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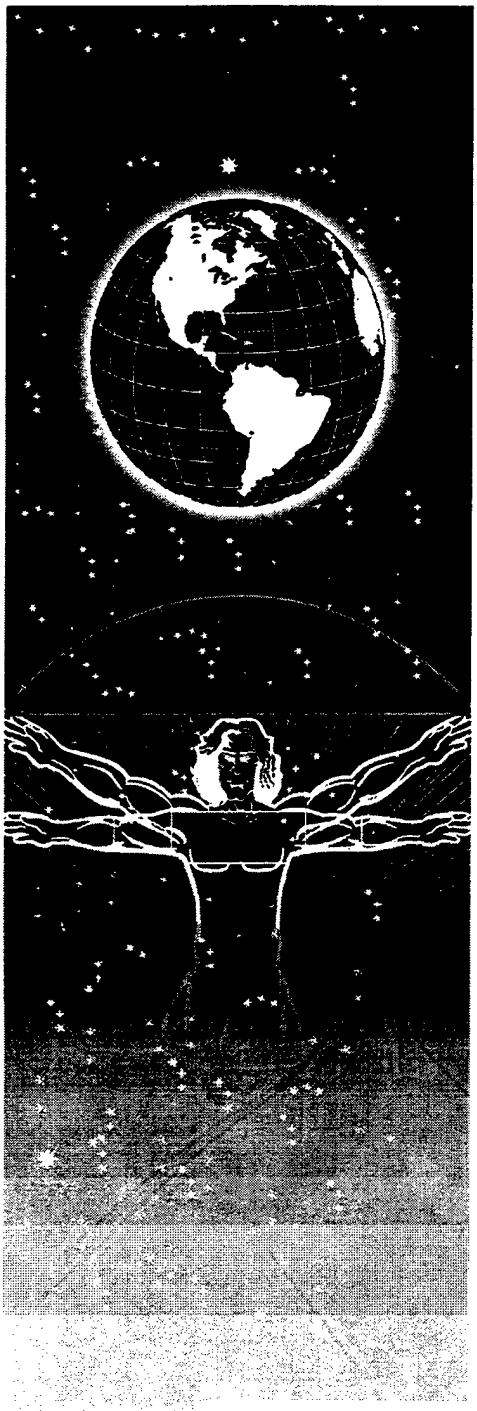

UNITED STATES AIR FORCE
ARMSTRONG LABORATORY

Wastewater Characterization Survey Cavalier Air Station, North Dakota (AFSPC)

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September 1997

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A wastewater characterization survey was conducted at Cavalier Air Station, North Dakota, during the week of 13 to 18 August 1995. The purpose of the survey was to: (1) conduct a baseline characterization of the influent wastewater in the on-site stabilization ponds and (2) to determine source discharge concentrations at specific locations throughout the facility. Special compliance concerns to local environmental officials are the Oil & Grease and Total Petroleum Hydrocarbons (TPH) concentrations entering the waste stabilization ponds and elevated constituents at selected locations throughout the base due to a regulated state effluent permit. A special soil/sediment sample was collected at the outfall of the old washrack..

Recommendations: Under normal conditions, Cavalier Air Station Does not discharge wastewater effluent from the evaporation pond to Willow Creek. In the unlikely event that effluent from the evaporation lagoons are to be diverted or released into Willow Creek tributary system, it is recommended that a grab sample of the effluent be taken without delay. The sample should be analyzed for the NPDES parmeters listed in the CAS discharge permit. Based on sampling results the discharge of COD (estimated BOD), oil and grease into the evaporation pond could equal or exceed the maximum daily discharge parameters for CAS NPDES permit. Analysis of the evaporation pond water would simulate the actual concentration being released into Willow Creek .

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Total Petroleum Hydorcarbon	Old Washrack Outfall	Evaporation Pond Effluent	16. PRICE CODE
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WASTEWATER CHARACTERIZATION SURVEY
CAVALIER AIR STATION, NORTH DAKOTA

INTRODUCTION

A wastewater characterization survey was conducted at Cavalier Air Station, North Dakota, during the week of 13 to 18 August 1995, by personnel from the Water Quality Branch of Armstrong Laboratory's Bioenvironmental Engineering Division (AL/OEBW). This survey was the result of a request from the 10th Space Wing Squadron Commander (10 SWS/CC). This request in response to comments and findings from an Army Environmental Compliance Assessment Survey (ECAS) report received by Cavalier Air Station. Thereby, the supporting Bioenvironmental Engineer, Major Daniel Turek (21 AMDS/SGPB, Peterson AFB, CO) requested the Water Quality Branch to conduct a wastewater characterization survey at Cavalier Air Station. The survey team was lead by Consultant Engineers Captain Christopher Williston and Captain Jeffrey Gillen with MSgt Terry Boyd and TSgt Doris Hemenway providing technical assistance. The purpose of the survey was to: (1) conduct a baseline characterization of the influent waste water into the on-site waste stabilization ponds and (2) to determine source discharge concentrations at specific locations throughout the facility. Special compliance concerns to local environmental officials are the Oil & Grease and Total Petroleum Hydrocarbons (TPH) concentrations entering the waste stabilization ponds and elevated constituents at selected locations throughout the base due to a regulated state effluent permit. At the special request of the environment, health, and safety coordinator, Ms Jean Kotchman, a soil/sediment sample was also collected at the outfall of the old washrack.

DISCUSSION

Background: Cavalier Air Station (CAS) is home to the 10th Space Wing Squadron (10 SWS). The mission of the 10 SWS is to operate, maintain, and support the Perimeter Acquisition Radar (PAR) Attack Characterization System. This radar provides surveillance, tracking, reporting, and object identification support for space surveillance and space intelligence operations. CAS is located in the north eastern corner of North Dakota, approximately 50 miles north of Grand Forks and 20 miles south of the Canadian border. The terrain is gently rolling farmland and representative of the northern great plains. Cavalier Air Station is named after the nearest community of Cavalier, North Dakota. Approximately 26 military, 5 Department of Defense civilian personnel, and 120 contracted civilians are assigned and support CAS. Twelve occupied military family housing units are located on site.

All waste waters generated on CAS eventually discharge to the on-site waste stabilization ponds consisting of a series of three evaporation lagoons located on-the southeast corner of the base. The initial lagoon, which is the smallest of the three, is aerated and discharges to the second lagoon. The third lagoon is not currently being used and was completely dry at the time of the survey. An Oil Intercept Pond, facility 759, adjacent to the initial lagoon receives storm drainage from the Parameter Acquisition Radar (PAR) facilities prior to discharging to the main pond system. The intercept pond is lined with a geo-membrane lining and contained a small quantity of recent storm drainage (approximately 20% of capacity) at the time of the survey. The intercept pond's water was not sampled during the course of this survey. During heavier flows or emergency situations, the final effluent from the evaporation ponds may require discharge via surface drainage to Willow Creek, south of Cavalier Air Station. It is important to note that CAS has not had to surface discharge from the evaporation ponds in over ten years. This comprises the entirety of CAS' waste water treatment system.

The treatment system has a National Pollutant Discharge Elimination System (NPDES) permit issued by the state of North Dakota. The permit identifies the regulated outfall as the surface drainage from the final effluent from the final evaporation lagoon. The maximum daily discharge limitations of the effluent to the Willow Creek system are specified in the NPDES permit outlined in Table 1. The NPDES permit to discharge was terminated by the North Dakota Department of Health and the EPA, Region 8, on 12 August 1996.

Analyte Criteria	Willow Creek Maximum Daily Effluent Limit
Oil & Grease	10 mg/l
Total Suspended Solids	45 mg/l
Biological Oxygen Demand	45 mg/l

TABLE 1. Cavalier Air Station NPDES Permit Maximum Daily Limits

Sampling Strategy: During a presurvey visit, Captain Chris Williston (AL/OEBW) and Ms Jean Kotchman (10 SWS Environmental Flight) reviewed a general layout of the base, noted the locations of potential contributors of domestic, industrial, or high TPH wastestreams, and determined candidate sampling locations for the subsequent wastewater characterization survey. It was believed that these

sampling locations would adequately characterize the base sewage and allow contributing industrial and domestic operations to be identified. Table 2, identifies the preliminary sampling sites chosen for the survey.

TABLE 2. PRE-SURVEY SAMPLING LOCATION DESCRIPTIONS

SITE AND LOCATION	DESCRIPTION / CONTRIBUTING OPERATIONS
SITE 1: 760 Pond Influent	Manhole C-2; north of bldg 820 parking lot, immediately upstream from evaporation ponds
SITE 2: Building 730 Industrial Building	Manhole located northwest of bldg 730.
SITE 3: Military Housing	Manhole located south of old Clinic (bldg 709).
SITE 4: North Base Complex	Manhole southeast of bldg 707, Fire Department
SITE 5: PAR Building 820 & 830	Manhole west of bldg 820 parking lot.

Composite samplers were installed at each sampling point to draw a sample every 30 minutes during a 24-hour time period. The sample aliquots were collected in a single 3 gallon glass container chilled with ice. At the end of each 24 hour period, the composite sample was stirred, samples were split into their respective containers ready for laboratory analyses. This sampling method provides a comprehensive picture of that specific day's activities. The analyses performed at each sampling location was tailored specifically to the anticipated effluent characteristics associated with activities contributing to that waste stream. For instance, all sample locations were analyzed for Chemical Oxygen Demand (COD) load contribution of the effluent. Table 3 summarizes the analyses conducted at each of the sampling points. Site 4 was not utilized during the survey because the Fire Department was being remodeled and was not conducting maintenance operations on any of the vehicles or extinguisher systems. Site 6 is the old washrack surface drainage outfall south east of the Vehicle Maintenance shop. Bldg 709, Clinic was demolished in September 1995.

TABLE 3. ANALYSES SUMMARY

SITE AND LOCATION AND SAMPLE TYPE	ANALYSES PERFORMED
SITE 1: 760 Pond Influent 24 Hr. Composite, 4 Days	• VOCS/SVOC (EPA 601/602/624), • COD, • Oil & Grease, TPH, • Ammonia, • Kjeldahl Nitrogen, Nitrate/Nltrite, • Total Phosphorus, • Phenols, • Metals (EPA 200.7), • Total Reside, Filterable Residue (TDS), Nonfilterable Residue (TSS) EPA 608, 624, & 625
SITE 2: Building 730 Industrial Building 24 Hr. Composite, 3 Days	• VOCS/SVOC (EPA 601/602), • COD, • TPH, • Oil & Grease, • Phenols, • Metals (EPA 200.7),
SITE 3: Military Housing 24 Hr. Composite, 3 Days	• VOCS/SVOC (EPA 601/602), • COD, • TPH, • Oil & Grease, • Ammonia, • Total Phosphorus, Phenols, • Metals (EPA 200.7), • Filterable Residue (TDS) Nonfilterable Residue (TSS) and Total Residue
SITE 4: North Base Complex 24 Hr. Composite, 4 Days	• Due to the limited activity sampling was not accomplished at this site.
SITE 5: PAR Building 820 & 830,24 Hr. Composite, 3 Days	• VOCS/SVOC (EPA 601/602), • COD, • TPH, • Oil & Grease, • Ammonia, • Total Phosphorus, Phenols, • Metals (EPA 200.7), • Filterable Residue (TDS) Nonfilterable Residue (TSS) and Total Residue
SITE 6: Washrack Outfall, Vehicle Maintenance Soil Sample	• TPH, • Oil & Grease, • Metals, (EPA 200.7)

The chemical oxygen demand (COD) characterizes the strength of the waste water. COD measurements are commonly utilized to estimate the biological oxygen demand (BOD) strength of a waste stream. BOD correlates the impact a waste stream has on the oxygen demand on the receiving water's ecosystem. High strength oxygen demanding(OD) wastes may create an anaerobic environment in the receiving water thus impacting aquatic life. For instance high BOD loads have caused fish kills or killed microbiological populations in a receiving water. Due to strict holding times and difficulties in shipping, BOD samples are commonly done with local laboratories or estimated from COD results. COD measurements are often correlated as being twice the biological oxygen demand factors of a waste. Therefore, BOD concentrations can be estimated by calculating 50% of the measured COD concentrations.

The survey team established a temporary laboratory and office in the old snack bar. This snack bar provided the team excellent support with access to sufficient refrigeration, ice, countertop space for sample preservation, and sinks for sample container decontamination. The snack bar is located in the community center which also facilitates the BX, library, bowling alley, social hall, meeting rooms, and Morale Welfare & Recreation (MWR) Services offices.

QUALITY ASSURANCE/QUALITY CONTROL

During this survey a field QA/QC program was utilized that will assist in ensuring the analytical results received are accurate, precise, and reliable. Therefore, the engineering conclusions and recommendations that will utilize these results are valid and competent. Specifically, during the course of the survey. the following QA/QC procedural samples were utilized: equipment blanks, spikes, duplicates, and reagent blank samples. Quality Assurance / Quality Control (QA/QC) protocols are necessary components of a quality environmental survey. QA/QC programs are designed to eliminate, minimize and detect errors involved with obtaining reproducible, accurate, high quality analytical results.

Equipment Blank Samples: This sampling series serves as a check of the contamination introduced due to sampling collection methods and sampling media. Equipment blank samples were collected by drawing laboratory grade water through the sampling collection system (pitcher, sampler, etc.) into the appropriate sample container similarly to an actual sample collected in the field. Preservation, refrigeration, packing and shipping were conducted in exactly the same manner as actual samples collected in the field.

Spike Samples: This series of samples, in conjunction with the laboratory's (AL/OEA) QA/QC plan, serves as to check the preservation of the samples, and the reproducibility of the analytical results Spike samples were collected by filling sample containers with a laboratory prepared, known concentration, spiked standard solution. The spiked standard solutions were prepared by Armstrong Laboratory Analytical Service Division (AL/OEA) Quality Assurance / Quality Control Branch.

Duplicate Samples: Duplicate samples serve to measure the precision of the laboratory to reproduce statistically similar results of a sample that has been equally divided or collected from the same source, and analyzed independently. The precision in which the two laboratories results agree determine whether procedural error has been encountered at one of the laboratories. Precision is the statistical agreement between a set of replicate measurements without assumption or knowledge of the true measured value.

Reagent Blanks Samples: Reagent blank samples ensure the purity of the preservation reagents and to eliminate contributing factors resulting in false analytical results. Reagent blanks were collected by filling sample containers with laboratory grade water and preserving the sample in a similar manner as the other samples were preserved.

SAMPLE RESULTS

SITE 1; POND INFLUENT (Facility 760): Twenty-four hour composite sampling was conducted for four consecutive days. The analytical results characterize the influent wastewater, before treatment. Measurable concentrations of oil and grease, total petroleum hydrocarbons, ammonia, total kjeldahl Nitrogen (TKN), nitrate/nitrite, phosphorus, phenols, sulfates, and metals such as aluminum, barium, copper, iron, manganese, molybdenum, zinc, going into the evaporation pond. Figure 1 summarizes the analytical results for estimated BOD, total petroleum hydrocarbons (TPH), oil & grease, and total suspended solids at the influent to the pond. See Table 4 for Typical Composition of Untreated Domestic Wastewater.

Total suspended solids concentrations ranged from 3 mg/L to 45 mg/L. Total suspended solids were at or below CAS NPDES permit maximum daily limits. Other related solids concentrations such as total residue, filterable residue (TDS), and sulfates can be found in Appendix A; Site 1, Analytical Results.

COD levels range from 38 mg/L to 109 mg/L with an average COD of 68.6 mg/L. The estimated biological oxygen demand range from 19 mg/L to 54.5 mg/L with an average of 34.3 mg/L. On Friday, 18 Aug 95, the estimated BOD going into the evaporation pond exceeded the NPDES permit standard for BOD of 45 mg/l.

The measured concentrations of oil and grease ranged from 2.92 to 28.8 mg/L. The highest 24 hour composite concentration of 28.8 mg/l was observed on Friday, 18 Aug.

EPA Method 625 Total Toxic Organics and Base Neutral Acids Extractable compounds (TTO & BNA) indicated 20.2 µg/L of Bis(2-ethylhexyl)phthalate was flowing into the evaporation pond on 15 Aug 95. No other analytes in this sampling method or EPA method 608 (for PCBs and pesticides) were detected. See Appendix A: Data Table Site 1.

On the 16th of August, a duplicate series of samples were collected as an integral part of our quality control & quality assurance program. Duplicate samples require twice the required sample volume. This duplicate sample did employ splitting one homogenous sample to determine laboratory precision, instead the normal 24-hour composite sample was obtained and then a grab sample was immediately collected for the duplicate. This provides an instantaneous snapshot of the characteristics of the wastewater during that 10 minute time frame. As expected in this case, the duplicate samples' concentration may not approximate equivalent effluent concentrations in the 24 hour composite samples collected just a few minutes before.

It is important to point out that the elevated levels of the criteria limitations identified in the NPDES permit are not indicating that Cavalier Air Station is out of compliance. It is indicating that if an emergency release to Willow Creek was to occur prior to entering the lagoon system that CAS would be out of compliance with its NPDES permit. In the event an emergency discharge is necessary, it is important to utilize the full holding capacity of CAS' lagoon system prior to releasing effluent into the Willow Creek system. Another factor in Cavalier's favor is that there is sufficient reserve storage capacity in the third and largest lagoon, thus greatly minimizing any unforeseen need to bypass the lagoon system altogether and discharge untreated waste water into Willow Creek.

In order to directly determine the compliance status of CAS with its NPDES permit, compliance samples would have to be conducted when an emergency or high volume situation occurred thus causing flow from the final lagoon to the Willow Creek. As stated earlier, this type of discharge has not occurred in over 10 years. Therefore, monitoring at the beginning (head) of the treatment facility will provide an idea of the strength and characteristics of the effluent going into the treatment system. Periodic monitoring at the pond influent will help establish a profile of the waste characteristics.

TABLE 4: Typical Composition of Untreated Domestic Wastewater

CONTAMINANTS	UNIT	CONCENTRATION		
		WEAK	MEDIUM	STRONG
Solids, total (TS)	mg/l	350	720	1200
Dissolved, total (TDS)	mg/l	250	500	850
Fixed	mg/l	145	300	525
Volatile	mg/l	105	200	325
Suspended solids (SS)	mg/l	100	220	350
Fixed	mg/l	20	55	75
Volatile	mg/l	80	165	275
Settleable solids	mg/l	5	10	20
Biochemical oxygen demand	mg/l	110	220	400
BOD_5, 20°C				
Total organic carbon (TOC)	mg/l	80	160	290
Chemical oxygen demand (COD)	mg/l	250	500	1000
Nitrogen (total as N)	mg/l	20	40	85
Organic	mg/l	8	15	35
Free ammonia	mg/l	12	25	50
Nitrites	mg/l	0	0	0
Nitrates	mg/l	0	0	0
Phosphorus (total as P)	mg/l	4	8	15
Organic	mg/l	1	3	5
Inorganic	mg/l	3	5	10
Chlorides	mg/l	30	50	100
Sulfate	mg/l	20	30	50
Alkalinity (as $CaCO_3$)	mg/l	50	100	200
Grease	mg/l	50	100	150
Total Coliform	no/100 ml	10^6 - 10^7	10^7 - 10^8	10^7 - 10^9
Volatile organic compounds (VOCs)	µg/l	<100	100-400	>400

*Metcalf and Eddy, Wastwater Engineering - Treatment, Disposal, Reuse.

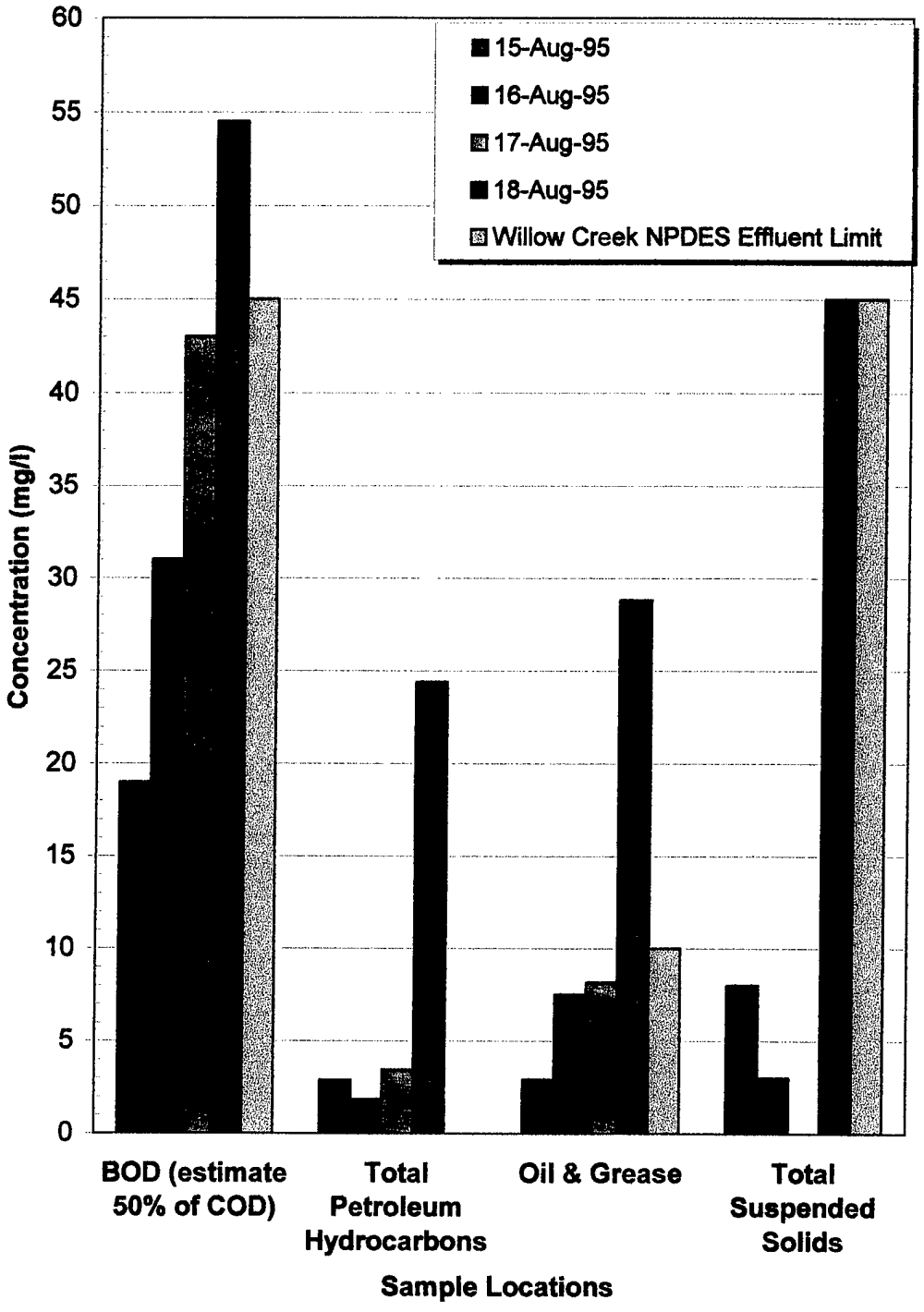

Figure 1 Site 1: 760 Pond Influent Sample Results Summary

SITE 2: VEHICLE MAINTENANCE (BLDG 730): COD is present in vehicle maintenance wastewater. It also contains measurable amounts of oil and grease, total petroleum hydrocarbons, phenols, metals such as aluminum, barium, cadmium, copper, iron, manganese, mercury, selenium, zinc and organic volatile like chloroform and toluene. Toluene levels ranged from 4.7 to 10.6 µg/L. Figure 2 summarizes the analytical results the estimated BOD, total petroleum hydrocarbons (TPH), oil and grease at the Vehicle Maintenance Complex. See Appendix A Table Site 2 for the additional sampling parameter data.

The COD at this site ranged from 111 mg/L to 430 mg/L with an average COD of 217.67 mg/L. BOD levels are from 55.5 mg/L to 215 mg/L with an average of 108.83 mg/L. BOD estimates exceed the permit standard.

Oil and grease levels at this site ranged from 10.24 mg/L to 18.4 mg/L. All the oil and grease levels at this site exceed the 1995 NPDES permit standard for oil and grease. These findings support the need for oil/water separators being added to the sewage lines serving the vehicle wash areas in bldg 730.

Total suspended solids were not analyzed at this site.

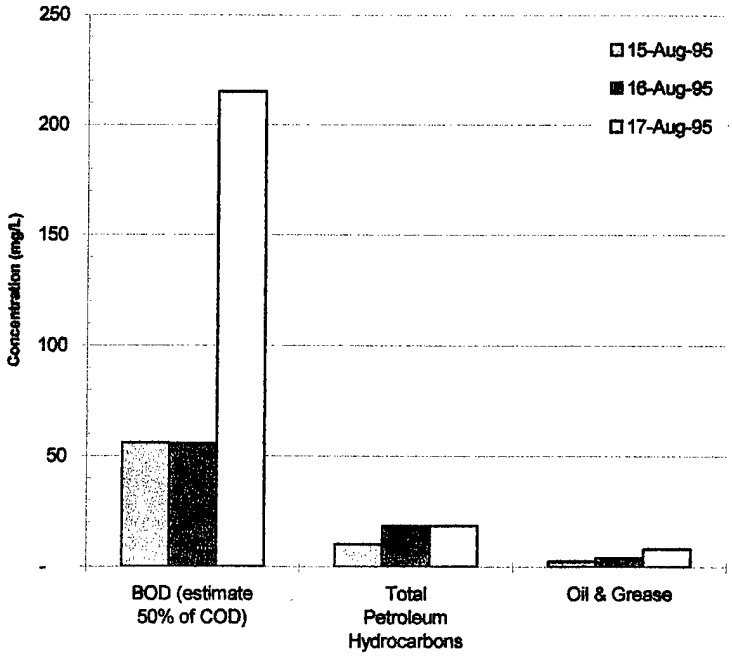

Figure 2 Site 2: Vehicle Maintenance Results Summary

SITE 3: HOUSING AREA: Housing wastewater analysis indicates the presents of COD, oil and grease, total petroleum hydrocarbons, ammonia, phenols, metals such as aluminum, barium, copper, iron, manganese, mercury, zinc, solids and chloroform, a volatile organic compound. Figure 3 summarizes the analytical results of the estimated BOD, total petroleum hydrocarbons (TPH), oil & grease, and total suspended solids from the housing area. See Appendix A Table Site 3 for actual amounts this site contributes to CAS waste stream.

COD ranged from 265 mg/L to 380 mg/L with an average COD of 333 mg/L. BOD estimates range from 132.5 mg/L to 190 mg/L with a average of 166.5 mg/L. BOD estimates at this site also exceed the NPDES permit limits for BOD. Oil and grease levels at this site ranged from 18.4 mg/L to 97.6 mg/L. All the oil and grease levels at this site exceeds the NPDES permit standard for oil and grease.

Total suspended solids ranged from 630 mg/L to 1234 mg/L. Total suspended solids at this site exceeded maximum daily limits.

The manhole at site 3 housing area is off center. A possible safety hazard to personnel and housing area residents does exist because the ground around this manhole is caving in, creating a tripping hazard. The repair to this manhole was completed 24 August 1995.

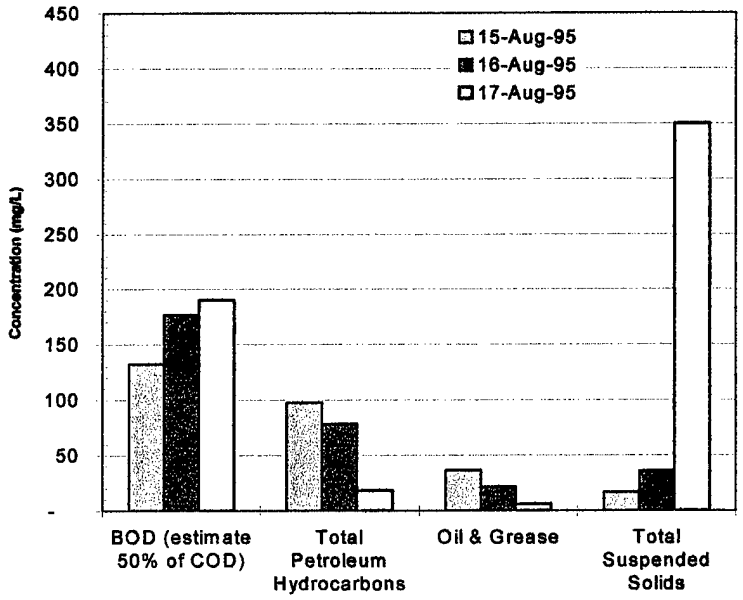

Figure 3 Site 3: Housing Area Results Summary

SITE 4: Fire Department & Billeting: Waste water samples were not taken from this location due to the fire department being remodeled and statements from fire department personnel indicated that the vehicle maintenance facility conducts all routine and special maintenance on all the fire equipment. The temporary lodging and bachelors quarters facilities do not represent a significant loading factor to require detailed analysis since the fire department does not conduct in-house maintenance on any of the fire response equipment.

SITE 5: PAR BLDG 820 & 830: The wastewater from this site indicates the presence of COD and measurable amounts of oil and grease, total petroleum hydrocarbons, ammonia, total phosphorus, phenols, metals such as aluminum, barium, cadmium, copper, iron, molybdenum, zinc, and solids. Figure 4 summarizes the analytical results of the estimated BOD, total petroleum hydrocarbons (TPH), oil & grease, and total suspended solids from PAR Bldg 820 and 830. See Appendix A Table Site 5 for amounts from this waste stream.

COD levels ranged from 43 mg/L to 52 mg/L , the average COD level is 48.67 mg/L. BOD estimates range from 21.5 mg/L to 26 mg/L, with an average BOD level of 24.33 mg/L. BOD estimates are below the BOD NPDES permit standard of 45 mg/L. Oil and grease levels ranged from 3.68 mg/L to 7.92 mg/L. Oil and grease levels are below the maximum daily limits. Total suspended solids ranged from 1 mg/L to 9 mg/L. Total suspended solids are below CAS NPDES permit maximum daily limits. EPA method 608 indicates PCBs and pesticides were not present in this wastewater. See Appendix A Data Table Site 5.

Potable Water Source: Total residue levels were 498 mg/L and filterable residue (TDS) were 536 mg/L. All other analytes in the potable water source did not contribute significant contamination to the wastewater samples. See Appendix A Potable Water Source Table.

Quality Assurance/Quality Control: These results show that sampling procedures did not contribute significant contamination to the samples, and that laboratory results are reliable. See Appendix A Equipment Blank Tables 1 to 3 and Spike Sample Table.

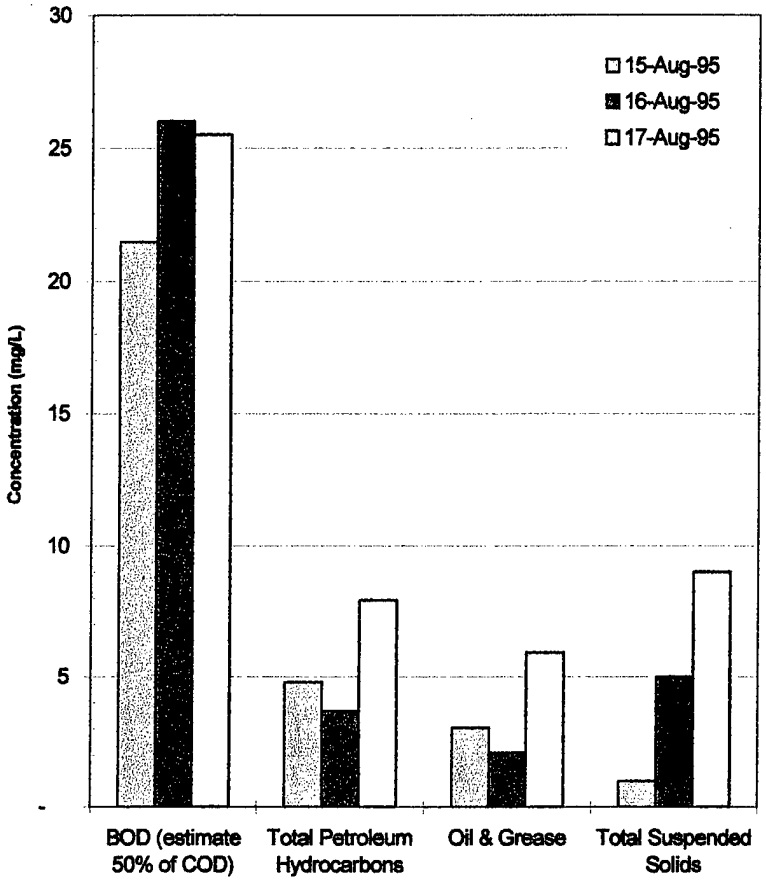

Figure 4 Site 5: PAR Building Area Results Summary

Sediment/Soil Sample from Old Washrack Outfall: Soil/sediment analysis indicates the soil/sediment at the old washrack outfall contains measurable amounts of petroleum hydrocarbons and metals such as arsenic, barium, cadmium, lead and silver. See Appendix A Soil Sample: Old Washrack Outfall.

CONCLUSIONS

The influent to the waste water lagoons were evaluated against the parameters stipulated in CAS' NPDES permit and those parameters of special concern to the base. It is important to point out that the elevated levels of the criteria limitations identified in the NPDES permit did not indicate that Cavalier Air Station was out of compliance. It indicates that if an emergency release to Willow Creek would have occurred prior to the sewage entering the lagoon system that CAS would have been out of compliance with its NPDES permit. In any event, the permit was terminated 12 August 1996. In the event an emergency discharge is necessary, it is important to utilize the full holding capacity of CAS' lagoon system. Prior to releasing effluent into the Willow Creek system, an emergency dewatering authorization must be obtained from the North Dakota Department of Health.

Another factor in Cavalier's favor is that there is sufficient reserve storage capacity in the third and largest lagoon, thus greatly minimizing any unforeseen need to bypass the lagoon system altogether and discharge untreated waste water into Willow Creek.

An emergency or high volume situation causing flow from the final lagoon to the Willow Creek has not occurred in over 10 years. The CAS NPDES discharge permit was terminated 12 Aug 1996. Periodic monitoring at the beginning (head) of the treatment facility will provide an idea of the strength and characteristics of the effluent going into the treatment system. Periodic monitoring at the pond influent will help establish a profile of the waste characteristics in the event any such emergency discharge to Willow Creek occurs.

The estimate of the BOD loading indicates that the concentrations ranged from 19 - 55 mg/l. The general trend shows an increase in BOD loading during the sampling week.

The other criterion parameters indicated minor concentrations (less than 10 mg/l) except for 18 Aug 95, when all 3 measured elevated concentrations higher than earlier in the week. For a facility the size of Cavalier, this could be most singularly attributable to that of the military housing has on the overall loading on the WW system. For instance with the generally low flow conditions prevalent at the facility, weekly routines such as laundry day would significantly increase the loading into the receiving waste water system.

The time weighted, 24 hour composite samples provide a snapshot of the average daily loading being introduced to the WW system, providing relative comparison to determine if more exhaustive, comprehensive compliance sampling, analysis, and monitoring is warranted. Had more significant or higher concentrations been observed at the lagoon influent, further detailed monitoring and individual flow data would have been recommended in order to normalize the snapshot concentrations and conduct contaminant specific mass balance evaluations. This would pin-point likely sources of any problem.

At sites 1, 2, 3, and 5, Figures 5 to 7 illustrate the TPH, Oil & Grease, and an estimate of the BOD concentrations observed at each sample site. Comparing the concentrations of each analyte at each of the sites during the sampling period. In general all three figures, identify the wasteloading from the housing area is significantly higher than the other areas on CAS. Therefore, the domestic waste load is the single most dominant waste contributor. This is consistent with field observations that the housing area had higher flow and that the samples were had visible signs of raw food products and higher solids content and pronounced

detergent sudsing. Sites 2 and 5 had substantially lower concentrations of all the target analytes.

BOD: A general trend of increased concentrations were measured at Site 1 over the course of the week. Site 3 was much higher than 5 and location 2. Location 2 did have a fairly high concentration on 17 Aug 96. Upon reviewing the field notes taken during the survey, no extraordinary remarks were noted concerning peculiarities of that sample when collected. The sharp increase lends itself to suggesting that a substantial (slug) quantity of some specific waste was disposed.

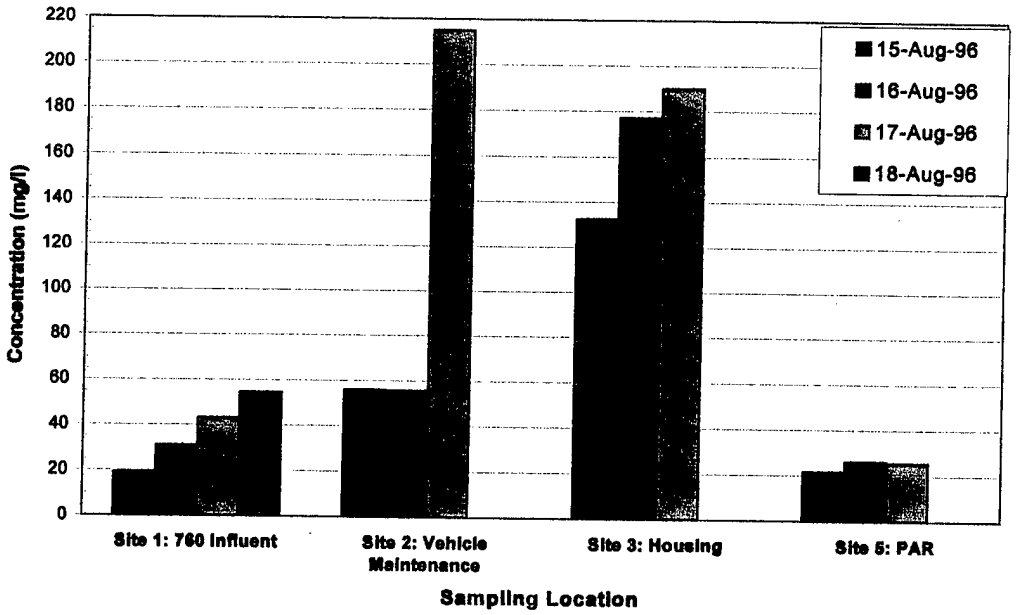

Figure 5: Biological Oxygen Demand Summary Results of All Sites

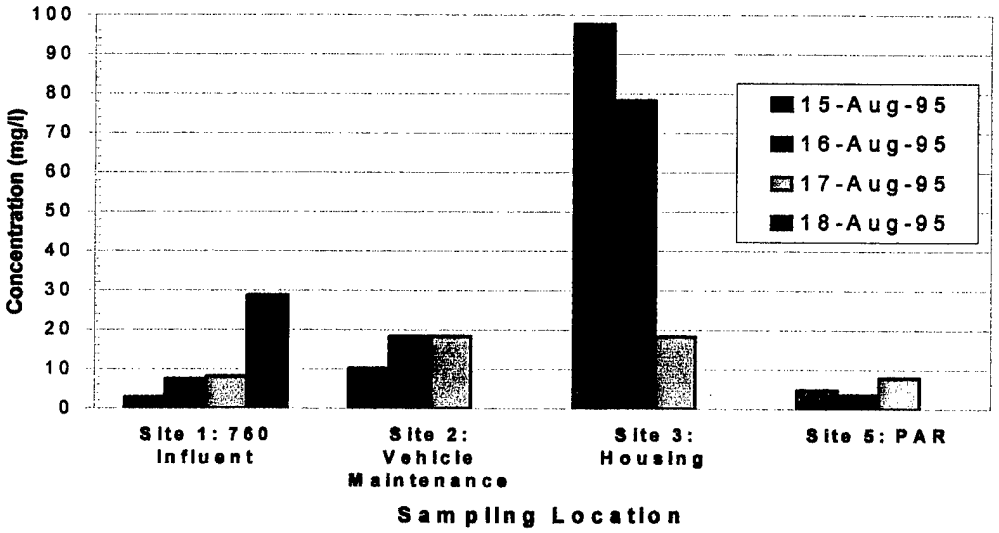

Figure 6: All Sites Oil and Grease Sample Results Summary

Oil and Grease: Similar trends were observed for Oil & Greases. Although housing measured a fairly high concentration of 98 mg/l, the combined effluent concentration to site 1 was only 8 mg/l.

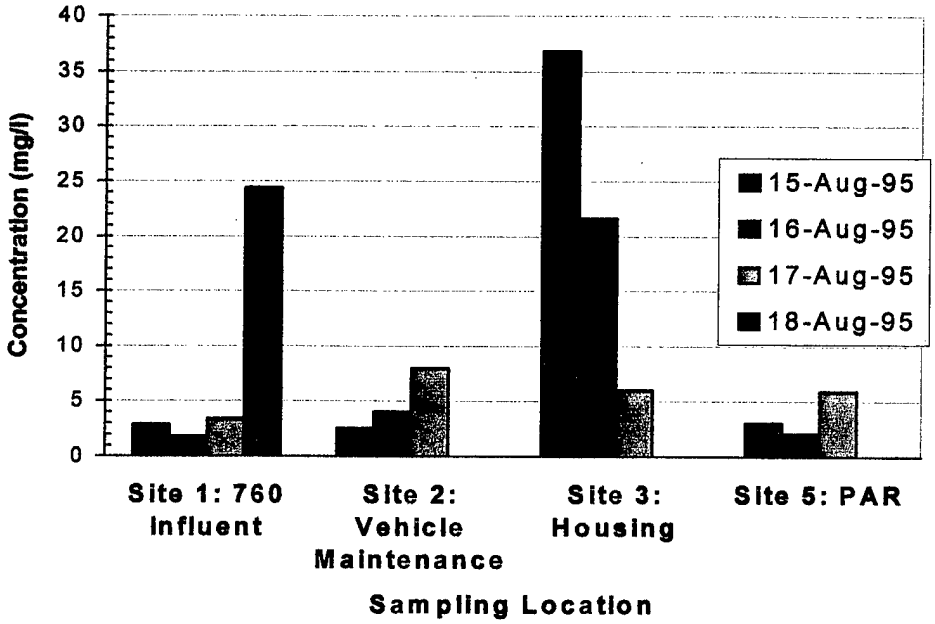

Figure 7: All Sites Total Petroleum Hydrocarbon Sample Results Summary

Total Petroleum Hydrocarbons: On 18 Aug (only site 1 was monitored) uncharacteristically high concentrations of TPH and O&G, were measured. Only site 1 was monitored on 18 August 95. It is not possible to track down the facility zone from which the TPH originated.

Comment: Should Cavalier Air Station ever have a NPDES violation or monitoring indicator, recommend next characterization/compliance survey should be expected to include 7 full days of sampling to compare the zones to the composite at the influent to the lagoon system.

The raw data tables are included as appendices of this technical report for your review and further study. The tables are designed such that only measured quantities are noted to the right side of the column. Concentrations at or below the detection limit are left justified. A few of the metals were measurable but do not have permitted limitation restrictions.

RECOMMENDATIONS

Under normal conditions, Cavalier Air Station does not discharge waste water effluent from the evaporation pond to Willow Creek. In the unlikely event that effluent from the evaporation lagoons be diverted or released into the Willow Creek tributary system, a grab sample of effluent must be taken without delay and notification of the spill/overflow be made to the North Dakota Department of Health (NDDH). It should be noted that the NDDH can authorize emergency dewatering in the event that all cells of the CAS sewage lagoons may be at capacity and discharge is needed. The sample(s) must be analyzed as required by the NDDH since there is potential of discharging wastewater to Willow Creek that could exceed levels of COD (estimated BOD), oil and grease higher than NDDH standards. Analysis of the effluent from the evaporation pond water would determine actual concentrations being released in to Willow Creek during the emergency dewatering activity.

Based on oil and grease samples from vehicle maintenance, site 2, recommend a oil water separator be installed to reduce the amount of oil and grease being discharged into the evaporation ponds.

REFERENCES

1. National Pollutant Discharge Elimination System (NPDES) Permit

2. Armstrong Laboratory, Occupational and Environmental Health Directorate, Analytical Services Division, *Laboratory Guide*. Brooks AFB, Texas: October 1994.

3. Standard Methods for the Examination of Water and Wastewater, 17th Edition, *Methods 5210B and 5220D*. Washington, DC: 1989.

4. Metcalf and Eddy, *Wastewater Engineering-Treatment, Disposal, Reuse*. New York: McGraw-Hill, Inc., 1991.

Appendix A

Data Tables

Cavalier AS, ND

Wastewater Characterization Survey: 13 AUG - 18 AUG 1995

Site 1: 760 Evaporation Pond Influent

			DUPLICATE		
	COLLECTION DATE	COLLECTION DATE	COLLECTION DATE	COLLECTION DATE	COLLECTION DATE
GROUP A & B ANALYTES (mg/L)	TUES, 15 AUG 1995	WED, 16 AUG 95	WED, 16 AUG 95	THUR, 17 AUG 95	FRI, 18 AUG 95
Chemical Oxygen Demand	38	62	48	86	109
Oil and Grease	2.92	7.52	14.4	8.16	28.8
Total Petroleum Hydrocarbon	2.88	1.84	12	3.44	24.4
GROUP C ANALYTES (mg/L)					
Ammonia	3	5	4.4	6.8	8.3
Kjeddahl Nitrogen	6.5	7.6	8	10.1	10.5
Nitrate/Nitrite	1.24	1.2	1.38	0.9	0.68
Total Phosphorus	3.5	4.6	4.7	4.7	4.3
GROUP E ANALYTES (µg/L)					
Phenols	100	50	69	66	66
GROUP F ANALYTES (mg/L)					
Aluminum	0.188	0.222	0.237	0.348	0.449
Antimony	<0.006	<0.006	<0.006	<0.006	<0.006
Arsenic	<0.010	<0.010	<0.010	<0.010	<0.010
Barium	<0.050	0.05	<0.050	<0.050	<0.050
Beryllium	<0.004	<0.004	<0.004	<0.004	<0.004
Cadmium	<0.001	<0.001	<0.001	<0.001	<0.001
Total Chromium	<0.010	<0.010	<0.010	<0.010	<0.010
Cobalt	<0.050	<0.050	<0.050	<0.050	<0.050
Copper	0.029	0.03	0.032	0.03	**0.033**
Iron	0.241	0.213	0.21	0.222	**0.33**
Lead	<0.020	<0.020	<0.020	<0.020	**<0.020**
Manganese	0.072	0.061	0.064	0.069	**0.092**
Mercury	<0.0002	<0.0002	<0.0002	<0.0002	**0.0003**
Molybdenum	1.859	1.953	2.063	1.303	**0.904**
Nickel	<0.030	<0.030	<0.030	<0.030	**<0.030**
Selenium	<0.010	<0.010	<0.010	<0.010	<0.010
Silver	<0.010	<0.010	<0.010	<0.010	<0.010
Thallium	<0.002	<0.002	<0.002	<0.002	<0.002
Titanium	<0.050	<0.050	<0.050	<0.050	<0.050
Vanadium	<0.050	<0.050	<0.050	<0.050	<0.050
Zinc	0.223	<0.050	0.239	0.163	**0.123**
Group G (mg/L)					
Residue Total	1081	1126	1127	*IPC**	907
Residue, Filterable (TDS)	917	934	958	*IPC**	784
Residue, Nonfilterable (TSS)	8	3	7	*IPC**	**45**
Residue, Settleable	1.18	0.4	0.3	*IPC**	<0.2
Residue, Total Volatile	151	178	170	*IPC**	251
Sulfate	434	478	452	*IPC**	329
IPC - Improperly preserved/collected*					
ON SITE ANALYSES					
pH (units)	6.4	6	6	5	6
Temperature (°C)	17	25	25	22	14
SAMPLE NUMBERS	CN951007	CN951014	CN951020	CN951031	CN951036
	CN951008	CN951015	CN951022	CN951032	CN951037
	GN951009	GN951016	GN951027	CN951033	GN951038

Cavalier AS, ND

Wastewater Characterization Survey: 13 AUG - 18 AUG 1995

Site 1: 760 Evaporation Pond Influent

			DUPLICATE		
EPA METHOD 601/602/624	COLLECTION DATE	COLLECTION DATE	COLLECTION DATE	COLLECTION DATE	COLLECTION DATE
VOLATILE COMPOUNDS (ug/L)	TUES, 15 AUG 1995	WED, 16 AUG 95	WED, 16 AUG 95	THUR, 17 AUG 95	FRI, 18 AUG 95
Benzene	<5	<5	<5	<1	<1
Benzyl Chloride	<5	<5	<5	<1	<1
Bromobenzene	<5	<5	<5	<1	<1
Bromodichloromethane	<5	<5	<5	<1	<1
Bromoform	<5	<5	<5	<1	<1
Bromomethane	<5	<5	<5	<1	<1
Carbon tetrachloride	<5	<5	<5	<1	<1
Chlorobenzene	<5	<5	<5	<1	<1
Chlorodibromomethane	<5	<5	<5	<1	<1
Chloroethane	<5	<5	<5	<1	<1
Chloroform	<5	<5	<5	<1	<1
2-Chlorethylvinyl Ether	<5	<5	<5	<1	<1
Chloromethane	<5	<5	<5	<1	<1
Chlorodibromomethane	<5	<5	<5	<1	<1
Dibromomethane	<5	<5	<5	<1	<1
1,2-Dichlorobenzene	<5	<5	<5	<1	<1
1,3-Dichlorobenzene	<5	<5	<5	<1	<1
1,4-Dichlorobenzene	<5	<5	<5	1	<1
Dichlorodifluoromethane	<5	<5	<5	<1	<1
1,1-Dichloroethane	<5	<5	<5	<1	<1
1,2-Dichloroethane	<5	<5	<5	<1	<1
1,1-Dichloroethene	<5	<5	<5	<1	<1
Trans-1,2-Dichloroethene	<5	<5	<5	<1	<1
1,2-Dichloroethene	<5	<5	<5	<1	<1
1,2-Dichloropropane	<5	<5	<5	<1	<1
Cis-1,3-Dichloropropene	<5	<5	<5	<1	<1
Trans-1,3-Dichloropropene	<5	<5	<5	<1	<1
Ethyl Benzene	<5	<5	<5	<1	<1
Methylene Chloride	<5	<5	<5	<1	<1
1,1,1,2-Tetrachloroethane	<5	<5	<5	<1	<1
1,1,2,2-Tetrachloroethane	<5	<5	<5	<1	<1
Tetrachloroethylene	<5	<5	<5	<1	<1
Toluene	<5	<5	<5	<1	<1
1,1,1-Trichloroethane	<5	<5	<5	<1	<1
1,1,2-Trichloroethane	<5	<5	<5	<1	<1
Trichloroethylene	<5	<5	<5	<1	<1
Trichlorofluoromethane	<5	<5	<5	<1	<1
1,2,3-Trichloropropane	<5	<5	<5	<1	<1
Vinyl Chloride	<5	<5	<5	<1	<1
o-Xylene	<5	<5	<5	<1	<1
p,m-Xylene	<5	<5	<5	<1	<1
SAMPLE NUMBER	GN951011	GN951019	GN951029	GN941035	GN951040

Cavalier AS, ND
Wastewater Characterization Survey:
13 AUG - 18 AUG 1995
Site 1: 760 Evaporation Pond Influent

	COLLECTION DATE	COLLECTION DATE	COLLECTION DATE
EPA METHOD 625 (ug/L)	TUES, 15 AUG 1995	WED, 16 AUG 95	WED, 16 AUG 95
Acenaphthene	<5	<5	<5
Acenaphthylene	<5	<5	<5
Anthracene	<5	<5	<5
Aroclor 1260	<5	<5	<5
Benzidine	<5	<5	<5
Benzo(a)anthracene	<5	<5	<5
Benzo(b)fluoranthene	<5	<5	<5
Benzo(k)fluoranthene	<5	<5	<5
Benzo(a)pyrene	<5	<5	<5
Benzo(ghi)perylene	<5	<5	<5
Benzyl butyl phthalate	<5	<5	<5
Bis(2-chloroethyl)ether	<5	<5	<5
Bis(2-chloroethoxy)methane	<5	<5	<5
Bis(2-ethylhexyl)phthalate	20.2	<5	<5
Bis(2-chloroisopropyl)ether	<5	<5	<5
4-Bromophenyl phenyl ether	<5	<5	<5
2-Chloronaphthalene	<5	<5	<5
4-Chlorophenyl phenyl ether	<5	<5	<5
Chrysene	<5	<5	<5
Dibenzo(a,h)anthracene	<5	<5	<5
Di-n-butylphthalate	<5	<5	<5
1,2-Dichlorobenzene	<5	<5	<5
1,3-Dichlorobenzene	<5	<5	<5
1,4-Dichlorobenzene	<5	<5	<5
3,3-Dichlorobenzidine	<5	<5	<5
Diethyl phthalate	<5	<5	<5
Dimethyl phthalate	<5	<5	<5
2,4-Dinitrotoluene	<5	<5	<5
2,6-Dinitrotoluene	<5	<5	<5
Di-n--octyl phthalate	<5	<5	<5
Fluoranthene	<5	<5	<5
Fluorene	<5	<5	<5
Hexachlorobenzene	<5	<5	<5
Hexachlorobutadiene	<5	<5	<5
Hexachlorocyclopentadiene	<5	<5	<5
Hexachloroethane	<5	<5	<5

Cavalier AS, ND

Wastewater Characterization Survey:

13 AUG - 18 AUG 1995

Site 1: 760 Evaporation Pond Influent

	COLLECTION DATE	COLLECTION DATE	COLLECTION DATE
EPA METHOD 625 (ug/L)	TUES, 15 AUG 1995	WED, 16 AUG 95	WED, 16 AUG 95
Indeno(1,2,3-cd)pyrene	<5	<5	<5
Isophorone	<5	<5	<5
Naphthalene	<5	<5	<5
Nitrobenzene	<5	<5	<5
N-Nitrosodimethylamine	<5	<5	<5
N-Nitrosodi-n-propylamine	<5	<5	<5
N-Nitrosodiphenylamine	<5	<5	<5
Phenanthrene	<5	<5	<5
Pyrene	<5	<5	<5
1,2,4-Trichlorobenzene	<5	<5	<5
4-Chloro-3-methylphenol	<5	<5	<5
2-Chlorophenol	<5	<5	<5
2,4-Dichlorophenol	<5	<5	<5
2,4-Dimethylphenol	<5	<5	<5
2,4-Dinitrophenol	<5	<5	<5
2-Methyl-4,6-dinitrophenol	<5	<5	<5
2-Nitrophenol	<5	<5	<5
4-Nitrophenol	<5	<5	<5
Pentachlorophenol	<5	<5	<5
Phenol	<5	<5	<5
2,4,6-Trichlorophenol	<5	<5	<5
SAMPLE NUMBER	GN951012	GN951019	GN951030

Cavalier AS, ND

Wastewater Characterization Survey: 13 AUG - 18 AUG 1995

Site 1: 760 Evaporation Pond Influent

			DUPLICATE		
COLLECTION DATE	COLLECTION DATE	COLLECTION DATE	COLLECTION DATE	COLLECTION DATE	COLLECTION DATE
EPA METHOD 608 (ug/L)	TUES, 15 AUG 1995	WED, 16 AUG 95	WED, 16 AUG 95	THUR, 17 AUG 95	FRI, 18 AUG 95
Aldrin	<0.04	<0.054	<0.04	<0.044	<0.04
alpha-BHC	<0.03	<0.041	<0.03	<0.033	<0.03
beta-BHC	<0.06	<0.081	<0.06	<0.081	<0.06
delta-BHC	<0.09	<0.12	<0.09	<0.66	<0.09
Lindane (gamma-BHC)	<0.03	<0.04	<0.03	<0.1	<0.03
Chlordane	<0.14	<0.19	<0.14	<0.15	<0.14
4,4' DDD	<0.11	<0.15	<0.11	<0.12	<0.11
4,4' DDE	<0.04	<0.054	<0.04	<0.044	<0.04
p, p - DDT	<0.12	<0.16	<0.12	<0.13	<0.12
Dieldrin	<0.02	<0.027	<0.02	<0.022	<0.02
Endosulfan I	<0.14	<0.19	<0.14	<0.15	<0.14
Endosulfan II	<0.04	<0.054	<0.04	<0.044	<0.04
Endosulfan Sulfate	<0.66	<0.89	<0.66	<0.73	<0.66
Endrin	<0.06	<0.081	<0.06	<0.66	<0.06
Endrin Aldehyde	<0.23	<0.31	<0.23	<0.25	<0.23
Heptachlor	<0.03	<0.04	<0.03	<0.033	<0.03
Heptachlor Epoxide	<0.83	<1.12	<0.83	<0.91	<0.83
Texaphene	<1	<1.35	<1	<1.1	<1
Aroclor 1016	<1	<1.35	<1	<1.1	<1
Aroclor 1221	<1	<1.35	<1	<1.1	<1
Aroclor 1232	<1	<1.35	<1	<1.1	<1
Aroclor 1242	<0.65	<0.88	<0.65	<0.72	<0.65
Aroclor 1248	<1	<1.35	<1	<1.1	<1
Aroclor 1254	<1	<1.35	<1	<1.1	<1
Aroclor 1260	<1	<1.35	<1	<1.1	<1
SAMPLE NUMBER	GN951010	GN951017	GN951028	GN951034*	GN951039

Cavalier AS, ND

Wastewater Characterization Survey: 13 AUG - 18 AUG 1995

Site 2: Vehicle Maintenance (Bldg 780)

	COLLECTION DATE	COLLECTION DATE	COLLECTION DATE
GROUP A & B ANALYTES (mg/L)	TUES, 15 AUG 1995	WED, 16 AUG 95	THUR, 17 AUG 95
Chemical Oxygen Demand	112.00	111.00	430.00
Oil and Grease	10.24	18.40	18.40
Total Petroleum Hydrocarbon	2.56	4.08	8.00
GROUP E ANALYTES (ug/L)			
Phenols	156	100	77
GROUP F ANALYTES (mg/L)			
Aluminum	0.95	0.405	0.529
Antimony	<0.006	<0.006	<0.006
Arsenic	<0.010	<0.010	<0.010
Barium	0.085	0.069	0.052
Beryllium	<0.004	<0.004	<0.004
Cadmium	0.001	0.001	<0.001
Total Chromium	<0.010	<0.010	<0.010
Cobalt	<0.050	<0.050	<0.050
Copper	<0.020	0.053	0.065
Iron	3.942	1.72	1.2
Lead	<0.010	<0.020	<0.020
Manganese	2.035	1.74	0.955
Mercury	0.0003	<0.0002	0.0006
Molybdenum	<0.030	<0.030	<0.030
Nickel	<0.030	<0.030	<0.030
Selenium	<0.005	0.005	<0.005
Silver	<0.010	<0.010	<0.010
Thallium	<0.002	<0.002	<0.002
Titanium	<0.050	<0.050	<0.050
Vanadium	<0.050	<0.050	<0.050
Zinc	0.17	0.116	0.171
ON SITE ANALYSES			
pH (units)	6.6	7	7
Temperature (°C)	17	15	14
SAMPLE NUMBERS	GN951041	CN951045	CN951049
	CN951042	CN951046	CN951050
	GN951043	GN951047	CN951051

Cavalier AS, ND

Wastewater Characterization Survey: 13 AUG - 18 AUG 1995

Site 2: Vehicle Maintenance (Bldg 780)

EPA METHOD 601/602	COLLECTION DATE	COLLECTION DATE	COLLECTION DATE
VOLATILE COMPOUNDS (ug/L)	TUES, 15 AUG 1995	WED, 16 AUG 95	THUR, 17 AUG 95
Benzene	<1	<1	<1
Benzyl Chloride	<1	<1	<1
Bromobenzene	<1	<1	<1
Bromodichloromethane	<1	<1	<1
Bromoform	<1	<1	<1
Bromomethane	<1	<1	<1
Carbon tetrachloride	<1	<1	<1
Chlorobenzene	<1	<1	<1
Chlorodibromomethane	<1	<1	<1
Chloroethane	<1	<1	<1
Chloroform	<1	<1	**1.8**
2-Chlorethylvinyl Ether	<1	<1	<1
Chloromethane	<1	<1	<1
Chlorodibromomethane	<1	<1	<1
Dibromomethane	<1	<1	<1
1,2-Dichlorobenzene	<1	<1	<1
1,3-Dichlorobenzene	<1	<1	<1
1,4-Dichlorobenzene	<1	<1	<1
Dichlorodifluoromethane	<1	<1	<1
1,1-Dichloroethane	<1	<1	<1
1,2-Dichloroethane	<1	<1	<1
1,1-Dichloroethene	<1	<1	<1
Trans-1,2-Dichloroethene	<1	<1	<1
1,2-Dichloroethene	<1	<1	<1
1,2-Dichloropropane	<1	<1	<1
Cis-1,3-Dichloropropene	<1	<1	<1
Trans-1,3-Dichloropropene	<1	<1	<1
Ethyl Benzene	<1	<1	<1
Methylene Chloride	<1	<1	<1
1,1,1,2-Tetrachloroethane	<1	<1	<1
1,1,2,2-Tetrachloroethane	<1	<1	<1
Tetrachloroethylene	<1	<1	<1
Toluene	**4.7**	**5.12**	**10.6**
1,1,1-Trichloroethane	<1	<1	<1
1,1,2-Trichloroethane	<1	<1	<1
Trichloroethylene	<1	<1	<1
Trichlorofluoromethane	<1	<1	<1
1,2,3-Trichloropropane	<1	<1	<1
Vinyl Chloride	<1	<1	<1
o-Xylene	<1	<1	<1
p,m-Xylene	<1	<1	<1
SAMPLE NUMBER	GN951044	GN951048	GN941052

Cavalier AS, ND

Wastewater Characterization Survey: 13 AUG - 18 AUG 1995

Site 3: Housing Area

	COLLECTION DATE	COLLECTION DATE	COLLECTION DATE
GROUP A & B ANALYTES (mg/L)	TUES, 15 AUG 1995	WED, 16 AUG 95	THUR, 17 AUG 95
Chemical Oxygen Demand	265	354	380
Oil and Grease	97.6	78.4	18.4
Total Petroleum Hydrocarbon	36.8	21.6	6
GROUP E ANALYTES (ug/L)			
Phenols	120	77	106
GROUP F ANALYTES (mg/L)			
Aluminum	3.77	3.76	7.86
Antimony	<0.006	<0.006	<0.006
Arsenic	<0.010	<0.010	<0.010
Barium	<0.050	0.055	0.09
Beryllium	<0.001	<0.001	<0.001
Cadmium	<0.001	<0.001	<0.001
Total Chromium	<0.010	<0.010	<0.010
Cobalt	<0.050	<0.050	<0.050
Copper	0.044	0.05	0.038
Iron	0.27	0.737	1.06
Lead	<0.020	<0.020	<0.020
Manganese	0.067	1.24	0.493
Mercury	0.0002	0.0002	0.0004
Molybdenum	<0.030	<0.030	<0.030
Nickel	<0.030	<0.030	<0.030
Selenium	<0.005	<0.005	<0.005
Silver	<0.010	<0.010	<0.010
Thallium	<0.002	<0.002	<0.002
Titanium	<0.050	<0.050	0.079
Vanadium	<0.050	<0.050	<0.050
Zinc	0.153	0.157	0.13
Group G (mg/L)			
Residue Total	1137	1039	1269
Residue, Filterable (TDS)	710	1234	630
Residue, Nonfilterable (TSS)	**17**	**36**	**350**
ON SITE ANALYSES			
pH (units)	10	7	7
Temperature (°C)	17	18	17
SAMPLE NUMBERS	CN951053	CN951057	CN951061
	CN951054	CN951058	CN951062
	GN951055	GN951059	CN951063

Cavalier AS, ND

Wastewater Characterization Survey: 13 AUG - 18 AUG 1995

Site 3: Housing Area

EPA METHOD 601/602	COLLECTION DATE	COLLECTION DATE	COLLECTION DATE
VOLATILE COMPOUNDS (ug/L)	TUES, 15 AUG 1995	WED, 16 AUG 95	THUR, 17 AUG 95
Benzene	<1	<1	<1
Benzyl Chloride	<1	<1	<1
Bromobenzene	<1	<1	<1
Bromodichloromethane	<1	<1	<1
Bromoform	<1	<1	<1
Bromomethane	<1	<1	<1
Carbon tetrachloride	<1	<1	<1
Chlorobenzene	<1	<1	<1
Chlorodibromomethane	<1	<1	<1
Chloroethane	<1	<1	<1
Chloroform	1.07	<1	2.6
2-Chlorethylvinyl Ether	<1	<1	<1
Chloromethane	<1	<1	<1
Chlorodibromomethane	<1	<1	<1
Dibromomethane	<1	<1	<1
1,2-Dichlorobenzene	<1	<1	<1
1,3-Dichlorobenzene	<1	<1	<1
1,4-Dichlorobenzene	<1	<1	<1
Dichlorodifluoromethane	<1	<1	<1
1,1-Dichloroethane	<1	<1	<1
1,2-Dichloroethane	<1	<1	<1
1,1-Dichloroethene	<1	<1	<1
Trans-1,2-Dichloroethene	<1	<1	<1
1,2-Dichloroethene	<1	<1	<1
1,2-Dichloropropane	<1	<1	<1
Cis-1,3-Dichloropropene	<1	<1	<1
Trans-1,3-Dichloropropene	<1	<1	<1
Ethyl Benzene	<1	<1	<1
Methylene Chloride	<1	<1	<1
1,1,1,2-Tetrachloroethane	<1	<1	<1
1,1,2,2-Tetrachloroethane	<1	<1	<1
Tetrachloroethylene	<1	<1	<1
Toluene	<1	<1	<1
1,1,1-Trichloroethane	<1	<1	<1
1,1,2-Trichloroethane	<1	<1	<1
Trichloroethylene	<1	<1	<1
Trichlorofluoromethane	<1	<1	<1
1,2,3-Trichloropropane	<1	<1	<1
Vinyl Chloride	<1	<1	<1
o-Xylene	<1	<1	<1
p,m-Xylene	<1	<1	<1
SAMPLE NUMBER	GN951056	GN951060	GN941064

Cavalier AS, ND

Wastewater Characterization Survey: 13 AUG - 18 AUG 1995

Site 5: PAR Facility (Bldg 820)

	COLLECTION DATE	COLLECTION DATE	COLLECTION DATE
GROUP A & B ANALYTES (mg/L)	TUES, 15 AUG 1995	WED, 16 AUG 95	THUR, 17 AUG 95
Chemical Oxygen Demand	43	52	51
Oil and Grease	4.8	3.68	7.92
Total Petroleum Hydrocarbon	3.04	2.08	5.92
GROUP C ANALYTES (mg/L)			
Ammonia	2.1	2.4	1.64
Total Phosphorus	4	3.8	4.1
GROUP E ANALYTES (ug/L)			
Phenols	<10	28	142
GROUP F ANALYTES (mg/L)			
Aluminum	0.077	0.057	<0.030
Antimony	<0.006	<0.006	<0.006
Arsenic	<0.010	<0.010	<0.010
Barium	0.06	0.055	<0.050
Beryllium	<0.001	<0.001	<0.001
Cadmium	0.001	<0.001	0.001
Total Chromium	<0.010	<0.010	<0.010
Cobalt	<0.050	<0.050	<0.050
Copper	0.032	0.023	<0.020
Iron	0.269	0.227	0.21
Lead	<0.020	<0.020	<0.020
Manganese	<0.030	<0.030	<0.030
Mercury	<0.0002	<0.0002	<0.0002
Molybdenum	2.93	2.76	2.53
Nickel	<0.030	<0.030	<0.030
Selenium	<0.005	<0.005	<0.005
Silver	<0.010	<0.010	<0.010
Thallium	<0.002	<0.002	<0.002
Titanium	<0.050	<0.050	<0.050
Vanadium	<0.050	<0.050	<0.050
Zinc	0.294	0.263	0.217
Group G (mg/L)			
Residue Total	1372	1393	1381
Residue, Filterable (TDS)	1230	1230	1274
Residue, Nonfilterable (TSS)	1	5	9
ON SITE ANALYSES			
pH (units)	6	6	5.5
Temperature (°C)	24	24	25
SAMPLE NUMBERS	CN951077	CN951082	CN951087
	CN951078	CN951083	CN951088
	GN951079	GN951084	GN951089

Cavalier AS, ND

Wastewater Characterization Survey: 13 AUG - 18 AUG 1995

Site 5: PAR Facility (Bldg 820)

EPA METHOD 601/602	COLLECTION DATE	COLLECTION DATE	COLLECTION DATE
VOLATILE COMPOUNDS (ug/L)	TUES, 15 AUG 1995	WED, 16 AUG 95	THUR, 17 AUG 95
Benzene	<1	<1	<1
Benzyl Chloride	<1	<1	<1
Bromobenzene	<1	<1	<1
Bromodichloromethane	<1	<1	<1
Bromoform	<1	<1	<1
Bromomethane	<1	<1	<1
Carbon tetrachloride	<1	<1	<1
Chlorobenzene	<1	<1	<1
Chlorodibromomethane	<1	<1	<1
Chloroethane	<1	<1	<1
Chloroform	<1	<1	<1
2-Chlorethylvinyl Ether	<1	<1	<1
Chloromethane	<1	<1	<1
Chlorodibromomethane	<1	<1	<1
Dibromomethane	<1	<1	<1
1,2-Dichlorobenzene	<1	<1	<1
1,3-Dichlorobenzene	<1	<1	<1
1,4-Dichlorobenzene	<1	<1	<1
Dichlorodifluoromethane	<1	<1	<1
1,1-Dichloroethane	<1	<1	<1
1,2-Dichloroethane	<1	<1	<1
1,1-Dichloroethene	<1	<1	<1
Trans-1,2-Dichloroethene	<1	<1	<1
1,2-Dichloroethene	<1	<1	<1
1,2-Dichloropropane	<1	<1	<1
Cis-1,3-Dichloropropene	<1	<1	<1
Trans-1,3-Dichloropropene	<1	<1	<1
Ethyl Benzene	<1	<1	<1
Methylene Chloride	<1	<1	<1
1,1,1,2-Tetrachloroethane	<1	<1	<1
1,1,2,2-Tetrachloroethane	<1	<1	<1
Tetrachloroethylene	<1	<1	<1
Toluene	<1	<1	<1
1,1,1-Trichloroethane	<1	<1	<1
1,1,2-Trichloroethane	<1	<1	<1
Trichloroethylene	<1	<1	<1
Trichlorofluoromethane	<1	<1	<1
1,2,3-Trichloropropane	<1	<1	<1
Vinyl Chloride	<1	<1	<1
o-Xylene	<1	<1	<1
p,m-Xylene	<1	<1	<1
SAMPLE NUMBER	GN951080	GN951085	GN941090

Cavalier AS, ND

Wastewater Characterization Survey:

13 AUG - 18 AUG 1995

Site 5: PAR Facility (Bldg 820)

	COLLECTION DATE	COLLECTION DATE	COLLECTION DATE
EPA METHOD 608 (ug/L)	TUES, 15 AUG 1995	WED, 16 AUG 95	THUR, 17 AUG 95
Aldrin	<0.04	<0.04	<0.05
alpha-BHC	<0.03	<0.03	<0.04
beta-BHC	<0.06	<0.06	<0.07
delta-BHC	<0.09	<0.09	<0.11
Lindane (gamma-BHC)	<0.03	<0.03	<0.04
Chlordane	<0.14	<0.14	<0.17
4,4' DDD	<0.11	<0.11	<0.13
4,4' DDE	<0.04	<0.04	<0.05
p, p - DDT	<0.12	<0.12	<0.14
Dieldrin	<0.02	<0.02	<0.02
Endosulfan I	<0.14	<0.14	<0.17
Endosulfan II	<0.04	<0.04	<0.05
Endosulfan Sulfate	<0.66	<0.66	<0.79
Endrin	<0.06	<0.06	<0.07
Endrin Aldehyde	<0.23	<0.23	<0.28
Heptachlor	<0.03	<0.03	<0.04
Heptachlor Epoxide	<0.83	<0.83	<1
Texaphene	<1	<1	<1.2
Aroclor 1016	<1	<1	<1.2
Aroclor 1221	<1	<1	<1.2
Aroclor 1232	<1	<1	<1.2
Aroclor 1242	<0.65	<0.65	<0.78
Aroclor 1248	<1	<1	<1.2
Aroclor 1254	<1	<1	<1.2
Aroclor 1260	<1	<1	<1.2
SAMPLE NUMBER	GN951081	GN951086	GN951091

Cavalier AS, ND

Wastewater Characterization Survey: 13 AUG - 18 AUG 1995

Potable Water Source (Barracks)

	COLLECTION DATE		COLLECTION DATE
GROUP A & B ANALYTES (mg/L)	WED, 16 AUG 95	EPA METHOD 624 (ug/L)	WED, 16 AUG 95
Chemical Oxygen Demand	10	Benzene	<5
Oil and Grease	0.56	Benzyl Chloride	<5
Total Petroleum Hydrocarbon	<1	Bromobenzene	<5
		Bromodichloromethane	6.3
GROUP C ANALYTES (mg/L)		Bromoform	<5
Ammonia	<0.2	Bromomethane	<5
Kjeddahl Nitrogen	0.5	Carbon tetrachloride	<5
Nitrate/Nitrite	1.16	Chlorobenzene	<5
Total Phosphorus	2.2	Chlorodibromomethane	<5
		Chloroethane	<5
GROUP E ANALYTES (ug/L)		Chloroform	6.5
Phenols	49	2-Chlorethylvinyl Ether	<5
		Chloromethane	<5
GROUP F ANALYTES (mg/L)		Chlorodibromomethane	<5
Aluminum	<0.030	Dibromomethane	<5
Antimony	<0.006	1,2-Dichlorobenzene	<5
Arsenic	<0.010	1,3-Dichlorobenzene	<5
Barium	<0.001	1,4-Dichlorobenzene	<5
Beryllium	<0.004	Dichlorodifluoromethane	<5
Cadmium	<0.001	1,1-Dichloroethane	<5
Total Chromium	<0.010	1,2-Dichloroethane	<5
Cobalt	<0.05	1,1-Dichloroethene	<5
Copper	<0.020	Trans-1,2-Dichloroethene	<5
Iron	<0.030	1,2-Dichloroethene	<5
Lead	<0.005	1,2-Dichloropropane	<5
Manganese	<0.030	Cis-1,3-Dichloropropene	<5
Mercury	<0.0002	Trans-1,3-Dichloropropene	<5
Molybdenum	<0.030	Ethyl Benzene	<5
Nickel	<0.010	Methylene Chloride	<5
Selenium	<0.010	1,1,1,2-Tetrachloroethane	<5
Silver	<0.010	1,1,2,2-Tetrachloroethane	<5
Thallium	<0.002	Tetrachloroethylene	<5
Titanium	<0.050	Toluene	<5
Vanadium	<0.050	1,1,1-Trichloroethane	<5
Zinc	<0.050	1,1,2-Trichloroethane	<5
		Trichloroethylene	<5
Group G (mg/L)		Trichlorofluoromethane	<5
Acidity Total	6	1,2,3-Trichloropropane	<5
Alkalinity Total	214	Vinyl Chloride	<5
Bromide	<0.1	o-Xylene	<5
Residue Total	498	p,m-Xylene	<5
Residue , Filterable (TDS)	536		
Residue, Nonfilterable (TSS)	7	SAMPLE NUMBER	GN951154
Sulfate	113		
		EPA METHOD 501.1 (ug/L)	
ON SITE ANALYSES		Bromodichloromethane	7.07
pH (units)	7	Bromoform	1
Temperature (°C)	20	Chloroform	5.2
		Chlorodibromomethane	5.5
SAMPLE NUMBERS	GP951150	Total Trihalomethane	18.8
	GP951151		
	GP951152	SAMPLE NUMBER	GP951155

Cavalier AS, ND

Wastewater Characterization Survey: 13 AUG - 18 AUG 1995

Potable Water Source (Barracks)

EPA METHOD 608 (ug/L)		Endosulfan Sulfate	<0.66
Aldrin	<0.04	Endrin	<0.06
alpha-BHC	<0.03	Endrin Aldehyde	<0.23
beta-BHC	<0.06	Heptachlor	<0.03
delta-BHC	<0.09	Heptachlor Epoxide	<0.83
Lindane (gamma-BHC)	<0.03	Texaphene	<1
Chlordane	<0.14	Aroclor 1016	<1
4,4' DDD	<0.11	Aroclor 1221	<1
4,4' DDE	<0.04	Aroclor 1232	<1
p, p - DDT	<0.12	Aroclor 1242	<1
Dieldrin	<0.02	Aroclor 1248	<0.65
Endosulfan I	<0.14	Aroclor 1254	<1
Endosulfan II	<0.04	Aroclor 1260	<1
			<1
		SAMPLE NUMBER	GP951123

Cavalier AS, ND

Wastewater Characterization Survey: 13 AUG - 18 AUG 1995

Equipment Blanks

	PITCHER BLANK		PITCHER BLANK
	COLLECTION DATE		COLLECTION DATE
GROUP A & B ANALYTES (mg/L)	TUES, 15 AUG 1995	EPA METHOD 601/602/624	TUES, 15 AUG 1995
Chemical Oxygen Demand	10	VOLATILE COMPOUNDS (ug/L)	
Oil and Grease	BROKE IN TRANSIT	Benzene	<5
Total Petroleum Hydrocarbon	BROKE IN TRANSIT	Benzyl Chloride	<5
		Bromobenzene	<5
GROUP C ANALYTES (mg/L)		Bromodichloromethane	<5
Ammonia	<0.2	Bromoform	<5
Kjeddahl Nitrogen	0.8	Bromomethane	<5
Nitrate/Nitrite	<0.1	Carbon tetrachloride	<5
Total Phosphorus	<0.10	Chlorobenzene	<5
		Chlorodibromomethane	<5
GROUP E ANALYTES (ug/L)		Chloroethane	<5
Phenols	NOT REQUESTED	Chloroform	<5
		2-Chlorethylvinyl Ether	<5
GROUP F ANALYTES (mg/L)		Chloromethane	<5
Aluminum	<0.030	Chlorodibromomethane	<5
Antimony	<0.006	Dibromomethane	<5
Arsenic	<0.010	1,2-Dichlorobenzene	<5
Barium	<0.050	1,3-Dichlorobenzene	<5
Beryllium	<0.004	1,4-Dichlorobenzene	<5
Cadmium	<0.005	Dichlorodifluoromethane	<5
Total Chromium	<0.005	1,1-Dichloroethane	<5
Cobalt	<0.050	1,2-Dichloroethane	<5
Copper	<0.020	1,1-Dichloroethene	<5
Iron	<0.020	Trans-1,2-Dichloroethene	<5
Lead	<0.020	1,2-Dichloroethene	<5
Manganese	<0.030	1,2-Dichloropropane	<5
Mercury	<0.0002	Cis-1,3-Dichloropropene	<5
Molybdenum	<0.030	Trans-1,3-Dichloropropene	<5
Nickel	<0.030	Ethyl Benzene	<5
Selenium	<0.010	Methylene Chloride	<5
Silver	<0.010	1,1,1,2-Tetrachloroethane	<5
Thallium	<0.002	1,1,2,2-Tetrachloroethane	<5
Titanium	<0.050	Tetrachloroethylene	<5
Vanadium	<0.050	Toluene	<5
Zinc	<0.050	1,1,1-Trichloroethane	<5
		1,1,2-Trichloroethane	<5
Group G (mg/L)		Trichloroethylene	<5
Acidity Total	2	Trichlorofluoromethane	<5
Alkalinity Total	4	1,2,3-Trichloropropane	<5
Residue Total	114	Vinyl Chloride	<5
Residue , Filterable (TDS)	421	o-Xylene	<5
Residue, Nonfilterable (TSS)	2		
Residue, Settleable	<0.2	SAMPLE NUMBER	GN951144
Residue, Volatile	22		GN951140
Sulfate	<1		GN951141
			GN951142

Cavalier AS, ND

Wastewater Characterization Survey: 13 AUG - 18 AUG 1995

Equipment Blanks

	PITCHER BLANK		PITCHER BLANK
	COLLECTION DATE		COLLECTION DATE
EPA METHOD 625 (ug/L)	TUES, 15 AUG 1995	EPA METHOD 625 (ug/L) Continued	TUES, 15 AUG 1995
Acenaphthene	<5	Fluoranthene	<5
Acenaphthylene	<5	Fluorene	<5
Anthracene	<5	Hexachlorobenzene	<5
Aroclor 1260	<5	Hexachlorobutadiene	<5
Benzidine	<5	Hexachlorocyclopentadiene	<5
Benzo(a)anthracene	<5	Hexachloroethane	<5
Benzo(b)fluoranthene	<5	Indeno(1,2,3-cd)pyrene	<5
Benzo(k)fluoranthene	<5	Isophorone	<5
Benzo(a)pyrene	<5	Naphthalene	<5
Benzo(ghi)perylene	<5	Nitrobenzene	<5
Benzyl butyl phthalate	10.2	N-Nitrosodimethylamine	<5
Bis(2-chloroethyl)ether	<5	N-Nitrosodi-n-propylamine	<5
Bis(2-chloroethoxy)methane	<5	N-Nitrosodiphenylamine	<5
Bis(2-ethylhexyl)phthalate	<5	Phenanthrene	<5
Bis(2-chloroisopropyl)ether	<5	Pyrene	<5
4-Bromophenyl phenyl ether	<5	1,2,4-Trichlorobenzene	<5
2-Chloronaphthalene	<5	4-Chloro-3-methylphenol	<5
4-Chlorophenyl phenyl ether	<5	2-Chlorophenol	<5
Chrysene	<5	2,4-Dichlorophenol	<5
Dibenzo(a,h)anthracene	<5	2,4-Dimethylphenol	<5
Di-n-butylphthalate	<5	2,4-Dinitrophenol	<5
1,2-Dichlorobenzene	<5	2-Methyl-4,6-dinitrophenol	<5
1,3-Dichlorobenzene	<5	2-Nitrophenol	<5
1,4-Dichlorobenzene	5.4	4-Nitrophenol	<5
3,3-Dichlorobenzidine	<5	Pentachlorophenol	<5
Diethyl phthalate	<5	Phenol	<5
Dimethyl phthalate	<5	2,4,6-Trichlorophenol	<5
2,4-Dinitrotoluene	<5		
2,6-Dinitrotoluene	<5	SAMPLE NUMBER	GN951145
Di-n--octyl phthalate	<5		

Cavalier AS, ND

Wastewater Characterization Survey: 13 AUG - 18 AUG 1995

Equipment Blanks

	PITCHER BLANK		PITCHER BLANK
	COLLECTION DATE		COLLECTION DATE
EPA METHOD 608 (ug/L)	TUES, 15 AUG 1995	EPA METHOD 608 (ug/L) Continued	TUES, 15 AUG 1995
Aldrin	<0.04	Endrin Aldehyde	<0.23
alpha-BHC	<0.03	Heptachlor	<0.03
beta-BHC	<0.06	Heptachlor Epoxide	<0.83
delta-BHC	<0.09	Texaphene	<1
Lindane (gamma-BHC)	<0.03	Aroclor 1016	<1
Chlordane	<0.14	Aroclor 1221	<1
4,4' DDD	<0.11	Aroclor 1232	<1
4,4' DDE	<0.04	Aroclor 1242	<0.65
p, p - DDT	<0.12	Aroclor 1248	<1
Dieldrin	<0.02	Aroclor 1254	<1
Endosulfan I	<0.14	Aroclor 1260	<1
Endosulfan II	<0.04		
Endosulfan Sulfate	<0.66		
Endrin	<0.06	SAMPLE NUMBER	GN9511143

Cavalier AS, ND

Wastewater Characterization Survey: 13 AUG - 18 AUG 1995

Equipment Blanks

	SAMPLER BLANK		SAMPLER BLANK
	COLLECTION DATE		COLLECTION DATE
GROUP A & B ANALYTES (mg/L)	TUES, 15 AUG 1995	GROUP F ANALYTES (mg/L)	TUES, 15 AUG 1995
Chemical Oxygen Demand	14	Aluminum	<0.030
Oil and Grease	NOT REQUESTED	Antimony	<0.006
Total Petroleum Hydrocarbon	NOT REQUESTED	Arsenic	<0.010
		Barium	<0.050
GROUP C ANALYTES (mg/L)		Beryllium	<0.004
Ammonia	<0.2	Cadmium	<0.005
Kjeddahl Nitrogen	1.3	Total Chromium	<0.005
Nitrate/Nitrite	<0.1	Cobalt	<0.050
Total Phosphorus	<0.10	Copper	<0.020
		Iron	<0.020
		Lead	<0.020
SAMPLE NUMBERS	GN951138	Manganese	<0.030
	GN951139	Mercury	<0.0002
		Molybdenum	<0.030
		Nickel	<0.030
		Selenium	<0.010
		Silver	<0.010
		Thallium	<0.002
		Titanium	<0.050
		Vanadium	<0.050
		Zinc	<0.050

Cavalier AS, ND

Wastewater Characterization Survey: 13 AUG - 18 AUG 1995

Reagent Blanks

	SULFURIC ACID		TRIP BLANK
	COLLECTION DATE	EPA METHOD 624	COLLECTION DATE
GROUP A & B ANALYTES (mg/L)	TUES, 15 AUG 1995	VOLATILE COMPOUNDS (ug/L)	TUES, 15 AUG 1995
Chemical Oxygen Demand	10	Benzene	<5
Oil and Grease	4	Benzyl Chloride	<5
Total Petroleum Hydrocarbon	<1	Bromobenzene	<5
		Bromodichloromethane	<5
GROUP C ANALYTES (mg/L)		Bromoform	<5
Ammonia	<0.2	Bromomethane	<5
Kjeddahl Nitrogen	0.7	Carbon tetrachloride	<5
Nitrate/Nitrite	<1	Chlorobenzene	<5
Total Phosphorus	<0.10	Chlorodibromomethane	<5
		Chloroethane	<5
GROUP E ANALYTES (ug/L)		Chloroform	<5
Phenols	32	2-Chlorethylvinyl Ether	<5
		Chloromethane	<5
GROUP F ANALYTES (mg/L)	NITRIC ACID	Chlorodibromomethane	<5
Aluminum	<0.030	Dibromomethane	<5
Antimony	<0.006	1,2-Dichlorobenzene	<5
Arsenic	<0.010	1,3-Dichlorobenzene	<5
Barium	<0.050	1,4-Dichlorobenzene	<5
Beryllium	<0.004	Dichlorodifluoromethane	<5
Cadmium	<0.005	1,1-Dichloroethane	<5
Total Chromium	<0.010	1,2-Dichloroethane	<5
Cobalt	<0.050	1,1-Dichloroethene	<5
Copper	<0.020	Trans-1,2-Dichloroethene	<5
Iron	<0.030	1,2-Dichloropropane	<5
Lead	<0.005	Cis-1,3-Dichloropropene	<5
Manganese	<0.030	Trans-1,3-Dichloropropene	<5
Mercury	<0.0002	Ethyl Benzene	<5
Molybdenum	<0.030	4-Isopropyltoluene	<5
Nickel	<0.030	Methylene Chloride	<5
Selenium	<0.010	1,1,1,2-Tetrachloroethane	<5
Silver	<0.010	1,1,2,2-Tetrachloroethane	<5
Thallium	<0.002	Tetrachloroethylene	<5
Titanium	<0.050	Toluene	<5
Vanadium	<0.050	1,1,1-Trichloroethane	<5
Zinc	<0.050	1,1,2-Trichloroethane	<5
		Trichloroethylene	<5
SAMPLE NUMBERS	BK951147,BK951148	Trichlorofluoromethane	<5
		1,2,3-Trichloropropane	<5
		Vinyl Chloride	<5
		SAMPLE NUMBER	GN951146

Cavalier AS, ND

Wastewater Characterization Survey: 13 AUG - 18 AUG 1995

Reagent Blanks

EPA METHOD 624	HCL BLANK
VOLATILE COMPOUNDS (ug/L)	COLLECTION DATE
	TUES, 15 AUG 1995
Benzene	<5
Benzyl Chloride	<5
Bromobenzene	<5
Bromodichloromethane	<5
Bromoform	<5
Bromomethane	<5
Carbon tetrachloride	<5
Chlorobenzene	<5
Chlorodibromomethane	<5
Chloroethane	<5
Chloroform	<5
2-Chlorethylvinyl Ether	<5
Chloromethane	<5
Chlorodibromomethane	<5
Dibromomethane	<5
1,2-Dichlorobenzene	<5
1,3-Dichlorobenzene	<5
1,4-Dichlorobenzene	<5
Dichlorodifluoromethane	<5
1,1-Dichloroethane	<5

EPA METHOD 624 Continued	HCL BLANK
VOLATILE COMPOUNDS (ug/L)	COLLECTION DATE
	TUES, 15 AUG 1995
1,2-Dichloroethane	<5
1,1-Dichloroethene	<5
Trans-1,2-Dichloroethene	<5
1,2-Dichloropropane	<5
Cis-1,3-Dichloropropene	<5
Trans-1,3-Dichloropropene	<5
Ethyl Benzene	<5
4-Isopropyltoluene	<5
Methylene Chloride	<5
1,1,1,2-Tetrachloroethane	<5
1,1,2,2-Tetrachloroethane	<5
Tetrachloroethylene	<5
Toluene	<5
1,1,1-Trichloroethane	<5
1,1,2-Trichloroethane	<5
Trichloroethylene	<5
Trichlorofluoromethane	<5
1,2,3-Trichloropropane	<5
Vinyl Chloride	<5
SAMPLE NUMBER	BK951149

Cavalier AS, ND

Wastewater Characterization Survey: 13 AUG - 18 AUG 1995

Sample Blanks

	COLLECTION DATE	COLLECTION DATE	VALUE RANGE
GROUP A & B ANALYTES (mg/L)	TUES, 15 AUG 1995	TUES, 15 AUG 1995	
Chemical Oxygen Demand	159	159	133-181
Oil and Grease	38.4	39.2	26.2 - 54.5 mg/bottle
Total Petroleum Hydrocarbon	36	32	No Value Range
GROUP C ANALYTES (mg/L)			
Ammonia	2.5	2.5	2.42-3.34
Kjeddahl Nitrogen	7.8	7.2	5.74-8.26
Nitrate/Nitrite	4.3	4.7	3.88-5.24
Total Phosphorus	7.5	7.6	5.98-7.92
GROUP F ANALYTES (mg/L)			in ug/l
Aluminum	0.222	0.191	211-342
Antimony	0.064	<0.006	53.6 - 84.3
Arsenic	0.062	0.049	48.2 - 75.9
Barium	0.152	0.119	146 -211
Beryllium	0.049	0.038	46.9 - 67.4
Cadmium	0.065	0.051	64.4 - 92.7
Total Chromium	0.144	0.113	135 - 194
Cobalt	0.205	0.16	193 - 278
Copper	0.177	0.136	170 - 244
Iron	0.342	0.279	310 - 447
Lead	0.134	0.108	129 - 185
Manganese	0.205	0.159	199 - 287
Mercury	0.0024	0.0021	2.14 - 3.57
Molybdenum	0.219	0.174	211 - 303
Nickel	0.193	0.152	187 - 270
Selenium	0.083	0.06	85.7 - 135
Silver	0.081	0.064	79.1 - 114
Thallium	0.048	0.039	48.2 - 75.9
Vanadium	0.127	0.099	126 - 181
Zinc	0.237	0.183	217 - 312
Group G (mg/L)			
Alkalinity Total	24	24	21.5 - 27.4
Bromide	1.9	1.9	1.9 - 2.1
Residue Total	496	507	485-635
Residue , Filterable (TDS)	298	326	248 - 336
Residue, Nonfilterable (TSS)	11	27	251 - 285
Sulfate	15	15	18.3 - 21.6
SAMPLE NUMBERS	GN951176	GN951178	LOT # 9964
	GN951177	GN951179	
	GN951180	GN951181	FOR METALS
	GN951182	GN951183	
LOT # WP1290	LOT # 9962	LOT # 9966	LOT # WP1190
TOTAL ALKALINITY	COD,TKN,NITRATE/ NITRITE, AMMONIA TOTAL PHOSPHORUS	OIL & GREASE	TDS,TSS&TOTAL RESIDUE

Cavalier AS, ND

Wastewater Characterization Survey: 13 AUG - 18 AUG 1995

Soil Sample: Old Washrack Outfall

	COLLECTION DATE
GROUP B ANALYTES (mg/G)	WED, 16 AUG 95
Total Petroleum Hydrocarbon	0.51
GROUP F ANALYTES (ug/G)	
Arsenic	3
Barium	45
Cadmium	2
Total Chromium	<4
Lead	32
Mercury	<0.02
Selenium	<0.4
Silver	32
SAMPLE NUMBERS	GS951166, GS951168