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WASTEWATER CHARACTERIZATION AND SURFACE WATER INFILTRATION SURVEY FOR 28TH BOMBARDMENT AND 99TH TRAINER WING, ELLSWORTH AIR FORCE BASE, SOUTH DAKOTA

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13. ABSTRACT *(Maximum 200 words)*

Personnel from the Armstrong Laboratory Water Quality Branch conducted a wastewater characterization and surface water infiltration survey for the 28th Bombardment and 99th Trainer Wing, Ellsworth Air Force Base, South Dakota, from 18 to 29 October 1993. The scope of the survey was to sample the wastewater throughout the base to determine if significant pollutant concentrations existed in the wastewater discharge. The wastewater did have detectable levels of organic and inorganic compounds in it however, these levels were within the current permitted parameters.

The surface water infiltration survey indicated an excess of fifteen sanitary manholes contained perforated covers at or below the local gradient. Some of these locations drained between 0.5 to 1.0 acres. This surface water infiltration would exceed the plant capacity and flush pollutants through the treatment plant.

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I would like to thank Captain Paul Legendre for the leadership and foresight to have our team instruct his environmental staff in sample selection and collection. These skills will enable the bioenvironmental engineering shop to continue the vigilance of environmental monitoring to ensure regulatory compliance at Ellsworth Air Force Base.

I would also like to acknowledge the great team effort by TSgt Mary Fields, SSgt Pete Davis, and SrA Leo Longoria. Selecting, packing, unpacking, setting up, cleaning, and repacking 4200 pounds of sampling and field laboratory equipment is no small effort, especially during a snow storm. In addition, I would to thank Ms Melissa Lopez for compiling over 400 pages of analyses into the 26 data tables used in this report.

WASTEWATER CHARACTERIZATION and INFILTRATION SURVEY,

ELLSWORTH AIR FORCE BASE, SOUTH DAKOTA

INTRODUCTION

Personnel from the Armstrong Laboratory, Water Quality Function conducted a wastewater characterization and stormwater infiltration survey at Ellsworth Air Force Base South Dakota from 18-29 Oct 93. The purpose of this survey was to characterize the wastewater going to and the effluent discharging from the Waste Water Treatment Facility (WWTF) into Box Elder Creek. In particular, we wanted to determine the potential sources of Total Suspended Solids (TSS), and Oils and Greases (O&G), that have resulted in a recent Notice of Violations (NOVs). In addition, we identified potential cross-connections from the stormwater to the sanitary sewer. These suspected cross connections cause elevated influent rates during precipitation events, and possibly resulted in greater solids loading into the plant that also may contribute to NOVs regarding TSS and O&G.

The wastewater characterization survey was requested by Lt Col David L. Potts of HQ ACC/SGP. Copies of the request and response letters are at Appendix A.

Armstrong Laboratory personnel performing the survey included Capt Christopher A. Williston, TSgt Mary K. Fields, SSgt Robert P. Davis, and SrA Leo Longoria. SSgt Theresa Miller and Airman Barbara Fillipello, from the Ellsworth Bioenvironmental Shop assisted in the daily sampling and sample preparation of five sampling sites during this survey. This effort was in cooperation with the BEE shop to train them in site and sample selection, and sampling protocol.

DISCUSSION

Background

Ellsworth AFB is located 6-miles east of Rapid City and immediately North of Box Elder and Intestate 90. The majority of the base is located on a mesa. The landscape surrounding the base is rolling hills and predominately farm and ranch land. The base supports the 28th bombardment wing and the 99th trainer wing.

The installation is divided into four main areas. The area along the flightline consists of many rows of maintenance hangars; the center of the base consists of logistical support and services; there is a missile maintenance complex located in

the northwest corner; and the north, northeast corner and east side consist of housing.

Wastewater Sources

There are two influent lines and one effluent line connected to the WWTF. The sanitary line collects wastewater from the housing area, missile maintenance area, flightline and the center of the base. In addition it also collects sewage from approximately 20 civilian mobile homes located in Box Elder. The industrial line collects from facilities along the flightline. Before the industrial line enters the WWTF it passes through a 16,000 gallon oil/water separator. The effluent line discharges into Box Elder Creek, which drains the base surface water runoff and runoff from the base's golf course.

There are other small facilities located in remote areas of the base that utilize a sanitary leach field. These facilities were not evaluated in this study.

Wastewater Permit Standards

Currently Ellsworth Air Force Base has a National Pollutant Discharge Elimination System Permit (NPDES) to discharge into Box Elder Creek. The State of South Dakota has standard discharge standards that must be adhered to by all industrial and domestic dischargers.

The Industrial Pretreatment Standards, which fall under the NPDES Permitting Program, impose general and specific prohibitions on industrial dischargers to Federally Owned Treatment Works (FOTWs) which fall into specific categories of industries. Categorical discharge limitations established by the Industrial Pretreatment Standards have been promulgated for certain categories of industries. The industrial categories under which typical U.S. Air Force operations may fall include electroplating, metal finishing, photographic processing, and hospitals.

The general prohibitions on discharges from industrial users include (a) pollutants which create a fire or explosion hazard, (b) pollutants which will cause corrosive structural damage to the POTW, (c) solid or viscous pollutants in amounts which will obstruct flow in the FOTW resulting in interference, (d) any pollutant, including oxygen-demanding pollutants released in a discharge at a flow rate and/or pollutant concentration which will cause interference with the FOTW, and (e) heat levels which will inhibit biological activity in the FOTW resulting in

interference. Ellsworth AFB discharges to a FOTW and must comply with federal, state and local regulations.

Ellsworth has a NPDES permit number SD0000281 to discharge into Box Elder Creek. The parameters that are monitored and reported monthly are Biochemical Oxygen Demand (5-Day), pH, Total Suspended Solids, Oil and Grease (O&G) both freon extractable and visible, Flow, and Fecal Coliform.

Sampling Strategy

AL/OEBW conducted a presurvey from 4-6 August 1993. Sampling site locations were discussed and selected during the presurvey based on the utility maps provided by the BEE shop. The sites were selected based on potential sources of contaminants, sewage branch lines off key industrial areas, and flow. These sites were inspected during the presurvey to insure accessibility and sufficient flow rates. A copy of the sampling strategy is at Appendix B. A map showing the locations of the wastewater sampling sites is enclosed in Appendix C.

A description of the 18 sampling sites is as follows:

Site 1: Plant Effluent, Located east of the Wastewater Treatment in the effluent weir. Samples were collected over seven days. Analyses at this location included: EPA methods 601/602 (Purgeable Halocarbons and Aromatics), EPA Methods 624 & 625 (Total Toxic Organic Compounds for 2-days), EPA Method 608 (Pesticides and PCB's for 4-days), Ammonia, TKN, Nitrate, Nitrite nitrogen, O&G, Total Petroleum Hydrocarbons (TPH), Total Metals, BOD, COD, Total Phosphorus, Cyanide, Phenols, (Total, Volatile, Filterable, Non-filterable and Settleable) Solids, Dissolved Oxygen, Temperature, and pH.

Site 2: Plant Influent, Manhole #43 located west of the Wastewater Treatment facility. Samples were collected over seven days. Analyses at this location included: EPA methods 601/602 (Purgeable Halocarbons and Aromatics), EPA Methods 624 & 625 (Total Toxic Organic Compounds), EPA Method 608 (Pesticides and PCB's), Ammonia, TKN, Nitrate, Nitrite Nitrogen, O&G, Total Petroleum Hydrocarbons (TPH), Total Metals, BOD, COD, Total Phosphorus, Cyanide, Phenols, (Total, Volatile, Filterable, Non filterable and Settleable) Solids, Dissolved Oxygen, Temperature, and pH.

Site 3: Midwest Base, Manhole #58 located mid-base, east of Building 102. Samples were collected over three days. Analyses at this location included: EPA methods 601/602 (Purgeable Halocarbons and Aromatics), O&G, Total Petroleum Hydrocarbons

(TPH), Total Metals, COD, Total Phosphorus, Cyanide, Phenols, Total Suspended Solids, Temperature, and pH. Some of the facilities upstream that discharge past this sampling point are the bowling alley, dormitories, security police, enlisted club and the chowhall.

Site 4: North Branch, Manhole #63 located north mid-base. Located south of Building 806. This collection point is downgradient of the missile maintenance facilities. Samples were collected over two days. Analyses at this location included: EPA methods 601/602 (Purgeable Halocarbons and Aromatics), O&G, Total Petroleum Hydrocarbons (TPH), Total Metals, COD, Total Phosphorus, Cyanide, Phenols, Total Solids, Temperature, and pH.

Site 5: West Branch, Manhole Unknown but east of #16. Located south of Building 909. This collection point is downgradient of the flightline maintenance facilities. Samples were collected over three days. Analyses at this location included: EPA methods 601/602 (Purgeable Halocarbons and Aromatics), O&G, Total Petroleum Hydrocarbons (TPH), Total Metals, COD, Total Phosphorus, Cyanide, Phenols, Total Solids, Temperature, and pH.

Site 6: Hangar 7504, Manhole #507. Located southeast of the Pride Hangar, Building 7504. This collection point is downgradient of the avionics and field maintenance facilities located in this historic hangar. A preliminary inspection indicated that degreasers, solvents, and paints may not be normally used however, some are occasionally brought in by temporary personnel. Samples were collected over two days. Analyses at this location included: EPA methods 601/602 (Purgeable Halocarbons and Aromatics), O&G, Total Petroleum Hydrocarbons (TPH), Total Metals, COD, Total Phosphorus, Cyanide, Phenols, and Total Solids.

Site 7: AGE Support, Manhole #135. Located west of Building 7520. This collection point is downgradient of aircraft ground support equipment. Analyses at this location included: EPA methods 601/602 (Purgeable Halocarbons and Aromatics), O&G, Total Petroleum Hydrocarbons (TPH), Total Metals, COD, Total Phosphorus, Cyanide, Phenols, Total Solids, Temperature, and pH.

Site 8: Flightline, Manhole #31. Located northwest of Building 7503. This collection point is downgradient of flightline maintenance Rows 60-100. Samples were collected over two days. Analyses at this location included: EPA methods 601/602 (Purgeable Halocarbons and Aromatics), O&G, Total Petroleum Hydrocarbons (TPH), Total Metals, COD, Total Phosphorus, Cyanide, Phenols, Total Solids, Temperature, and pH.

Site 9: Middle Base, Manhole #213. Located southeast of BX Service Station. This collection point is downgradient of the Dorms, NCO Club, Chow Hall, Arts and Crafts, Service Station and Ellsworth security police. Samples were collected over three days. Analyses at this location included: EPA methods 601/602 (Purgeable Halocarbons and Aromatics), Ammonia, O&G, Total Petroleum Hydrocarbons (TPH), Total Metals, COD, Total Phosphorus, Cyanide, Phenols, Total Solids, Temperature, and pH.

Site 10: Hospital and BX Complex, Manhole #251. Located east of Building 5912 (Base Service Station). This collection point is downgradient of the Hospital, BX, Commissary, Officer Club, and the BEE shop. Samples were collected over three days. Analyses at this location included: EPA methods 601/602 (Purgeable Halocarbons and Aromatics), Ammonia, O&G, Total Petroleum Hydrocarbons (TPH), Total Metals, COD, Total Phosphorus, Cyanide, Phenols, Total Solids, Temperature, and pH.

Site 11: East Base Housing, Manhole #310. Located on the perimeter road south of the lift station east of Building 9800. This collection point is downgradient of the northwest housing complex. Samples were collected over six days. The sampling program were a two day composite and a three day grab sample event. Analyses at this location included: EPA methods 601/602 (Purgeable Halocarbons and Aromatics), Ammonia, O&G, Total Petroleum Hydrocarbons (TPH), Total Metals, COD, Total Phosphorus, Phenols, Total Solids, Temperature, and pH.

Site 12: North West Housing, Manhole #400. Located east of Building 9800. This collection point is downgradient of the northwest housing complex. Samples were collected over five days. The sampling program were a two day composite and three days of grab sampling. Analyses at this location included: EPA methods 601/602 (Purgeable Halocarbons and Aromatics), Ammonia, COD, O&G, TPH, Total Phosphorus, Total Metals, Total Solids, Temperature, Phenols and pH.

Site 13: Northeast Housing, Manhole Unmarked. Located northwest of Building 9252. This collection point is downgradient of the northeast housing complex. This is a new sanitary system and has not been updated on the utility maps. Samples were collected over five days. The sampling program were a two day composite and three day grab sample event. Analyses at this location included: EPA methods 601/602 (Purgeable Halocarbons and Aromatics), Ammonia, COD, O&G, TPH, Total Phosphorus, Total Metals, Total Solids, Temperature, Phenols and pH.

Site 14: Industrial line influent to WWTF. Located at the Oil/Water Separator weir, Building 3013. This collection point

is the final industrial line influent prior to mixing with the sanitary influent. The sampling program for this location consisted of three composite samples. Analyses at this location included: EPA methods 601/602 (Purgeable Halocarbons and Aromatics), EPA Methods 624 & 625 (Total Toxic Organic Compounds), EPA Method 608 (Pesticides and PCB's), Ammonia, O&G, Total Petroleum Hydrocarbons (TPH), Total Metals, COD, Total Phosphorus, Cyanide, Phenols, (Total, Volatile, Filterable, Non-filterable and Settleable) Solids, Temperature, and pH.

Site 15: Industrial Line, Manhole I-50. Located northwest of Building 7503. The flow was minimal during the presurvey therefore, a sandbag were required to obtain a composite sample. The sampling program for this location consisted of four composite samples. This collection point is downgradient of the aircraft maintenance hangars along the flightline. Analyses at this location included: EPA methods 601/602 (Purgeable Halocarbons and Aromatics), O&G, TPH, Total Metals, COD, Phenols, Temperature, Total Residue and pH.

Site 16: Audio Visual and Graphics, Manhole Unmarked. The audio visual and graphics collection site is located north west of Building 820. The sampling duration for this location was two days. Analyses at this location included: EPA methods 601/602 (Purgeable Halocarbons and Aromatics), Total Acidity, Total Metals, COD, Cyanide, Phenols, Temperature, Nitrate, Nitrite, Kjeldahl Nitrogen, Total Phosphorus, and pH.

Potable Drinking Water from Building 3005: A sample of potable water was collected from the base's drinking water supply at Building 3005. This sample was collected to identify possible source elements that in turn add to the effluent concentration. Analysis at this source included: EPA Methods 601/602 (Purgeable Halocarbons and Aromatics), O&G, TPH, Total Metals, Ammonia, COD, Cyanide, Phenols, Nitrate, Nitrite, Kjeldahl Nitrogen, Temperature, Total Phosphorus.

Sampling Methods

Wastewater samples were typically collected over a 24-hour period as a time-proportional composite. Ice was added in sufficient quantity to the sampler's base insuring the wastewater being composited in the 2.5-gallon (10-liter) jar was maintained at <4°C. At the end of the compositing period, each water sample was stirred to mix the solids thoroughly and the contents poured directly from the jar into appropriate prelabeled sample containers and placed in a cooler filled with ice. The collection jar was replaced with a clean jar prior to each sampling interval. After all of the samples were collected for each time period, they were transported in coolers to the

temporary work center (located at Building 3005), where appropriate preservatives were placed in each bottle as required. The samples were then placed in a refrigerator. They were placed in insulated shipping coolers, packed with blue ice, transported to TMO and shipped overnight to Armstrong Analytical Laboratory. The samples that were analyzed for total toxic organics and pesticides and PCB's by the contract laboratory were also shipped overnight to Kemron Laboratories located in Marietta, OH. The samples analyzed for biochemical oxygen demand (BOD) were delivered daily to a local analytical laboratory at Rapid City, S.D.

Samples collected for volatile organic halocarbons and aromatics, oils and greases, total petroleum hydrocarbons, total solids or residues and total toxic organics were collected as grab samples. These samples were captured directly from the wastestream and then poured directly into the appropriate sample container. The samples were preserved and shipped in the same conditions as the previously mentioned samples.

The sample pH and temperature were measured from each site's wastestream and recorded daily along with pertinent information relevant to the sample integrity (rain, odor, color, sampler condition, etc.).

All samples were collected and analyzed using Environmental Protection Agency (EPA) approved procedures. Sample preservation was in accordance with the AFOEHL Sampling Guide, March 1989. Appendix E lists the analysis procedures and preservation methods.

Field Quality Assurance/Quality Control (QA/QC)

A field QA/QC program, was used during this survey to verify the accuracy and reproducibility of laboratory results. The following types of samples were collected:

Equipment Blank Samples: Equipment blank samples were collected by pumping a liter of Laboratory Grade distilled water through the pump/purge cycle of the sampler into the appropriate sample container. Preservation and shipping was conducted in the same manner as the routine samples. These samples are used to check for cross contamination from the sampler, which may leach contaminants into the sample through residuals or desorption from the sampler tubing.

Reagent Blank Samples: Reagent blank samples are made by adding a standard aliquot of reagent preservative to a standard sample volume of Laboratory Grade distilled water. These samples

are analyzed for analytical parameters that were collected in the field. These samples serve to verify that the reagent does not add quantitative value to the analyte from its own matrix.

Duplicate Samples: Duplicate samples are collected by splitting grab or composite samples under identical protocol. Sample collection is accomplished by splitting the samples in the 2.5-gallon (10-liter) jar or grabbing double samples of each analyte. Each group of two samples is managed the same regarding collection, handling, preservation, storage, and shipment. This series monitors the reproducibility of sample analytical results. It should be noted that replicating duplicate sample results is difficult because changes in flow and unequal capture of solids can contribute to variability between the original and the duplicate sample.

Analytical Laboratory QA/QC

The Armstrong Laboratory Analytical Division Quality Assurance Plan establishes the guidelines and rules necessary to meet the analytical requirements of 43 states, U.S. EPA, and private accrediting agencies. Specific activities include: (a) inserting a minimum of one blind sample control for each parameter analyzed on a monthly basis, (b) periodic audit of the quality assurance items from each branch, (c) daily calibration of equipment, (d) a minimum of one National Institute Standards and Technology/Standard Reference Materials (NIST/SRM) traceable standard and control sample that is included with each analytical run, (e) corrective action documented each time a quality assurance is not met, (f) established detection limits for all sample data, (g) participation by the laboratory in numerous proficiency surveys and interlaboratory quality evaluation programs, and (h) plotting and tracking all quality control samples by the appropriate analytical section.

Quality assurance, also mandatory for all contracted analytical services, is validated periodically by Armstrong Laboratory personnel.

Spike Samples: Spike samples were prepared by Armstrong Laboratory's Analytical Services Division. These samples were prepared by filling the appropriate sample container with laboratory grade distilled water, adding a known quantity of an analytical parameter, and preserving the sample as appropriate. This series monitors the sample collection, preservation, and reproducibility of analytical results. Spike samples were split at the lab, brought to Ellsworth Air Force Base and shipped to the contract lab to evaluate sample integrity and duplication.

RESULTS AND CONCLUSIONS FOR WASTE WATER CHARACTERIZATION

Contaminant concentrations and physical and chemical parameters are presented in the following section to characterize the various wastewater streams sampled during the survey. Some of the concentrations show potential problems with disposal methods. Others simply contribute to the identifying characteristics of the wastewater that reflect the types of materials being discharged into the sewers. Please note that all analyses results by site number may be found in Appendix D.

The results are segregated into tables as follows:

Table No.	
DA-1 to DA-4	Site 1, BASE EFFLUENT TO BOX ELDER CREEK

DB-1 to DB-4	Site 2, SANITARY LINE INFLUENT TO PLANT
DC-1	SITE 3, MIDWEST BASE
DD-1	SITE 4, NORTH BRANCH, MANHOLE #63
DE-1	SITE 5, WEST BRANCH LOCATED ADJACENT TO BLDG 909
DF-1	SITE 6, PRIDE HANGAR 7504, MANHOLE #507
DG-1	SITE 7, AGE SUPPORT, MANHOLE #135
DH-1	SITE 8, FLIGHTLINE SANITARY, MANHOLE #31
DI-1	SITE 9, MIDDLE BASE, MANHOLE #213
DJ-1	SITE 10, HOSPITAL and BX COMPLEX, MANHOLE #251
DK-1	SITE 11, EAST BASE HOUSING, MANHOLE #310
DL-1	SITE 12, NORTHWEST BASE HOUSING, MANHOLE #400
DM-1	SITE 13, NORTH EAST BASE HOUSING, MANHOLE UNMARKED
DN-1 to DN-3	SITE 14, INDUSTRIAL LINE INFLUENT TO WWTF
DO-1	SITE 15, FLIGHTLINE INDUSTRIAL, MANHOLE #51
DP-1	SITE 16, AUDIO VISUAL AND GRAPHICS, MANHOLE UNMARKED
DQ-1	SITE 17, POTABLE WATER SAMPLE
DQ-2	SPIKE SAMPLES

Oils, Greases and Total Petroleum Hydrocarbons

Oil and Grease (O&G) is not a specific analysis because a group of substances with similar properties are measured due to their solubility in trichlorotrifluoroethane. Some of these compounds could include organic dyes, sulfur compounds, and chlorophyll. Total Petroleum Hydrocarbons (TPH) compounds are extracted and analyzed in the same manner as O&G; however, after measuring for O&G with a infrared detector, a silica gel is added to the sample to adsorb the nonpetroleum compounds and remeasured (Standard Methods 18th Edition). Total Petroleum Hydrocarbons compounds detected can also come from detergents and other domestic sources, and not solely from fuels.

Tables DA-1 through DP-1 indicate few elevated levels of O&G. Table DO-1 indicates the most elevated O&G sample collected during the survey. This sample collected from Site 15 Flightline Industrial was measured at 212.9 mg/L. The associated TPH level, 160 mg/L, indicated that the origin of the O&G source found was predominately petroleum. The next highest detected sample was collected from the North East Housing at 112 mg/L with an associated TPH of 2.3 which indicates that the majority of the O&G is not petroleum based.

Chemical Oxygen and Biochemical Oxygen Demand

Biochemical Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) are two common analytical procedures to determine the oxygen demand of a water sample. This demand may be caused by biodegradable organics, nutrients, refractory organics, heavy metals or dissolved inorganic solids. The BOD_5 procedure requires 5 days to incubate microbes which biochemically exert an oxygen demand. This procedure must begin within 24 hours after the sample is collected. The results can also vary depending on the microbial colony and concentration of contaminants. The COD procedure, with a holding time of up to 28 days, utilizes a chemical oxidizer to determine the oxygen demand. This procedure is more consistent than the BOD procedure. The BOD samples were directly transported to Energy Laboratories Inc. The COD samples were analyzed at the laboratory set up in Building 3005 and Armstrong Laboratories.

There was a communication error that resulted in the termination of the BOD results. The Energy Laboratories assumed that the samples were dechlorinated prior to delivery. This was the practice prior to this survey between Ellsworth AFB and Energy laboratories. Tables DA-1 through DP-1 indicate several elevated levels of COD. Table DH-1 and DO-1 indicates the most elevated sample collected during the survey. Both of these sites came from the sanitary and industrial sewer lines from the flightline and measured 2000 and 1090 mg/L respectively. The COD levels detected in all three housing areas varied between 260 and 588 mg/L indicated normal levels for the operations conducted upstream of these collection points. Table DF-1 indicates that the operations conducted at the Pride Hangar 7504 had consistently moderate levels of COD.

Total Cyanides

Total cyanides were analyzed at selected sites throughout the base. Almost all of the samples indicated detectable levels except for the industrial sewage, housing sanitary and the sanitary lines upstream from Site 9 located at the base service

station. The highest concentration at 0.63 mg/L was detected at Site 4 and 0.675 at Site 5 that represents the north branch and the flightline operations drainage of the sanitary system respectively. The levels detected at the other sites located at or near the flightline operations were much lower in concentration. The sources can most probably be attributed to the ingredients of the pesticides used at these facilities. This may be verified by evaluating what pesticides that are used in these facilities.

Miscellaneous Analyses

Phenolic compounds are used in many products from cough syrup to cleaning compounds. The most elevated levels (210 mg/L) were detected at Site 6 the Pride Hangar. The next elevated levels were at Sites 7 and 9 with levels of 158 mg/L and 137 mg/L respectively. These concentrations are low level and appear to be diluted or consumed before entering the plant as evident by the sole detected samples collected at Site 2 at 13 mg/L. Phenols were not detected in the WWTP effluent to Box Elder Creek.

The remaining analyses from Groups A, D, E, and infield readings do not indicate any significant industrial or sanitary discharges from these facilities.

Group G Parameters

Solids analyses are compiled in Tables DA-1 though DQ-1. The solids are separated into Total Residue, Filterable Residue (Total non-dissolved solids), Volatile Residue, and Total Suspended Solids (TSS). Most sites had only total suspended solids analysis. TSS was analyzed at the WWTF laboratory by Armstrong Laboratory personnel. Residue samples were split in the field with a sample splitting twin funnel and analyzed at Armstrong Laboratories.

The solids levels found at Site 8 was the most elevated at 1242 and 1920 mg/L. It was noted that the sample was thick and soapy. This sample point represents the sanitary discharge of the maintenance hangars on flightline Row 60 to Row 110. This system may have been once combined with stormwater and was flushed with precipitation events, however now since it is segregated from the stormwater, there does not appear to be enough water flow to suspend the solids. The bottom of this manhole was 4 to 5-inches thick with solids and water flow was minimal. This solids build up is also typical when high volume toilets are replaced with water efficient toilets. The low slope grade of the sanitary line is not enough to support a minimum of 2 feet per second flow to suspend solids.

The northeast housing area, (Site 13) had the most elevated TSS levels of the three housing areas. Again this may be due to water efficient toilets and garbage disposals. The TSS levels in the WWTP effluent was in compliance (ú30 mg/L) except for the sample collected on 28 Oct 93. The TSS level was detected at 55 mg/L. It is not unusual for an isolated event to have elevated levels in a trickling filter system due to sloughing or low retention time in the final clarifiers due to surges or elevated flows. The solids levels at other locations of the base were not unusual.

Total Acidity was analyzed at Site 16 (TABLE DP-1), only. The acidity levels detected do not appear unusual.

Metals Analyses

Total metal analyses were performed on the wastewater samples by Induction Coupled Plasma (ICP) and Graphite Furnace methods. The base effluent at Site 1 indicated no abnormally elevated levels of metals except for two samples that had levels of 0.001 mg/L of cadmium(See TABLES DA-1 and DA-2). Cadmium was detected in low concentrations at Sites 3, 4, 5, 6, 7, 8, 9, 10, 14, 15, and 16. Cadmium is often generated predominately in corrosion control activities. Copper was also detected at in minor levels throughout the base. Silver was detected in the usual locations (Sites 4, 5, 10 and 16) that use photo developers such as Audio/Visual and the Hospital. Lead was detected at Sites 6, 7, 8, 9, and 14 between .020 - 0.112 mg/L. Lead is typically found at operations involving batteries and vehicle maintenance. Flightline support operations discharge to Sites 6, 7, 8, and 14. The base service station and the auto hobby shop discharge to Site 9. The other sites also did not exhibit levels of concern for total metals.

Volatile Organic Compounds (GC)

Volatile Organic Compounds (VOCs) were analyzed via EPA Methods 601 (Volatile Organic Hydrocarbons) and 602 (Volatile Organic Aromatics).

VOCs are widely used in many products and are also by-products of ongoing processes throughout any USAF base. Usually, the small amounts that enter the sanitary system are treated by biodegradation or volatilization. Small amounts are routinely treated with no impact to the biological treatment system. Large amounts, however, can cause a toxic shock to the system in the POTW and create a fire or explosion hazard.

The VOCs present in the base effluent are not significantly elevated with the exception of o-xylene and methylene chloride. The only elevated xylene level was detected on 26 October 1993 at 2.38 mg/L and methylene chloride at 2.38 mg/L on 27 October 1993. (See TABLE DA-2). The most elevated level of xylene was detected coming from the Pride Hangar at 76.78 mg/L. Other sources of xylene were detected at flightline locations Sites 7 and 8. The only sample collected from the operations area containing detectable levels of methylene chloride was collected at Site 3 which was detected at 156.99 mg/L. The other VOCs detected in the WWTP effluent are; bromodichloromethane, chlorobenzene, and chlorodibromomethane, are disinfection byproducts as detected in the potable water sample TABLE DA-1 and DA-2.

Other compounds present at various sites are bromodichloromethane, chloroform, chlorodibromomethane, 1,4-Dichlorobenzene, dichlorodifluoromethane, ethylbenzene, methylene chloride, tetrachloroethylene, trichloroethylene, 1,1,1-Trichloroethane. Bromodichloromethane, toluene, and chloroform are byproducts from chlorination. The other compounds can be traced to fuels, paints, cleaners and solvents. Most of the sites had relatively low levels of these compounds.

Chlorodibromomethane (a.k.a. dibromochloromethane) is used as a chemical intermediate in the manufacturing of fire extinguishing agents, aerosol propellants, refrigerants and pesticides. The national primary drinking water MCL for total trihalomethanes is 0.10 mg/L 40 CFR 141.12 (7/1/88). This compound, a toxic pollutant pursuant to section 307(a)(1) of the Clean Water Act, is subject to effluent limitations (40 CFR 401.15 (7/1/88)). This compound was detected at 4.17 mg/L in the potable water sample collected at Building 3005 on 22 Oct 1993. This trihalomethanes compound consequently was also detected throughout the base and in the base effluent.

1,4 Dichlorobenzene or *para*-Dichlorobenzene is predominately used as a insecticidal fumigant and a deodorant for garbage and rest rooms. It has minor uses in resins and abrasive wheel production. This compound is designated as a hazardous substance under section 311(b)(2)(A) of the Federal Water Pollution Control Act and further regulated by the Clean Water Act Amendments of 1978 and 1978, (40 CFR 116.4 (7/1/87)). This compound, a toxic pollutant pursuant to section 307(a)(1) of the Clean Water Act, is subject to effluent limitations (40 CFR 401.15 (7/1/90)). It was detected at every site except Sites 1, 10, 14, and 15. The highest concentration of 21.73 ppb was detected at the Powered AGE support on 22 Oct 1993. It should be noted that the EPA is promulgating National Primary Drinking Water Regulations (NPDWRs) for certain volatile synthetic organic chemicals. Specifically,

this notice promulgates a maximum contaminant level for *para*-dichlorobenzene at 75.0 ppb. Drinking water standards should not be used for sanitary effluent standards. It would appear however, that if the maximum detected level of *para*-dichlorobenzene from the sanitary sewer is less than the NPDWRs standard, then there should be minimal concern in removing deodorizers from the base supply.

Ethylbenzene is used as a solvent or diluent; component for automotive and aviation fuel; precursor to styrene production; and a alkyd for surface coatings. This compound, a toxic pollutant pursuant to section 307(a)(1) of the Clean Water Act, is subject to effluent limitations (40 CFR 401.15 (7/1/91)). This compound was detected in the industrial sewage line sampling Sites 14 and 15 at 6.15 and 19.4 mg/L respectively. This compound was not detected at any of the sanitary sewage sampling points.

Methylene Chloride or Dichloromethane is used in solvents for cellulose acetate; medical anesthetics; paint removers; vapor degreasing solvents for metal and plastics; cleaning agents; carrier solvents for insecticides and herbicides; adhesives; cleaning solvents for circuit boards; refrigerants; dyes and perfumes; components of fire extinguishing compounds; molding of dental materials; and in quite a number of uses that are unrelated to the normal operations of a military installation that is not a logistics center. This compound, a toxic pollutant pursuant to section 307(a)(1) of the Clean Water Act, is subject to effluent limitations (40 CFR 401.15 (7/1/90)). It was detected in the Base's effluent at Site 1 on 27 Oct 1993 at 2.38 ppb. The highest concentration of 156.99 was detected at Site 3 on 21 Oct 1993. This chemical is commonly used; however, it was not found at any other source points. It was detected at the WWTP influent on 21 Oct 1993. This chemical is often found in samples as analytical cross contamination.

Tetrachloroethylene is used in dry-cleaning; cold cleaning and vapor degreasing of metals; synthesis of fluorocarbon 113, 114, 115, and 116; heat exchange fluid; and typewriter correction fluid. This compound, a toxic pollutant pursuant to section 307(a)(1) of the Clean Water Act, is subject to effluent limitations (40 CFR 401.15 (7/1/88)). The compound was detected at both industrial sewage line sampling Sites 14 and 15 at 1.12 and 19.18 ppb respectively. It was also detected five out of the seven sampling days at Site 2, the WWTP sanitary influent. It was not detected in the effluent.

Toluene is used in solvents for paints, lacquers, gums, and resins; as a gasoline and aviation fuel additive; inks; cements; cosmetics; spot removers; antifreezes; and fuel blending.

Toluene, designated a hazardous substance under section 311(b)(2)(A) of the Federal Water Pollution Control Act, is further regulated by the Clean Water Act Amendments of 1977 and 1978, (40 CFR 116.4 (7/1/88)). This compound, a toxic pollutant pursuant to section 307(a)(1) of the Clean Water Act, is subject to effluent limitations (40 CFR 401.15 (7/1/91)). The highest concentration of 94.23 ppb on 27 Oct 1993 at Site 15 the industrial line coming off of the flightline. It was also detected at Sites 9, 11, 13, 14 and 16. It would be usual to see minor levels of toluene at Sites 9 and 16; however not the housing areas Sites (11 and 13).

1,1,1-Trichloroethane is found in solvents used for: precision instruments, adhesives, and metal degreasing; pesticides; dry cleaning; lubricants in metal cutting oils; and components in inks and drain cleaners. A toxic pollutant pursuant to section 307(a)(1) of the Clean Water Act, it is subject to effluent limitations (40 CFR 401.15 (7/1/90)). It was detected in minor concentrations of 1.89 and 1.45 ppb at Sites 15 and 16 respectively.

Xylene is used in: the manufacture of resins, paints, varnishes, and general solvent for adhesives; aviation gasoline; protective coatings; and many other processes. This compound, a hazardous substance pursuant to section 311(b)(2)(A) of the Federal Water Pollution Control Act and further regulated by the Clean Water Act Amendments of 1977 and 1978, and is subject to effluent limitations (40 CFR 116.4 (7/1/88)). This compound was detected in the base effluent as previously described. The highest concentration was detected at Site 15 at 99.99 mg/L on 27 Oct 1993. It was also detected in minor concentrations at Sites 2, 3, 6, 7, and 8.

Total Toxic Organic Compounds

Total Toxic Organic (TTO) compounds are detected with EPA Methods 608, 624 and 625. These are purgeable, base-, neutral-, and acid-extractable organic compounds. Total Toxic Organics analyses are very expensive and were therefore limited to the influent and effluent of the WWTP and the effluent of the oil/water separator of the industrial line at Site 14.

Tables DA-3, DA-4, DB-3, DB-4, DN-2, and DN-3 list the Polychlorinated Biphenyls (PCBs), pesticides, volatile, base-neutral, and acid extractable compounds for the base effluent at Sites 1, 2, and 14. No PCBs and organic pesticides were detected. Low to moderate levels of base-neutral compounds were detected in addition to the typical volatile compounds described in the previous section. The other organic compounds found in the TTO analyses are described as follows:

Bis(2-Ethylhexyl)Phthalate is used in plasticizers for polymeric materials such as natural rubber, synthetic rubber, cellulose acetate butyrate, polystyrene; vacuum pump oil; dielectric fluids for capacitors; inert ingredients for pesticides; insect repellent formulations; cosmetics; rubbing alcohol; and photographic film, wire and cable adhesives. It is also one of the predominate laboratory contaminants due to sample container and instrumentation plastic parts. This compound has a human criteria for ingestion of water at 15.0 mg/L. Contaminated aquatic organisms criteria is set at 50 mg/L. This compound, designated a toxic pollutant pursuant to section 307(a)(1) of the CWA, is subject to effluent limitations. It was detected at 15 mg/L at Site 1, 33 mg/L at Site 2, Site 14 at 17 mg/L on 27 Oct 1993.

Benzidine is used in the manufacturing of dyes; as a reagent for hydrogen peroxide; stain in microscopy; security printing; and plastic films. This compound, a toxic pollutant pursuant to section 307(a)(1) of the Clean Water Act, is subject to effluent limitations (40 CFR 401.15 (7/1/91)). This compound was detected at Site 2 at 26 mg/L on 27 Oct 1993.

Phenanthrene, a polynuclear aromatic hydrocarbon, is used in the manufacturing of explosives; and the synthesis of drugs. Neither of these operations are found commercially at Ellsworth AFB. Phenanthrene is found in smoked foods, charbroiled steaks, and cigarette smoke. It can also be found in high octane gasoline, used engine oil, diesel exhaust, It is often generated from the incomplete combustion of fossil fuels. This compound, a toxic pollutant pursuant to section 307(a)(1) of the Clean Water Act, is subject to effluent limitations (40 CFR 401.15 (7/1/87)). This compound was detected at Site 14 at 17 mg/L on 27 Oct 1993. The most probable source is from washing engine exhaust carbon from the aircraft on the washrack.

QA/QC DATA

Table DQ-1, lists the analytical results for the potable water from Building 3005. The analyses performed on the potable water reveal what chemical concentrations and impurities are found in the incoming treated water. These levels can be subtracted from the concentrations revealed by the analyses performed on the sanitary outfalls to determine the additive effects of effluents on the system. For example, chloroform, a chlorination byproduct is present at 2.04 mg/L and it is found in most of the samples throughout the base. Magnesium is also found throughout the entire survey at approximately 11 to 45 mg/L. If a sample indicated a level of 22 mg/L , then the "relative ambient" level of 20 mg/L would be subtracted from the 22 mg/L

for an reading of 2 mg/L. The potable water contains detectable concentrations of ammonia, calcium, and nitrates. All of these levels are below the current drinking water MCLs.

Table DQ-2 indicate spike samples that were created at Armstrong Laboratory. These results are supposed to fall within an acceptable window or advisory range. Most of the results fell within this window. Few other analytes fell close to this window or were not analyzed for that particular parameter. Variances can be the results of matrix interferences, poor recovery, or technician error. These results indicate fairly good recovery.

Table DQ-2 also contains reagent blanks results, collected and analyzed to determine if there are other interferences due to the reagent composition, are prepared by filling typical sample bottles with laboratory grade water and preserving them with the standard reagent used in the field. These blank samples are analyzed for the same parameters as those requested for the field samples. If there are significant values detected, then that value may be subtracted from the gross levels detected in the field sample for a net gain. The reagent blank results listed in Table DQ-2, indicate that two parameters were detected. The sulfuric acid used to preserve Groups A and E analytes indicated a low, near detection level of chemical oxygen demand and kjeldahl nitrogen of 0.8 mg/L. The nitric acid used in the preservation of metals in Group F indicated a detectable level of 0.001 mg/L of cadmium. These levels are not significant with respect to the levels detected in the sanitary waste water samples collected. Therefore the levels detected throughout the survey may be accepted as valid. The potable water analytes detected should still be considered when reviewing the samples collected throughout the base.

CROSS-CONNECT STUDY

During our discussion with the BEE during the presurvey, it was expressed that Ellsworth Air Force Base is pending litigation for exceeding the maximum solids discharge limits. Elevated levels are more apparent during precipitation events. Stormwater infiltration due to cross connections is suspected. This infiltration problem is another primary concern for Ellsworth Air Force Base.

During the presurvey, there were several flush mounted storm sewer covers on sanitary lines observed that would drain over 3/4-acre area. Some of these covers had significant amounts of debris collected due to storm events washing into these covers. It was also noted at this time that there were many unknown

termination points listed on the storm and sanitary sewer line utilities maps. It should be noted that of the many bases that we survey, that Ellsworth AFB had some of the most accurate utilities maps. There were only a couple of manholes that could not be located such as manhole #482 located north of the NDI Building #905.

We recommended during the outbriefing that these storm grate covered flush mounted manholes be refitted with sanitary covers and elevated with extension rings. During a staff assistance visit on 28 - 31 March 1994, it was noted that the civil engineers were in the process of retrofitting these manholes.

SUMMARY AND RECOMMENDATIONS

Overall the base's effluent looks good with the exception of the minor levels of xylene and methylene chloride compounds detected. The solids problem was more thoroughly addressed with the staff assistance survey. Site 7 and Site 8 indicated large amounts of solids building up in the bottom of the manhole and should have regular preventative maintenance to flush these out to prevent possible costly repairs to the sanitary lines.

At the time of the survey, no one from Civil Engineering could produce a document permitting the trailer park located adjacent to the base to discharge their sanitary to Ellsworth AFB. This is probably an improper use of government property and resources that should be rectified. The waste treatment plant has had problems in the past with unknown sources crashing the system. There is an inherently greater potential for petroleum products being discharged to the sanitary from patrons in a trailer park who perform their own automobile and recreational vehicle maintenance. The Air Force does not have enforcement capability on this civilian site in the event of an illegal discharge.

FINAL SUMMARY

The final effluent appears to be in compliance with regard to analyte content however, the organic compounds xylene and methylene chloride should be addressed. Maintenance and disposal activities should be monitored at the Pride hangar and the flightline. The toluene detected in the housing area is unusual and a message in the base bulletin or newspaper should remind patrons not to dispose of organic solvents into the sanitary sewer. An alternate disposal site could be made at DRMO for patrons to dispose of these compounds or establish a trading post for household chemicals similar to that at Whitehead AFB, where

base patrons can leave their used and unused cleaners, solvents and supplies when they move from the base. Incoming and current patrons can utilize these compounds until they are finished instead of wasting a usable resource or disposing of it down the sanitary sewer.

APPENDIX A

CORRESPONDENCE REQUESTING SURVEY

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS TACTICAL AIR COMMAND
LANGLEY AIR FORCE BASE VA 23665-

REPLY TO ATTN OF: SGPB

11 Dec 91

SUBJECT: Tactical Air Command (TAC) Request for Waste Water and Hazardous Waste Surveys

TO: AL/OEB

1. During a recent TAC Water Quality Working Group meeting, the committee discussed the need and benefit of waste water and hazardous waste studies. Everyone agreed that these surveys are invaluable and that Armstrong Laboratories does an excellent job performing them. As a result, TAC would like to develop a program to have Armstrong Laboratory perform baseline waste water and hazardous waste studies at each TAC base over the next few years. In addition, we are interested in establishing a reoccurring schedule of studies to update the baseline surveys.

2. I have informally discussed this proposal with Maj John Garland and Capt Pat McMullen from your staff to determine the viability of the request. It appears TAC's request is similar to what you are already doing for ATC. Suggest we set-up a meeting to layout the details for this undertaking.

3. Meanwhile, I would like to request three waste water studies be accomplished in the near future. Cannon AFB, Mountain Home AFB, and Langley AFB all have MCP projects scheduled for FY 95 to upgrade their sewage treatment plants. Waste water studies are needed to provide input for their proper design.

4. Please advise me when you would be available to have the requested meeting to develop the TAC survey program. In addition, please indicate when you will be able to perform the three waste water surveys requested in this letter. As always, your assistance and support is greatly appreciated. Please contact me at HQ TAC/SGPB, DSN 574-4611.

7874

David L. Potts

DAVID L. POTTS, Lt Col, USAF, BSC
Command Bioenvironmental Engineer
Office of the Command Surgeon

cc: TAC/DEVC
1 Med Gp/SGPB
27 Med Gp/SGPB
366 Med Gp/SGPB

DEPARTMENT OF THE AIR FORCE
ARMSTRONG LABORATORY (AFSC)
BROOKS AIR FORCE BASE, TEXAS 78235-5000

18 MAR 1992

REPLY TO ATTN OF: OEBE (Maj Garland, DSN 240-3305)

SUBJECT: Air Combat Command Strawman Survey Schedule

TO: HQ TAC/SGPB/DEVC

1. Attached is the strawman survey schedule for the next six years. For the first four years, we plan to survey all the bases that have never been surveyed. The anticipated month of the survey is next to each base. In 1998, we will be surveying those bases that have had wastewater characterizations in recent years to the present. Those surveys are in parentheses by the base. In 1999, we will start to resurvey the bases in sequence starting from those surveyed in 1993.

2. If you have any questions, please contact Maj Garland.

EDWARD F. MAHER, Colonel, USAF, BSC
Chief, Bioenvironmental Engineering
Division

1 Atch
Survey

cc: HQ SAC/SGPB/DEVC

Air Combat Command Strawman Survey Schedule

1993

Shaw AFB SC--April
Griffiss AFB NY--May
Minot AFB ND--June
Ellsworth AFB SD--July

1994

McConnell AFB KS--April
Offut AFB NE--May
Grand Forks AFB ND--June
K.I. Sawyer AFB MI--July

1995

Dyess AFB TX--March
Pope AFB NC--April
Seymour Johnson AFB NC--May
Fairchild AFB WA--July

1996

Tyndall AFB FL--March
Nellis AFB NV--May
F.E.Warren WY--July
Moody AFB GA--September

1997

Homestead AFB FL(87)--May
Barksdale AFB LA(88)--June
Beale AFB CA(89)--July
Davis-Monthan AFB AZ(89)--August

1998

Luke AFB AZ(89)--April
Holloman AFB NM(91)--June
Whiteman AFB MS(91)--August
Langley AFB VA(92)--September

1999

Mountain Home AFB ID(92)--July
Cannon AFB NM(92)--September

APPENDIX B

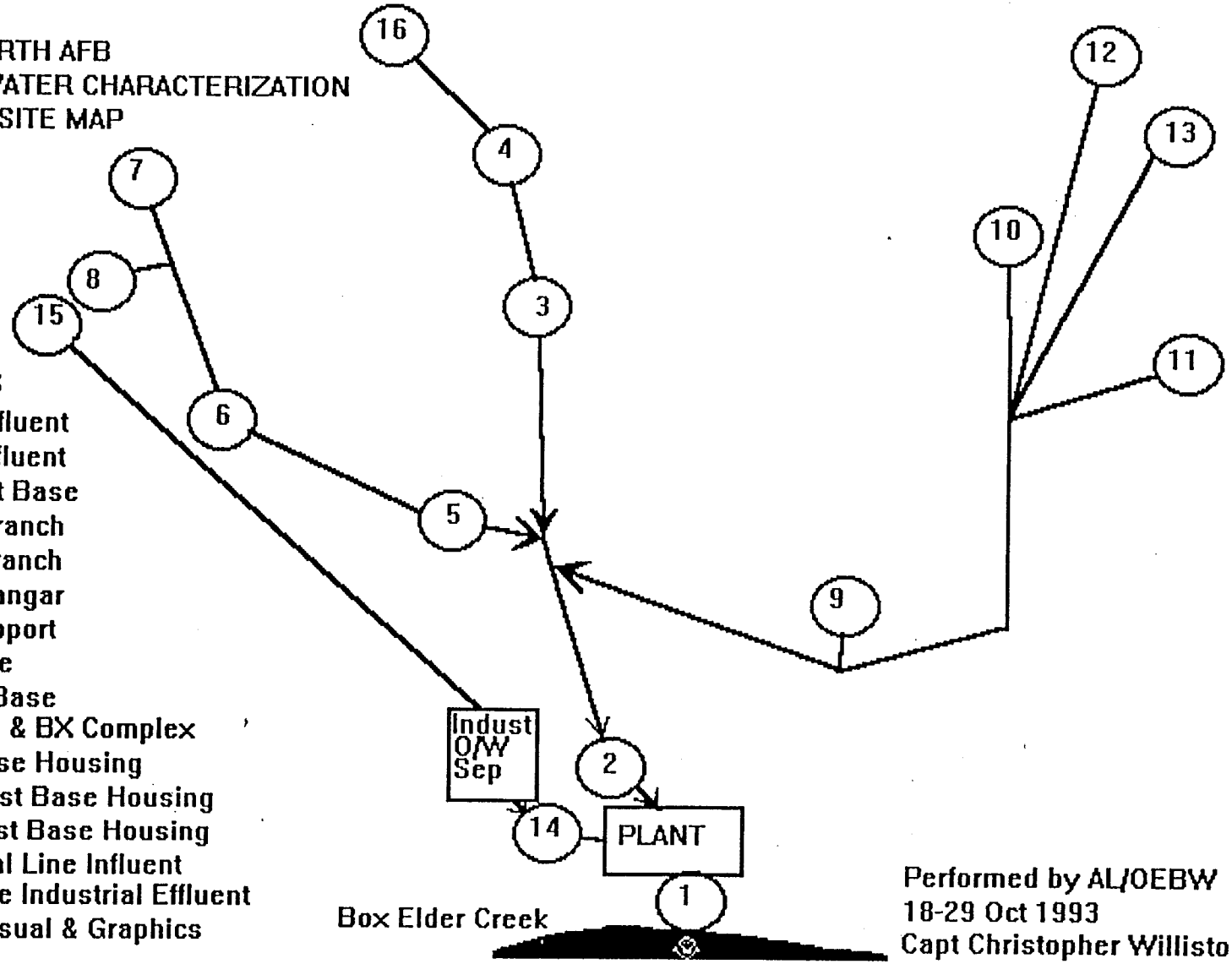
SAMPLING STRATEGY

ANALYTES	Site-1	Site-2	Site-3	Site-4	Site-5	Site-6	Site-7	Site-8	Site-9	Site-10	Site-11	Site-12	Site-13	Site-14	Site-15	Site-16	QC/QA	Total
ELLSWORTH 18-29 OCT 93	PLANT EFF	PLANT INF	Midwest Base	N Branch	W Branch	Hgr 3504	AGE Support	Flightline	Middle Base	Hosp&DX	EastHousing	NW Housing	NE Housing	Ind PreWWT	Ind60-100Row	Photo/NDI		Samples
GROUP A	7 Day	7 Day	3 Day	2 Day	3 Day	2 Day	2 Day	3 Day	3 Day	3 Day	2C-4G	2C-4G	2C-4G	3@48Hr	3@48Hr	4 Day		
Ammonia	7	7							3	3	2	2	2	3			2	31
Chemical Oxygen Demand	7	7	3	2	3	2	2	3	3	3	2	2	2	3	3	4	4	55
Kjeldahl Nitrogen	7	7																14
Nitrate	7	7																14
Nitrite	7	7																14
Oil & Grease	7	7	3	2	3	2	2	3	3	3	6	6	6	3	3		5	64
Total Petroleum Hydrocarbon	7	7	3	2	3	2	2	3	3	3	6	6	6	3	3		5	64
Biochemical Oxygen Demand	7	7															2	16
Orthophosphate																		0
Total Phosphorus	7	7	3	2	3	2	2	3	3	3	2	2	2	3	3	4	3	54
GROUP D																		0
Cyanide, Total	7	7	3	2	3	2	2	3	3	3								0
														3	3	4	2	47
GROUP E																		
Phenols	7	7	3	2	3	2	2	3	3	3	3	3	3	3	3	4	5	59
GROUP F, METALS																		0
Aluminum	7	7																0
Arsenic	7	7	3	2	3	2	2	3	3	3	2	2	2	3	3		5	19
Barium	7	7															5	52
Beryllium	7	7															5	19
Boron	7	7															4	18
Cadmium	7	7	3	2	3	2	2	3	3	3	2	2	2	3	3	4	4	22
Calcium																	5	56
Chromium (Total)	7	7	3	2	3	2	2	3	3	3	2	2	2	3	3		5	52
Copper	7	7	3	2	3	2	2	3	3	3	2	2	2	3	3	4	5	56
Iron	7	7	3	2	3	2	2	3	3	3	2	2	2	3	3	4	4	55
Lead	7	7	3	2	3	2	2	3	3	3	2	2	2	3	3	4	5	56
Magnesium	7	7	3	2	3	2	2	3	3	3				3	3	4	4	49
Manganese	7	7	3	2	3	2	2	3	3	3	2	2	2	3	3		4	51
Mercury	7	7	3	2	3	2	2	3	3	3	2	2	2	3	3	4	5	56
Nickel			3	2	3	2	2	3	3	3				3	3		5	32
Potassium																		0
Selenium	7	7	3	2	3	2	2	3	3	3				3	3		5	46
Silver	7	7	3	2	3	2	2	3	3	3	2	2	2	3	3	4	5	56
Vanadium																	4	4
Thallium																	4	4
Zinc	7	7	3	2	3	2	2	3	3	3	2	2	2	3	3		5	52
GROUP G																		0
Acidity																		0
Alkalinity																4		4
Alkalinity																		0
Bromide																		0
Residue, total	7	7	3	2	3	2	2	3	3	3	6	6	6	3	3		5	64
Residue, Filterable	7	7												3			5	22
Residue, Nonfilterable	7	7												3			5	22
Residue, Settleable	7	7												3			5	22
Residue, Volatile	7	7												3			5	22
Silica																		0
Specific Conductance																		0
Sulfate																		0
Surfactants-MBAS																		0
Turbidity																		0
EPA METHODS																		0
601 Purgeable Halocarbon	7	7																0
602 Purgeable Aromatics	7	7																14
601/602			3	2	3	2	2	3	3	3	2	2	2	3	3	4	4	41
608 Pesticides and PCB's	4	4												3			2	13
608 Modified PCB's only																		0
624/625 BNA's TTO's	2	2												2				6
Total Site Analytes	244	244	63	42	63	42	42	63	66	66	49	49	49	83	63	56	147	1431

APPENDIX C

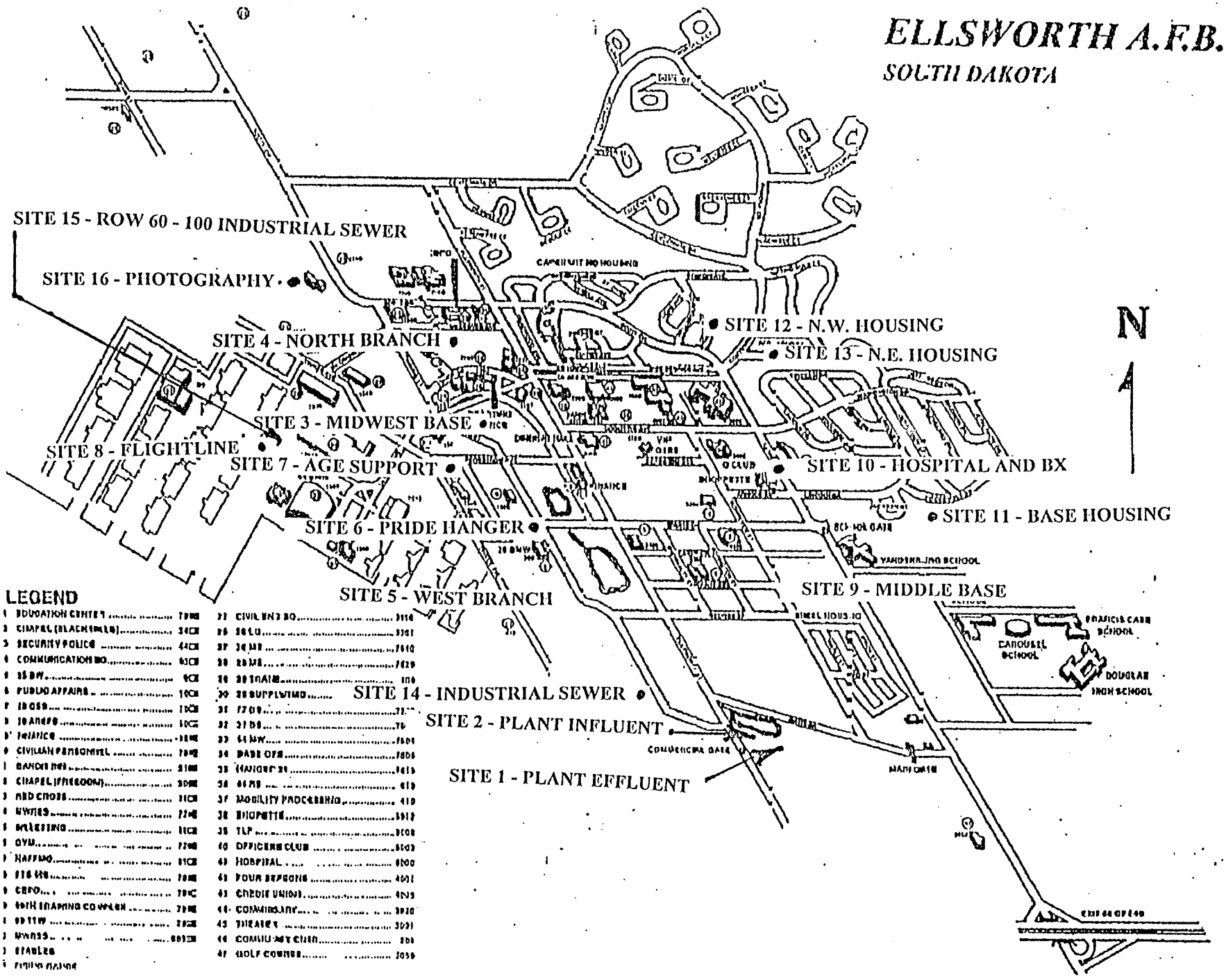
SAMPLING LOCATION MAP

ELLSWORTH AFB
WASTEWATER CHARACTERIZATION
SAMPLE SITE MAP



SITES
1-Plant Effluent
2-Plant Influent
3-Midwest Base
4-North Branch
5-West Branch
6-Pride Hangar
7-AGE Support
8-Flightline
9-Middle Base
10-Hospital & BX Complex
11-East Base Housing
12-Northwest Base Housing
13-Northeast Base Housing
14-Industrial Line Influent
15-Flightline Industrial Effluent
16-Audio Visual & Graphics

Performed by AL/OEBW
18-29 Oct 1993
Capt Christopher Williston


ELLSWORTH A.F.B.
SOUTH DAKOTA
SITE 15 - ROW 60 - 100 INDUSTRIAL SEWER
SITE 16 - PHOTOGRAPHY
SITE 4 - NORTH BRANCH
SITE 12 - N.W. HOUSING
SITE 13 - N.E. HOUSING
SITE 3 - MIDWEST BASE
SITE 8 - FLIGHTLINE
SITE 7 - AGE SUPPORT
SITE 10 - HOSPITAL AND BX
SITE 11 - BASE HOUSING
SITE 6 - PRIDE HANGER
SITE 5 - WEST BRANCH
SITE 9 - MIDDLE BASE
SITE 14 - INDUSTRIAL SEWER
SITE 2 - PLANT INFLUENT
SITE 1 - PLANT EFFLUENT
N
LEGEND

APPENDIX D

ANALYTICAL RESULTS

TABLE DA-1, SITE 1, BASE EFFLUENT TO BOX ELDER CREEK
Base Survey: ELLSWORTH AIR FORCE BASE
Survey Dates: 18-29 October 1993
Contributing Sources: Base Sanitary and Industrial Discharges

	COLLECTION DATE	COLLECTION DATE	COLLECTION DATE	COLLECTION DATE
GROUP A ANALYTES	Thursday, 21 Oct 93	Friday, 22 Oct 93	Saturday, 23 Oct 93	Monday, 25 Oct 93
Ammonia	2.2	2.8	2.6	2.3
Kjeddahl Nitrogen	6	6.1	6.6	6.4
Nitrate	8.8	8.4	8	5.2
Nitrite	0.02	<.02	<.02	<.02
Chemical Oxygen Demand (mg/L)	55	40	57	50
Oil and Grease (mg/L)	3.1	3.1	leaked in transit	3.8
Total Petroleum Hydrocarbon (mg/L)	1	1.3	leaked in transit	1.4
Total Phosphorus (mg/L)	3.3	3	3.4	3.9
GROUP D ANALYTES				
Cyanide	0.005	0.015	0.011	<.005
GROUP E ANALYTES				
Phenols (ug/L)	<10	<10	<10	<10
GROUP F ANALYTES				
Aluminum	0.32	<0.100	0.116	0.38
Arsenic (mg/L)	<0.010	<0.010	<0.010	<0.010
Barium	<0.100	<0.100	<0.100	<0.100
Beryllium (mg/L)	<0.010	<0.010	<0.010	<0.010
Cadmium (mg/L)	<0.001	<0.001	0.001	<0.001
Calcium	62	56.06	53.54	60
Total Chromium (mg/L)	<0.050	<0.050	<0.050	<0.050
Cobalt	<0.100	<0.100	<0.100	<0.100
Copper (mg/L)	0.032	0.021	0.024	0.026
Iron (mg/L)	<0.100	0.103	0.11	0.17
Lead (mg/L)	<0.020	<0.020	<0.020	<0.020
Magnesium (mg/L)	28	27.03	26.49	28
Manganese (mg/L)	<0.050	<0.050	<0.050	<0.050
Mercury (mg/L)	<0.001	<0.001	<0.001	<0.001
Molybdenum	<0.100	<0.100	<0.100	<0.100
Nickel (mg/L)	<0.050	<0.050	<0.050	<0.050
Silver (mg/L)	<0.005	<0.005	<0.005	<0.005
Titanium	<0.100	<0.100	<0.100	<0.100
Vanadium	<0.100	<0.100	<0.100	<0.100
Zinc (mg/L)	<0.050	<0.050	<0.100	<0.050
Group G				
Residue (total)				
Residue, filterable				
Residue, nonfilterable				
Residue, total volatile				
TSS	22	21	18	25
ON SITE ANALYSES				
pH (units)	6.3	6.3	6.7	6.6
Temperature (°C)	13	16	15	15
Dissolved Oxygen mg/L	6.3	6.6	6.6	6.45
SAMPLE NUMBERS	GN931001	GN931035	GN931061	GN932005
	GN931002	CN931037	CN931063	CN932007
	CN931003	GN931036	GN931062	GN932006
VOLATILE COMPOUNDS (ug/L)	Thursday, 21 Oct 93	Friday, 22 Oct 93	Saturday, 23 Oct 93	Monday, 25 Oct 93
Bromodichloromethane	<1.0	1.36	5.33	7.4
Bromoform	<1.0	<1.0	<1.0	<1.0
Bromomethane	<1.0	<1.0	<1.0	<1.0
Carbon tetrachloride	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	<1.0	<1.0	<1.0	<1.0
Chlorodibromomethane	<1.0	<1.0	2.03	1.69
Chloroethane	<1.0	<1.0	<1.0	<1.0
2-Chlorethylvinyl Ether	<1.0	<1.0	<1.0	<1.0
Chloroform	1.92	3.2	7.14	16.27
Chloromethane	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	<1.0	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	<1.0	<1.0	<1.0	<1.0
1,4-Dichlorobenzene	<1.0	<1.0	<1.0	<1.0
Dichlorodifluoromethane	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethene	<1.0	<1.0	<1.0	<1.0
Trans-1,2-Dichloroethene	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane	<1.0	<1.0	<1.0	<1.0
Cis-1,3-Dichloropropene	<1.0	<1.0	<1.0	<1.0
Trans-1,3-Dichloropropene	<1.0	<1.0	<1.0	<1.0
Ethyl Benzene	<1.0	<1.0	<1.0	<1.0
Methylene Chloride	<1.0	<1.0	<1.0	<1.0
1,1,2,2-Tetrachloroethane	<1.0	<1.0	<1.0	<1.0
Tetrachloroethylene	<1.0	<1.0	<1.0	<1.0
Toluene	<1.0	<1.0	<1.0	<1.0
1,1,1-Trichloroethane	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	<1.0	<1.0	<1.0	<1.0
Trichloroethylene	<1.0	<1.0	<1.0	<1.0
Trichlorofluoromethane	<1.0	<1.0	<50.0	<1.0
Vinyl Chloride	<1.0	<1.0	<1.0	<1.0
o-Xylene	<1.0	<1.0	<1.0	<1.0
m-Xylene	<1.0	<1.0	<1.0	<1.0
p-Xylene	<1.0	<1.0	<1.0	<1.0

TABLE DA-2, SITE 1, BASE EFFLUENT TO BOX ELDER CREEK
Base Survey: ELLSWORTH AIR FORCE BASE
Survey Dates: 18-29 October 1993
Contributing Sources: Base Sanitary and Industrial Discharges

	COLLECTION DATE	COLLECTION DATE	COLLECTION DATE	COLLECTION DATE
GROUP A ANALYTES	Tuesday, 26 Oct 93	Duplicate	Wednesday, 27 Oct 93	Thursday, 28 Oct 93
Ammonia	1.42	1.4	4.1	3.3
Kjeddahl Nitrogen	3.9	4.4	7.2	6.4
Nitrate	8.8	8.8	8	8
Nitrite	<.02	<.02	<.02	<.02
Chemical Oxygen Demand (mg/L)	58	70	60	49
Oil and Grease (mg/L)	4.7	3.8	3.8	4.6
Total Petroleum Hydrocarbon (mg/L)	2.1	1.2	2.1	2.1
Total Phosphorus (mg/L)	3.7	3.85	3.8	3.1
GROUP D ANALYTES				
Cyanide (mg/L)	<.005	<.005	0.027	0.005
GROUP E ANALYTES				
Phenols (ug/L)	<10	<10	<10	<10
GROUP F ANALYTES				
Aluminum	<0.100	0.28	0.31	NA
Arsenic (mg/L)	<0.010	<0.010	<0.010	<0.010
Barium	<0.100	<0.100	<0.100	<0.100
Beryllium (mg/L)	<0.010	<0.010	<0.010	<0.010
Cadmium (mg/L)	0.001	<0.001	<0.001	<0.001
Calcium	53	55	54	55
Total Chromium (mg/L)	<0.050	<0.050	<0.050	<0.050
Cobalt	<0.100	<0.100	<0.100	<0.100
Copper (mg/L)	0.024	0.023	0.03	0.021
Iron (mg/L)	0.14	0.13	0.16	0.1
Lead (mg/L)	<0.020	<0.020	<0.020	<.020
Magnesium (mg/L)	24	26	26	26
Manganese (mg/L)	<0.050	<0.050	<0.050	<0.050
Mercury (mg/L)	<0.001	<0.001	<0.001	<0.001
Molybdenum	<0.100	<0.100	<0.100	<0.100
Nickel (mg/L)	<0.050	<0.050	<0.050	<0.050
Silver (mg/L)	<0.005	<0.005	<0.005	<0.005
Titanium	<0.100	<0.100	<0.100	<0.100
Vanadium	<0.100	<0.100	<0.100	<0.100
Zinc (mg/L)	<0.050	<0.050	<0.050	<0.050
Group G				
Residue (total)	530	524	571	601
Residue, filterable	535	532	1078	536
Residue, nonfilterable	9	7	10	14
Residue, total volatile	107	115	15	129
TSS	16	NA	55	
ON SITE ANALYSES				
pH (units)	6.5	6.5	6.2	6.4
Temperature (°C)	10	10	15	14
Dissolved Oxygen mg/L	6.35	6.35	6.9	6.9
SAMPLE NUMBERS	GN932037	GN932038	GN932071	GN932108
	CN932043	CN932044	CN932073	CN932110
	GN932039	GN932040	GN932072	GN932109
VOLATILE COMPOUNDS (ug/L)	Tuesday, 26 Oct 93	Duplicate	Wednesday, 27 Oct 93	Thursday, 28 Oct 93
Bromodichloromethane	4.84	4.97	3.94	2.66
Bromoform	<1.0	<1.0	<1.0	<1.0
Bromomethane	<1.0	<1.0	<1.0	<1.0
Carbon tetrachloride	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	<1.0	<1.0	<1.0	<1.0
Chlorodibromomethane	1.54	1.69	1.37	<1.0
Chloroethane	<1.0	<1.0	<1.0	<1.0
2-Chlorethylvinyl Ether	<1.0	<1.0	<1.0	<1.0
Chloroform	10.9	10.9	6.63	5.23
Chloromethane	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	<1.0	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	<1.0	<1.0	<1.0	<1.0
1,4-Dichlorobenzene	<1.0	<1.0	<1.0	<1.0
Dichlorodifluoromethane	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethene	<1.0	<1.0	<1.0	<1.0
Trans-1,2-Dichloroethene	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane	<1.0	<1.0	<1.0	<1.0
Cis-1,3-Dichloropropene	<1.0	<1.0	<1.0	<1.0
Trans-1,3-Dichloropropene	<1.0	<1.0	<1.0	<1.0
Ethyl Benzene	<1.0	<1.0	<1.0	<1.0
Methylene Chloride	<1.0	<1.0	2.38	<1.0
1,1,2,2-Tetrachloroethane	<1.0	<1.0	<1.0	<1.0
Tetrachloroethylene	<1.0	<1.0	<1.0	<1.0
Toluene	<1.0	<1.0	<1.0	<1.0
1,1,1-Trichloroethane	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	<1.0	<1.0	<1.0	<1.0
Trichloroethylene	<1.0	<1.0	<1.0	<1.0
Trichlorofluoromethane	<1.0	<1.0	<1.0	<1.0
Vinyl Chloride	<1.0	<1.0	<1.0	<1.0
o-Xylene	2.37	2.38	<1.0	<1.0
m-Xylene	<1.0	<1.0	<1.0	<1.0
p-Xylene	<1.0	<1.0	<1.0	<1.0

TABLE DA-3, SITE 1, BASE EFFLUENT TO BOX ELDER CREEK
Base Survey: ELLSWORTH AIR FORCE BASE
Survey Dates: 18-29 October 1993
Contributing Sources: Base Sanitary and Industrial Discharges

Total Toxic Organics 624&625 (ug/L)	COLLECTION DATE	COLLECTION DATE
Volatile Compounds	Saturday, 23 Oct 93	Wed, 27 Oct 93
Benzene	<5.0	<5.0
Bromodichloromethane	<5.0	<5.0
Bromoform	<5.0	<5.0
Bromomethane	<10.0	<10.0
Carbon tetrachloride	<5.0	<5.0
Chlorobenzene	<5.0	<5.0
Chloroethane	<10.0	<10.0
2-Chloroethyvinylether	<10.0	<10.0
Chloroform	<5.0	<5.0
Chloromethane	<10.0	<10.0
Dibromochloromethane	<5.0	<5.0
1,2-Dichlorobenzene	<5.0	<5.0
1,3-Dichlorobenzene	<5.0	<5.0
1,4-Dichlorobenzene	<5.0	<5.0
1,1-Dichloroethane	<5.0	<5.0
1,2-Dichloroethane	<5.0	<5.0
1,1-Dichloroethene	<5.0	<5.0
cis-1,2-Dichloroethene	<5.0	<5.0
Trans-1,2-Dichloroethene	<5.0	<5.0
1,2-Dichloropropane	<5.0	<5.0
Cis-1,3-Dichloropropene	<5.0	<5.0
Trans-1,3-Dichloropropene	<5.0	<5.0
Ethylbenzene	<5.0	<5.0
Methylene Chloride	<5.0	<5.0
1,1,2,2-Tetrachloroethane	<5.0	<5.0
Tetrachloroethene	<5.0	<5.0
Toluene	<5.0	<5.0
1,1,1-Trichloroethane	<5.0	<5.0
1,1,2-Trichloroethane	<5.0	<5.0
Trichloroethylene	<5.0	<5.0
Trichlorofluoromethane	<10.0	<10.0
Vinyl Chloride	<10.0	<10.0
Base Neutral Compounds (ug/L)		
Acenapthene	<10.0	<10.0
Acenaphthylene	<10.0	<10.0
Anthracene	<10.0	<10.0
Benzo(a)anthracene	<10.0	<10.0
Benzo(b)fluoranthene	<10.0	<10.0
Benzo(a)pyrene	<10.0	<10.0
Benzo(g,h,i,)perylene	<10.0	<10.0
Bis(2-chloroethyl)ether	<10.0	<10.0
Bis(2-chloroethoxy)methane	<10.0	<10.0
Bis(2-chloroisopropal)ether	<10.0	<10.0
Bis(2-ethylhexyl)phthalate	<10.0	15
4-Bromophenyl-phenlether	<10.0	<10.0
Butylbenzylphthalate	<10.0	<10.0
2-Chloronaphthalene	<10.0	<10.0
4-Chlorophenyl-phenlether	<10.0	<10.0
Chrysene	<10.0	<10.0
Dibenzoa,hanthracene	<10.0	<10.0
Di-n-butlphthalate	<10.0	<10.0
1,2-Dichlorobenzene	<10.0	<10.0
1,3-Dichlorobenzene	<10.0	<10.0
1,4-Dichlorobenzene	<10.0	<10.0
3,3'-Dichlorobenzidine	<20.0	<20.0
Diethylphthalate	<10.0	<10.0
Dimethyl phthalate	<10.0	<10.0
2,4-Dinitrotoluene	<10.0	<10.0
2,6-Dinitrotoluene	<10.0	<10.0
Di-n-octylphthalate	<10.0	<10.0
Fluoranthene	<10.0	<10.0
Fluorene	<10.0	<10.0
Hexachlorobenzene	<10.0	<10.0
Hexachlorobutadiene	<10.0	<10.0
Hexachlorocyclopentadiene	<10.0	<10.0
Hexachloroethane	<10.0	<10.0
Indeno(1,2,3-cd)pyrene	<10.0	<10.0
Isophorone	<10.0	<10.0
Naphthalene	<10.0	<10.0
Nitrobenzene	<10.0	<10.0
N-Nitroso dimethyl amine	<10.0	<10.0
N-Nitroso-di-n-propylamine	<10.0	<10.0
N-Nitrosodiphenylamine	<10.0	<10.0
Phenanthiene	<10.0	<10.0
Pyrene	<10.0	<10.0
1,2,4-Trichlorobenzene	<10.0	<10.0
Acid Compounds (ug/L)		
P-Chloro-m-cresol	<10.0	<10.0
2-Chorophenol	<10.0	<10.0
2,4-Dichorophenol	<10.0	<10.0
2,4-Dimethylphenol	<10.0	<10.0
2,4-Dinitrophenol	<50.0	<50.0
4,6-Dinitro-2-methylphenol	<50.0	<50.0
2-Nitrophenol	<10.0	<10.0
4-Nitrophenol	<50.0	<50.0
Pentachlorophenol	<50.0	<50.0
Phenol	<10.0	<10.0
2,4,6-Trichlorophenol	<10.0	<10.0
Sample Number	CN931064	CN932074
	CN931087	CN932075

TABLE DA-4, SITE 1, BASE EFFLUENT TO BOX ELDER CREEK
Base Survey: ELLSWORTH AIR FORCE BASE
Survey Dates: 18-29 October 1993
Contributing Sources: Base Sanitary and Industrial Discharges

	COLLECTION DATE	COLLECTION DATE	COLLECTION DATE	COLLECTION DATE
PCB's & PESTICIDES (ug/L)	Saturday, 23 Oct 93	Tuesday, 26 Oct 93	Wednesday, 27 Oct 93	Thursday, 28 Oct 93
Alpha-BHC	<0.05	<0.05	<0.05	<0.05
Beta-BHC	<0.05	<0.05	<0.05	<0.05
Delta-BHC	<0.05	<0.05	<0.05	<0.05
Lindane	<0.05	<0.05	<0.05	<0.05
Heptachlor	<0.05	<0.05	<0.05	<0.05
Aldrin	<0.05	<0.05	<0.05	<0.05
Heptachlor Epoxide	<0.05	<0.05	<0.05	<0.05
Endosulfan I	<0.05	<0.05	<0.05	<0.05
Dieldrin	<0.10	<0.10	<0.10	<0.10
4,4' DDE	<0.10	<0.10	<0.10	<0.10
Endrin	<0.10	<0.10	<0.10	<0.10
Endosulfan II	<0.10	<0.10	<0.10	<0.10
4,4' DDD	<0.10	<0.10	<0.10	<0.10
Endosulfan Sulfate	<0.10	<0.10	<0.10	<0.10
4,4-DDT	<0.10	<0.10	<0.05	<0.05
Endrin Ketone	NA	NA	NA	NA
Methoxychlor	<0.50	<0.50	NA	NA
Chlordane	<1.00	<1.00	<1.00	<1.00
Alpha-Chlorodane	NA	NA	NA	NA
Gamma-Chlorodane	NA	NA	NA	NA
Toxaphene	<1.00	<1.00	<1.00	<1.00
Endrin Aldehyde	<0.1	<0.10	<0.10	<0.10
Arochlor 1016	<0.50	<0.50	<0.50	<0.50
Arochlor 1221	<0.50	<0.50	<0.50	<0.50
Arochlor 1232	<0.50	<0.50	<0.50	<0.50
Arochlor 1242	<0.50	<0.50	<0.50	<0.50
Arochlor 1248	<0.50	<0.50	<0.50	<0.50
Arochlor 1254	<1.00	<1.00	<1.00	<1.00
Arochlor 1260	<1.00	<1.00	<1.00	<1.00
Sample numbers	CN931064	CN932041	CN932074	CN932112

NA = Not Analyzed

TABLE DB-1, SITE 2, SANITARY LINE INFLUENT TO PLANT
Base Survey: ELLSWORTH AIR FORCE BASE
Survey Dates: 18-29 October 1993
Contributing Sources: Base Sanitary and Industrial Discharges

	COLLECTION DATE	COLLECTION DATE	COLLECTION DATE	COLLECTION DATE
GROUP A ANALYTES	Thursday, 21 Oct 93	Friday, 22 Oct 93	Saturday, 23 Oct 93	Monday, 25 Oct 93
Ammonia (mg/L)	14.8	8.8	9.6	2.6
Kjeldahl Nitrogen (total)	19.5	15.5	14	5.6
Nitrate(as Nitrogen)	0.26	0.4	0.38	0.42
Nitrite (as Nitrogen)	<.02	<.02	<.02	<.02
Chemical Oxygen Demand (mg/L)	37	40	80	62
Oil and Grease (mg/L)	5.9	3.5	2.3	2.7
Total Petroleum Hydrocarbon (mg/L)	1	1	<1	<1
Total Phosphorus (mg/L)	1.8	2.9	1.9	0.87
Group D ANALYTES				
Cyanide (mg/L)	0.124	<.005	0.065	<.005
Group E ANALYTES				
Phenols (ug/L)	<10	13	<10	<10
GROUP F ANALYTES				
Aluminum	0.131	<0.100	0.117	0.1
Arsenic (mg/L)	<0.010	<0.010	<0.010	<0.010
Barium	0.052	<0.100	<0.100	<0.100
Beryllium (mg/L)	<0.010	<0.010	<0.010	<0.010
Cadmium (mg/L)	0.002	<0.001	<0.001	<0.001
Calcium	57.59	75	71.17	82
Total Chromium (mg/L)	<0.050	<0.050	<0.050	<0.050
Cobalt	<0.100	<0.100	<0.100	<0.100
Copper (mg/L)	0.022	<0.020	0.023	<0.020
Iron (mg/L)	0.404	0.243	0.449	0.12
Lead (mg/L)	<0.020	0.031	0.023	0.02
Magnesium (mg/L)	38.08	36.59	37.5	40
Manganese (mg/L)	0.123	0.126	0.122	0.11
Mercury (mg/L)	<0.001	<0.001	<0.001	<0.001
Molybdenum	<0.100	<0.100	<0.100	<0.100
Nickel (mg/L)	<0.050	<0.050	<0.050	<0.050
Silver (mg/L)	<0.005	<0.005	<0.005	<0.005
Titanium	<0.100	<0.100	<0.100	<0.100
Vanadium	<0.100	<0.100	<0.100	<0.100
Zinc (mg/L)	<0.050	<0.050	<0.050	<0.050
Group G				
TSS	68	47	31	58
ON SITE ANALYSES				
pH (units)	6.6	6.4	6.5	6.5
Temperature (°C)	13	13	14	12
Dissolved Oxygen mg/L	3.9	7.4	NR	5.75
SAMPLE NUMBERS	GN931004	GN931039	GN931066	GN932009
	CN931006	CN931041	CN931068	CN932011
	GN931005	GN931040	CN931067	GN932010
VOLATILE COMPOUNDS (ug/L)	Thursday, 21 Oct 93	Friday, 22 Oct 93	Saturday, 23 Oct 93	Monday, 25 Oct 93
Benzene	<1.0	<1.0	<1.0	<1.0
Bromodichloromethane	<1.0	<1.0	<1.0	<1.0
Bromoform	<1.0	<1.0	<1.0	<1.0
Bromomethane	<1.0	<1.0	<1.0	<1.0
Carbon tetrachloride	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	<1.0	<1.0	<1.0	<1.0
Chloroethane	<1.0	<1.0	<1.0	<1.0
2-Chloroethyvinylether	<1.0	<1.0	<1.0	<1.0
Chloroform	<1.0	<1.0	<1.0	<1.0
Chloromethane	<1.0	<1.0	<1.0	<1.0
Chlorodibromomethane	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	<1.0	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	<1.0	<1.0	<1.0	<1.0
1,4-Dichlorobenzene	3.75	2.67	1.93	1.73
Dichlorodifluoromethane	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethene	<1.0	<1.0	<1.0	<1.0
Trans-1,2-Dichloroethene	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane	<1.0	<1.0	<1.0	<1.0
Cis-1,3-Dichloropropene	<1.0	<1.0	<1.0	<1.0
Trans-1,3-Dichloropropene	<1.0	<1.0	<1.0	<1.0
Ethylbenzene	<1.0	<1.0	<1.0	<1.0
Methylene Chloride	11.18	<1.0	<1.0	<1.0
1,1,2,2-Tetrachloroethane	<1.0	<1.0	<1.0	<1.0
Tetrachloroethylene	1.07	1.09	1.2	<1.0
Toluene	<1.0	<1.0	<1.0	<1.0
1,1,1-Trichloroethane	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	<1.0	<1.0	<1.0	<1.0
Trichloroethylene	11.5	11.35	12.59	8.89
Trichlorofluoromethane	<1.0	<1.0	<1.0	<1.0
Vinyl Chloride	<1.0	<1.0	<1.0	<1.0
m-Xylene	*	<1.0	<1.0	<1.0
o-Xylene	1.26	<1.0	<1.0	<1.0
p-Xylene	1.69	<1.0	<1.0	<1.0
* - m- and p- xylene coelute. p-xylene result is the sum of both analytes.				

TABLE DB-2, SITE 2, SANITARY LINE EFFLUENT TO PLANT
Base Survey: ELLSWORTH AIR FORCE BASE
Survey Dates: 18-29 October 1993
Contributing Sources: Base Sanitary and Industrial Discharges

	COLLECTION DATE	COLLECTION DATE	COLLECTION DATE	COLLECTION DATE
GROUP A ANALYTES	Tuesday, 26 Oct 93	Tuesday, 26 Oct 93 Duplicate	Wednesday, 27 Oct 93	Thursday, 28 Oct 93
Ammonia (mg/L)	14.4	14	13.2	16.8
Kjeldahl Nitrogen (total)	17	15.5	16.5	16.5
Nitrate(as Nitrogen)	0.38	0.36	0.26	0.34
Nitrite (as Nitrogen)	<.02	<.02	<.02	<.02
Chemical Oxygen Demand (mg/L)	85	65	112	57
Oil and Grease (mg/L)	11.8	<0.3 Duplicate	4.9	5.4
Total Petroleum Hydrocarbon (mg/L)	2.3	<1.0 Duplicate	<1	1.3
Total Phosphorus (mg/L)	2.7	2.6	3.4	2.6
Group D ANALYTES				
Cyanide	0.005	<0.005	0.005	2.5
Group E ANALYTES				
Phenols (ug/L)	<10	<10	<10	<10
GROUP F ANALYTES				
Aluminum	0.22	0.22	0.46	<0.100
Arsenic (mg/L)	<0.010	<0.010	<0.010	<0.010
Barium	<0.100	<0.100	<0.100	<0.100
Beryllium (mg/L)	<0.010	<0.010	<0.010	<0.010
Cadmium (mg/L)	<0.001	0.01	<0.001	<0.001
Calcium	80	79	71	70
Total Chromium (mg/L)	<0.050	<0.050	<0.050	<0.050
Cobalt	<0.100	<0.100	<0.100	<0.100
Copper (mg/L)	0.033	0.029	0.064	<0.020
Iron (mg/L)	0.41	0.49	0.99	0.28
Lead (mg/L)	<0.020	<0.020	0.263	0.02
Magnesium (mg/L)	37	37	33	36
Manganese (mg/L)	0.13	0.13	0.11	0.099
Mercury (mg/L)	<0.001	<0.001	<0.001	<0.001
Molybdenum	<0.100	<0.100	<0.100	<0.100
Nickel (mg/L)	<0.050	<0.050	<0.050	<0.050
Silver (mg/L)	<0.005	<0.005	<0.005	0.008
Titanium	<0.100	<0.100	<0.100	<0.100
Vanadium	<0.100	<0.100	<0.100	<0.100
Zinc (mg/L)	0.055	0.055	0.075	<0.050
Group G		Duplicates		
TSS	18		76	
ON SITE ANALYSES				
pH (units)	6.6		6.7	6.4
Temperature (°C)	11		12	14
Dissolved Oxygen mg/L	5.5		6.1	6.9
SAMPLE NUMBERS	GN932045	GN932046	GN932077	GN932113
	CN932051	CN932052	CN932079	CN932115
	CN932047	CN932048	GN932078	GN932114
VOLATILE COMPOUNDS (ug/L)	Tuesday, 26 Oct 93	Tuesday, 26 Oct 93 Equip Blank	Wednesday, 27 Oct 93	Thursday, 28 Oct 93
Benzene	<1.0	<1.0	<1.0	<1.0
Bromodichloromethane	<1.0	<1.0	<1.0	<1.0
Bromoform	<1.0	<1.0	<1.0	<1.0
Bromomethane	<1.0	<1.0	<1.0	<1.0
Carbon tetrachloride	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	<1.0	<1.0	<1.0	<1.0
Chloroethane	<1.0	<1.0	<1.0	<1.0
2-Chloroethyvinylether	<1.0	<1.0	<1.0	<1.0
Chloroform	<1.0	<1.0	<1.0	<1.0
Chloromethane	<1.0	<1.0	<1.0	<1.0
Chlorodibromomethane	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	<1.0	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	<1.0	<1.0	<1.0	<1.0
1,4-Dichlorobenzene	2.59	<1.0	4.13	2.56
Dichlorodifluoromethane	<1.0	<1.0	<1.0	1.11
1,1-Dichloroethane	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethene	<1.0	<1.0	<1.0	<1.0
Trans-1,2-Dichloroethene	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane	<1.0	<1.0	<1.0	<1.0
Cis-1,3-Dichloropropene	<1.0	<1.0	<1.0	<1.0
Trans-1,3-Dichloropropene	<1.0	<1.0	<1.0	<1.0
Ethylbenzene	<1.0	<1.0	<1.0	<1.0
Methylene Chloride	<1.0	<1.0	<1.0	<1.0
1,1,2,2-Tetrachloroethane	<1.0	<1.0	<1.0	<1.0
Tetrachloroethylene	1.15	<1.0	1.05	<1.0
Toluene	<1.0	<1.0	<1.0	<1.0
1,1,1-Trichloroethane	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	<1.0	<1.0	<1.0	<1.0
Trichloroethylene	13.89	<1.0	11.6	10.86
Trichlorofluoromethane	<1.0	<1.0	<1.0	<1.0
Vinyl Chloride	<1.0	<1.0	<1.0	<1.0
m-Xylene	<1.0	<1.0	<1.0	<1.0
o-Xylene	<1.0	<1.0	<1.0	<1.0
p-Xylene	<1.0	1.68	<1.0	<1.0

TABLE DB-3, SITE 2, SANITARY LINE INFLUENT TO PLANT
Base Survey: ELLSWORTH AIR FORCE BASE
Survey Dates: 18-29 October 1993
Contributing Sources: Base Sanitary and Industrial Discharges

Total Toxic Organics 624 & 625 (ug/L)	COLLECTION DATE	COLLECTION DATE
Volatile Compounds	Saturday, 23 Oct 93	Wed, 27 Oct 93
Benzene	<5.0	<5.0
Bromodichloromethane	<5.0	<5.0
Bromoform	<5.0	<5.0
Bromomethane	<10.0	<10.0
Carbon tetrachloride	<5.0	<5.0
Chlorobenzene	<5.0	<5.0
Chloroethane	<10.0	<10.0
2-Chloroethyvinylether	<10.0	<10.0
Chloroform	<5.0	<5.0
Chloromethane	<10.0	<10.0
Dibromochloromethane	<5.0	<5.0
1,2-Dichlorobenzene	<5.0	<5.0
1,3-Dichlorobenzene	<5.0	<5.0
1,4-Dichlorobenzene	<5.0	9
1,1-Dichloroethane	<5.0	<5.0
1,2-Dichloroethane	<5.0	<5.0
1,1-Dichloroethene	<5.0	<5.0
cis-1,2-Dichloroethene	<5.0	<5.0
Trans-1,2-Dichloroethene	<5.0	<5.0
1,2-Dichloropropane	<5.0	<5.0
Cis-1,3-Dichloropropene	<5.0	<5.0
Trans-1,3-Dichloropropene	<5.0	<5.0
Ethylbenzene	<5.0	<5.0
Methylene Chloride	<5.0	<5.0
1,1,2,2-Tetrachloroethane	<5.0	<5.0
Tetrachloroethene	<50.0	<5.0
Toluene	<5.0	<5.0
1,1,1-Trichloroethane	<5.0	<5.0
1,1,2-Trichloroethane	<5.0	<5.0
Trichloroethylene	<5.0	11
Trichlorofluoromethane	<10.0	<10.0
Vinyl Chloride	<10.0	<10.0
Base Neutral Compounds (ug/L)		
Acenapthene	<10.0	<10.0
Acenaphthylene	<10.0	<10.0
Anthracene	<10.0	<10.0
Benzidene	<5.0	26
Benzo(a)anthracene	<10.0	<10.0
Bis(2-chloroethoxy)methane	<10.0	<10.0
Bis(2-chloroisopropal)ether	<10.0	<10.0
Bis(2-ethylhexyl)phthalate	<10.0	33
4-Bromophenyl-phenlether	<10.0	<10.0
Butylbenzylphthalate	<10.0	<10.0
2-Chloronaphthalene	<10.0	<10.0
4-Chlorophenyl-phenlether	<10.0	<10.0
Chrysene	<10.0	<10.0
Dibenzoa,hanthracene	<10.0	<10.0
Di-n-butlphthalate	<10.0	<10.0
1,2-Dichlorobenzene	<10.0	<10.0
1,3-Dichlorobenzene	<10.0	<10.0
1,4-Dichlorobenzene	<10.0	<10.0
3,3'-Dichlorobenzidine	<20.0	<20.0
Diethylphthalate	<10.0	<10.0
Dimethyl phthalate	<10.0	<10.0
2,4-Dinitrotoluene	<10.0	<10.0
2,6-Dinitrotoluene	<10.0	<10.0
Di-n-octylphthalate	<10.0	<10.0
Fluoranthene	<10.0	<10.0
Fluorene	<10.0	<10.0
Hexachlorobenzene	<10.0	<10.0
Hexachlorobutadiene	<10.0	<10.0
Hexachlorocyclopentadiene	<10.0	<10.0
Hexachloroethane	<10.0	<10.0
Indeno(1.2.3-cd)pyrene	<10.0	<10.0
Isophorone	<10.0	<10.0
Naphthalene	<10.0	<10.0
Nitrobenzene	<10.0	<10.0
N-Nitroso dimethyl amine	<10.0	<10.0
N-Nitroso-di-n-propylamine	<10.0	<10.0
N-Nitrosodiphenylamine	<10.0	<10.0
Phenanthrene	<10.0	<10.0
Pyrene	<10.0	<10.0
1,2,4-Trichlorobenzene	<10.0	<10.0
Acid Compounds (ug/L)		
P-Chloro-m-cresol	<10.0	<10.0
2-Chorophenol	<10.0	<10.0
2,4-Dichorophenol	<10.0	<10.0
2,4-Dimethylphenol	<10.0	<10.0
2,4-Dinitrophenol	<50.0	<50.0
4,6-Dinitro-2-methylphenol	<50.0	<50.0
2-Nitrophenol	<10.0	<10.0
4-Nitrophenol	<50.0	<50.0
Pentachlorophenol	<50.0	<50.0
Phenol	<10.0	<10.0
2,4,6-Trichlorophenol	<10.0	<10.0
Sample Number	CN931070	CN932080
	GN931088	GN932081

TABLE DB-4, SITE 2, SANITARY LINE INFLUENT TO PLANT
Base Survey: ELLSWORTH AIR FORCE BASE
Survey Dates: 18-29 October 1993
Contributing Sources: Base Sanitary and Industrial Discharges

	COLLECTION DATE	COLLECTION DATE	COLLECTION DATE	COLLECTION DATE
PCB's & PESTICIDES (ug/L)	Saturday, 23 Oct 93	Tuesday, 26 Oct 93	Wednesday, 27 Oct 93	Thursday, 28 Oct 93
Alpha-BHC	<0.05	<0.05	<0.05	<0.05
Beta-BHC	<0.05	<0.05	<0.05	<0.05
Delta-BHC	<0.05	<0.05	<0.05	<0.05
Lindane	<0.05	<0.05	<0.05	<0.05
Heptachlor	<0.05	<0.05	<0.05	<0.05
Aldrin	<0.05	<0.05	<0.05	<0.05
Heptachlor Epoxide	<0.05	<0.05	<0.05	<0.05
Endosulfan I	<0.05	<0.05	<0.05	<0.05
Deildrin	<0.10	<0.10	<0.10	<0.10
4,4' DDE	<0.10	<0.10	<0.10	<0.10
Endrin	<0.10	<0.10	<0.10	<0.10
Endosulfan II	<0.10	<0.10	<0.10	<0.10
Chlordane	<1.00	<1.00	<1.00	<1.00
4,4' DDD	<0.10	<0.10	<0.10	<0.10
Endosulfan Sulfate	<0.10	<0.10	<0.10	<0.10
4,4-DDT	<0.05	<0.05	<0.05	<0.05
Endrin Ketone	NA	NA	NA	NA
Methoxychlor	<0.50	<0.50	<0.50	<0.50
Alpha-Chlorodane	NA	NA	NA	NA
Gamma-Chlorodane	NA	NA	NA	NA
Toxaphene	<1.00	<1.00	<1.00	<1.00
Endrin Aldehyde	<0.10	<0.10	<0.10	<0.10
Arochlor 1016	<0.50	<0.50	<0.50	<0.50
Arochlor 1221	<0.50	<0.50	<0.50	<0.50
Arochlor 1232	<0.50	<0.50	<0.50	<0.50
Arochlor 1242	<0.50	<0.50	<0.50	<0.50
Arochlor 1248	<0.50	<0.50	<0.50	<0.50
Arochlor 1254	<1.00	<1.00	<1.00	<1.00
Arochlor 1260	<1.00	<1.00	<1.00	<1.00
Sample numbers	CN931070	CN932050	CN932080	CN932117

TABLE DC-1, SITE 3, MIDWEST BASE
Base Survey: ELLSWORTH AIR FORCE BASE
Survey Dates: 18-29 October 1993
Contributing Sources: Vehicle Maintenance, C.E. and BOQ

	COLLECTION DATE	COLLECTION DATE	COLLECTION DATE
GROUP A ANALYTES	Thursday, 21 Oct 93	Friday, 22 Oct 93	Saturday, 23 Oct 93
Chemical Oxygen Demand (mg/L)	850	525	Not Performed
Oil and Grease (mg/L)	13.6	53.2	10.4
Total Petroleum Hydrocarbon (mg/L)	4.9	14.4	1.4
Total Phosphorus (mg/L)	11.4	8	7.4
GROUP D ANALYTES			
Cyanide (mg/L)	<.005	0.005	<.005
GROUP E ANALYTES			
Phenols (ug/L)	43	65	43
GROUP F ANALYTES			
Aluminum	2.335	0.983	0.713
Arsenic (mg/L)	<0.010	<0.010	<0.010
Barium	0.233	<0.100	0.105
Beryllium (mg/L)	<0.010	<0.010	<0.010
Cadmium (mg/L)	0.003	0.001	0.004
Calcium	68.98	49.88	46.49
Total Chromium (mg/L)	<0.050	<0.050	<0.050
Copper (mg/L)	0.556	0.118	0.144
Iron (mg/L)	4.184	0.566	0.655
Lead (mg/L)	0.188	0.025	0.201
Magnesium (mg/L)	24.44	21.56	20.166
Manganese (mg/L)	0.185	0.052	<0.050
Mercury (mg/L)	<0.001	<0.001	<0.001
Molybdenum	<0.100	<0.100	<0.100
Nickel (mg/L)	<0.050	<0.050	<0.050
Silver (mg/L)	<0.005	<0.005	<0.005
Titanium	<0.100	<0.100	<0.100
Vanadium	<0.100	<0.100	<0.100
Zinc (mg/L)	0.398	0.133	0.08
ON SITE ANALYSES			
pH (units)	6.4	8	6.4
Temperature (°C)	17	19	19
GROUP G ANALYTES			
TSS	151	134	26
SAMPLE NUMBERS	GN931026	GN931052	GN931084
	CN931028	CN931054	CN931086
	CN931027	GN931053	CN931085
VOLATILE COMPOUNDS (ug/L)	Thursday, 21 Oct 93	Friday, 22 Oct 93	Saturday, 23 Oct 93
Benzene	<1.0	<1.0	<1.0
Bromodichloromethane	<1.0	<1.0	<1.0
Bromoform	<1.0	<1.0	<1.0
Bromomethane	<1.0	<1.0	<1.0
Carbon tetrachloride	<1.0	<1.0	<1.0
Chlorobenzene	<1.0	<1.0	<1.0
Chloroethane	<1.0	<1.0	<1.0
2-Chloroethyvinylether	<1.0	<1.0	<1.0
Chloroform	<1.0	<1.0	<1.0
Chloromethane	<1.0	<1.0	<1.0
Chlorodibromomethane	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	<1.0	<1.0	<1.0
1,4-Dichlorobenzene	9.34	5.87	8.32
Dichlorodifluoromethane	<1.0	<1.0	<1.0
1,1-Dichloroethane	<1.0	<1.0	<1.0
1,2-Dichloroethane	<1.0	<1.0	<1.0
1,1-Dichloroethene	<1.0	<1.0	<1.0
Trans-1,2-Dichloroethene	<1.0	<1.0	<1.0
1,2-Dichloropropane	<1.0	<1.0	<1.0
Cis-1,3-Dichloropropene	<1.0	<1.0	<1.0
Trans-1,3-Dichloropropene	<1.0	<1.0	<1.0
Ethylbenzene	<1.0	<1.0	<1.0
Methylene Chloride	156.99	<1.0	<1.0
1,1,2,2-Tetrachloroethane	<1.0	<1.0	<1.0
Tetrachloroethene	<1.0	<1.0	<1.0
Toluene	1.53	<1.0	<1.0
1,1,1-Trichloroethane	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	<1.0	<1.0	<1.0
Trichloroethene	<1.0	<1.0	<1.0
Trichlorofluoromethane	<1.0	<1.0	<1.0
Vinyl Chloride	<1.0	<1.0	<1.0
m-Xylene	*	<1.0	<1.0
o-Xylene	<1.0	<1.0	<1.0
p-Xylene	2.43	<1.0	<1.0

* - m- and p-xylene coelute. p-xylene result is sum of both analytes.

TABLE DD-1, SITE 4, NORTH BRANCH, MANHOLE #63
Base Survey: ELLSWORTH AIR FORCE BASE
Survey Dates: 18-29 October 1993
Contributing Sources: Missle Maintenance, Graphics, and Civil Engineering

	COLLECTION DATE	COLLECTION DATE
GROUP A ANALYTES	Thursday, 21 Oct 93	Friday, 22 Oct 93
Chemical Oxygen Demand (mg/L)	65	123
Oil and Grease (mg/L)	21.2	1.4
Total Petroleum Hydrocarbon (mg/L)	1.2	1.2
Total Phosphorus (mg/L)	1.5	2.2
GROUP D ANALYTES		
Cyanide (mg/L)	0.63	0.006
GROUP E ANALYTES		
Phenols (ug/L)	<10	27
GROUP F ANALYTES		
Aluminum	<0.100	<0.100
Arsenic (mg/L)	<0.010	<0.010
Barium	<0.100	<0.100
Beryllium (mg/L)	<0.010	<0.010
Cadmium	<0.001	0.014
Calcium	82	83.31
Total Chromium (mg/L)	<0.050	<0.050
Cobalt	<0.100	<0.100
Copper (mg/L)	<0.020	0.087
Iron (mg/L)	0.356	2.549
Lead (mg/L)	<0.020	0.023
Magnesium (mg/L)	45.8	43.223
Manganese (mg/L)	0.061	0.225
Mercury (mg/L)	<0.001	<0.001
Molybdenum	<0.100	<0.100
Nickel (mg/L)	<0.050	<0.050
Silver (mg/L)	0.023	0.023
Titanium	<0.100	0.1
Vanadium	<0.100	<0.100
Zinc (mg/L)	<0.050	0.191
ON SITE ANALYSES		
pH (units)	6.4	6.4
Temperature (°C)	16	18
GROUP G ANALYTES		
TSS	200	16
SAMPLE NUMBERS	GN931029	GN931055
	CN931031	CN931057
	CN931030	GN931056
VOLATILE COMPOUNDS (ug/L)	Thursday, 21 Oct 93	Friday, 22 Oct 93
Benzene	<1.0	<1.0
Bromodichloromethane	<1.0	<1.0
Bromoform	<1.0	<1.0
Bromomethane	<1.0	<1.0
Carbon tetrachloride	<1.0	<1.0
Chlorobenzene	<1.0	<1.0
Chloroethane	<1.0	<1.0
2-Chloroethyvinylether	<1.0	<1.0
Chloroform	<1.0	<1.0
Chloromethane	<1.0	<1.0
Chlorodibromomethane	<1.0	<1.0
1,2-Dichlorobenzene	<1.0	<1.0
1,3-Dichlorobenzene	<1.0	<1.0
1,4-Dichlorobenzene	2.63	2.32
Dichlorodifluoromethane	<1.0	<1.0
1,1-Dichloroethane	<1.0	<1.0
1,2-Dichloroethane	<1.0	<1.0
1,1-Dichloroethene	<1.0	<1.0
Trans-1,2-Dichloroethene	<1.0	<1.0
1,2-Dichloropropane	<1.0	<1.0
Cis-1,3-Dichloropropene	<1.0	<1.0
Trans-1,3-Dichloropropene	<1.0	<1.0
Ethylbenzene	<1.0	<1.0
Methylene Chloride	<1.0	<1.0
1,1,2,2-Tetrachloroethane	<1.0	<1.0
Tetrachloroethylene	<1.0	<1.0
Toluene	<1.0	<1.0
1,1,1-Trichloroethane	<1.0	<1.0
1,1,2-Trichloroethane	<1.0	<1.0
Trichloroethylene	<1.0	<1.0
Trichlorofluoromethane	<1.0	<1.0
Vinyl Chloride	<1.0	<1.0

TABLE DE-1, SITE 5, WEST BRANCH LOCATED ADJACENT TO BUILDING 909
Base Survey: ELLSWORTH AIR FORCE BASE
Survey Dates: 18-29 October 1993
Contributing Sources: Flightline Maintenance, PMEL, and Logistics Support

	COLLECTION DATE	COLLECTION DATE	COLLECTION DATE
GROUP A ANALYTES	Thursday, 21 Oct 93	Friday, 22 Oct 93	Saturday, 23 Oct 93
Chemical Oxygen Demand (mg/L)	200	225	245
Oil and Grease (mg/L)	5.4	3.8	4.3
Total Petroleum Hydrocarbon (mg/L)	5.4	<1	<1
Total Phosphorus (mg/L)	5	4.3	4
GROUP D ANALYTES			
Cyanide (mg/L)	0.23	0.006	0.675
GROUP E ANALYTES			
Phenols (ug/L)	22	18	18
GROUP F ANALYTES			
Aluminum	0.357	0.533	0.233
Arsenic (mg/L)	<0.010	<0.010	<0.010
Barium	<0.100	<0.100	<0.100
Beryllium (mg/L)	<0.010	<0.010	<0.010
Cadmium (mg/L)	0.028	0.005	0.002
Calcium	77.43	70.45	70.61
Total Chromium (mg/L)	<0.050	<0.050	<0.050
Colbalt (mg/L)	<0.100	<0.100	<0.100
Copper (mg/L)	0.035	0.06	0.05
Iron (mg/L)	0.554	0.765	0.699
Lead (mg/L)	<0.020	<0.020	<0.020
Magnesium (mg/L)	38.56	35.9	37.98
Manganese (mg/L)	<0.050	0.067	<0.050
Mercury (mg/L)	<0.001	<0.001	<0.001
Molybdenum	<0.100	<0.100	<0.100
Nickel (mg/L)	<0.050	<0.050	<0.050
Silver (mg/L)	<0.005	0.011	0.033
Titanium	<0.100	<0.100	<0.100
Vanadium	<0.100	<0.100	<0.100
Zinc (mg/L)	0.075	0.103	0.08
ON SITE ANALYSES			
pH (units)	6.8	6.8	6.4
Temperature (°C)	18	16	18
GROUP G ANALYTES			
TSS	87	86	35
SAMPLE NUMBERS	GN931032	GN931058	GN931081
	CN931034	CN931060	CN931083
	CN931033	CN931059	CN931082
VOLATILE COMPOUNDS (ug/L)	Thursday, 21 Oct 93	Friday, 22 Oct 93	Saturday, 23 Oct 93
Benzene	<1.0	<1.0	<1.0
Bromodichloromethane	<1.0	<1.0	<1.0
Bromoform	<1.0	<1.0	<1.0
Bromomethane	<1.0	<1.0	<1.0
Carbon tetrachloride	<1.0	<1.0	<1.0
Chlorobenzene	<1.0	<1.0	<1.0
Chloroethane	<1.0	<1.0	<1.0
2-Chloroethyvinylether	<1.0	<1.0	<1.0
Chloroform	<1.0	<1.0	<1.0
Chloromethane	<1.0	<1.0	<1.0
Chlorodibromomethane	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	<1.0	<1.0	<1.0
1,4-Dichlorobenzene	4.45	4.38	5.14
Dichlorodifluoromethane	<1.0	<1.0	<1.0
1,1-Dichloroethane	<1.0	<1.0	<1.0
1,2-Dichloroethane	<1.0	<1.0	<1.0
1,1-Dichloroethene	<1.0	<1.0	<1.0
Trans-1,2-Dichloroethene	<1.0	<1.0	<1.0
1,2-Dichloropropane	<1.0	<1.0	<1.0
Cis-1,3-Dichloropropene	<1.0	<1.0	<1.0
Trans-1,3-Dichloropropene	<1.0	<1.0	<1.0
Ethylbenzene	<1.0	<1.0	<1.0
Methylene Chloride	<1.0	<1.0	<1.0
1,1,2,2-Tetrachloroethane	<1.0	<1.0	<1.0
Tetrachloroethylene	<1.0	<1.0	<1.0
Toluene	<1.0	<1.0	<1.0
1,1,1-Trichloroethane	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	<1.0	<1.0	<1.0
Trichloroethylene	5.09	4.64	6.14
Trichlorofluoromethane	<1.0	<1.0	<1.0
Vinyl Chloride	<1.0	<1.0	<1.0
m-Xylene	<1.0	<1.0	<1.0
o-Xylene	<1.0	<1.0	<1.0
p-Xylene	<1.0	<1.0	<1.0

TABLE DF-1, SITE 6, PRIDE HANGER 7504, MANHOLE #507
Base Survey: ELLSWORTH AIR FORCE BASE
Survey Dates: 18-29 October 1993
Contributing Sources: Aircraft Maintenance and Sanitary

	COLLECTION DATE		COLLECTION DATE	
GROUP A ANALYTES	Thursday, 21 Oct 93		Friday, 22 Oct 93	
Chemical Oxygen Demand (mg/L)		635		250
Oil and Grease (mg/L)		19.2		8.8
Total Petroleum Hydrocarbon (mg/L)		1.7		1
Total Phosphorus (mg/L)		18		5.2
GROUP D ANALYTES				
Cyanide (mg/L)		0.013		0.005
GROUP E ANALYTES				
Phenols (ug/L)		210		86
GROUP F ANALYTES				
Aluminum		0.779		0.151
Arsenic (mg/L)	<0.010		<0.010	
Barium		0.178	<0.100	
Beryllium (mg/L)	<0.010		<0.010	
Cadmium (mg/L)		0.024		0.002
Calcium		62.95		48.02
Total Chromium (mg/L)	<0.050		<0.050	
Cobalt	<0.100		<0.100	
Copper (mg/L)		0.066		0.02
Iron (mg/L)		0.856		0.319
Lead (mg/L)		0.022		0.021
Magnesium (mg/L)		24.33		21.28
Manganese (mg/L)		0.054	<0.050	
Mercury (mg/L)	<0.001		<0.001	
Molybdenum	<0.100		<0.100	
Nickel (mg/L)	<0.050		<0.050	
Silver (mg/L)	<0.005		<0.005	
Titanium	<0.100		<0.100	
Vanidium	<0.100		<0.100	
Zinc (mg/L)		0.492		0.092
ON SITE ANALYSES				
pH (units)	Lost Record		Lost Record	
Temperature (°C)	Lost Record		Lost Record	
GROUP G ANALYTES				
TSS		400		348
SAMPLE NUMBERS	GN931017		GN931043	
	CN931019		CN931045	
	GN931018		GN931044	
VOLATILE COMPOUNDS (ug/L)	Thursday, 21 Oct 93		Friday, 22 Oct 93	
Benzene	<1.0		<1.0	
Bromodichloromethane	<1.0		<1.0	
Bromoform	<1.0		<1.0	
Bromomethane	<1.0		<1.0	
Carbon tetrachloride	<1.0		<1.0	
Chlorobenzene	<1.0		<1.0	
Chloroethane	<1.0		<1.0	
2-Chloroethyvinylether	<1.0		<1.0	
Chloroform	<1.0			1.07
Chloromethane	<1.0		<1.0	
Chlorodibromomethane	<1.0		<1.0	
1,2-Dichlorobenzene	<1.0		<1.0	
1,3-Dichlorobenzene	<1.0		<1.0	
1,4-Dichlorobenzene		11.26		17.56
Dichlorodifluoromethane	<1.0		<1.0	
1,1-Dichloroethane	<1.0		<1.0	
1,2-Dichloroethane	<1.0		<1.0	
1,1-Dichloroethene	<1.0		<1.0	
Trans-1,2-Dichloroethene	<1.0		<1.0	
1,2-Dichloropropane	<1.0		<1.0	
Cis-1,3-Dichloropropene	<1.0		<1.0	
Trans-1,3-Dichloropropene	<1.0		<1.0	
Ethylbenzene	<1.0		<1.0	
Methylene Chloride	<1.0		<1.0	
1,1,2,2-Tetrachloroethane	<1.0		<1.0	
Tetrachloroethylene	<1.0		<1.0	
Toluene	<1.0		<1.0	
1,1,1-Trichloroethane	<1.0		<1.0	
1,1,2-Trichloroethane	<1.0		<1.0	
Trichloroethylene	<1.0		<1.0	
Trichlorofluoromethane	<1.0		<1.0	
Vinyl Chloride	<1.0		<1.0	
m-Xylene	*		<1.0	
o-Xylene	<1.0		<1.0	
p-Xylene		76.78	<1.0	
* - m- and p-xylene coelute. p-xylene result is sum of both				

TABLE DG-1, SITE 7, AGE SUPPORT, MANHOLE #135
Base Survey: ELLSWORTH AIR FORCE BASE
Survey Dates: 18-29 October 1993
Contributing Sources: Aircraft Ground Support Equipment

	COLLECTION DATE	COLLECTION DATE
	Thursday, 21 Oct 93	Friday,22 Oct 93
GROUP A ANALYTES		
Chemical Oxygen Demand (mg/L)	350	Noted Greasy 600
Oil and Grease (mg/L)	2.7	1
Total Petroleum Hydrocarbon (mg/L)	<1	1.4
Total Phosphorus (mg/L)	8.8	12
GROUP D ANALYTES		
Cyanide	0.02	0.016
GROUP E ANALYTES		
Phenols (ug/L)	158	98
GROUP F ANALYTES		
Aluminum	0.636	0.437
Arsenic (mg/L)	<0.010	<0.010
Barium	0.31	0.117
Beryllium (mg/L)	<0.010	<0.010
Cadmium (mg/L)	0.008	0.005
Calcium	59.54	56.09
Total Chromium (mg/L)	<0.050	<0.050
Cobalt	<0.100	<0.100
Copper (mg/L)	0.155	0.133
Iron (mg/L)	1.72	0.817
Lead (mg/L)	0.031	<0.020
Magnesium (mg/L)	24.08	23.58
Manganese (mg/L)	0.056	0.05
Mercury (mg/L)	<0.100	<0.100
Nickel (mg/L)	<0.050	<0.050
Silver (mg/L)	<0.005	<0.005
Titanium	<0.100	<0.100
Vanadium	<0.100	<0.100
Zinc (mg/L)	0.213	0.214
ON SITE ANALYSES		
pH (units)	7.6	8
Temperature (°C)	16	18
GROUP G ANALYTES		
TSS	48	291
SAMPLE NUMBERS	GN931020	GN931046 Verbal from AL/SA
	CN931022	CN931048
	GN931021	GN931047
VOLATILE COMPOUNDS (ug/L)	Thursday, 21 Oct 93	Friday, 22 Oct 93
Benzene	<1.0	<1.0
Bromodichloromethane	<1.0	<1.0
Bromoform	<1.0	<1.0
Bromomethane	<1.0	<1.0
Carbon tetrachloride	<1.0	<1.0
Chlorobenzene	<1.0	<1.0
Chloroethane	<1.0	<1.0
2-Chloroethyvinylether	<1.0	<1.0
Chloroform	<1.0	<1.0
Chloromethane	<1.0	<1.0
Chlorodibromomethane	<1.0	<1.0
1,2-Dichlorobenzene	<1.0	<1.0
1,3-Dichlorobenzene	<1.0	<1.0
1,4-Dichlorobenzene	7.83	21.73
Dichlorodifluoromethane	<1.0	<1.0
1,1-Dichloroethane	<1.0	<1.0
1,2-Dichloroethane	<1.0	<1.0
1,1-Dichloroethene	<1.0	<1.0
Trans-1,2-Dichloroethene	<1.0	<1.0
1,2-Dichloropropane	<1.0	<1.0
Cis-1,3-Dichloropropene	<1.0	<1.0
Trans-1,3-Dichloropropene	<1.0	<1.0
Ethylbenzene	<1.0	<1.0
Methylene Chloride	<1.0	<1.0
1,1,2,2-Tetrachloroethane	<1.0	<1.0
Tetrachloroethylene	<1.0	<1.0
Toluene	<1.0	<1.0
1,1,1-Trichloroethane	<1.0	<1.0
1,1,2-Trichloroethane	<1.0	<1.0
Trichloroethylene	<1.0	<1.0
Trichlorofluoromethane	<1.0	<1.0
Vinyl Chloride	<1.0	<1.0
m-Xylene	<1.0	*
o-Xylene	<1.0	<1.0
p-Xylene	<1.0	1.9
* - m- and p-xylene coelute. p-xylene result is the sum of both analytes.		

TABLE DH-1, SITE 8, FLIGHTLINE SANITARY, MANHOLE #31
Base Survey: ELLSWORTH AIR FORCE BASE
Survey Dates: 18-29 October 1993
Contributing Sources: Flightline Sanitary System Rows 60 to 110

	COLLECTION DATE	COLLECTION DATE
GROUP A ANALYTES	Friday, 22 Oct 93	Saturday, 23 Oct 93
Ammonia	Not Requested	52
Chemical Oxygen Demand (mg/L)	710	2000
Oil and Grease (mg/L)	32.8	31.2
Total Petroleum Hydrocarbon (mg/L)	5.1	8.8
Total Phosphorus (mg/L)		18
GROUP D ANALYTES		
Cyanide (mg/L)	Not Requested	0.008
GROUP E ANALYTES		
Phenols (ug/L)	57	60
GROUP F ANALYTES		
Aluminum	25	3.454
Arsenic (mg/L)	0.012	0.037
Barium	0.38	0.704
Beryllium (mg/L)	<0.010	<0.010
Cadmium (mg/L)	0.033	0.065
Calcium	81	96.13
Total Chromium (mg/L)	0.11	0.07
Cobalt	<0.100	<0.100
Copper (mg/L)	0.32	0.653
Iron (mg/L)	6	5.658
Lead (mg/L)	0.076	0.112
Magnesium (mg/L)	25	27.06
Manganese (mg/L)	25	0.243
Mercury (mg/L)	<0.001	<0.001
Molybdenum	<0.100	<0.100
Nickel (mg/L)	<0.050	<0.050
Silver (mg/L)	<0.005	<0.005
Titanium	<0.100	<0.100
Vanadium	<0.100	<0.100
Zinc (mg/L)	1.1	1.923
ON SITE ANALYSES		
pH (units)	7.5	6.7
Temperature (°C)	14	15
GROUP G ANALYTES		
TSS	1242	(Chunky and Soapy) 1920
SAMPLE NUMBERS	GN931014	GN931075
	CN931016	CN931077
	GN931015	GN931076
VOLATILE COMPOUNDS (ug/L)	Friday, 22 Oct 93	Saturday, 23 Oct 93
Benzene	<1.0	<1.0
Bromodichloromethane	<1.0	<1.0
Bromoform	<1.0	<1.0
Bromomethane	<1.0	<1.0
Carbon tetrachloride	<1.0	<1.0
Chlorobenzene	<1.0	<1.0
Chloroethane	<1.0	<1.0
2-Chloroethyvinylether	<1.0	<1.0
Chloroform	<1.0	<1.0
Chloromethane	<1.0	<1.0
Dibromochloromethane	<1.0	<1.0
1,2-Dichlorobenzene	<1.0	<1.0
1,3-Dichlorobenzene	<1.0	<1.0
1,4-Dichlorobenzene	7.34	8.08
Dichlorodifluoromethane	<1.0	<1.0
1,1-Dichloroethane	<1.0	<1.0
1,2-Dichloroethane	<1.0	<1.0
1,1-Dichloroethene	<1.0	<1.0
Trans-1,2-Dichloroethene	<1.0	<1.0
1,2-Dichloropropane	<1.0	<1.0
Cis-1,3-Dichloropropene	<1.0	<1.0
Trans-1,3-Dichloropropene	<1.0	<1.0
Ethylbenzene	<1.0	<1.0
Methylene Chloride	<1.0	<1.0
1,1,2,2-Tetrachloroethane	<1.0	<1.0
Tetrachloroethene	<1.0	<1.0
Toluene	<1.0	<1.0
1,1,1-Trichloroethane	<1.0	<1.0
1,1,2-Trichloroethane	<1.0	<1.0
Trichloroethene	<1.0	<1.0
Trichlorofluoromethane	<1.0	<1.0
Vinyl Chloride	<1.0	<1.0
m-Xylene	*	<1.0
o-Xylene	<1.0	<1.0
p-Xylene	1.78	<1.0
* - m- and p-xylene are coeluted		
Sample numbers	GN930804	GN930844

TABLE DI-1, SITE 9, MIDDLE BASE, MANHOLE #213
Base Survey: ELLSWORTH AIR FORCE BASE
Survey Dates: 18-29 October 1993
Contributing Sources: BX, Commisary, Chow Hall, Service Stations, SP, & VOQ

	COLLECTION DATE	COLLECTION DATE	COLLECTION DATE	COLLECTION DATE
GROUP A ANALYTES	Tuesday, 26 Oct 93	Wednesday, 27 Oct 93	Wed, 27 Oct 93, Duplicate	Thursday, 28 Oct 93
Ammonia	20	21.2	20.8	21.6
Chemical Oxygen Demand (mg/L)	503	517	345	421
Oil and Grease (mg/L)	90	31.9	18	13.4
Total Petroleum Hydrocarbon (mg/L)	2.4	1.9	1.8	<1.0
Total Phosphorus (mg/L)	6.8	14.6	604	4.6
GROUP D ANALYTES				
Cyanide	<.005	<.005	<.005	<.005
GROUP E ANALYTES				
Phenols (ug/L)	64	137	128	<10
GROUP F ANALYTES				
Aluminum	2	1.5	1.5	1
Arsenic (mg/L)	<0.010	<0.010	<0.010	<0.010
Barium	<0.100	<0.100	<0.100	0.46
Beryllium (mg/L)	<0.010	<0.010	<0.010	<0.010
Cadmium (mg/L)	0.003	<0.001	<0.001	<0.001
Calcium	53	50	49	50
Total Chromium (mg/L)	<0.050	<0.050	<0.050	<0.050
Cobalt	<0.100	<0.100	<0.100	<0.100
Copper (mg/L)	0.064	0.081	0.077	0.079
Iron (mg/L)	0.35	0.61	0.62	0.36
Lead (mg/L)	<0.020	<0.020	<0.020	<0.020
Magnesium (mg/L)	23	22	22	22
Manganese (mg/L)	<0.050	<0.050	<0.050	<0.050
Mercury (mg/L)	<0.001	<0.001	<0.001	<0.001
Nickel (mg/L)	0.05	0.05	0.05	0.05
Silver (mg/L)	<0.005	<0.005	<0.005	<0.005
Titanium	<0.100	<0.100	<0.100	0.18
Vanadium	<0.100	<0.100	<0.100	<0.100
Zinc (mg/L)	0.081	0.069	0.062	0.065
ON SITE ANALYSES				
pH (units)	6.4	6.6	Not Requested	Not Recorded
Temperature (°C)	20	18	Not Requested	Not Recorded
GROUP G ANALYTES				
Residue, (total)	731	455	525	681
Residue, nonfilterable	115	85	75	110
TSS (mg/L)	156	98	Not Requested	Not Performed
SAMPLE NUMBERS	GN932053	GN932083	GN932103	GN932118
	CN932055	CN932085	CN932107	CN932120
	GN932054	GN932084	GN932105	GN932119
VOLATILE COMPOUNDS (ug/L)	Tuesday, 26 Oct 93	Wednesday, 27 Oct 93	Duplicate	Thursday, 28 Oct 93
Benzene	<1.0	<1.0	<1.0	<1.0
Bromodichloromethane	<1.0	<1.0	<1.0	<1.0
Bromoform	<1.0	<1.0	<1.0	<1.0
Bromomethane	<1.0	<1.0	<1.0	<1.0
Carbon tetrachloride	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	<1.0	<1.0	<1.0	<1.0
Chloroethane	<1.0	<1.0	<1.0	<1.0
2-Chloroethyvinylether	<1.0	<1.0	<1.0	<1.0
Chloroform	<1.0	<1.0	<1.0	<1.0
Chloromethane	<1.0	<1.0	<1.0	<1.0
Chlorodibromomethane	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	<1.0	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	<1.0	<1.0	<1.0	<1.0
1,4-Dichlorobenzene	3.6	4.36	3.95	4.87
Dichlorodifluoromethane	<1.0	<1.0	<1.0	1.11
1,1-Dichloroethane	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethene	<1.0	<1.0	<1.0	<1.0
Trans-1,2-Dichloroethene	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane	<1.0	<1.0	<1.0	<1.0
Cis-1,3-Dichloropropene	<1.0	<1.0	<1.0	<1.0
Trans-1,3-Dichloropropene	<1.0	<1.0	<1.0	<1.0
Ethylbenzene	<1.0	<1.0	<1.0	<1.0
Methylene Chloride	<1.0	<1.0	<1.0	<1.0
1,1,2,2-Tetrachloroethane	<1.0	<1.0	<1.0	<1.0
Tetrachloroethylene	<1.0	<1.0	<1.0	<1.0
Toluene	<1.0	1.27	1.44	1.63
1,1,1-Trichloroethane	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	<1.0	<1.0	<1.0	<1.0
Trichloroethylene	<1.0	<1.0	<1.0	<1.0
Trichlorofluoromethane	<1.0	<1.0	<1.0	<1.0
Vinyl Chloride	<1.0	<1.0	<1.0	<1.0
m-Xylene	<1.0	<1.0	<1.0	<1.0
o-Xylene	<1.0	<1.0	<1.0	<1.0
p-Xylene	<1.0	<1.0	<1.0	<1.0

TABLE DJ-1, SITE 10, HOSPITAL and BX COMPLEX, MANHOLE #251
Base Survey: ELLSWORTH AIR FORCE BASE
Survey Dates: 18-29 October 1993
Contributing Sources: BX, Commisary, Chow Hall, Service Stations, SP, & VOQ

	COLLECTION DATE	COLLECTION DATE	COLLECTION DATE
GROUP A ANALYTES	Tuesday, 26 Oct 93	Wednesday, 27 Oct 93	Thursday, 28 Oct 93
Ammonia	6	5.5	13.6
Chemical Oxygen Demand (mg/L)	176	198	180
Oil and Grease (mg/L)	5.1	23.6	11.8
Total Petroleum Hydrocarbon (mg/L)	1	2.4	<1
Total Phosphorus (mg/L)	2.3	3.6	7.2
GROUP D ANALYTES			
Cyanide	<.005	<.005	<.005
GROUP E ANALYTES			
Phenols (ug/L)	21	18	40
GROUP F ANALYTES			
Aluminum	<0.100	0.11	0.14
Arsenic (mg/L)	<0.010	<0.010	<0.010
Barium	<0.100	<0.100	0.46
Beryllium (mg/L)	<0.010	<0.010	<0.010
Cadmium (mg/L)	0.002	<0.001	<0.001
Calcium	27	71	37
Total Chromium (mg/L)	<0.050	<0.050	<0.050
Cobalt	<0.100	<0.100	<0.100
Copper (mg/L)	<0.050	<0.020	0.076
Iron (mg/L)	0.46	0.69	0.52
Lead (mg/L)	<0.020	<0.020	<0.20
Magnesium (mg/L)	11	17	16
Manganese (mg/L)	<0.050	<0.050	<0.050
Mercury (mg/L)	<0.001	<0.001	<0.050
Molybdenum	<0.100	<0.100	<0.10
Nickel (mg/L)	<0.050	<0.050	<0.050
Silver (mg/L)	<0.005	0.035	0.019
Titanium	<0.100	<0.100	<0.100
Vanadium	<0.100	<0.100	<0.100
Zinc (mg/L)	0.078	0.073	0.052
ON SITE ANALYSES			
pH (units)	6.2	6.4	
Temperature (°C)	18	20	
GROUP G ANALYTES			
Residue (total)	398	766	349
Residue, nonfilterable	50	40	8
TSS	91	65	Not Requested
SAMPLE NUMBERS	GN932056	GN932086	GN932121
	CN932058	CN932088	CN932123
	CN932057	CN932087	CN932122
VOLATILE COMPOUNDS (ug/L)	Tuesday, 26 Oct 93	Wednesday, 27 Oct 93	Thursday, 28 Oct 93
Benzene	<1.0	<1.0	<1.0
Bromodichloromethane	<1.0	<1.0	<1.0
Bromoform	<1.0	<1.0	<1.0
Bromomethane	<1.0	<1.0	<1.0
Carbon tetrachloride	<1.0	<1.0	<1.0
Chlorobenzene	<1.0	<1.0	<1.0
Chloroethane	<1.0	<1.0	<1.0
2-Chloroethyvinylether	<1.0	<1.0	<1.0
Chloroform	1.73	3.35	1.32
Chloromethane	<1.0	<1.0	<1.0
Chlorodibromomethane	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	<1.0	<1.0	<1.0
1,4-Dichlorobenzene	<1.0	<1.0	<1.0
Dichlorodifluoromethane	<1.0	<1.0	<1.0
1,1-Dichloroethane	<1.0	<1.0	<1.0
1,2-Dichloroethane	<1.0	<1.0	<1.0
1,1-Dichloroethene	<1.0	<1.0	<1.0
Trans-1,2-Dichloroethene	<1.0	<1.0	<1.0
1,2-Dichloropropane	<1.0	<1.0	<1.0
Cis-1,3-Dichloropropene	<1.0	<1.0	<1.0
Trans-1,3-Dichloropropene	<1.0	<1.0	<1.0
Ethylbenzene	<1.0	<1.0	<1.0
Methylene Chloride	<1.0	<1.0	<1.0
1,1,2,2-Tetrachloroethane	<1.0	<1.0	<1.0
Tetrachloroethylene	<1.0	<1.0	<1.0
Toluene	<1.0	<1.0	<1.0
1,1,1-Trichloroethane	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	<1.0	<1.0	<1.0
Trichloroethylene	<1.0	<1.0	<1.0
Trichlorofluoromethane	<1.0	<1.0	<1.0
Vinyl Chloride	<1.0	<1.0	<1.0

TABLE DK-1, SITE 11, EAST BASE HOUSING, MANHOLE #310
Base Survey: ELLSWORTH AIR FORCE BASE
Survey Dates: 18-29 October 1993
Contributing Sources: Domestic Sanitary

	COLLECTION DATE	COLLECTION DATE	COLLECTION DATE	COLLECTION DATE	COLLECTION DATE	COLLECTION DATE
GROUP A ANALYTES	Saturday, 23 Oct 93	Sunday, 24 Oct 93	Monday, 25 Oct 93	Monday, 25 Oct 93, Duplicat	Tuesday, 26 Oct 93	Wednesday, 27 Oct 93
Ammonia	14		Not Requested			
Chemical Oxygen Demand (mg/L)	260		298			-
Oil and Grease (mg/L)	27.2	12.2	11.8	27.2	35.2	11.2
Total Petroleum Hydrocarbon (mg/L)	6.4	<1.0	1.3	1.9	1	<1
Total Phosphorus (mg/L)	3.2		2.8			
GROUP E ANALYTES						
Phenols (ug/L)	68		43			
GROUP F ANALYTES						
Aluminum	0.996		1.9			
Arsenic (mg/L)	<0.010		<0.010			
Barium	<0.100		<0.100			
Beryllium (mg/L)	<0.010		<0.010			
Cadmium (mg/L)	<0.001		<0.001			
Calcium	57.96		59			
Total Chromium (mg/L)	<0.050		<0.050			
Cobalt	<0.100		<0.100			
Copper (mg/L)	0.024		0.028			
Iron (mg/L)	0.316		0.46			
Lead (mg/L)	<0.020		<0.020			
Magnesium (mg/L)	28.68		27			
Manganese (mg/L)	0.174		0.12			
Mercury (mg/L)	<0.001		<0.001			
Molybdenum	<0.100		<0.100			
Nickel (mg/L)	<0.050		<0.050			
Silver (mg/L)	<0.005		<0.005			
Titanium	<0.100		<0.100			
Vanadium	<0.100		<0.100			
Zinc (mg/L)	<0.050		0.053			
ON SITE ANALYSES						
pH (units)	6.4	6.4	6.6	6.7	6.4	6.8
Temperature (°C)	18	20	18	19	17	18
GROUP G ANANLYTES						
Residue (total)				597	537	457
Residue, nonfilterable				65	70	45
TSS	205		112			
SAMPLE NUMBERS	GN931090	GN932034	GN932013	GN932025	GN932026	GN932031
	CN931092		CN932015			
	CN931092		CN932014			
VOLATILE COMPOUNDS (ug/L)	Saturday, 23 Oct 93		Monday, 25 Oct 93			
Benzene	<1.0		<1.0			
Bromodichloromethane	<1.0		<1.0			
Bromoform	<1.0		<1.0			
Bromomethane	<1.0		<1.0			
Carbon tetrachloride	<1.0		<1.0			
Chlorobenzene	<1.0		<1.0			
Chloroethane	<1.0		<1.0			
2-Chloroethyvinylether	<1.0		<1.0			
Chloroform	1.02		<1.0			
Chloromethane	<1.0		<1.0			
Chlorodibromomethane	<1.0		<1.0			
1,2-Dichlorobenzene	<1.0		<1.0			
1,3-Dichlorobenzene	<1.0		<1.0			
1,4-Dichlorobenzene	2.99		<1.0			
Dichlorodifluoromethane	<1.0		<1.0			
1,1-Dichloroethane	<1.0		<1.0			
1,2-Dichloroethane	<1.0		<1.0			
1,1-Dichloroethene	<1.0		<1.0			
Trans-1,2-Dichloroethene	<1.0		<1.0			
1,2-Dichloropropane	<1.0		<1.0			
Cis-1,3-Dichloropropene	<1.0		<1.0			
Trans-1,3-Dichloropropene	<1.0		<1.0			
Ethylbenzene	<1.0		<1.0			
Methylene Chloride	<1.0		<1.0			
1,1,2,2-Tetrachloroethane	<1.0		<1.0			
Tetrachloroethylene	<1.0		<1.0			
Toluene	8.71		7.33			
1,1,1-Trichloroethane	<1.0		<1.0			
1,1,2-Trichloroethane	<1.0		<1.0			
Trichloroethylene	<1.0		<1.0			
Trichlorofluoromethane	<1.0		<1.0			
Vinyl Chloride	<1.0		<1.0			
m-Xylene	<1.0		<1.0			
o-Xylene	<1.0		<1.0			
p-Xylene	<1.0		<1.0			

TABLE DL-1, SITE 12, NORTH WEST BASE HOUSING, MANHOLE #400
Base Survey: ELLSWORTH AIR FORCE BASE
Survey Dates: 18-29 October 1993
Contributing Sources: Domestic Sanitary

	COLLECTION DATE	COLLECTION DATE	COLLECTION DATE	COLLECTION DATE	COLLECTION DATE
GROUP A ANALYTES	Saturday, 23 Oct 93	Tuesday, 24 Oct 93	Wednesday, 25 Aug 93	Thursday, 26 Aug 93	Friday, 27 Oct 93
Ammonia	17.2		Not Requested		
Chemical Oxygen Demand (mg/L)	490		451		
Oil and Grease (mg/L)	3.5	43.2	36.8	32.8	13.4
Total Petroleum Hydrocarbon (mg/L)	1.2	1	1.4	1.9	<1
Total Phosphorus (mg/L)	6.8		6		
GROUP E ANALYTES					
Phenols (ug/L)	60		64		
GROUP F ANALYTES					
Alumium	2.718		4		
Arsenic (mg/L)	<0.010		<0.010		
Barium	<0.105		<0.100		
Beryllium (mg/L)	<0.010		<0.010		
Cadmium (mg/L)	<0.001		<0.001		
Calcium	51.39		53		
Total Chromium (mg/L)	<0.050		<0.050		
Cobalt	<0.100		<0.100		
Copper (mg/L)	0.143		0.13		
Iron (mg/L)	0.132		0.13		
Lead (mg/L)	<0.020		<0.020		
Magnesium (mg/L)	22.25		23		
Manganese (mg/L)	<0.050		<0.050		
Mercury (mg/L)	<0.001		<0.001		
Molybdenum	<0.100		<0.100		
Nickel (mg/L)	<0.050		<0.050		
Silver (mg/L)	<0.005		<0.005		
Titanium	<0.100		<0.100		
Vanadium	<0.100		<0.100		
Zinc (mg/L)	0.06		0.059		
ON SITE ANALYSES					
pH (units)	7	6.8	6.8	6.4	6.8
Temperature (˚C)	22	20	18	19	21
GROUP G ANALYTES					
Residue (total)				651	578
Residue, nonfilterable				85	125
TSS	171		118		
SAMPLE NUMBERS	GN931093	GN932035	GN932017	GN932029	GN932032
	CN931095		CN932019		
	GN931094		GN932018		
VOLATILE COMPOUNDS (ug/L)	Tuesday, 24 Aug 93		Wednesday, 25 Aug 93		
Benzene	<1.0		<1.0		
Bromodichloromethane	<1.0		<1.0		
Bromoform	<1.0		<1.0		
Bromomethane	<1.0		<1.0		
Carbon tetrachloride	<1.0		<1.0		
Chlorobenzene	<1.0		<1.0		
Chloroethane	<1.0		<1.0		
2-Chloroethyvinylether	<1.0		<1.0		
Chloroform	2.06		2.57		
Chloromethane	<1.0		<1.0		
Chlorodibromomethane	<1.0		<1.0		
1,2-Dichlorobenzene	<1.0		<1.0		
1,3-Dichlorobenzene	<1.0		<1.0		
1,4-Dichlorobenzene	3.07		1.84		
Dichlorodifluoromethane	<1.0		<1.0		
1,1-Dichloroethane	<1.0		<1.0		
1,2-Dichloroethane	<1.0		<1.0		
1,1-Dichloroethene	<1.0		<1.0		
Trans-1,2-Dichloroethene	<1.0		<1.0		
1,2-Dichloropropane	<1.0		<1.0		
Cis-1,3-Dichloropropene	<1.0		<1.0		
Trans-1,3-Dichloropropene	<1.0		<1.0		
Ethylbenzene	<1.0		<1.0		
Methylene Chloride	<1.0		<1.0		
1,1,2,2-Tetrachloroethane	<1.0		<1.0		
Tetrachloroethylene	<1.0		<1.0		
Toluene	<1.0		<1.0		
1,1,1-Trichloroethane	<1.0		<1.0		
1,1,2-Trichloroethane	<1.0		<1.0		
Trichloroethylene	<1.0		<1.0		
Trichlorofluoromethane	<1.0		<1.0		
Vinyl Chloride	<1.0		<1.0		
m-Xylene	<1.0		<1.0		
o-Xylene	<1.0		<1.0		
p-Xylene	<1.0		<1.0		

TABLE DM-1, SITE 13, NORTH EAST BASE HOUSING, MANHOLE UNMARKED
Base Survey: ELLSWORTH AIR FORCE BASE
Survey Dates: 18-29 October 1993
Contributing Sources: Domestic Sanitary

	COLLECTION DATE	COLLECTION DATE	COLLECTION DATE	COLLECTION DATE	COLLECTION DATE
GROUP A ANALYTES	Saturday, 23 Oct 93	Sunday, 24 Oct 93	Monday, 25 Oct 93	Tuesday, 26 Oct 93	Wednesday, 27 Oct 93
Ammonia	21.6		Not Requested		
Chemical Oxygen Demand (mg/L)	440		588		
Oil and Grease (mg/L)	19.2	112	11.3	16.6	14.6
Total Petroleum Hydrocarbon (mg/L)	1.2	2.3	<1	1	1
Total Phosphorus (mg/L)	5.2		7.5		
GROUP E ANALYTES					
Phenols (ug/L)	57		37		
GROUP F ANALYTES					
Aluminum	2.312		4.7		
Arsenic (mg/L)	<0.010		<0.010		
Barium	0.102		0.18		
Beryllium (mg/L)	<0.010		<0.010		
Cadmium (mg/L)	<0.001		<0.001		
Calcium	49.25		64		
Total Chromium (mg/L)	<0.050		<0.010		
Cobalt	<0.100		<0.100		
Copper (mg/L)	0.132		0.26		
Iron (mg/L)	0.343		0.9		
Lead (mg/L)	<0.020		<0.020		
Magnesium (mg/L)	21.19		23		
Manganese (mg/L)	<0.050		<0.050		
Mercury (mg/L)	<0.001		<0.001		
Molybdenum	<0.100		<0.100		
Nickel (mg/L)	<0.050		<0.050		
Silver (mg/L)	<0.005		<0.005		
Titanium	<0.100		<0.100		
Vanadium	<0.100		<0.100		
Zinc (mg/L)	0.065		0.24		
ON SITE ANALYSES					
pH (units)					
Temperature (°C)					
GROUP G ANALYTES					
Residue (total)				542	493
Residue, nonfilterable				90	95
TSS	232		486		
SAMPLE NUMBERS	GN931096	GN932036	GN932021	GN932030	GN932033
	CN931098		CN932023		
	CN931097		GN932022		
VOLATILE COMPOUNDS (ug/L)	Saturday, 23 Oct 93		Monday, 25 Oct 93		
Benzene	<1.0		<1.0		
Bromodichloromethane	<1.0		<1.0		
Bromoform	<1.0		<1.0		
Bromomethane	<1.0		<1.0		
Carbon tetrachloride	<1.0		<1.0		
Chlorobenzene	<1.0		<1.0		
Chloroethane	<1.0		<1.0		
2-Chloroethyvinylether	<1.0		<1.0		
Chloroform	2.93		1.42		
Chloromethane	<1.0		<1.0		
Chlorodibromomethane	<1.0		<1.0		
1,2-Dichlorobenzene	<1.0		<1.0		
1,3-Dichlorobenzene	<1.0		<1.0		
1,4-Dichlorobenzene	2.25		1.73		
Dichlorodifluoromethane	<1.0		<1.0		
1,1-Dichloroethane	<1.0		<1.0		
1,2-Dichloroethane	<1.0		<1.0		
1,1-Dichloroethene	<1.0		<1.0		
Trans-1,2-Dichloroethene	<1.0		<1.0		
1,2-Dichloropropane	<1.0		<1.0		
Cis-1,3-Dichloropropene	<1.0		<1.0		
Trans-1,3-Dichloropropene	<1.0		<1.0		
Ethylbenzene	<1.0		<1.0		
Methylene Chloride	<1.0		<1.0		
1,1,2,2-Tetrachloroethane	<1.0		<1.0		
Tetrachloroethylene	<1.0		<1.0		
Toluene	7.78		9.48		
1,1,1-Trichloroethane	<1.0		<1.0		
1,1,2-Trichloroethane	<1.0		<1.0		
Trichloroethylene	<1.0		<1.0		
Trichlorofluoromethane	<1.0		<1.0		
Vinyl Chloride	<1.0		<1.0		
m-Xylene	<1.0		<1.0		
o-Xylene	<1.0		<1.0		
p-Xylene	<1.0		<1.0		

TABLE DN-1, SITE 14, INDUSTRIAL LINE INFLUENT TO WWTF
Base Survey: ELLSWORTH AIR FORCE BASE
Survey Dates: 18-29 October 1993
Contributing Sources: Industrial Line After Oil/Water Separator

	COLLECTION DATE		COLLECTION DATE		COLLECTION DATE	
GROUP A ANALYTES	Friday, 22 Oct 93		Saturday, 23 Oct 93		Wednesday, 27 Oct 93	
Ammonia	<.2		<.2			
Chemical Oxygen Demand (mg/L)		98		325		429
Oil and Grease (mg/L)	7.0			67.2		188.8
Total Petroleum Hydrocarbon (mg/L)	4.3			21.6		59.2
Total Phosphorus (mg/L)	.35			0.43		0.55
GROUP D ANALYTES						
Cyanide (mg/L)	<.005		<.005		<.005	
GROUP E ANALYTES						
Phenols (ug/L)		27		10		27
GROUP F ANALYTES						
Aluminum		0.47	<0.100			0.28
Arsenic (mg/L)	<0.010		<0.010		<0.010	
Barium		0.102	<0.100			0.11
Beryllium (mg/L)	<0.010		<0.010		<0.010	
Cadmium (mg/L)		0.005	<0.001			0.017
Calcium		57.02		53.72		55
Total Chromium (mg/L)	<0.050		<0.050		<0.050	
Cobalt	<0.100		<0.100		<0.100	
Copper (mg/L)		0.024	<0.020			0.036
Iron (mg/L)		2.07		0.788		1.6
Lead (mg/L)		0.02		0.02		0.03
Magnesium (mg/L)		22.55		21.17		21.4
Manganese (mg/L)		0.14		0.086		0.093
Mercury (mg/L)	<0.001		<0.001		<0.001	
Molybdenum	<0.100		<0.100		<0.100	
Nickel (mg/L)	<0.050		<0.050		<0.050	
Silver (mg/L)	<0.005		<0.005		<0.005	
Titanium	<0.100		<0.100		<0.100	
Vanadium	<0.100		<0.100		<0.100	
Zinc		0.47	<0.050			0.054
ON SITE ANALYSES						
pH (units)		6.5		6		6.2
Temperature (°C)		15		13		14
GROUP G ANALYTES						
Residue (total)	Not Requested		Not Requested			488
Residue, filterable	Not Requested		Not Requested			335
Residue, nonfilterable	Not Requested		Not Requested			10
Residue, total volatile	Not Requested		Not Requested			13
TSS		16		33		29
SAMPLE NUMBERS	GN931007		GN931071		GN932092	
	CN931009		CN931073		CN932094	
	GN931008		GN931072		GN932093	
VOLATILE COMPOUNDS (ug/L)	Friday, 22 Oct 93		Saturday, 23 Oct 93		Wednesday, 27 Oct 93	
Benzene	<1.0		<10			3.87
Bromodichloromethane		1.15	<10		<1.0	
Bromoform	<1.0		<10		<1.0	
Bromomethane	<1.0		<10		<1.0	
Carbon tetrachloride	<1.0		<10		<1.0	
Chlorobenzene	<1.0		<10		<1.0	
Chloroethane	<1.0		<10		<1.0	
2-Chloroethyvinylether	<1.0		<10		<1.0	
Chloroform		1.09	<10		<1.0	
Chloromethane	<1.0		<10		<1.0	
Chlorodibromomethane		1.42	<10		<1.0	
1,2-Dichlorobenzene	<1.0		<10		<1.0	
1,3-Dichlorobenzene	<1.0		<10		<1.0	
1,4-Dichlorobenzene	<1.0		<10		<1.0	
Dichlorodifluoromethane	<1.0		<10		<1.0	
1,1-Dichloroethane	<1.0		<10		<1.0	
1,2-Dichloroethane	<1.0		<10		<1.0	
1,1-Dichloroethene	<1.0		<10		<1.0	
Trans-1,2-Dichloroethene	<1.0		<10		<1.0	
1,2-Dichloropropane	<1.0		<10		<1.0	
Cis-1,3-Dichloropropene	<1.0		<10		<1.0	
Trans-1,3-Dichloropropene	<1.0		<10		<1.0	
Ethylbenzene	<1.0		<10			6.15
Methylene Chloride	<1.0		<10		<1.0	
1,1,2,2-Tetrachloroethane	<1.0		<10		<1.0	
Tetrachloroethylene		1.12	<10			1.02
Toluene	<1.0			33.9		19.62
1,1,1-Trichloroethane	<1.0		<10		<1.0	
1,1,2-Trichloroethane	<1.0		<10		<1.0	
Trichloroethylene		5.49	<10			2.85
Trichlorofluoromethane	<1.0		<10		<1.0	
Vinyl Chloride	<1.0		<10		<1.0	
m-Xylene	<1.0		*		*	
o-Xylene		4.24	<10		<1.0	
p-Xylene	<1.0			36.1		38.14

* - m- and p-xylene coelute. p-xylene result is sum of both analytes.

TABLE DN-2, SITE 14, INDUSTRIAL LINE INFLUENT TO WWTF
Base Survey: ELLSWORTH AIR FORCE BASE
Survey Dates: 18-29 October 1993
Contributing Sources: Industrial Line After Oil/Water Separator

Total Toxic Organics 624&625 (ug/L)	COLLECTION DATE	COLLECTION DATE
Volatile Compounds	Saturday, 23 Oct 93	Wed, 27 Oct 93
Benzene	<5.0	<5.0
Bromodichloromethane	<5.0	<5.0
Bromoform	<5.0	<5.0
Bromomethane	<10.0	<10.0
Carbon tetrachloride	<5.0	<5.0
Chlorobenzene	<5.0	<5.0
Chloroethane	<10.0	<10.0
2-Chloroethyvinylether	<10.0	<10.0
Chloroform	<5.0	<5.0
Chloromethane	<10.0	<10.0
Dibromochloromethane	<5.0	<5.0
1,2-Dichlorobenzene	<5.0	<5.0
1,3-Dichlorobenzene	<5.0	<5.0
1,4-Dichlorobenzene	<5.0	<5.0
1,1-Dichloroethane	<5.0	<5.0
1,2-Dichloroethane	<5.0	<5.0
1,1-Dichloroethene	<5.0	<5.0
cis-1,2-Dichloroethene	<5.0	<5.0
Trans-1,2-Dichloroethene	<5.0	<5.0
1,2-Dichloropropane	<5.0	<5.0
Cis-1,3-Dichloropropene	<5.0	<5.0
Trans-1,3-Dichloropropene	<5.0	<5.0
Ethylbenzene	8	<5.0
Methylene Chloride	<5.0	<5.0
1,1,2,2-Tetrachloroethane	<5.0	<5.0
Tetrachloroethene	<5.0	<5.0
Toluene	36	<5.0
1,1,1-Trichloroethane	<5.0	<5.0
1,1,2-Trichloroethane	<5.0	<5.0
Trichloroethylene	<5.0	<5.0
Trichlorofluoromethane	<10.0	<10.0
Vinyl Chloride	<10.0	<10.0
Base Neutral Compounds (ug/L)		
Acenapthene	<10.0	<10.0
Acenaphthylene	<10.0	<10.0
Anthracene	<10.0	<10.0
Benzo(a)anthracene	<10.0	<10.0
Benzo(b)fluoranthene	<10.0	<10.0
Benzo(a)pyrene	<10.0	<10.0
Benzo(g,h,i,)perylene	<10.0	<10.0
Bis(2-chloroethyl)ether	<10.0	<10.0
Bis(2-chloroethoxy)methane	<10.0	<10.0
Bis(2-chloroisopropal)ether	<10.0	<10.0
Bis(2-ethylhexyl)phthalate	29	130
4-Bromophenyl-phenlether	<10.0	<10.0
Butylbenzylphthalate	<10.0	<10.0
2-Chloronaphthalene	<10.0	<10.0
4-Chlorophenyl-phenlether	<10.0	<10.0
Chrysene	<10.0	<10.0
Dibenzoa,hanthracene	<10.0	<10.0
Di-n-butlphthalate	<10.0	<10.0
1,2-Dichlorobenzene	<10.0	<10.0
1,3-Dichlorobenzene	<10.0	<10.0
1,4-Dichlorobenzene	<10.0	<10.0
3,3'-Dichlorobenzidine	<20.0	<20.0
Diethylphthalate	<10.0	<10.0
Dimethyl phthalate	<10.0	<10.0
2,4-Dinitrotoluene	<10.0	<10.0
2,6-Dinitrotoluene	<10.0	<10.0
Di-n-octylphthalate	<10.0	<10.0
Fluoranthene	<10.0	<10.0
Fluorene	<10.0	<10.0
Hexachlorobenzene	<10.0	<10.0
Hexachlorobutadiene	<10.0	<10.0
Hexachlorocyclopentadiene	<10.0	<10.0
Hexachloroethane	<10.0	<10.0
Indeno(1,2,3-cd)pyrene	<10.0	<10.0
Isophorone	<10.0	<10.0
Naphthalene	<10.0	<10.0
Nitrobenzene	<10.0	<10.0
N-Nitroso dimethyl amine	<10.0	<10.0
N-Nitroso-di-n-propylamine	<10.0	<10.0
N-Nitrosodiphenylamine	<10.0	<10.0
Phenanthrene	<10.0	17
Pyrene	<10.0	<10.0
1,2,4-Trichlorobenzene	<10.0	<10.0
Acid Compounds (ug/L)		
P-Chloro-m-cresol	<10.0	<10.0
2-Chorophenol	<10.0	<10.0
2,4-Dichorophenol	<10.0	<10.0
2,4-Dimethylphenol	<10.0	<10.0
2,4-Dinitrophenol	<50.0	<50.0
4,6-Dinitro-2-methylphenol	<50.0	<50.0
2-Nitrophenol	<10.0	<10.0
4-Nitrophenol	<50.0	<50.0
Pentachlorophenol	<50.0	<50.0
Phenol	<10.0	<10.0
2,4,6-Trichlorophenol	<10.0	<10.0
Sample Number	CN931074	CN932098
	GN931089	GN932099

TABLE DN-3, SITE 14, INDUSTRIAL LINE INFLUENT TO WWTF
Base Survey: ELLSWORTH AIR FORCE BASE
Survey Dates: 18-29 October 1993
Contributing Sources: Industrial Line After Oil/Water Separator

	COLLECTION DATE	COLLECTION DATE
PCB's & PESTICIDES (ug/L)	Saturday, 23 Oct 93	Tuesday, 26 Oct 93
Alpha-BHC	<0.05	<0.05
Beta-BHC	<0.05	<0.05
Delta-BHC	<0.05	<0.05
Lindane	<0.05	<0.05
Heptachlor	<0.05	<0.05
Aldrin	<0.05	<0.05
Heptachlor Epoxide	<0.05	<0.05
Endosulfan I	<0.05	<0.05
Dieldrin	<0.10	<0.10
4,4' DDE	<0.10	<0.10
Endrin	<0.10	<0.10
Endosulfan II	<0.10	<0.10
4,4' DDD	<0.10	<0.10
Endosulfan Sulfate	<0.10	<0.10
4,4-DDT	<0.10	<0.10
Endrin Ketone	NA	NA
Methoxychlor	<0.50	<0.50
Chlordane	<1.00	<1.00
Alpha-Chlorodane	NA	NA
Gamma-Chlorodane	NA	NA
Toxaphene	<1.00	<1.00
Endrin Aldehyde	<0.1	<0.10
Arochlor 1016	<0.50	<0.50
Arochlor 1221	<0.50	<0.50
Arochlor 1232	<0.50	<0.50
Arochlor 1242	<0.50	<0.50
Arochlor 1248	<0.50	<0.50
Arochlor 1254	<1.00	<1.00
Arochlor 1260	<1.00	<1.00
Sample numbers	CN931074	CN932098

NA = Not Analyzed

TABLE DO-1, SITE 15, FLIGHTLINE INDUSTRIAL, MANHOLE #51
Base Survey: ELLSWORTH AIR FORCE BASE
Survey Dates: 18-29 October 1993
Contributing Sources: Flightline Industrial System Rows 60 to 110

	COLLECTION DATE		COLLECTION DATE		COLLECTION DATE		COLLECTION DATE	
GROUP A ANALYTES	Thursday, 21 Oct 93		Friday, 22 Oct 93		Saturday, 23 Oct 93		Wednesday, 27 Oct 93	
Ammonia	NR		NR			0.74		
Nitrate	NR		NR		NR		<.1	
Nitrite	NR		NR		NR		<.02	
Chemical Oxygen Demand (mg/L)		63		70		1090		870
Oil and Grease (mg/L)		15.6		63.6	Visible Grease 212.8			63.6
Total Petroleum Hydrocarbon (mg/L)		9.8		39.2		160		54.4
Total Phosphorus (mg/L)		1.7		1.95		1.7		1
GROUP D ANALYTES								
Cyanide	<.005		<.005		<.005		<.005	
GROUP E ANALYTES								
Phenols (ug/L)		27	<10		<27			42
GROUP F ANALYTES								
Aluminum	<0.100		<0.100			0.138		0.14
Arsenic (mg/L)	<0.010		<0.010		<0.010		<0.010	
Barium		0.116	<0.100			0.105	<0.100	
Beryllium (mg/L)	<0.010		<0.010		<0.010		<0.010	
Cadmium (mg/L)		0.005		0.004	<0.001			0.04
Calcium		60.43		46.98		44.65		51
Total Chromium (mg/L)	<0.050		<0.050		<0.050		<0.050	
Cobalt	<0.100		<0.100		<0.100		<0.100	
Copper (mg/L)		0.038		0.021		0.176		0.07
Iron (mg/L)		0.375		0.32		0.64		0.64
Lead (mg/L)	<0.020		<0.020		<0.020		<0.020	
Magnesium (mg/L)		21.88		19.71		19.02		21
Manganese (mg/L)		0.11		0.054		0.053		0.066
Mercury (mg/L)	<0.001		<0.001		<0.001		<0.001	
Molybdenum	<0.100		<0.100		<0.100		<0.100	
Nickel (mg/L)	<0.050		<0.050		<0.050		<0.050	
Silver (mg/L)	<0.005		<0.005		<0.005		<0.005	
Titanium	<0.100		<0.100		<0.100		<0.100	
Vanadium	<0.100		<0.100		<0.100		<0.100	
Zinc (mg/L)	<0.050		<0.050			0.106		0.09
ON SITE ANALYSES								
pH (units)		6.3		6.2		6.8		6.2
Temperature (°C)		14		15		17		12
GROUP G ANALYTES								
Residue (total)								457
Residue, filterable								325
Residue, nonfilterable								130
Residue, total volatile								120
TSS		27		14		27		289
SAMPLE NUMBERS	GN931023		GN931049		GN931078		GN932095	
	CN931025		CN931051		CN931080		CN932097	
	GN931024		GN931050		GN931079		GN932096	
VOLATILE COMPOUNDS (ug/L)	Thursday, 21 Oct 93		Friday, 22 Oct 93		Saturday, 23 Oct 93		Wednesday, 27 Oct 93	
Benzene	<1.0		<1.0		<10			24.74
Bromodichloromethane		1.62	<1.0		<10		<1.0	
Bromoform	<1.0		<1.0		<10		<1.0	
Bromomethane	<1.0		<1.0		<10		<1.0	
Carbon tetrachloride	<1.0		<1.0		<10		<1.0	
Chlorobenzene	<1.0		<1.0		<10		<1.0	
Chloroethane	<1.0		<1.0		<10		<1.0	
2-Chloroethyvinylether	<1.0		<1.0		<10		<1.0	
Chloroform		1.41	<1.0		<10		<1.0	
Chloromethane	<1.0		<1.0		<10		<1.0	
Chlorodibromomethane		2.28	<1.0		<10		<1.0	
1,2-Dichlorobenzene	<1.0		<1.0		<10		<1.0	
1,3-Dichlorobenzene	<1.0		<1.0		<10		<1.0	
1,4-Dichlorobenzene	<1.0		<1.0		<10		<1.0	
Dichlorodifluoromethane	<1.0		<1.0		<10			1
1,1-Dichloroethane	<1.0		<1.0		<10		<1.0	
1,2-Dichloroethane	<1.0		<1.0		<10		<1.0	
1,1-Dichloroethene	<1.0		<1.0		<10		<1.0	
Trans-1,2-Dichloroethene	<1.0		<1.0		<10		<1.0	
1,2-Dichloropropane	<1.0		<1.0		<10		<1.0	
Cis-1,3-Dichloropropene	<1.0		<1.0		<10		<1.0	
Trans-1,3-Dichloropropene	<1.0		<1.0		<10		<1.0	
Ethylbenzene	<1.0		<1.0		<10			19.4
Methylene Chloride	<1.0		<1.0		<10		<1.0	
1,1,2,2-Tetrachloroethane	<1.0		<1.0		<10		<1.0	
Tetrachloroethylene		19.18		3.59	<10			11.46
Toluene	<1.0		<1.0		<10			94.23
1,1,1-Trichloroethane		1.89	<1.0		<10		<1.0	
1,1,2-Trichloroethane	<1.0		<1.0		<10		<1.0	
Trichloroethylene	<1.0		<1.0		<10		<1.0	
Trichlorofluoromethane	<1.0		<1.0		<10		<1.0	
Vinyl Chloride	<1.0		<1.0		<10		<1.0	
m-Xylene	<1.0		<1.0		<10		*	
o-Xylene		1.92	<1.0		<10			51.59
p-Xylene	<1.0		<1.0		<10			99.99

* - m- and p-xylene coelute. p-xylene result is sum of both analytes

TABLE DP-1, SITE 16, AUDIO VISUAL AND GRAPHICS
Base Survey: ELLSWORTH AIR FORCE BASE
Survey Dates: 18-29 October 1993
Contributing Sources: C.E. Administration and Audio Visual

	COLLECTION DATE		COLLECTION DATE		COLLECTION DATE	
GROUP A ANALYTES	Tuesday, 26 Oct 93		Tuesday, 26 Oct 93 Equip Blk		Wednesday, 27 Oct 93	
Ammonia		20	<0.2			29.6
Kjeldahl Nitrogen (total)		24		0.4		46
Nitrate		0.24	<0.1			1.3
Nitrite	<.02		<.02		<.02	
Chemical Oxygen Demand (mg/L)		59		14		235
Oil and Grease (mg/L)		2.7		0.6		6.4
Total Petroleum Hydrocarbon (mg/L)	<1		<1.0			1.3
Total Phosphorus (mg/L)		2.7		2.1		7.9
GROUP D ANALYTES						
Cyanide		0.02	<0.005			0.147
GROUP E ANALYTES						
Phenols (ug/L)		10	<10.0			27
GROUP F ANALYTES						
Aluminum	<0.100		<0.100			0.17
Arsenic (mg/L)	<0.010		<0.010		<0.010	
Barium	<0.100		<0.100			0.1
Beryllium (mg/L)	<0.010		<0.010		<0.010	
Cadmium (mg/L)		0.004		0.006	<0.001	
Calcium		39	<1.0			50
Total Chromium (mg/L)	<0.050		<0.050		<0.050	
Cobalt	<0.100		<0.100		<0.100	
Copper (mg/L)	<0.020		<0.020			0.054
Iron (mg/L)		0.12	<0.100			1.9
Lead (mg/L)	<0.020		<0.020		<0.020	
Magnesium (mg/L)		16	<1.0			22
Manganese (mg/L)	<0.050		<0.050		<0.050	
Mercury (mg/L)	<0.001		<0.001		<0.001	
Molybdenum	<0.100		<0.100		<0.100	
Nickel (mg/L)	<0.050		<0.050		<0.050	
Silver (mg/L)		0.023		0.023		0.013
Titanium	<0.100		<0.100		<0.100	
Vanadium	<0.100		<0.100		<0.100	
Zinc (mg/L)	<0.050		<0.050			0.077
ON SITE ANALYSES						
pH (units)		6.4	not performed			6.4
Temperature (°C)		18	not performed			20
GROUP G ANALYTES						
Acidity (total)		34		2		95
Residue (total)		431	<1.0			5482
Residue, nonfilterable		55		44		190
TSS		92				184
SAMPLE NUMBERS	GN932065		GN932066		GN932089	
	CN932069		CN932070		CN932091	
	CN932067		CN932068		GN932090	
VOLATILE COMPOUNDS (ug/L)	Tuesday, 26 Oct 93		Tuesday, 26 Oct 93 Equipment Blank		Wednesday, 25 Aug 93	
Benzene	<1.0		<1.0		<1.0	
Bromodichloromethane	<1.0		<1.0		<1.0	
Bromoform	<1.0		<1.0		<1.0	
Bromomethane	<1.0		<1.0		<1.0	
Carbon tetrachloride	<1.0		<1.0		<1.0	
Chlorobenzene	<1.0		<1.0		<1.0	
Chloroethane	<1.0		<1.0		<1.0	
2-Chloroethyvinylether	<1.0		<1.0		<1.0	
Chloroform	<1.0		<1.0		<1.0	
Chloromethane	<1.0		<1.0		<1.0	
Chlorodibromomethane	<1.0		<1.0		<1.0	
1,2-Dichlorobenzene	<1.0		<1.0		<1.0	
1,3-Dichlorobenzene	<1.0		<1.0		<1.0	
1,4-Dichlorobenzene		3.81	<1.0			19.96
Dichlorodifluoromethane	<1.0		<1.0		<1.0	
1,1-Dichloroethane	<1.0		<1.0		<1.0	
1,2-Dichloroethane	<1.0		<1.0		<1.0	
1,1-Dichloroethene	<1.0		<1.0		<1.0	
Trans-1,2-Dichloroethene	<1.0		<1.0		<1.0	
1,2-Dichloropropane	<1.0		<1.0		<1.0	
Cis-1,3-Dichloropropene	<1.0		<1.0		<1.0	
Trans-1,3-Dichloropropene	<1.0		<1.0		<1.0	
Ethylbenzene	<1.0		<1.0		<1.0	
Methylene Chloride	<1.0		<1.0		<1.0	
1,1,2,2-Tetrachloroethane	<1.0		<1.0		<1.0	
Tetrachloroethylene	<1.0		<1.0		<1.0	
Toluene	<1.0			1.1	<1.0	
1,1,1-Trichloroethane		1.45	<1.0		<1.0	
1,1,2-Trichloroethane	<1.0		<1.0		<1.0	
Trichloroethylene	<1.0		<1.0		<1.0	
Trichlorofluoromethane	<1.0		<1.0		<1.0	
Vinyl Chloride	<1.0		<1.0		<1.0	
m-Xylene	<1.0		<1.0		<1.0	
o-Xylene	<1.0		<1.0		<1.0	
p-Xylene	<1.0		<1.0		<1.0	

TABLE DQ-1, POTABLE WATER SAMPLE
Base Survey: ELLSWORTH AIR FORCE BASE
Survey Dates: 18-29 October 1993
Contributing Sources: WWTF Latrine

	COLLECTION DATE			
GROUP A ANALYTES	Friday, 22 Oct 93		VOLATILE COMPOUNDS (ug/L)	Friday, 22 Oct 93
Ammonia	0.22		Benzene	<0.5
Kjeldahl Nitrogen (total)	1.1		Bromodichloromethane	3.45
Nitrate	0.22		Bromoform	1.4
Nitrite	<.02		Bromomethane	<0.5
Chemical Oxygen Demand (mg/L)	Not Requested		n-Butylbnezene	<0.5
Oil and Grease (mg/L)	<.3		sec-Butylbenzene	<0.5
Total Petroleum Hydrocarbon (mg/L)	<1		tert-Butylbenzene	<0.5
Total Phosphorus (mg/L)	<.10		Carbon tetrachloride	<0.5
			Chlorobenzene	<0.5
GROUP D ANALYTES			Chloroethane	<0.5
Cyanide	<.005		2-Chloroethyvinylether	<0.5
			Chloroform	2.04
GROUP E ANALYTES			Chloromethane	<0.5
Phenols (ug/L)	<10		Chlorodibromomethane	4.17
			2-Chlorotoluene	<0.5
GROUP F ANALYTES			4-Chlorotoluene	<0.5
Aluminum	<0.100		p-Cymene	<0.5
Arsenic (mg/L)	<0.010		Dibromomethane	<0.5
Barium	<0.100		1,2-Dichlorobenzene	<0.5
Beryllium (mg/L)	<0.010		1,3-Dichlorobenzene	<0.5
Cadmium (mg/L)	<0.001		1,4-Dichlorobenzene	<0.5
Calcium	50		Dichlorodifluoromethane	<0.5
Total Chromium (mg/L)	<0.050		1,1-Dichloroethane	<0.5
Cobalt	<0.100		1,2-Dichloroethane	<0.5
Copper (mg/L)	<0.020		1,1-Dichloroethene	<0.5
Iron (mg/L)	<0.100		Cis-1,2-Dichloroethene	<0.5
Lead (mg/L)	<0.020		Trans-1,2-Dichloroethene	<0.5
Magnesium (mg/L)	20		1,3-Dichloropropane	<0.5
Manganese (mg/L)	<0.050		2,2-Dichloropropane	<0.5
Mercury (mg/L)	<0.001		1,1-Dichloropropane	<0.5
Molybdenum	<0.100		1,2-Dichloropropane	<0.5
Nickel (mg/L)	<0.050		Cis-1,3-Dichloropropene	<0.5
Silver (mg/L)	<0.005		Trans-1,3-Dichloropropene	<0.5
Titanium	<0.100		Ethylbenzene	<0.5
Vanadium	<0.100		Hexachlorobutadiene	<0.5
Zinc (mg/L)	<0.050		Isopropylbenzene	<0.5
			Methylene Chloride	<0.5
ON SITE ANALYSES			Naphthalene	<0.5
pH (units)	Not Performed		n-Propylbenzene	<0.5
Temperature (°C)	Not Performed		Styrene	<0.5
			1,1,1,2-Tetrachloroethane	<0.5
SAMPLE NUMBERS	GP932000		1,1,2,2-Tetrachloroethane	<0.5
			Tetrachloroethylene	<0.5
			Toluene	<0.5
			1,2,3-Trichlorobenzene	<0.5
			1,2,4-Trichlorobenzene	<0.5
			1,1,1-Trichloroethane	<0.5
			1,1,2-Trichloroethane	<0.5
			Trichloroethylene	<0.5
			Trichlorofluoromethane	<0.5
			1,2,3-Trichloropropane	<0.5
			1,2,4-trimethylbenzene	<0.5
			1,3,5-Trimethylbenzene	<0.5
			Vinyl Chloride	<0.5
			m-Xylene	<0.5
			o-Xylene	<0.5
			p-Xylene	<0.5
			Sample numbers	GP932001

TABLE DQ-2, SPIKE SAMPLES
Base Survey: ELLSWORTH AIR FORCE BASE
Survey Dates: 18-29 October 1993
Contributing Sources:

	COLLECTION DATE	COLLECTION DATE	Parameter Window	Reagent Blank
GROUP A ANALYTES	Tuesday, 26 Oct 93	Wednesday, 27 Oct 93		
Ammonia	9.2	6.2		<0.2
Kjeldahl Nitrogen (mg/L)	8.2	7.7		0.8
Nitrate	4	4		<0.1
Nitrite	<.02	<.02		<0.02
Chemical Oxygen Demand (mg/L)	152	156		
Oil and Grease (mg/L)	36.2	38.4		<.3
Total Petroleum Hydrocarbon (mg/L)	36.2	38.4		<1.0
Total Phosphorus (mg/L)	4.8	5.1		<0.10
GROUP D ANALYTES				
Cyanide	0.34			<0.005
GROUP E ANALYTES				
Phenols (ug/L)	171			<10.0
GROUP F ANALYTES				
Aluminum	0.19	0.18		<0.100
Arsenic (mg/L)	0.043	0.044		<0.010
Barium	0.21	0.2		<0.100
Beryllium (mg/L)	0.05	0.047		<0.010
Cadmium (mg/L)	0.001	0.083		0.001
Calcium	<1.0	<1.0		<1.0
Total Chromium (mg/L)	0.88	0.89		<0.050
Cobalt	<0.100	<0.100		<0.100
Copper (mg/L)	0.071	0.072		<0.02
Iron (mg/L)	0.11	0.11		<0.100
Lead (mg/L)	<0.020	0.068		<0.02
Magnesium (mg/L)	<1.0	<1.0		<1.0
Manganese (mg/L)	0.11	0.11		<0.050
Mercury (mg/L)	0.007	0.004		<0.001
Molybdenum	<0.100	<0.100		<0.100
Nickel (mg/L)	0.099	0.08		<0.050
Silver (mg/L)	0.039	0.037		<0.005
Thallium	0.053	0.059		Not Performed
Titanium	<0.100	<0.100		<0.100
Vanadium	0.13	0.13		<0.100
Zinc (mg/L)	0.088	0.11		<0.100
ON SITE ANALYSES				
pH (units)	3	3		Not Performed
GROUP G ANALYTES				
Acidity (total)				Not Performed
Residue (total)				Not Performed
Residue, nonfilterable				Not Performed
TSS				Not Performed
SAMPLE NUMBERS	GN932100	GN932124		GN931099
	GN932101	GN932125		

APPENDIX E

ANALYSES AND PRESERVATION

WASTEWATER ANALYSES AND PRESERVATION METHODS

Analysis	Preservation	EPA Method	Holding Time (days)
Purgeable Aromatics (VOAs)	4°C	602	14
Purgeable Hydrocarbons (VOHs)	4°C	601	14
Total Metals			
Arsenic	HNO_3	206.2	180
Barium	HNO_3	200.7	180
Beryllium	HNO_3	210.1	180
Cadmium	HNO_3	213.1	180
Chromium	HNO_3	218.1	180
Chromium (VI)	HNO_3	218.1	180
Copper	HNO_3	220.1	180
Iron	HNO_3	236.1	180
Lead	HNO_3	239.1	180
Mercury	HNO_3	245.1	180
Nickel	HNO_3	249.1	180
Silver	HNO_3	272.1	180
Zinc	HNO_3	289.1	180
Cyanide	NaOH	335.3	14
Phenols	H_2SO_4, 4°C	420.2	28
Oils & Greases	H_2SO_4, 4°C	413.2	28
Hydrocarbons, Total Petroleum	H_2SO_4, 4°C	418.1	28
Chemical Oxygen Demand, (COD)	H2S04, 4°C	STD METH 508C	28
Biochemical Oxygen Demand (BOD)	4°C	STD Method 5210	24 hr
Hazardous Waste Characterization	No Preservation	1110,1120, 7.3.3.2, 7.3.4.2	7
Purgeable Halocarbons	4°C	SW-846-8010	1
Purgeable Aromatic Hydrocarbons	4°C	SW-846 8020	14
Total Toxic Organics	4°C	624	14
Total Toxic Organics	4°C	625, 608	7

(CONTINUED)

NOTES: 4°C = Chilled to 4°C
HNO_3 = Add nitric acid to pH < 2.0
H_2SO_4 = Add sulfuric acid to pH < 2.0
NaOH = Add sodium hydroxide to pH > 12.0