 2 | Allied Chemical | 8.0 | NY0002160 |
| | 3 | Buffalo Color | 10.0 | NY0002470 |
| | 4 | Republic Steel | 40.0 | NY0001881 |
| | 5 | PVS Chemical | 8.0 | NY0110043 |
| Upper Niagara | 6 | Bethlehem Steel | 215.0 | NY0001368 |
| | 7 | Hanna Furnace | 39.5 | NY0001597 |
| | 8 | Buffalo Sewer Authority | 180.0 | NY0028410 |
| Tonawanda Channel | 9 | Ashland Petroleum | 20.0 | NY0001678 |
| | 10 | Chevrolet Motor Division | 24.3 | NY0000574 |
| | 11 | FMC | 10.1 | NY0000337 |
| | 12 | Spaulding Fiber | 2.5 | NY0002364 |
| | 13 | Tonawanda (T) S.D. #2 | 30.0 | NY0026395 |
| | 14 | Niagara Co. S.D. #1 | 14.1 | NY0027979 |
| | 15 | North Tonawanda (C) | 13.0 | NY0026280 |
| | 16 | Tonawanda Coke | 3.4 | NY0002399 |
| | 17 | Hooker - Durez | 0.99 | NY0001198 |
| Falls Section | 18 | Dupont (Niagara Falls) | 13.5 | NY0003328 |
| | 19 | Hooker (Niagara Falls) | 50.0 | NY0003336 |
| | 20 | Niagara Falls (C) | 48.0 | NY0026336 |
| | 21 | Olin (Cooling Water) | 6.5 | NY0001635 |
| Lower Niagara | 22 | SCA | 1.0 | NY0072061 |

## TABLE 2 - PERMIT STATUS CODE

Status 1 - Permit has been issued.

Status 2 - Permit has gone to public notice.

Status 3 - Permit application pending.

## TABLE 3 - REFERENCE CODE

| Reference Code | Technical Basis |
|---|---|
| A | BAT |
| B | BPT |
| C | BEJ (Best Engineering Judgment) |
| D | WQ (Water quality of Niagara River) |
| E | Mass loading was included in the permit application, or was a reported level. |
| F | BCT |
| G | Mass loading was calculated from DMR's (Discharge Monitoring Reports). |

## TABLE 4 - AMBIENT STANDARD CODE

| Note | Technical Basis |
|---|---|
| D | DEC Bureau of Environmental Protection (Protection of aquatic organisms) |
| H | NYS Department of Health (Protection of Drinking Water Resource) |
| L | Environmental Conservation Law |

## BUFFALO RIVER REACH - INDUSTRIAL LISTING

| PARAMETER | DONNER HANNA STATUS-2 | REF | ALLIED CHEMICAL STATUS-2 | REF | BUFFALO COLOR STATUS-1 | REF | REPUBLIC STEEL STATUS-2 | REF | P.V.S. CHEMICAL STATUS-2 | REF |
|---|---|---|---|---|---|---|---|---|---|---|
| ALKYL DIPHENYL OXIDE SULFONATE | - | - | - | - | - | - | - | - | - | - |
| AMMONIA | 240.000 | D | 12.000 | E | 85.000 | A | 400.000 | E | 200.000 | D |
| ANTIMONY | - | - | - | - | .134 | - | - | - | 50.000 | D |
| ARSENIC | .500 | E | - | - | - | - | - | - | - | - |
| BARIUM | - | - | - | - | - | - | - | - | 50.000 | E |
| BIS(2-ETHYLHEXYL)PHTHALATE | - | - | - | - | .111 | E | - | - | 3.390 | - |
| BENZENE | .120 | D | - | - | - | - | - | - | - | - |
| BENZOIC ACID | - | - | - | - | - | - | - | - | - | - |
| BORON | - | - | - | - | - | - | - | - | - | - |
| CADMIUM | - | - | 1.100 | E | - | - | - | - | - | - |
| CARBONTETRACHLORIDE | - | - | - | - | - | - | - | - | - | - |
| CHLORENDIC ACID | - | - | - | - | - | - | - | - | - | - |
| CHLOROFORM | - | - | - | - | - | - | - | - | - | - |
| CHLORINE(TOTAL RESIDIUAL) | - | - | - | - | - | - | .630 | E | - | - |
| COPPER | - | - | 1.200 | E | 6.125 | E | 67.000 | D | 2.000 | E |
| CHROMIUM | - | - | - | - | - | - | 17.000 | D | - | - |
| CYANIDE | 12.000 | D | 1.000 | E | 1.545 | E | 3.400 | A | - | - |
| DECHLORANE PLUS | - | - | - | - | - | - | - | - | - | - |
| DECHLORANE 602 | - | - | - | - | - | - | - | - | - | - |
| ,2 DIBROMO-3-NITRILO PROPRIONAMIDE(DBNPA) | 24.000 | D | - | - | - | - | - | - | - | - |
| DICHLOROBENZOTRIFLOURIDE | - | - | - | - | - | - | - | - | - | - |
| DICHLOROBENZENE | - | - | - | - | - | - | - | - | - | - |
| 1,1-DICHLORDETHYLENE | .020 | E | - | - | - | - | - | - | - | - |
| DICHLOROETHYLENE | - | - | - | - | - | - | - | - | - | - |
| DICHLOROTOLUENE | - | - | - | - | - | - | - | - | - | - |
| DI HYLENE ETHER SEE (DIMETHYL FORMAMIDE) | - | - | - | - | - | - | - | - | - | - |
| DIMETHYL FORMAMIDE | - | - | - | - | - | - | - | - | - | - |
| 2,4-DIMETHYL PHENOL | - | - | - | - | - | - | - | - | - | - |
| DIMETHYL PHTHLATE | - | - | - | - | - | - | - | - | - | - |
| DI(N-BUTYL)PHTHALATE | - | - | - | - | - | - | - | - | - | - |
| DI-N-OCTYL PHTHALATE | - | - | - | - | - | - | - | - | - | - |
| ENDOSULFAN | - | - | .030 | E | - | - | - | - | - | - |
| ETHYL BENZENE | - | - | - | - | - | - | - | - | - | - |
| FLOURANTHENE | .006 | D | - | - | - | - | .001 | D | - | - |
| FLOURENE | .200 | A | - | - | - | - | - | - | - | - |
| FLOURIDE | 11.000 | E | - | - | - | - | - | - | - | - |
| HEXACHLOROBENZENE | - | - | - | - | - | - | - | - | - | - |
| HEXACHLOROBUTADIENE | - | - | - | - | - | - | - | - | - | - |
| HEXACHLOROCYCLOHEXANES | .020 | A | - | - | - | - | - | - | - | - |
| HEXACHLOROPENTADIENE | - | - | - | - | - | - | - | - | - | - |
| XY DROXYETHYLIDENE-1-DIPHOSPHONIC ACID | - | - | - | - | - | - | - | - | - | - |
| IRON | - | - | 20.000 | E | - | - | - | - | 66.000 | E |
| LEAD | - | - | 1.000 | E | - | - | 7.900 | A | 3.000 | D |
| MAGNAFLOX 573-C | - | - | - | - | - | - | - | - | - | - |
| MAGNAFLOC 844A | - | - | - | - | - | - | - | - | - | - |
| METHYLENE BISTHIOCYANATE | - | - | - | - | - | - | - | - | - | - |
| METHYLENE CHLORIDE | 61.000 | E | - | - | - | - | - | - | - | - |
| MONOCHLOROBENZOTRIFLOURIDE | - | - | - | - | - | - | - | - | - | - |
| MONOCHLOROBENZENE | - | - | - | - | - | - | - | - | - | - |
| MONOCHLORO PHENOL | - | - | - | - | - | - | - | - | - | - |

## BUFFALO RIVER REACH - INDUSTRIAL LISTING

| PARAMETER | DONNER HANNA STATUS-2 | R E F | ALLIED CHEMICAL STATUS-2 | R E F | BUFFALO COLOR STATUS-1 | R E F | REPUBLIC STEEL STATUS-2 | R E F | P.V.S. CHEMICAL STATUS-2 | R E F |
|---|---|---|---|---|---|---|---|---|---|---|
| MONOCHLOROTOLUENE | - | - | - | - | - | - | - | - | - | - |
| MERCURY | - | - | - | - | - | - | - | - | .180 | E |
| NALCO 7320(SEE DBNPA) | - | - | - | - | - | - | - | - | - | - |
| NALCO 8361 | - | - | - | - | - | - | - | - | - | - |
| NAPHTHALENE | .300 | A | - | - | - | - | - | - | - | - |
| NICKEL | - | - | 1.500 | E | - | - | - | - | 1.090 | E |
| NITRATE | 76.000 | E | 32.000 | E | 101.400 | E | - | - | 6.000 | E |
| OIL & GREASE | 194.000 | F | 1,800.000 | D | 13.200 | E | 2,488.000 | E | 1,500.000 | D |
| PENTAC | - | - | - | - | - | - | - | - | - | - |
| PENTACHLOROBENZENE | - | - | - | - | - | - | - | - | - | - |
| PHENANTHRENE | - | - | - | - | - | - | - | - | - | - |
| PHENOLIC COMPOUNDS ( AS PHENOL) | .120 | D | .500 | D | .358 | E | 52.200 | E | .500 | D |
| PHOSOPHORUS | - | - | - | - | 14.400 | E | - | - | - | - |
| PHOSPHORIC ACID (AS PO4) | - | - | - | - | - | - | - | - | - | - |
| POLYACRYLAMIDE EMULSION POLYMER | - | - | - | - | - | - | - | - | - | - |
| POLYCHLORINATED BIPHENYLS (PCB) | - | - | - | - | - | - | - | - | - | - |
| POLYETHYLENE GLYCOL | - | - | - | - | - | - | - | - | - | - |
| POLYMETHACRYLIC ACID | - | - | - | - | - | - | - | - | - | - |
| POTASSIUM HYDROXIDE | - | - | - | - | - | - | - | - | - | - |
| PYRENE | .200 | A | - | - | - | - | - | - | - | - |
| SELENIUM | .120 | D | - | - | - | - | .330 | D | - | - |
| SILVER | - | - | - | - | - | - | .033 | D | 2.000 | D |
| SODIUM | - | - | - | - | - | - | - | - | - | - |
| SODIUM CARBOXYLATE POLYMER | - | - | - | - | - | - | - | - | - | - |
| SODIUM SILICATE | - | - | - | - | - | - | - | - | - | - |
| SODIUM MEXAMETAPHOSPHATE | - | - | - | - | - | - | - | - | - | - |
| SULFATE | 2,690.000 | E | 50.000 | E | 277.500 | E | - | - | 50.000 | E |
| SULFIDE | .240 | D | - | - | - | - | - | - | - | - |
| SULFITE | - | - | - | - | - | - | - | - | - | - |
| TERACOL 6 | - | - | - | - | - | - | - | - | - | - |
| TETRACHLOROBENZENE | - | - | - | - | - | - | - | - | - | - |
| 1,1,2,2-TETRACHLOROETHANE | - | - | - | - | - | - | - | - | - | - |
| TETRACHLOROETHENE | - | - | - | - | - | - | - | - | - | - |
| TETRAHYDRO FURAN | - | - | - | - | - | - | - | - | - | - |
| TETRA POTASSIUM PYROPHOSPHATE | - | - | - | - | - | - | - | - | - | - |
| TOLUENE | 1.200 | D | - | - | .025 | E | - | - | - | - |
| TOLYTRIAZOLE | - | - | - | - | - | - | - | - | - | - |
| TOTAL DISSOLVED SOLIDS (TDS) | - | - | - | - | - | - | - | - | - | - |
| TOTAL SUSPENDED SOLIDS (TSS) | 650.000 | F | - | - | - | - | - | - | - | - |
| TOTAL KJELDAHL NITROGEN | 214.000 | E | - | - | - | - | - | - | - | - |
| 1,2-TRANS DICHLOROETHYLENE | - | - | - | - | - | - | - | - | - | - |
| TRICHLOROBENZENE | - | - | - | - | - | - | - | - | - | - |
| 1,2,4-TRICHLOROBENZENE | - | - | - | - | - | - | - | - | - | - |
| TRICHLOROETHANE | - | - | - | - | - | - | - | - | - | - |
| 1,1,1-TRICHLOROETHANE | - | - | - | - | - | - | - | - | - | - |
| TRICHLOROETHYLENE | - | - | - | - | - | - | - | - | - | - |
| 1,1,1-TRICHLOROETHENE | - | - | - | - | - | - | - | - | - | - |
| TRICHLOROTOLUENE | - | - | - | - | - | - | - | - | - | - |
| TRI SODIUM NITRILO TRIACETATE MONOHYDRATE | - | - | - | - | - | - | - | - | - | - |
| VINYL CHLORIDE | - | - | - | - | - | - | - | - | - | - |

## BUFFALO RIVER REACH - INDUSTRIAL LISTING

| PARAMETER | DONNER | R | ALLIED | R | BUFFALO | R | REPUBLIC | R | P.V.S. | R |
|---|---|---|---|---|---|---|---|---|---|---|
| | HANNA | E | CHEMICAL | E | COLOR | E | STEEL | E | CHEMICAL | E |
| | STATUS-2 | F | STATUS-2 | F | STATUS-1 | F | STATUS-2 | F | STATUS-2 | F |
| ZINC | - | - | .500 | E | 5.394 | E | 8.600 | A | .670 | - |
| ZINC CHLORIDE | - | - | - | - | - | - | - | - | - | - |
| CHLORODIBROMOMETHANE | - | - | - | - | - | - | - | - | - | - |
| DICHLOROBROMOMETHANE | - | - | - | - | - | - | - | - | - | - |
| BROMOFORM | - | - | - | - | - | - | - | - | - | - |
| DICHLOROPROPYLENE | - | - | - | - | - | - | - | - | - | - |
| METHYLENE CHLORIDE | - | - | - | - | - | - | - | - | - | - |
| MONOCHLOROPHENOL | - | - | - | - | - | - | - | - | - | - |
| DICHLOROPHENOL | - | - | - | - | - | - | - | - | - | - |
| MONOCHLOROCRESOL | - | - | - | - | - | - | - | - | - | - |
| TRICHLOROPHENOL | - | - | - | - | - | - | - | - | - | - |
| PENTACHLOROPHENOL | - | - | - | - | - | - | - | - | - | - |
| BUTYL BENZYL PHTHALATE | - | - | - | - | - | - | - | - | - | - |
| DIBUTYL PHTHALATE | - | - | - | - | - | - | - | - | - | - |
| DIETHYL PHTHALATE | - | - | - | - | - | - | - | - | - | - |
| DIOCTYL PHTHALATE | - | - | - | - | - | - | - | - | - | - |
| NITROSODIPHENYLAMINE | - | - | - | - | - | - | - | - | - | - |
| ACENAPHTHENE | .200 | A | - | - | - | - | - | - | - | - |
| CHRYSENE | - | - | - | - | - | - | - | - | - | - |
| BENZ(A)ANTHRACENE | .200 | A | - | - | - | - | - | - | - | - |
| MIREX | - | - | - | - | - | - | - | - | - | - |
| THIOCYANATES | - | - | - | - | - | - | - | - | - | - |
| CHLORIDE | - | - | - | - | - | - | - | - | - | - |
| BROMIDE | - | - | - | - | - | - | - | - | - | - |
| IODIDE | - | - | - | - | - | - | - | - | - | - |
| HALOGENATED HYDROCARBON | - | - | - | - | - | - | - | - | - | - |
| BENZIDINE | - | - | - | - | - | - | - | - | - | - |
| PHTHALATE ESTERS | - | - | - | - | - | - | - | - | - | - |
| BENZISOTHIAZOLE | - | - | - | - | - | - | - | - | - | - |
| HEXAMETHYLBENZENE | - | - | - | - | - | - | - | - | - | - |
| ALUMINUM | - | - | - | - | - | - | - | - | - | - |
| BERYLLIUM | - | - | - | - | - | - | - | - | - | - |
| COBALT | - | - | - | - | - | - | - | - | - | - |
| GOLD | - | - | - | - | - | - | - | - | - | - |
| MANGANESE | - | - | - | - | - | - | - | - | - | - |
| MOLYBDENUM | - | - | - | - | - | - | - | - | - | - |
| PALLADIUM | - | - | - | - | - | - | - | - | - | - |
| PLATINUM | - | - | - | - | - | - | - | - | - | - |
| STRONTIUM | - | - | - | - | - | - | - | - | - | - |
| TELLURIUM | - | - | - | - | - | - | - | - | - | - |
| THALLIUM | - | - | - | - | - | - | - | - | - | - |
| TIN | - | - | - | - | - | - | - | - | - | - |
| TITANIUM | - | - | - | - | - | - | - | - | - | - |
| ANTHRACENE | .200 | A | - | - | - | - | - | - | - | - |
| 2,4-DIMETHYLPHENOL | - | - | - | - | - | - | - | - | - | - |
| MAGNAFLOX 344A | - | - | - | - | - | - | - | - | - | - |
| DIETHYLPHTHALATE | - | - | - | - | - | - | - | - | - | - |
| HEXACHLOROCYCLOPENTADIENE | - | - | - | - | - | - | - | - | - | - |
| BENZO(B)FLUORANTHENE | .200 | A | - | - | - | - | - | - | - | - |
| DICHLOROETHANE | - | - | - | - | - | - | - | - | - | - |

## BUFFALO RIVER REACH - BALANCE SHEET

| PARAMETER | AMBIENT LIMIT (PPM) | NOTE | SUM | ALLOC | BALANCE |
|---|---|---|---|---|---|
| | | | lbs./day | | |
| ALKYL DIPHENYL OXIDE SULFONATE | .05 | H | - | - | 0 |
| AMMONIA | 2.0 | L | 937.000 | 2,400.0 | 1,463.000 |
| ANTIMONY | .05 | H | 50.184 | 300.0 | 249.816 |
| ARSENIC | .05 | H | .500 | 30.0 | 29.500 |
| BARIUM | 1.0 | H | 50.000 | - | -50.000 |
| BIS[2-ETHYLHEXYL]PHTHALATE | .0006 | D | 3.501 | - | -3.501 |
| BENZENE | .0015 | H | .120 | .6 | .480 |
| BENZOIC ACID | 35 | H | - | - | 0 |
| BORON | .125 | H | - | 3,002.0 | 3,002.000 |
| CADMIUM | .3 | L | 1.100 | 180.0 | 178.900 |
| CARBONTETRACHLORIDE | .0003 | H | - | - | 0 |
| CHLORENDIC ACID | .001 | H | - | - | 0 |
| CHLOROFORM | .00019 | D | - | - | 0 |
| CHLORINE(TOTAL RESIDIUAL) | .15 | D | .630 | 30.0 | 29.370 |
| COPPER | .2 | L | 76.325 | 120.0 | 43.675 |
| CHROMIUM | .15 | H | 17.000 | 30.0 | 13.000 |
| CYANIDE | .1 | L | 17.945 | 106.0 | 88.055 |
| DECHLORANE PLUS | .0001 | H | - | - | 0 |
| DECHLORANE 602 | .001 | H | - | - | 0 |
| DIBROMO-3-NITRILO PROPRIONAMIDE(DBNPA) | .05 | H | 24.000 | - | -24.000 |
| DICHLOROBENZOTRIFLOURIDE | .01 | H | - | - | 0 |
| DICHLOROBENZENE | .00025 | D | - | - | 0 |
| 1,1-DICHLOROETHYLENE | .00003 | D | .020 | - | -.020 |
| DICHLOROETHYLENE | .0009 | D | - | - | 0 |
| DICHLOROTOLUENE | .001 | D | - | - | 0 |
| DI THYLENE ETHER SEE (DIMETHYL FORMAMIDE) | .05 | H | - | - | 0 |
| DIMETHYL FORMAMIDE | 0.05 | H | - | - | 0 |
| 2,4-DIMETHYL PHENOL | .001 | H | - | - | 0 |
| DIMETHYL PHTHLATE | .0002 | D | - | - | 0 |
| DI(N-BUTYL)PHTHALATE | .00045 | D | - | - | 0 |
| DI-N-OCTYL PHTHALATE | .0002 | D | - | - | 0 |
| ENDOSULFAN | .000003 | D | .030 | - | -.030 |
| ETHYL BENZENE | .017 | D | - | - | 0 |
| FLOURANTHENE | .0000015 | D | .007 | - | -.007 |
| FLOURENE | .0002 | H | .200 | - | -.200 |
| FLOURIDE | 1.2 | D | 11.000 | 900.0 | 889.000 |
| HEXACHLOROBENZENE | .00000072 | D | - | - | 0 |
| HEXACHLOROBUTADIENE | .000005 | D | - | - | 0 |
| HEXACHLOROCYCLOHEXANES | .00001 | D | .020 | - | -.020 |
| HEXACHLOROPENTADIENE | .00007 | D | - | - | 0 |
| XY DROXYETHYLIDENE-1-DIPHOSPHONIC ACID | .05 | H | - | - | 0 |
| IRON | .3 | L | 86.000 | - | -86.000 |
| LEAD | .03 | H | 11.900 | 18.0 | 6.100 |
| MAGNAFLOX 573-C | N | N | - | - | 0 |
| MAGNAFLOC 844A | N | N | - | - | 0 |
| METHYLENE BISTHIOCYANATE | .001 | D | - | - | 0 |
| METHYLENE CHLORIDE | .05 | H | 61.000 | 5,765.0 | 5,704.000 |
| MONOCHLOROBENZOTRIFLOURIDE | .01 | H | - | - | 0 |
| MONOCHLOROBENZENE | .0012 | D | - | - | 0 |
| MONOCHLORO PHENOL | .00015 | D | - | - | 0 |

H - DOH

L - ECL

D - WQ

## BUFFALO RIVER REACH - BALANCE SHEET

| PARAMETER | AMBIENT LIMIT (PPM) | NOTE | SUM | ALLOC | BALANCE | |
|---|---|---|---|---|---|---|
| MONOCHLOROTOLUENE | .0027 | D | - | - | 0 | |
| MERCURY | .0002 | D | .180 | - | -.180 | WQ |
| NALCO 7320(SEE DBNPA) | - | - | - | - | 0 | |
| NALCO 8361 | - | - | - | - | 0 | |
| NAPHTHALENE | ).0015 | D | .300 | - | -.300 | |
| NICKEL | .015 | D | 2.590 | 18.0 | 15.410 | WQ |
| NITRATE | 2.3 | D | 215.400 | - | -215.400 | |
| OIL & GREASE | - | - | 5,995.200 | - | -5,995.200 | |
| PENTAC | .001 | H | - | - | 0 | |
| PENTACHLOROBENZENE | .00001 | D | - | - | 0 | |
| PHENANTHRENE | .000003 | D | - | - | 0 | |
| PHENOLIC COMPOUNDS ( AS PHENOL) | .001 | H | 54.173 | 1.2 | -52.973 | |
| PHOSOPHORUS | 1.0 | D | 14.400 | - | -14.400 | |
| PHOSPHORIC ACID (AS PO4) | 1.0 | D | - | - | 0 | |
| POLYACRYLAMIDE EMULSION POLYMER | .05 | H | - | - | 0 | |
| POLYCHLORINATED BIPHENYLS (PCB) | .000001 | D | - | - | 0 | |
| POLYETHYLENE GLYCOL | 70 | H | - | - | 0 | |
| POLYMETHACRYLIC ACID | .05 | H | - | - | 0 | |
| POTASSIUM HYDROXIDE | 100 | ? | - | - | 0 | |
| PYRENE | .0000015 | D | .200 | - | -.200 | |
| SELENIUM | .001 | D | .450 | .6 | .150 | |
| SILVER | .0001 | D | 2.033 | .1 | -1.933 | |
| SODIUM | 20 | H | - | - | 0 | |
| SODIUM CARBOXYLATE POLYMER | ? | ? | - | - | 0 | |
| SODIUM SILICATE | 3.7 | D | - | - | 0 | |
| SODIUM HEXAMETAPHOSPHATE | 1.0 | D | - | - | 0 | |
| SULFATE | 200 | ? | 3,067.500 | - | -3,067.500 | |
| SULFIDE | .002 | D | .240 | 1.2 | .960 | |
| SULFITE | .2 | D | - | - | 0 | |
| TERACOL 8 | ? | ? | - | - | 0 | |
| TETRACHLOROBENZENE | .00001 | D | - | - | 0 | |
| 1,1,2,2-TETRACHLOROETHANE | .00017 | D | - | - | 0 | |
| TETRACHLOROETHENE | .001 | D | - | - | 0 | |
| TETRAHYDRO FURAN | .05 | H | - | - | 0 | |
| TETRA POTASSIUM PYROPHOSPHATE | 1.0 | D | - | - | 0 | |
| TOLUENE | ? | ? | 1.225 | 20.0 | 18.775 | |
| TOLYTRIAZOLE | .001 | D | - | - | 0 | |
| TOTAL DISSOLVED SOLIDS (TDS) | 200 | L | - | - | 0 | |
| TOTAL SUSPENDED SOLIDS (TSS) | - | L | 650.000 | - | -650.000 | |
| TOTAL KJELDAHL NITROGEN | .15 | H | 214.000 | - | -214.000 | |
| 1,2-TRANS DICHLOROETHYLENE | .002 | H | - | - | 0 | |
| TRICHLOROBENZENE | .00005 | D | - | - | 0 | |
| 1,2,4-TRICHLOROBENZENE | .00005 | D | - | - | 0 | |
| TRICHLOROETHANE | .0005 | D | - | - | 0 | |
| 1,1,1-TRICHLOROETHANE | .05 | D | - | - | 0 | |
| TRICHLOROETHYLENE | .0006 | D | - | - | 0 | |
| 1,1,1-TRICHLOROETHENE | .0005 | D | - | - | 0 | |
| TRICHLOROTOLUENE | .001 | D | - | - | 0 | |
| TR ODIUM NITRILO TRIACETATE MONOHYDRATE | .013 | H | - | - | 0 | |
| VINYL CHLORIDE | .001 | H | - | - | 0 | |

/09/82 NIAGARA RIVER LOAD ALLOCATIONS 13:07EDT

BUFFALO RIVER REACH - BALANCE SHEET

| PARAMETER | AMBIENT LIMIT (PPM) | NOTE | SUM | ALLOC | BALANCE | |
|---|---|---|---|---|---|---|
| ZINC | .3 | L | 15.164 | 180.0 | 164.836 | ECL |
| ZINC CHLORIDE | .03 | D | - | - | 0 | |
| CHLORODIBROMOMETHANE | - | - | - | - | 0 | |
| DICHLOROBROMOMETHANE | - | - | - | - | 0 | |
| BROMOFORM | - | - | - | - | 0 | |
| DICHLOROPROPYLENE | - | - | - | - | 0 | |
| METHYLENE CHLORIDE | - | - | - | - | 0 | |
| MONOCHLOROPHENOL | - | - | - | - | 0 | |
| DICHLOROPHENOL | - | - | - | - | 0 | |
| MONOCHLOROCRESOL | - | - | - | - | 0 | |
| TRICHLOROPHENOL | - | - | - | - | 0 | |
| PENTACHLOROPHENOL | - | - | - | - | 0 | |
| BUTYL BENZYL PHTHALATE | - | - | - | - | 0 | |
| DIBUTYL PHTHALATE | - | - | - | - | 0 | |
| DIETHYL PHTHALATE | - | - | - | - | 0 | |
| DIOCTYL PHTHALATE | - | - | - | - | 0 | |
| NITROSODIPHENYLAMINE | - | - | - | - | 0 | |
| ACENAPHTHENE | - | - | .200 | - | -.200 | |
| CHRYSENE | - | - | - | - | 0 | |
| BENZ(A)ANTHRACENE | - | - | .200 | - | -.200 | |
| MIREX | - | - | - | - | 0 | |
| THIOCYANATES | - | - | - | - | 0 | |
| CHLORIDE | - | - | - | - | 0 | |
| BROMIDE | - | - | - | - | 0 | |
| IODIDE | - | - | - | - | 0 | |
| HALOGENATED HYDROCARBON | - | - | - | - | 0 | |
| BENZIDINE | - | - | - | - | 0 | |
| PHTHALATE ESTERS | - | - | - | - | 0 | |
| BENZISOTHIAZOLE | - | - | - | - | 0 | |
| HEXAMETHYLBENZENE | - | - | - | - | 0 | |
| ALUMINUM | - | - | - | - | 0 | |
| BERYLLIUM | - | - | - | - | 0 | |
| COBALT | - | - | - | - | 0 | |
| GOLD | - | - | - | - | 0 | |
| MANGANESE | - | - | - | - | 0 | |
| MOLYBDENUM | - | - | - | - | 0 | |
| PALLADIUM | - | - | - | - | 0 | |
| PLATINUM | - | - | - | - | 0 | |
| STRONTIUM | - | - | - | - | 0 | |
| TELLURIUM | - | - | - | - | 0 | |
| THALLIUM | - | - | - | - | 0 | |
| TIN | - | - | - | - | 0 | |
| TITANIUM | - | - | - | - | 0 | |
| ANTHRACENE | - | - | .200 | - | -.200 | |
| 2,4-DIMETHYLPHENOL | - | - | - | - | 0 | |
| MAGNAFLOX 844A | - | - | - | - | 0 | |
| DIETHYLPHTHALATE | - | - | - | - | 0 | |
| HEXACHLOROCYCLOPENTADIENE | - | - | - | - | 0 | |
| BENZO(B)FLUORANTHENE | - | - | .200 | - | -.200 | |
| DICHLOROETHANE | - | - | - | - | 0 | |

# NIAGARA RIVER LOAD ALLOCATIONS

13:07EDT

## BUFFALO RIVER REACH - BALANCE SHEET

| PARAMETER | AMBIENT LIMIT (PPM) | NOTE | SUM | ALLOC | BALANCE |
|---|---|---|---|---|---|
| CHLOROMETHANE | - | - | - | - | 0 |
| HYDRAZINE | - | - | .600 | - | -.600 |
| VANADIUM | - | - | 50.000 | - | -50.000 |
| HEPTACHLOR | - | - | .020 | - | -.020 |
| BENZO(A)PYRENE | - | - | .200 | - | -.200 |
| ACENAPHTHALENE | - | - | .200 | - | -.200 |

LOOKUP CODES ---

A-BAT B-BPT C-BEJ D-WQ E-PERMIT APPLICATION OR REPORTING LEVEL F-BCT G-FROM DMR (NOT A LIMIT)

TF H-DOH D-F&W L-E.C.L. N-N/A

US (1) ISSUED (2) PUBLIC NOTICE (3) APPLICATION PENDING

## BUFFALO RIVER REACH - INDUSTRIAL LISTING

| PARAMETER | DONNER HANNA STATUS-2 | REF | ALLIED CHEMICAL STATUS-2 | REF | BUFFALO COLOR STATUS-1 | REF | REPUBLIC STEEL STATUS-2 | REF | P.V.S. CHEMICAL STATUS-2 | REF |
|---|---|---|---|---|---|---|---|---|---|---|
| CHLOROMETHANE | - | - | - | - | - | - | - | - | - | - |
| HYDRAZINE | .600 | D | - | - | - | - | - | - | - | - |
| VANADIUM | - | - | - | - | - | - | - | - | 50.000 | D |
| HEPTACHLOR | .020 | E | - | - | - | - | - | - | - | - |
| BENZO(A)PYRENE | .200 | A | - | - | - | - | - | - | - | - |
| ACENAPHTHALENE | .200 | A | - | - | - | - | - | - | - | - |

REF CODES ---

A-BAT B-BPT C-BEJ D-WQ E-PERMIT APPLICATION OR REPORTING LEVEL F-BCT G-FROM DMR (NOT A LIMIT)

E H-DOH D-F&W L-E.C.L. N-N/A

(1) ISSUED (2) PUBLIC NOTICE (3) APPLICATION PENDING