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BECHTEL JACOBS
Bechtel Jacobs Company LLC

DOE Contract No. DE-AC05-98OR22700
Job No. 23900
March 18, 2003

RECORD COPY

Mr. W. Don Seaborg
Paducah Site Manager
Department of Energy
P.O. Box 1410
Paducah, KY 42002-1410

Subject: *Toxicity Reduction Evaluation for Permit Number KY0004049, Outfall 001 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*

Dear Mr. Seaborg:

Bechtel Jacobs Company LLC is providing the attached plan, *Toxicity Reduction Evaluation for Permit Number KY0004049, Outfall 001 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, for your review. This plan was developed in response to the toxicity exceedences that occurred at Outfall 001 in October and December 2002.

Please forward this information to the following by March 28, 2003:

Mr. Larry Sowder
Department for Environmental Protection
KPDES Branch
Kentucky Division of Water
14 Reilly Rd.
Frankfort, Kentucky 40601

If you should have any questions or comments, please contact John Young at 5077 or Danny Guminski at 5051.

Sincerely,

Gordon L. Dover
Paducah Manager of Projects

GLD:sm
LTR-PAD/ESS-JB-03-0032

Enclosures: 1. Draft letter from DOE to KDOW
2. TRE Plan for Outfall 001

c/w enc. 2: Environmental Information Center

c/w encs. 1 & 2: D. R. Jolly
J. D. Young
File-CDM/ESS
File-EMEF-DMC-PAD-RC

March 28, 2003

Mr. Larry Sowder
Department for Environmental Protection
KPDES Branch
Kentucky Division of Water
14 Reilly Rd.
Frankfort, Kentucky 40601

Dear Mr. Scott:

TOXICITY REDUCTION EVALUATION FOR KENTUCKY POLLUTANT DISCHARGE ELIMINATION SYSTEM PERMIT NUMBER KY0004049, OUTFALL 001 AT THE PADUCAH GASEOUS DIFFUSION PLANT, PADUCAH, KENTUCKY

The Department of Energy (DOE) is providing the attached plan for your approval in response to the toxicity exceedences that occurred in October and December 2002 for Outfall 001. DOE will begin implementing this toxicity reduction evaluation plan upon receipt of approval from the Kentucky Division of Water.

If you should have any questions or require additional information, please contact David Tidwell at (270) 441-6804.

Sincerely,

W. Don Seaborg, Site Manager
Paducah Site Office

Enclosure

cc w/ enclosure:
Charles A. Roth, KDOW/Frankfort

cc w/out enclosure:
N. L. Carnes/R. Blumenfeld, CC-10
DMC/Kevil
G. L. Dover, BJC/Kevil
D. R. Jolly, BJC/Kevil
File-CDM/ESS

BECHTEL JACOBS

Bechtel Jacobs Company LLC

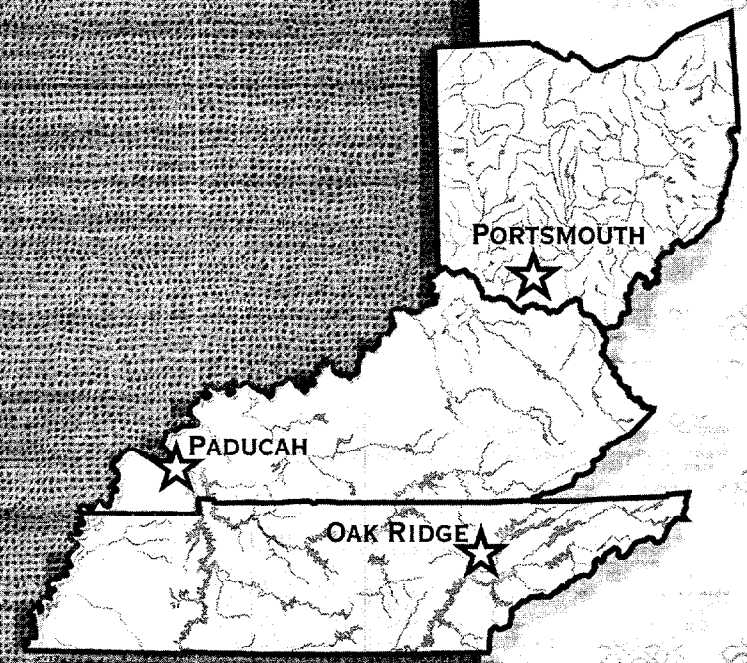
BJC/PAD-508

ENVIRONMENTAL MANAGEMENT

& ENRICHMENT FACILITIES

MANAGEMENT AND INTEGRATION CONTRACT

Toxicity Reduction Evaluation for Permit Number KY0004049 Outfall 001 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky



MANAGED BY
BECHTEL JACOBS COMPANY LLC
FOR THE UNITED STATES
DEPARTMENT OF ENERGY

DEPARTMENT OF ENERGY · UNITED STATES OF AMERICA ·

This document has received the appropriate reviews for release to the public.

BJC-4 (8-98)

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Toxicity Reduction Evaluation for Permit Number KY0004049 Outfall 001 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky

Date Issued—March 2003

Prepared by
CDM Federal Services Inc.,
under subcontract 23900-SC-RM056F

Prepared for the
U. S. Department of Energy
Office of Environmental Management

BECHTEL JACOBS COMPANY LLC
managing the
Environmental Management Activities at the
East Tennessee Technology Park
Oak Ridge Y-12 Plant Oak Ridge National Laboratory
Paducah Gaseous Diffusion Plant Portsmouth Gaseous Diffusion Plant
under contract DE-AC05-98OR22700
for the
U. S. DEPARTMENT OF ENERGY

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ACRONYMS

EDTA	ethylenediaminetetraacetate ligand
IC	inhibition concentration
KDOW	Kentucky Division of Water
KPDES	Kentucky Pollutant Discharge Elimination System
PGDP	Paducah Gaseous Diffusion Plant
SPE	solid phase extraction
TIE	Toxicity Identification Evaluation
TRE	Toxicity Reduction Evaluation
TUc	Chronic Toxicity Unit

1. INTRODUCTION

1.1 PURPOSE

The Kentucky Division of Water (KDOW) administers the Clean Water Act for the Paducah Site through the Kentucky Pollutant Discharge Elimination System (KPDES) Wastewater Discharge Permitting Program. The current permit for the Paducah Site issued in March 1998, requires that quarterly chronic toxicity tests with *Ceriodaphnia* and *Primephales promelas* (fathead minnows) are conducted for Outfall 001. This outfall is a continuously flowing outfall that receives discharges from plant facilities of the Paducah Gaseous Diffusion Plant (PGDP) and discharges to the west into Bayou Creek.

During the fourth quarter of 2002, two successive chronic toxicity tests of effluent from Outfall 001 collected during October 20-25, 2002 and December 1-6, 2002 resulted in chronic toxicity units (TUc) of 1.008 and 7.1, respectively. In addition, the result for January 2003 failed at 30.0. All three failures were for fathead minnows. The tests for *Ceriodaphnia* passed. Because the TUc results for the December 2002 and January 2003 samples were greater than 1.2 times the TUc limit of 1.0 TUc, these results were considered significant noncompliances and in accordance with the KPDES permit, the Paducah Site is required to initiate a Toxicity Reduction Evaluation (TRE).

1.2 BACKGROUND

Outfall 001 lies on the west side PGDP and discharges into Bayou Creek. The C-616 Lagoon and the C-612 Northwest Plume Groundwater System (NWPGS), a pump and treat system, both discharge into the ditch that lead to this outfall. There are two additional ditches that lead from inside the PGDP area into this ditch. Figure 1 identifies Outfall 001 and the patterns of flow through the outfall.

Chronic toxicity tests are performed quarterly in accordance with KPDES Permit Number KY0004049. Part IV of this permit describes the chronic toxicity test methods for fathead minnows and *Ceriodaphnia* (USEPA 2002). During one test, *Ceriodaphnia* are exposed in a static renewal system to different concentrations of effluent, or to receiving water, until 60 percent or more of surviving control females have three broods of offspring. Test results are based on survival and reproduction. During the other test, fathead minnow larvae are exposed in a static renewal system for seven days to different concentrations of effluent or to receiving water. Test results are based on the survival and weight of the larvae.

2. SCOPE AND OBJECTIVES

The overall purpose of this plan is to determine which measures are necessary to maintain the chronic toxicity of effluent from Outfall 001 at or below permitted levels.

2.1 SCOPE

Toxicity tests of effluent from Outfall 001 have been conducted quarterly as required by the KPDES Permit. In October 2002, the test failed for the fathead minnows evaluation of the test. A resample was conducted in December 2002 and also failed. In January 2003, the quarterly test at Outfall 001 along with two other locations was conducted. Outfall 001 failed again. A sample was taken at the C-616 discharge point. This sample passed for toxicity. A sample was also collected in the ditch near the C-612 discharge point. This sample resulted in a value that would fail the permit criteria. Table 1 identifies the toxicity test results for calendar year 2002 and January 2003.

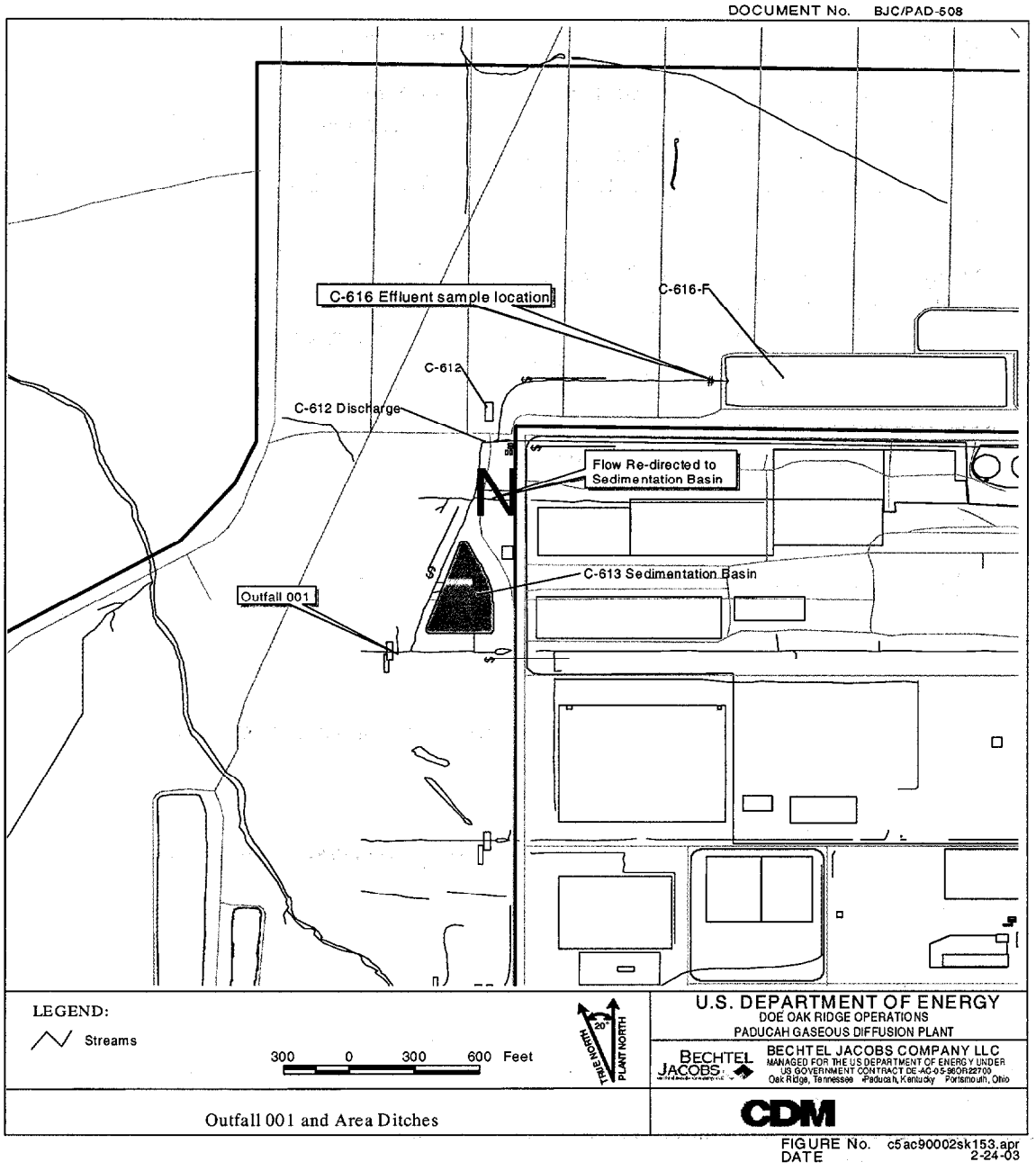

Figure 1. KPDES Outfall 001

Table 1. Toxicity Results for Outfall 001 and Other Relevant Locations for Calendar Year 2002 and January 2003

	Outfall 001		Ditch Near C-612 Effluent		Ditch Near C-616 Effluent	
Sample Date[3]	Minnows[1]	Daphnids[2]	Minnows[1]	Daphnids[2]	Minnows[1]	Daphnids[2]
January 5-10, 2003	TUc(G) = 30.0	TUc(R) = <1.0	TUc(G) = 9.7	not tested	TUc(G) = <1.0	not tested
December 1-6, 2002	TUc(G) = 7.1	TUc(R) = <1.0	not tested	not tested	not tested	not tested
November 10-15, 2002	test invalidated by laboratory	TUc(R) = 2.7	not tested	not tested	not tested	not tested
October 20-25, 2002	TUc(G) = 1.008	TUc(R) = <1.0	not tested	not tested	not tested	not tested
August 18-23, 2002	TUc(G) = <1.0	not tested	not tested	not tested	not tested	not tested
July 16-22, 2002	test invalidated by laboratory	TUc(R) = <1.0	not tested	not tested	not tested	not tested
April 2-8, 2002	TUc(G) = <1.0	TUc(R) = <1.0	not tested	not tested	not tested	not tested
March 5-11, 2002	TUc(G) = <1.0	TUc(R) = <1.0	not tested	not tested	not tested	not tested

1 – *Pimephales promelas* (fathead minnows)
2 – *Ceriodaphnia dubia*
3 – Dates of sample collection for those samples actually used in the tests
4 – Reported as 2.0 on discharge monitoring report due to laboratory calculation error.

G = Growth
R = Reproduction

Failing results highlighted.

2.2 OBJECTIVES

The objective of the TRE is to determine which measures are necessary to maintain the toxicity of effluent from Outfall 001 at permitted levels. The compliance or acceptable level is defined in the KPDES permit for Outfall 001 as a TUc < 1.0 (TUc=100/ inhibition concentration $(IC)_{25}$). The IC_{25} is also a calculated percentage of effluent. It is the level at which the organisms exhibit 25% reduction in a biological measurement such as reproduction or growth.

The objectives will be accomplished by the use of the following tasks.

1. Information and data acquisition;
2. Identification of sources;
3. Toxicity testing of sources;
4. EPA Toxicity Identification Evaluation (TIE) procedures; and
5. Monthly toxicity tests of effluent from Outfall 001.

3. TECHNICAL SPECIFICATIONS

3.1 INFORMATION AND DATA ACQUISITION

The first step of the TRE will be to collect all information and data that may relate to effluent toxicity and that might prove useful in conducting the TRE. Chemical data obtained from Outfall 001 will be examined for changes that occurred during the period January through December 2002. Older data may be evaluated if necessary to understand normal levels of various chemicals. A summary of the data is provided in Appendix A.

3.2 IDENTIFICATION OF SOURCES

Sampling will be conducted at the following locations to capture the sources identified in Appendix B. Samples will be conducted at all locations initially (see Table 2). TRE testing will be conducted in phases as outlined in Section 3.4.

Table 2. TRE Sampling Locations

K001TRES1-03	Convergence of ditch from C-616 and the north Patrol Road ditch
K001TRES2-03	Northwest Plume facility location HV-171 (effluent)
K001TRES3-03	Northwest Plume facility location HV-082 (equalization tank)
K001TRES4-03	Ditch flowing south from C-612 to K001
K001TRES5-03	Ditch from inside PGDP directly flowing to K001
K001	Outfall 001

3.3 TOXICITY TESTING OF SOURCES

Because the toxicant has not been chemically identified, toxicity tests will be used for source tracking. Samples of effluent will be collected at the sampling locations identified in Section 3.2, which includes Outfall 001. Samples will be placed on ice upon collection and shipped to the testing facility using standard chain-of-custody procedures. An additional sample will be collected each time and

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preserved for possible chemical analyses. Sufficient sample volume will be collected such that Toxicity Identification Evaluation (TIE) Phase I procedures (Section 3.4) could be applied, if warranted, for particular samples.

3.4 EPA TOXICITY IDENTIFICATION EVALUATION (TIE)

The number of tests that will need to be conducted for Phase I will be determined as the process moves forward. Figure 2 outlines the TIE process as related to the TRE. Initially, chronic toxicity tests will be performed for the five locations and at Outfall 001. Phase I TIE procedures will be conducted simultaneously at Outfall 001. The decision to conduct Phase II and Phase III procedures will be dependant on the findings from Phase I or the results of the source toxicity tests. For these reasons, limited detail is provided in the plan for Phases II and III. Discussions with the KDOW will be instrumental in determining subsequent steps of the TIE process.

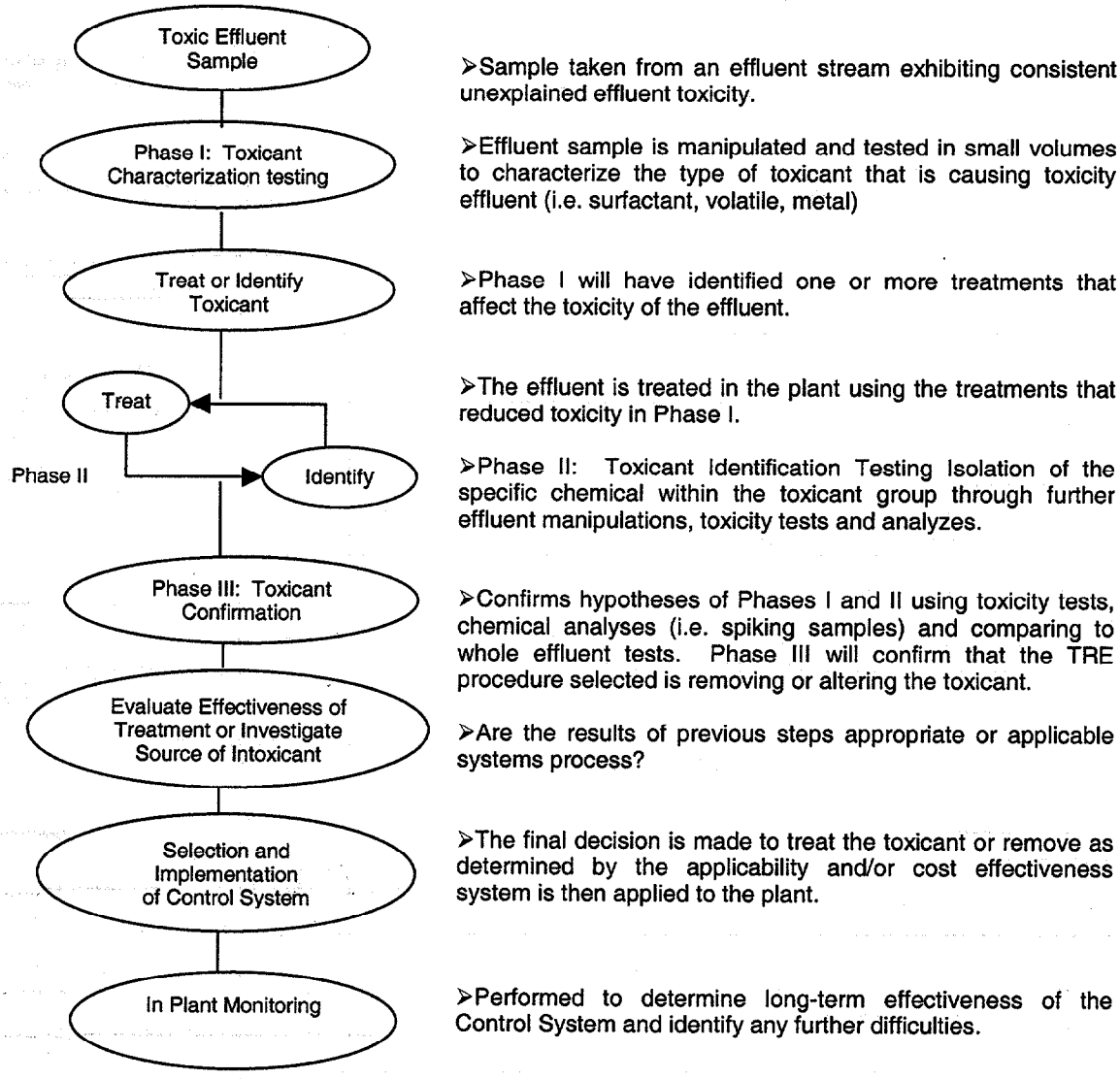

Figure 2. Toxicity Identification/Reduction Evaluation Process

3.5 PHASE I, TOXICITY CHARACTERIZATION PROCEDURES

Following the evaluation of source toxicity, TIE Phase I toxicity characterization procedures for chronic toxicity (EPA 1991) will be followed to alter or remove classes of toxicants (e.g. cationic metals, polar organics) from the sample. Toxicity tests are conducted on the manipulated samples to identify treatments, which remove or significantly reduce toxicity. Knowing the class of toxicant(s) responsible is often sufficient information to control effluent toxicity. Test results will be evaluated to determine the effectiveness of the treatment and provide information on the nature of the toxicant(s).

The U. S. Environmental Protection Agency recommended characterization treatments will be used on effluent samples that have demonstrable chronic toxicity. Following characterization of the first two samples, it will be determined how beneficial the characterization treatments are for Outfall 001. If some are not beneficial (i.e. the toxicity of the sample is not changed), some treatments may be eliminated from subsequent characterization tests. In addition, if the source evaluation identifies a potential source toxicant that would be altered or rendered biologically unavailable using an alternative characterization treatment, this alternative treatment will be used. The total number of toxicity characterization tests for the outfall will depend upon the presence of chronic toxicity and the results of each successive set of Phase I tests. By repeating the toxicity characterization tests with several samples of effluent collected over time, the screening tests will provide information on whether the characteristics of the compounds causing toxicity remain consistent.

Briefly, the procedures to conduct the characterization tests are as follows. Upon receipt of the effluent sample (day 1), initial routine chemical measurements will be taken and a chronic toxicity test will be started. This toxicity test will be conducted according to the methods required in the KPDES permit. If the sample is non-toxic, the characterization treatments will not be done. For the characterization treatments, aliquots of the sample will be adjusted to pH 3 and 11, filtered, aerated and/or chromatographed using a C_{18} solid phase extraction (SPE) column. Following these manipulations, each effluent aliquot will be readjusted to the initial pH of the effluent. In addition, the ethylenediaminetetraacetate ligand (EDTA) addition, sodium thiosulfate addition, and graduated pH tests will be conducted. The toxicity tests of the treated effluent will be initiated upon completion of the manipulations. Should the effluent prove to be consistently, chronically toxic, the initiation times will be modified accordingly.

With successful completion of Phase I, the toxicants will be tentatively categorized as cationic metals, non-polar organics, oxidants, substances whose toxicity is pH dependant and others. Information on physical/chemical characteristics of the toxicants will indicate filterability, degradability, volatility and solubility.

3.6 PHASE II, TOXICITY IDENTIFICATION PROCEDURES

The results of the characterization treatments in Phase I will guide the procedures followed in Phase II to identify the suspected toxicant(s) in the sample. For example, if the results of the Phase I characterization treatments identified metals as the suspected toxicant(s), then atomic absorption spectrometry could be used to measure metal concentrations in the sample. If non-polar organics were identified as the toxicant(s), more elaborate separation and or concentration techniques may be needed to identify the particular organic. EPA guidance (EPA 1993a) will be followed to conduct Phase II of this investigation. However, alternatives to proceeding with Phase II will also be considered. For example, if the source toxicity task and toxicity characterization of the source identifies that a particular source area is contributing to the toxicity at Outfall 001, changes in maintenance, housekeeping, or best management practices may be able to eliminate or reduce the toxicity without a positive identification of the toxicant.

EPA guidance (EPA 1993a) provides recommendations for toxicity identification when results of the Phase I characterization treatments identify the possible toxicant(s) as non-polar organic compounds, ammonia, metals, chlorine, and those that can be removed by filtration. The choice of particular methods will be determined by the results of Phase I and discussed with the KDOW prior to implementation.

3.7 PHASE III, TOXICITY CONFIRMATION PROCEDURES

In Phase III a final group of steps is conducted with the intent to confirm that the suspect cause(s) of toxicity is correctly identified and that all the toxicity is accounted for (EPA 1993b). This will follow the toxicity characterization (Phase I) and analysis and additional experiments conducted in the toxicity identification (Phase II). Six different approaches are recommended by EPA (1993a): correlation, symptom, species sensitivity, spiking, mass balance, and deletion. Rarely is one step or one test used to conclusively prove the cause of toxicity. Rather, all practical approaches are used to provide a weight of evidence that the cause of toxicity has been identified. The approaches chosen for Phase III will be dependant upon the results of Phases I and II and will be discussed with KDOW prior to implementation.

3.8 MONTHLY CHRONIC TOXICITY TESTS

The frequency of conducting routine compliance fathead minnow chronic toxicity tests will be increased from quarterly to monthly upon approval to begin the TRE. During the TRE, *Ceriodaphnia* will not be sampled since there have been no failures for tests on this species. Where possible, samples collected for these tests will also be used in toxicity tests of identified sources (Section 3.3) and/or TIE procedures (Section 3.4).

If four of the first six monthly toxicity tests at the outfall demonstrate compliance with the permit limit before the TRE testing is complete, the TRE will be cancelled and the site will return to quarterly monitoring for both species.

4. IMPLEMENTATION AND REPORTING SCHEDULE

4.1 IMPLEMENTATION

The TRE will be conducted in accordance with the following schedule outlined in Table 3.

Table 3. TRE Schedule

Task	Initiation	Completion
Information and data acquisition	Upon approval	Included in TRE Plan
Identification of sources	Upon approval	Included in TRE Plan
Toxicity tests of sources	Upon approval	3 months
EPA Phase I TIE Procedures	1 month	6 months
Monthly Toxicity Test	1 month[a]	6 months

[a]Test may be initiated prior to approval of plan.

4.2 REPORTING

The monthly toxicity test will be included with the monthly discharge monitoring report for Outfall 001. Quarterly reports will be issued to KDOW until completion of the TRE or compliance with the permit is achieved. The first report will be issued 4 months following approval of this plan. Subsequent reports will be submitted every 3 months until the final report is completed. The final report will be completed within 30 days after the conclusion of testing.

5. REFERENCES

USEPA 1989. *Generalized methodology for conducting industrial toxicity reduction evaluations (TREs).* EPA/600/2-88/070 Water Engineering Research Laboratory, Cincinnati, Ohio.

USEPA 1991. *Toxicity identification evaluation: Characterization of Chronically Toxic Effluents Phase 1.* EPA/600/6-91-005F. Environmental Research Laboratory, Duluth, Minnesota.

USEPA 1993a. *Methods for aquatic toxicity identification evaluations: Phase II toxicity identification procedures for samples exhibiting acute and chronic toxicity.* EPA/600/R-92/080. Environmental Research Laboratory, Duluth, Minnesota.

USEPA 1993b. *Methods for aquatic toxicity identification evaluations: Phase III toxicity confirmation procedures for samples exhibiting acute and chronic toxicity.* EPA/600/R-92/081. Environmental Research Laboratory, Duluth, Minnesota.

USEPA 2002. *Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms.* Fourth Edition. EPA/821/R-02/013.

APPENDIX A

SUMMARY OF DATA FROM OUTFALL 001 FROM JANUARY THROUGH DECEMBER 2002

Outfall 001 Field Measurements January 2002 - February 2003

Date Collected	Conductivity	Dissolved Oxygen	Flow Rate	pH	Temperature	Total Residual Chlorine
	umho/cm	mg/L	mgd	Std Unit	deg F	mg/L
1/2/02	1300	10.64	3	7.4	52.3	< 0.03
1/8/02	840	11.31	1.8	7.5	49.3	< 0.03
1/15/02	1307	10.41	2.6	7.37	54.6	< 0.03
1/22/02	1338	11.32	2.9	7.3	53.2	< 0.03
1/29/02	1071	9.1	3.2	7.2	57.6	< 0.03
2/5/02	1054	10.94	2.5	7.2	53.3	< 0.03
2/12/02	1156	9.61	2.4	7.18	53.6	< 0.03
2/19/02	1200	10.07	2.3	7.78	57.5	< 0.04
2/26/02	1072	9.15	3.7	7.2	52.9	< 0.03
3/4/02	1176	12.13	2.6	7.5	51	< 0.03
3/5/02	1167	12.04	2.6	7	50.1	< 0.03
3/6/02	1344	11.23	2.9	7.35	51.5	< 0.03
3/8/02	1350	9.77	2.9	7.22	57.2	< 0.03
3/11/02	1248	10.51	2.6	7.32	55.5	< 0.03
3/19/02	615	9.78	6	7.33	54.1	< 0.03
3/26/02	708	11.15	5.7	7.74	51.8	< 0.03
4/1/02	1058	9.63	2.6	8.25	63.4	< 0.03
4/2/02	1052	10.06	2.6	7.8	64.5	< 0.03
4/3/02	1063	10.84	2.8	7.3	60.2	< 0.03
4/5/02	1190	11.27	3	7.7	65.4	< 0.03
4/8/02	1279	9.1	3	7.23	63.7	< 0.03
4/9/02	1269	9.46	3.2	7.3	63.9	< 0.03
4/10/02	1269	10.25	3	8.13	66.1	< 0.03
4/16/02	1197	9.05	2.4	7.45	73.2	< 0.03
4/23/02	1001	7.6	3.4	7.55	70.1	< 0.03
4/30/02	1125	7.41	0.84	7.31	67.7	< 0.03
5/1/02	913	7.25	0.3	7.5	69	
5/7/02	1490	5.92	2.5	6.92	73.7	< 0.03
5/14/02	1333	7.4	3	7.1	75.3	< 0.05
5/21/02	988	6.78	0.8	7.1	65	< 0.03
5/28/02	1500	7.39	3	6.9	77.8	< 0.03
6/4/02	1560	7.68	1.8	7.4	89.5	< 0.03
6/11/02	1398	7.62	1.5	7.48	85.6	< 0.03
6/18/02	1142	6.8	2.5	7.1	77	< 0.03
6/25/02	929.4	7.1	1.65	7.34	82.8	< 0.03
7/2/02	596	6	0.8	7.2	82.4	< 0.03
7/9/02	1191	8.79	2.6	7.98	86.3	< 0.03
7/15/02	1183.9	6.8	2.1	7.8	39.1	< 0.03
7/16/02	1118	7.46	0.95	7.8	81.6	< 0.03
7/17/02	963	7.14	1.5	7.31	80	< 0.03
7/19/02	839	8.9	1.2	8.4	85	< 0.03
7/22/02	732	8.23	1.2	7.72	81.8	< 0.03
7/28/02	746	8.89	1.2	8.41	84.7	< 0.03
7/30/02	591	6.86	1.3	7.4	80.1	< 0.03
8/6/02	1250	7.48	2.5	7.32	85.1	< 0.08
8/13/02	1016	6.42	1.3	7.16	75.4	< 0.03
8/19/02	1365	6.92	2.5	7.15	79.6	< 0.03
8/20/02	1380	6.17	2.5	7.06	80.2	< 0.03

[**Bold**] = Failure during toxicity evaluation

Outfall 001 Field Measurements January 2002 - February 2003

Date Collected	Conductivity	Dissolved Oxygen	Flow Rate	pH	Temperature	Total Residual Chlorine
	umho/cm	mg/L	mgd	Std Unit	deg F	mg/L
8/21/02	1396	6.24	2.5	7.35	81.5	< 0.03
8/23/02	1418	7.19	2.5	7.46	86.2	< 0.09
8/26/02	1359	6.2	2.3	7.22	80.3	< 0.03
8/27/02	1375	7.06	2.3	7.43	84.1	< 0.03
9/3/02	1017	7.55	0.7	7.47	79.3	< 0.03
9/10/02	783	7.88	1.1	7.58	77.9	< 0.03
9/17/02	1214	8.37	2	7.35	80.9	< 0.12
9/24/02	1311	7.59	2.2	7.27	74	< 0.05
10/1/02	1001	7.76	1.1	7.28	71.4	< 0.03
10/4/02	1130	8.08	2.7	7.3	74.8	< 0.03
10/8/02	1320	8.21	2.2	7.58	73.4	< 0.06
10/15/02	1609	7.76	1.7	6.97	69.6	< 0.03
10/21/02	1417	8.53	2.2	7.23	67.1	< 0.03
10/22/02	1434	8.58	2.2	7.18	66.3	< 0.03
10/23/02	1051	8.98	3.8	7.56	64.1	< 0.03
10/25/02	**1560**	**7.57**	**1.9**	**7.11**	**68.2**	**< 0.03**
10/28/02	**1352**	**8.55**	**2.7**	**7.27**	**64.6**	**< 0.03**
10/29/02	**1112**	**8.54**	**2.9**	**7.4**	**63.7**	**< 0.03**
11/5/02	1120	9.11	3.4	7.34	57.4	< 0.03
11/11/02	1308	8.81	3.3	7.19	61.2	< 0.03
11/12/02	1321	9.09	2.2	7.48	61.2	< 0.03
11/13/02	1331	9.72	2	7.27	60.2	< 0.03
11/15/02	1340	9.45	2.3	7.29	60.5	< 0.03
11/18/02	1353	10.18	2.1	7.55	57.7	< 0.03
11/19/02	920	10.55	3.7	7.62	54.6	< 0.04
11/26/02	1388	9.07	2.3	7.09	56.3	< 0.03
12/2/02	**1263**	**10.25**	**2.1**	**7.33**	**52.7**	**< 0.03**
12/3/02	**1188**	**10.78**	**1.28**	**7.56**	**52.1**	**< 0.03**
12/4/02	**1161**	**10.2**	**1.7**	**7.29**	**47.5**	**< 0.03**
12/6/02	**1025**	**10.64**	**1.35**	**7.41**	**50.4**	**< 0.03**
12/9/02	938	10.82	1.35	7.31	46.7	< 0.03
12/10/02	932	10.43	1.3	7.51	48.2	< 0.03
12/16/02	1034	10.91	2.3	7.38	53.7	< 0.03
12/23/02	1115	11.59	2.4	7.2	54.3	< 0.03
12/30/02	1145	10.03	2	7.1	54.8	< 0.03
1/6/03	**1062**	**11.06**	**2.1**	**7.44**	**50.3**	**< 0.03**
1/7/03	**1041**	**10.76**	**2.1**	**7.53**	**50.7**	**< 0.03**
1/8/03	**1055**	**10.99**	**1.8**	**7.61**	**52.5**	**< 0.03**
1/10/03	**1096**	**10.95**	**1.5**	**7.73**	**51.6**	**< 0.03**
1/13/03	1118	12.73	1.5	7.23	47.2	< 0.03
1/14/03	1168	11.41	1.65	7.9	50.3	< 0.03
1/21/03	1375	12.37	2.1	7.12	47.3	< 0.03
1/28/03	1510	12.6	2.1	7.1	48.9	< 0.03
2/4/03	722	10.84	2.8	7.61	45.4	< 0.03

[**Bold**] = Failure during toxicity evaluation

Outfall 001 Phosphorous January 2002 - February 2003

Date Collected	Phosphorus mg/L
1/2/02	0.11
1/8/02	0.14
1/15/02	0.14
1/22/02	0.13
1/29/02	0.18
2/5/02	0.13
2/12/02	0.12
2/19/02	0.2
2/26/02	0.15
3/5/02	0.23
3/11/02	0.21
3/19/02	0.18
3/26/02	0.09
4/2/02	0.2
4/9/02	0.21
4/10/02	0.21
4/16/02	0.17
4/23/02	0.2
4/30/02	0.21
5/7/02	0.57
5/14/02	0.28
5/21/02	0.19
5/28/02	0.27
6/4/02	0.27
6/11/02	0.27
6/18/02	0.22
6/25/02	0.19
7/2/02	0.37
7/9/02	0.26
7/16/02	0.33
7/28/02	0.31
7/30/02	0.3
8/6/02	0.35
8/13/02	0.39
8/20/02	0.17
8/27/02	0.29
9/3/02	0.23
9/10/02	0.28
9/17/02	0.43
9/24/02	0.48
10/1/02	0.23
10/4/02	0.31
10/8/02	0.17
10/15/02	0.16
10/22/02	**0.14**
10/29/02	**0.17**
11/5/02	0.21
11/12/02	0.19

[Bold] = Failure during toxicity evaluation

Outfall 001 Phosphorous January 2002 - February 2003

Date Collected	Phosphorus mg/L
11/19/02	0.14
11/26/02	0.2
12/3/02	0.16
12/10/02	0.12
12/16/02	0.17
12/23/02	0.18
12/30/02	0.25
1/7/03	**0.18**
1/14/03	0.32
1/21/03	0.25
1/28/03	0.17

[**Bold**] = Failure during toxicity evaluation

Outfall 001 Metals (Detect) CY 1999-2002 (mg/L)

Date Collected	Aluminum	Barium	Cadmium	Chloride	Copper	Hardness - Total as CaCO3	Iron	Magnesium	Manganese	Silver	Technetium-99	Uranium
04/06/99						327	0.942				24.1	0.073
05/04/99						426						
06/01/99						301						
07/07/99						284	0.371				1.04	0.002
08/03/99						223						
09/07/99						131						
10/05/99						149	0.38				11.2	0.001
11/02/99						316						
12/07/99						464						
01/03/00						106	1.3				96.9	0.06
02/01/00						338						
03/06/00						452						
04/04/00						313	0.443					0.008
05/02/00						314						
06/06/00						236						
07/05/00			0.021			210	0.271					0.002
07/29/00	1.38	0.043		29.4		99	1.11	6.86	0.078			
08/01/00						192						
08/24/00				48.9								
09/05/00						126						
10/02/00						59	0.296				32.4	0.002
10/26/00							0.307					
11/06/00						315						
12/04/00						435						
01/02/01						366	0.417					0.005
02/07/01						334						
03/06/01						283						
04/03/01						352	0.497					0.046
05/01/01						421						
06/05/01						309						
07/03/01						149	0.416					0.003
08/07/01						213						
09/04/01						104						
10/02/01						164	0.245					0.002
11/06/01						187						
11/13/01												
12/04/01						369						
01/02/02						405						
02/05/02						221						

2/

Outfall 001 Metals (Detect) CY 1999-2002 (mg/L)

Date Collected	Aluminum	Barium	Cadmium	Chloride	Copper	Hardness - Total as CaCO3	Iron	Magnesium	Manganese	Silver	Technetium-99	Uranium
03/04/02						126	0.253					0.018
04/02/02						220	0.903					0.012
04/10/02	0.454	0.032		98.1			0.449	26.5	0.053			
05/01/02						240						
06/04/02						390						
07/02/02						149	0.635					0.004
08/06/02						151						
09/03/02						213						
10/01/02						219	0.946				29.8	0.00511
10/04/02					0.0312	240	0.884				22.8	0.00267
11/05/02						269						
12/03/02						284						
01/07/03			0.00103			276				0.0014		0.0143

Outfall 001 RAD (Detect) CY 1999-2002 (mg/L)

Date Collected	Alpha activity	Beta activity	Color	Dissolved Alpha	Dissolved Beta	Fecal Coliform (PIP)	Fluoride	Nitrate/Nitrite as Nitrogen	Oil and Grease	Radium	Sulfate	Suspended Alpha	Suspended Beta
04/06/99				15.7	73.75							0.18	10.55
05/04/99													
06/01/99													
07/07/99				0.34	37.65							-0.11	-1.93
08/03/99													
09/07/99													
10/05/99				2.13	24.21							0.53	1.83
11/02/99													
12/07/99													
01/03/00				33.13	106.55								16.61
02/01/00													
03/06/00													
04/04/00					55.62								
05/02/00													
06/06/00													
07/05/00					27.62								
07/29/00	20.87	84.89	80				0.36	0.58		0.899	71.6		
08/01/00													
08/24/00			32			230	0.31	0.54			98.7		
09/05/00													
10/02/00					16.33								
10/26/00													
11/06/00													
12/04/00													
01/02/01					39.9								
02/07/01													
03/06/01													
04/03/01					36.3								
05/01/01													
06/05/01													
07/03/01					13.3								
08/07/01													
09/04/01													
10/02/01													
11/06/01													
11/13/01									6.2				
12/04/01													
01/02/02													
02/05/02													

Outfall 001 RAD (Detect) CY 1999-2002 (mg/L)

Date Collected	Alpha activity	Beta activity	Color	Dissolved Alpha	Dissolved Beta	Fecal Coliform (PIP)	Fluoride	Nitrate/Nitrite as Nitrogen	Oil and Grease	Radium	Sulfate	Suspended Alpha	Suspended Beta
03/04/02					35.7								
04/02/02					30								
04/10/02	19.5	34.3	25			26	0.54	4.5			414.4		
05/01/02													
06/04/02													
07/02/02					14.4								
08/06/02													
09/03/02													
10/01/02					29							5.51	
10/04/02					28.6								
11/05/02													
12/03/02													
01/07/03					26.9								

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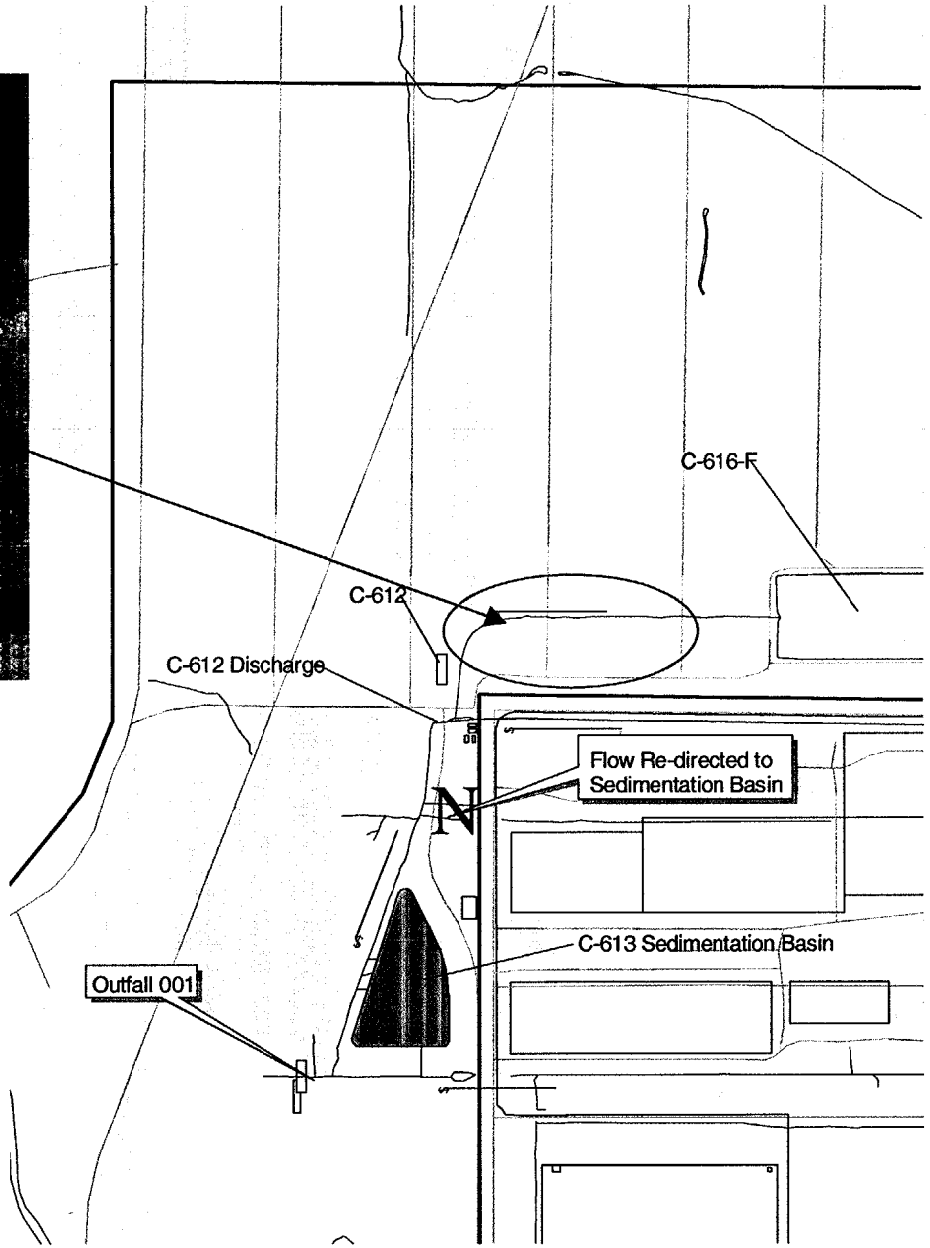
APPENDIX B

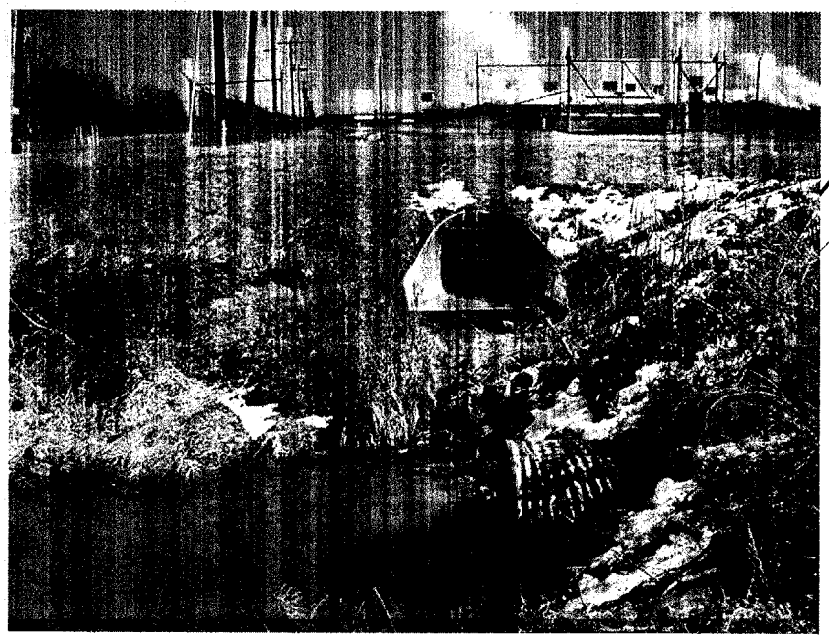
SOURCES OF DISCHARGE FOR OUTFALL 001

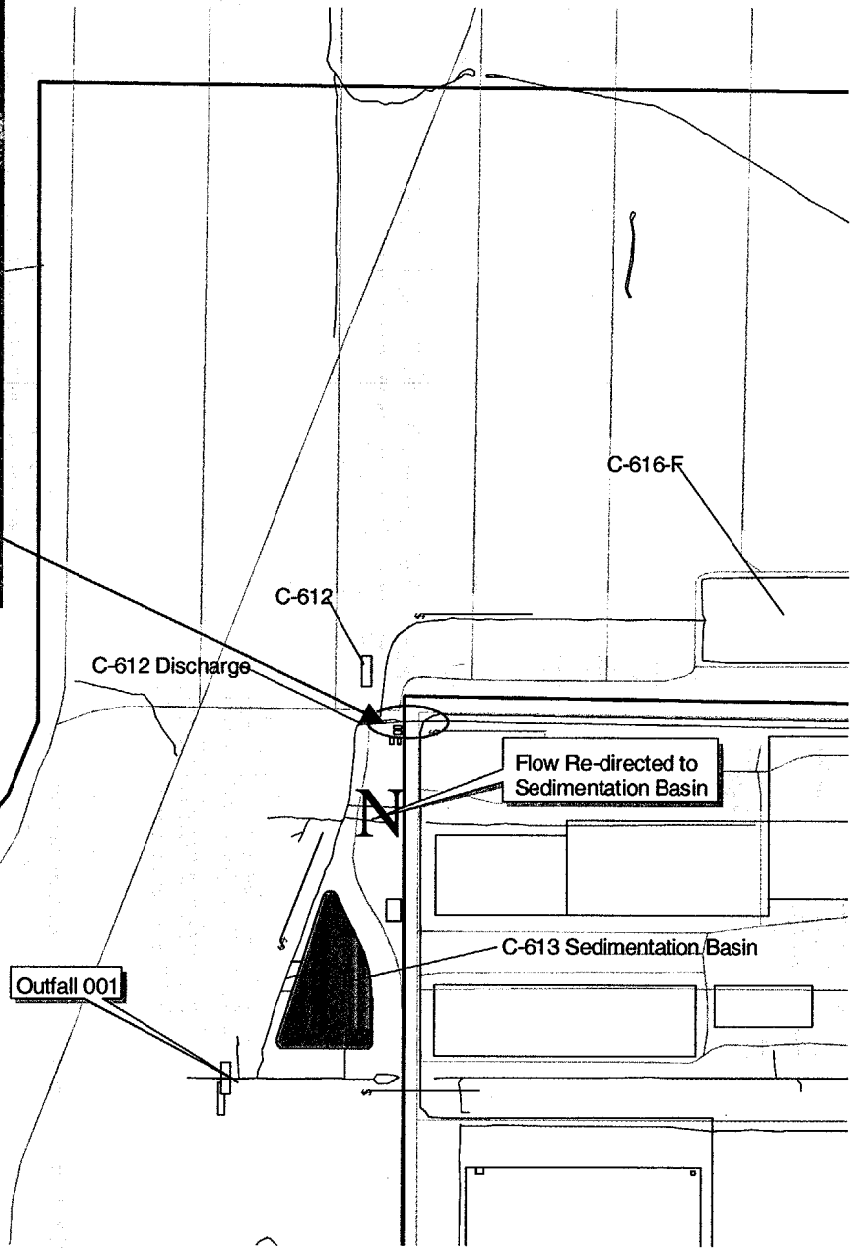
Ditch from C-616 to Outfall 001



26

East-West Ditch north of Patrol Road

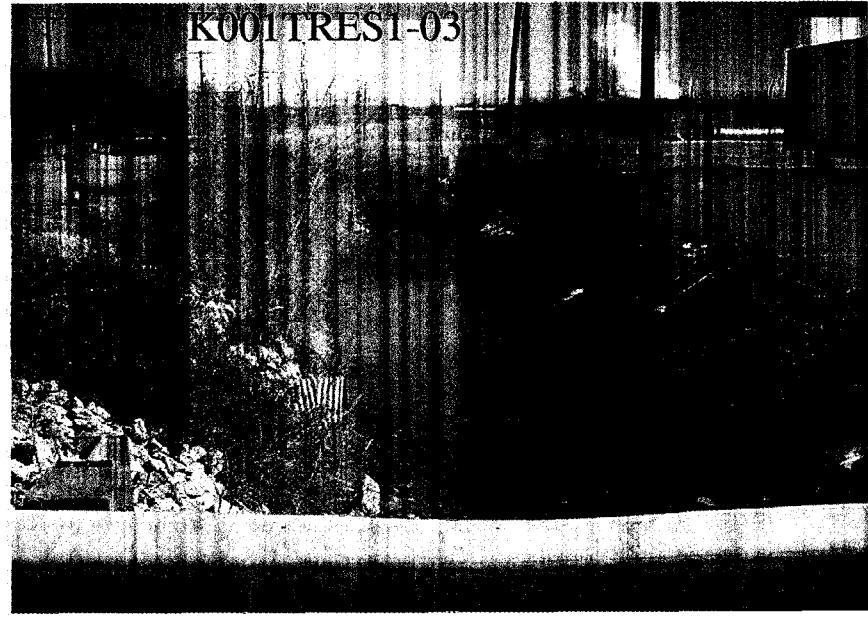


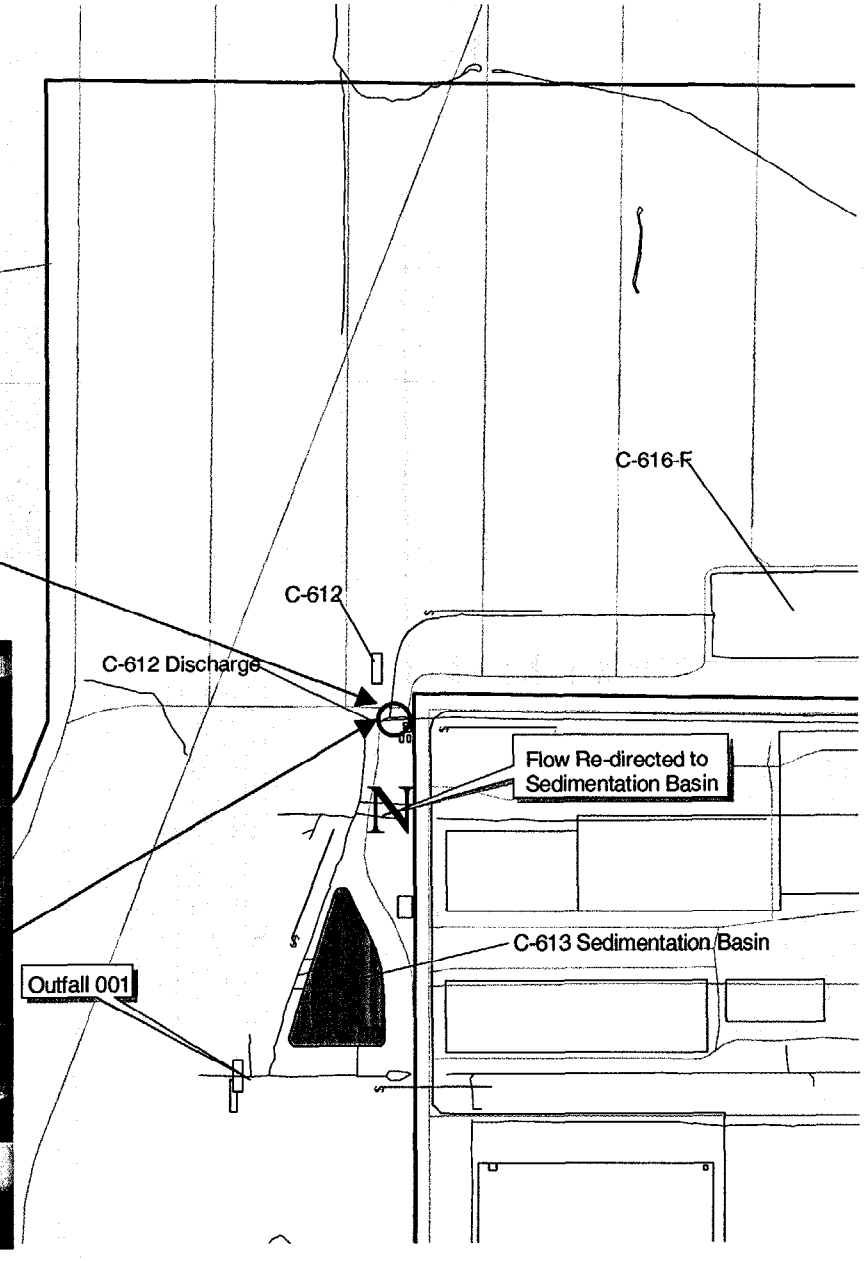


27

Proposed Sampling Location

K001TREST-03

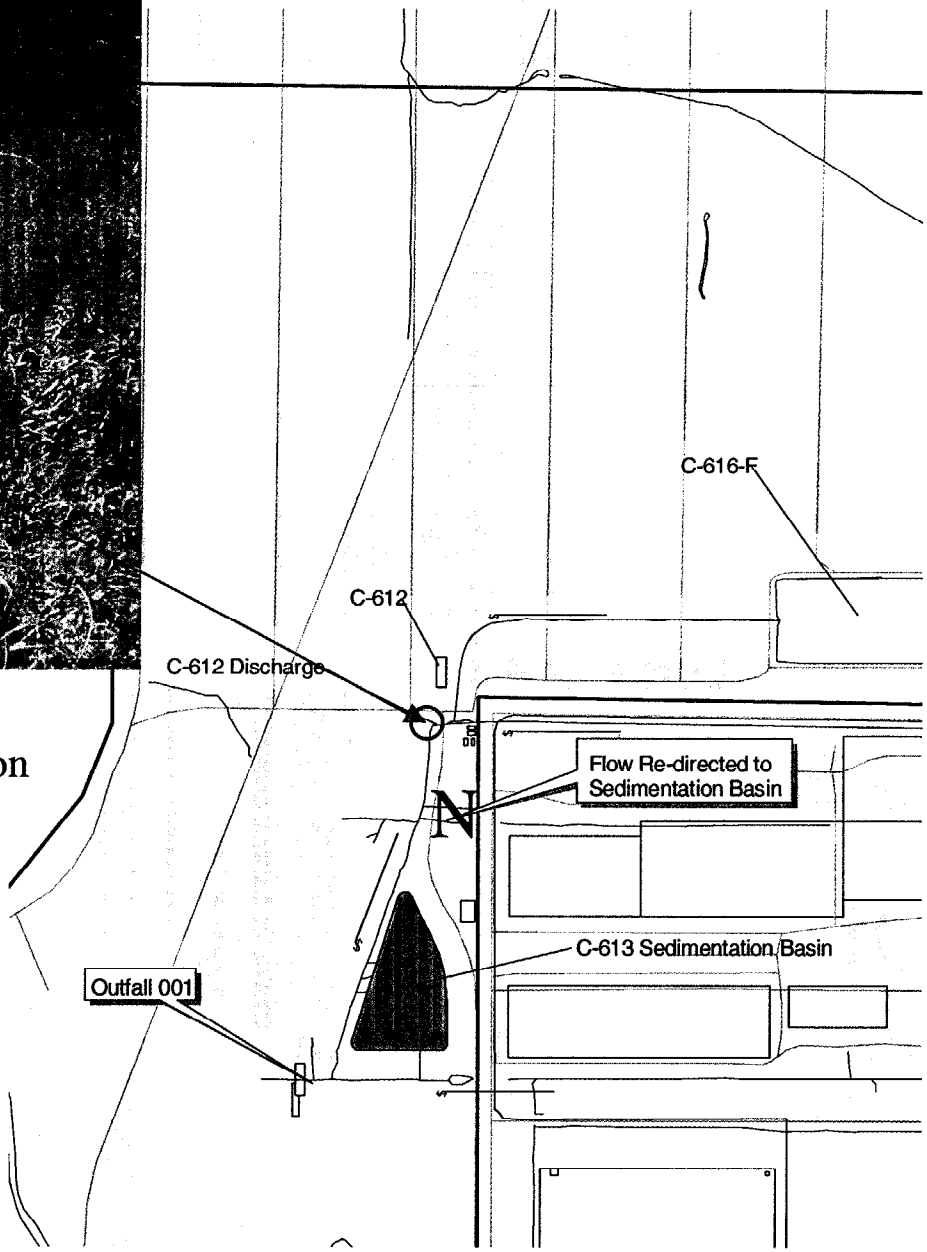




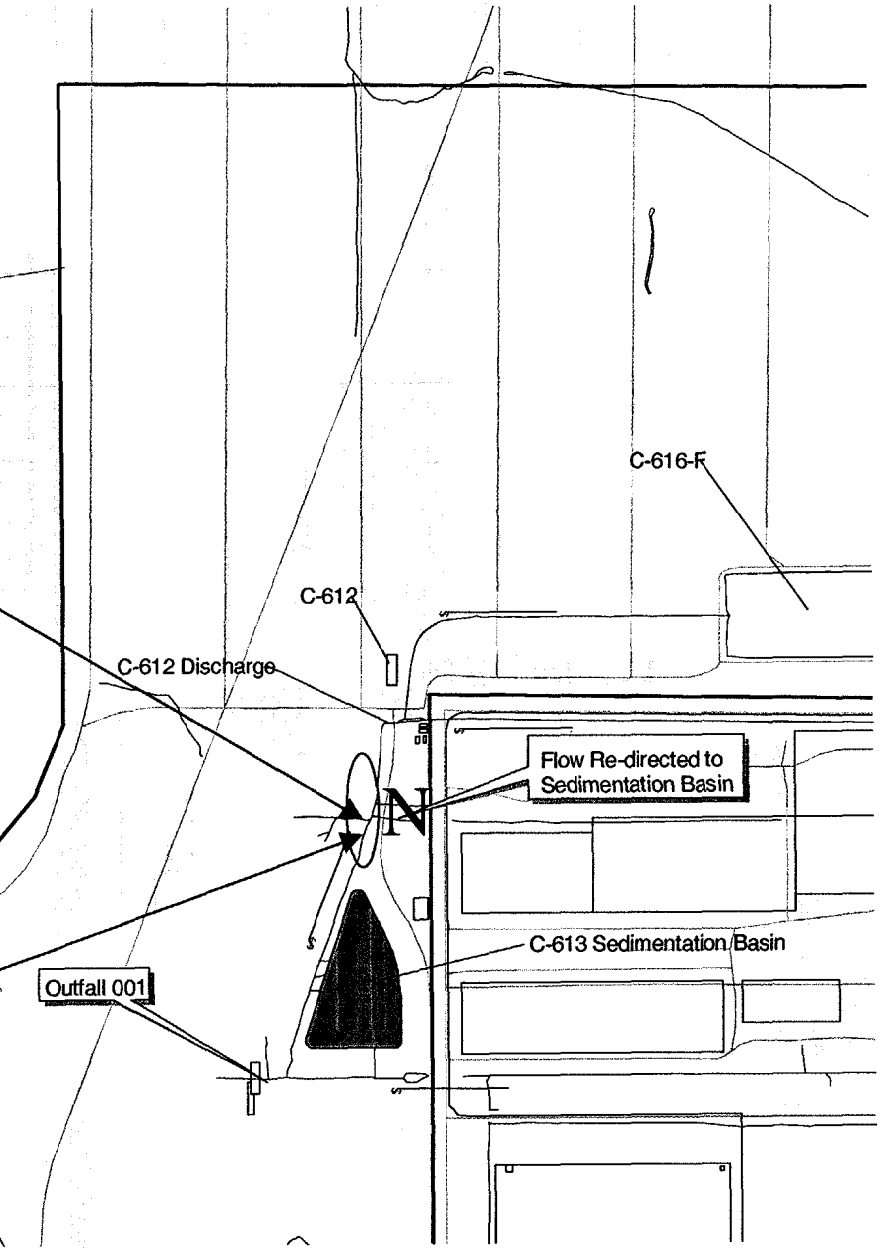
28

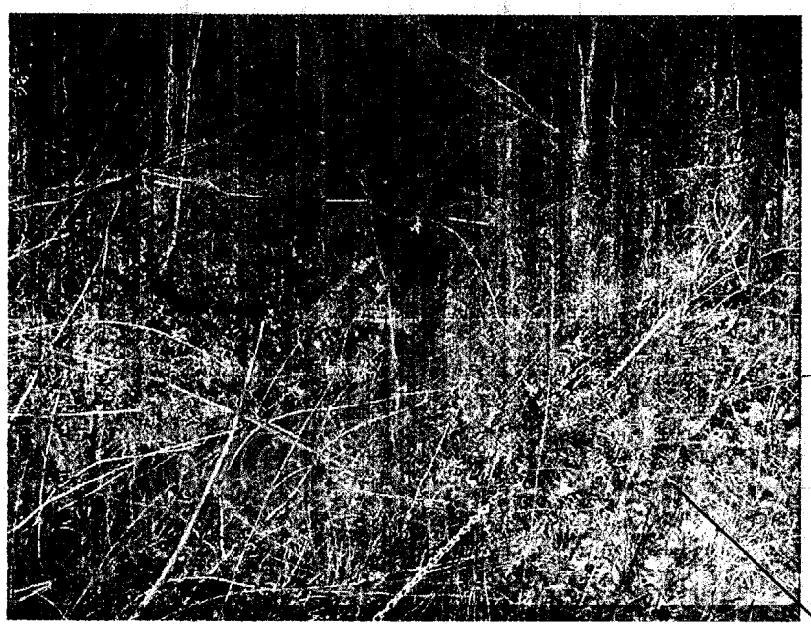
C-612 Discharge Point

Proposed Sampling Location
Inside Facility – Not at discharge location
HV-171
HV-082

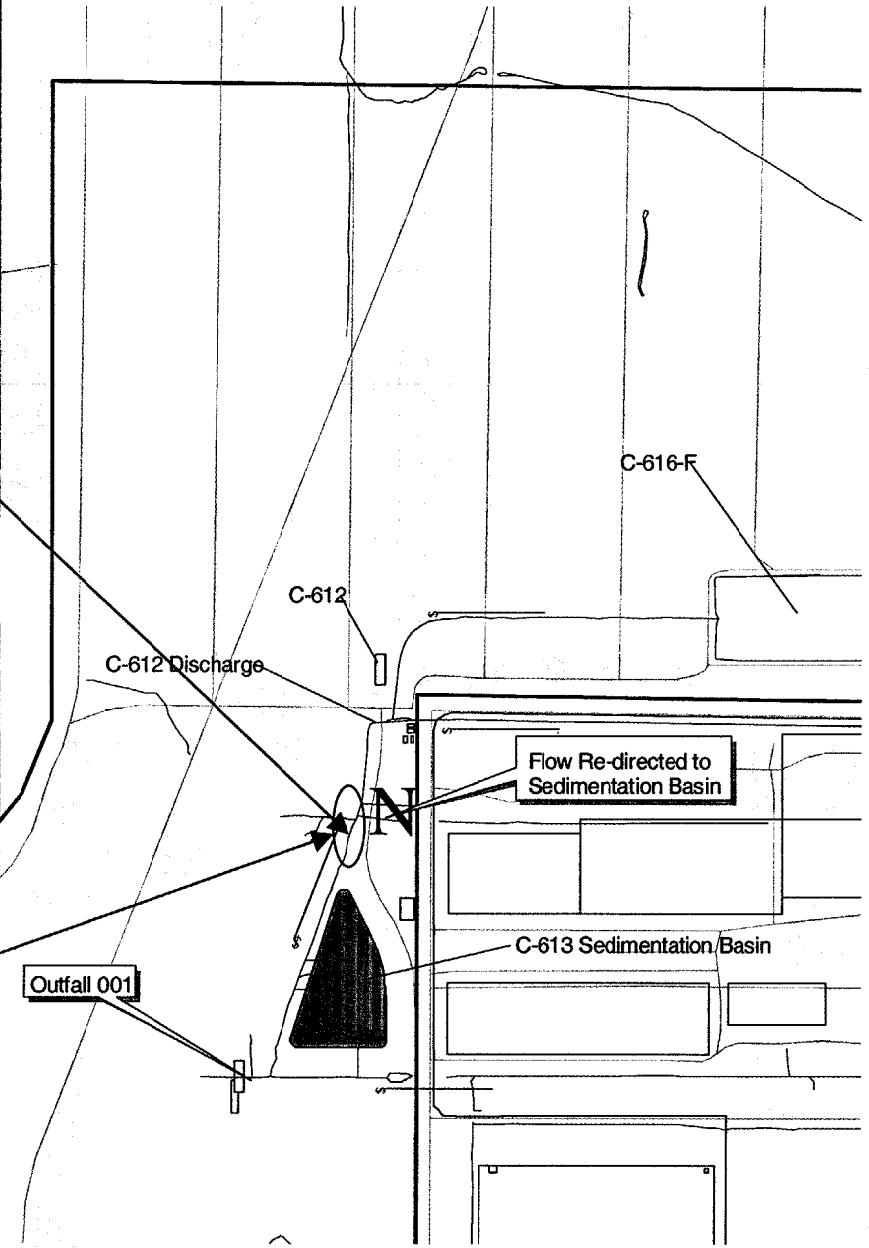


29

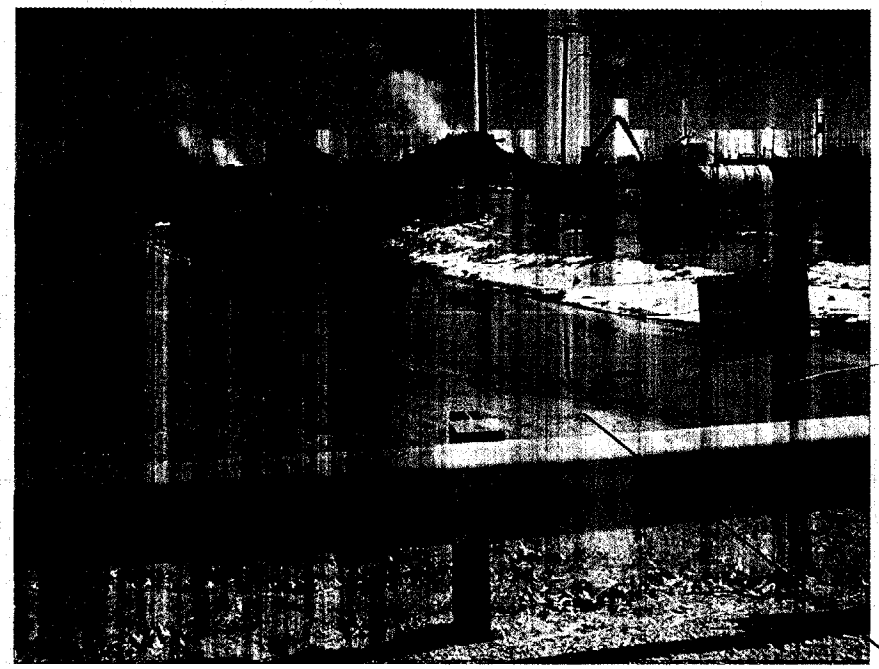

C-616-F
C-612
C-612 Discharge
Flow Re-directed to Sedimentation Basin
N
C-613 Sedimentation Basin
Outfall 001



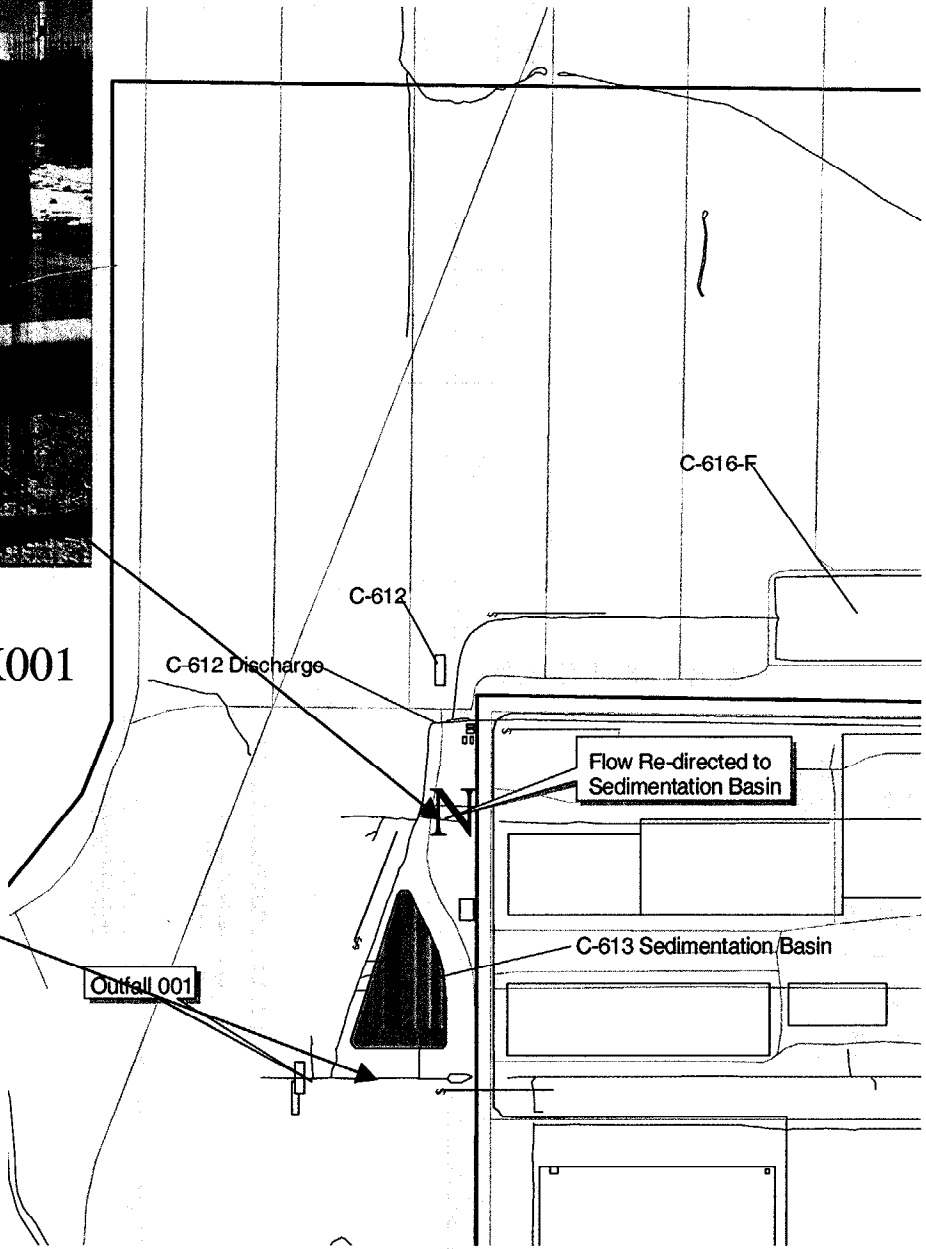
Proposed Sampling Location
K001TRES4-03



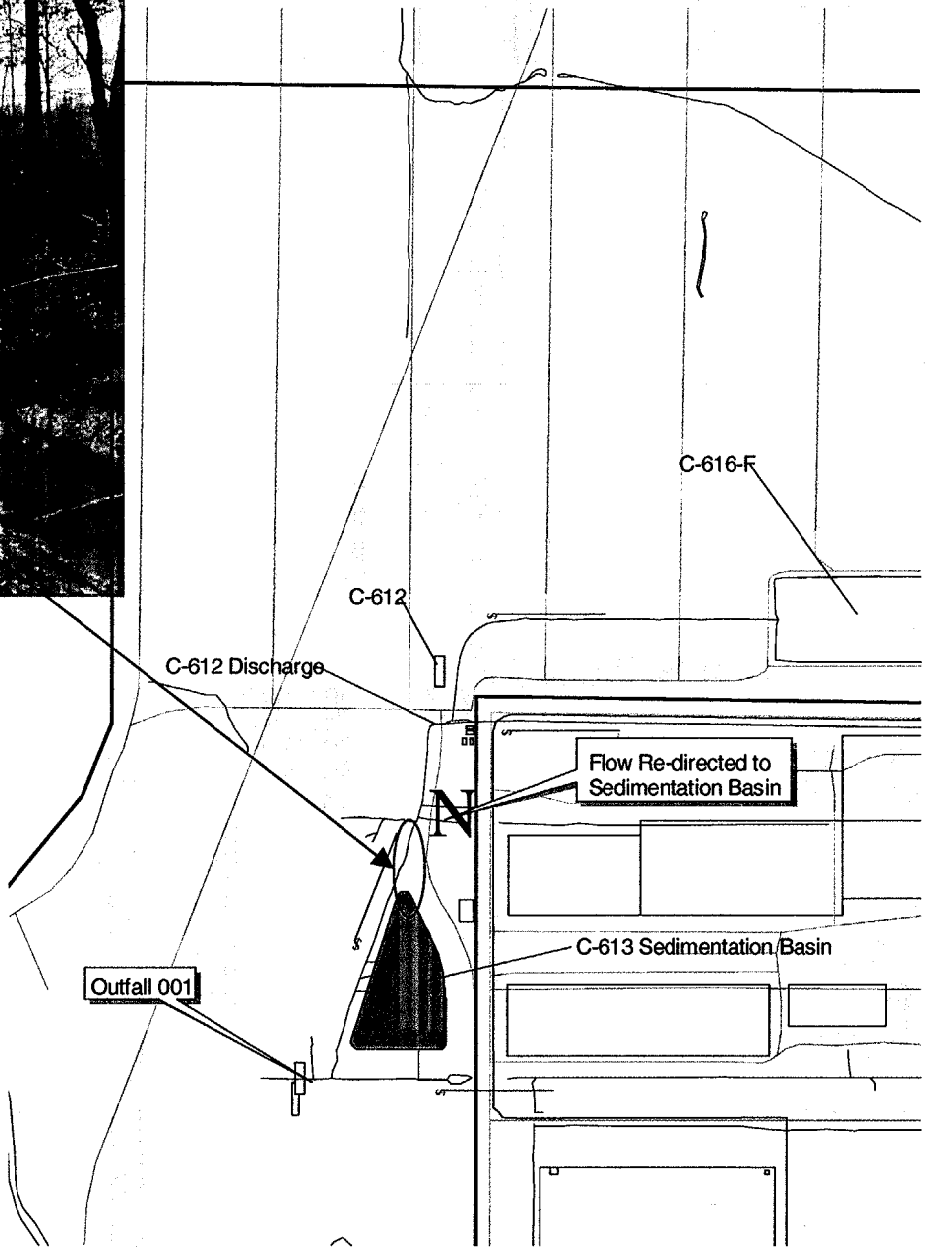
31

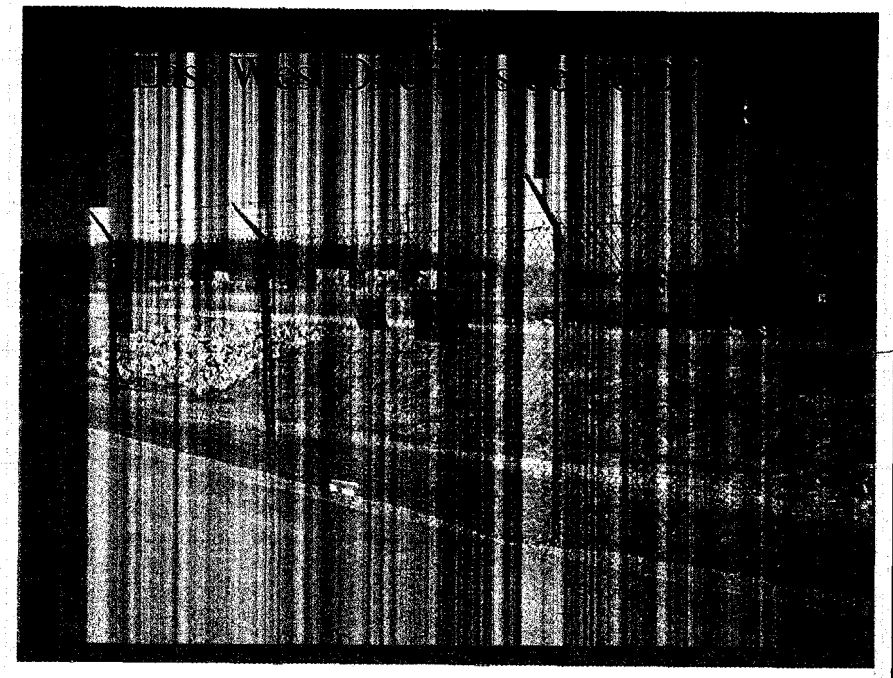


Flows to C-613 – Does not Flow to K001
Effluent from C-613 is pumped into
the outfall ditch

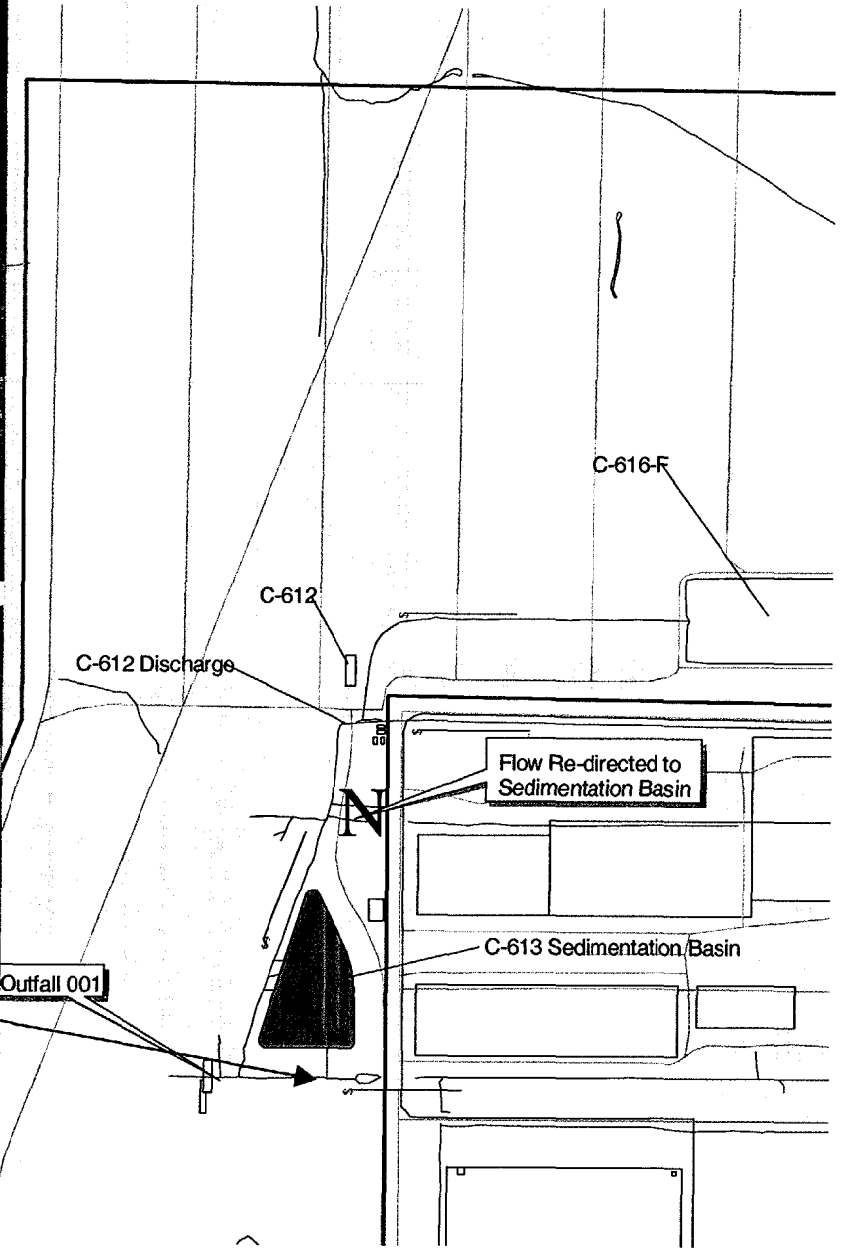


32

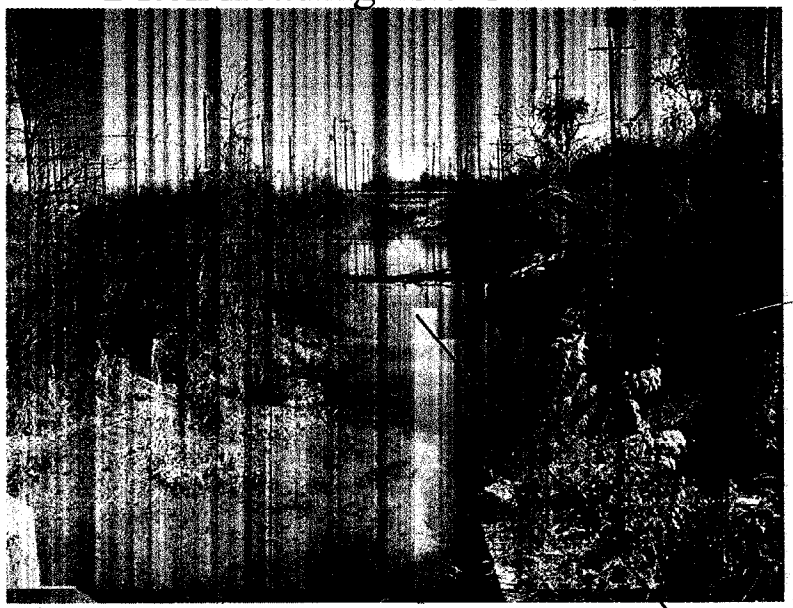

C-616-F
C-612
C-612 Discharge
Flow Re-directed to Sedimentation Basin
N
C-613 Sedimentation Basin
Outfall 001

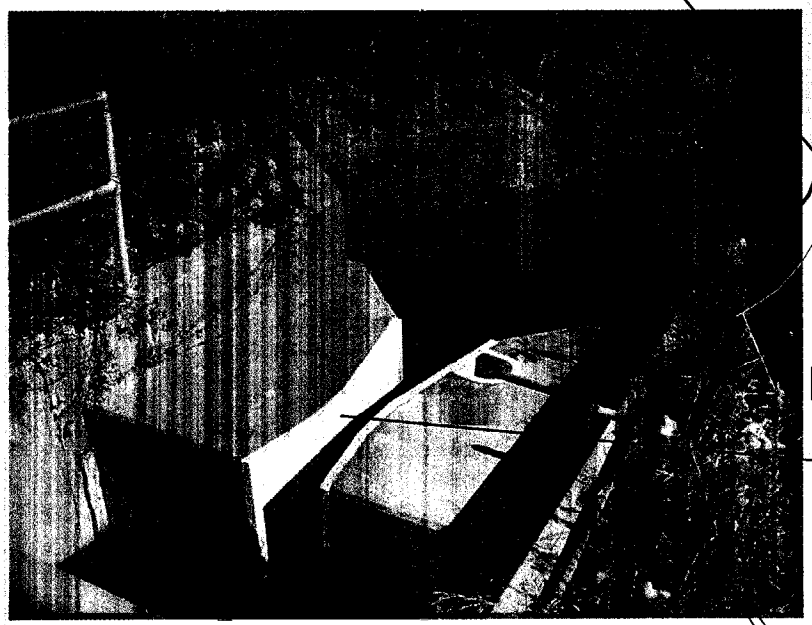


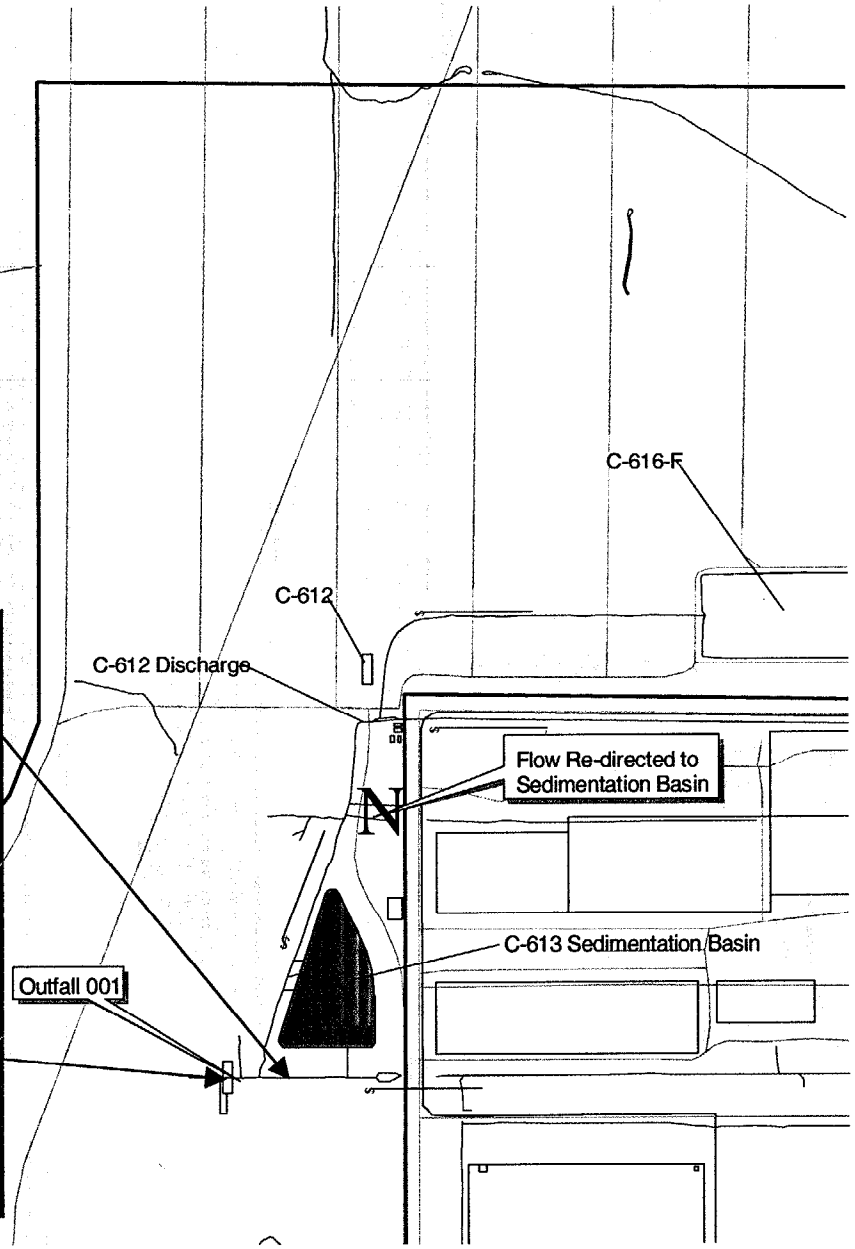

Proposed Sampling Location
K001TRES5-03


C-616-F
C-612
C-612 Discharge
Flow Re-directed to
Sedimentation Basin
N
C-613 Sedimentation Basin
Outfall 001

Ditch Leading into Outfall 001







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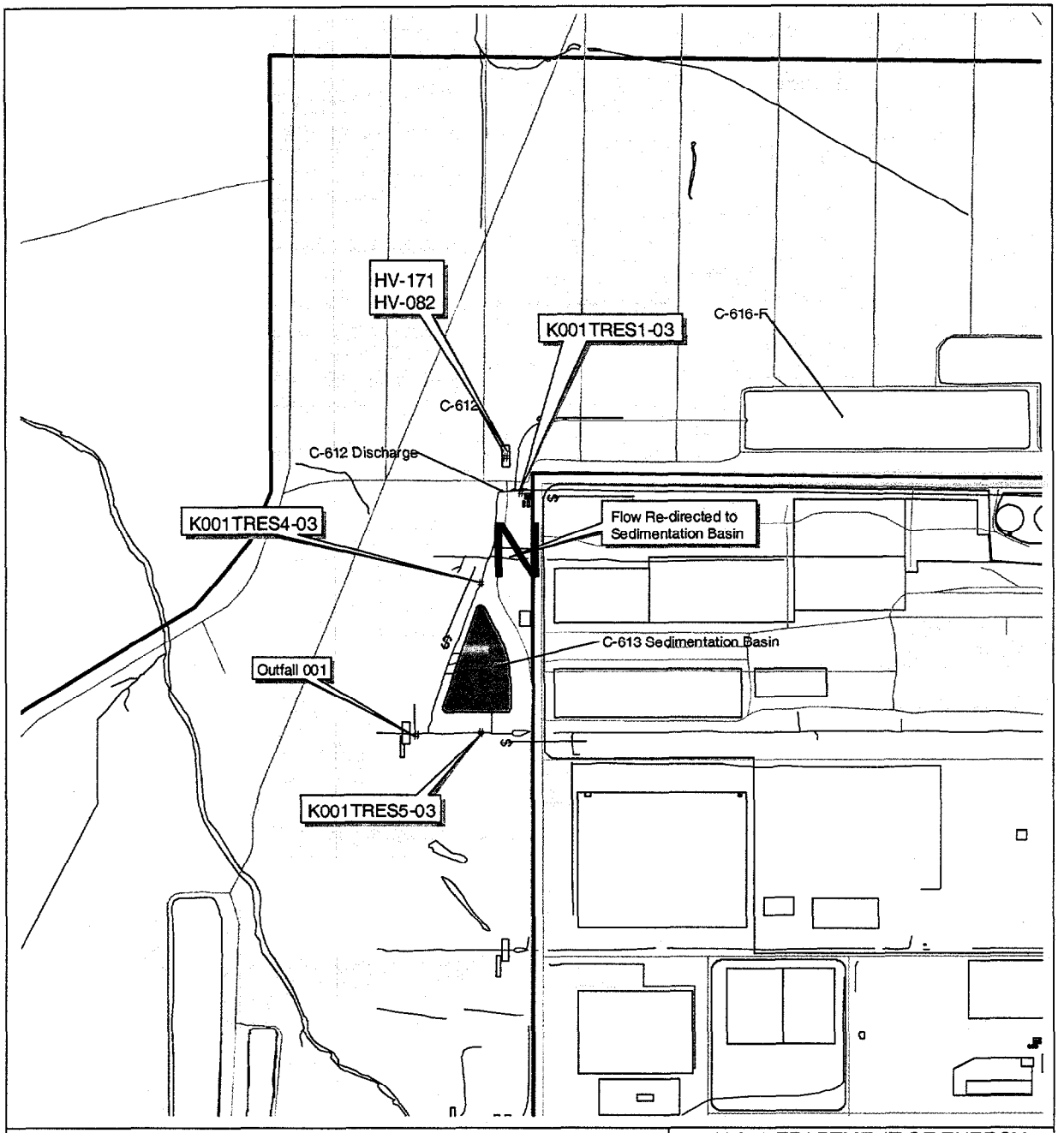
DOCUMENT No. BJC/PAD-508



LEGEND:

\# TRE Sampling Location

300 0 300 600 Feet

TRUE NORTH 20° PLANT NORTH

U.S. DEPARTMENT OF ENERGY
DOE OAK RIDGE OPERATIONS
PADUCAH GASEOUS DIFFUSION PLANT

BECHTEL JACOBS COMPANY LLC
MANAGED FOR THE US DEPARTMENT OF ENERGY UNDER
US GOVERNMENT CONTRACT DE-AC-05-98OR22700
Oak Ridge, Tennessee Paducah, Kentucky Portsmouth, Ohio

Outfall 001 TRE Sampling Locations

CDM

FIGURE No. c5ac90002sk154.apr
DATE 2-24-03

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