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USAF OEHL REPORT

84-228EQ040EWA



WATER QUALITY MANAGEMENT SURVEY

COLUMBUS AFB MS

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USAF Occupational and Environmental Health Laboratory
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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM												
1. REPORT NUMBER 84-228EQ040EWA	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER												
4. TITLE (and Subtitle) Water Quality Management Survey Columbus AFB, Mississippi		5. TYPE OF REPORT & PERIOD COVERED Final - 18-22 Jul 83												
		6. PERFORMING ORG. REPORT NUMBER												
7. AUTHOR(s) DULCIE A. WEISMAN, 1Lt, USAF, BSC		8. CONTRACT OR GRANT NUMBER(s)												
9. PERFORMING ORGANIZATION NAME AND ADDRESS USAF Occupational and Environmental Health Laboratory, Brooks AFB TX 78235		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS												
11. CONTROLLING OFFICE NAME AND ADDRESS USAF Occupational and Environmental Health Laboratory, Brooks AFB TX 78235		12. REPORT DATE May 1984												
		13. NUMBER OF PAGES 19												
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		15. SECURITY CLASS. (of this report) UNCLASSIFIED												
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE												
16. DISTRIBUTION STATEMENT (of this Report) Approved for public release; distribution unlimited.														
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)														
18. SUPPLEMENTARY NOTES														
19. KEY WORDS (Continue on reverse side if necessary and identify by block number)														
<table><tr><td>Water Quality Management</td><td>NPDES</td><td>Columbus AFB M.</td></tr><tr><td>Drinking water</td><td>Chemical storage</td><td>ATC</td></tr><tr><td>Wastewater</td><td>Ambient stream monitoring</td><td></td></tr><tr><td>Storm drainage</td><td></td><td></td></tr></table> <p><i>(Occupational and Environmental Health Laboratory)</i></p>			Water Quality Management	NPDES	Columbus AFB M.	Drinking water	Chemical storage	ATC	Wastewater	Ambient stream monitoring		Storm drainage		
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<p>The USAF OEHL conducted an on-site water quality management survey at Columbus AFB MS from 18-22 July 1983 at the request of HQ ATC/SGPB. Main areas of interest were, (1) wastewater discharge permits, (2) outdoor storage of drummed chemicals and chemical wastes, and (3) ambient stream monitoring. The water and wastewater treatment plants, and industrial shops, were also included in the survey. Results of the survey indicated that the wastewater discharge permits need to be revised to reflect current base conditions. The</p>														

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→ recommendation was made that outdoor storage practices for chemicals and chemical wastes be reviewed so that the chance of environmental contamination is minimized.



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I. INTRODUCTION

HQ Air Training Command (HQ ATC/SGPB) requested the USAF Occupational and Environmental Health Laboratory (USAF OEHL) to conduct an on-site water quality management survey of Columbus AFB MS. The author visited the base and conducted the survey during the period 18-22 July 1983.

Specific areas addressed by this survey were the wastewater discharge and stream sampling programs. In addition, the wastewater treatment plant, drinking water plant, and industrial shop areas were visited. Environmental monitoring programs and monitoring data were reviewed.

II. WATER QUALITY MANAGEMENT SYSTEM

A. Drinking Water

1. Drinking water at Columbus AFB is supplied by a base-operated treatment plant, and serves an effective population of 4340. The water supply comes from on-base wells. Three main wells, with production capacities of 300 gallons per minute (gpm), 385 gpm, and 195 gpm, are the principal base water sources. Water from these wells is routed to the water treatment plant. Four other on-base wells serve only the facility at which each is located: entomology shop; base riding stables; and two communication squadron sites. Water from these four wells receives chlorination treatment only.

2. The primary function of the Columbus AFB water treatment plant is iron removal. The treatment sequence consists of:

- a. Mechanical aeration
- b. Lime coagulation, chlorination, and fluoridation
- c. Sedimentation
- d. Iron sludge centrifugation

3. The plant's design capacity is 1.5 million gallons per day (MGD). Finished water is pumped into two elevated storage tanks with 200,000 and 400,000 gallon capacities. Both tanks are cathodically protected.

4. Monitoring of the drinking water quality is a responsibility of the base Bioenvironmental Engineering (SGPB) office. Parameters monitored routinely are: total coliforms, chlorine residual, and fluoride. Chemicals covered by the Safe Drinking Water Act are monitored every three years, in compliance with AFR 161-44 (Management of the Drinking Water Surveillance Program). The chemicals to be monitored are: arsenic, barium, cadmium, chromium, lead, mercury, nitrate, selenium, silver, endrin, lindane, methoxychlor, toxaphene, 2,4-D, and 2,4,5-TP Silvex. Radiological sampling of the water distribution system is performed every four years. SGPB is also required, by AFR 161-44, paragraph 6-6f(5), to analyze a disinfected ground-water sample for the Total Trihalomethane Potential.

5. The water treatment plant operator also maintains records of chlorine residual, fluoride, pH, and iron. Chlorine residual, fluoride, and iron concentrations of the finished water average 1 mg/L, 0.9 mg/L, and 0.2 mg/L, respectively.

B. Wastewater

1. Wastewater routed to sanitary sewers on Columbus AFB receive treatment at the base wastewater treatment plant (WTP). The design capacity is 700,000 gallons per day. During periods of rainfall, infiltration/inflow have increased flows up to 1 MGD. Industrial wastewater is combined with domestic wastewater for treatment. Industrial wastewater sources include oil/water separators, neutralized waste from the battery/electric shop, overflow from the parts cleaning/plating/welding holding basin, and aircraft washrack wastewater.

2. The wastewater treatment system consists of the following sequence of units:

- a. Bar screen
- b. Comminutor
- c. Grit chambers (two)
- d. Primary clarifiers (two)
- e. Trickling filters (two)
- f. Tertiary trickling filter with plastic media
- g. Final clarifiers (three)
- h. Anaerobic digester

3. After the sludge is digested, it is spread onto drying beds. Dried sludge is disposed of off base by private contractor.

C. Surface Water

Columbus AFB is located in the Tombigbee River Basin. Surface drainage originating on base flows off the facility at four points. The discharges at these points are monitored by SGPB for discharge quality compliance under the National Pollutant Discharge Elimination System (NPDES). SGPB also performs compliance monitoring of the Tombigbee River, as directed by the State of Mississippi water quality law.

D. Solid Waste, Industrial Waste, Hazardous Waste, and Chemical Storage

1. Municipal-type solid wastes generated at Columbus AFB are disposed of at a county sanitary landfill. An old sanitary landfill exists on Columbus AFB. This fill still receives material such as construction rubble and tree limbs.

2. Temporary storage of waste chemicals, and hazardous waste, prior to disposal off base, is accomplished at the following facilities:

- a. Industrial shops, where generated.
- b. Civil Engineering (DE) Waste Fuels Storage Area. This area consists of five underground steel tanks, each with a capacity of 10,000 gallons. The tanks contain JP-4, solvents, hydraulic fluid, and waste oil.
- c. Parts Cleaning/Plating/Welding Shop Holding Basin. DE pumps it out; overflow is routed to the sanitary sewer.
- d. Stripping Shop Waste Holding Tank. DE transfers the contents to drums approximately every six months; the drums are shipped to a site off base.
- e. Defense Property Disposal Office (DPDO) Storage Yard. At the time of this survey, the lot contained various metal parts, rubber tires on pallets, 55-gallon drums on pallets, spent 105 mm shells, and small transformers on pallets. Only transformers containing less than 50 parts per million polychlorinated biphenyls (PCBs) are accepted for storage in this lot. A small prefabricated building is also located at the DPDO facility. It contains flammable material. The building has a curbed concrete floor to contain spills.
- f. DE Hazardous Waste Temporary Storage Area. This is a section of a paved yard which is used for drum storage when the DPDO cannot provide space. The yard is locked at night, and at the time of the survey, a work order had already been submitted for the construction of a diked concrete pad for the drums.

E. National Pollutant Discharge Elimination System

The National Pollutant Discharge Elimination System (NPDES) is a program that regulates, by way of permits, the discharge of pollutants from point sources into navigable waters. Permits are issued by either the U.S. Environmental Protection Agency (U.S. EPA), or by states approved by the U.S. EPA to administer the program. The responsibility for the NPDES program for federal facilities in Mississippi was transferred from the U.S. EPA to the State of Mississippi Air & Water Pollution Control Commission (MAWPCC) in February 1983.

2. Three permits exist for Columbus AFB. These are described below.

- a. MS0001473 regulates discharges to the Tombigbee River from the base water treatment plant, and storm drain system.
- b. MS0040258 regulates the discharge to the Tombigbee River from the base WTP.
- c. MS0020028 regulates the discharge to Sucarnoochee Creek from the WTP at OLF-ALPHA, an auxiliary location at Shuqualak MS.

III. OBSERVATIONS

A. Drinking Water

1. The State of Mississippi requires flaming of water taps, prior to water distribution system sampling. This is contrary to Air Force recommendations.

2. SGPB is currently monitoring all seven base water production wells for Safe Drinking Water Act chemical constituents.

B. Wastewater

1. The base is considering either rehabilitating the existing WTP outfall to the Tombigbee River, or building a new, shorter outfall to Stinson Creek, a tributary of the Tombigbee. The existing outfall provides chlorine contact time, since the WTP does not have a chlorine contact tank.

2. The base anaerobic digester is operated by controlling pH, temperature, and volatile solids. These parameters alone are not good indicators of the changes that the system can undergo; the digester may be souring, but the pH and solids may not indicate the impending upset.

C. Surface Water

1. According to the State of Mississippi Water Quality Criteria for Intrastate, Interstate and Coastal Waters (25 Feb 1982), the Tombigbee River Basin, at Columbus AFB, is classified as, "Fish and Wildlife."

2. Currently, surface water quality monitoring is performed on the Tombigbee River. One sampling point is located one mile upstream from the WTP outfall (below the juncture with the Buttahatchie River); the second sampling point is located four miles downstream from the WTP outfall. Prior to the USAF OEHL visit, water samples were collected at the river bank. These were probably not well mixed, representative samples.

3. A sheen was observed on a stream originating on base, that flows adjacent to the POL tank farm, and discharges to the Tombigbee. The floating material appeared to be fuel. We did not observe a point source of discharge. We suspected that it was coming from the soil beneath the POL tanks. Upon breaking apart the soil along one bank, more pollutant entered the water. There was also a strong fuel smell on a wooden stick that we pushed into the bank, and then removed.

D. Industrial Waste, Hazardous Waste, and Chemical Storage

1. Battery/Electric Shop wastes are disposed of correctly. Sulphuric acid is neutralized with baking soda; potassium hydroxide with boric acid. Neutralized waste flows to the sanitary sewer.

2. Auto Hobby Shop washwater and runoff from the back yard flows directly to a storm drain. The yard contained 55 gallon drums with waste oil

ponded on the tops. The spigot on one drum was leaking what appeared to be kerosene. The concrete back yard had surface deposits of oil. Runoff from this shop is a source of oil & grease discharge to surface water. At the time of the survey, the shop supervisor said that a work order for an oil/water separator had been submitted.

3. Runoff from the aircraft washrack is routed, by way of a valve, to either a storm drain, or to a holding tank, with release to the sanitary sewer. During washing operations, personnel are supposed to turn the valve so that all runoff flows to the holding tank. A spot check made during washing operations revealed that the runoff, containing aircraft cleaning compound, was flowing directly to the storm drain. This is a source of discharge of phenols to surface water. Washrack personnel questioned at that time were not familiar with the valve's operation.

4. Table 1 shows shops where new and/or waste chemicals in drums are stored outside, on either concrete, gravel, or grass. No engineering safeguards to contain spills had been constructed to minimize accidental discharge of chemicals directly to soil, or to surface water, by way of storm drains. At one shop we saw evidence of a chemical on the gravel on which drums were stored. Note that this table was compiled from observations made during the survey and from conversations with shop personnel. The list of shops and chemicals may not be inclusive.

5. From observation and discussion with base personnel, it appears that aircraft cleaning compound, which contains phenols, is used unofficially and occasionally to clean motor vehicles. If the runoff is not routed to the sanitary sewer, it is a source of discharge of phenolic compounds to surface water.

6. A hydraulic test stand located at the Aero Repair hangar has lost 45 gallons of hydraulic fluid during each of three recent accidental spills. The spilled fluid entered a storm drain.

7. The Base Supply storage yard contained approximately 30 small transformers on pallets. According to the shop representative we spoke to, all were marked with PCB stickers, although it was not known whether any actually contained PCBs.

8. Each jet engine test cell has a central floor drain which routes wastewater to an oil/water separator and the sanitary sewer. When the cell floors and engine compressors are cleaned, an effort is made to wash all of the wastewater, which contains POL and detergent, into the central drains. One shop employee estimated that one-third of the wastewater flows to an exterior drain situated along the front entrance to the cells. Wastewater from this drain is discharged to nearby grass.

**Table 1. Outdoor Storage of Drummed Chemicals
(New and/or Waste) for Columbus AFB**

<u>Shop</u>	<u>Chemicals</u>
Pneudraulics	PD-680
AGE	Waste oil, hydraulic fluid, PD-680, synthetic oil
Wheel & Tire	PD-680
Fuels Flow Room	Aircraft soap, carbon remover, 1010 oil, PD-680, trichloroethylene, calibration fluid
T-37 Maintenance Hangar	Contaminated engine oil, aircraft cleaning compound
Auto Hobby Shop	POL (petroleum, oil, and lubricants)
Vehicle Maintenance	POL
Aero Repair	Any fluid drained from aircraft, cleaning compounds, PD-680
Power Production	Gasoline, paint remover, anti-freeze, diesel fuel, oil
Entomology	Pesticides
DPDO and Base Supply Storage Yards	(Drum contents not known to USAF OEHL survey group)

E. NPDES

1. MS0001473. Since this permit was issued, the water treatment plant was upgraded and wastes have not been discharged. After the iron sludge is centrifuged, the solids are disposed of by a contractor, and the liquid supernatant is recycled through the plant.

Monitoring of storm runoff is performed at four streams that originate on base. Two streams discharge to the Buttahatchie, a tributary of the Tombigbee. Two streams discharge to the Tombigbee. Possible sources of contamination of the surface drainage are described in Table 2.

Table 2. Sources of Contamination of Surface Drainage Monitored under the NPDES Program for Columbus AFB

<u>Sampling Location Number</u>	<u>Discharges To</u>	<u>Discharge Contains</u>
001	Tombigbee	Storm runoff, swimming pool filter backwash water, runoff from the aircraft washrack area, boiler blowdown water, runoff from aircraft and vehicle maintenance areas, garbage truck washing area, and drainage from the POL tank farm.
002	Tombigbee	Storm runoff, swimming pool filter backwash water, runoff from vehicle maintenance areas, and runoff from the fire fighting training area.
003	Buttahatchie	Storm runoff and drainage from POL pumphouse area.
004	Buttahatchie	Storm runoff (includes some runoff from flight line).

This permit expired in August 1980. Columbus AFB submitted an application for renewal to the U.S. EPA in July 1980. Due to administrative lag at U.S. EPA, the permit was not renewed. When the NPDES program was transferred to the State, files for this permit, including the renewal application, were not transferred. At the time of this survey, MAWPCC had no record of this permit. USAF OEHL brought this to the attention of U.S. EPA and MAWPCC in June 1983. The State responded that the provisions of the expired permit should be considered to be in effect until the files are brought up to date and a new permit issued. A 6 Dec 83 letter from the USAF OEHL to USAF Hospital Columbus/SGPB, with copies to the U.S. EPA and MAWPCC,

was written to help coordinate the three parties in an effort to get the NPDES files transferred to MAWPCC.

2. MS0040258. The effluent discharge pipe for the base WTP is submerged, making it impossible to collect "end-of-pipe" samples. Since the WTP does not have a chlorine contact tank, necessary contact time is provided by the discharge pipe. This permit expires 1 Dec 84.

3. MS0020028. The WTP at OLF-ALPHA is an activated sludge package plant, which is currently idle because a negligible amount of waste is generated at the site. The waste flows into the plant, but there is no effluent discharge. This permit expires 1 Dec 84. MAWPCC had no record of this permit at the time of the survey.

F. Miscellaneous

1. SGPB and the DE water and wastewater laboratories do not have the newest (15th) edition of Standard Methods for the Examination of Water and Wastewater (Standard Methods).

2. SGPB does not have operating instructions (OIs) for its drinking water and environmental monitoring programs.

IV. RECOMMENDATIONS

A. Drinking Water

1. The Air Force recommends that water taps not be flamed. A letter dated 7 October 1982, from Headquarters, Air Force, Office of the Surgeon General, states that, "flaming of taps should not be performed because it is ineffective and can be dangerous and destructive." The letter references U.S. EPA publication, Handbook for Evaluating Water Bacteriological Laboratories, p 17. A copy of this letter is being sent to SGPB, under separate cover.

We recommend that the Bioenvironmental Engineer forward a copy of the letter to the State, and request a waiver from the requirement.

2. AFR 161-44, Part 6-6b, requires a complete chemical analysis for chemical constituents of ground-water sources, every three years. An installation that has no more than three wells, producing from the same aquifer, should sample each well. An installation that has more than three wells producing from the same aquifer should sample from two outlying wells up-gradient, and from one well which is centrally located.

Even though Columbus AFB has seven production wells, we recommend chemical constituents monitoring of the three centrally located major production wells (Bldgs 363, 604, and 858), for the following reasons:

(1) These wells are, for practical purposes, the water supply wells for the base.

(2) None of the four remote wells serves more than 20 people/day.

B. Wastewater

1. The base Civil Engineer should consider whether a shorter WTP outfall will provide sufficient chlorine contact time, such that fecal coliform discharge limits are met, without excessive discharge of chlorine to Stinson Creek.

2. The volatile acids to alkalinity ratio should be added as a control indicator for the anaerobic digester. Changes in the ratio can indicate hydraulic overload, organic overload, and the presence of inhibitory concentrations of metals. This ratio should be between 0.1 and 0.25, for best results.

C. Surface Water

1. Surface water quality of the Tombigbee River basin should meet minimum conditions applicable to all waters, and specific criteria for water classified as Fish and Wildlife, as stated in the State of Mississippi Water Quality Criteria for Intrastate, Interstate and Coastal Waters. The parameters to be monitored routinely are: dissolved oxygen, pH, temperature, fecal coliforms, specific conductance, dissolved solids, and phenolic compounds.

2. Surface water quality monitoring should be expanded to include one sampling point on the Buttahatchie, above the juncture with the Tombigbee and below the two base drainage discharge points.

3. Multipoint stream sampling should be performed for the compliance monitoring. The simplest method consists of selecting three points across the stream, and collecting samples at 20 and 80 percent depths. The samples should be composited for analyses.

4. DE should excavate several boreholes between the POL storage tank and the on-base stream, so that the soil can be examined for evidence of fuel. The presence of fuel in the soil could indicate a line or tank leak, or a past fuel spill.

D. Industrial Waste, Hazardous Waste, and Chemical Storage

1. AFR 19-1 (Pollution Abatement and Environmental Quality) states that it is Air Force policy to provide control measures for environmental pollution in both new designs of facilities and in projects for rehabilitation or modification of structures. It also states that all materials shall be stored in a manner which minimizes the possibilities for pollution of the environment. This includes engineering safeguards (such as dikes, catchment areas, relief vessels) that are necessary to prevent pollution of water by accidental discharge of stored fuels, solvents, oils, and other chemicals.

Drums containing new or waste chemicals that are stored outside, should be stored on relatively impermeable surfaces, completely surrounded by a curb to contain spills. This is important where accidental chemical release onto soil can contaminate the ground water, or accidental chemical release can enter a storm drain and flow to a stream where the chemical may be toxic to fish, or cause an oxygen depletion.

In addition, waste chemicals identified as hazardous in Part 261 of the Resource Conservation and Recovery Act of 1976, such as trichloroethylene, must be stored in an area designed to minimize the possibility of any unplanned sudden or non-sudden release of that waste to soil or surface water which could threaten human health or the environment (Subpart C, 264.31).

2. Efforts to install an oil/water separator at the Auto Hobby Shop should be accelerated.

3. All aircraft washrack personnel should be instructed in the proper use of the runoff routing valve; instructions for its use should be included in the shop's OIs. A sign should be posted at the washrack as a reminder.

4. The use of aircraft cleaning soap containing phenolic compounds should be restricted to shops where its use is specifically listed in the shops' technical orders.

5. At industrial shops where the use of chemicals containing phenolic compounds are authorized, waste effluent should be routed to the sanitary sewer or a holding tank.

6. The base should follow-up on the Air Training Command Entomologist's recommendation that the front yard of the Entomology Shop be curbed to contain spills.

7. The hydraulic test stand at Aero Repair should either be operated in an area where spilled hydraulic fluid cannot flow to a storm drain or be operated in a curbed area that will contain spills.

8. The base should connect the drain at the entrance to the engine test cells to an oil/water separator, by way of a valve similar to that at the aircraft washrack. During washing operations, wastewater would be routed to the oil/water separator; at other times, runoff would be routed to natural drainage.

9. Transformers stored at the Base Supply yard should be sampled to determine PCB content. If any transformers contain greater than 50 parts per million PCBs, conditions of their storage must comply with Code of Federal Regulations, Title 40, Parts 761.60 and 761.65.

E. NPDES PERMITS

1. MS0001473. Because there is no discharge from the base water treatment plant, you should consider eliminating the discharge standards for the plant in this permit. Industrial operations listed in this permit, pp 17-19, should be reviewed and revised as necessary. Recommended parameters to be monitored at the four discharge points are shown in Table 3.

2. MS0040258. The sampling location on the discharge pipe should be discussed with the State, since you cannot collect "end-of-pipe" samples.

3. MS0020028. The base should discuss with the State the elimination of this permit, since there is no discharge at this site.

Table 3. Parameters to be Monitored at NPDES MS0001473
Discharge Points 001, 002, 003, 004*

Parameter	Limitation		Frequency	Type
	Daily Average	Daily Maximum		
Flow	—	—	1/mo	—
Temperature		38°C, 100°F	1/mo	Grab
pH	—	—	1/mo	Grab
Oil & Grease	—	15 mg/L	**	Grab
Susp Solids	—	50 mg/L	quarterly	Grab

*Monitoring at point 004 may not be necessary. The base should get an interpretation from the State on whether runoff from the flight line is considered to contain a waste discharge.

**As directed by State of Mississippi.

F. Miscellaneous

1. Each new edition of Standard Methods is considered to contain the latest and most widely accepted analytical procedures. We recommend that the SGPB and DE water and wastewater laboratories obtain copies of the 15th Edition of Standard Methods.

2. SGPB should develop OIs for its water quality monitoring program. These will allow continuity of the programs when personnel change stations. The surveillance programs that should be included are:

a. NPDES

b. State of Mississippi compliance monitoring of surface water (ambient monitoring)

c. AFR 161-44 drinking water monitoring

d. Hazardous materials inventory

The OIs should discuss sampling locations, water quality parameters, collection/preservation methods and reporting requirements. The hazardous materials OI should include an inventory of the locations where hazardous materials are used or stored. Particular attention should be given to locations that could impact upon receiving waters (surface or ground) through spills or improper disposal methods.

References

1. AFR 161-44, Management of the Drinking Water Surveillance Program (29 May 1979)
2. AFR 19-1, Pollution Abatement and Environmental Quality (9 January 1978)
3. State of Mississippi Water Quality Criteria for Intrastate, Interstate and Coastal Waters, 25 February 1982
4. Handbook for Evaluating Water Bacteriological Laboratories, 2nd Ed., EPA-670/9-75-006, August 1975
5. Operations Manual-Anaerobic Sludge Digestion, EPA-430/9-76-001, February 1976
6. Standard Methods for the Examination of Water and Wastewater, 15th Ed., 1980

