GROUNDWATER MONITORING TASK CIBA-GEIGY MAIN PLANT SITE GLENS FALLS, NEW YORK

Prepared for:

CIBA-GEIGY Corporation Lower Warren Street Glens Falls, New York 12801

Prepared by:

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January, 1989



consultants in environmental management

January 23, 1989

6966 6993

Mrs. LaVerne Fagel CIBA-GEIGY Corporation Lower Warren Street Glens Falls, New York 12801

RE: Glens Falls Main Plant Site

Dear Mrs. Fagel:

AWARE is pleased to submit the following reports for your review:

- o Evaluation Of Off-Site Bedrock Hydrogeology
- o Groundwater Monitoring Task

As requested, we have also forwarded copies to the appropriate offices at NYSDEC.

Should you have any questions, please feel free to contact us at (201) 529-0800.

Very truly yours,

AWARE Incorporated

William G. Soukup

Senior Hydrogeologist

WGS:k1 enclosures

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1.0 INTRODUCTION

This Groundwater Monitoring Task has been prepared in response to the Preliminary Assessment, Main Plant Site Technical Notice of Deficiency (TNOD) issued by NYSDEC. The Task describes the objectives, technical approach and specific methods to be employed in the installation of monitoring wells and groundwater sample collection at the CIBA-GEIGY Main Plant site in Glens Falls, New York. The Task makes specific reference and relies upon several documents which have not been reproduced for this submittal. These include the Preliminary Assessment by Malcolm Pirnie (September 1987) and the Evaluation of Off-Site Bedrock Hydrogeology prepared by AWARE (December 1988). Lastly, this Task is but one of several tasks and ongoing studies being prepared and implemented by CIBA-GEIGY. These tasks and studies comprise an overall remedial investigation program for the Main Plant site.

1.1 OBJECTIVES AND SCOPE

The overall goal of this Groundwater Monitoring Task is to provide the appropriate groundwater quality data necessary for the evaluation of remedial alternatives. In order to achieve this goal, the following objectives have been identified.

- Confirm through the installation of monitoring wells the "conceptual" groundwater flow scenarios developed in the off-site bedrock study.
- Determine the extent to which contaminants have migrated off-site (if at all) and thus provide the basis for an evaluation of their impact.
- Identify the distribution of individual organic and inorganic compounds in the groundwater on the Main Plant site.

- Provide a groundwater monitoring well network which can be used for site-wide monitoring.
- In conjunction with data collected from other related on-site studies (i.e. soil sampling plan), provide an insight as to the location of source areas for each of the groundwater contaminants.

The scope of this proposed investigation focuses on two specific concerns put forth in the Main Plant Site TNOD. These are summarized as follows:

- TNOD Item #9 Provide a better definition of groundwater flow through the installation of overburden and deep bedrock wells.
- TNOD Item #10 Provide a better delineation of groundwater contamination both on-site and off-site through the installation and sampling of additional wells.

This Task also addresses the groundwater quality discharging into the limestone quarry south of the Hudson River. All other items contained in the Main Plant Site TNOD will be addressed under separate tasks.

1.2 PREVIOUS INVESTIGATIONS

A fairly extensive preliminary groundwater investigation consisting of the installation of 48 groundwater monitoring wells was conducted by Dunn Geoscience Corporation and Malcolm Pirnie. The initial set of wells (MW-1 through MW-22) was completed by Dunn Geoscience in 1983 with relatively long open rock intervals. Several of these wells were later modified (shortened) during the 1987 Malcolm Pirnie investigation. The 1987 investigation installed 30 wells with 10 foot long open rock sections representing two depth intervals below the top of bedrock. These wells were installed in accordance with the approved Preliminary Assessment Work Plan



(1986) and under the general oversight of NYSDEC. Wells with an open interval from approximately five to fifteen feet below top of rock were identified as shallow ("S") and wells open from 25 to 35 feet below top of rock were identified as deep ("D").

The results of the AWARE off site bedrock evaluation conducted in 1988 identified three specific hydrostratigraphic horizons which serve as open groundwater fractures. These horizons have been correlated over 4,800 feet from the Main Plant site, across the Hudson River to the lands south of the limestone quarry. These horizons have been termed the A, B and C horizons in order of their depth and are stratigraphically controlled fractures which have a significant influence on the occurrence and movement of groundwater in the bedrock.

The AWARE report has categorized each of the existing monitoring wells (including the five C horizon wells installed by AWARE) according to the hydrostratigraphic horizon it appears to represent (if any). This categorization is repeated on Table 1-1 and has been the basis for the selection of additional wells both on and off site. The reader is referred to the AWARE report "Evaluation of Off Site Bedrock Hydrogeology" (December, 1988) for a further discussion of the site stratigraphy and the mechanisms influencing groundwater flow.

There have been three principal rounds of groundwater quality sampling at the Main Plant site. The first round was during the Malcolm Pirnie investigation in 1987 and included the wells in existence at that time. The second round was conducted in December 1987 and included a subset of these wells. The objective of this round was to confirm results of the earlier round, specifically in the western portion of the site where groundwater contamination was detected. The third round was conducted during the 1988 AWARE off site bedrock evaluation and generally included this same subset of wells, plus the five newly installed AWARE wells (horizon C).

Four rounds of water samples were also collected across the river in the limestone quarry over a four-month period. This program was a part of the off site bedrock study and ran from August to November 1988. Each month samples

 $\label{thm:condition} \textbf{Table } \textbf{1-1}$ Preliminary Well Categorization by Hydrostratigraphic Horizon

| Hydrostratigraphic Horizon | | | | | |
|----------------------------|-------------------|-----|-----|---------------|-----------|
| Overburden | Weathered Bedrock | A | В | С | Undefined |
| | | | | | |
| 2 | 1 | 6 | 10 | AW-1 | 17 |
| 7 | 4 | 8 | 15* | AW-2 | 178 |
| 9 | 5 | 15* | 20D | A W -3 | 21 |
| 14 | 13 | 19 | 22* | AW-4 | 298 |
| 16 | 34 | 22* | 23D | AW-5 | 308 |
| 18 | | 208 | 25D | | 30D |
| 24 | | 238 | 27D | | 338 |
| 26 | | 25S | 35D | | 33D |
| 28 | | 27S | 36D | | 37S |
| 31 | | 358 | | | 40D |
| 45 | | 36S | | | 40S |
| P-46 | | | | | |
| P-53 | | | | | |
| P-71 | | | | | |

 $[\]star$ Well may represent two horizons.

were collected from two coreholes in the western quarry floor (representing horizon B), a seep in the northern quarry wall (representing horizon A) and the quarry pond prior to discharge to the Hudson River.

Although the investigations to date provide a good deal of subsurface information, they do not fully achieve the objectives identified above. It is the intent of this Task to build on the existing data and to fill in those areas which require more information.

2.0 TECHNICAL APPROACH

In order to achieve the objectives stated above, the following issues must be addressed:

- the spatial distribution of wells for water quality and water level data
- the hydrostratigraphic interval(s) from which groundwater quality
 data will be collected for laboratory analysis
- the chemical parameters which will be analyzed

2.1 DISTRIBUTION OF WELLS

2.1.1 Horizon C

Generally speaking, all wells installed primarily for the purpose of groundwater quality monitoring will also yield water level data useful in the interpretation of flow direction. For horizons A and B there are a sufficient number of wells on the Main Plant site to adequately map groundwater flow direction. South of the Hudson River, however, there currently exist only three wells (in the C horizon) and thus several additional wells are proposed in order to help define groundwater flow.

In the C horizon two additional wells are proposed on the Main Plant site in order to define the width of the contamination detected in AW-2. As shown on Sheet 6993-1, one well is located west of this area and one southeast of building 56 on the Main Plant site. Since the yield of this horizon is likely to be very low or non-existent south of the quarry (i.e., AW-5) no additional C horizon wells are proposed in this area.

2.1.2 Horizon B

A total of four additional horizon B wells have been proposed as shown on Sheet 6993-2. In addition, three existing wells (MW-40S, MW-10 and MW-22) are proposed to be modified in order that they also represent this horizon.

Two horizon B wells are proposed south of the Hudson River. Well AW-B3 would form a couplet with existing C horizon well AW-4. Well AW-B4 is located south of AW-3 since the B horizon is too close to the surface on the northern side of this quarry floor area. This well, along with the corehole data, will provide the head measurements necessary to determine horizontal and vertical gradients with respect to horizon C (AW-3).

2.1.3 Horizon A

Horizon A is only present over a limited area on the Main Plant site and is represented by ten existing wells (Sheet 6993-3). Across the river, Horizon A outcrops in a seep in the northern wall of the western quarry area. This seep has been sampled four times and was found not to contain detectable concentrations of contaminants. As a consequence, no additional A horizon wells are proposed.

2.1.4 Overburden Soils

Currently there are 14 overburden wells on the Main Plant site property. These wells provide good areal coverage for most of the site with the exception of immediately downgradient of the south waste pile and along the eastern downgradient Main Plant site border.

A preliminary array of seven additional overburden wells has been developed as shown on Sheet 2-1. These locations are considered preliminary since they do not have the benefit of the additional geologic information to be provided during the soil sampling program. This program consists of over 70 soil borings which, together with existing data will further identify top of clay topography which may locally influence groundwater flow direction in the

overburden. Thus this data may require that modifications to the proposed locations he made. A revised overburden well distribution will be developed for review after the soil sampling program and prior to installation.

2.2 SELECTION OF PARAMETERS

The chemical parameters to be analyzed for each of the groundwater samples are listed on Table 2-1. These parameters have been selected based on the historical account of site operations and previous groundwater sampling results. In addition, 25 percent of the wells will be further analyzed for the full list of Hazardous Substance List (HSL) parameters. These wells have been identified as follows:

| Overburden | Horizon A | Horizon B | Horizon C |
|------------|-----------|-----------|-----------|
| OB-1 | MW-20S | AW-B1 | AW-2 |
| OB-2 | MW-25S | AW-B2 | AW-C2 |
| OB-3 | MW-36S | MW-25D | |
| OB-7 | | | |
| MW-26 | | | |

It is proposed, based on the previous three sampling rounds, that only a filtered sample for metals be included. In the case of total chromium, for example, the results for the filtered and non-filtered samples were nearly identical. Hexavalent chromium requires a laboratory filtered sample for its colormetric test and thus does not impact this issue.

TABLE 2-1

WATER QUALITY PARAMETERS FOR ANALYSIS

Volatile Organics

benzene
chlorobenzene
1,1,1-trichloroethane
o-dichlorobenzene
toluene
trichloroethene
total xylenes
cyanide

Metals

Arsenic Cadmium Chromium (Total) Chromium (Hexavalent) Zinc

Indicators and Field Parameters

Chloride
Sulfate
Sodium
TDS
TOX
pH
Specific Conductivity
Temperature

3.0 FIELD INVESTIGATIONS

The implementation of this Groundwater Monitoring Task consists of five sub-tasks described below.

Sub-task 1 - Existing Well Evaluation

During the evaluation of off site bedrock hydrogeology conducted by AWARE (December 1988) each of the existing wells were categorized based on the hydrostratigraphic horizon they represented. This categorization was considered preliminary since it relied upon a certain degree of interpolation of structural contours.

The objective of this sub-task is to evaluate each well and confirm or modify this categorization. In order to accomplish this, the following tests will be conducted.

- sounding the total depth of the well
- conducting downhole geophysics including caliper, gamma and temperature probes
- conducting a slug-test in the well
- conducting a pressure packer test within discrete intervals of selected wells.

The downhole geophysical program will not include the SP and resistivity probes normally used in a completely open borehole. These logs were not instrumental in the stratigraphic correlation process and would only provide data in the uncased portion of the well. The caliper tool will not only be helpful in locating fractures in the open rock interval but will identify the exact length of the steel casing. Gamma logging is independent of casing and will provide a continuous stratigraphic record for the entire depth of the well. The temperature tool will only identify fractures in the uncased portion of the well.

If the results of these logs are inconclusive, it may be useful to conduct pressure packer tests in small discrete intervals within the open rock borehole. These tests may help to locate individual fractures that have a significant hydraulic conductivity.

The results of each of these tests would be collectively evaluated in order to assess the representativeness of each well. Recommendations would then be made for continued use of the well or some sort of modification (i.e., shortening the interval).

Considering the potential impact of the long open rock intervals of the production wells, a search will be conducted for the wells that remain obscured. The search will include a review of site plans, a thorough site reconnaissance, and perhaps discussions with former employees. As these wells are found, they will be subjected to the same evaluation testing described above.

Sub-task 2 - Well Installation

Based on the discussion in section 2-1, the following bedrock wells are proposed for installation. An estimate of their total depth (in feet) has also been included for general information.

| Horizon B | Horizon C |
|-------------|-------------|
| AW-B1 (60) | AW-C1 (160) |
| AW-B2 (50) | AW-C2 (150) |
| AW-B3 (70) | |
| AW-B4 (275) | |

In addition, seven overburden wells will be installed to approximately two feet above bedrock. The average depth of these wells is estimated to be 15 to 20 feet.

Each well will be installed by Empire Soils of Latham, New York, under the observation of AWARE. The wells will be installed in accordance with the following procedures.

B Horizon

An eight-inch borehole will be drilled one foot into the top of bedrock and a six-inch diameter steel surface casing grouted into place. The borehole will be extended to the target zone using an NX core barrel. Core will be retrieved and geophysical and packer tests conducted in the open borehole. The borehole will then be reamed to six inches and a two-inch diameter PVC well with a ten-foot long screen installed at the target interval. Clean, coarse sand will then be placed to two feet above the screen. Three feet of bentonite pellets will be installed and the remainder of the annulus grouted with bentonite-cement grout. A steel locking protective casing will be cemented into place.

The following site-specific procedures will also be followed if applicable.

- At locations on the Main Plant site a permanent surface casing will be grouted in place and allowed to set for at least 24 hours. The hole will then be advanced inside of this casing.
- At locations which contain an A horizon, a temporary casing will be installed to a depth of five feet below the A horizon. Drilling and well construction will proceed through the temporary casing in order to prevent the loss of circulation in the A horizon. The temporary casing will be removed during the final grouting procedure. Bentonite pellets will be used, if necessary, to prohibit the grout from entering the A horizon.
- Borehole and casing diameters will be modified to provide sufficient space for installation of these casings.

C Horizon

Wells installed in the C horizon will be installed in a similar fashion to those described for the B horizon with the following exceptions:

 At locations which also contain an A and/or B horizon temporary casing will be used to seal off these fractures during the drilling.

Sub-task 3 - Groundwater Sampling and Analysis

Groundwater samples will be collected from each of the existing and proposed wells shown on Sheets 6993-1 through 6993-3 and Figure 2-1. These wells have also been tabulated on Table 3-1. Sample collection will be conducted by Aquatec Inc. of Burlington, Vermont, in accordance with the procedures contained in Appendix A.

Each sample will be analyzed by Aquatec for the parameters on Table 2-1. In addition, the 13 wells identified in section 2-1 will be subjected to a complete analysis of HSL parameters.

In conjunction with the proposed monitoring well program, four samples will be collected from the limestone quarry. These sample locations will be the same as those used in the off site bedrock evaluation for consistency and include: discharge from coreholes 2 and 5, seepage from the north quarry wall of the western area, and the quarry pond prior to discharge to the Hudson River.

One round of samples will be collected during this investigation. The results will be compared to previous groundwater quality data in order to evaluate future sample collection requirements.

Inorganic analysis will be in accordance with New York State protocol and will be analyzed at Level III which includes reporting of internal quality assurance/quality control. For every twenty samples, matrix pike and matrix pike duplicates will be included for quality control.

Table 3-1 Wells for Groundwater Sampling

| F | ٠ | _ | _ | ٠ | _ | _ |
|----|---|---|---|---|---|---|
| Ex | 1 | S | τ | 1 | n | 2 |

| Overburden | Horizon A | Horizon B | <u>Horizon</u> C |
|------------|-----------|-----------|------------------|
| MW-2 | MW-6 | MW-10* | AW-1 |
| MW-7 | MW-8 | MW-22* | AW-2 |
| MW-9 | MW-19 | MW-20D | AW-3 |
| MW-14 | MW-20S | MW-23D | AW-4 |
| MW-16 | MW-23S | MW-25D | AW-5 |
| MW-18 | MW-25S | MW-27D | |
| MW-24 | MW-27S | MW-35D | |
| MW-26 | MW-35S | MW-36D | |
| MW-28 | MW-36S | MW-40S* | |
| MW-31 | | | |
| MW-45 | | | |
| P-46 | | | |
| P-53 | | | |
| P-71 | | | |

Proposed

| Overburden | Horizon B | Horizon C |
|------------|-----------|-----------|
| OB-1 | AW-Bl | AW-C1 |
| OB-2 | AW-B2 | AW-C2 |
| OB-3 | AW-B3 | |
| OB-4 | AW-B4 | |
| OB-5 | | |
| OB-6 | | |
| OB-7 | | |
| | | |

^{*}Well construction to be modified.

Samples for organics will be analyzed using U.S. EPA OSW Methods 8010 (volatiles) and 8020 (semivolatiles). These analyses will be in accordance with New York State protocol and will be analyzed at Level III which includes reporting of internal quality assurance/quality control. For every twenty samples, matrix spike and matrix spike duplicates will be included for quality control.

Sub-task 4 - Water Level Measurements/Survey

Water levels will be measured in each available well on three separate occasions during this study. In addition, two staff gauges will be installed in the Hudson River to record surface water elevations. All measurements will be made from the top of the inner-most casing and recorded to the nearest 0.01 feet.

During a one-month period, remote data loggers using pressure transducers will be employed at selected locations. Readings of water levels will be made electronically every hour during this period in order to evaluate the response to Hudson River fluctuations and precipitation events. One probe will be set in the Hudson River and others in wells screened in different horizons. This data may provide insight to the vertical hydraulic connection between the horizons.

Each of the wells will be surveyed for horizontal location (New York State Plane Coordinates) and elevation. Ground surface elevation and top of inside casing elevation will be surveyed to 0.1 and 0.01 feet (USGS Datum) respectively. All survey work will be conducted by a New York State licensed surveyor. The locations will be clearly identified on a site base map along with their respective elevations.

Sub-task 5 - Data Compilation and Report

All data collected during this investigation, as well as previous groundwater quality data, will be placed in a computerized database. Parameters, such as coordinate location, well depth, sample interval, field measured values and analytical results will be included. Once entered, various data management

procedures will be used to evaluate vertical and/or horizontal relationships (trends). These procedures may include sorting, kriging, graphing or statistical analysis. This data will be presented in both tabular and graphical form.

The data will also be presented on site maps and cross sections. Maps may include modifications to the piezometric surface contour maps, structural contour maps and cross-sections and isoconcentration maps of the various metals and organics of concern. Depending on the results, maps will likely be prepared for each of the selected horizons and/or along selected cross sections. All data, including laboratory QA/QC would be included.

APPENDIX A GROUNDWATER SAMPLING PROTOCOL

SITE-SPECIFIC STANDARD OPERATING PROCEDURES

CG Bedrock Aquatec Project No. 88117

Site: Ciba-Geigy Location: Glens Falls, New York

Prepared By:
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75 Green Mountain Drive
South Burlington, Vermont 05403
(802)658-1074

August 1988

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1. <u>Introduction</u>

This document is Aquatec's Site-Specific Standard Operating Procedures (SOP) for field sampling at Ciba-Geigy Corporation in Glens Falls, New York. This plan outlines the procedures and equipment that will be used for sample collection, sample preservation and handling, chain-of-custody, and field Quality Assurance/Quality Control (QA/QC) for project CG Bedrock, No. 88117.

2. Water Sample Collection

2.1 Ground Water

2.1.1 Measurement of Static Water Levels

Depth to the static water level and the adjusted depth (depth to the bottom of the well) will be measured at each well. These measurements and the inside casing diameter will be used to calculate the volume of stagnant water in the well. A calibrated electronic water level indicator will be used to make the measurements. The measurements will be recorded to the nearest 0.01 foot. A reference point identified on the well will be used. If no reference point is identified, the highest point on the PVC riser pipe is assumed to be the reference point. The measuring device will be cleaned between each well. Cleaning procedures are explained in Section 4.

2.1.2 Well Evacuation

The preferred equipment to use to evacuate stagnant water from two and four inch diameter monitoring wells are dedicated PVC bladder pumps. In cases where bladder pumps are not suitable, dedicated bailers may be used. These bladder pumps will be activated by an oilless air compressor.

The amount of water evacuated from each well will ultimately depend on the yield characteristics of each well. A minimum of three well volumes will be evacuated from each well or until the well is purged dry. Samples will then be collected as described below. All stagnant water pumped from the well will be contained in 55-gallon drums supplied by Ciba-Geigy.

2.1.3 Sample Withdrawal

Samples will be collected via the bladder pump. Specific conductance, pH and temperature measurements will be recorded just prior to and following sample collection. The preferred order in which the parameters will be sampled is as follows:

- 1. Volatile Organics
- 2. Semivolatile Organics (BNA)
- 3. HCO₃
- 4. TOX, TOC
- 5. Metals (Dissolved and Total)
- 6. Hexavalent Chromium
- 7. Phenols
- 8. Cyanide
- 9. Fluoride, Chloride, Turbidity, TDS
- 10. Nitrate/Nitrite-N

Samples collected for dissolved metals will be field filtered by placing an in-line disposable 0.45 micron filter on the end of the pump discharge line.

2.1.4 Sample Containers

All sample containers will be certified clean I-Chem bottles.

2.1.5 Sample Preservation

Listed below are the number, size, and type of bottle used for each analytical parameter. Bottles will be preserved prior to sample collection.

| <u>Parameter</u> | <u>Bottle Size, Material</u> | <u>Preservative</u> |
|----------------------|------------------------------|--|
| Temperature | field determined | - |
| рН | field determined | - |
| Specific Conductance | field determined | - |
| HCO ₃ | 1-250 ml glass w/TFE cap | 4°C |
| VOC | 2-40 ml glass w/TFE cap | 4°C HCl |
| Semi-VOC (BNA) | 1-4 liter glass w/TFE cap | 4°C |
| TOX | 1-250 ml glass w/TFE cap | 1 ml 1.1M NaSO3, 4°C |
| Dissolved Metals | 1-500 ml plastic | HNO ₃ to pH <2 |
| Hexavalent Chromium | 1-500 ml plastic | 4°C |
| Phenols | 1-500 m1 | H ₂ SO ₄ to pH <2, 4°C |
| Cyanide | 1-500 ml plastic | NaOH to pH <12, 4°C |
| Chloride, Fluoride, | • | • |
| Turbidity, TDS | 1-1/2 gallon plastic | 4°C |
| Nitrate/Nitrite-N | 1-500 ml plastic | H_2SO_4 to pH <2, 4°C |
| TOC | 1-250 ml glass w/TFE cap | 4°C |

2.2 Surface Water

Generally, samples of surface water, i.e., seepage, streams, outfalls or discharge systems, are grab samples. In most cases, samples will be collected and placed directly into the sample containers. In cases where samples cannot be collected directly, sampling devices will be used. These devices will consist of bailers, pumps, syringes, or Kemmerer bottles. For seepage sample collection Teflon tubes will be driven into seepage faces.

The sample order, containers, and preservation are the same as Section 2.1.3, 2.1.4, and 2.1.5, respectively.

3. Chain-of-Custody Program

The chain-of-custody program will include:

Sample Labels
Sample Seals
Personal Field Log Book
Chain-of-custody Record
Sample Analysis Request Sheet
Dissection Log (fish only)

3.1 Sample Labels

Sample labels are gummed labels affixed to each chemical sample container. The labels will be filled out entirely and covered with clean Mylar tape prior to filling the container. A copy of the label can be found in Figure 1.

I-Chem bottles are pre-labeled. These labels are to be used when possible.

3.2 Sample Seals

Sample seals will be placed over the top of each chemical sample container cap immediately following collection. A seal will also be placed on the shipping cooler by the person relinquishing or transporting the cooler to Aquatec's laboratory. A copy of the label can be found in Figure 1.

3.3 Personal Field Log Book

The designated field director will be responsible for maintaining a field log book. The log book will include documenting the following where applicable:

- o Identification of well
- o Well depth
- o Static water level depth and measurement technique
- o Well yield high or low estimate
- o Purge volume and pumping rate
- o Time well purged
- o Well evacuation procedure/equipment
- o Sample withdrawal procedure/equipment
- o Date and time of collection
- o Well sampling sequence
- o Types of sample containers used and sample ID numbers
- o Preservative(s) used
- o Parameters requested for analysis
- o Field analysis data and method(s)
- o Sample distribution and transporter
- o Field observation on sampling event
- o Name of collector
- o Climatic conditions including air temperature

3.4 Chain-of-Custody Record

Chain-of-custody records will be filled out entirely for each sample station. More than one sample may be recorded on a single chain-of-custody record if the sample destination is the same. A chain-of-custody record is shown in Figure 2.

4. Field Quality Assurance/Quality Control

4.1 Equipment Cleaning

All nondedicated equipment used to measure, pump, sample, or the like will be cleaned between each station. The equipment will be washed with a soap solution consisting of Liquinox and deionized water, followed by three successive rinses with deionized water. All the equipment will be wiped dry with paper towels following the final rinse. Clean disposable gloves will be worn when cleaning equipment. The wash water and rinse water will be disposed of in the 55-gallon drums supplied by Ciba-Geigy.

4.2 Duplicates and Trip Blanks

Duplicate water samples for laboratory matrix spikes and matrix spike duplicates will be collected. The number of duplicate samples depend on program requirements. In general, for groups of ten samples or less, one duplicate will be collected. Trip blanks for each sampling trip will be included and analyzed.

5. Data Entry

All paperwork will be reviewed by the field and laboratory personnel conducting the work for completeness and accuracy. The paperwork will then be submitted to the project quality control officer. The officer will review the data for completeness and submit data for entry into the computer. After entry, the original data forms will be used to check the computer file for accuracy. Corrections will be made until no known errors exist. Original forms will be retained on file.

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| СНЕМ | I-CHEM RESEARCH (800) 443-1689 (800) 553-3696 |
|-----------|--|
| SITE NAME | DATE |
| ANALYSIS | TIME |
| | PRESERVATIVE |
| | l |
| SPECIALT | Y CLEANED CONTAINER |

| | aquatec inc. | SEALED BY |
|---|--|-----------|
| | ENVIRONMENTAL SERVICES 75 Green Mountain Drive, So. Burlington, VT 05403 | |
| i | TEL. 802/658-1074 | |
| | CUSTODY SEAL | DATETIME |

CHAIN OF CUSTODY RECORD

Aquatec, Inc. 75 Green Mountain Drive' South Burlington, VT 05403 (802) 658-1074

Date/Time Received Remarks Analysis Company Sampler(s): _ (Signature) Containers No. Type/Size Signature ~ က Sample Description Date/Time Relinquished Collection Date: Project Name: Quote No.: Project No.: Company Matrix Grab Collection Comp. Comments: Client: _ Address: Signature Sample Number 8 ကန့်

(Created July '88)

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