

ENVIRONMENTAL ENGINEERING SURVEY
MARINE CORPS BASE, CAMP LEJEUNE
JACKSONVILLE, NORTH CAROLINA

FY-80 UPDATE

UTILITIES, ENERGY AND ENVIRONMENTAL DIVISION
ATLANTIC DIVISION, NAVAL FACILITIES ENGINEERING COMMAND
NORFOLK, VIRGINIA

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ATTACHMENTS

- Attachment 1 - Physical and Chemical Analysis of Water
- Attachment 2 - LANTNAVFACENCOM ltr 114:DPG ser 6280 of 13 Oct 1978
- Attachment 3 - LANTNAVFACENCOM ltr 114:DPG ser 6280 of 8 Feb 1979
- Attachment 4 - Laws and Rules for Ground Absorption Sewage Disposal Systems of 3,000 Gallons or Less Design Capacity - State of North Carolina
- Attachment 5 - Rules and Regulations for Erosion and Sediment Control - State of North Carolina
- Attachment 6 - Legal Compendium on Hazardous and Toxic Materials and Solid Wastes
- Attachment 7 - Section 112 of the Federal Clean Air Act as amended (40 CFR 61)
- Attachment 8 - Hazardous Materials Identification List
- Attachment 9 - Preliminary Survey Findings and Recommendations

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ENVIRONMENTAL ENGINEERING SURVEY
MARINE CORPS BASE, CAMP LEJEUNE
JACKSONVILLE, NORTH CAROLINA

I. EXECUTIVE SUMMARY

A. Authority. In compliance with OPNAVINST 6240.3E and NAVFACINST 5450.19B, the FY-80 update of the Marine Corps Base, Camp Lejeune Environmental Engineering Survey Report was conducted on 14-24 August 1979.

B. Objectives and Scope. The objectives of this year's update are:

1. Identification of current environmental facility deficiencies and status of corrective projects previously identified.

2. Identification of environmental operation and maintenance deficiencies and recommended corrective actions.

C. Compliance Status with Environmental Regulations

<u>Media</u>	<u>Deficiencies Noted</u>	<u>Remarks</u>
Air	Yes	See Pages 4-5
Water	Yes	MCON P-996 to correct. See Pages 5-7, 11-12
Wastewater	Yes	MCON P-996 to correct. See Pages 7-10, 11-12
Oil	Yes	MCON P-996 to correct. See Pages 12-13
Solid Waste	Yes	See Pages 13-14
Hazardous Waste/ Toxic Substance	Yes	See Pages 15-17

D. Any environmental problem(s) that should arise between surveys or problem(s) inadvertently omitted during the current survey, should be directed to the program manager concerned as indicated in LANTNAVFACENGCOM environmental organization chart on the next page.

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ATLANTIC DIVISION
NAVAL FACILITIES ENGINEERING COMMAND

ENVIRONMENTAL PROTECTION COORDINATION OFFICE
LCDR J. G. DEMPSEY, CEC, USN (09BE)
(ENVIRONMENTAL PROTECTION COORDINATION OFFICER)

UTILITIES, ENERGY & ENVIRONMENTAL DIVISION
E. A. BARCO (11)
(DIRECTOR)

ENVIRONMENTAL QUALITY BRANCH
MR. A. TALTS (114)
(BRANCH HEAD)

MRS. E. ROMERO (114A)
(PROGRAM ASSISTANT/POLLUTION CONTROL REPORT)

1141

ENVIRONMENTAL PROTECTION SECTION

Mr. S. L. Robison
(Section Head; Point of Contact
for activities of CINCLANTFLT;
COMSECGRUCOM; CNO; CNR; CMC)

Mr. S. Azar
(Boiler Feedwater; Industrial
Water)

Mr. C. Thompson
(Air Pollution; Noise)

Mr. P. Cunanan
(Solid Wastes)

Mr. M. White
(Water Conservation; Hazardous Waste)

Ms. D. Cantor
(Potable Water)

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ENVIRONMENTAL PROGRAMS SECTION

Mr. J. R. Bailey
(Section Head; Point of Contact
for activities of CINCLANAVEUR;
NAVMAT; CNET; TELCOM; BUMED)

Mr. J. Harwood
(ESR's; Dist. Systems)

Mr. J. Lancaster
(Oily Wastes/Ship-to-Shore
Sewage)

Mr. P. Rakowski
(Industrial Wastes; Dredging)

Mr. D. Goodwin
(Wastewater Discharge Permits)

Mr. W. Carter
(Operator Training; Environmental
Engineering Surveys)

Mr. J. Parrish
(Data Collection)

Commercial: 804-444-7313
AUTOVON: 690-7313

Environmental Hotline
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II. INTRODUCTION

A. Description of Activity. Marine Corps Base, Camp Lejeune, located in the coastal region of North Carolina, is the nation's most complete Amphibious Training Base. It encompasses approximately one hundred and seventy square miles of land and water, and twelve miles of ocean frontage. The principal watershed drainage areas are Bear Creek, Freeman Creek, French Creek, Northeast Creek, Southwest Creek, Wallace Creek and New River.

Established in 1941 and named in honor of Lieutenant General John A. Lejeune, the base houses four Marine Corps commands and two Navy commands: Marine Corps Base; Marine Corps Air Station (Helicopter); Force Troops, FMFLANT; 2nd Marine Division, FMF; Naval Regional Medical Center; and Naval Regional Dental Center.

The Base is divided into nine major subdivisions: Hadnot Point; Tarawa Terrace (I & II); Midway Park (Housing Area); Montford Point (Camp Johnson); Camp Geiger; Marine Corps Air Station (H), New River; Rifle Range; Courthouse Bay; and Onslow Beach. The current military population is approximately 40,000 military personnel, 4,000 civilian employees, and 32,000 military dependents on and off base.

The mission of Marine Corps Base, Camp Lejeune is as follows:

1. To provide housing, training facilities, logistic support, and certain administrative support for Fleet Marine Force units and other units as assigned.
2. To receive and process personnel as assigned and conduct individual combat training as directed.
3. To conduct specialized schools and other training as directed.

B. List of Station Personnel Contacted

Mr. W. Elston	Ass't. Base Maintenance Officer
Mr. B. Lanier	Acting Utilities Director
Mr. J. Wooten	Environmental Coordinator
Mr. M. King	Defense Property Disposal Officer
LT B. Salamanca	OIC Base EOD
CWO C. Rolle	Fuel Officer
MMSGT H. Manhein	MCAS (H) S-4 Chief
GSGT Redman	NCOIC Base EOD
SSGT D. Farmer	Fuel Distribution System Inspector
Mr. W. Mayo	Ground Structures General Foreman
Mr. M. Gray	General Foreman Pest Control
Mr. Wetherington	Central Heating Plant Foreman
Mr. P. Huffman	General Foreman, Sewage Treatment Plants
Mr. W. Price	General Foreman, Water Treatment Plants

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Mr. L. Holland	Water Treatment Plant Operator
Mr. R. Vick	Water Treatment Plant Operator
Mr. J. Shackelford	Water Treatment Plant Operator
Mr. M. Rich	Water Treatment Plant Operator
Mr. C. Kelly	Water Treatment Plant Operator
Mr. T. Stone	Water Treatment Plant Operator
Mr. J. Lucas	Water Treatment Plant Operator
Mr. B. Morton	Water Treatment Plant Operator
Mr. N. Fisher	Sewage Treatment Plant Operator
Mr. N. Futrell	Sewage Treatment Plant Operator
Mr. C. Schmidt	Sewage Treatment Plant Operator
Mr. W. Burnette	Sewage Treatment Plant Operator
Mr. V. Williams	Sewage Treatment Plant Operator
Mr. C. Huffman	Sewage Treatment Plant Operator
Mr. H. Burns	Laboratory Technician
Mr. R. Sutton	Liquid Fuel Mechanic

C. The Environmental Engineering Survey Preliminary Report and Recommendations, (Attachment 9), was provided to base personnel at the end of the survey.

III. DISCUSSION OF DEFICIENCIES AND RECOMMENDATIONS

A. Air Pollution

1. Camp Lejeune has over 200 air pollution sources registered with the North Carolina Division of Environmental Management. This registration was accomplished over two years ago using the Navy Air Pollution Source Inventory System Report. This report currently contains out-dated data. The report needs to be reverified and updated for resubmittal to the North Carolina Division of Environmental Management.

RECOMMENDATION NO. 1 - The above review and update should be accomplished by 1 March 1980 using 1979 calendar data.

2. Camp Lejeune has obtained permits from the North Carolina Division of Environmental Management to operate one oil-fired and four coal-fired boilers in Building 1700. The North Carolina air pollution regulations require most of the Camp Lejeune air pollution sources to have permits to operate. During a discussion with the North Carolina Division of Environmental Management personnel, in August, it was agreed that only coal-fired boilers, Numbers 5 and 6 oil-fired boilers and incinerators currently operating will require permits at this time. LANTNAVFACENGCOM records show that there are one classified waste incinerator, one pathological incinerator and sixteen No. 6 oil-fired boilers requiring permits.

RECOMMENDATION NO. 2 - It is recommended that permit applications for these sources be submitted to the North Carolina Division of Environmental Management no later than the end of December 1979.

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3. The classified waste incinerator located in Building S-355 does not meet North Carolina air pollution regulations .0505 and .0521 covering particulates and visible emissions respectively.

RECOMMENDATION NO. 3 - This incinerator should be closed down immediately and replaced by either a document destructor or a controlled air incinerator. If the controlled air incinerator option is chosen, then a permit to construct will be required to be submitted to the North Carolina Division of Environmental Management and manufacturers stack emission data must be obtained to demonstrate compliance of the incinerator. Pollution abatement funding is available from the Commandant, Marine Corps, Washington, to procure either of the above replacements.

B. Potable Water

MCAS Water Treatment Plant

1. When the lime hopper at the MCAS potable water treatment plant is refilled, excessive amounts of dust are generated causing much accumulation within the enclosed room. The current dust collector and fan provided are inadequate to alleviate the problem. This condition as is appears hazardous. Origin of dust generation is around hopper door seal and auger shaft located under the hopper. Even though measures have been taken to eliminate the problem, little success has been achieved.

RECOMMENDATION NO. 1 - The current hopper should be replaced with a larger externally fed lime hopper.

2. Unlike the other treatment facilities, the above plant is not fenced in. It is located on the corner of Curtis and Bandcross Road, making it very accessible to trespassers. The chlorine drums are located outside of building. This situation is potentially dangerous since these drums are accessible to the public and can be easily tampered with.

RECOMMENDATION NO. 2 - Fence in the entire treatment facility.

3. This facility is, also, not provided with auxiliary power for in-plant operation in the case of power outage.

RECOMMENDATION NO. 3 - Provide auxiliary power for in-plant operation for such an emergency situation.

Courthouse Bay and Montford Point Water Treatment Plants

4. The zeolite softeners at these two treatment facilities will eventually need replacing. At Montford Point Plant, the softeners are very old and antiquated. One of the Courthouse Bay Plant softeners has begun to corrode. Hence, the latter was tested by Base personnel this past summer and was still found to be structurally sound.

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RECOMMENDATION NO. 4 - Efforts should be initiated to provide for the future replacement of these tanks.

Hadnot Point Water Treatment Plant

5. The chlorine tanks are located in the chlorine storage room where there is inadequate ventilation. There was a window open, however, during cold weather, this window will be shut. Further, it is located too high off the floor to be of any benefit to plant personnel entering the room in the event of a chlorine gas leakage.

RECOMMENDATION NO. 5 - Chlorine gas is approximately 2.5 times as heavy as air. In case of a leak, it would therefore seek the lowest level. Install a vent with an exhaust fan at floor level to be switched on prior to entering the room. This will prevent the inhalation of toxic and hazardous fumes, which can be fatal. Personnel using gas masks should practice regularly with them in order to become proficient in their use and accustomed to breathing through them. The acceptable safety practice for the chlorine gas mask is to properly store it, available for instant use at a convenient location outside of the chlorination facility.

6. At the present time, the Quality Control Laboratory Chemist position is vacant. The vacancy announcement to fill this position has been advertised since March 1979, however, no one has been hired. The incumbent will be in charge of this laboratory, which performs a variety of chemical, physical and bacteriological analyses of boiler, domestic waste, river, storm drain and potable water samples.

7. The Quality Control Laboratory is not certified. In accordance with EPA's requirement, this lab should apply for interim certification.

RECOMMENDATION NO. 6 - In filing an application for certification, the EPA Region IV office, Athens, Georgia, is to be contacted. The point of contact is:

Mr. Bob J. Carroll
Chief, Lab Services Branch
EPA Surveillance and Analysis Division
College Station Road
Athens, GA 30605

8. The inorganic chemical analysis for potable water is to be performed every three years. It had not been done. Accordingly, potable water samples were collected from various points on Base by LANTNAVFAC-ENGGCOM's Code 114 personnel. They were then sent to the LANTNAVFACENGGCOM contracted laboratory for the required inorganic chemicals analysis. The results are shown in Attachment 1. As noted, the suggested limit of 20 mg/l for sodium in many cases exceeds concentration for people on severe salt restricted diets.

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RECOMMENDATION NO. 7 - The Base Medical Center should be notified concerning the levels of sodium concentration in the potable water supply in order that alternative measures may be implemented for those individuals whose salt intake should not exceed the allowable limit. Further questions concerning this matter should be directed to Ms. D. Cantor, Code 114 of this command, telephone AUTOVON 690-7313.

C. Wastewater

1. LANTNAVFACENCOM letter 114:DPG ser 6280 of 13 Oct 1978, Attachment 2, noted the rapid increase in water and sewage flows. If this recent growth trend continues, the MARCORB CAMP LEJEUNE water and sewage treatment facilities capacity may be exceeded in the early 1980's.

RECOMMENDATION NO. 1 - The above reference recommended a base-wide A/E study of water/wastewater systems in order to program an approximated \$20-80 million MCON(s) (non-pollution abatement funds) to relieve possible outyear overloads. Please advise LANTNAVFACENCOM Code 114 as to the Base evaluation of this situation.

2. The EPA nation-wide enforced secondary National Pollutant Discharge Elimination System (NPDES) limit for fecal coliform is 200 MPN per 100 ml. There is no maximum chlorine limit, however, in the current NPDES permit for MARCORB CAMP LEJEUNE.

3. It was discussed in LANTNAVFACENCOM letter of 8 Feb 1979 (Attachment 3) that toxic amounts of excess chlorine were being used (e.g. historical weighted average effluent chlorine of 4.0 mg/l). As a result, LANTNAVFACENCOM recommended that the chlorine residual be reduced to approximately 2.0 mg/l, based on (a) toxicity literature forwarded with the 8 February 1979 letter, (b) the Virginia limit of 2.5 mg/l maximum, and (c) the Maryland limit of 0.5 mg/l maximum. MARCORB CAMP LEJEUNE has since reduced the residual levels to 2.0-3.0 mg/l.

RECOMMENDATION NO. 2 - Continuing efforts should be made to maintain chlorine residual at approximately 2.0 mg/l. Although chlorine effluent limits vary, effluent chlorine greater than 1.0-2.0 mg/l is generally not required for adequate disinfection. It can cause the sewage effluent to become toxic, thereby negating beneficial effects of the sewage treatment plant.

4. Metal steps leading into the Tarawa Terrace sewage treatment plant wet well are badly corroded. Some of the steps are missing entirely. This condition makes access into and out of the facility very dangerous.

RECOMMENDATION NO. 3 - It is recommended that the metal steps be replaced immediately.

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5. The Hadnot Point sewage treatment plant two 25-inch comminutors are old and worn. They are no longer cutting/functioning properly. Utilization of these devices tends to reduce odors, flies and unsightliness often found around screenings when comminutors are not used.

RECOMMENDATION NO. 4 - It is recommended that the Hadnot Point sewage treatment plant two 25-inch comminutors be replaced.

6. Exhaust fans for the chlorination room at the Montford Point and Onslow Beach sewage treatment plants are absent. Moreover, the chlorine gas mask at the Montford Point plant is located in the operator office, away from the chlorination facility.

Chlorine gas is extremely toxic and corrosive in moist atmospheres. It is very irritating to mucous membranes and small amounts in the air will cause severe coughing when inhaled. Heavy exposure to this gas can be fatal.

RECOMMENDATION NO. 5 - For the above treatment facilities, install exhaust fans at floor level to be switched on prior to entering the chlorine rooms. Further, the acceptable safety practice for the chlorine gas mask is to properly store it, available for instant use, at a convenient location outside of the chlorination facility.

7. Bathroom fixtures for plant personnel at the Onslow Beach sewage treatment plant are present, but have not been installed.

The importance of preventing infections cannot be overemphasized. Wastewater, sludge, screenings, etc. are potentially infectious to plant personnel. Plant personnel should therefore exercise great care since they are not only confronted with danger from infected wounds, but are also subject to water-borne diseases from contamination introduced through the mouth. Good personnel hygiene and prompt medical attention are the best defense against infections.

RECOMMENDATION NO. 6 - It is recommended that the sanitary fixtures at the Onslow Beach sewage treatment facility be installed to immediately increase opportunities for plant personnel to exercise better personal hygiene, thereby reducing the chances of getting infection from contamination while treating the sewage.

8. The Camp Geiger sewage treatment plant is meeting current NPDES limitation requirements, even though the advanced wastewater treatment portion of the plant is inoperative. The tertiary unit pumps and Quality Automatic Control System won't function. In addition, the SILS No. 6 high level panel light indicator on the lift station console won't go off, indicating a possible shortage in wiring.

RECOMMENDATION NO. 7 - The decision has been made by base personnel to continue operating the Camp Geiger advanced wastewater portion of the

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sewage treatment plant. Accordingly, it is recommended that personnel from the Base Maintenance Department be brought in to work on/put the facility back into operation.

9. The MARCORB CAMP LEJEUNE boilers are contract-serviced by the Dearborn Aqua Service of Wilson, North Carolina. It was indicated that services were provided approximately every two months. At this time, samples are taken, tests are run and personnel are trained to properly operate the equipment. Hence, there does exist a need for a technically trained individual to administer the boilers feedwater treatment program to adequately interpret test data and to provide optimum boiler operation. Finally, no boiler samples are currently being submitted to BUMINES for check analysis, as required.

RECOMMENDATION NO. 8 - An experienced chemist with technical knowledge of boiler water treatment should be hired to supervise the boiler feedwater treatment program at all the MARCORB CAMP LEJEUNE steam plants.

RECOMMENDATION NO. 9 - In accordance with the requirements set forth through NAVFACINST 5450.19B and LANTDIVINST 11300.4A, it is recommended that a boiler water sample for each applicable boiler be collected/ submitted to the Bureau of Mines Water Service Laboratory, 4900 LaSalle Road, Avondale, Maryland 20782 for check analysis. NOTE: This is their new address.

10. The MARCORB CAMP LEJEUNE water and sewage treatment plants are excellently run operations. Nevertheless, there was evidence of sporadic maintenance problems which indicated the periodic shortages of plant personnel. Likewise, a severe personnel shortage was reported in the Natural Resources and Environmental Affairs Division.

RECOMMENDATION NO. 10 - It is recommended that additional personnel be hired at both the water and sewage treatment facilities to provide adequate staffing.

RECOMMENDATION NO. 11 - It is further recommended that the Natural Resources and Environmental Affairs Division be adequately staffed to perform/meet the necessary demands for the environmental program.

Field Head Facilities

1. During a recent conversation with Mr. Jack Knight at the North Carolina State Board of Health, existing state statutes governing the installation and use of ground absorption sewage disposal systems were discussed. It was stated that primary regulatory responsibility for these systems lies with the local health departments. For sanitary sewage disposal systems with 3,000 gallons or less which do not discharge to surface waters, permits are issued by the North Carolina Health Department. For all other such facilities of greater than 3,000 gallons capacity, the North Carolina Department of Natural Resources and Community Development issues permits. These permit requirements are primarily applicable to the

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private sector, unless it is established that the sewage disposal (from military installations) result in the discharge or runoff of pollutants affecting public waters.

RECOMMENDATION NO. 1 - Attachment 4 provides a copy of North Carolina's statute for Ground Absorption Sewage Disposal Systems of 3,000 gallons or less design capacity for review. Accordingly, it is recommended that these requirements to construct/operate an "approved privy" as outlined in the legislation be strictly adhered to.

2. Field head facilities at the MARCORB CAMP LEJEUNE Veronah Loop K Range are wooden structures consisting of a pit, floor and seat assembly. Drums are placed at the bottom of these pits to collect humanwastes. It was learned that, in certain instances, these drums had been found sitting in pools of water, due to the high groundwater table.

RECOMMENDATION NO. 2 - In no case should the depth of the pit be excavated such that contamination of groundwater will occur. The recommended depth should be no less than 12" above the groundwater table. It is also recommended that any existing field head facilities located in or found contaminating the groundwater be abolished, the pit completely covered with earth and the privy building moved to a suitable site.

Erosion/Sediment Control

1. Accelerated erosion from unprotected construction sites and other land disturbing activities constitute a major pollution problem. Sediment suspended in water runoff settles out depositing soil and other materials into rivers, lakes and streams. As a result, stream channels, lakes and reservoirs become filled, thereby having detrimental impact upon the environment. Accordingly, Federal and State regulations have been created and are being enforced to effectively control erosion/sedimentation during active construction or after stabilization. Preventive measures, however, are generally considered from both a technical and economic view point.

2. It was observed during the recent visit that MARCORB CAMP LEJEUNE does have significant erosion/sediment control problems associated with the sanitary landfill site, and the Engineering Equipment/Rifle Range training areas. Comments on construction site erosion problems have been addressed to the ROICC.

RECOMMENDATION NO. 1 - Compliance with Soil Conservation Service erosion control requirements, and other Federal or North Carolina State regulations (Attachment 5) are legally mandated. It is therefore recommended that a separate FY-82 pollution abatement MCON project be submitted as soon as possible. An A/E preliminary study may be required to outline the scope of this project and the scope of work for this project should be coordinated with North Carolina State Coastal Zone Management Office.

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D. Operator's Training and Certification

1. Operators of Navy treatment facilities (potable water, sewage and industrial waste treatment plants) are now required by law to meet certification requirements of the state in which the facility is located. Compliance with the aforementioned requirement is mandated by the following legislation:

a. Safe Drinking Water Act (SDWA), PL95-523 - established specific legal requirements for the provision of adequate treatment and monitoring of public water supplies.

b. Clean Water Act (CWA), PL95-217 - established requirements for pollution control facilities to comply with state and local administrative and procedural requirements, including operator training and certification, as well as all discharge standards.

2. There is one operator in responsible charge for all potable water plants on the base and another for all the sewage treatment plants.

3. The highest state certification requirement for water treatment plant operators is Class A and lowest is Class C-well. The highest certification level for wastewater plant operators is Class IV and the lowest is Class I.

4. The potable water treatment plant operator in responsible charge has a Class B license. However, a recent conversation with Mr. C. Rundgren of the North Carolina State Health Department stated that in order for the MARCORB CAMP LEJEUNE water treatment plants to be in compliance with the state certification requirement, the operator in responsible charge must pass the Class A licensing examination. This certification requirement was not only based on types of potable water treatment performed, but also considered that one man is in responsible charge of eight separate treatment systems.

RECOMMENDATION NO. 1 - In order to meet state requirements for the Potable Water Works, it is recommended that the Class B operator in responsible charge be recertified at the Class A level.

5. The operator in responsible charge of the seven wastewater plants has a Class IV license. These facilities are, therefore, in compliance with the state certification requirements.

6. The Environmental Quality Control Laboratory physical science technicians perform the following tests: turbidity, bacteriological, fluoride and chlorides on potable water samples, and BOD, SS and fecal coliform on the wastewater samples. Moreover, analyses are performed once a month for BOD, DO, fecal coliform, pH and temperature on upstream and downstream receiving waters, including 71 storm drain outfalls monitoring for oil, grease, SS and pH.

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RECOMMENDATION NO. 2 - The Environmental Protection Agency conducts excellent training courses in the areas of water quality management, chemical and bacteriological analyses, and others. Such courses, designed to develop expertise and sharpen required skills necessary to achieve an effective water pollution control and abatement program, would prove beneficial to the laboratory technicians. For additional information and details concerning these courses, refer to LANTDIVNOTE 6280, 114 of 20 September 1979, entitled "Availability of EPA's water quality control training courses for FY-80; announcement of."

E. Oil

1. As a result of two previous comprehensive studies, one performed by Stearns, Conrad and Schmidt (SCS) Engineers (Contract N62470-76-C-1863) and the other by Austin Brockenbrough and Associates (Contract No. N62470-78-B-8268), all known areas of existing and potential oil spills and oily wastewater discharges on Base were identified. MILCON Project P-996, entitled "Industrial Waste Collection and Treatment Facilities", to correct those deficiencies is approximately ninety percent design complete and is scheduled to begin construction in FY-80. However, Spill Prevention Control and Countermeasures (SPCC) to eliminate/control spills from 55-gallon oil drums for an estimated 1,561 space heaters have been deleted due to cost limitations.

RECOMMENDATION NO. 1 - A separate FY-81/82 oil SPCC pollution abatement MCON project should be resubmitted to include provisions for the estimated 1,561 space heaters.

MCAS (H), NEW RIVER

2. A berm at the motor pool, Building 119 utilized to retain the wash water until it enters the sewer collection system is inadequate. It does not extend far enough to enclose the entire wash area to prevent wastewater runoff from entering the adjacent storm drain.

RECOMMENDATION NO. 2 - The MCAS motor pool, Building 119 washrack berm should be extended to enclose the entire area to prevent wastewater runoff from entering the adjacent storm drain.

3. Many problems identified during the recent survey were related to personnel carelessness and negligence rather than the lack of proper oil spill/collection equipment. The following were noted:

a. Cigarette butts and other garbage placed in waste oils, eventually clogging up funnel discharging into the waste oil tanks.

b. Oil needlessly being spilled around waste oil collection tanks.

c. Old paint, rags, paper and similar refuse discarded on ground around waste oil collection tanks.

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d. Helicopter washing and evidence of solvents, and fluids/oil discharges on helicopter pad area at MCAS (H), NEW RIVER which drains into the storm drainage system. These storm drains are not equipped with oil/water separators.

RECOMMENDATION NO. 3 - Pollution control equipment will prevent/abate environmental impact if properly utilized. The above practices must therefore be discontinued. All waste streams should be segregated and disposed of in an environmentally acceptable manner. Helicopter washings should not be done on the helicopter pads, but on wash racks intended for that purpose.

4. The catch basin at HTMS-29 for the oil/water separator is not functioning properly. The seal appears clogged up and the storm drain needs cleaning out, evidenced by much sand buildup. A work order request had been submitted, but no action has currently been initiated to correct the situation.

RECOMMENDATION NO. 4 - Expedite the work order request to put this oil/water separator back into proper operation.

5. After maintenance is completed on the helicopter internal fuel storage tanks at Hangar 518, they are placed outside on a concrete pad and allowed to drain. An oil path can be observed heading toward a storm drainage ditch located at the base of the down hill grade.

RECOMMENDATION NO. 5 - These fuel tanks should not be allowed to drain their oily residues onto the concrete pad(s). The tanks should be rinsed clean to collect and dispose of the oily residuals in an acceptable manner prior to draining, or ports permitting tanks to drain should be closed.

6. It is understood by LANTNAVFACENCOM that remaining known wastewater/oil environmental deficiencies which concern the treatment of coal piles runoff will be accomplished as part of the MARCORB CAMP LEJEUNE boilers coal conversion program.

F. Solid Waste

1. P.L. 94-580, Resource Conservation and Recovery Act of 1976 and Executive Order 12088 of 13 October 1978 mandate that federal agencies involved in solid waste management shall comply with both substantive and procedural requirements of Federal, State and local regulatory agencies. Consequently, the State of North Carolina does require permit(s) to operate solid waste landfills.

At the time of this survey, MARCORB CAMP LEJEUNE did not have a permit to operate the sanitary landfill. However, a sanitary landfill operating plan had been submitted to the State for approval to acquire a permit for the disposal site.

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RECOMMENDATION NO. 1 - It is requested that this Command be kept advised of the Base landfill permit compliance status. Upon receipt of the permit, it is further requested that a file copy be forwarded to this Command.

2. 40 CFR 241, "Guidelines for Land Disposal of Solid Waste" and 40 CFR 257, "Criteria for the Classification of Solid Waste Disposal Facilities" require that land disposal facilities be designed, constructed and operated in a manner to protect groundwater from leachate contamination.

Since the Camp Lejeune area depends extensively on groundwater as a potable source, MARCORB CAMP LEJEUNE was requested on 7 September 1978 to forward 15 water samples to this Command from landfill test wells for chemical analysis. Results of the chemical analysis dated 18 July 1978 did not indicate any severe contamination of the ground-water under the landfill.

RECOMMENDATION NO. 2 - Once a year, monitoring of the landfill test wells is recommended. Monitoring is necessary to evaluate either the potential danger to or the impact on groundwater quality by providing early indications of contaminants movement from disposal facility into the groundwater.

3. Large quantities of aluminum cans, cardboard, wood and various types of metal are still being disposed of in the landfill, inspite of the Base recycling program to recover such materials. Moreover, it is DOD policy to reduce the amount of materials wasted and to recover/recycle materials from solid and other waste products as an alternative to landfilling, incineration or other disposal manner which is environmentally harmful/economically wasteful.

Recent solid waste management study performed by SCS Engineers has found it feasible, and recommended increased material recovery and energy recovery. Energy recovery is to be generated in the form of steam recovered from the wastes after material recovery.

RECOMMENDATION NO. 3 - More stringent control should be initiated on types of material being disposed of in the landfill. This control may be implemented through stricter enforcement of current Base regulation(s) to source separate/recycle materials or by establishing a staging area at the landfill site, in addition to Base regulation(s) for materials recovery.

RECOMMENDATION NO. 4 - Based upon the SCS Engineers report, plans should be finalized soon concerning future solid waste management. Further questions or guidance concerning this matter should be directed to Mr. P. Cunanan, Code 114 of this Command, telephone AUTOVON 690-7313.

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G. Hazardous Waste/Toxic Substances

Background

1. Hazardous wastes are those wastes which may cause or contribute to adverse acute or chronic effects on human health or the environment when such wastes are not properly controlled. These wastes primarily consist of by-products of industrial production, surplus chemicals, salvage materials and sludges and may be in the form of solids, slurries, liquids, gases and powders. Hazardous wastes may include residues from pollution control devices (e.g. electrostatic precipitator dusts, industrial waste treatment plant sludges) as well as chemicals and pesticide substances (DDT, etc.)

2. Identification, handling and disposal of hazardous and toxic materials has in the past been an area of relatively minor concern. New stringent legislation, increased information concerning toxicity to humans and the environment, along with the increasing frequency of accidents involving hazardous materials have rendered past handling and disposal methods unacceptable and re-emphasized the importance of acceptable handling and disposal methods.

A legal compendium regarding hazardous and toxic materials and solid waste is included as Attachment 6.

Pesticide

1. At the present time, MARCORB CAMP LEJEUNE's pest control shop has 132 gallons of silvex stored. This chemical along with the herbicide 2,4,5-T was published on an EPA Stop sale list for their manufacture and use.

RECOMMENDATION NO. 1 - It is strongly recommended that remaining containers of silvex NOT be used. The herbicide should continue to be stored until further notification from the Applied Biology Branch, LANTNAVFAC-ENGCOD Code 10A. In the case of significant container(s) deterioration, Code 10A should be contacted immediately for instructions.

Asbestos

2. Asbestos presents serious occupational, health and environmental problems. Prolonged inhalation of asbestos fibers can cause impaired breathing or asbestosis. Asbestosis is a progressive, diffuse, non-nodular fibrosis of the lungs. Asbestos has also been linked as a contributing agent to cancer of the chest and abdominal membranes.

3. Section 112 of the Federal Clean Air Act as amended (40 CFR 61) prohibits visible air emissions and provides proper handling and disposal procedures for asbestos. See Attachment 7.

CLW

4. Under the Resource Conservation and Recovery Act (P.L. 94-580), hazardous wastes legislation addressing handling, transport, storage and disposal requirements are in proposed form. However, they should be finalized and promulgated in final form sometime during the early 1980's. These proposed regulations will also address state requirements for Hazardous Waste Management.

5. It was stated that asbestos shingles have been disposed of at the Base landfill. The current practice includes wetting the material and burying it along with the rest of the refuse.

RECOMMENDATION NO. 2 - There should be a specific location within the landfill to dispose of asbestos materials. This location must then be recorded for future reference, because once asbestos has been buried in a landfill, future excavation of that site is prohibited.

RECOMMENDATION NO. 3 - It is recommended that MARCORB CAMP LEJEUNE landfill be operated in accordance with 40 CFR 241 guidelines. Asbestos materials properly handled and disposed of will not pose a health hazard or environmental problem.

RECOMMENDATION NO. 4 - It is recommended that the Camp Lejeune Regional Medical Center and LANTNAVFACENCOM, Code 114 be contacted concerning specific health or environmental disposal problems, respectively.

6. On 5 July 1979, a letter was forwarded from the Natural Resources and Environmental Affairs Division to Base tenants requesting identification of hazardous materials requiring acceptable environmental disposal. Accordingly, hazardous waste materials identification lists (Attachment 8) from MCAS (H) NEW RIVER and 2nd Marine Division, FMF, Tarawa Terrace were provided. In addition, laboratory chemicals from MARCORB CAMP LEJEUNE High School have also been stored awaiting acceptable disposal.

RECOMMENDATION NO. 5 - All questions concerning environmentally acceptable disposal methods for hazardous materials should be directed to Mr. Sonny White, Code 114 of this Command, telephone 804-444-7313 or AUTOVON 690-7313.

7. Base Maintenance conducted a Base survey of all transformers containing Polychlorinated Bi-phenyls (PCB's). An Engineering Service Request has also been submitted to LANTNAVFACENCOM Code 114 to provide technical assistance in the development of a plan to prevent PCB's from spilling into the waterways.

8. MARCORB CAMP LEJEUNE's Defense Property Disposal Office (DPDO) is currently holding 304 transformers received from Base Maintenance for disposal. However, DPDO decided not to get rid of these transformers until it has been determined whether or not they contain cooling oil or PCB's. Approximately 5,094 4-ounce cans of DDT are also being stored in a trailer awaiting disposal by DPDO.

CLW

RECOMMENDATION NO. 6 - Disposal for the above materials should be undertaken in accordance with Defense Logistics Agency (DLA) guidelines. It is further recommended that the transformers be tested to ascertain their content.

CLW

IV. MARCORB CAMP LEJEUNE, POLLUTION CONTROL PROJECTS REVIEW

<u>Project Number</u>	<u>Program Year</u>	<u>Project Description</u>	<u>Remarks</u>
P-996	FY-80	Provide wastewater treatment for 8 water plants, 1 cooling tower, 14 boilers, 6 pools, 1 septic tank, 7 battery shops, 1 pest shop, 2 paint shops, 1 PPP shop, 3 photo shops, 20 washracks, 69 waste oil systems, 53 maintenance shops, 46 grease racks, 50 POL storage areas, 146 fill pipes, 144 fuel tanks, 20 unloading areas, 9 fueling areas, 9 pumphouses, 3 condensates, 1 wash basin, 2 coil pits, 1 crash crew facility, 4 maintenance lots, 3 streams and phaseout 64 washracks.	\$10,000,000

CLW

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PHYSICAL AND CHEMICAL ANALYSIS OF WATER				SAMPLE NO. #1381	
FROM: (Station or unit) MOB CAMP LEJEUNE				DATE August 31, 1979	
TO: (Name and location of laboratory) JENNINGS LABORATORIES, INC. 1118 Cypress Avenue, Virginia Beach, Virginia					
SAMPLE FROM (Location of sampling point) BUILDING 1006 EM Club - Hadnot Point					
COLLECTED BY		DATE 8/24/79	HOUR	SOURCE (Designate ground, surface, raw, treated)	
REASON FOR EXAMINATION SDWA ANALYSIS			EXAMINATION REQUESTED BY		
NOTE: All results reported in parts per million unless otherwise noted except for pH, temperature, and specific conductance. One liter of potable water is assumed to weigh one kilogram.					
I. FIELD ANALYSIS			III. ROUTINE LABORATORY ANALYSIS		
1. pH		TEMPERATURE		(CHECK ONE)	
		°F	°C	REQUESTED	NOT REQUESTED
ITEM		PPM		1. COLOR	
2. CARBON DIOXIDE (CO ₂)				<1	
3. DISSOLVED OXYGEN (O ₂)				2. TURBIDITY	
4. HYDROGEN SULFIDE (H ₂ S)				3. ALKALINITY (CaCO ₃)	
5. CHLORINE DEMAND (Cl ₂)				P	NO
FIELD ANALYSIS BY			4. TOTAL HARDNESS (CaCO ₃)		
DATE OF ANALYSIS			5. NON-CARBONATE HARDNESS (CaCO ₃) (By Computation)		
II. SPECIAL LABORATORY ANALYSES			6. CARBONATE HARDNESS (CaCO ₃) (By Computation)		
Check (X) individual items to be included in the Special Analyses. Request determination only of those substances suspected of being present in significant amounts.			7. TOTAL DISSOLVED SOLIDS 224.0		
(X)	ITEM	PPM		8. SPECIFIC CONDUCTANCE (Microhos)	
	1. As	<0.01		ITEM	
	2. Se	<0.005		PPM	
	3. Pb	<0.005		9. CALCIUM (Ca)	
	4. B			10. MAGNESIUM (Mg)	
	5. Cu	0.083		11. SODIUM (Na) AND POTASSIUM (K)	
	6. Zn	0.006		20.4	
	7. Cr (Hexavalent)	<0.002		12. HYDROXIDE (OH)*	
	8. PO			13. BICARBONATE (HCO ₃)*	
	9. Cd	<0.005		14. CARBONATE (CO ₃)*	
	10. CN			15. SULFATE (SO ₄)	
	11. Phenolic Compounds (PPB)			16. CHLORIDE (Cl) mg/l	
	12. Others (Specify)			17. NITRATE (NO ₃)	
	13. Barium	<0.02		18. IRON (Fe) TOTAL mg/l	
	14. Mercury	<0.002		19. MANGANESE (Mn)	
	15. Silver	<0.01		20. SILICA (SiO ₂)	
	16.			21. FLUORIDE (F)	
			*State whether determined or computed from P and SO alkalinity.		
REMARKS (Such as unusual appearance, taste, odor, etc.)					
(*) Sample preserved with Nitric Acid					
				CLW	
				0000000266	
LABORATORY ANALYSIS BY <i>[Signature]</i>				DATE OF ANALYSIS 8/31/79	

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ATTACHMENT (1)

S/AL 0102-LF-007-210
\$168.0

PHYSICAL AND CHEMICAL ANALYSIS OF WATER				SAMPLE NO. #1380	
FROM: (Station or unit) MCB CAMP LEJEUNE				DATE August 31, 1979	
TO: (Name and location of laboratory) JENNINGS LABORATORIES, INC. 1118 Cypress Avenue, Virginia Beach, Virginia					
SAMPLE FROM: (Location of sampling point) TERAWA TERRACE					
COLLECTED BY		DATE 8/24/79	HOUR	SOURCE (Designate ground, surface, raw, treated)	
REASON FOR EXAMINATION SDWA ANALYSIS			EXAMINATION REQUESTED BY		
NOTE: All results reported in parts per million unless otherwise noted except for pH, temperature, and specific conductance. One liter of potable water is assumed to weigh one kilogram.					
I. FIELD ANALYSIS			III. ROUTINE LABORATORY ANALYSIS		
1. pH		TEMPERATURE		(CHECK ONE)	
		°F	°C	REQUESTED	NOT REQUESTED
ITEM		PPM		1. COLOR	
2. CARBON DIOXIDE (CO ₂)				<1	
3. DISSOLVED OXYGEN (O ₂)				2. TURBIDITY	
4. HYDROGEN SULFIDE (H ₂ S)				3. ALKALINITY (CaCO ₃)	
5. CHLORINE DEMAND (Cl ₂)				P	MD
FIELD ANALYSIS BY			4. TOTAL HARDNESS (CaCO ₃)		
DATE OF ANALYSIS			5. NON-CARBONATE HARDNESS (CaCO ₃) (By Computation)		
II. SPECIAL LABORATORY ANALYSES			6. CARBONATE HARDNESS (CaCO ₃) (By Computation)		
Check (X) individual items to be included in the Special Analyses. Request determination only of those substances suspected of being present in significant amounts.			7. TOTAL DISSOLVED SOLIDS 134.0		
(X)	ITEM	PPM		8. SPECIFIC CONDUCTANCE (Microhm/cm)	
	1. As	<0.01		ITEM	
	2. Se	<0.005		PPM	
	3. Pb	<0.005		9. CALCIUM (Ca)	
	4. B			10. MAGNESIUM (Mg)	
	5. Cu	0.087		11. SODIUM (Na) AS ROXANNA (S)	7.2
	6. Zn	<0.005		12. HYDROXIDE (OH) [*]	
	7. Cr (Hexavalent)	<0.002		13. BICARBONATE (HCO ₃) [*]	
	8. PO			14. CARBONATE (CO ₃) [*]	
	9. Cd	<0.005		15. SULFATE (SO ₄)	32.0
	10. CN			16. CHLORIDE (Cl)	mg/l 16.24
	11. Phenolic Compounds (PP ₂)			17. NITRATE (NO ₃)	(*)
	12. Others (Specify)			18. IRON (Fe) TOTAL	mg/l 0.18
	13. Barium	<0.02		19. MANGANESE (Mn)	<0.01
	14. Mercury	<0.002		20. SILICA (SiO ₂)	
	15. Silver	<0.01		21. FLUORIDE (F)	0.71
	16.			*State whether determined or computed from P and SO alkalinity.	
REMARKS (Such as unusual appearance, taste, odor, etc.)					
				CLW	
(*) Sample preserved with Nitric Acid				0000000267	
LABORATORY ANALYSIS BY <i>C. J. H. Jennings</i>				DATE OF ANALYSIS 8/31/79	

PHYSICAL AND CHEMICAL ANALYSIS OF WATER				SAMPLE NO. #1379	
FROM: (Station or unit) MCB CAMP LEJEUNE			DATE August 31.1979		
TO: (Name and location of laboratory) JENNINGS LABORATORIES, INC. 1118 Cypress Avenue, Virginia Beach, Virginia					
SAMPLE FROM (Location of sampling point) COURTHOUSE BAY CO-MESS					
COLLECTED BY		DATE 8/24/79	HOUR	SOURCE (Designate ground, surface, raw, treated)	
REASON FOR EXAMINATION			EXAMINATION REQUESTED BY		
NOTE: All results reported in parts per billion unless otherwise noted except for pH, temperature, and specific conductance. One liter of potable water is assumed to weigh one kilogram.					
I. FIELD ANALYSIS			III. ROUTINE LABORATORY ANALYSIS		
1. pH	TEMPERATURE		(CHECK ONE)		
	°F	°C	REQUESTED		NOT REQUESTED
ITEM		PPM			
2. CARBON DIOXIDE (CO ₂)			1. COLOR <1		
3. DISSOLVED OXYGEN (O ₂)			2. TURBIDITY		
4. HYDROGEN SULFIDE (H ₂ S)			3. ALKALINITY (CaCO ₃)		
5. CHLORINE DEMAND (Cl ₂)			P		
FIELD ANALYSIS BY			MO		
DATE OF ANALYSIS			4. TOTAL HARDNESS (CaCO ₃)		
II. SPECIAL LABORATORY ANALYSES			5. NON-CARBONATE HARDNESS (CaCO ₃) (By Computation)		
Check (X) individual items to be included in the Special Analysis. Request determination only of those substances suspected of being present in significant amounts.			6. CARBONATE HARDNESS (CaCO ₃) (By Computation)		
(X)	ITEM	PPM	7. TOTAL DISSOLVED SOLIDS 160.0		
	1. As	<0.01	8. SPECIFIC CONDUCTANCE (Microhos)		
	2. Se	<0.005	ITEM		PPM
	3. Pb	<0.005	9. CALCIUM (Ca)		
	4. B		10. MAGNESIUM (Mg)		
	5. Cu	0.037	11. SODIUM (Na) BY COMPUTATION		50.4
	6. Zn	0.005	12. HYDROXIDE (OH)*		
	7. Cr (Hexavalent)	<0.002	13. BICARBONATE (HCO ₃)*		
	8. PO		14. CARBONATE (CO ₃)*		
	9. Cd	<0.005	15. SULFATE (SO ₄)		<0.1
	10. CN		16. CHLORIDE (Cl)		17.49
	11. Phenolic Compounds (PPB)		17. NITRATE (NO ₃)		(*)
	12. Others (Specify)		18. IRON (Fe) TOTAL		0.02
	13. Barium	<0.02	19. MANGANESE (Mn)		<0.01
	14. Mercury	<0.002	20. SILICA (SiO ₂)		
	15. Silver	<0.01	21. FLUORIDE (F)		0.34
	16.		*State whether determined or computed from P and MO alkalinity.		

REMARKS (Such as unusual appearance, taste, odor, etc.)

(*) Sample preserved with Nitric Acid

CLW

0000000268

LABORATORY ANALYSIS BY

[Signature]

DATE OF ANALYSIS

8/31/79

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S/N 0107-LF-007-2100
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PHYSICAL AND CHEMICAL ANALYSIS OF WATER				SAMPLE NO. #1378
FROM: (Station or unit) MCB CAMP LEJEUNE			DATE August 31, 1979	
TO: (Name and location of laboratory) JENNINGS LABORATORIES, INC. 1118 Cypress Avenue, Virginia Beach, Virginia				
SAMPLE FROM (Location of sampling point) MIDWAY PARK (HOLCOMB BLVD.) 1711 B Butter Drive				
COLLECTED BY	DATE 8/24/79	HOURLY	SOURCE (Designate ground, surface, raw, treated)	
REASON FOR EXAMINATION		EXAMINATION REQUESTED BY		
NOTE: All results reported in parts per million unless otherwise noted except for pH, temperature, and specific conductance. One liter of potable water is assumed to weigh one kilogram.				
I. FIELD ANALYSIS			III. ROUTINE LABORATORY ANALYSIS	
1. pH	TEMPERATURE		(CHECK ONE)	
	°F	°C	REQUESTED	NOT REQUESTED
ITEM		PPM		
2. CARBON DIOXIDE (CO ₂)			1. COLOR	<1
3. DISSOLVED OXYGEN (O ₂)			2. TURBIDITY	
4. HYDROGEN SULFIDE (H ₂ S)			3. ALKALINITY (CaCO ₃)	
5. CHLORINE DEMAND (Cl ₂)			P	HO
FIELD ANALYSIS BY			4. TOTAL HARDNESS (CaCO ₃)	
DATE OF ANALYSIS			5. NON-CARBONATE HARDNESS (CaCO ₃) (By Computation)	
II. SPECIAL LABORATORY ANALYSES			6. CARBONATE HARDNESS (CaCO ₃) (By Computation)	
Check (X) individual items to be included in the Special Analyses. Request determination only of those substances suspected of being present in significant amounts.			7. TOTAL DISSOLVED SOLIDS 260.0	
(X)	ITEM	PPM	8. SPECIFIC CONDUCTANCE (Microhos)	
	1. As	<0.01	ITEM	
	2. Se	<0.005	PPM	
	3. Pb	<0.005	9. CALCIUM (Ca)	
	4. B		10. MAGNESIUM (Mg)	
	5. Cu	0.012	11. SODIUM (Na)	11.4
	6. Zn	0.011	12. HYDROXIDE (OH)*	
	7. Cr (hexavalent)	0.002	13. BICARBONATE (HCO ₃)*	
	8. PO		14. CARBONATE (CO ₃)*	
	9. Cd	<0.005	15. SULFATE (SO ₄)	<0.1
	10. CN		16. CHLORIDE (Cl)	mg/l 19.99
	11. Phenolic Compounds (PPB)		17. NITRATE (NO ₃)	(*)
	12. Others (Specify)		18. IRON (Fe) TOTAL	mg/l 0.02
	13. Barium	<0.02	19. MANGANESE (Mn)	<0.01
	14. Mercury	<0.002	20. SILICA (SiO ₂)	
	15. Silver	<0.01	21. FLUORIDE (F)	1.05
	16.		*State whether determined or computed from P and HO alkalinity.	
REMARKS (Such as unusual appearance, taste, odor, etc.)				
(*) Sample preserved with Nitric Acid			CLW	
0000000269				
LABORATORY ANALYSIS BY <i>[Signature]</i>				DATE OF ANALYSIS 8/31/79

DD FORM 710 1 APR 53

S/N 01C2-LF-007-2100 \$168.00

PHYSICAL AND CHEMICAL ANALYSIS OF WATER				SAMPLE NO. #1377	
FROM: (Station or unit) MCB CAMP LEJEUNE				DATE August 31, 1979	
TO: (Name and location of laboratory) JENNINGS LABORATORIES, INC. 1118 Cypress Avenue, Virginia Beach, Virginia					
SAMPLE FROM (Location of sampling point) MONTFORD POINT "O" CLUB					
COLLECTED BY		DATE 8/24/79	HOUR	SOURCE (Designate ground, surface, raw, treated)	
REASON FOR EXAMINATION			EXAMINATION REQUESTED BY		
NOTE: All results reported in parts per million unless otherwise noted except for pH, temperature, and specific conductance. One liter of potable water is assumed to weigh one kilogram.					
I. FIELD ANALYSIS			III. ROUTINE LABORATORY ANALYSIS		
1. pH		TEMPERATURE		(CHECK ONE)	
		°F	°C	REQUESTED	NOT REQUESTED
ITEM		PPM		1. COLOR	
2. CARBON DIOXIDE (CO ₂)				<1	
3. DISSOLVED OXYGEN (O ₂)				2. TURBIDITY	
4. HYDROGEN SULFIDE (H ₂ S)				3. ALKALINITY (CaCO ₃)	
5. CHLORINE DEMAND (Cl ₂)				P	
FIELD ANALYSIS BY				NO	
DATE OF ANALYSIS				4. TOTAL HARDNESS (CaCO ₃)	
II. SPECIAL LABORATORY ANALYSES				5. NON-CARBONATE HARDNESS (CaCO ₃) (By Computation)	
Check (X) individual items to be included in the Special Analysis. Request determination only of those substances suspected of being present in significant amounts.					
(X)	ITEM	PPM		6. CARBONATE HARDNESS (CaCO ₃) (By Computation)	
	1. As	<0.01		7. TOTAL DISSOLVED SOLIDS	
	2. Se	<0.005		344.0	
	3. Pb	<0.005		8. SPECIFIC CONDUCTANCE (Microhos)	
	4. B			ITEM	
	5. Cu mg/l	0.021		9. CALCIUM (Ca)	
	6. Zn	0.011		10. MAGNESIUM (Mg)	
	7. Cr (Hexavalent)	<0.002		11. SODIUM (Na) XXXXXXXXXX	
	8. PO			82.5	
	9. Cd	<0.005		12. HYDROXIDE (OH)*	
	10. CN			13. BICARBONATE (HCO ₃)*	
	11. Phenolic Compounds (PP3)			14. CARBONATE (CO ₃)*	
	12. Others (Specify)			15. SULFATE (SO ₄) mg/l	
	13. Barium	<0.02		2.50	
	14. Mercury	<0.002		16. CHLORIDE (Cl) mg/l	
	15. Silver	<0.01		35.99	
	16.			17. NITRATE (NO ₃)	
				18. IRON (Fe) TOTAL mg/l	
				1.35	
				19. MANGANESE (Mn)	
				0.01	
				20. SILICA (SiO ₂)	
				0.47	
				21. FLUORIDE (F)	
REMARKS (Such as unusual appearance, taste, odor, etc.)					
(*) Sample preserved with Nitric Acid					
CLW					
0000000270					
LABORATORY ANALYSIS BY W. H. Jennings, Jr.				DATE OF ANALYSIS 8/31/79	

PHYSICAL AND CHEMICAL ANALYSIS OF WATER				SAMPLE NO. #1376	
FROM: (Station or well) MCB CAMP LEJEUNE				DATE August 31, 1979	
TO: (Name and location of laboratory) JENNINGS LABORATORIES, INC. 1118 Cypress Avenue, Virginia Beach, Virginia					
SAMPLE FROM (Location of sampling point) ONslow "O" CLUB					
COLLECTED BY		DATE 8/24/79	HOUR	SOURCE (Designate ground, surface, raw, treated)	
REASON FOR EXAMINATION SDWA ANALYSIS			EXAMINATION REQUESTED BY		
NOTE: All results reported in parts per million unless otherwise noted except for pH, temperature, and specific conductance. One liter of potable water is assumed to weigh one kilogram.					
I. FIELD ANALYSIS			III. ROUTINE LABORATORY ANALYSIS		
1. pH		TEMPERATURE		(CHECK ONE)	
		°F	°C	REQUESTED	NOT REQUESTED
ITEM		PPM			
2. CARBON DIOXIDE (CO ₂)				1. COLOR	0 <1
3. DISSOLVED OXYGEN (O ₂)				2. TURBIDITY	
4. HYDROGEN SULFIDE (H ₂ S)				3. ALKALINITY (CaCO ₃)	
5. CHLORINE DEMAND (Cl ₂)				P	MD
FIELD ANALYSIS BY			4. TOTAL HARDNESS (CaCO ₃)		
DATE OF ANALYSIS			5. NON-CARBONATE HARDNESS (CaCO ₃) (By Computation)		
II. SPECIAL LABORATORY ANALYSES			6. CARBONATE HARDNESS (CaCO ₃) (By Computation)		
Check (X) individual items to be included in the Special Analyses. Request determination only of those substances suspected of being present in significant amounts.					
(X)	ITEM	PPM		7. TOTAL DISSOLVED SOLIDS 284.0 mg/l	
	1. As	<0.01		8. SPECIFIC CONDUCTANCE (Microhos)	
	2. Se	<0.005		ITEM	
	3. Pb	<0.005		PPM	
	4. B			9. CALCIUM (Ca)	
	5. Cu	mg/l	0.058	10. MAGNESIUM (Mg)	
	6. Zn	0.012		11. SODIUM (Na) PPM	413.2
	7. Cr (Hexavalent)	<0.002		12. HYDROXIDE (OH)*	
	8. PO	<0.005		13. BICARBONATE (HCO ₃)*	
	9. Cd	<0.005		14. CARBONATE (CO ₃)*	
	10. CN			15. SULFATE (SO ₄)	mg/l 1.0
	11. Phenolic Compounds (PPB)			16. CHLORIDE (Cl)	mg/l 21.24
	12. Others (Specify)			17. NITRATE (NO ₃)	(*)
	13. Barium	<0.02		18. IRON (Fe) TOTAL	mg/l 0.41
	14. Mercury	<0.002		19. MANGANESE (Mn)	<0.01
	15. Silver	<0.01		20. SILICA (SiO ₂)	
	16.			21. FLUORIDE (F)	0.42
*State whether determined or computed from P and MD alkalinity.					
REMARKS (Such as unusual appearance, taste, odor, etc.)					
(*) SAMPLE PRESERVED WITH NITRIC ACID				CLW	
000000271					
LABORATORY ANALYSIS BY <i>[Signature]</i>				DATE OF ANALYSIS #15 August 31, 1979	

PHYSICAL AND CHEMICAL ANALYSIS OF WATER

SAMPLE NO. #1375

FROM: (Station or unit)
MCB CAMP LEJEUNE

DATE
August 31, 1979

TO: (Name and location of laboratory)
JENNINGS LABORATORIES, INC., 1118 Cypress Avenue, Virginia Beach, Virginia

SAMPLE FROM (Location of sampling point)
RIFLE RANGE EXCHANGE SNACK SHOP

COLLECTED BY	DATE 8/24/79	HOUR	SOURCE (Designate ground, surface, raw, treated)
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REASON FOR EXAMINATION SDWA ANALYSIS	EXAMINATION REQUESTED BY
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NOTE: All results reported in parts per million unless otherwise noted except for pH, temperature, and specific conductance. One liter of potable water is assumed to weigh one kilogram.

I. FIELD ANALYSIS		III. ROUTINE LABORATORY ANALYSIS	
1. pH	TEMPERATURE		(CHECK ONE)
	°F	°C	REQUESTED NOT REQUESTED
ITEM	PPM	1. COLOR	
2. CARBON DIOXIDE (CO ₂)		<1	
3. DISSOLVED OXYGEN (O ₂)		2. TURBIDITY	
4. HYDROGEN SULFIDE (H ₂ S)			
5. CHLORINE DEMAND (Cl ₂)		3. ALKALINITY (CaCO ₃)	
FIELD ANALYSIS BY		P	NO
DATE OF ANALYSIS		4. TOTAL HARDNESS (CaCO ₃)	
		5. NON-CARBONATE HARDNESS (CaCO ₃) (By Computation)	

II. SPECIAL LABORATORY ANALYSES

Check (X) individual items to be included in the Special Analyses. Request determination only of those substances suspected of being present in significant amounts.

(X)	ITEM	PPM	8. SPECIFIC CONDUCTANCE (Microhos)
	1. As	<0.01	
	2. Se	<0.005	
	3. Pb	<0.005	
	4. B		
	5. Cu mg/l	0.033	
	6. Zn	0.034	
	7. Cr (Hexavalent)	<0.002	
	8. PO		
	9. Cd	<0.005	
	10. CN		
	11. Phenolic Compounds (PPB)		
	12. Others (Specify)		
	13. Barium	<0.02	
	14. Mercury	<0.002	
	15. Silver	<0.01	
	16.		

9. CALCIUM (Ca)	PPM
10. MAGNESIUM (Mg)	
11. SODIUM (Na) ANALYSIS (X)	77.5
12. HYDROXIDE (OH)*	
13. BICARBONATE (HCO ₃)*	
14. CARBONATE (CO ₃)*	
15. SULFATE (SO ₄)	<0.1
16. CHLORIDE (Cl)	mg/l 44.99
17. NITRATE (NO ₃)	(*)
18. IRON (Fe) TOTAL	mg/l 0.02
19. MANGANESE (Mn)	<0.01
20. SILICA (SiO ₂)	
21. FLUORIDE (F)	0.34

REMARKS (Such as unusual appearance, taste, odor, etc.)

(*) Sample preserved with Nitric Acid

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LABORATORY ANALYSIS BY <i>W. H. Jennings, Jr.</i>	DATE OF ANALYSIS 8/31/79
--	-----------------------------

PHYSICAL AND CHEMICAL ANALYSIS OF WATER					SAMPLE NO. #1374
FROM: (Station or unit) MCB CAMP LEJEUNE				DATE August 31, 1979	
TO: (Name and location of laboratory) JENNINGS LABORATORIES, INC., 1118 Cypress Avenue, Virginia Beach, Virginia					
SAMPLE FROM (Location of sampling point) CAMPGEIGER (MCAS) MESS HALL g-640					
COLLECTED BY	DATE 8/24/79	HOUR	SOURCE (Designate ground, surface, sea, treated)		
REASON FOR EXAMINATION SDWA ANALYSIS			EXAMINATION REQUESTED BY		
NOTE: All results reported in parts per million unless otherwise noted except for pH, temperature, and specific conductance. One liter of potable water is assumed to weigh one kilogram.					
I. FIELD ANALYSIS			III. ROUTINE LABORATORY ANALYSIS		
1. pH	TEMPERATURE		(CHECK ONE)		
	OF	°C	REQUESTED	NOT REQUESTED	
ITEM		PPM			
2. CARBON DIOXIDE (CO ₂)			1. COLOR	<1	
3. DISSOLVED OXYGEN (O ₂)			2. TURBIDITY		
4. HYDROGEN SULFIDE (H ₂ S)			3. ALKALINITY (CaCO ₃)		
5. CHLORINE DEMAND (Cl ₂)			P	MO	
FIELD ANALYSIS BY			4. TOTAL HARDNESS (CaCO ₃)		
DATE OF ANALYSIS			5. NON-CARBONATE HARDNESS (CaCO ₃) (By Computation)		
II. SPECIAL LABORATORY ANALYSES			6. CARBONATE HARDNESS (CaCO ₃) (By Computation)		
Check (X) individual items to be included in the Special Analyses. Request determination only of those substances suspected of being present in significant amounts.			7. TOTAL DISSOLVED SOLIDS 624.0		
(X)	ITEM	PPM	8. SPECIFIC CONDUCTANCE (Microhos)		
1. As		<0.01	ITEM		
2. Se		<0.005	PPM		
3. Pb		<0.005	9. CALCIUM (Ca)		
4. B			10. MAGNESIUM (Mg)		
5. Cu	mg/l	0.025	11. SODIUM (Na) AS 2-3-3-2-3	142.5	
6. Zn		0.005	12. HYDROXIDE (OH)*		
7. Cr (Hexavalent)		<0.002	13. BICARBONATE (HCO ₃)*		
8. PO			14. CARBONATE (CO ₃)*		
9. Cd		<0.005	15. SULFATE (SO ₄)	26.50	
10. CN			16. CHLORIDE (Cl)	102.47	
11. Phenolic Compounds (PPB)			17. NITRATE (NO ₃)	(*)	
12. Others (Specify)			18. IRON (Fe) TOTAL	mg/l	0.04
13. Barium		<0.02	19. MANGANESE (Mn)	<0.01	
14. Mercury		<0.002	20. SILICA (SiO ₂)		
15. Silver		<0.01	21. FLUORIDE (F)	1.07	
16.			*State whether determined or computed from P and SO alkalinity.		
REMARKS (Such as unusual appearance, taste, odor, etc.)					
(*) Sample preserved with Nitric Acid				CLW	
				000000273	
LABORATORY ANALYSIS BY <i>J. H. Jennings, Jr.</i>					DATE OF ANALYSIS 8/31/79

A44-7313
ACTOVON 690-7313

114:DPG
6229
13 OCT 1978

From: Commander, Atlantic Division, Naval Facilities Engineering Command
To: Commanding General, Marine Corps Base, Camp Lejeune

Subj: Marine Corps Base, Camp Lejeune; proposal for Base-wide Water/
Wastewater System Study

Encl: (1) Summary of the Review for Sewage Treatment Requirements for a
New Barracks in the Courthouse Bay Area and the New Hospital
in the Hadnot Point Area of Marine Corps Base, Camp Lejeune

1. Review of sewage treatment requirements for a new barracks in the
Courthouse Bay area and the new hospital in the Hadnot Point area of
Marine Corps Base, Camp Lejeune (MARCORB CAMP LEJEUNE), is summarized in
enclosure (1). Water treatment demand records have shown similar increases.

2. If these recent trends continue, the water and sewage treatment
facilities will exceed their design capacity in the early 1980's.
Continued growth may require major facility expansions costing \$20
million to \$30 million. Therefore, the Atlantic Division, Naval Faci-
lities Engineering Command (LANTNAVFACENCOM) recommends MARCORB CAMP
LEJEUNE review the recent growth trends and provide current projected
growth figures for each area of MARCORB CAMP LEJEUNE. It is recommended
that these projections include population estimates, proposed industrial
operations, and usage rates per person and/or industrial operation.

3. Design of such a major facility expansion will require extensive
preliminary studies including: potential for upgrading/consolidating
treatment units/pump stations, study of infiltration/inflow, effects of
consolidated discharges in receiving waters, potential for elimination
of discharges through land application, applicability and potential
savings from water conservation techniques. It is therefore recommended
that these projections be completed in time to allow for project pro-
gramming and preliminary studies to accommodate FY-82/83 projects.

J. G. Leech
By direction

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Richard

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CNC (LNF-2)
CNS CHERRY POINT

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NRS

ATTACHMENT (2)

SUMMARY OF THE REVIEW FOR THE
SEWAGE TREATMENT REQUIREMENTS FOR A NEW BARRACKS IN THE COURTHOUSE BAY AREA
AND THE NEW HOSPITAL IN THE HADNOT POINT AREA OF MARINE CORPS BASE, CAMP LEJEUNE

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TIMEFRAME	BASEWIDE TOTAL AVERAGE SEWAGE FLOW (000 GPD*)	REMARKS	COURTHOUSE BAY SEWAGE TREATMENT PLANT AVERAGE FLOW (000 GPD*)	REMARKS	HADNOT POINT SEWAGE TREATMENT PLANT AVERAGE FLOW (000 GPD)	REMARKS
NAR-DEC 76	6687	Total Capacity: ** 13,100,000 GPD	276	Design Capacity: 525,000 GPD	4177	Design Capacity: 8,000,000 GPD
JAN-DEC 77	7402	11% Increase	328	20% Increase	4716	9-13% Increase**
JAN-JUL 78	8316	12% Increase	412	20% Increase	5476	16% Increase
1 OCT 79 Est.	9000+	10%+ Increase Assumed	450+	10%+ Increase Assumed	6000+	10%+ Increase Assumed
1 OCT 80 Est.	10,000+	10%+ Increase Assumed	500+	10%+ Increase Assumed	6500+	10%+ Increase Assumed
1 OCT 81 Est.	11,000+	10%+ Increase Assumed	550+	10%+ Increase Assumed	7000+	10%+ Increase Assumed
1 OCT 82 Est.	12,000+	10%+ Increase Assumed	600+	10%+ Increase Assumed	7700+	10%+ Increase Assumed
1 OCT 83 Est.	13,000+	10%+ Increase Assumed	650+	10%+ Increase Assumed	8500+	10%+ Increase Assumed

NOTE:

- (1) Possible FY-84 base-wide overload even without FY-80 P-996 (500,000 GPD; not included in above).
- (2) Possible FY-81 Courthouse Bay overload even without FY-80 P-996 (50-100,000 GPD; not included in above).
- (3) Possible FY-83 Hadnot Point overload even without FY-80 P-996 (300,000 GPD; not included in above) and the new hospital (300,000 GPD; not included in above).
- (4) Possible causes of flow increases:
 - (a) Flow meter errors (unlikely that all 7 meters would increase)
 - (b) Infiltration/inflow increasing
 - (c) More persons and/or industrial operations
 - (d) Higher generation rate per person and/or industrial operation

*GPD = Gallons per Day

**Excludes New River Sewage Treatment Plant (abandoned)

***% increase variability due to whether include SEP 76 average flow of 2,930,000 GPD (appears too low).

ENCLOSURE (1)



DEPARTMENT OF THE NAVY
ATLANTIC DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
NORFOLK, VIRGINIA 23511

TELEPHONE NO.
AUTOVON 690-7313
IN REPLY REFER TO:

114:DPG
6280

8 FEB 1979

From: Commander, Atlantic Division, Naval Facilities Engineering Command
To: Commanding General, Marine Corps Base, Camp Lejeune, NC

Subj: Recommended corrective actions for remaining known wastewater/
oil environmental deficiencies

Ref: (a) National Pollutant Discharge Elimination System (NPDES)
Wastewater Discharge Permit NC0003239
(b) FY80 Pollution Control MCON Project P-996 (\$9,000 + K)
(c) Clean Water Act of 1977

Encl: (1) Sewage Treatment Plant Excessive Chlorination estimates
(2) LANTNAVFACENGCOM ltr 6280 114:DPG of 13 Oct 78

1. On 22 September 1977, the U. S. Environmental Protection Agency (EPA) cited Marine Corps Base, Camp Lejeune, as a "major polluter" for noncompliance with the legal requirements of reference (a), which covers the seven Marine Corps Base, Camp Lejeune, sewage treatment plants and the industrial wastewater/oil discharges to the 71 storm drains.

2. Reference (b) will provide by 1 July 1981, the several hundred corrective action items which will bring Marine Corps Base, Camp Lejeune, into compliance with reference (a).

3. In accordance with reference (c), state environmental requirements will become part of the next National Pollutant Discharge Elimination System (NPDES) wastewater discharge permit. The present permit expires 31 December 1979, and reapplication is due 30 June 1979. (LANTNAVFACENGCOM technical assistance will be available).

4. The next (FY80) NPDES Permit may require:

a. More monitoring of the sewage treatment plants and receiving waters (e.g. monitoring for chemical oxygen demand, phosphorus, and oil in accordance with the new definition of secondary treatment).

b. Operation of the advanced wastewater treatment portion of the Camp Geiger sewage treatment plant. A "Waste Load Allocation Report" should be requested of North Carolina to justify whether there is even an environmental need to operate this system.

c. Sewage treatment plant effluent chlorine limits. As discussed in enclosure (1), excessive, toxic amounts of chlorine are being used at a cost of \$50 - 100,000 per year.

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ATTACHMENT (3)

114:DPG

Subj: Recommended corrective actions for remaining known wastewater/
oil environmental deficiencies

5. Although the EPA considers the operation/maintenance of the seven sewage treatment plants to be excellent, the capacity of the plants may be exceeded in the early 1980's as discussed in enclosure (2). Please advise LANTNAVFACENGCOCM Code 114 as to your evaluation of this situation.

6. Due to cost limitations of reference (b), the \$375K to provide oil Spill Prevention Control Counter Measures (SPCC) for an estimated 1,561 space heaters was deleted. These items should be resubmitted as a separate FY81/82 oil SPCC pollution abatement MCON.

7. Reference (b) is to attain compliance with reference (a) which does not require erosion control. Compliance with Soil Conservation Service erosion control requirements is, however, also legally required and a separate FY82 pollution abatement MCON should be submitted as soon as possible. An A/E preliminary study will probably be required to delineate the scope of this project.

8. Remaining known wastewater/oil environmental deficiencies concern the treatment of the coal pile runoff, which is understood by LANTNAVFACENGCOCM to be accomplished as part of the coal conversion of the Marine Corps Base, Camp Lejeune, boilers.

J. G. Leech
By direction

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COMNAVFACENGCOCM
CMC (LFF-2)

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MARINE CORPS BASE, CAMP LEJEUNE
SEWAGE TREATMENT PLANT EXCESSIVE CHLORINATION ESTIMATES

Note: Although chlorine effluent limits vary, effluent chlorine greater than 1.0-2.0 MG/L is generally not required for adequate disinfection and can cause the sewage treatment plant effluent to become toxic, thereby negating the entire purpose of the sewage treatment plant. (See attached discussion of chlorine toxicity).

<u>Month</u>	<u>Total Flow (MGD)</u>	<u>Weighted Average Chlorine (MG/L)</u>	<u>Excess Chlorine (100 lbs./month)</u>	<u>Estimated Cost per month (\$000)</u>
OCT 76	6.7	3.1	19-36	2-7
NOV 76	6.5	5.0	49-65	5-13
DEC 76	6.9	4.4	43-61	4-12
JAN 77	6.7	5.1	54-71	5-14
FEB 77	6.6	4.9	45-60	5-12
MAR 77	7.1	4.6	48-66	5-13
APR 77	6.4	4.3	37-53	4-11
MAY 77	7.7	3.3	26-46	3-9
JUN 77	7.6	3.4	27-46	3-9
JUL 77	7.6	3.5	30-49	3-10
AUG 77	8.1	3.7	36-57	4-11
SEP 77	7.5	3.8	34-53	3-11
OCT 77*	7.6	3.8	35-55	4-11
NOV 77	8.1	4.1	43-63	4-13
DEC 77	7.9	3.9	39-59	4-12
JAN 78	8.7	3.5	34-56	3-11
FEB 78	7.9	3.7	31-50	3-10
MAR 78	8.3	3.9	41-62	4-12
APR 78	8.0	4.0	40-60	4-12
MAY 78	8.8	3.9	43-66	4-13
JUN 78	8.3	3.9	40-60	4-12
JUL 78	8.3	3.5	32-54	3-11
AUG 78	7.9	4.1	43-63	4-13
SEP 78	8.1	3.6	32-53	3-11
OCT 78	8.1	3.9	40-61	4-12
NOV 78	8.3	4.0	42-62	4-12
DEC 78	9.3	3.9	46-70	5-14
27 Months (822 days)	7.7	4.0	40-58	4-12

Say: \$50-\$100,000 per year

*Chlorine cost: \$1-2 per pound depending on locale and amount of purchase.
** LANTNAVFACENCOM initiated monthly recommendations that the effluent chlorine be lowered (i.e. to less than 2.0 MG/L).

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Enclosure (1)

PB 263 943

QUALITY CRITERIA FOR WATER



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TECHNICAL REPORT DATA
(Please read instructions on the reverse before completing)

1. REPORT NO. EPA-440/9-76-023		2.	3. RECIPIENT'S ACCESSION NO.	
4. TITLE AND SUBTITLE Quality Criteria for Water			5. REPORT DATE Jul 1976	
			6. PERFORMING ORGANIZATION CODE	
7. AUTHOR(S)			8. PERFORMING ORGANIZATION REPORT	
9. PERFORMING ORGANIZATION NAME AND ADDRESS			10. PROGRAM ELEMENT NO.	
			11. CONTRACT/GRANT NO.	
12. SPONSORING AGENCY NAME AND ADDRESS U.S. Environmental Protection Agency Office of Water Planning and Standards Washington DC 20460			13. TYPE OF REPORT AND PERIOD COVERED	
			14. SPONSORING AGENCY CODE	
15. SUPPLEMENTARY NOTES				
16. ABSTRACT The Federal Water Pollution Control Act Amendments of 1972 require the Administrator of the Environmental Protection Agency to publish criteria for water quality accurately reflecting the latest scientific knowledge on the kind and extent of all identifiable effects on health and welfare which may be expected from the presence of pollutants in any body of water, including ground water. Proposed Water Quality Criteria were developed and a notice of their availability was published on Oct 26, 1973 (38 FR 29646). This present volume represents a revision of the proposed water quality criteria based upon a consideration of comments received from other Federal agencies, State agencies, special interest groups and individual scientists.				
17. KEY WORDS AND DOCUMENT ANALYSIS				
a. DESCRIPTORS		b. IDENTIFIERS/OPEN ENDED TERMS		c. COSATI Field/Group
18. DISTRIBUTION STATEMENT		19. SECURITY CLASS (This Report)		21. NO. OF PAGES
		20. SECURITY CLASS (This page) CLW		22. PRICE

CHLORINE

CRITERIA:

Total residual chlorine:

2.0 ug/l for salmonid fish;
10.0 ug/l for other freshwater and marine organisms.

INTRODUCTION:

Elemental chlorine is a greenish-yellow gas that is highly soluble in water. It reacts readily with many inorganic substances and all animal and plant tissues. The denaturing effect of chlorine on animal and plant tissues forms the basis for its use as an effective water or wastewater disinfectant. When chlorine dissolves in water, it hydrolyzes according to the reaction: $\text{Cl}_2 + \text{H}_2\text{O} \rightarrow \text{HOCl} + \text{H}^+ + \text{Cl}^-$. Unless the concentration of the chlorine solution is above 1000 mg/l, all chlorine will be in the form of HOCl or its dissociated ions H^+ and OCl^- . The HOCl is a weak acid and is dissociated according to the equation, $\text{HOCl} \rightleftharpoons \text{H}^+ + \text{OCl}^-$.

The ratio between HOCl and OCl^- is a function of the pH, with 96 percent HOCl remaining at pH 6, 75 percent at pH 7, 22 percent at pH 8, and 3 percent at pH 9. The relationship of HOCl to pH is significant as the undissociated form appears to be the bactericidal agent in the use of chlorine for disinfection (Moore, 1951).

Chlorine is not a natural constituent of water. Free available chlorine (HOCl and OCl^-) and combined available chlorine (mono- and

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di-chloramines) appear transiently in surface or ground waters as a result of disinfection of domestic sewage or from industrial processes that use chlorine for bleaching operations or to control organisms that grow in cooling water systems.

RATIONALE:

Chlorine, in the free available form reacts readily with nitrogenous organic materials to form chloramines. These compounds are toxic to fish. Chloramines have been shown to be slightly less toxic to fish than free chlorine, but their toxicity is considered to be close enough to free chlorine that differentiation is not warranted (Merkens, 1958). Since the addition of chlorine or hypochlorite to water containing nitrogenous materials rapidly forms chloramines, toxicity in most waters is related to the chloramine concentration. The toxicity to aquatic life of chlorine will depend upon the concentration of total residual chlorine, which is the amount of free chlorine plus chloramines. The persistence of chloramines is dependent on the availability of material with a lower oxidation-reduction potential.

In field studies in Maryland and Virginia, Tsai (1973) observed that downstream from plants discharging chlorinated sewage effluents the total numbers of fish species were drastically reduced with the stream bottom clear of aquatic organisms characteristically present in unchlorinated wastewater discharges. No fish were found in water with a chlorine residual above 0.37 mg/l and the species diversity

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index reached zero at 0.25 mg/l. A 50 percent reduction in the species diversity index occurred at 0.10 mg/l. Of the 45 species of fish observed in the study areas, the brook trout and brown trout were the most sensitive and were not found at residual chlorine levels above about 0.02 mg/l. In studies of caged fish placed in waters downstream from chlorinated wastewater discharges, the Michigan Department of Natural Resources (1971) reported that 50 percent of the rainbow trout died within 96 hours at residual chlorine concentrations of 0.014 to 0.029 mg/l. Some fish died as far as 0.8 miles (1.3 km) downstream from the outfall.

Studies described by Brungs (1973) indicate that salmonids are the most sensitive fish to chlorine. A residual chlorine concentration of 0.006 mg/l was lethal to trout fry in two days (Coventry, et al., 1935). The 7-day LC₅₀ for rainbow trout was 0.08 mg/l with an estimated median period of survival of one year at 0.004 mg/l (Merkens, 1958). Rainbow trout were shown to avoid a concentration of 0.001 mg/l (Sprague and Drury, 1969). Dandy (1972) demonstrated that brook trout had a mean survival time of 9 hours at 0.35 mg/l, 18 hours at 0.08 mg/l and 48 hours at 0.04 mg/l, with mortality of 67 percent after 4 days at 0.01 mg/l. Pike (1971) observed a 50 percent brown trout mortality at 0.02 mg/l within 10.5 hours and 0.01 mg/l with 43.5 hours.

The range of acutely lethal residual chlorine concentrations is narrow for various species of warm water fish. Arthur (1972) determined

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96-hour LC₅₀ values for the walleye, black bullhead, white sucker, yellow perch, largemouth bass, and the fathead minnow. The observed concentration range was 0.09 to 0.30 mg/l.

Using fathead minnows in a continuous bioassay technique at Michigan treatment plants, Zillich (1972) found that an average concentration of 0.16 to 0.21 mg/l killed all of the test fish and that concentrations as low as 0.07 mg/l caused some mortalities. Pyle (1960) demonstrated a 50 percent mortality of smallmouth bass exposed to 0.5 mg/l within 15 hours. The mean 96-hour LC₅₀ value for golden shiners was 0.19 mg/l (Esvelt, et al., 1971). Arthur and Eaton (1971), working with fathead minnows and the freshwater crustacean, Gammarus pseudolimnaeus, in dilute wastewater, found that the 96-hour LC₅₀ of total residual chlorine for Gammarus was 0.22 mg/l and that all fathead minnows were dead after 72 hours at 0.15 mg/l. At concentrations of .09 mg/l, all fish survived until the seventh day when the first death occurred. In exposure to 0.05 mg/l residual chlorine, these investigators found reduced survival of Gammarus and at 0.0034 mg/l there was reduced reproduction. Growth and survival of fathead minnows after 21 weeks were not affected by continuous exposure to 0.043 mg/l residual chlorine. The highest level showing no significant effect was 0.016 mg/l. Working with secondary wastewater effluent, Arthur (1972) found that reproduction by Gammarus was reduced by residual concentrations above 0.012 mg/l residual chlorine.

In marine water, 0.05 mg/l was the critical chlorine level for young Pacific salmon exposed for 23 days (Holland, et al., 1960). The

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lethal threshold for chinook salmon and coho salmon for a 72-hour exposure was noted by these investigators to be less than 0.01 mg/l chlorine. Studies on the effect of residual chlorine to marine phytoplankton indicate that continuous exposure to 0.10 mg/l reduced primary production by 70 percent while 0.2 mg/l for 1.5 hours reduced primary production by 25 percent (Carpenter, et al., 1972). Laboratory studies on ten species of marine phytoplankton indicate that a 50 percent reduction in growth rate occurred at chlorine concentrations of 0.075 to 0.250 mg/l during a 24-hour exposure period (Gentile, et al., 1973). Oysters are sensitive to chlorine concentrations of 0.01 to 0.05 mg/l and react by reducing pumping activity. At chlorine concentrations of 1.0 mg/l, effective pumping could not be maintained (Galtsoff, 1945).

Chlorine residuals of 10 ug/l have been shown to kill adult salmonid fish in a period of several days in fresh water and the fry of these species have been killed in chlorine residuals of 6 ug/l. The criterion of 2 ug/l chlorine should afford protection to this group of fish when exposed on a continuing basis. Considering the data presented above, a criterion of 10 ug/l should afford protection to other freshwater fish and marine aquatic life (Brungs, In Press). Brungs (1973) reported that aquatic organisms may tolerate short-term exposure to higher levels of residual chlorine than the concentrations which have adverse chronic effects. Basch and Trenchan (In Press) have shown that repeated daily exposure at these levels will have toxic effects on aquatic life.

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LAWS AND RULES
FOR
GROUND ABSORPTION SEWAGE DISPOSAL SYSTEMS
OF 3000 GALLONS OR LESS DESIGN CAPACITY

SECTION .1900
OF THE
NORTH CAROLINA ADMINISTRATIVE CODE
TITLE 10
DEPARTMENT OF HUMAN RESOURCES
CHAPTER 10
HEALTH SERVICES; SANITARY ENGINEERING
SUBCHAPTER 10A
SANITATION

NORTH CAROLINA
DEPARTMENT OF HUMAN RESOURCES
DIVISION OF HEALTH SERVICES
SANITARY ENGINEERING SECTION
EFFECTIVE

JULY 1, 1977

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10 NCAC 10A .1900; SEWAGE DISPOSAL SYSTEMS;

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SECTION 130-160 OF CHAPTER 130
OF THE GENERAL STATUTES OF NORTH CAROLINA
AS AMENDED BY 1977 GENERAL ASSEMBLY

§130-160. Sanitary Sewage Disposal; Rules.

(a) Any person owning or controlling any single or multiple family residence, place of business or place of public assembly shall provide a sanitary system of sewage disposal consisting of an approved privy, an approved septic tank system, or a connection to a public or community sewerage system. Any such sanitary sewage disposal system with 3,000 gallons or less design capacity serving a single or multiple family residence, place of business, or place of public assembly, the effluent from which is not discharged to the surface waters, shall be approved under rules and regulations promulgated by the Commission for Health Services. All other such sanitary sewage disposal systems with more than 3,000 gallons design capacity shall be approved under rules and regulations promulgated by the Environmental Management Commission pursuant to the applicable provisions of Article 21 of Chapter 143.

(b) Notwithstanding the provisions of subsection (a) of this section and the provisions of G.S. 130-17(b), any sanitary sewage disposal system subject to approval under rules and regulations of the Commission for Health Services shall be reviewed and approved under rules and regulations of a local board of health in the following circumstances:

- (1) The local board of health, on its own motion, has requested the Commission for Health Services to review its proposed regulations concerning sanitary sewage disposal systems.
- (2) The Commission for Health Services has found that the regulations of the local board of health concerning sanitary sewage disposal systems are substantially equivalent to the commission's regulations, and are sufficient to safeguard the public health.

(c) The Commission for Health Services from time to time, upon its own motion or upon the request of a local board of health or upon the request of a citizen of an affected county, may review its findings under subsection (b) of this section. Subject to such review, the commission's finding that local regulations meet the requirements of subsection (b) of this section shall be binding and conclusive.

(d) The relationship between State and local regulations concerning sanitary sewage disposal systems shall continue to be governed by G.S. 130-17(b) except in those cases where local regulations have been reviewed and approved pursuant to subsection (b) of this section. (1957, c. 1357, s. 1; 1973, c. 471, s. 1; c. 476, s. 128; c. 860; 1977, c. 857, s. 1.)

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G.S. 130-17 is amended to read as follows:

(b) The local boards of health shall make such rules and regulations, not inconsistent with law, as are necessary to protect and advance the public health. Subject to the provisions of G.S. 130-160, where such rules and regulations deal with subject matter also covered by rules and regulations of the Commission for Health Services, and there is an emergency, or peculiar local condition or circumstances, requiring such action in the interest of public health, the rules and regulations of the local boards may be more stringent, but not less stringent, than those of the commission. In other instances where there is a conflict between the rules and regulations of the Commission and the local boards, the rules and regulations of the Commission shall prevail. All rules and regulations heretofore adopted by a local board of health shall remain in full force and effect until repealed by said local board of health or superseded by rules and regulations duly adopted by said local board of health. (1977, c. 857, s. 2.)

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ARTICLE 13C OF CHAPTER 130
OF THE GENERAL STATUTES OF NORTH CAROLINA

GROUND ABSORPTION SEWAGE DISPOSAL SYSTEM ACT OF 1973

§130-166.22. Short title. -- This Article shall be known and may be cited as the "Ground Absorption Sewage Disposal System Act of 1973." (1973, c. 452, s. 2.)

§130-166.23. Preamble. -- The General Assembly finds and declares that continued installation, at a rapidly and constantly accelerating rate, of septic tanks and other types of ground absorption sewage disposal systems in a faulty or improper manner and in areas where unsuitable soil and population density adversely affect the efficiency and functioning of these systems has a detrimental effect on the public health through contamination of the ground water supply. Recognizing, however, that ground absorption sewage disposal can be rendered ecologically safe and the public health protected if such methods of sewage disposal are properly regulated and recognizing that ground absorption sewage disposal will continue to be necessary for the adequate and economical housing of an expanding population, the General Assembly intends hereby to insure the regulation of ground absorption sewage disposal systems so that such systems may continue to be used, where appropriate, without jeopardizing the public health. (1973, c. 452, s. 3.)

§130-166.24. Definitions. -- As used herein, unless the context otherwise requires:

- (1) "Construction" means any work at the site of placement done for the purpose of preparing a dwelling or mobile home for initial occupancy;
- (2) "Ground absorption sewage disposal system" means a sewage disposal method relying primarily on the soil for leaching and removal of dissolved and suspended organic or mineral materials from human waste, including a privy;
- (3) "Health department" means any county, city, district, consolidated city-county or other health department authorized to be organized under Chapter 130 of the General Statutes;
- (4) "Location" means the initial placement of a mobile home;
- (5) "Mobile home dealer" means every person or firm offering mobile homes for sale within this State;
- (6) "Mobile home sales lot" means any place where two or more mobile homes are displayed and offered for sale;
- (7) "Relocation" means the displacement of a dwelling or mobile home from one site to another;
- (8) "Septic tank system" means a ground absorption sewage disposal system consisting of a holding or settling tank and a ground absorption field. (1973, c. 452, s. 4.)

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§130-166.25. Improvements permit require. -- (a) No person shall commence the construction or relocation of any dwelling nor shall any person locate, relocate or cause to be located or to be relocated any mobile home intended for use as a dwelling, other than one in a mobile home park, on a site in an area not served by a public or community sewage disposal system without first obtaining an improvements permit from the local health department having jurisdiction.

(b) The local health department shall issue an improvements permit authorizing work to proceed and the use of a septic tank or other ground absorption disposal system when it has determined, after a field investigation of the area, including such factors as character and porosity of soil, percolation rate, topography, depth to water table and rock or other impervious formations and location or proposed location of any water supply wells, that such a system can be installed at the site in compliance with the rules and regulations of the local board of health governing such installations; provided, however, that no septic tank system which is attempted to be installed shall be covered with the soil until the local health department determines that the system as installed is in compliance with the rules and regulations governing such installations; provided further, that this Article does not limit or interfere with the authority of the Department of Human Resources to adopt and enforce reasonable rules and regulations under authority of G.S. 130-160, (1973, c. 452, s. 5; c. 476, s. 128.)

§130-166.26. Certificate of completion. -- Upon determining that a ground absorption sewage disposal system is properly installed, the local health department shall issue a certificate of completion authorizing a conventional dwelling to be occupied following construction or relocation activity upon that dwelling. Upon determining that a ground absorption sewage disposal system is properly installed, the local health department shall issue a certificate of completion authorizing a mobile home to be occupied following its location or relocation. No person shall occupy a dwelling or mobile home until a certificate of completion has been issued. (1973, c. 452, s. 6.)

§130-166.27. Improvements permit or certificate of completion required before other permits to issue. -- (a) Where construction or relocation activity is proposed to be done upon a conventional dwelling, no permit required for electrical, plumbing, heating, air conditioning or other construction, location or relocation activity under any provision of general or special law shall be issued until after an improvement permit has been issued.

(b) Where location or relocation is proposed for a mobile home, no permit required for electrical, plumbing, heating, air conditioning or other construction, location or relocation activity under any provision of general or special law shall be issued until after a certificate of completion has been issued, (1973, c. 452, s. 7.)

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§130-166.28. Limitation on electrical service. -- It shall be unlawful for any person, partnership, firm, or corporation to allow any electric current for use at the locating or relocating of a mobile home intended to be used as a dwelling, other than one in a mobile home park, or to a dwelling upon construction, location or relocation until the official electrical inspector with jurisdiction as provided in G.S. 143-143.2 certifies to the electrical supplier that the required improvements permit for conventional dwellings or the required certificate of completion for mobile homes has been issued. (1973, c. 452, s. 8.)

§130-166.29. Appeal to local board of health. -- Any owner or builder denied an improvements permit or a certificate of completion under this Article shall have a right of appeal to the local board of health, provided such action is taken within 15 days of denial. Notice of appeal shall be given by filing with the local health director a demand for a hearing. Upon filing of such notice the local health director shall, within five working days, transmit to the board of health the papers and materials constituting the record upon which the decision appealed from was made.

The local board of health shall hold a hearing within 15 days of the receipt of the notice of appeal. The board shall give the appellant not less than five days' notice of the date, time, and place of the hearing. Any party may appear in person or by agent or attorney. In considering appeals, the board shall have authority only to determine whether a ground absorption system can be installed in compliance with its rules and regulations or whether the work done so complies.

No person denied an improvements permit or certificate of completion shall proceed with any work or improvement activity whatsoever or shall occupy any dwelling or reside in any mobile home unless and until the department issues the necessary permit. (1973, c. 452, s. 9; 1977, c.239.)

§130-166.30. Judicial review. -- Any owner or builder denied a permit under this Article shall have a right of appeal to the district court having jurisdiction, if such appeal be made within 10 days after the date of the denial by the board. (1975, c. 452, s. 10.)

§130-166.31. Duties of mobile home dealers. -- (a) Every mobile home dealer doing business in this State shall be required to furnish each purchaser of a mobile home an easily understandable summary of the provisions of this Article. The Department of Human Resources shall prepare the summary and shall make sufficient copies available to dealers.

(b) Each mobile home dealer shall be required to post conspicuously at the office of each mobile home sales lot the following:

"NOTICE: State law requires that the local health department determine the method and adequacy of sewage disposal before a mobile home is placed on the premises."

(1973, c. 452, s. 11; c. 476, s. 128)

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§130-166.32. Exemptions. -- No provision of this Article shall apply to persons developing land in areas not served by community sewer systems who present acceptable plans for installation of community sewer systems to the local health department and the North Carolina Environmental Management Commission and who certify that such system will be installed before permitting occupancy. (1973, c. 452, s. 12; 1974, c. 1262, s. 23.)

§130-166.33. Penalties. -- Any person who knowingly violates any provision of this Article shall be guilty of a misdemeanor and shall be punishable by a fine not to exceed two hundred dollars (\$200.00). (1973, c. 452, s. 13.)

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